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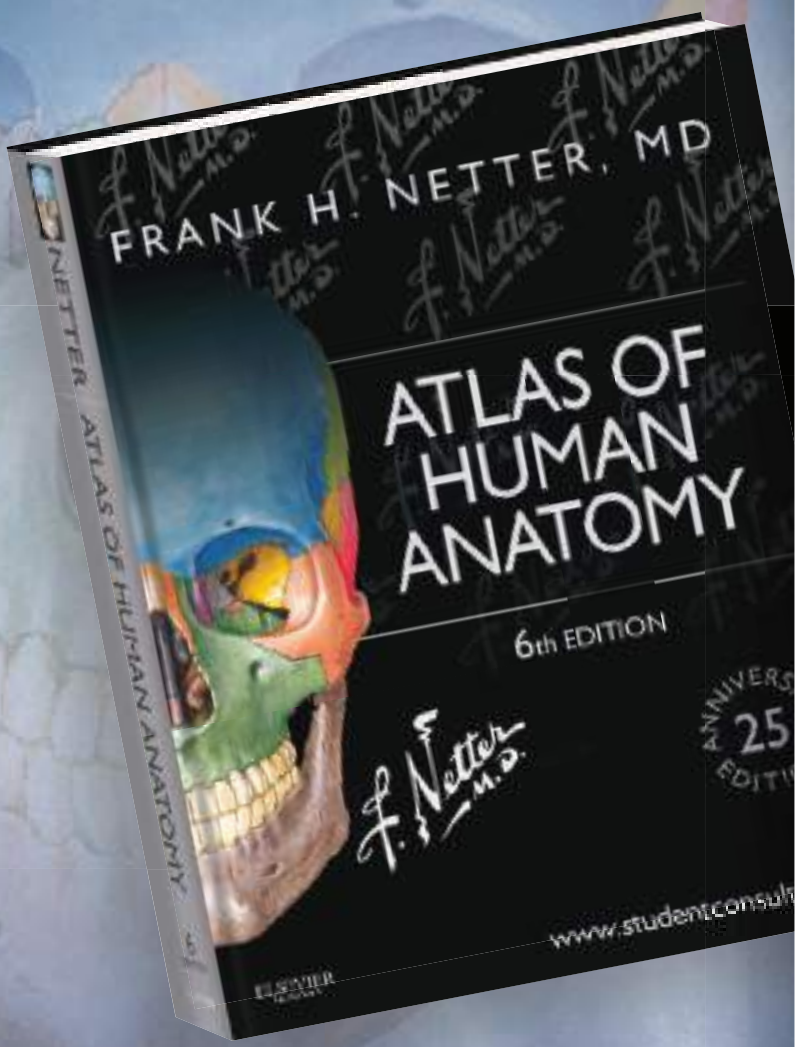

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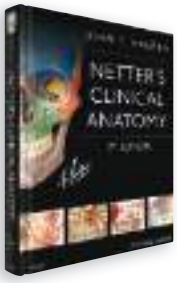

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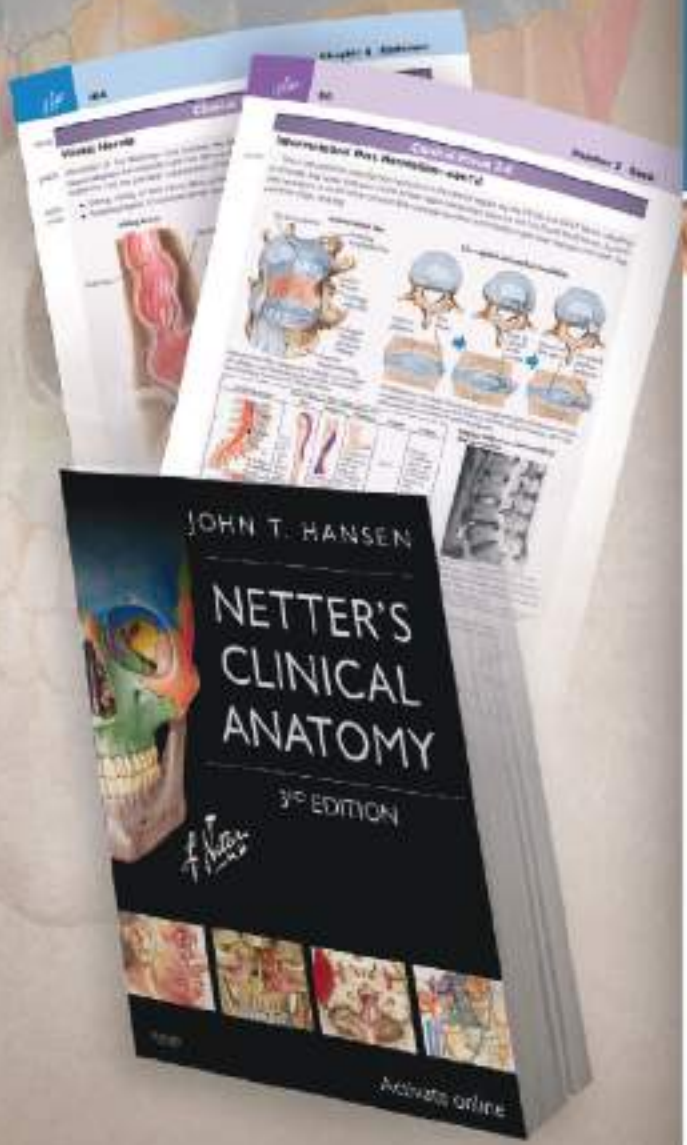

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Sixth Edition

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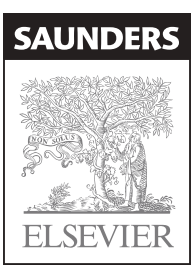

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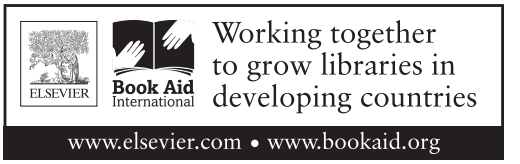

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Netter's Atlas of Human Anatomy – Celebrating 25 Years

"Anatomy, of course, does not change, but our understanding of anatomy and its clinical significance does."

– **Frank H. Netter, MD**

Whether you're using this 6th edition of ***Atlas of Human Anatomy*** in print, as an e-Book, online, or in the Netter's Anatomy Atlas for iPad app—Dr. Netter's paintings of the intricacies of the human form remain as relevant today as at first launch. The publication of the 6th edition marks the silver anniversary of the first release of Frank H. Netter's *Atlas of Human Anatomy*—when its vibrant colors and unique clinical perspective made it a must-have companion in anatomy classes, dissection labs, and clinical professional offices worldwide—solidifying his legacy to so many as one of the world's most influential medical educators.

Anatomy remains a cornerstone of healthcare education. It is often one of the first topics taught in medical or healthcare curricula. Anatomy is also central to so much in clinical practice, from physical examination and radiologic imaging to surgery and physical rehabilitation. However, changes in anatomy education and its clinical application over these past 25 years have been significant. Medical and healthcare curricula increasingly integrate anatomy throughout and dedicated gross-anatomy hours have decreased. Some programs have discontinued full-body dissection. Advances in imaging technology have provided increasingly clearer views of living anatomy, and 3D models of anatomy continue to evolve. Likewise, the *Atlas* has evolved. Thanks to the tremendous guidance of leading clinical anatomists and expert anatomy educators, as well as the contributions of talented medical illustrators, the 6th edition features newly created illustrations and modern radiologic images that provide students with views of current clinical significance and perspectives that elucidate complex anatomic relationships. This edition also includes the illustrations from older editions of the *Atlas*, like Dr. Netter's depictions of common anatomic variations (in electronic editions and print+electronic packages) as bonus plates to help provide more comprehensive coverage that dissection lab hours may not allow. For the first time, the *Atlas* incorporates muscle tables as quick look-up appendices at the end of each section for the convenience of the clinician, student, or educator with little time. StudentConsult.com and NetterReference.com electronic resources include some 3D models extracted from Netter's 3D Interactive Anatomy, dissection video selections from Netter's Online Dissection Modules by UNC at Chapel Hill, and other supporting resources. In addition, all text throughout the Atlas has been meticulously updated to be in line with the most recent version of *Terminologia Anatomica* by the Federal International Program for Anatomical Terminology (FIPAT) of the International Federation of Associations of Anatomists (IFAA).

The unique visual perspective of Frank H. Netter is unsurpassed. Dr. Netter brought the hand of a master medical illustrator, the brain of a physician, and the soul of an artist to his depictions of the human body. This 25th anniversary edition celebrates the lasting impact of his work that continues to teach and inspire.

We want to hear from you—about the history and future of anatomy education and medicine and the Netter legacy and invite you to share your thoughts, inspirations, memories, tributes, and feedback with us through email: NetterAppFeedback@elsevier.com and on Facebook: www.facebook.com/NetterImages

Frank H. Netter, MD
Photograph by James L. Clayton

To my dear wife, Vera

Preface to the First Edition

I have often said that my career as a medical artist for almost 50 years has been a sort of "command performance" in the sense that it has grown in response to the desires and requests of the medical profession. Over these many years, I have produced almost 4,000 illustrations, mostly for *The CIBA* (now *Netter*) *Collection of Medical Illustrations* but also for *Clinical Symposia.* These pictures have been concerned with the varied subdivisions of medical knowledge such as gross anatomy, histology, embryology, physiology, pathology, diagnostic modalities, surgical and therapeutic techniques, and clinical manifestations of a multitude of diseases. As the years went by, however, there were more and more requests from physicians and students for me to produce an atlas purely of gross anatomy. Thus, this atlas has come about, not through any inspiration on my part but rather, like most of my previous works, as a fulfillment of the desires of the medical profession.

It involved going back over all the illustrations I had made over so many years, selecting those pertinent to gross anatomy, classifying them and organizing them by system and region, adapting them to page size and space, and arranging them in logical sequence. Anatomy of course does not change, but our understanding of anatomy and its clinical significance does change, as do anatomical terminology and nomenclature. This therefore required much updating of many of the older pictures and even revision of a number of them in order to make them more pertinent to today's ever-expanding scope of medical and surgical practice. In addition, I found that there were gaps in the portrayal of medical knowledge as pictorialized in the illustrations I had previously done, and this necessitated my making a number of new pictures that are included in this volume.

In creating an atlas such as this, it is important to achieve a happy medium between complexity and simplification. If the pictures are too complex, they may be difficult and confusing to read; if oversimplified, they may not be adequately definitive or may even be misleading. I have therefore striven for a middle course of realism without the clutter of confusing minutiae. I hope that the students and members of the medical and allied professions will find the illustrations readily understandable, yet instructive and useful.

At one point, the publisher and I thought it might be nice to include a foreword by a truly outstanding and renowned anatomist, but there are so many in that category that we could not make a choice. We did think of men like Vesalius, Leonardo da Vinci, William Hunter, and Henry Gray, who of course are unfortunately unavailable, but I do wonder what their comments might have been about this atlas.

Frank H. Netter, MD
(1906–1991)

Frank H. Netter, MD

Frank H. Netter was born in New York City in 1906. He studied art at the Art Students League and the National Academy of Design before entering medical school at New York University, where he received his Doctor of Medicine degree in 1931. During his student years, Dr. Netter's notebook sketches attracted the attention of the medical faculty and other physicians, allowing him to augment his income by illustrating articles and textbooks. He continued illustrating as a sideline after establishing a surgical practice in 1933, but he ultimately opted to give up his practice in favor of a full-time commitment to art. After service in the United States Army during World War II, Dr. Netter began his long collaboration with the CIBA Pharmaceutical Company (now Novartis Pharmaceuticals). This 45-year partnership resulted in the production of the extraordinary collection of medical art so familiar to physicians and other medical professionals worldwide.

Icon Learning Systems acquired the Netter Collection in July 2000 and continued to update Dr. Netter's original paintings and to add newly commissioned paintings by artists trained in the style of Dr. Netter. In 2005, Elsevier Inc. purchased the Netter Collection and all publications from Icon Learning Systems. There are now over 50 publications featuring the art of Dr. Netter available through Elsevier Inc.

Dr. Netter's works are among the finest examples of the use of illustration in the teaching of medical concepts. The 13-book *Netter Collection of Medical Illustrations,* which includes the greater part of the more than 20,000 paintings created by Dr. Netter, became and remains one of the most famous medical works ever published. *The Netter Atlas of Human Anatomy,* first published in 1989, presents the anatomic paintings from the Netter Collection. Now translated into 16 languages, it is the anatomy atlas of choice among medical and health professions students the world over.

The Netter illustrations are appreciated not only for their aesthetic qualities, but, more importantly, for their intellectual content. As Dr. Netter wrote in 1949 "clarification of a subject is the aim and goal of illustration. No matter how beautifully painted, how delicately and subtly rendered a subject may be, it is of little value as a *medical illustration* if it does not serve to make clear some medical point." Dr. Netter's planning, conception, point of view, and approach are what inform his paintings and what make them so intellectually valuable.

Frank H. Netter, MD, physician and artist, died in 1991.

Acknowledgments

Brion Benninger, MD, MS

I would like to thank my wife, Alison, and our son, Jack, for their wit, caring, and the love they provide me daily. I want to thank Elsevier, especially Marybeth Thiel, for her insight and direction, enabling John Hansen, my fellow coeditors, and Carlos Machado to work in such a rich environment. I particularly want to thank my early clinical anatomy mentors, Gerald Tressidor and Harold Ellis (Guy's Hospital); Dean P. Crone and the University Board for continuous support; all my past and future patients and students; and clinical colleagues who keep anatomy dynamic. Special thanks to Jim McDaniel and Bill Bryan and all who represent what is good in teaching. Lastly, I thank my mother for her love of education and my father for his inquisitive mind.

Jennifer Brueckner-Collins, PhD

I am very grateful to the wonderful Elsevier team, particularly Marybeth Thiel and Elyse O'Grady, for their guidance and expertise during our preparation of the sixth edition. It is always privilege to collaborate with Carlos Machado, whose artistic talent brings our anatomical visions from concept to reality. Sincere thanks to Mark Sturgill, DO, who most generously provided us with updated images for abdominal MRCP, axial and coronal CT with contrast, as well as CT angiography. Finally, I am eternally indebted to my parents, John and Rheba, and to my husband, Kurt, for their support, encouragement, love, and inspiration; they are my raison d'etre.

John T. Hansen, PhD

At Elsevier I would like to thank Marybeth Thiel, Senior Development Editor, Elyse O'Grady, Senior Content Strategist, John Casey, Senior Project Manager, and Madelene Hyde, Publishing Director, for their continuous support and meticulous attention to detail during the development of this sixth edition of the *Atlas of Human Anatomy.* They, along with the entire Editorial, Production, Design, and Marketing team at Elsevier have been a delight to work with and to know. I am also indebted to Carlos Machado for his superb artistic skill in producing and updating plates appearing in the *Atlas*. His renderings of human anatomy are the perfect complement to the Netter images. In addition to my fellow editors of this edition, I wish to express my thanks to my faculty colleagues at Rochester and to all my past and present students who have provided generous and constructive feedback and have enriched my life. Finally, I am indebted to my entire family for their continued support and especially to my wife, Paula. Their love and encouragement sustains me and is the source of all the happiness and joy I know.

Todd M. Hoagland, PhD

It is a privilege to teach clinical human anatomy and I am eternally grateful to all the body donors and their families for enabling healthcare professionals to train in the dissection laboratory. It is my honor to work with outstanding medical students and colleagues at the Medical College of Wisconsin. I am grateful to John Hansen and the professionals of the Elsevier team for the opportunity to be a steward of the incomparable *Netter Atlas*. Marybeth Thiel and Elyse O'Grady were especially helpful and a pleasure to work with. It was an honor to collaborate with the brilliant Carlos Machado and all the consulting editors. I thank Joe Besharse for being an outstanding mentor. I am deeply appreciative of Stan Hillman and Jack O'Malley for inspiring me with masterful teaching and rigorous expectations. I am indebted to Richard Hoyt, Jr., for helping me become a competent anatomist, and to Rob Bouchie for his support. I am most grateful to my brother, Bill, for his unwavering optimism and gregarious nature. I thank my mother, Liz, for her dedication and love and for instilling a strong work ethic. Finally, I am humbled by my two awesome children, Ella and Caleb, for helping me redefine love, wonder, and joy.

R. Shane Tubbs, MS, PA-C, PhD

First and foremost, I would like to thank Elsevier and in particular, Madelene Hyde, Marybeth Thiel, and Elyse O'Grady for all of their hard work in making this edition come to life. The evolution of the current atlas continues with the superb skills of Dr. Carlos Machado and his works of art. I would like to thank Dr. Satinder Singh for his kind assistance in providing radiographic images of the heart. I thank my beautiful wife, Susan, and son, Isaiah, for their patience and guidance during the editing of the sixth edition. Without the continued support of my mentor, friend, and colleague, Dr. W. Jerry Oakes, I could not fulfill all of my academic endeavors. I dedicate my efforts in this edition to my late brother-in-law, Nelson Jones, whose appetite for inquisitiveness inspires me today.

Contents

Section 1 HEAD AND NECK

Topographic Anatomy	1
Superficial Head and Neck	2–3
Bones and Ligaments	4–23
Superficial Face	24–25
Neck	26–34
Nasal Region	35–55
Oral Region	56–63
Pharynx	64–75
Thyroid Gland and Larynx	76–82
Orbit and Contents	83–93
Ear	94–100
Meninges and Brain	101–116
Cranial and Cervical Nerves	117–136
Cerebral Vasculature	137–149
Regional Scans	150–151
Muscle Tables	Table 1-1–Table 1-6

Section 2 BACK AND SPINAL CORD

Topographic Anatomy	152
Bones and Ligaments	153–159
Spinal Cord	160–170
Muscles and Nerves	171–175
Cross-Sectional Anatomy	176–177
Muscle Tables	Table 2-1–Table 2-2

Section 3 THORAX

Topographic Anatomy	178
Mammary Gland	179–182
Body Wall	183–192
Lungs	193–207
Heart	208–226
Mediastinum	227–236
Regional Scans	237
Cross-Sectional Anatomy	238–241
Muscle Table	Table 3-1

Section 4 ABDOMEN

Topographic Anatomy	242
Body Wall	243–262
Peritoneal Cavity	263–268
Viscera (Gut)	269–276
Viscera (Accessory Organs)	277–282
Visceral Vasculature	283–296
Innervation	297–307

Kidneys and Suprarenal Glands 308–320
Sectional Anatomy 321–328
Muscle Table Table 4-1

Section 5 PELVIS AND PERINEUM

Topographic Anatomy 329
Bones and Ligaments 330–334
Pelvic Floor and Contents 335–345
Urinary Bladder 346–348
Uterus, Vagina, and Supporting Structures 349–353
Perineum and External Genitalia: Female 354–357
Perineum and External Genitalia: Male 358–365
Homologues of Genitalia 366–367
Testis, Epididymis, and Ductus Deferens 368
Rectum 369–374
Regional Scans 375
Vasculature 376–386
Innervation 387–395
Cross-Sectional Anatomy 396–397
Muscle Tables Table 5-1–Table 5-2

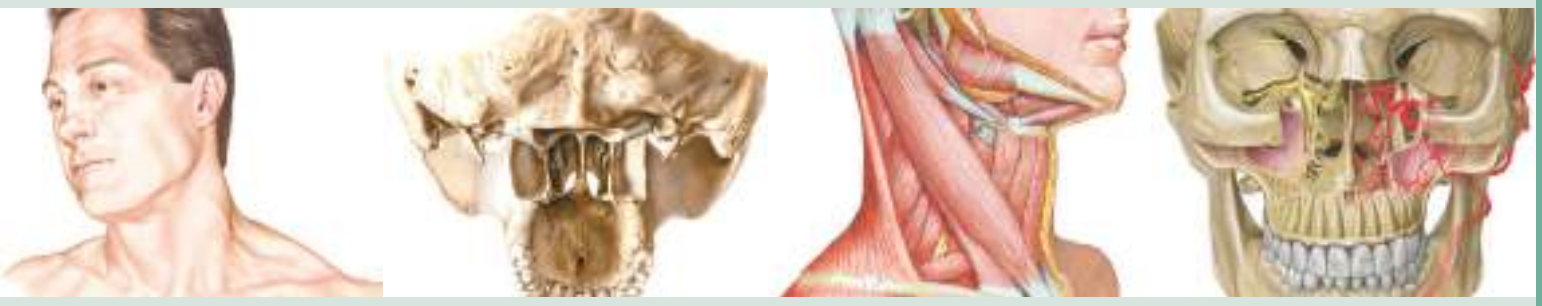
Section 6 UPPER LIMB

Topographic Anatomy 398
Cutaneous Anatomy 399–403
Shoulder and Axilla 404–416
Arm 417–421
Elbow and Forearm 422–438
Wrist and Hand 439–458
Neurovasculature 459–466
Regional Scans 467
Muscle Tables Table 6-1–Table 6-4

Section 7 LOWER LIMB

Topographic Anatomy 468
Cutaneous Anatomy 469–472
Hip and Thigh 473–492
Knee 493–499
Leg 500–510
Ankle and Foot 511–524
Neurovasculature 525–529
Regional Scans 530–531
Muscle Tables Table 7-1–Table 7-4

References 577



Section

1 HEAD AND NECK

Topographic Anatomy

Plate 1

1 Head and Neck: Surface Anatomy

Superficial Head and Neck

Plates 2–3

2 Cutaneous Nerves of Head and Neck
3 Superficial Arteries and Veins of Face and Scalp

Bones and Ligaments

Plates 4–23

4 Skull: Anterior View
5 Skull: Anteroposterior Radiograph
6 Skull: Lateral View
7 Skull: Lateral Radiograph
8 Skull: Midsagittal Section
9 Calvaria
10 Cranial Base: Inferior View
11 Cranial Base: Superior View
12 Foramina and Canals of Cranial Base: Inferior View
13 Foramina and Canals of Cranial Base: Superior View
14 Skull of Newborn
15 Bony Framework of Head and Neck
16 Pterygoid Fossae: Posterior and Inferolateral Views
17 Mandible

18 Temporomandibular Joint
19 Cervical Vertebrae: Atlas and Axis
20 Cervical Vertebrae (continued)
21 Cervical Vertebrae: Uncovertebral Joints
22 External Craniocervical Ligaments
23 Internal Craniocervical Ligaments

Superficial Face

Plates 24–25

24 Facial Nerve Branches and Parotid Gland
25 Muscles of Facial Expression: Lateral View

Neck

Plates 26–34

26 Fascial Layers of Neck
27 Muscles of Neck: Anterior View
28 Infrahyoid and Suprahyoid Muscles
29 Muscles of Neck: Lateral View
30 Scalene and Prevertebral Muscles
31 Superficial Veins and Cutaneous Nerves of Neck
32 Nerves and Vessels of Neck
33 Nerves and Vessels of Neck (continued)
34 Carotid Arteries

Nasal Region

Plates 35–55

35 Nose
36 Lateral Wall of Nasal Cavity
37 Lateral Wall of Nasal Cavity (continued)
38 Medial Wall of Nasal Cavity (Nasal Septum)
39 Nerves of Nasal Cavity
40 Arteries of Nasal Cavity: Nasal Septum Turned Up
41 Nerves of Nasal Cavity: Nasal Septum Turned Up
42 Nose and Maxillary Sinus: Transverse Section
43 Paranasal Sinuses
44 Paranasal Sinuses (continued)
45 Paranasal Sinuses: Changes with Age
46 Salivary Glands
47 Tongue and Salivary Glands: Sections
48 Muscles Involved in Mastication
49 Muscles Involved in Mastication (continued)
50 Mandibular Nerve (V_3)
51 Maxillary Artery
52 Ophthalmic (V_1) and Maxillary (V_2) Nerves
53 Autonomic Innervation of Nasal Cavity
54 Pterygopalatine Fossa
55 Orientation of Nerves and Vessels of the Cranial Base

Oral Region

Plates 56–63

56 Inspection of Oral Cavity
57 Roof of Oral Cavity
58 Floor of Oral Cavity
59 Tongue
60 Tongue (continued)
61 Afferent Innervation of Oral Cavity and Pharynx
62 Teeth
63 Teeth (continued)

Pharynx

Plates 64–75

64 Pharynx: Median Section
65 Muscles of Pharynx: Sagittal Section
66 Pharynx: Opened Posterior View
67 Muscles of Pharynx: Partially Opened Posterior View
68 Fauces
69 Pharyngoesophageal Junction
70 Muscles of Pharynx: Lateral View
71 Nerves of Oral and Pharyngeal Regions
72 Arteries of Oral and Pharyngeal Regions
73 Veins of Oral and Pharyngeal Regions
74 Lymph Vessels and Nodes of Head and Neck
75 Lymph Vessels and Nodes of Pharynx and Tongue

Thyroid Gland and Larynx

Plates 76–82

76 Thyroid Gland: Anterior View
77 Thyroid Gland and Pharynx: Posterior View
78 Parathyroid Glands
79 Cartilages of Larynx
80 Intrinsic Muscles of Larynx
81 Action of Intrinsic Muscles of Larynx
82 Nerves of Larynx

Orbit and Contents

Plates 83–93

83 Eyelids
84 Lacrimal Apparatus
85 Fasciae of Orbit and Eyeball
86 Extrinsic Eye Muscles
87 Arteries and Veins of Orbit and Eyelids
88 Nerves of Orbit
89 Eyeball
90 Anterior and Posterior Chambers of Eye
91 Lens and Supporting Structures
92 Intrinsic Arteries and Veins of Eye
93 Vascular Supply of Eye

Ear

Plates 94–100

94 Pathway of Sound Reception
95 External Ear and Tympanic Cavity
96 Tympanic Cavity
97 Bony and Membranous Labyrinths
98 Bony and Membranous Labyrinths (continued)
99 Orientation of Labyrinths in Skull
100 Pharyngotympanic (Auditory, Eustachian) Tube

Meninges and Brain

Plates 101–116

101 Meninges and Diploic Veins
102 Meningeal Arteries
103 Meninges and Superficial Cerebral Veins
104 Dural Venous Sinuses
105 Dural Venous Sinuses (continued)
106 Cerebrum: Lateral Views
107 Cerebrum: Medial Views
108 Cerebrum: Inferior View
109 Ventricles of Brain
110 Circulation of Cerebrospinal Fluid
111 Basal Nuclei (Ganglia)
112 Thalamus
113 Hippocampus and Fornix
114 Cerebellum
115 Brainstem
116 Fourth Ventricle and Cerebellum

Cranial and Cervical Nerves

Plates 117–136

117 Cranial Nerve Nuclei in Brainstem: Schema
118 Cranial Nerve Nuclei in Brainstem: Schema (continued)
119 Cranial Nerves (Motor and Sensory Distribution): Schema
120 Olfactory Nerve (I): Schema
121 Optic Nerve (II) (Visual Pathway): Schema
122 Oculomotor (III), Trochlear (IV), and Abducent (VI) Nerves: Schema
123 Trigeminal Nerve (V): Schema
124 Facial Nerve (VII): Schema
125 Vestibulocochlear Nerve (VIII): Schema
126 Glossopharyngeal Nerve (IX): Schema
127 Vagus Nerve (X): Schema
128 Accessory Nerve (XI): Schema
129 Hypoglossal Nerve (XII): Schema
130 Cervical Plexus: Schema
131 Autonomic Nerves in Neck
132 Autonomic Nerves in Head
133 Ciliary Ganglion: Schema
134 Pterygopalatine and Submandibular Ganglia: Schema
135 Otic Ganglion: Schema
136 Taste Pathways: Schema

Cerebral Vasculature

Plates 137–149

137 Arteries to Brain and Meninges

138 Internal Carotid Artery in Petrous Part of Temporal Bone

139 Arteries to Brain: Schema

140 Arteries of Brain: Inferior Views

141 Cerebral Arterial Circle (of Willis)

142 Arteries of Brain: Frontal View and Section

143 Arteries of Brain: Lateral and Medial Views

144 Arteries of Posterior Cranial Fossa

145 Veins of Posterior Cranial Fossa

146 Deep Veins of Brain

147 Subependymal Veins of Brain

148 Hypothalamus and Hypophysis

149 Arteries and Veins of Hypothalamus and Hypophysis

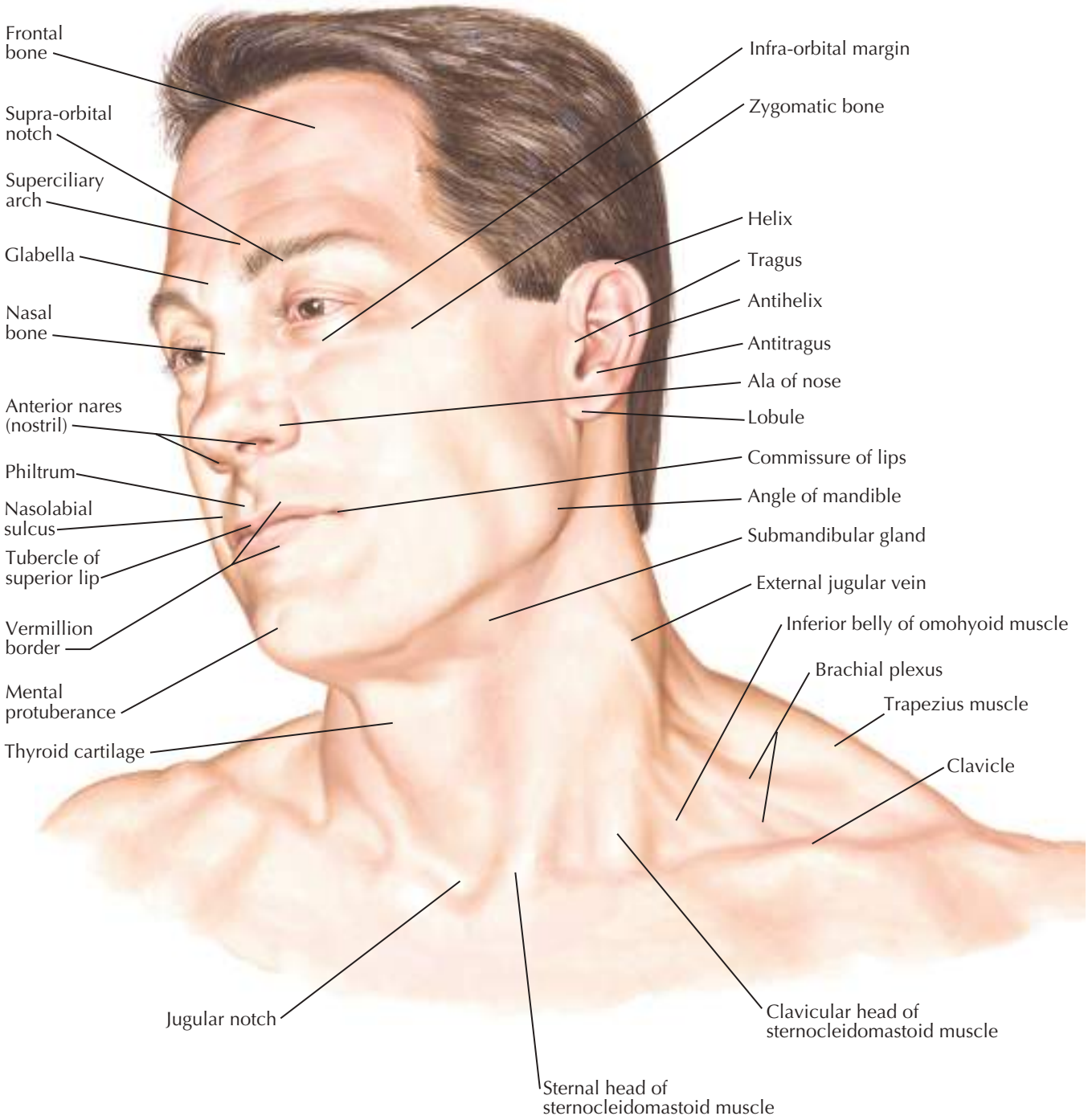
Regional Scans

Plates 150–151

150 Cranial Imaging (MRV and MRA)

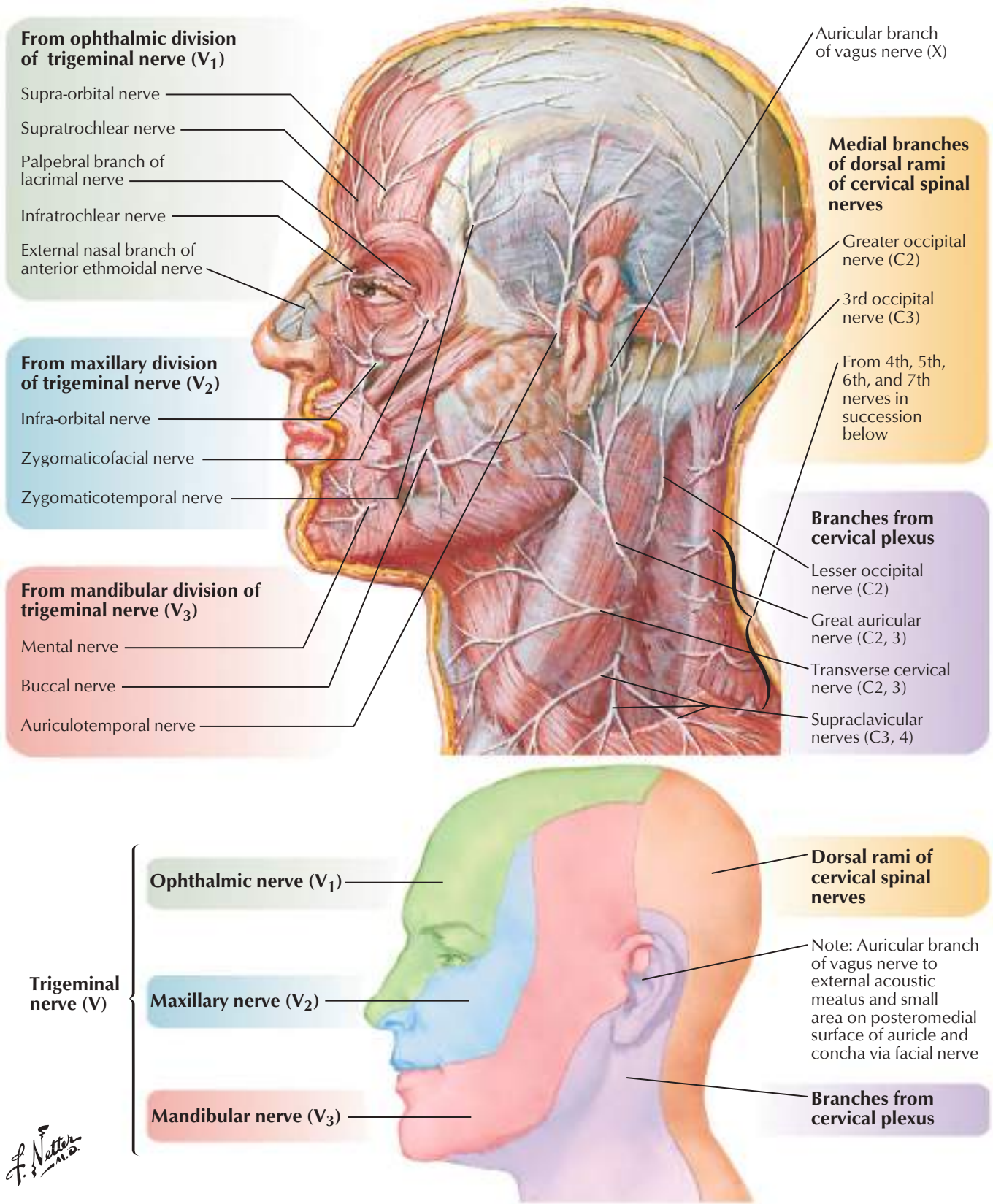
151 Cranial Imaging (MRI)

Muscle Tables


Frontal bone
Supra-orbital notch
Superciliary arch
Glabella
Nasal bone
Anterior nares (nostril)
Philtrum
Nasolabial sulcus
Tubercle of superior lip
Vermillion border
Mental protuberance
Thyroid cartilage
Jugular notch
Infra-orbital margin
Zygomatic bone
Helix
Tragus
Antihelix
Antitragus
Ala of nose
Lobule
Commissure of lips
Angle of mandible
Submandibular gland
External jugular vein
Inferior belly of omohyoid muscle
Brachial plexus
Trapezius muscle
Clavicle
Clavicular head of sternocleidomastoid muscle
Sternal head of sternocleidomastoid muscle
C. Machado M.D.

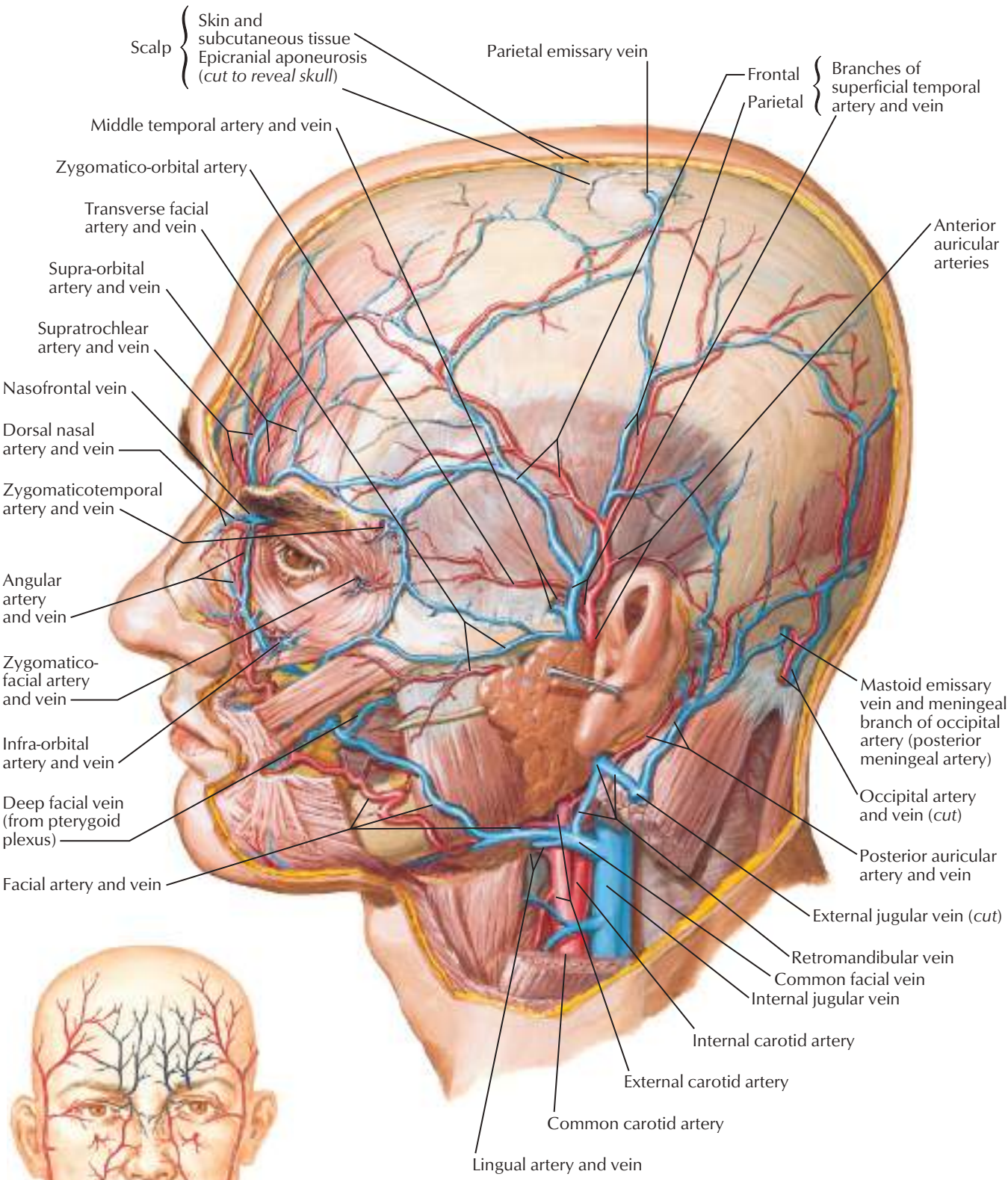
Cutaneous Nerves of Head and Neck

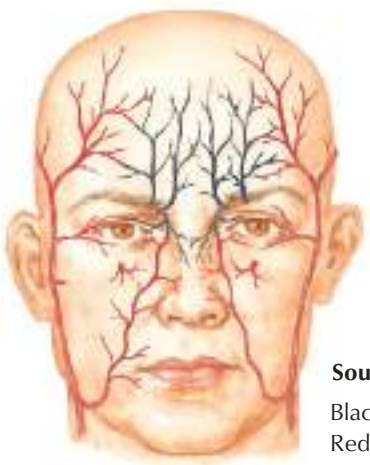
See also Plates 32, 35, 52



Superficial Arteries and Veins of Face and Scalp

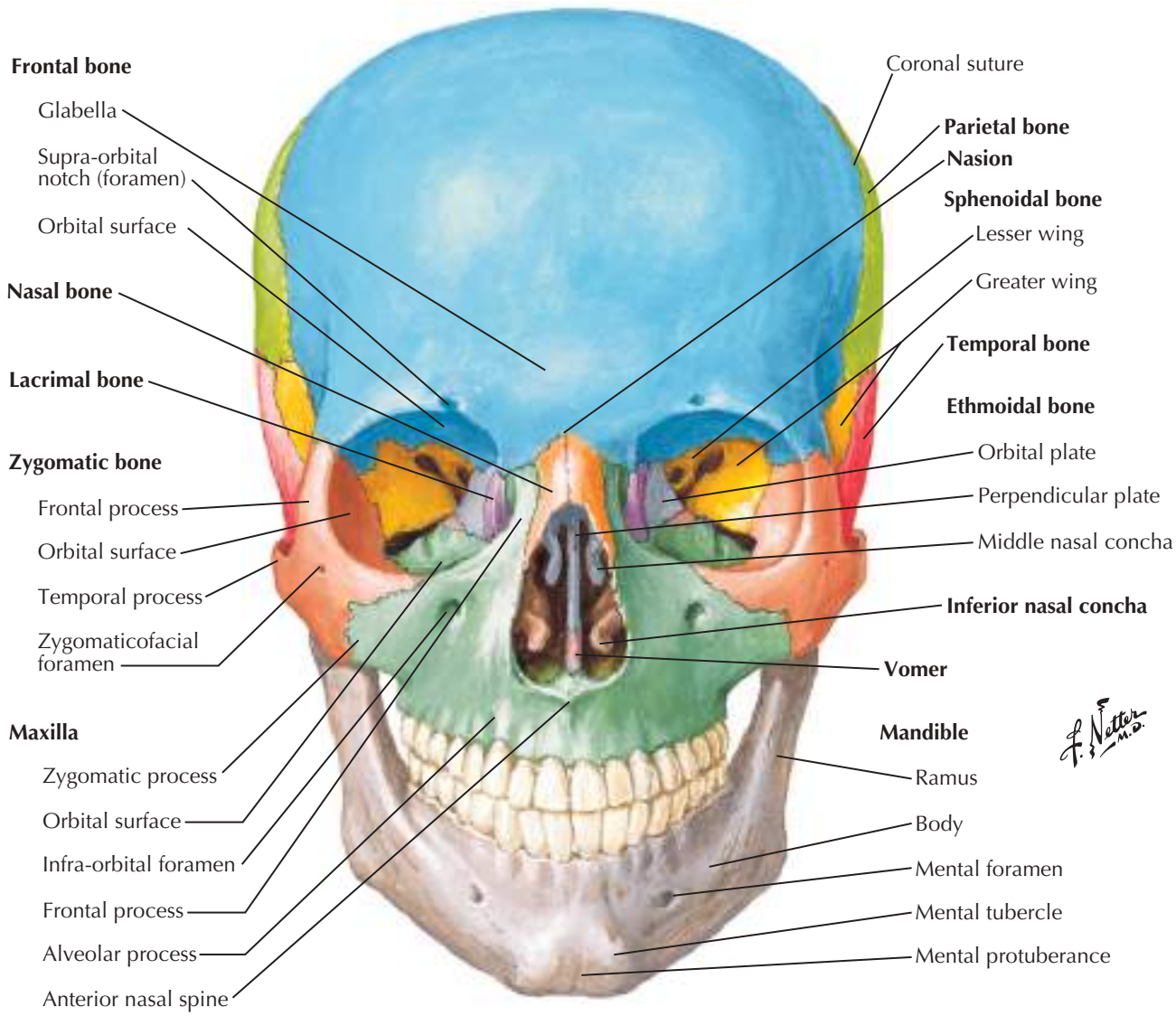
See also Plates 51, 72, 73



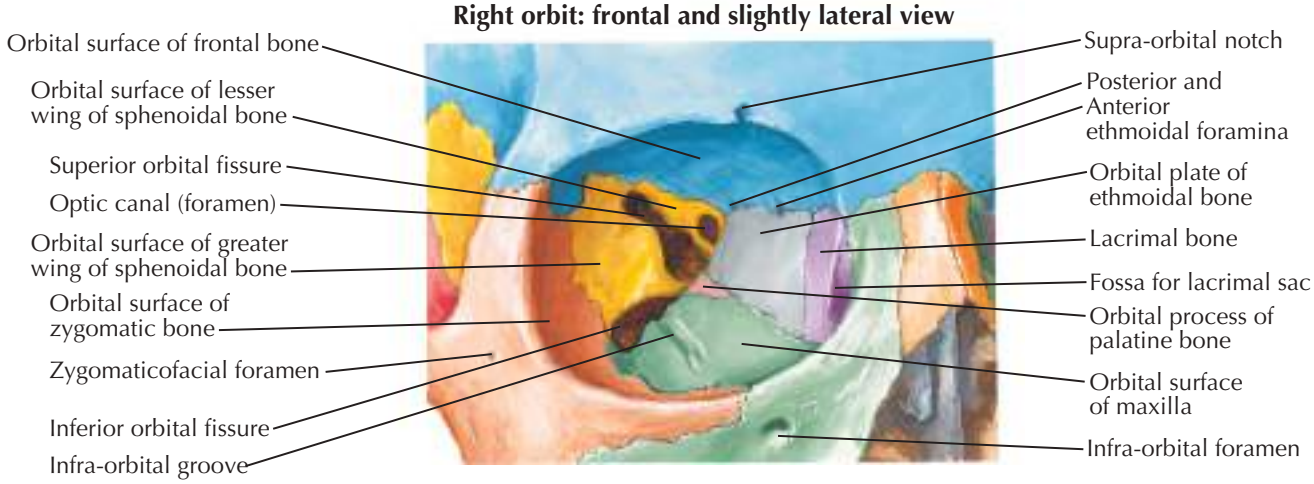


Sources of arterial supply of face

Black: from internal carotid artery (via ophthalmic artery)
Red: from external carotid artery

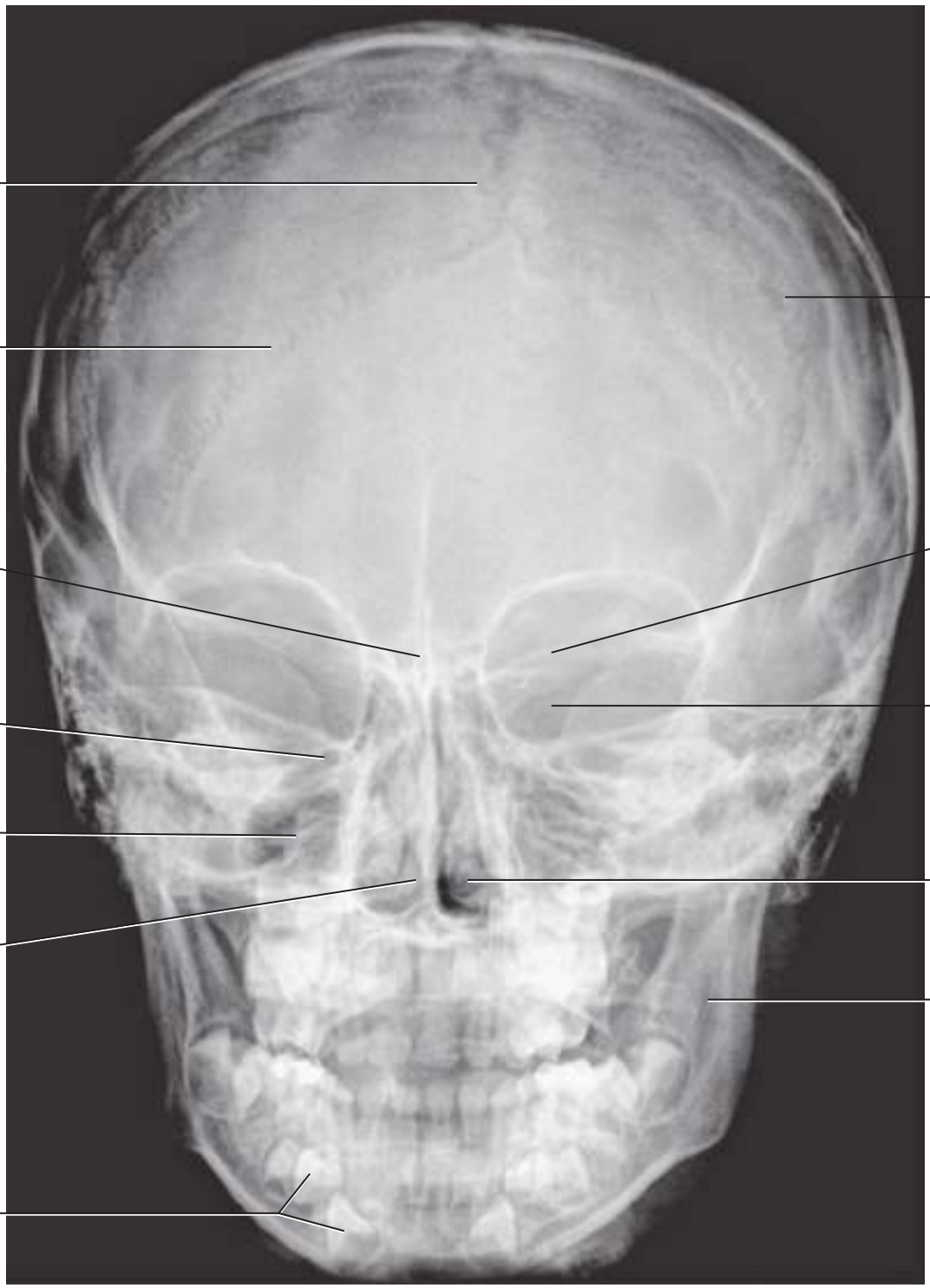


Right orbit: frontal and slightly lateral view



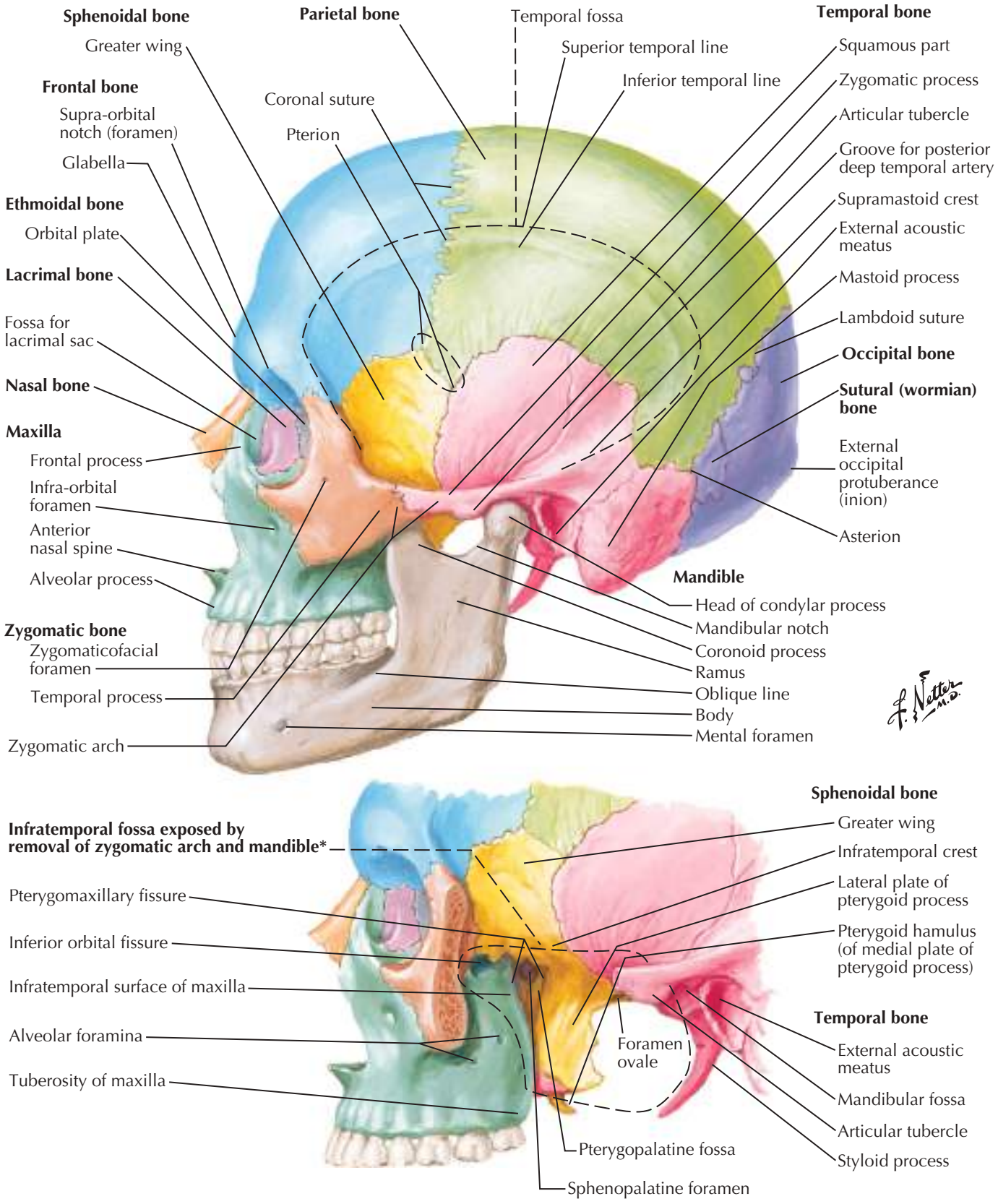
Skull: Anteroposterior Radiograph

See also **Plate 4**



Skull: Lateral View

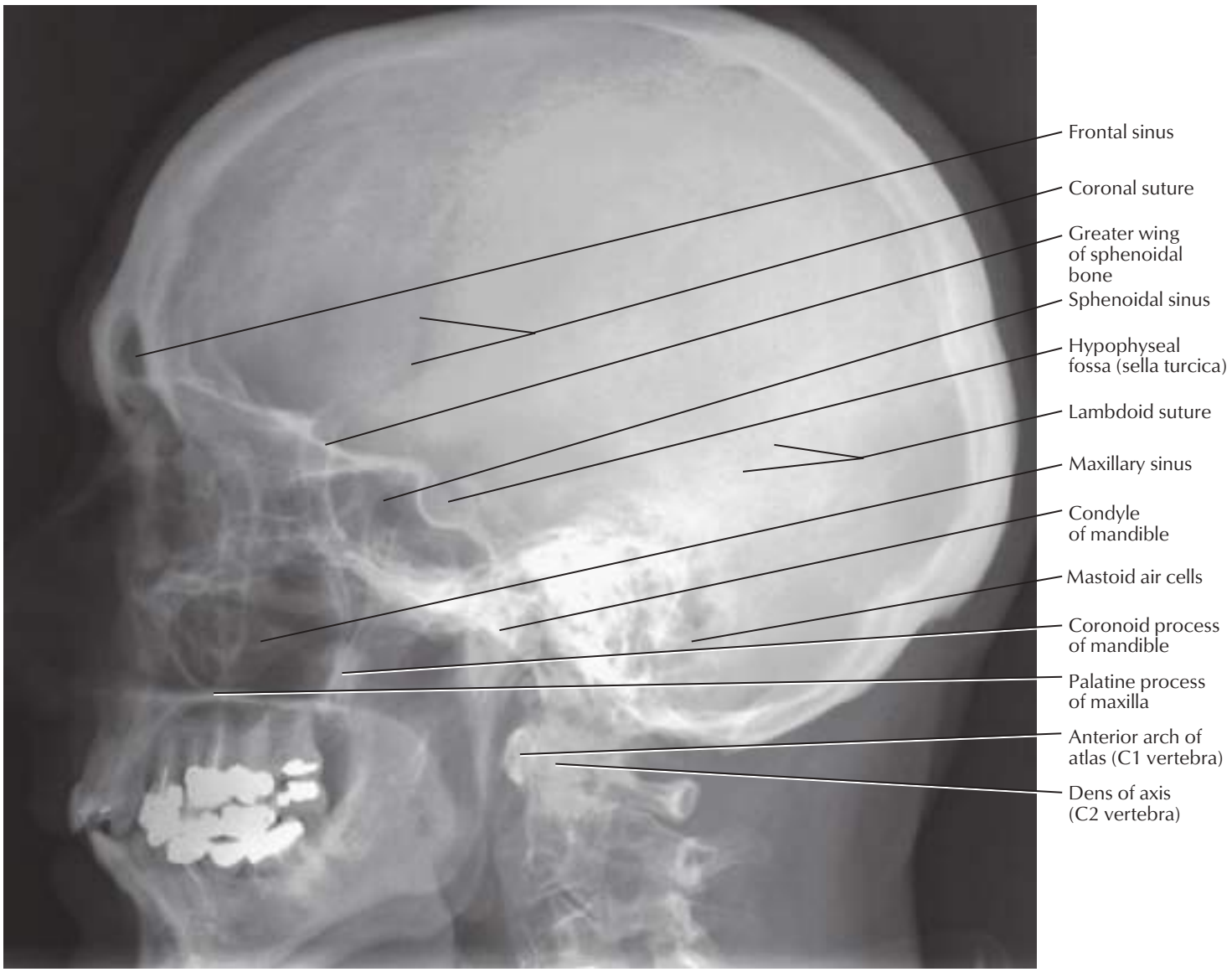
See also **Plates 7, 8, 15**



**Superficially, mastoid process forms posterior boundary.*

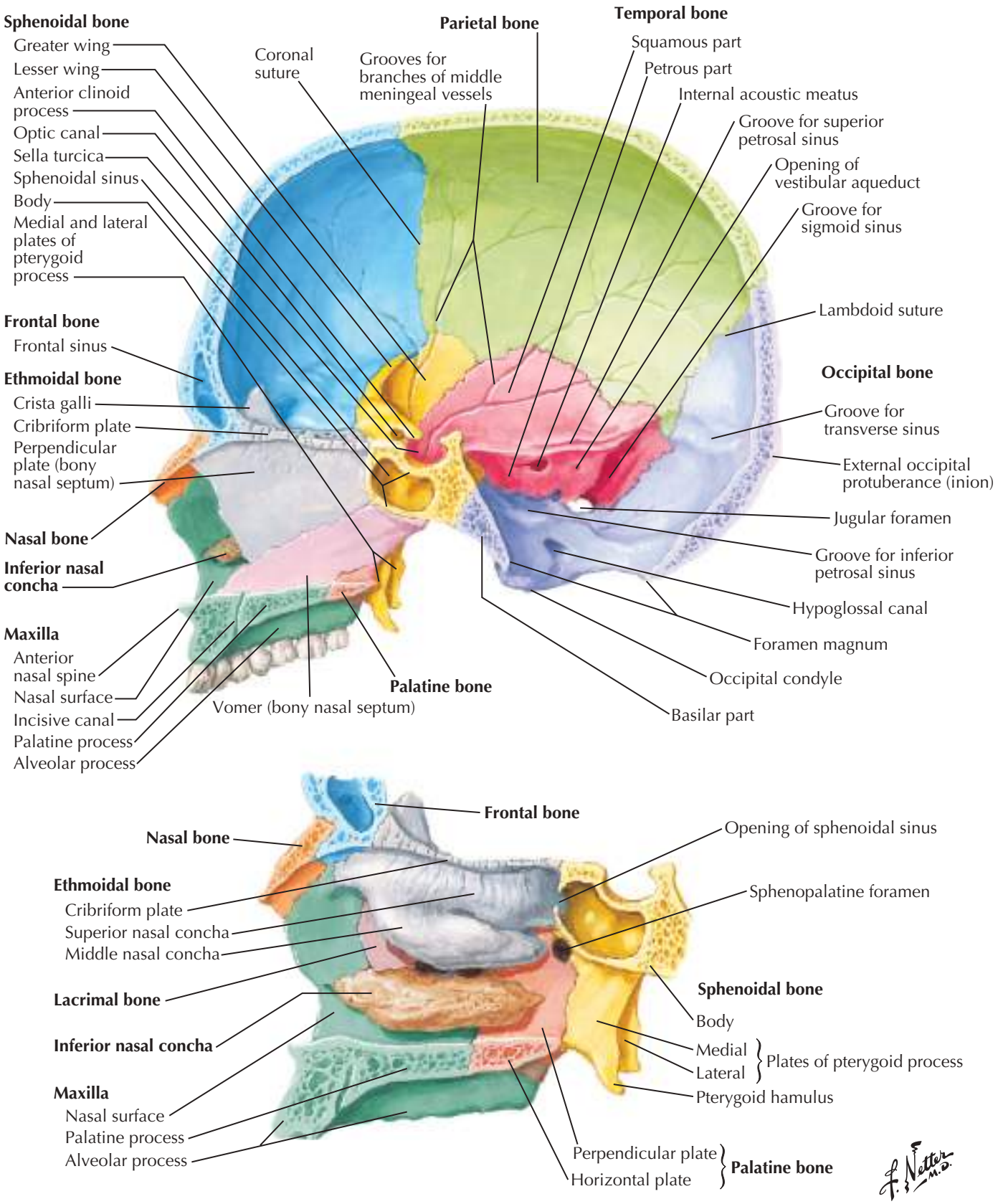
Skull: Lateral Radiograph

See also **Plate 8**

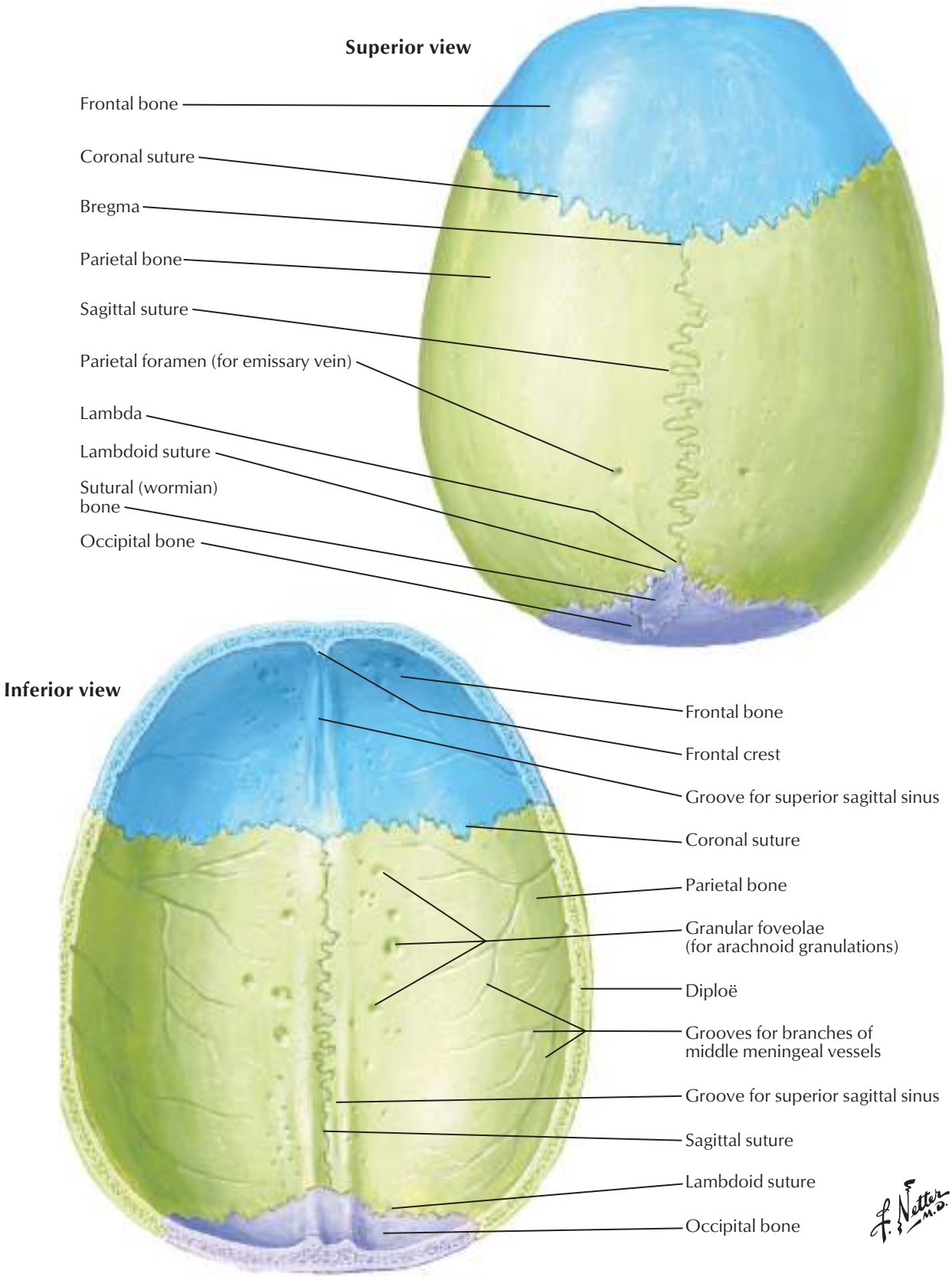


Skull: Midsagittal Section

See also Plates 37, 39

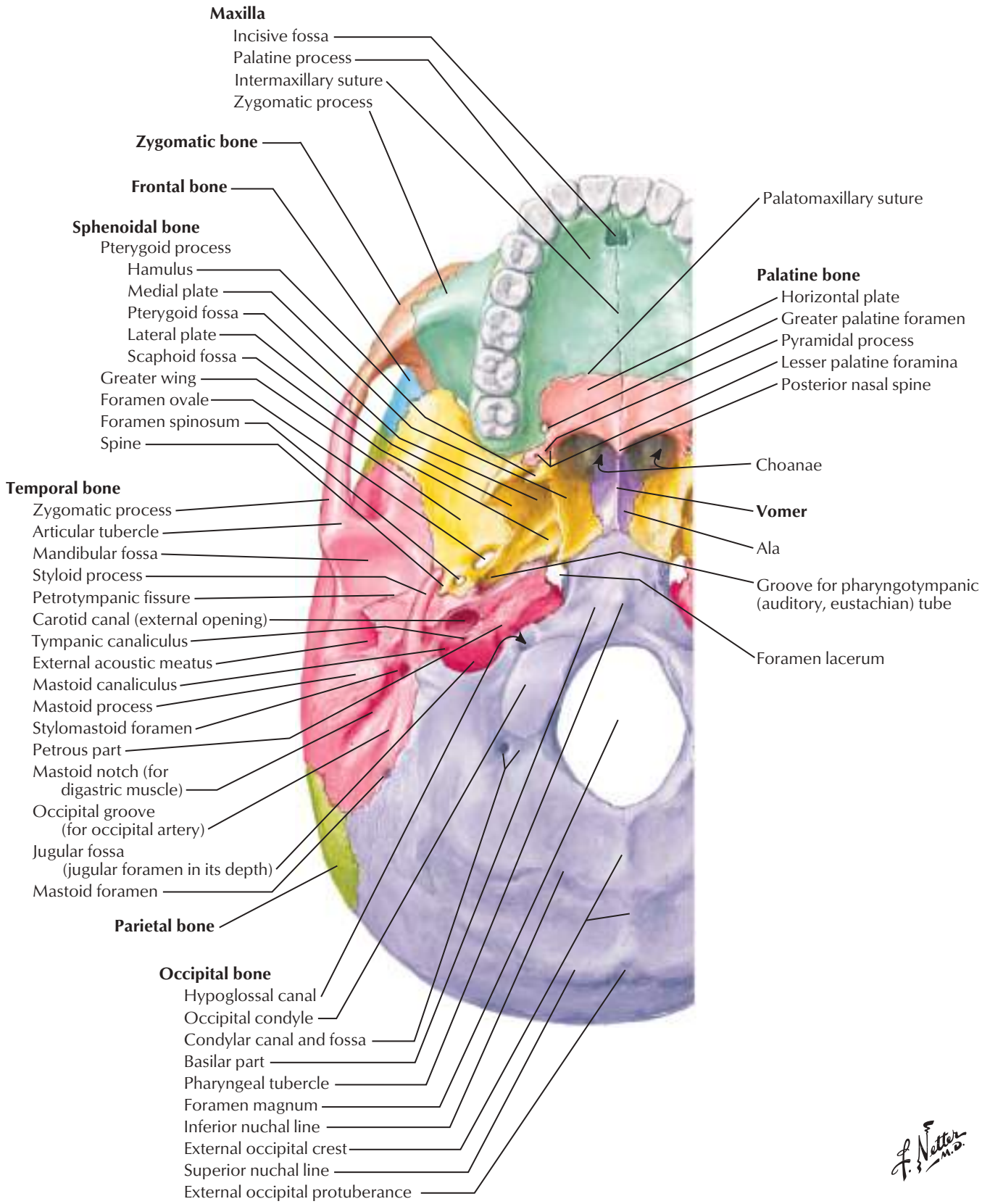


View of lateral nasal wall with nasal septum removed


Superior view
Frontal bone
Coronal suture
Bregma
Parietal bone
Sagittal suture
Parietal foramen (for emissary vein)
Lambda
Lambdoid suture
Sutural (wormian) bone
Occipital bone
Inferior view
Frontal bone
Frontal crest
Groove for superior sagittal sinus
Coronal suture
Parietal bone
Granular foveolae (for arachnoid granulations)
Diploë
Grooves for branches of middle meningeal vessels
Groove for superior sagittal sinus
Sagittal suture
Lambdoid suture
Occipital bone
F. Netter M.D.

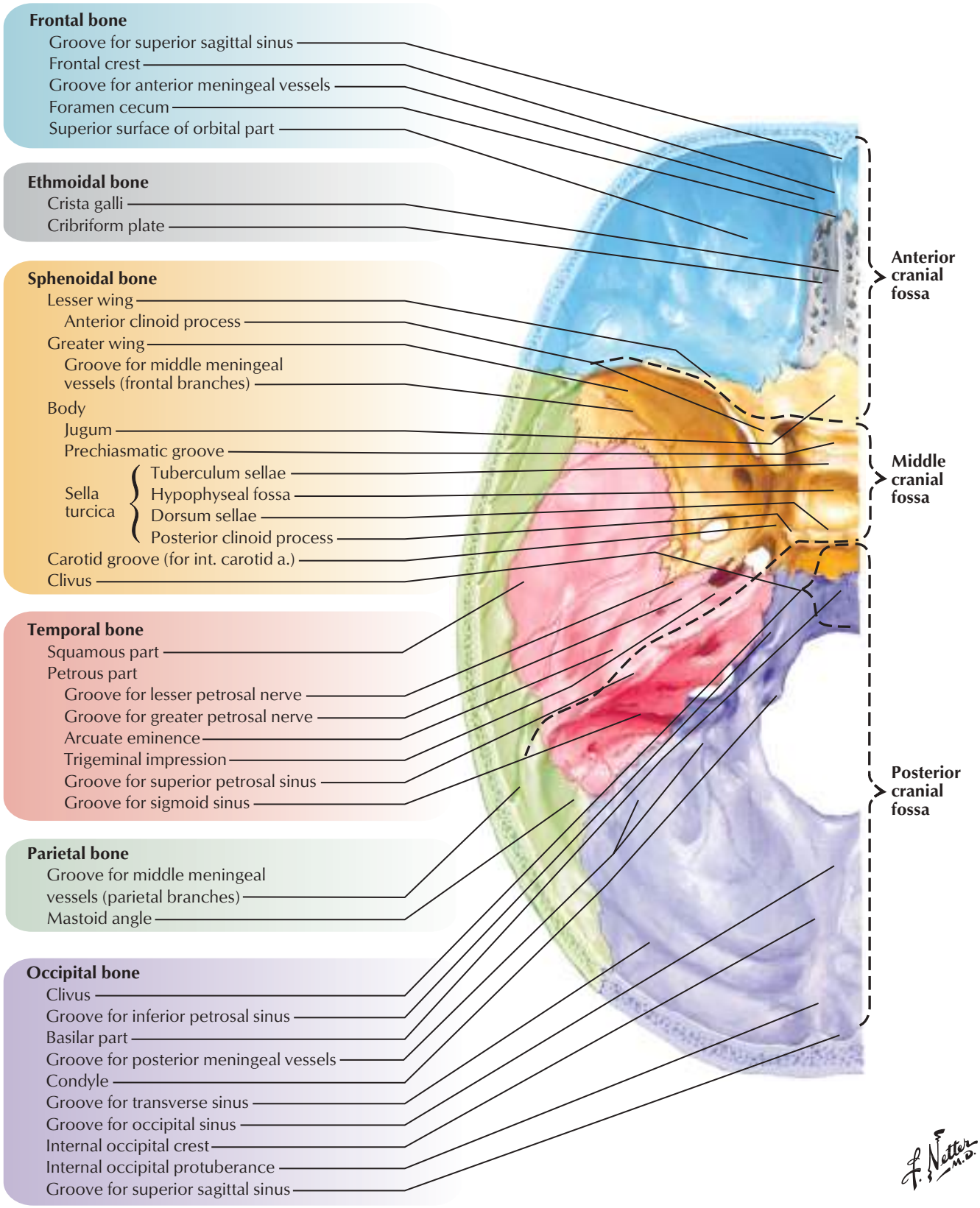
Cranial Base: Inferior View

See also **Plate 12**



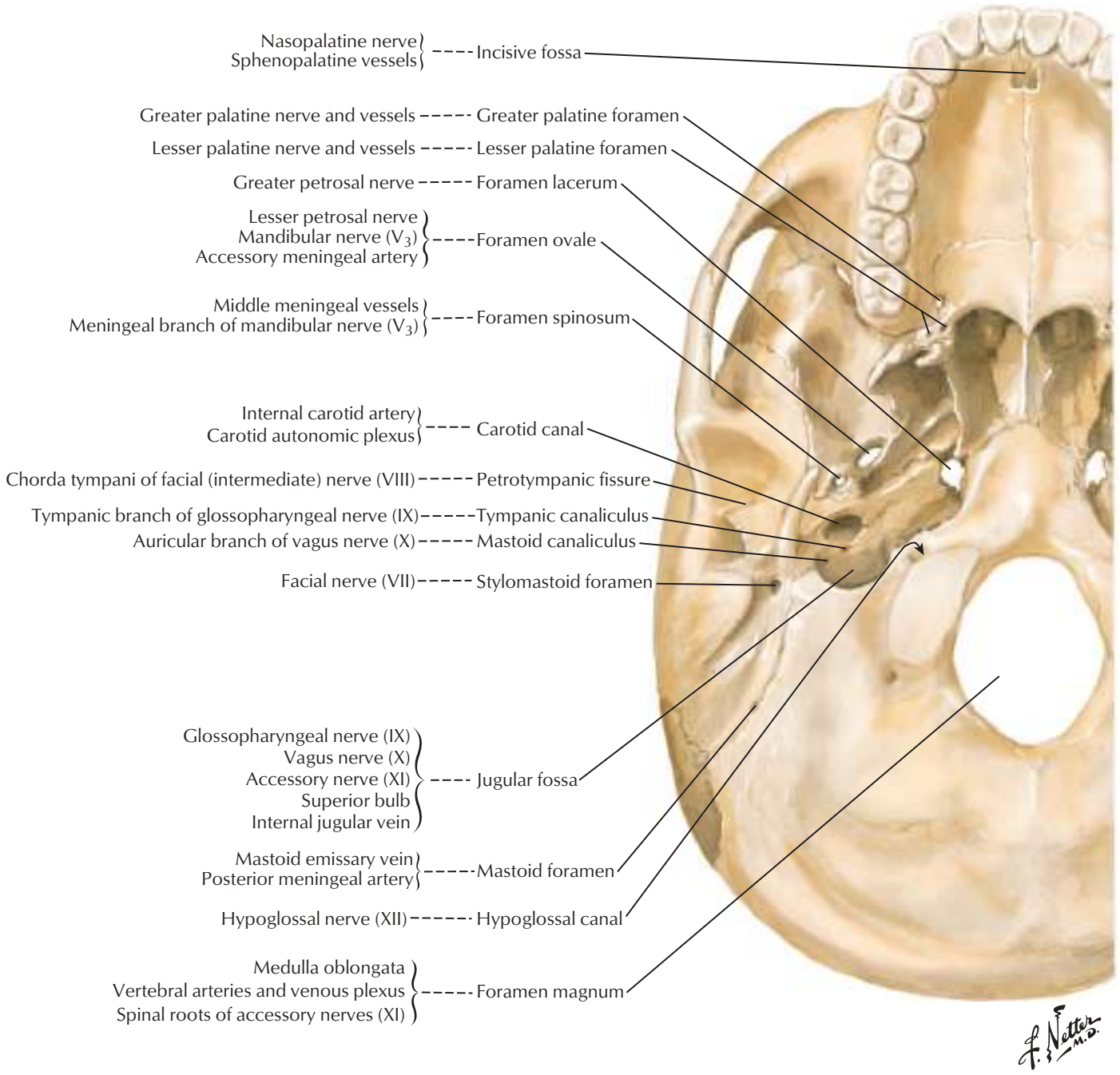
Cranial Base: Superior View

See also Plate 13



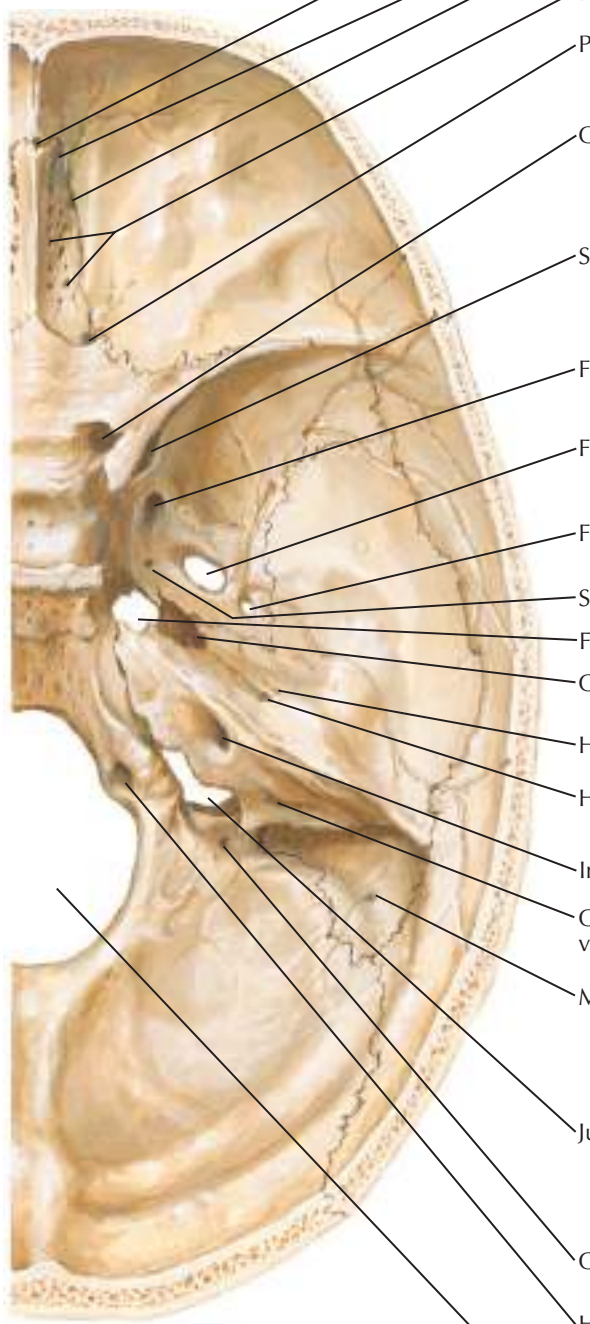
Foramina and Canals of Cranial Base: Inferior View

See also **Plate 10**



Foramina and Canals of Cranial Base: Superior View

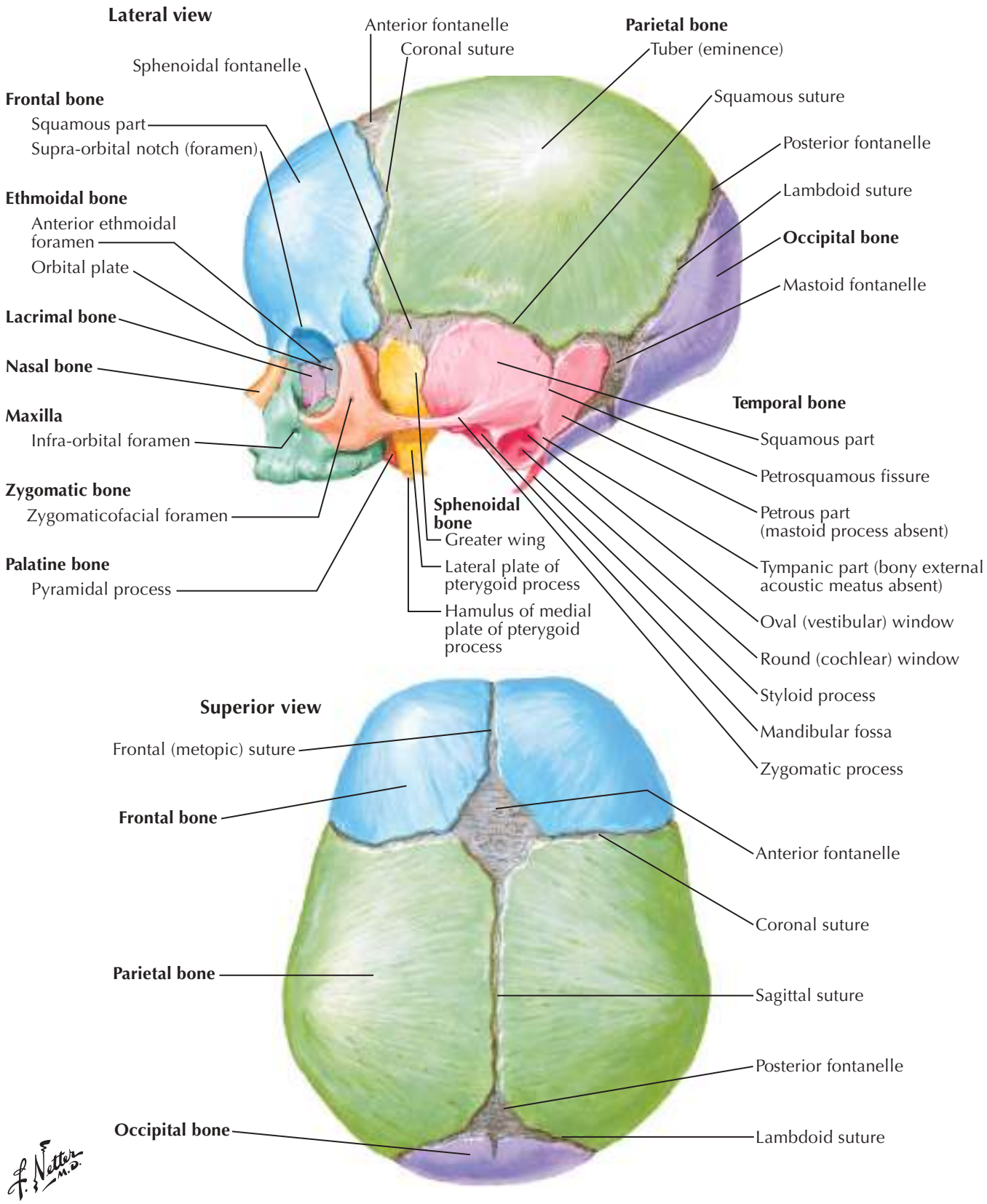
See also **Plate 11**

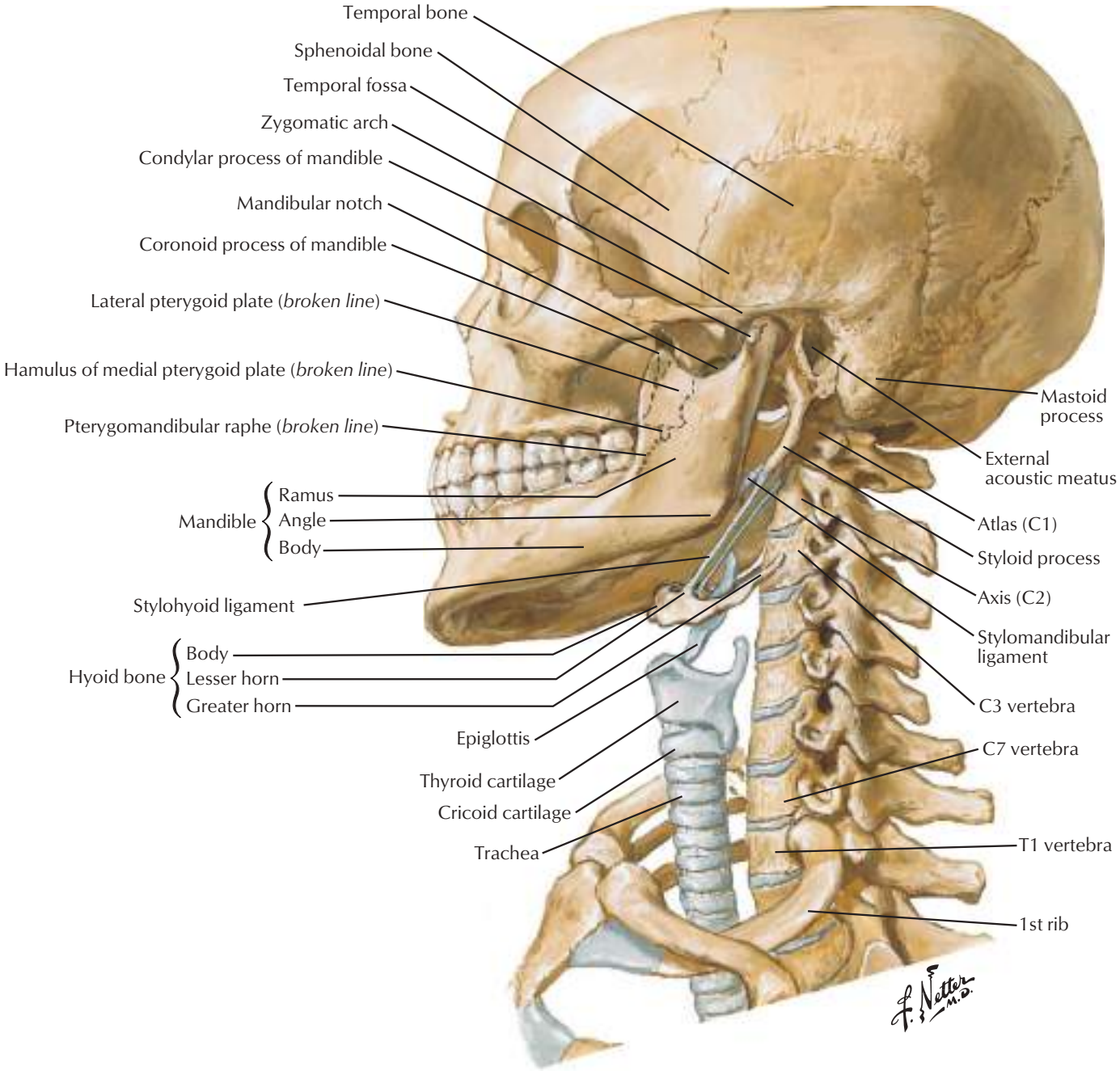


Foramen cecum	Emissary vein to superior sagittal sinus
Nasal slit Anterior ethmoidal foramen	Anterior ethmoidal artery, vein, and nerve
Foramina of cribriform plate	Olfactory nerves
Posterior ethmoidal foramen	Posterior ethmoidal artery, vein, and nerve
Optic canal	Optic nerve (II) Ophthalmic artery
Superior orbital fissure	Oculomotor nerve (III) Trochlear nerve (IV) Lacrimal, frontal, and nasociliary branches of ophthalmic nerve (V_1) Abducent nerve (VI) Superior ophthalmic vein
Foramen rotundum	Maxillary nerve (V_2)
Foramen ovale	Mandibular nerve (V_3) Accessory meningeal artery Lesser petrosal nerve
Foramen spinosum	Middle meningeal artery and vein Meningeal branch of mandibular nerve
Sphenoidal emissary foramen (of Vesalius) (inconstant)	
Foramen lacerum	Greater petrosal nerve
Carotid canal	Internal carotid artery Internal carotid nerve plexus
Hiatus for	Lesser petrosal nerve
Hiatus for	Greater petrosal nerve
Internal acoustic meatus	Facial nerve (VII) Vestibulocochlear nerve (VIII) Labyrinthine artery
Opening of vestibular aqueduct	Endolymphatic duct
Mastoid foramen (inconstant)	Emissary vein (and occasional branch of occipital artery)
Jugular foramen	Inferior petrosal sinus Glossopharyngeal nerve (IX) Vagus nerve (X) Accessory nerve (XI) Sigmoid sinus Posterior meningeal artery
Condylar canal (inconstant)	Emissary vein and meningeal branch of ascending pharyngeal artery
Hypoglossal canal	Hypoglossal nerve (XII)
Foramen magnum	Medulla oblongata Meninges Vertebral arteries Meningeal branches of vertebral arteries Spinal roots of accessory nerves

Skull of Newborn

See also **Plate 6**

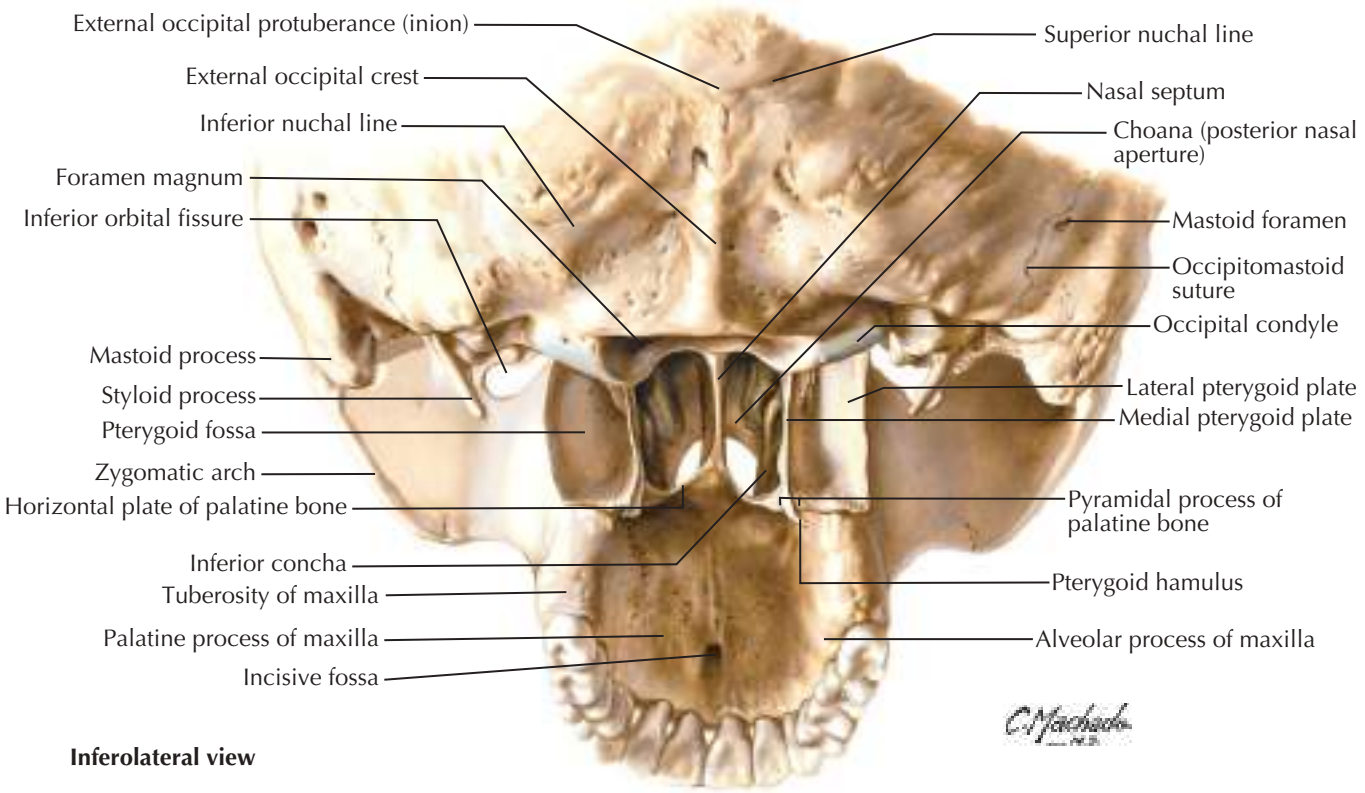



Temporal bone
Sphenoidal bone
Temporal fossa
Zygomatic arch
Condylar process of mandible
Mandibular notch
Coronoid process of mandible
Lateral pterygoid plate (broken line)
Hamulus of medial pterygoid plate (broken line)
Pterygomandibular raphe (broken line)
Mandible
Ramus
Angle
Body
Stylohyoid ligament
Hyoid bone
Body
Lesser horn
Greater horn
Epiglottis
Thyroid cartilage
Cricoid cartilage
Trachea
Mastoid process
External acoustic meatus
Atlas (C1)
Styloid process
Axis (C2)
Stylomandibular ligament
C3 vertebra
C7 vertebra
T1 vertebra
1st rib
F. Netter M.D.

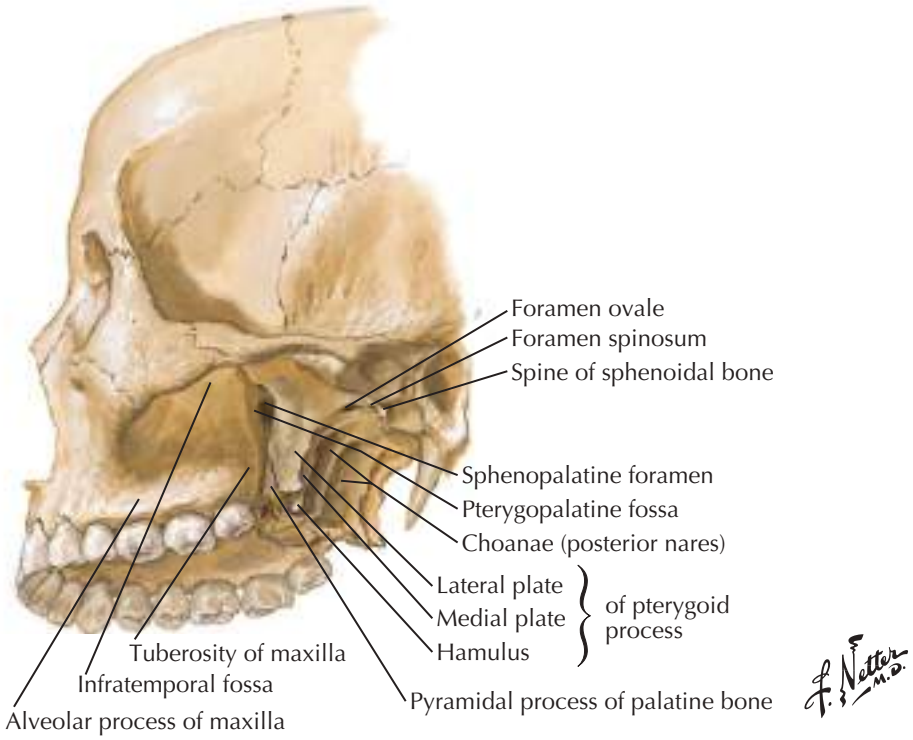
Pterygoid Fossae: Posterior and Inferolateral Views

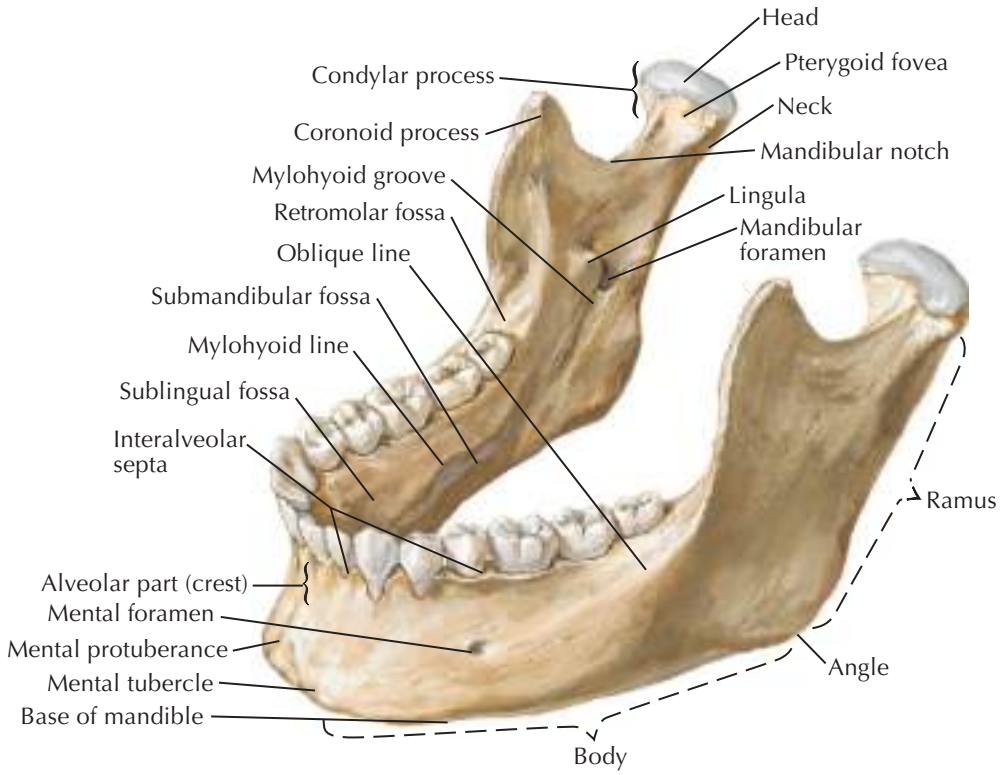
See also Plates 39, 40, 41

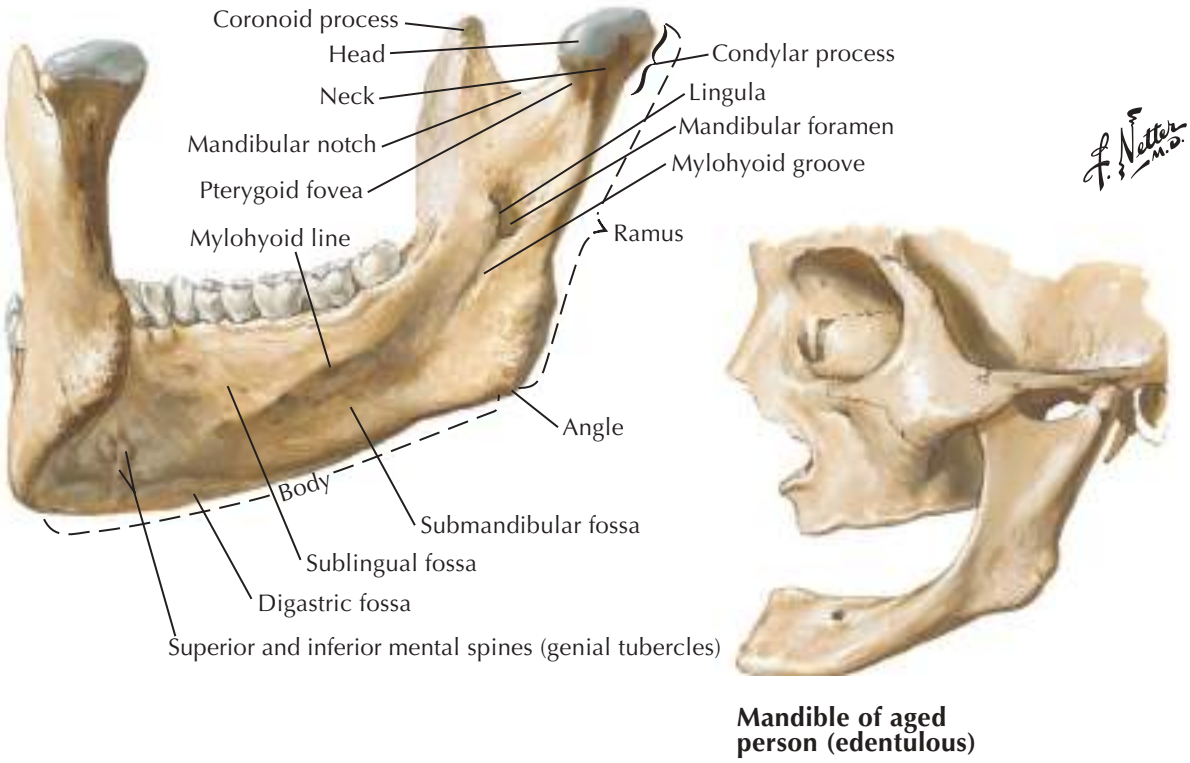
Posterior view



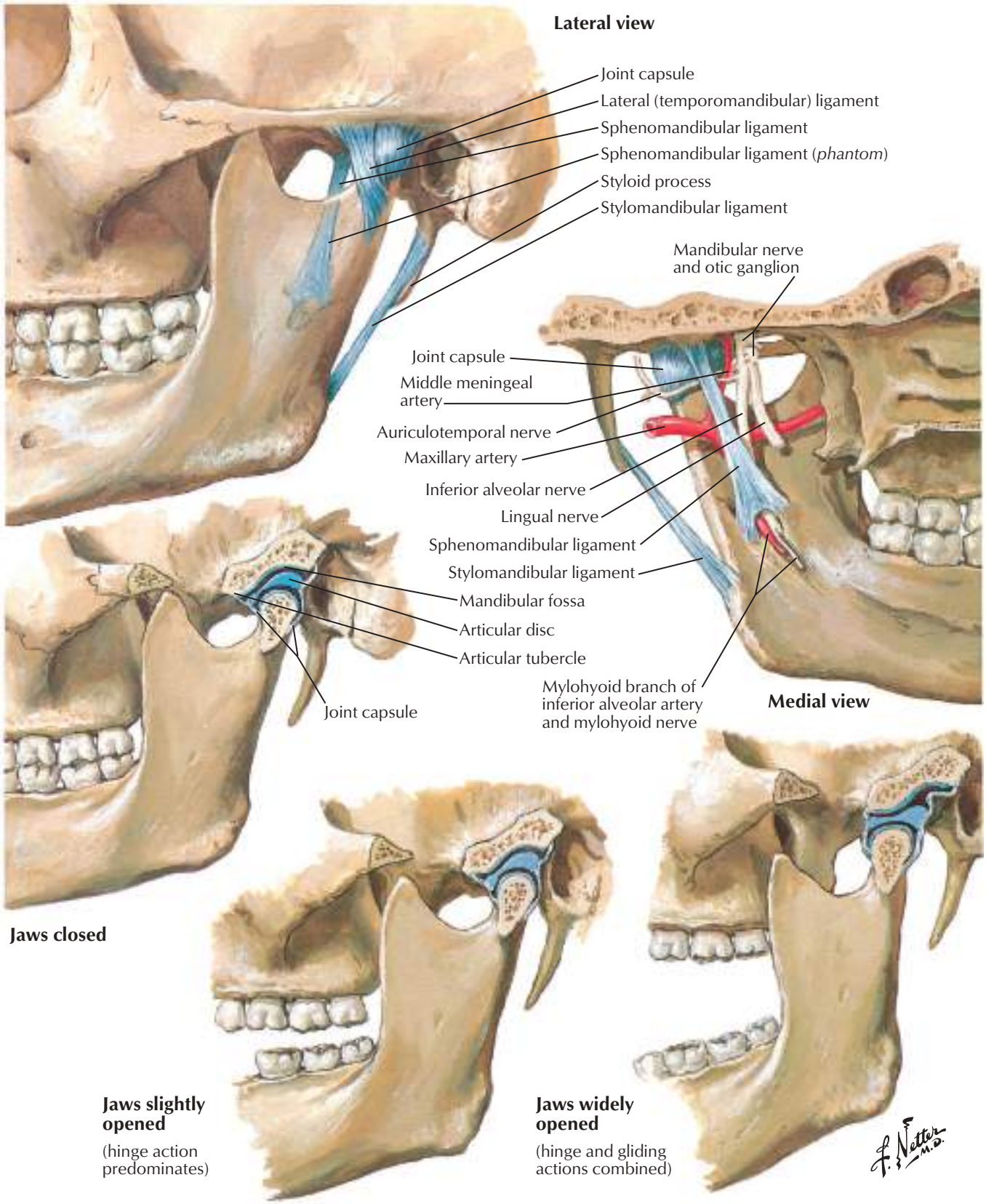
Inferolateral view

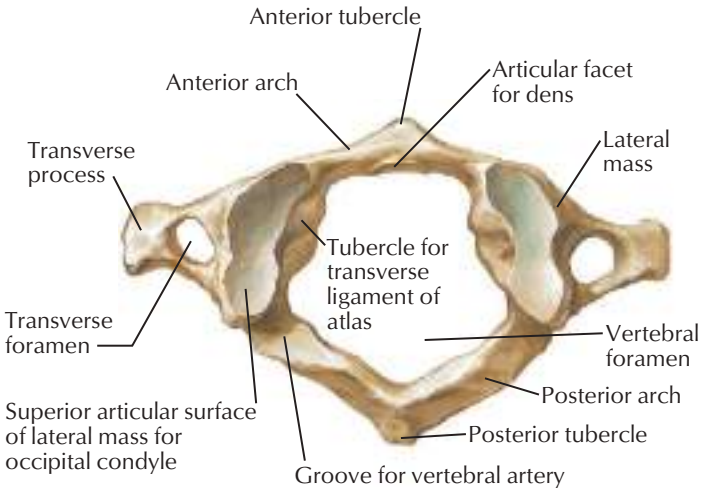




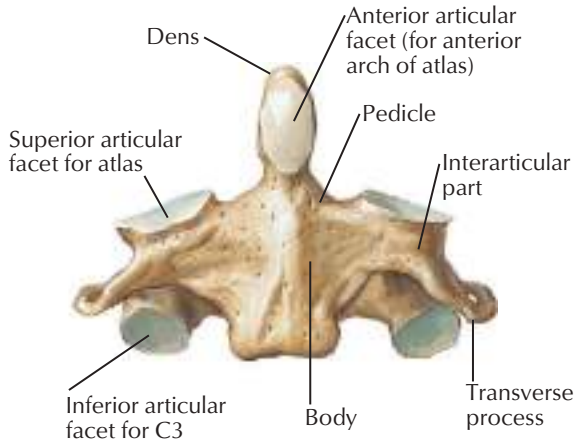


Mandible of aged person (edentulous)

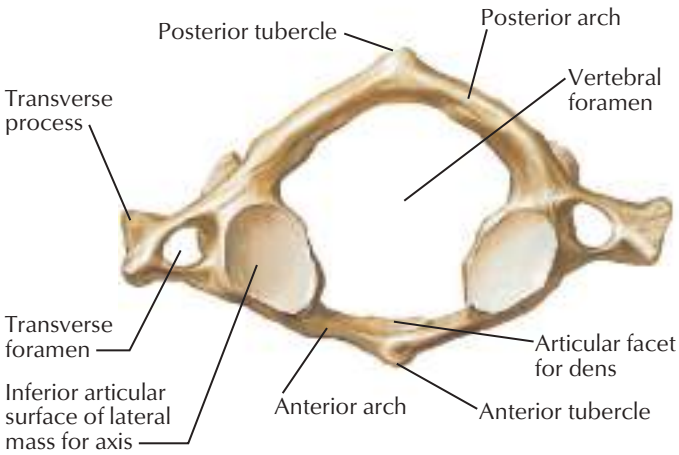

Lateral view
Joint capsule
Lateral (temporomandibular) ligament
Sphenomandibular ligament
Sphenomandibular ligament (*phantom*)
Styloid process
Stylomandibular ligament
Mandibular nerve and otic ganglion
Joint capsule
Middle meningeal artery
Auriculotemporal nerve
Maxillary artery
Inferior alveolar nerve
Lingual nerve
Sphenomandibular ligament
Stylomandibular ligament
Mandibular fossa
Articular disc
Articular tubercle
Joint capsule
Mylohyoid branch of inferior alveolar artery and mylohyoid nerve
Medial view
Jaws closed
Jaws slightly opened
(hinge action predominates)
Jaws widely opened
(hinge and gliding actions combined)



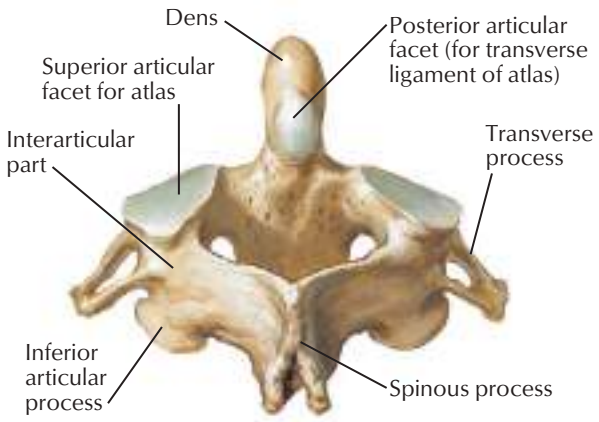
Atlas (C1): superior view



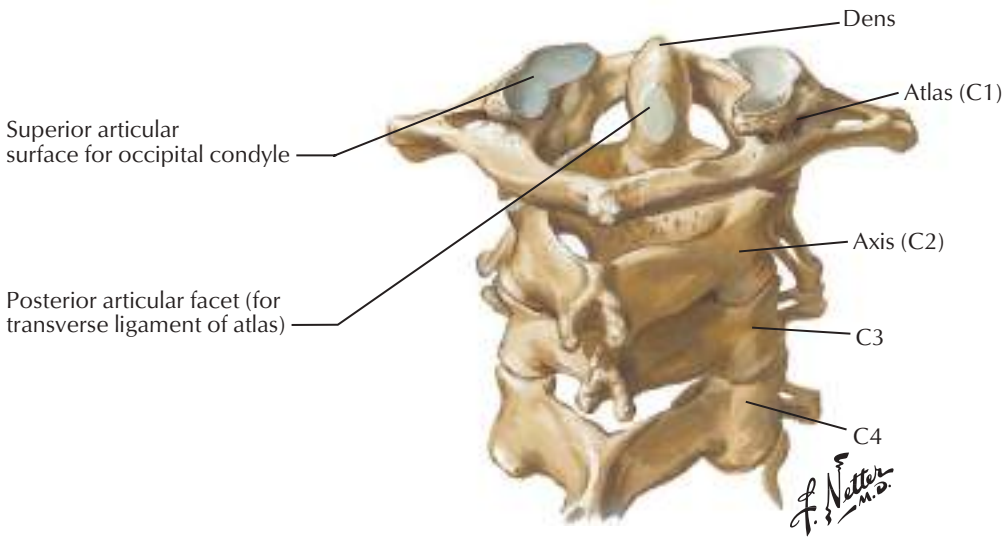
Axis (C2): anterior view



Atlas (C1): inferior view

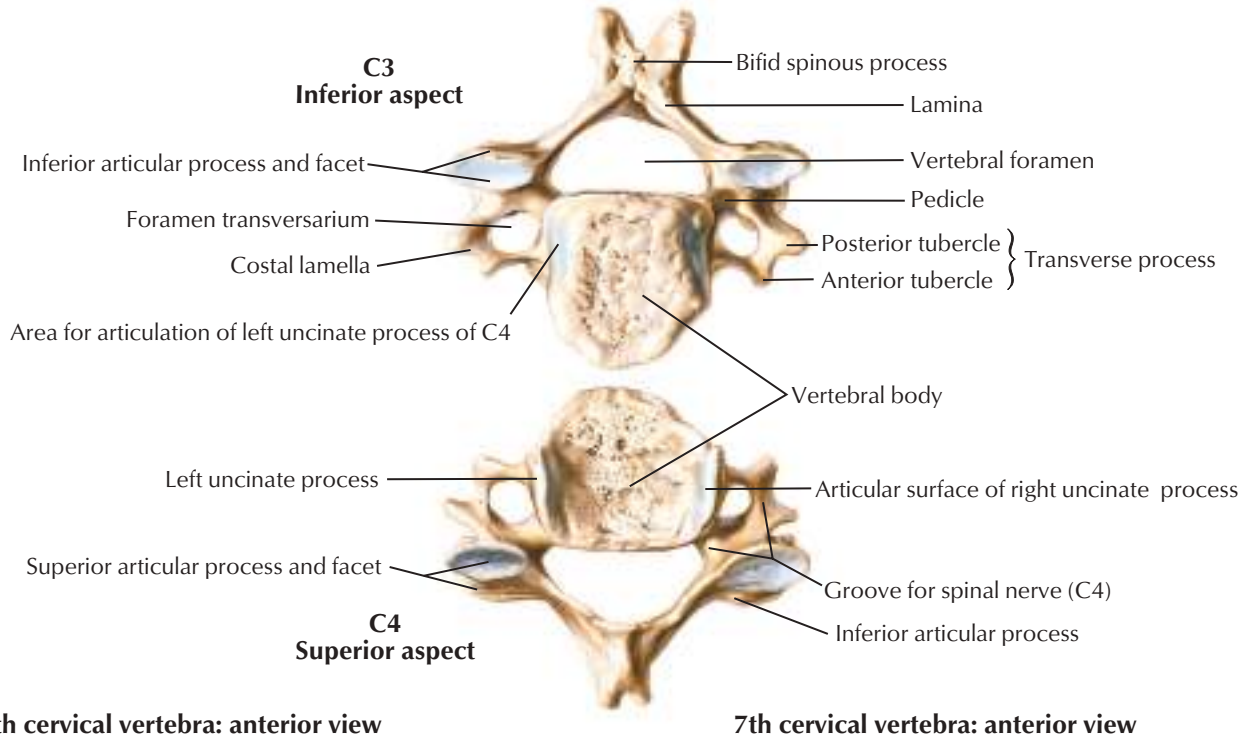


Axis (C2): posterosuperior view

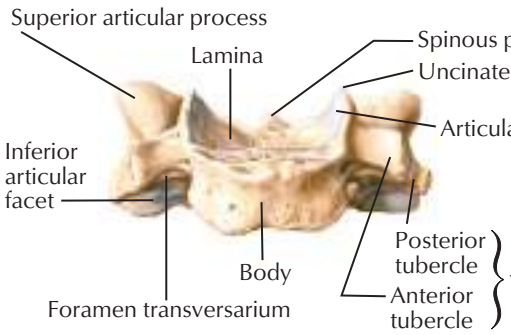


Upper cervical vertebrae, assembled: posterosuperior view

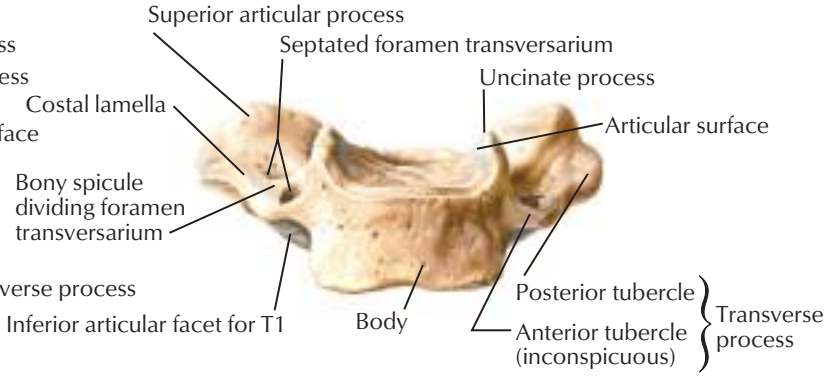
Inferior aspect of C3 and superior aspect of C4 showing the sites of the facet and uncovertebral articulations



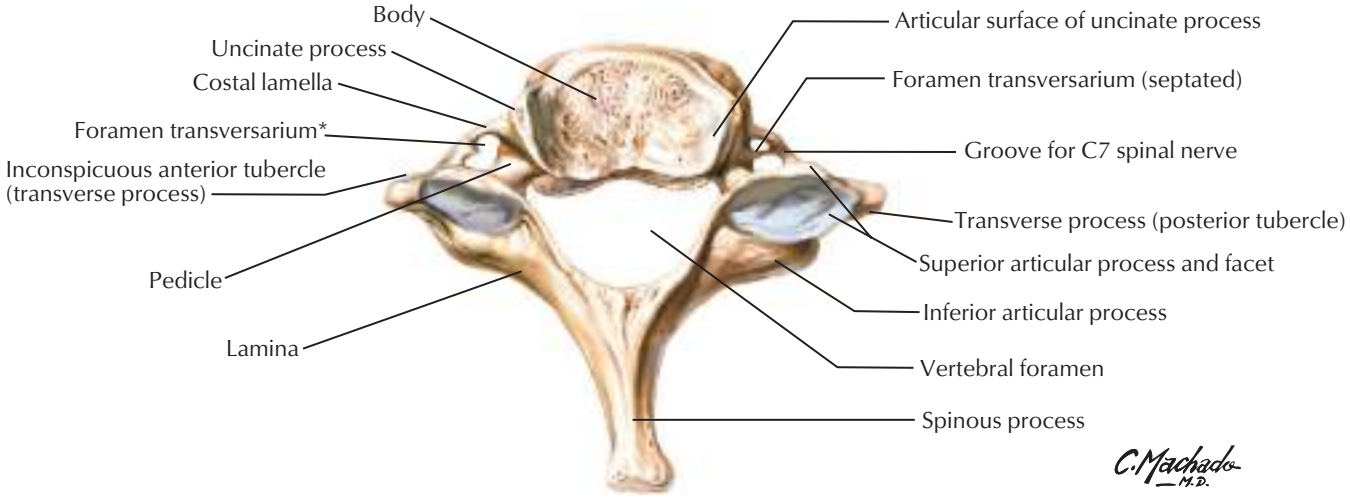
4th cervical vertebra: anterior view



7th cervical vertebra: anterior view

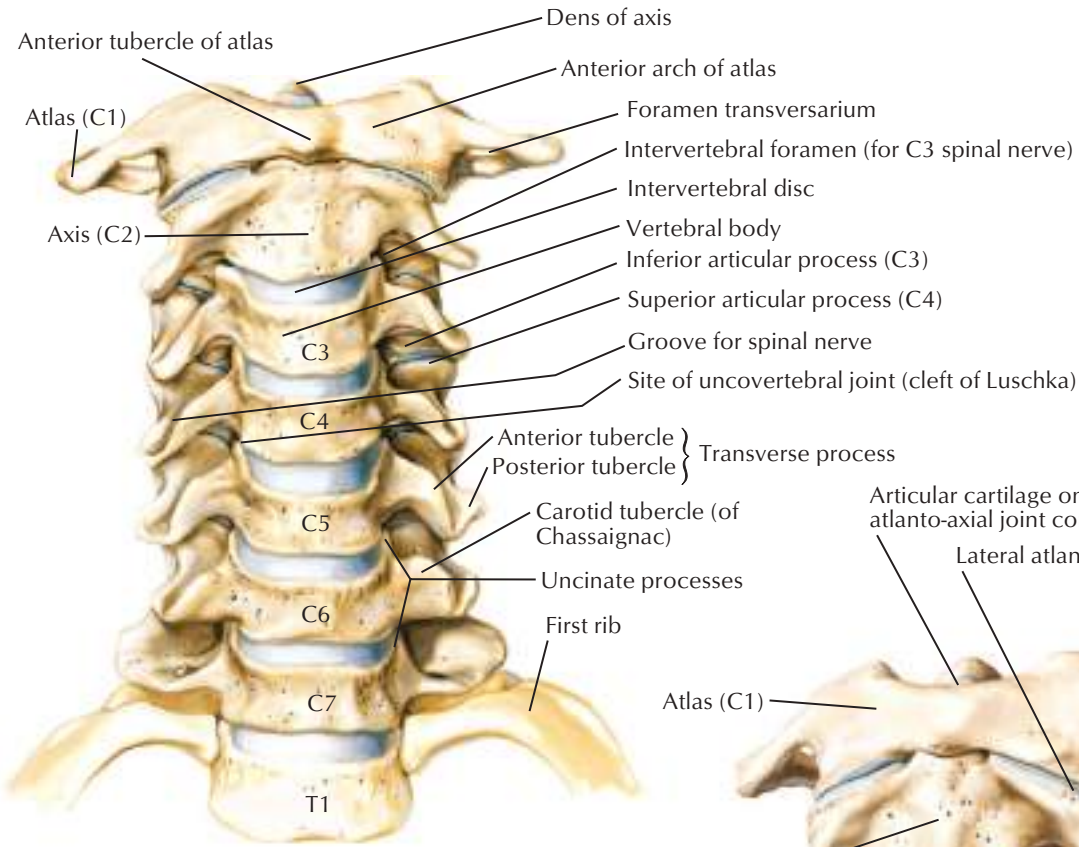


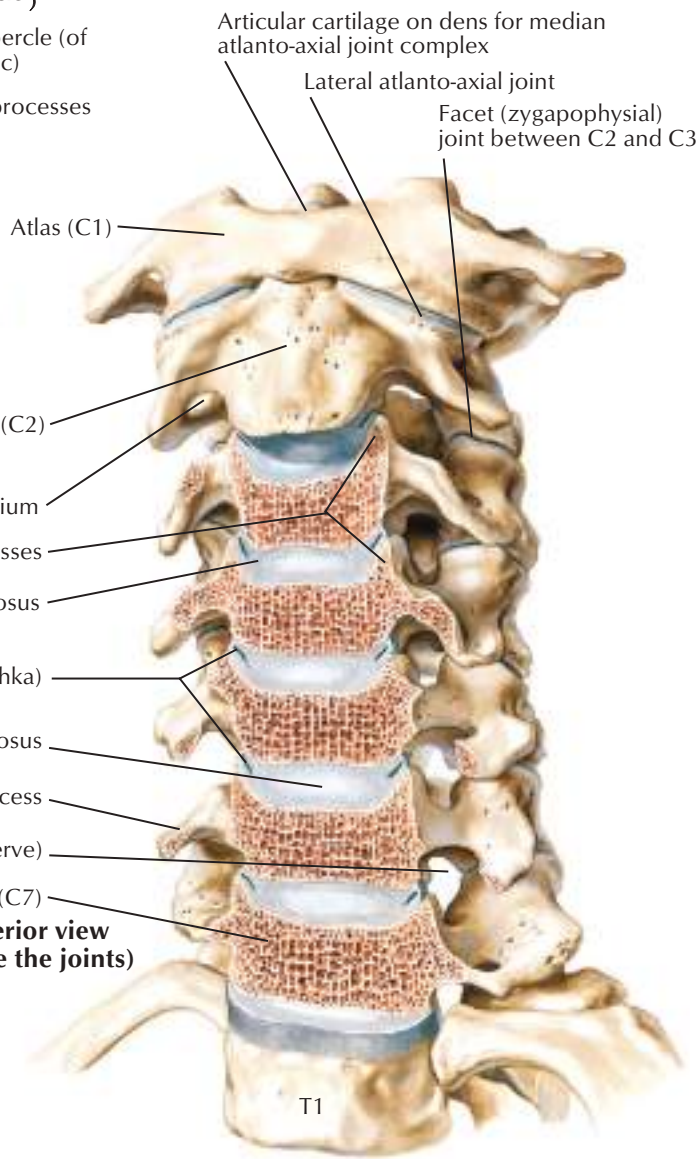
7th cervical vertebra (vertebra prominens): superior view



**The foramina transversaria of C7 transmit vertebral veins, but usually not the vertebral artery, and are asymmetrical in this specimen.*

Cervical vertebrae: anterior view





The uncovertebral joints of the cervical spine: anterior view (C3 to C7 have been sectioned coronally to expose the joints)

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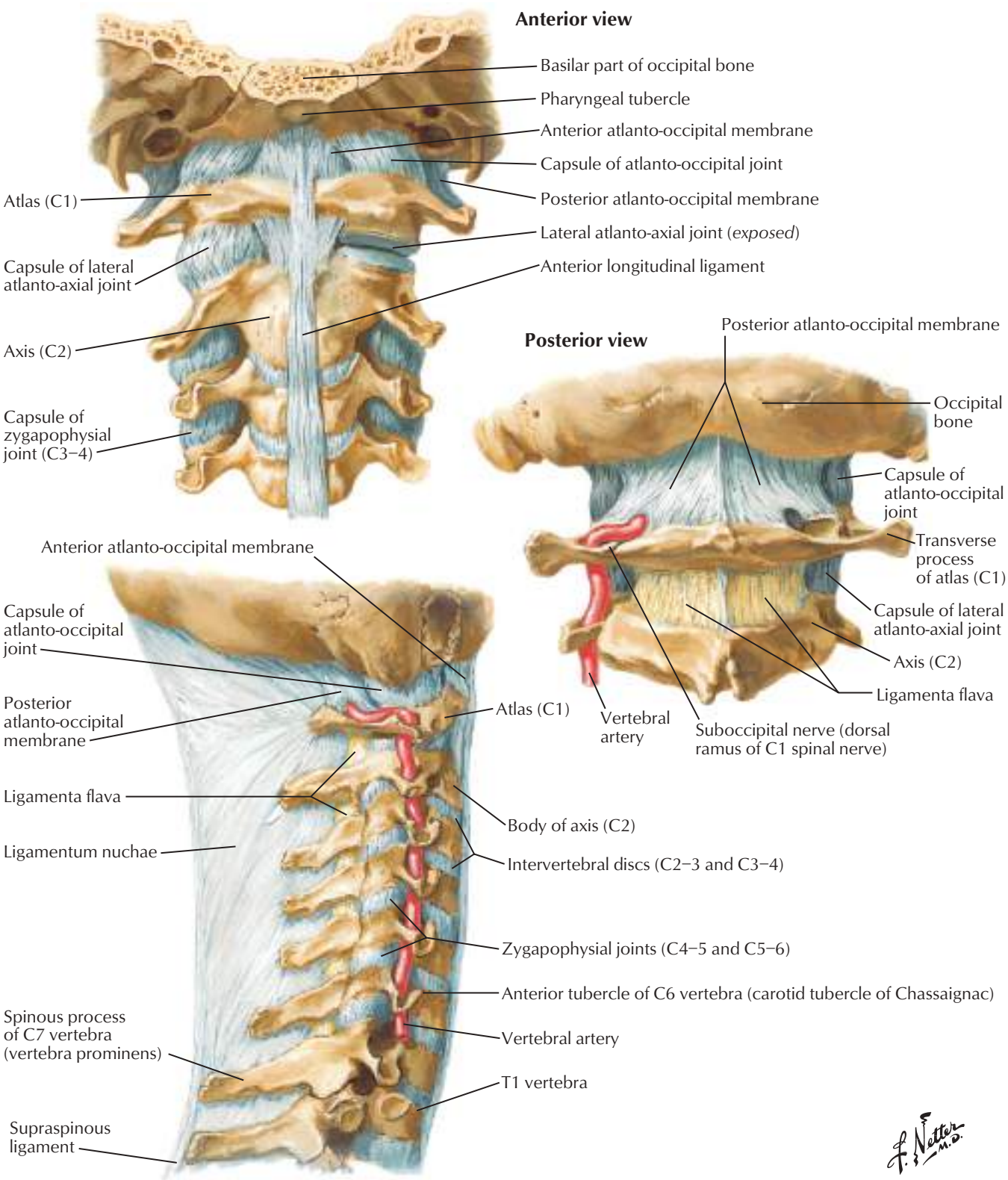
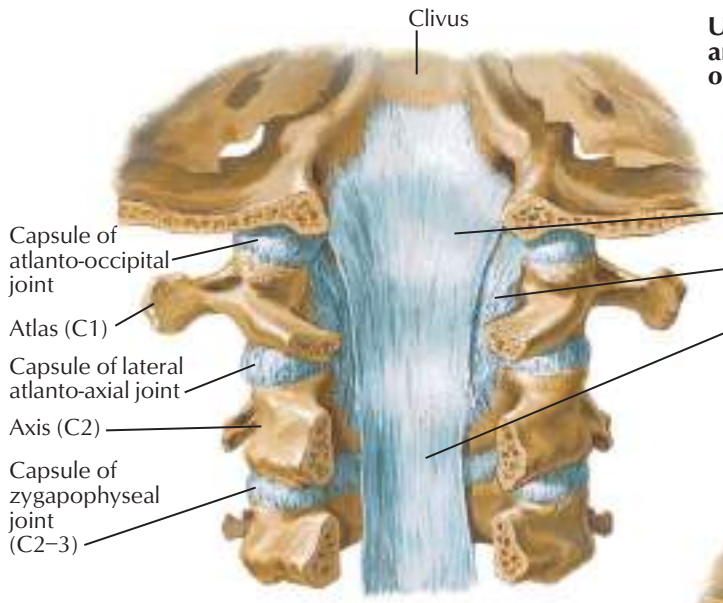
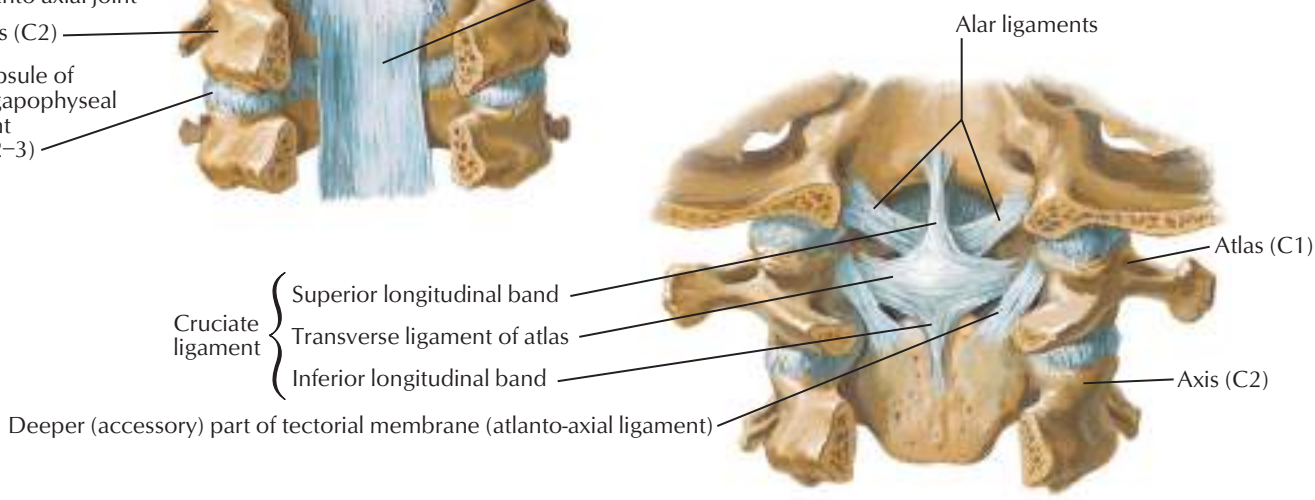

Anterior view
Basilar part of occipital bone
Pharyngeal tubercle
Anterior atlanto-occipital membrane
Capsule of atlanto-occipital joint
Posterior atlanto-occipital membrane
Lateral atlanto-axial joint (exposed)
Anterior longitudinal ligament
Atlas (C1)
Capsule of lateral atlanto-axial joint
Axis (C2)
Capsule of zygapophysial joint (C3–4)
Posterior view
Posterior atlanto-occipital membrane
Occipital bone
Capsule of atlanto-occipital joint
Transverse process of atlas (C1)
Capsule of lateral atlanto-axial joint
Axis (C2)
Ligamenta flava
Vertebral artery
Suboccipital nerve (dorsal ramus of C1 spinal nerve)
Anterior atlanto-occipital membrane
Capsule of atlanto-occipital joint
Posterior atlanto-occipital membrane
Atlas (C1)
Ligamenta flava
Ligamentum nuchae
Body of axis (C2)
Intervertebral discs (C2–3 and C3–4)
Zygapophysial joints (C4–5 and C5–6)
Anterior tubercle of C6 vertebra (carotid tubercle of Chassaignac)
Vertebral artery
Spinous process of C7 vertebra (vertebra prominens)
T1 vertebra
Supraspinous ligament
Right lateral view

Internal Craniocervical Ligaments

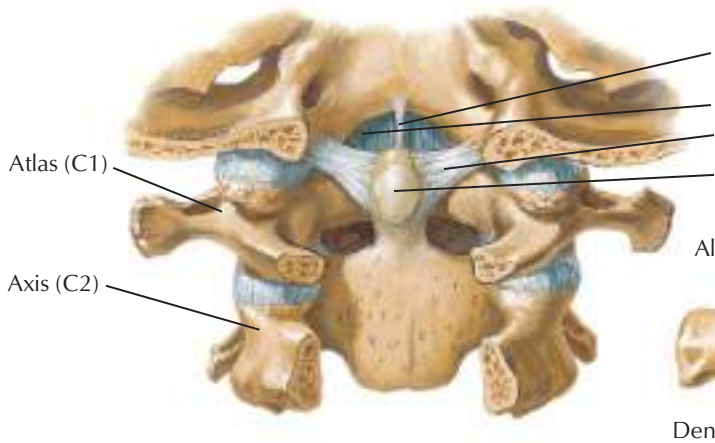
See also Plates 46, 124



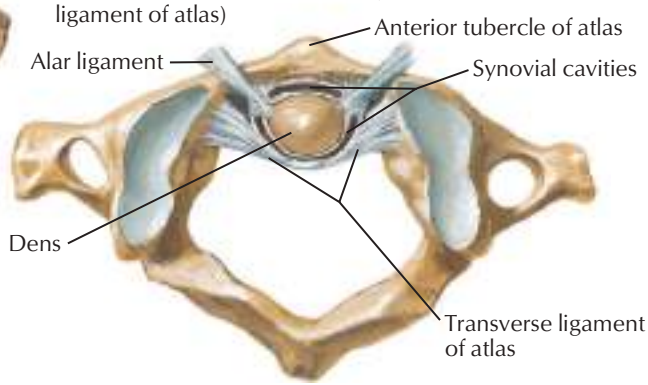
Upper part of vertebral canal with spinous processes and parts of vertebral arches removed to expose ligaments on posterior vertebral bodies: posterior view



Principal part of tectorial membrane removed to expose deeper ligaments: posterior view



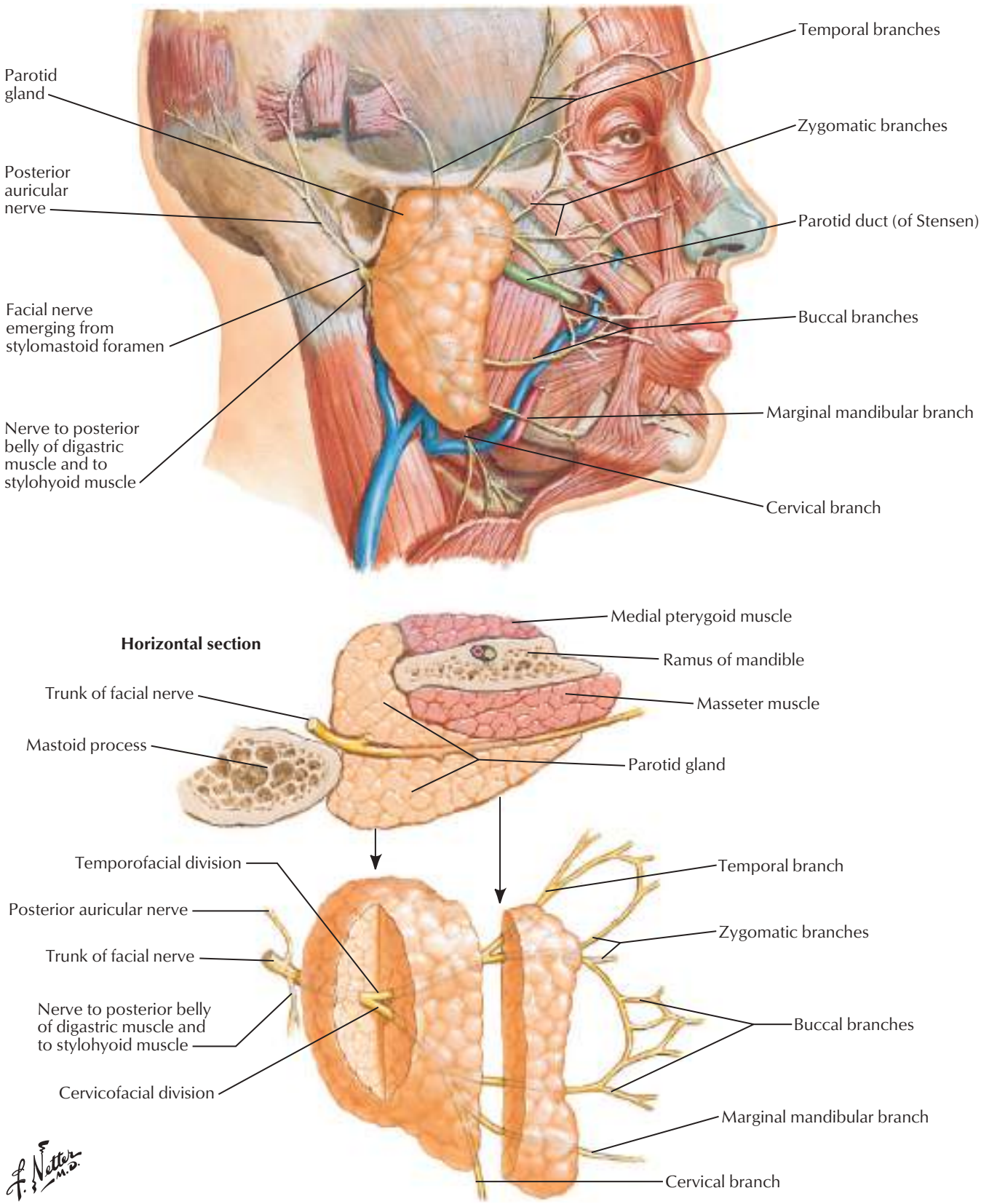
Cruciate ligament removed to show deeper ligaments: posterior view



Median atlanto-axial joint: superior view

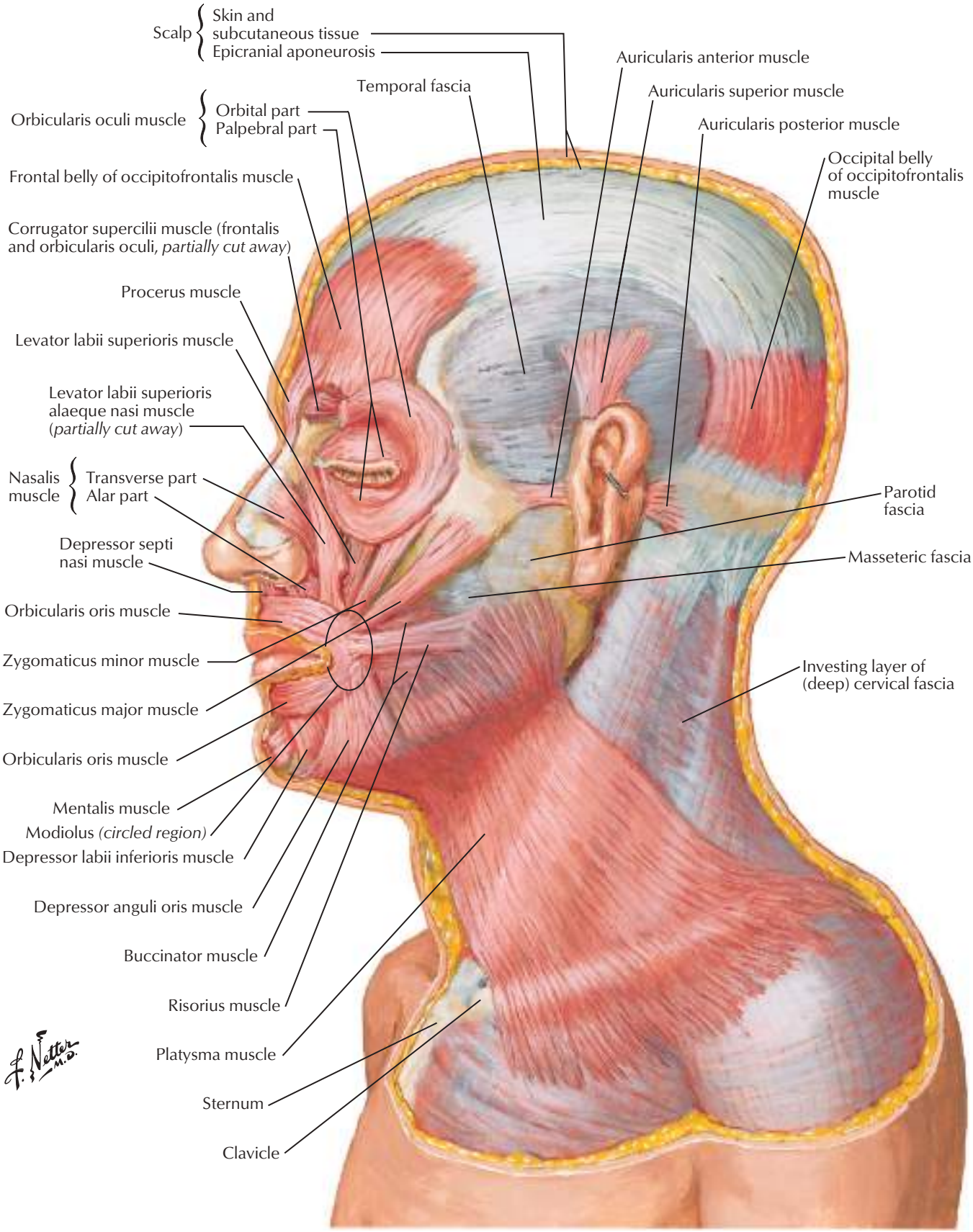
Facial Nerve Branches and Parotid Gland

See also Plates 46, 124



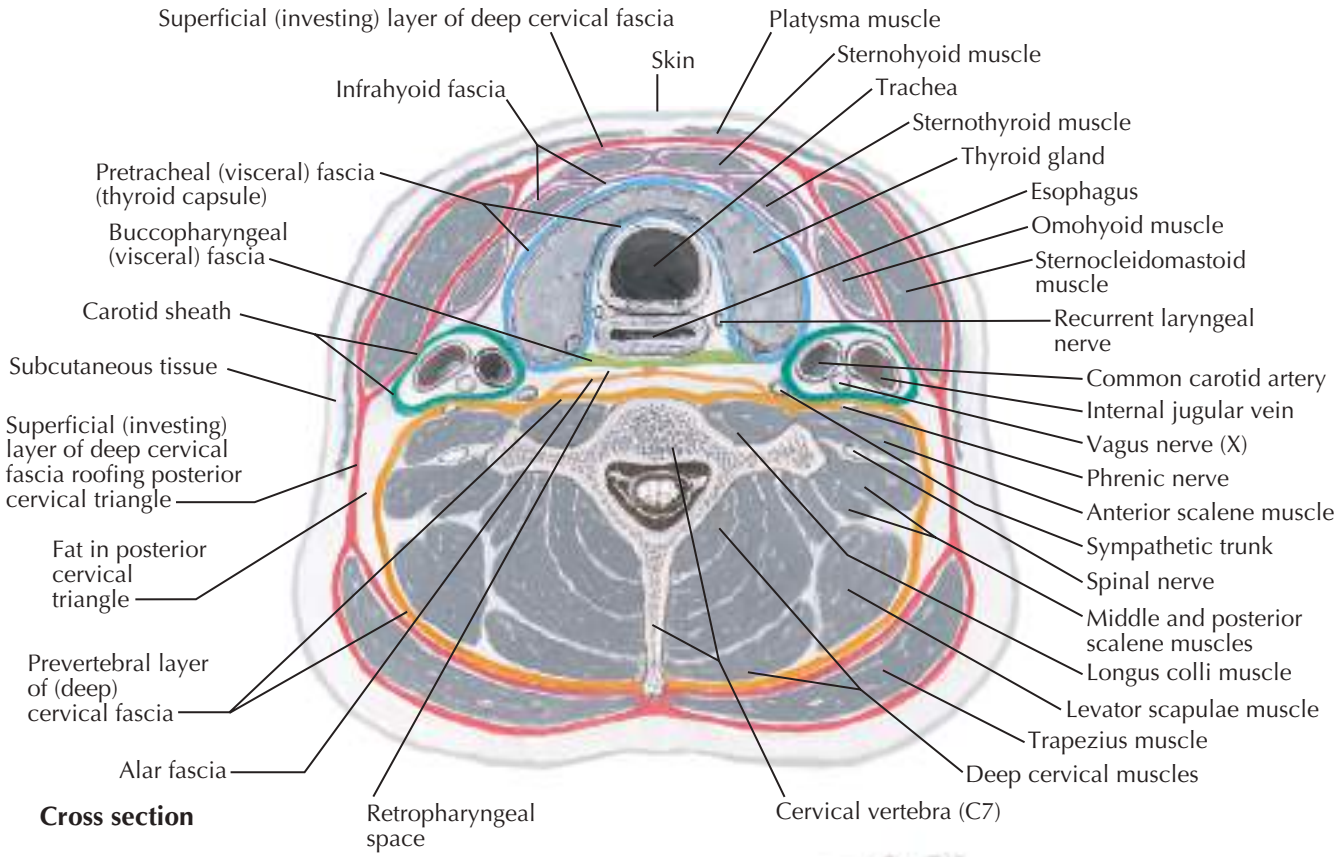
Muscles of Facial Expression: Lateral View

See also Plates 48, 49

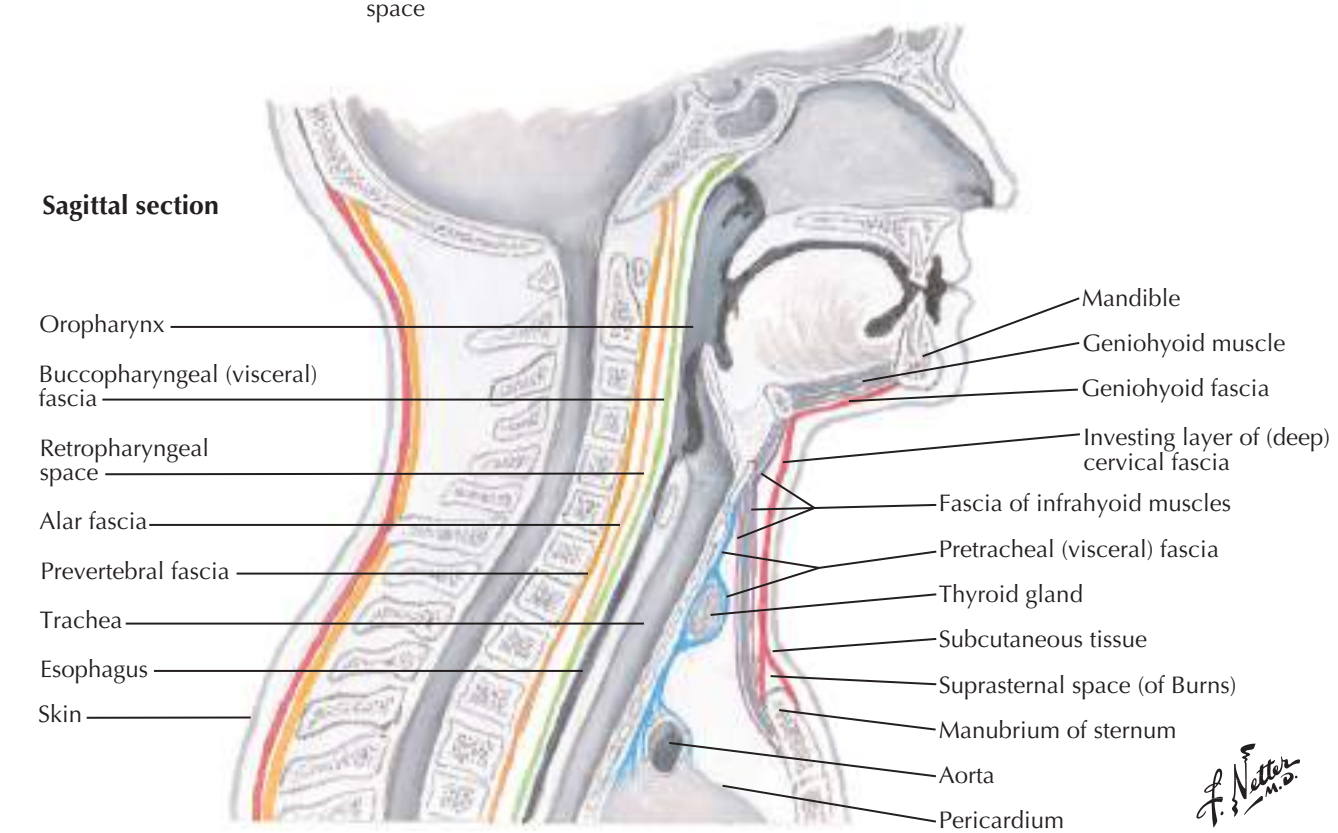


Fascial Layers of Neck

See also Plate 27



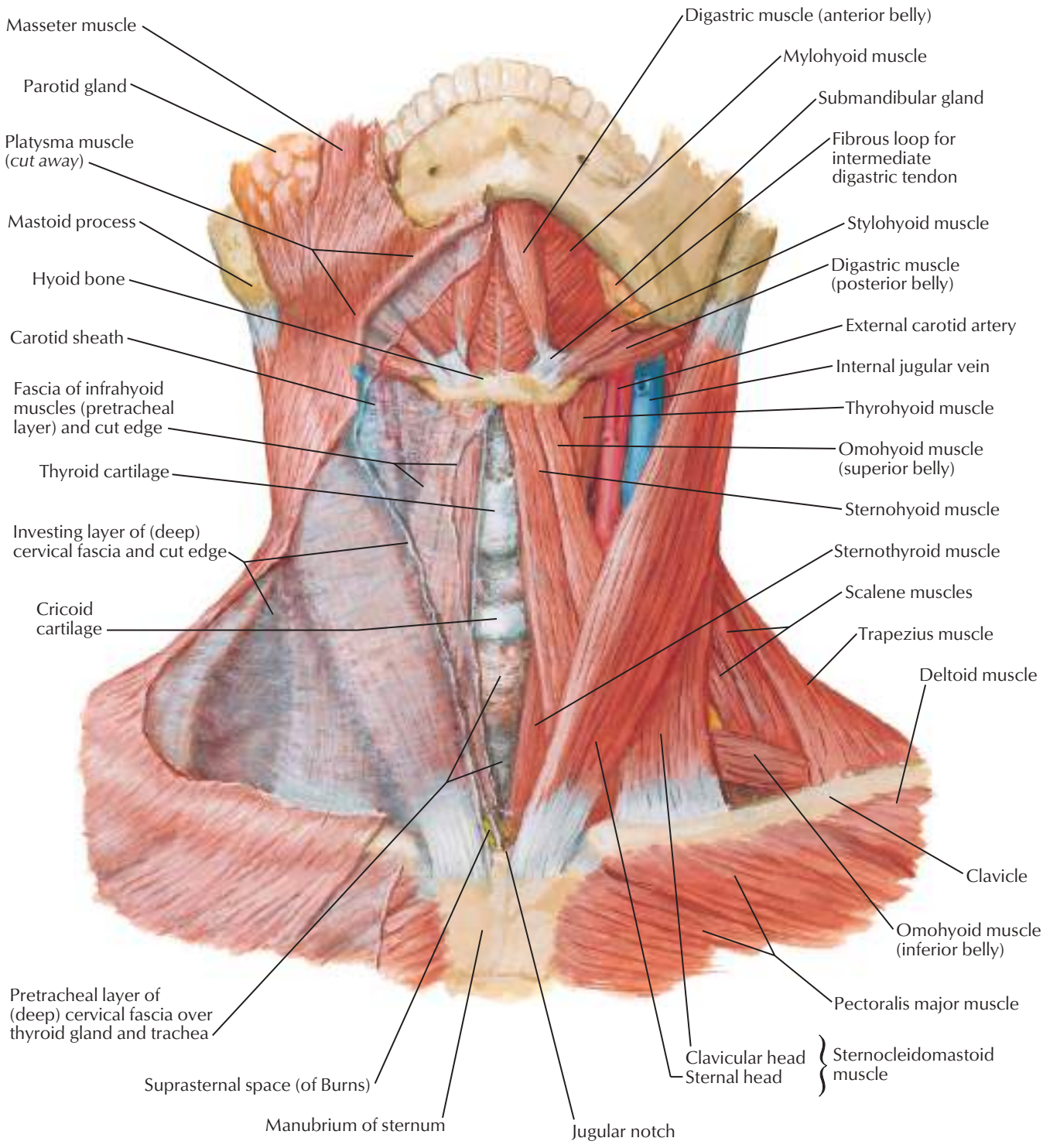
Cross section



Sagittal section

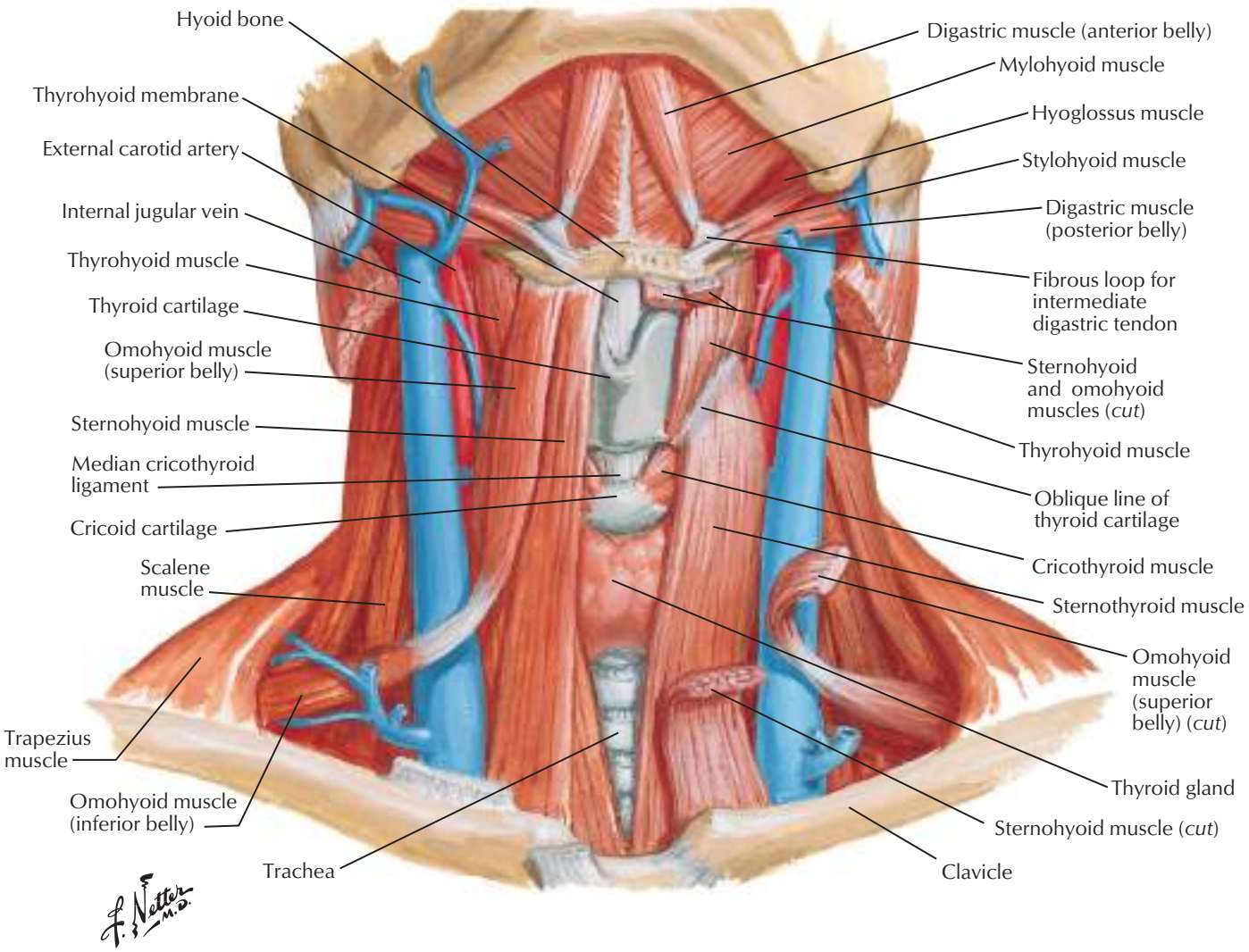
Muscles of Neck: Anterior View

See also Plates 26, 28, 31



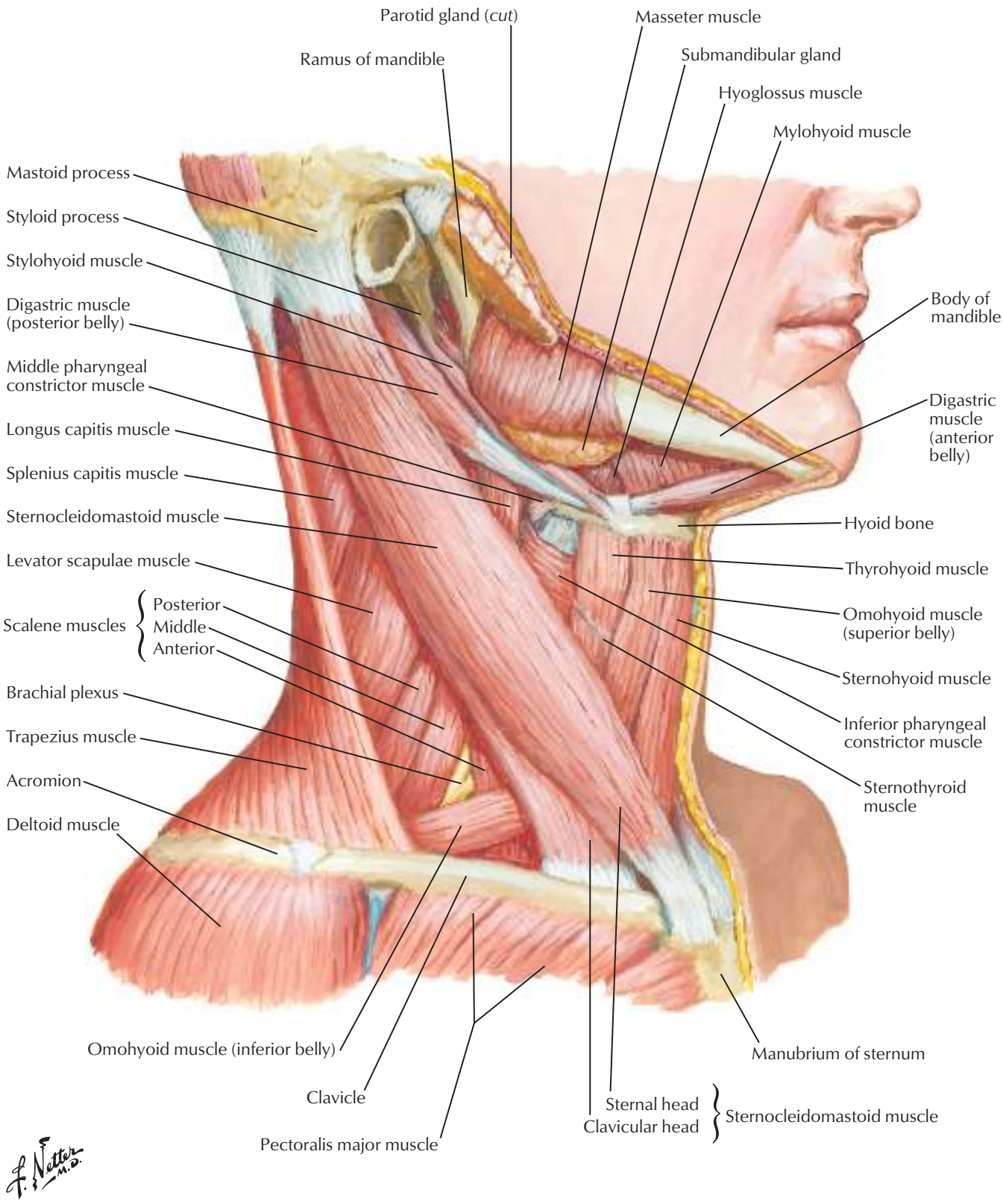
Infrahyoid and Suprahyoid Muscles

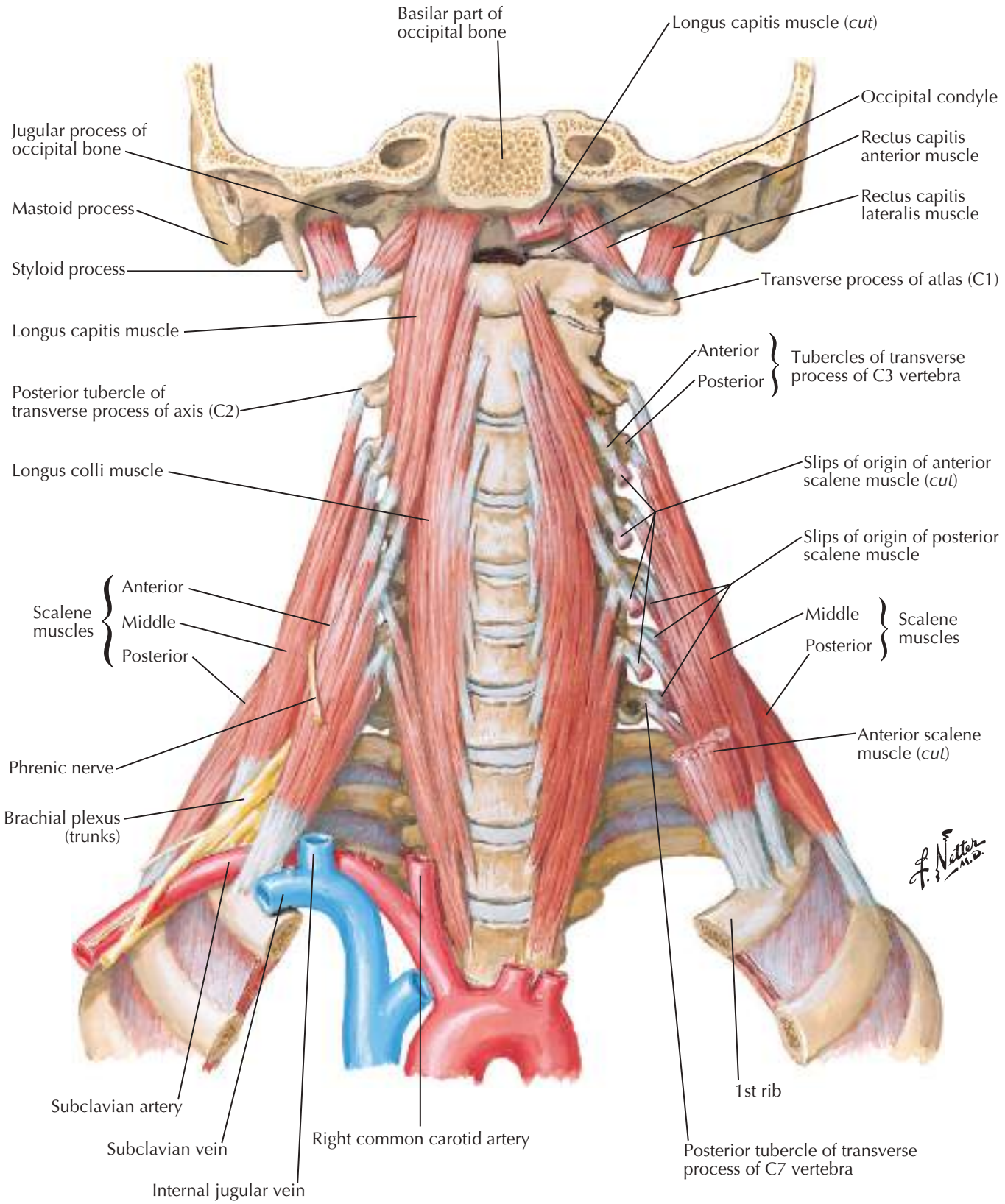
See also **Plates 27, 29, 58**



Muscles of Neck: Lateral View

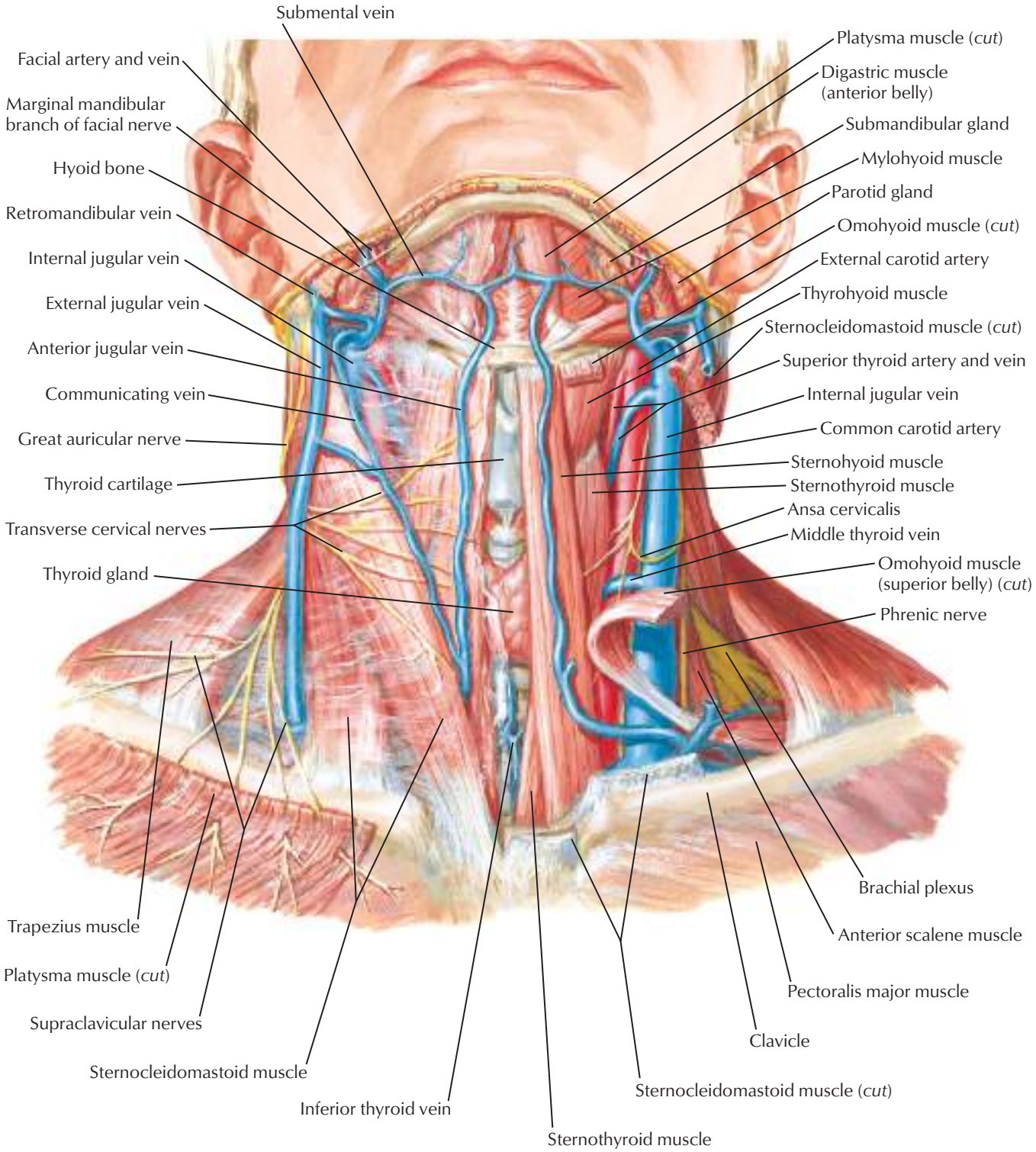
See also Plates 27, 28, 31



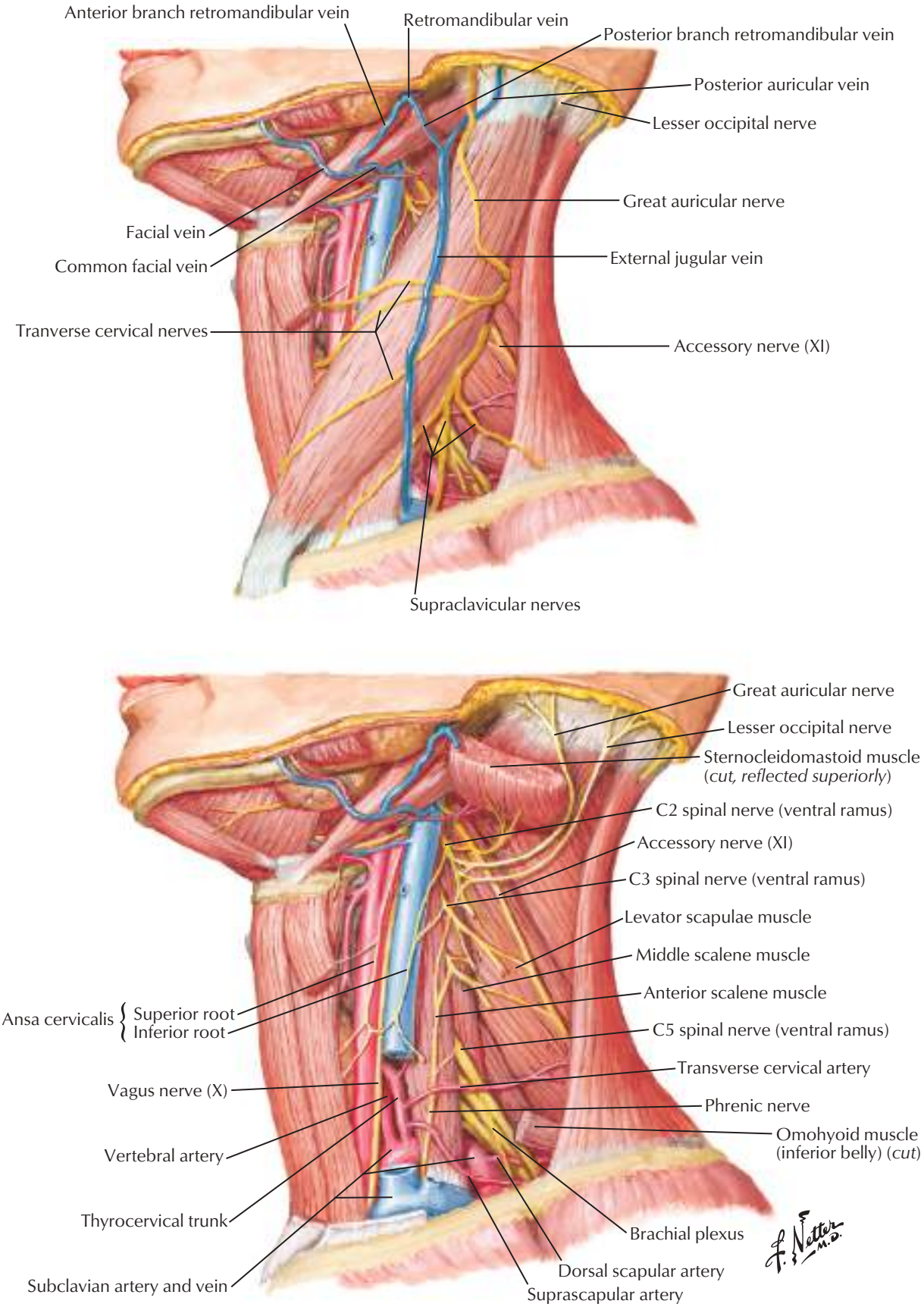

Basilar part of occipital bone
Longus capitis muscle (*cut*)
Occipital condyle
Jugular process of occipital bone
Rectus capitis anterior muscle
Mastoid process
Rectus capitis lateralis muscle
Styloid process
Transverse process of atlas (C1)
Longus capitis muscle
Anterior
Posterior
Tubercles of transverse process of C3 vertebra
Posterior tubercle of transverse process of axis (C2)
Longus colli muscle
Slips of origin of anterior scalene muscle (*cut*)
Slips of origin of posterior scalene muscle
Scalene muscles
Anterior
Middle
Posterior
Middle
Posterior
Scalene muscles
Anterior scalene muscle (*cut*)
Phrenic nerve
Brachial plexus (trunks)
Subclavian artery
Subclavian vein
Internal jugular vein
Right common carotid artery
1st rib
Posterior tubercle of transverse process of C7 vertebra

Superficial Veins and Cutaneous Nerves of Neck

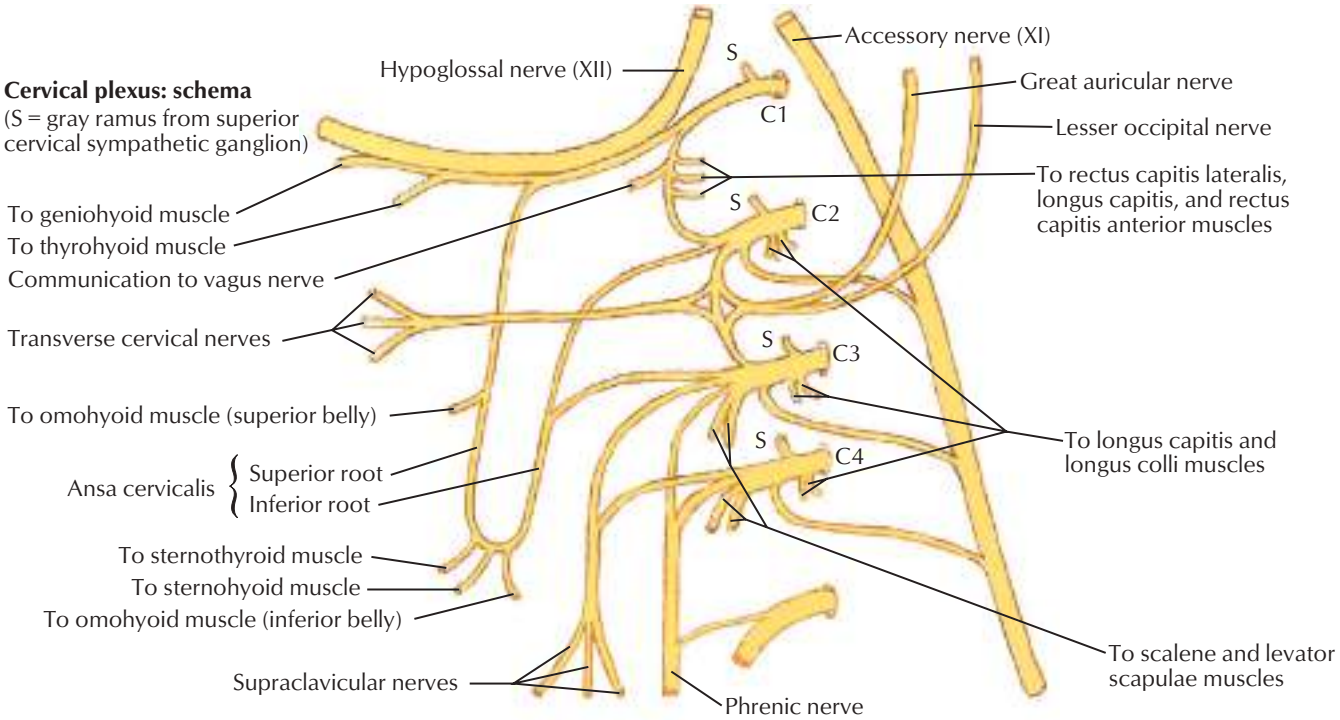
For deep veins of neck see **Plate 73**



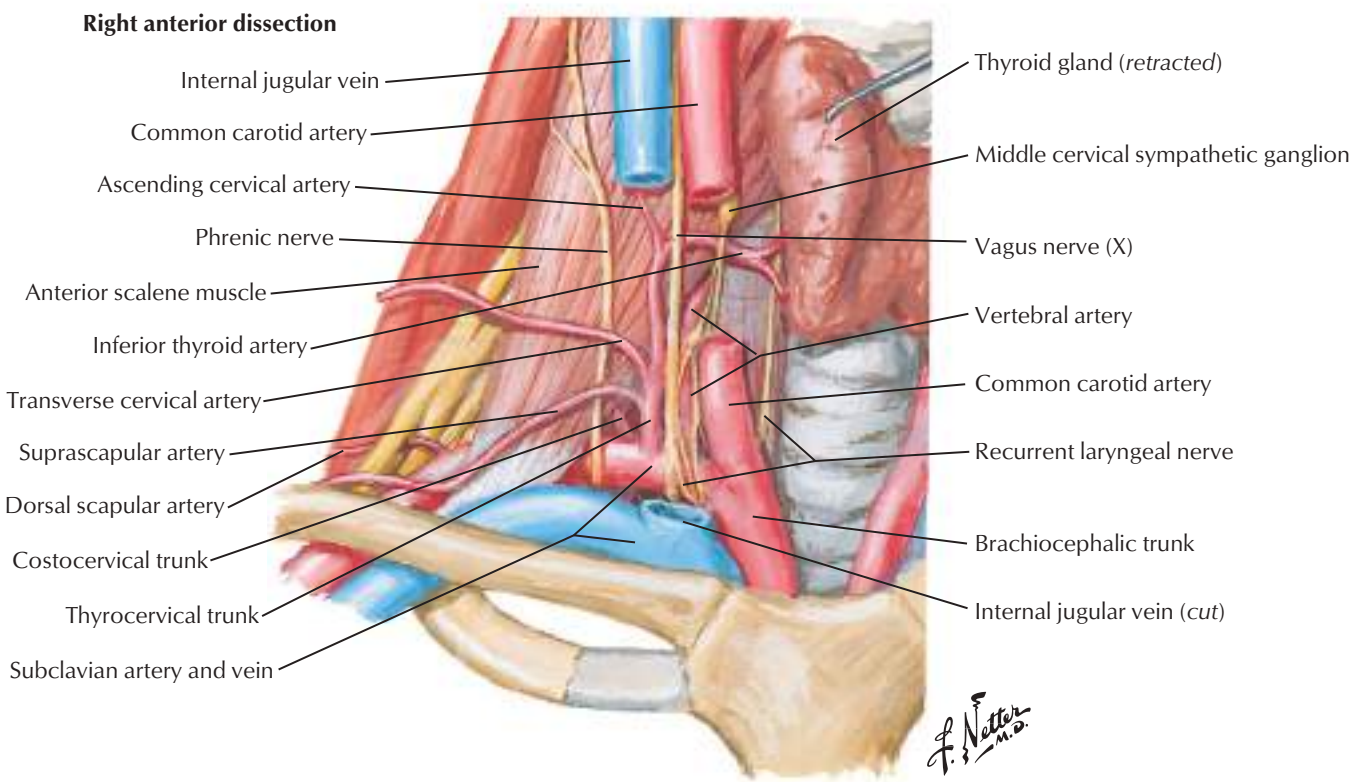
See also Plates 128–130



Cervical plexus: schema
(S = gray ramus from superior cervical sympathetic ganglion)



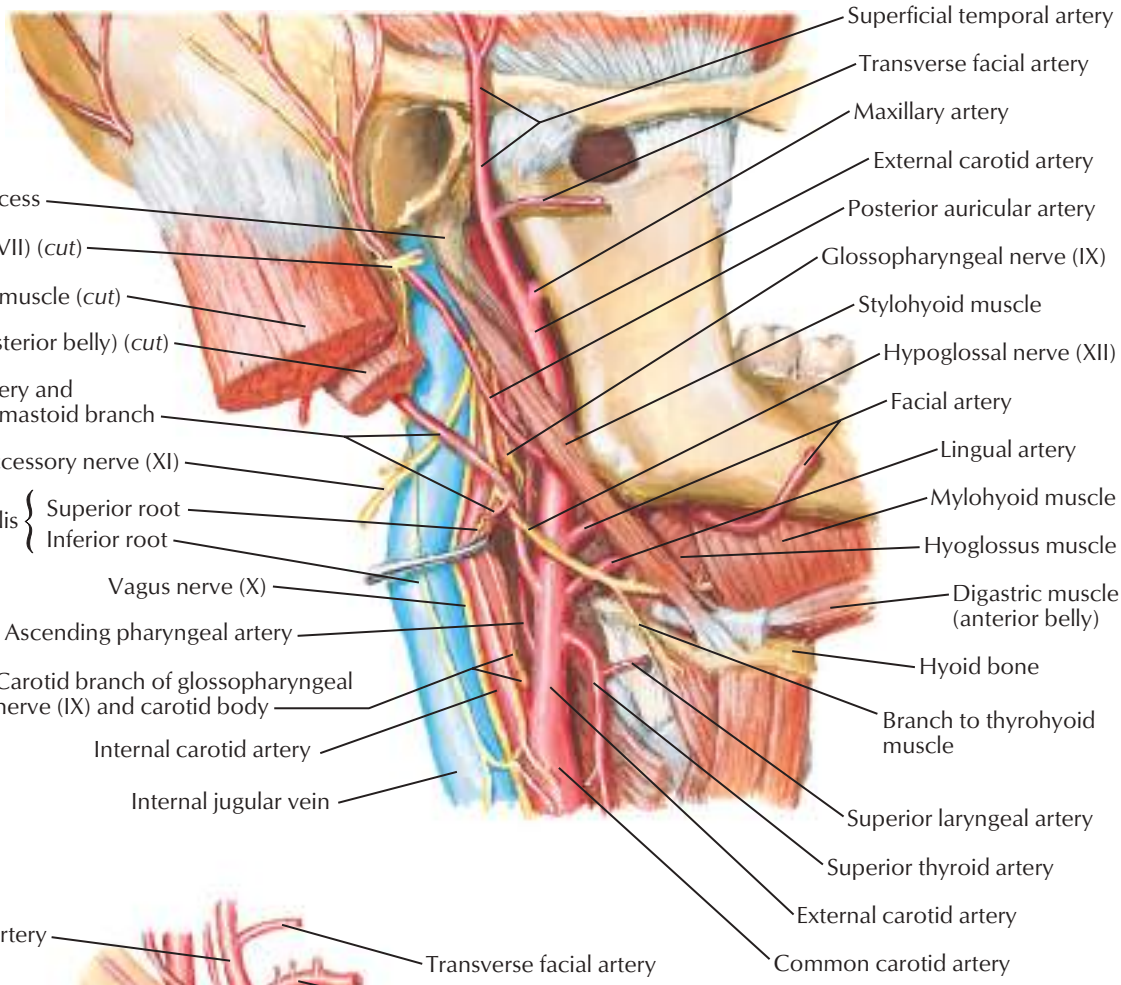
Right anterior dissection

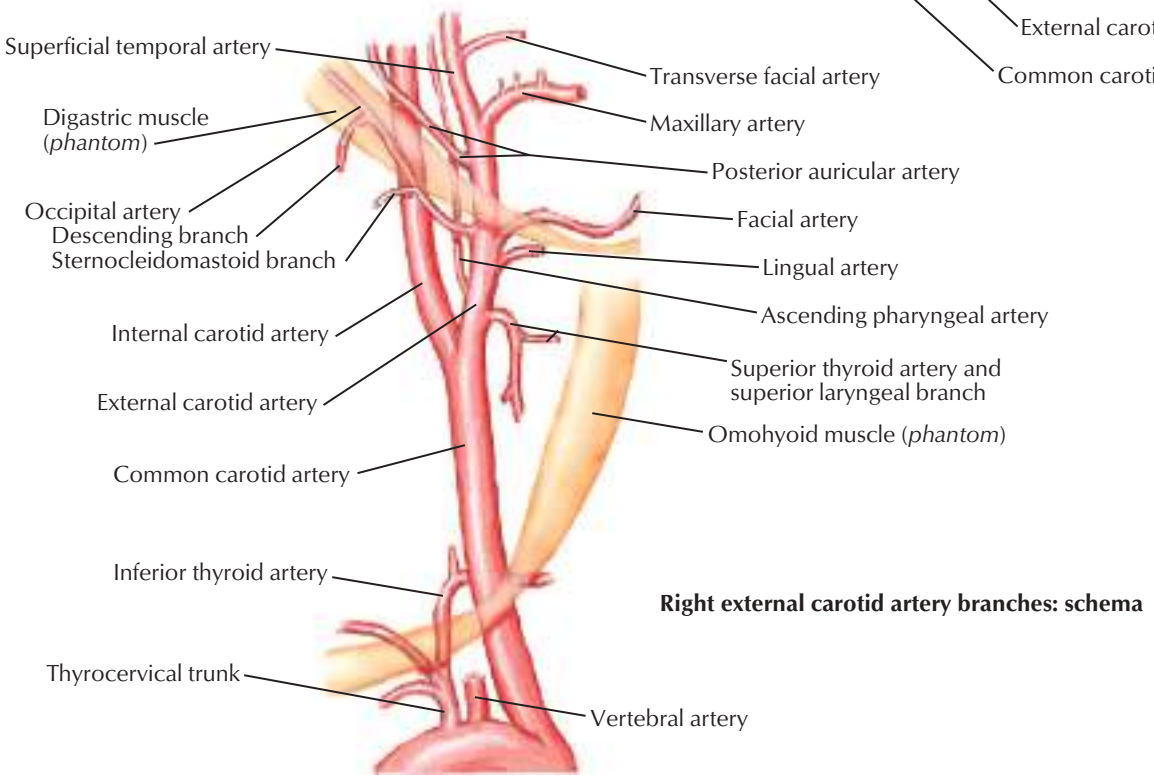


Carotid Arteries

See also **Plates 3, 137, 139**

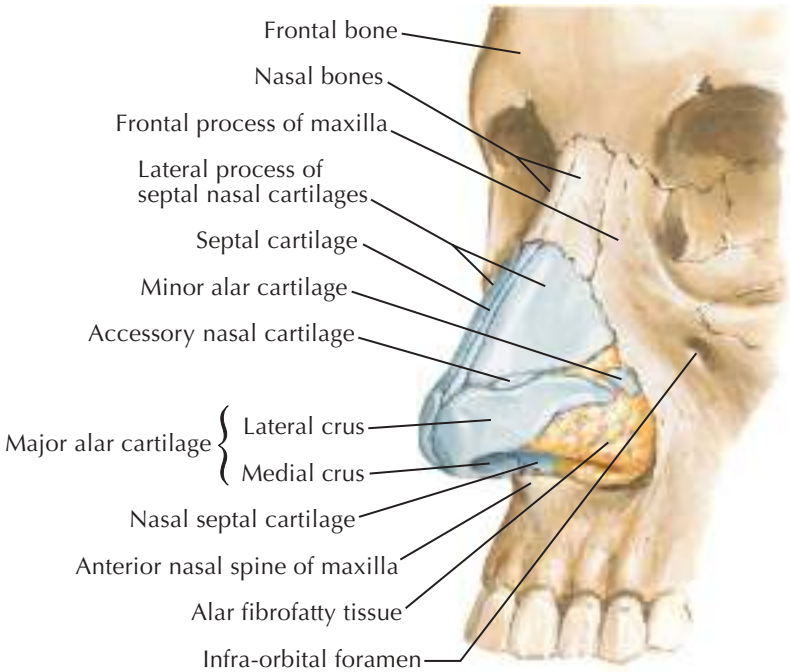
Parotid space (bed): right lateral dissection



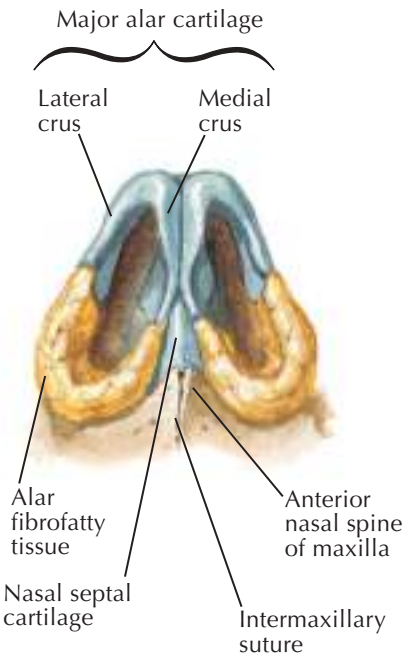


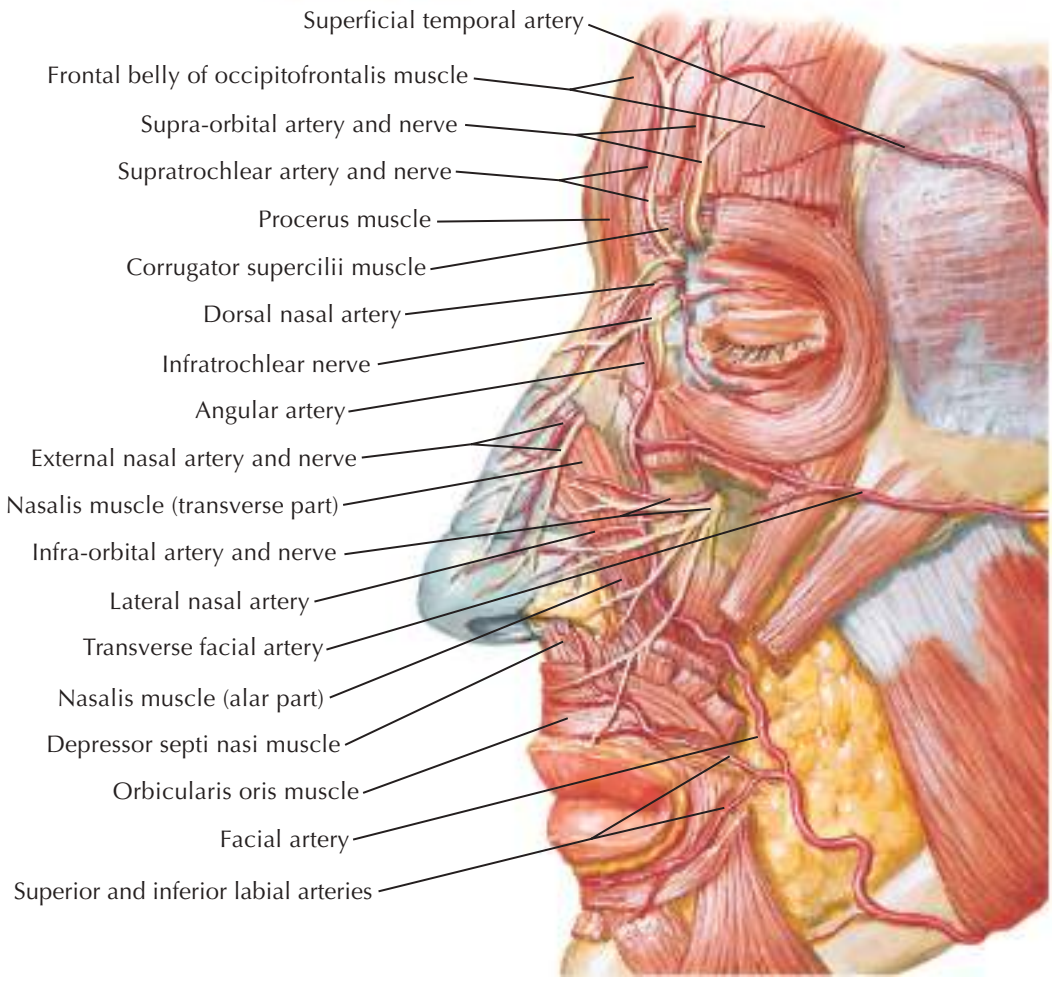
Right external carotid artery branches: schema

Anterolateral view

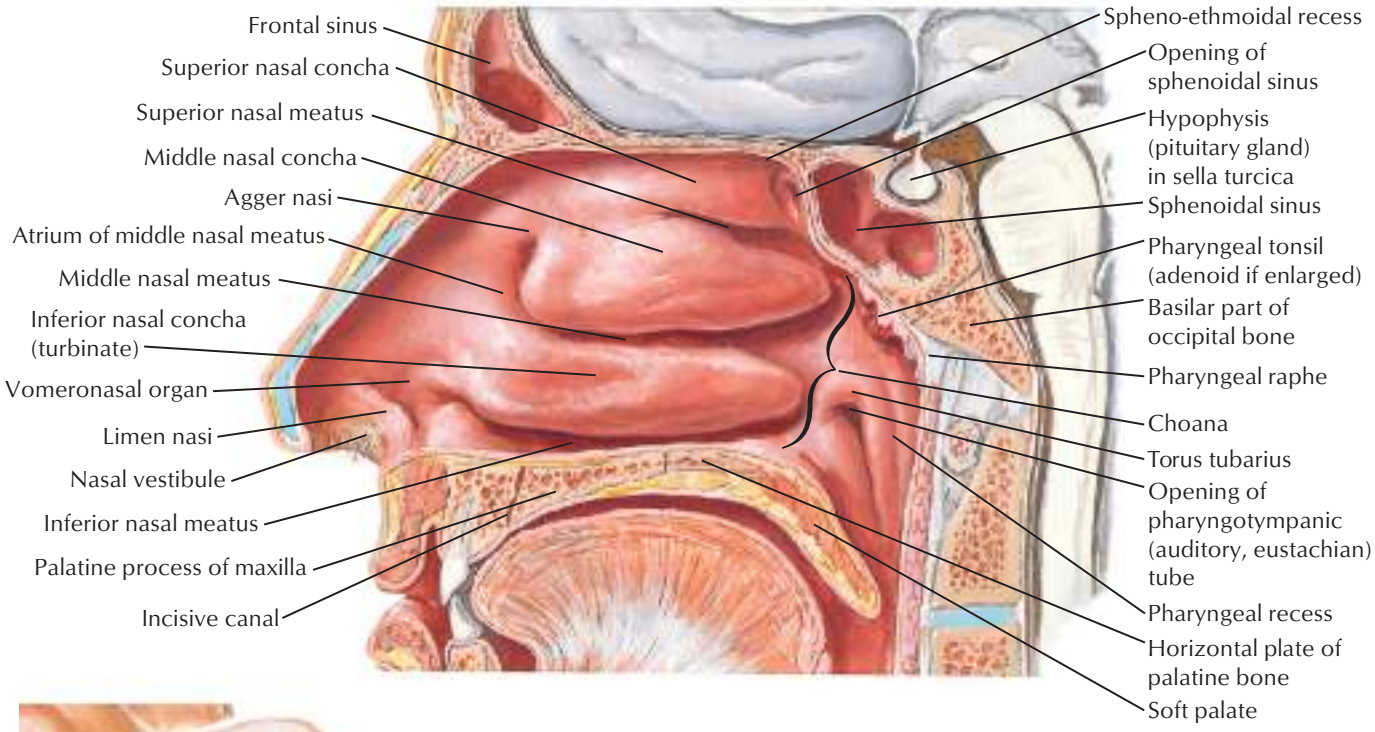


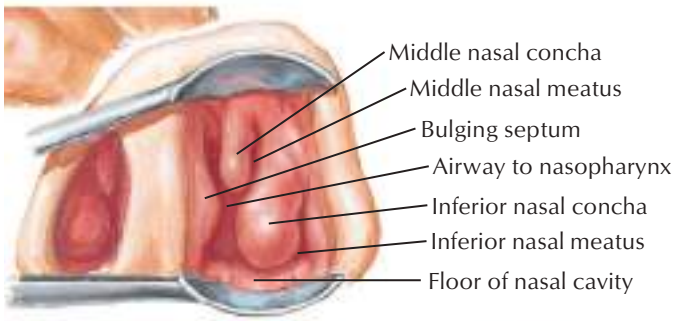
Inferior view



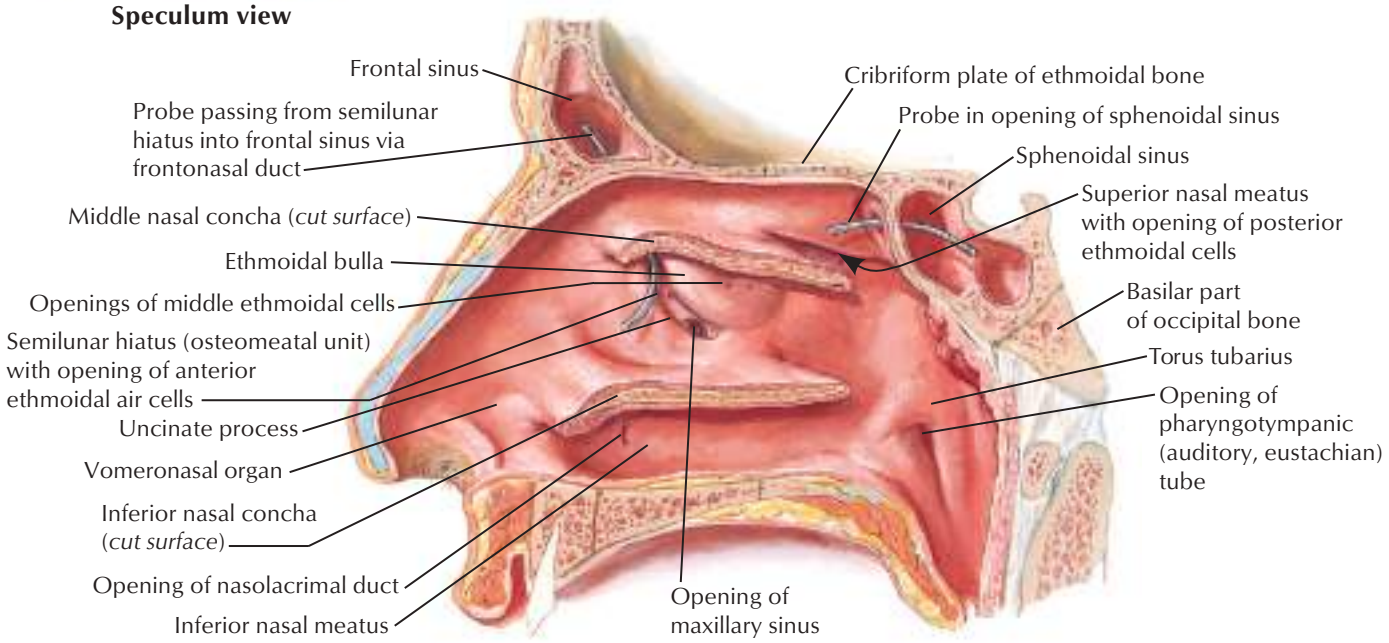


Lateral Wall of Nasal Cavity



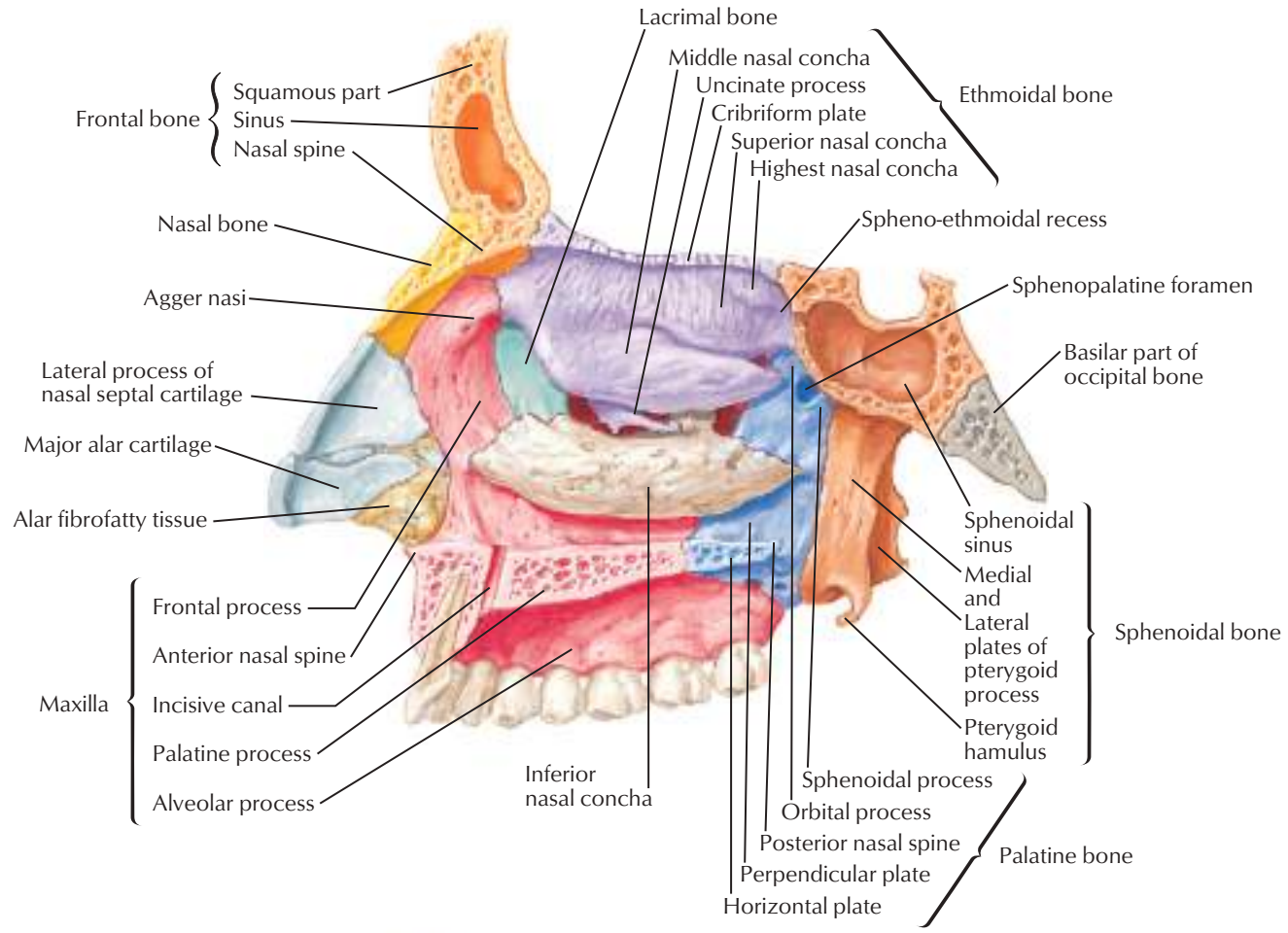


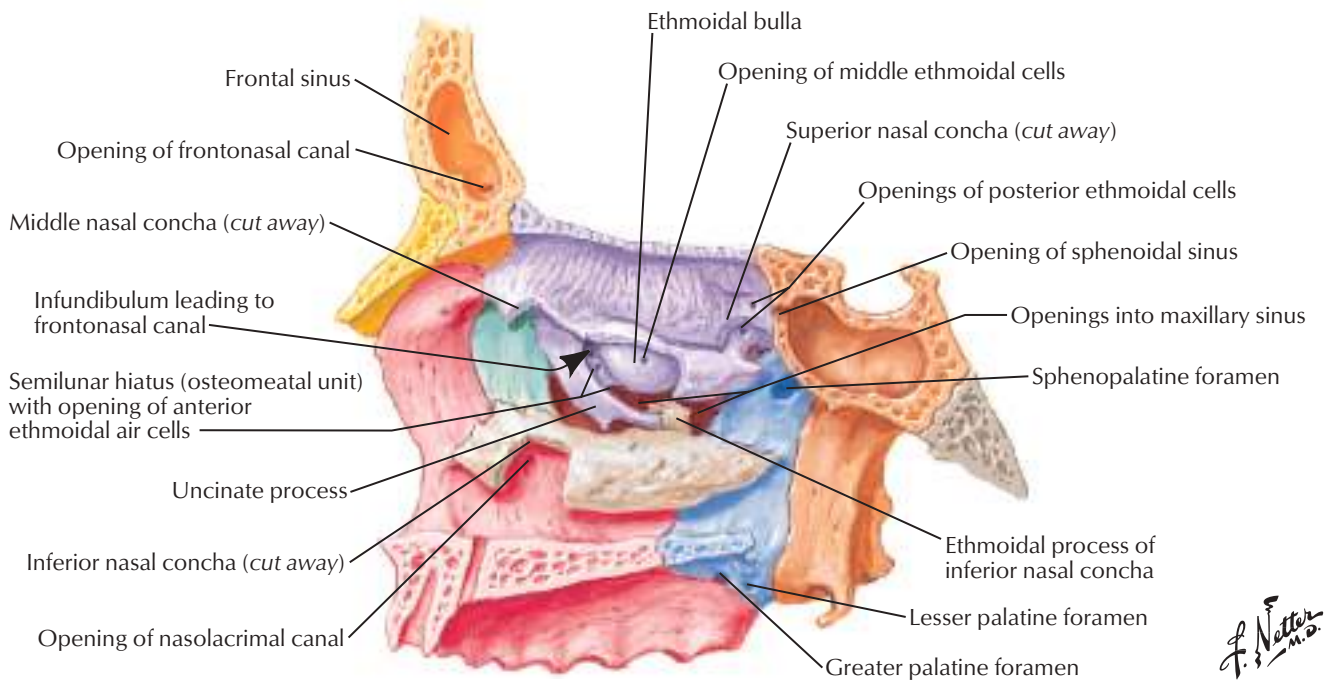
Speculum view



Lateral Wall of Nasal Cavity (continued)

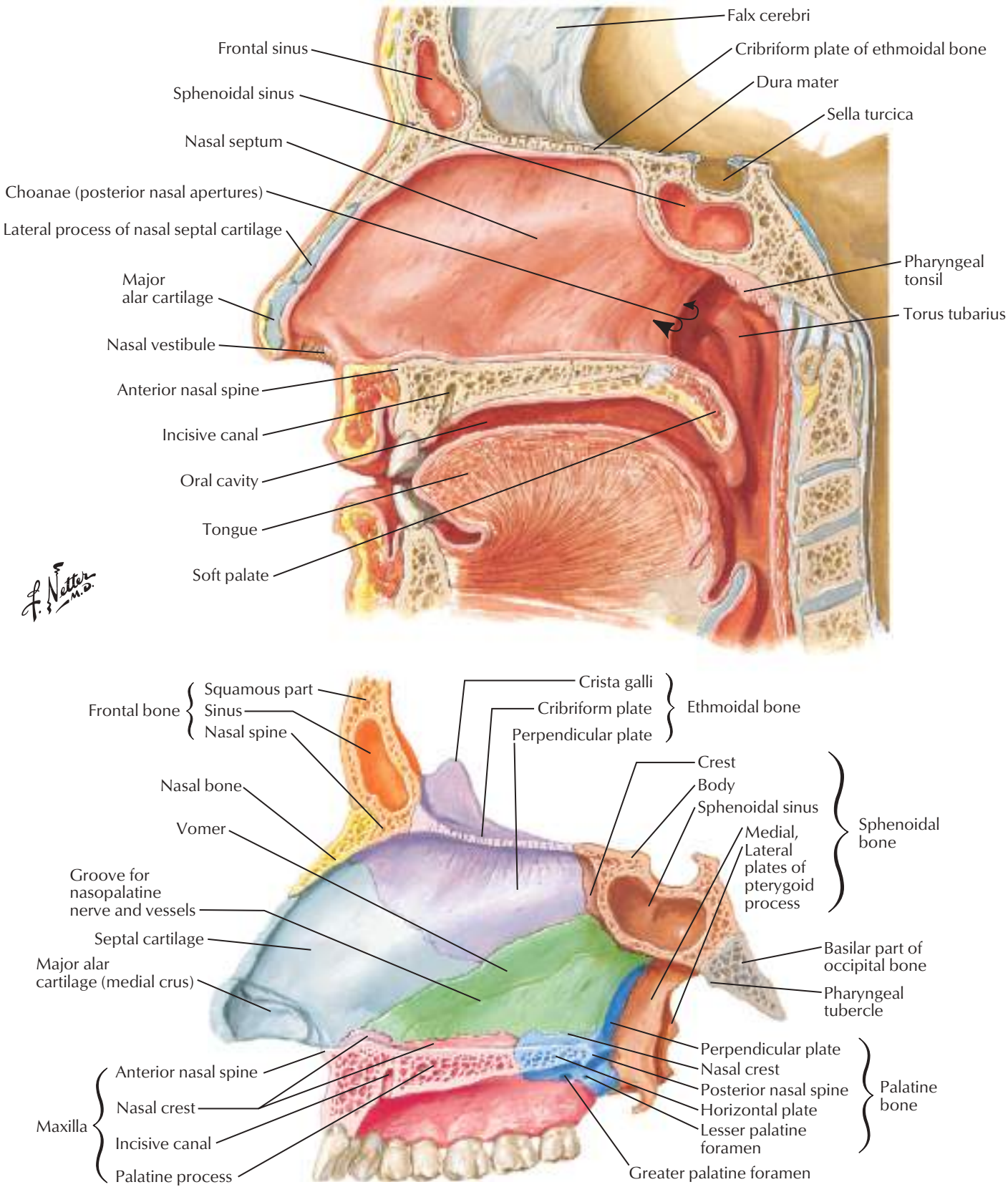
See also Plate 36

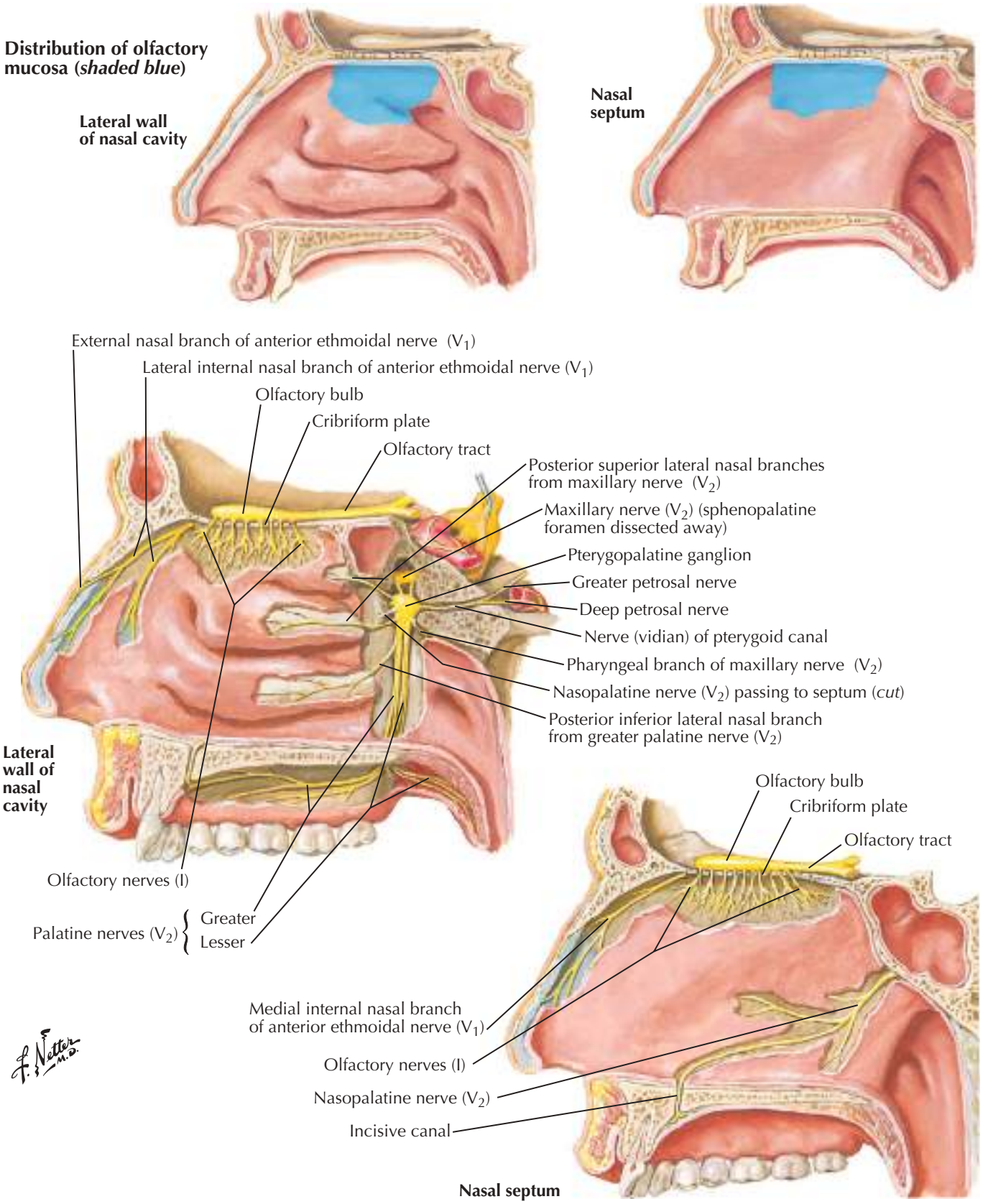




Medial Wall of Nasal Cavity (Nasal Septum)

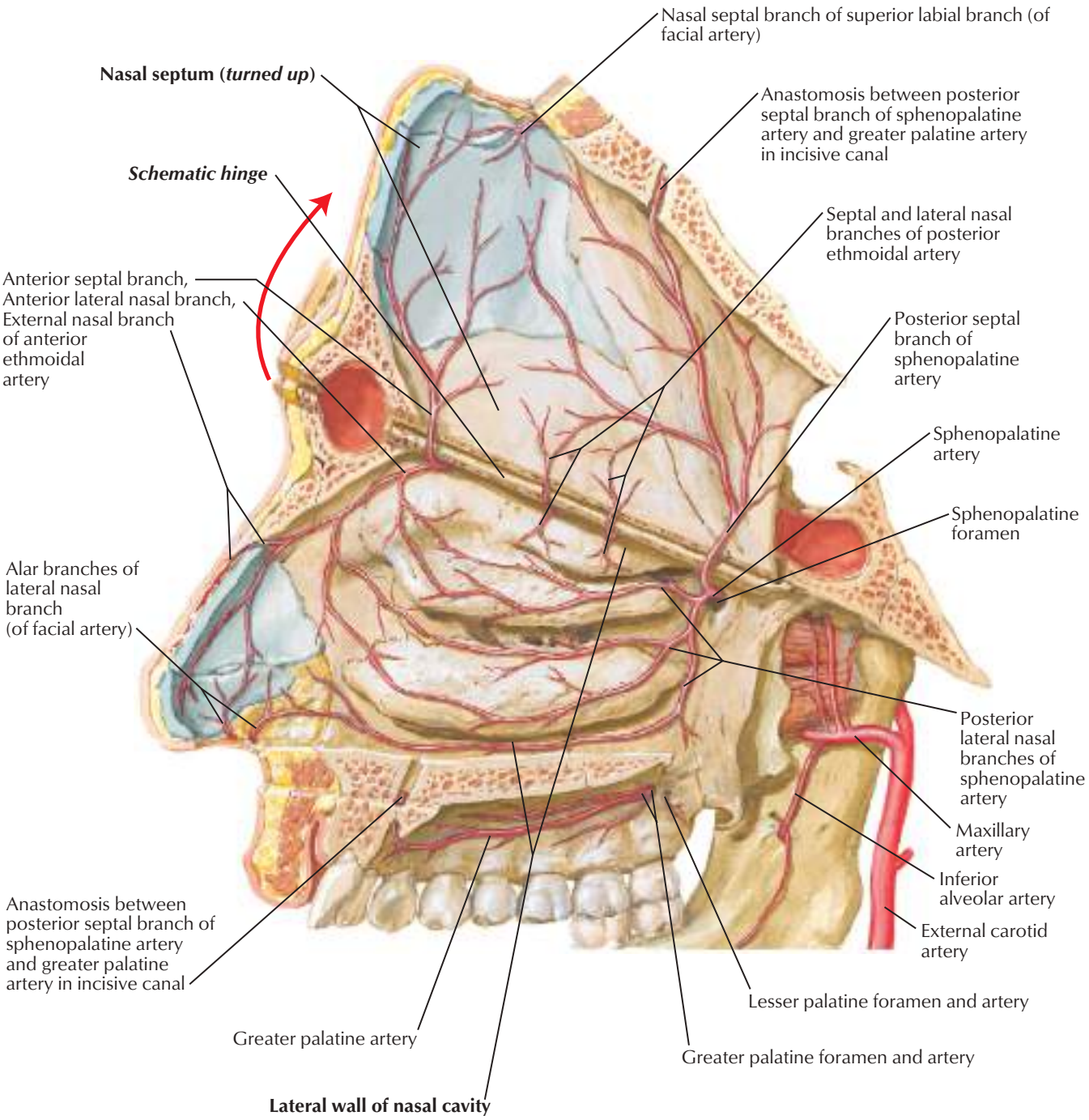
See also **Plate 8**




Distribution of olfactory mucosa (*shaded blue*)
Lateral wall of nasal cavity
Nasal septum
External nasal branch of anterior ethmoidal nerve (V1)
Lateral internal nasal branch of anterior ethmoidal nerve (V1)
Olfactory bulb
Cribriform plate
Olfactory tract
Posterior superior lateral nasal branches from maxillary nerve (V2)
Maxillary nerve (V2) (sphenopalatine foramen dissected away)
Pterygopalatine ganglion
Greater petrosal nerve
Deep petrosal nerve
Nerve (vidian) of pterygoid canal
Pharyngeal branch of maxillary nerve (V2)
Nasopalatine nerve (V2) passing to septum (*cut*)
Posterior inferior lateral nasal branch from greater palatine nerve (V2)
Lateral wall of nasal cavity
Olfactory nerves (I)
Palatine nerves (V2)
Greater
Lesser
Olfactory bulb
Cribriform plate
Olfactory tract
Medial internal nasal branch of anterior ethmoidal nerve (V1)
Olfactory nerves (I)
Nasopalatine nerve (V2)
Incisive canal
Nasal septum

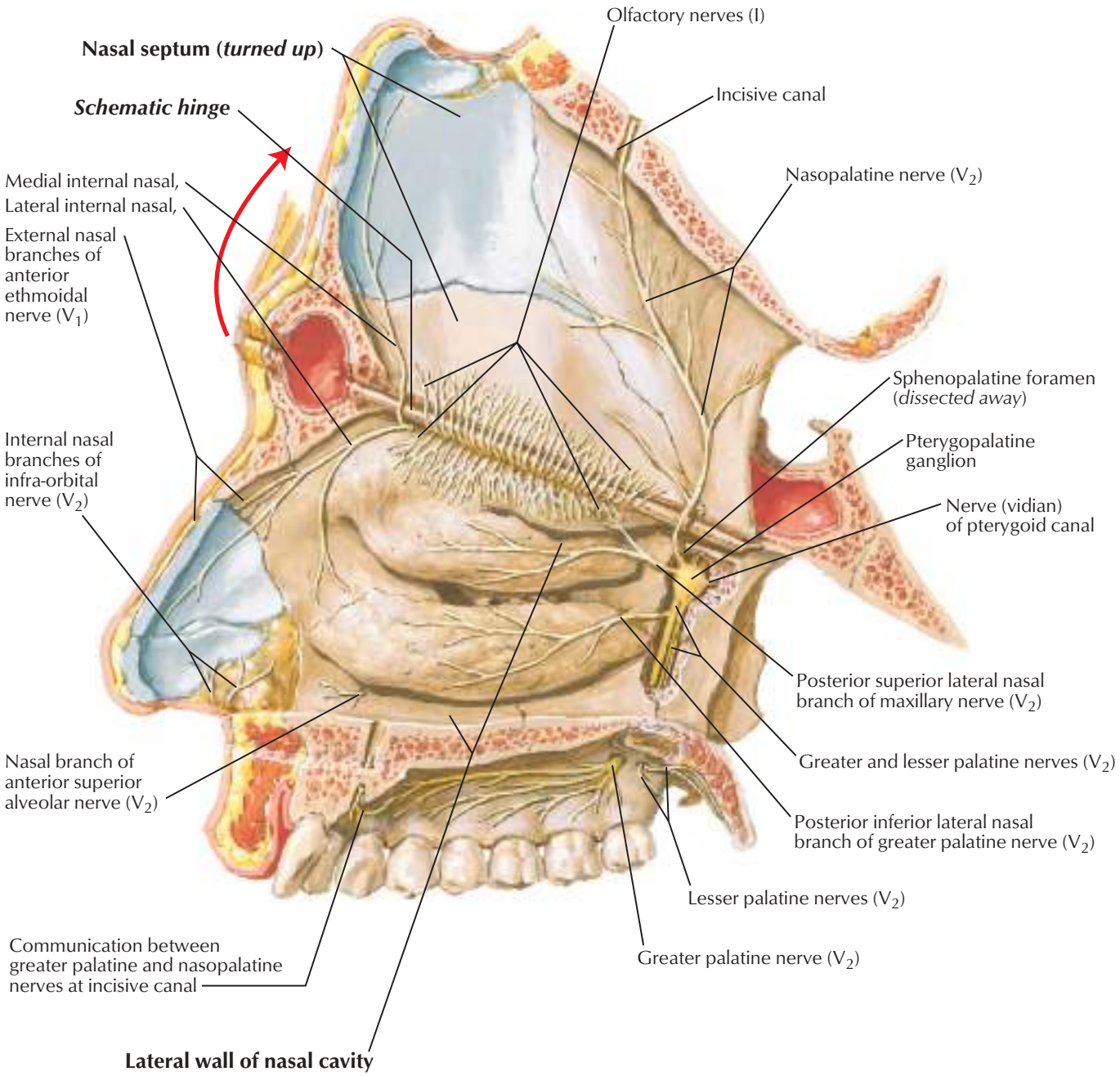
Arteries of Nasal Cavity: Nasal Septum Turned Up

See also **Plate 57**

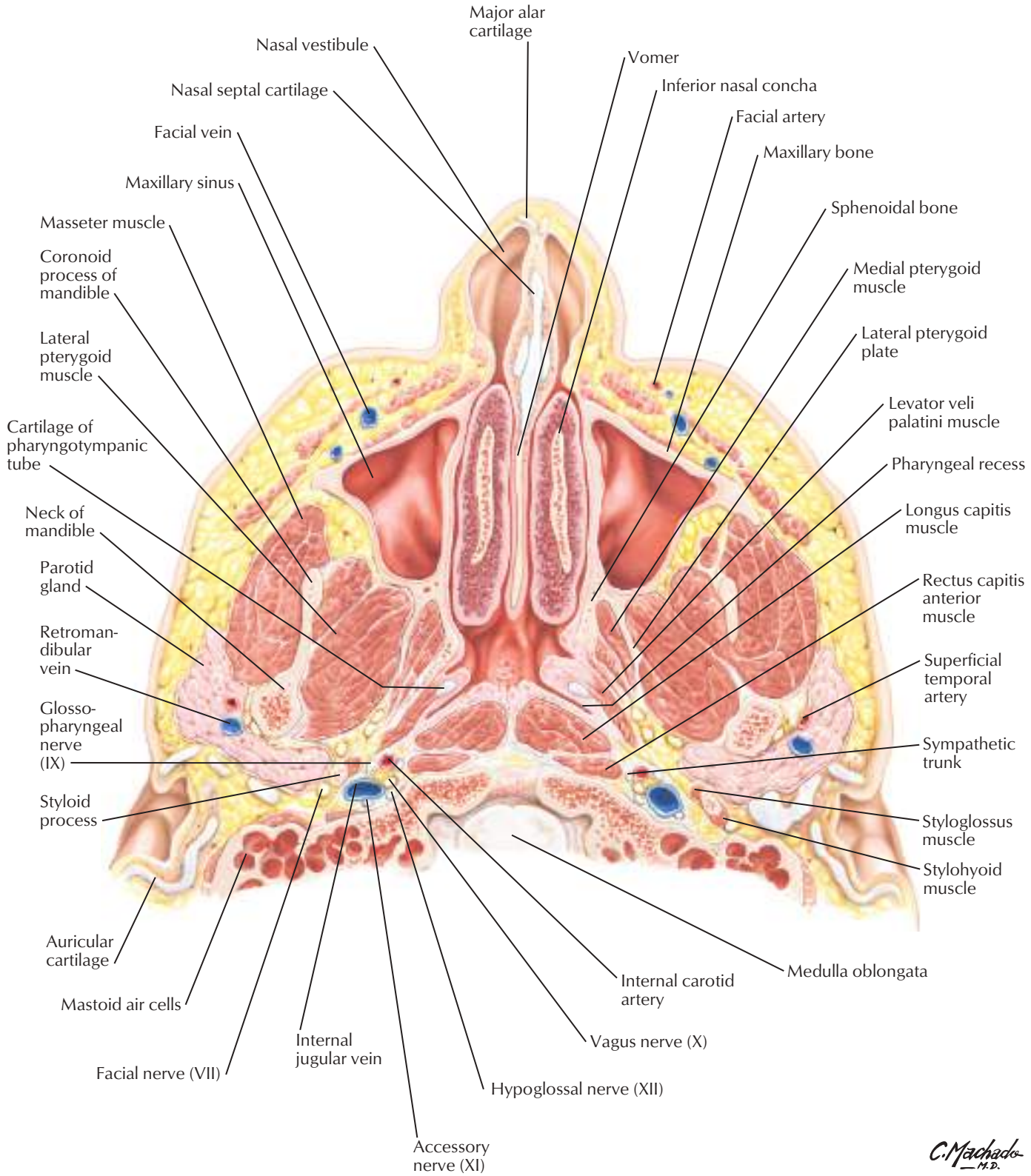


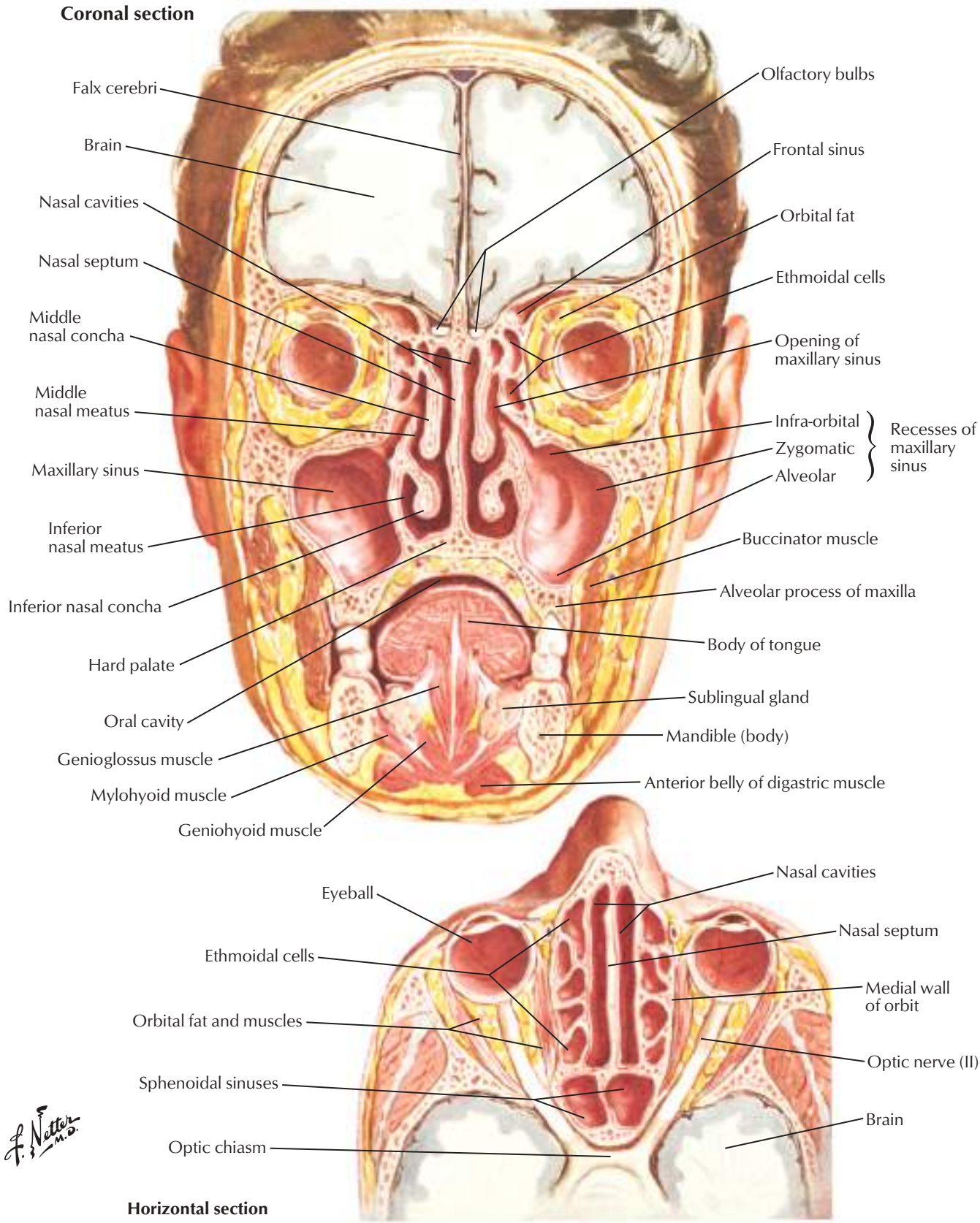
Nerves of Nasal Cavity: Nasal Septum Turned Up

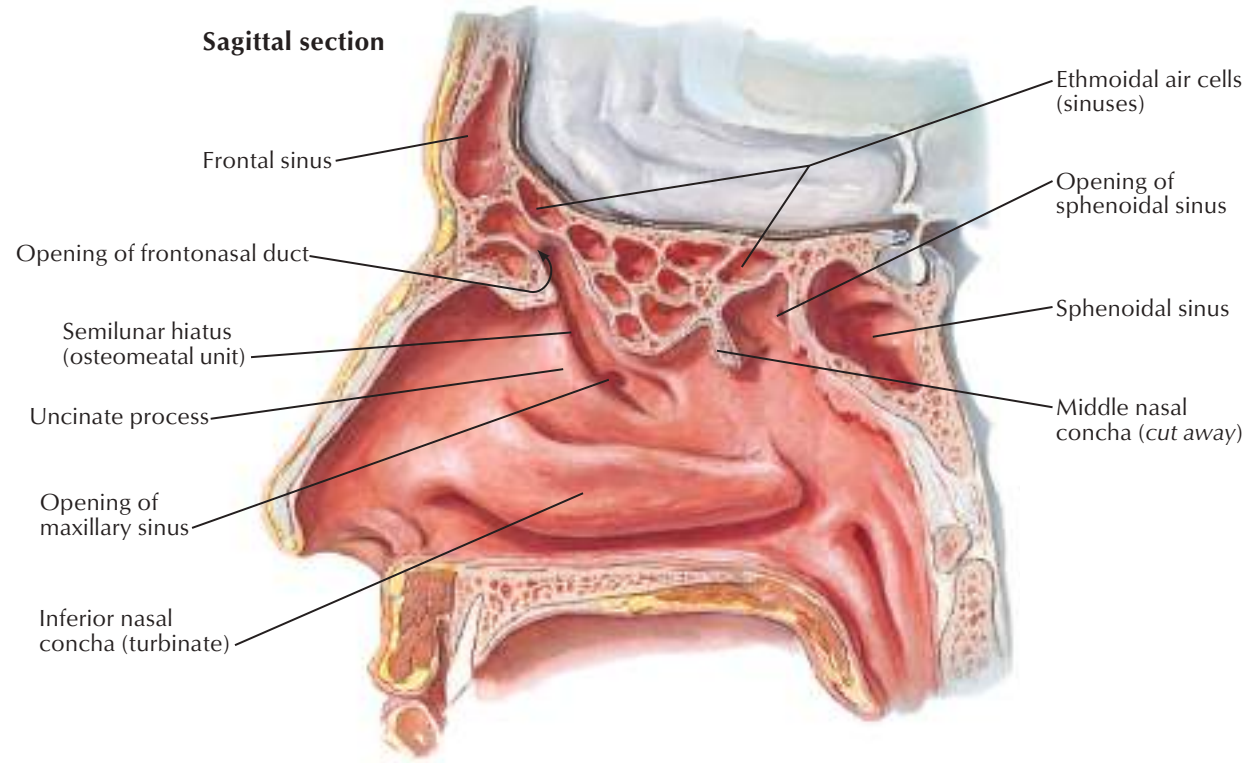
See also Plates 52, 53

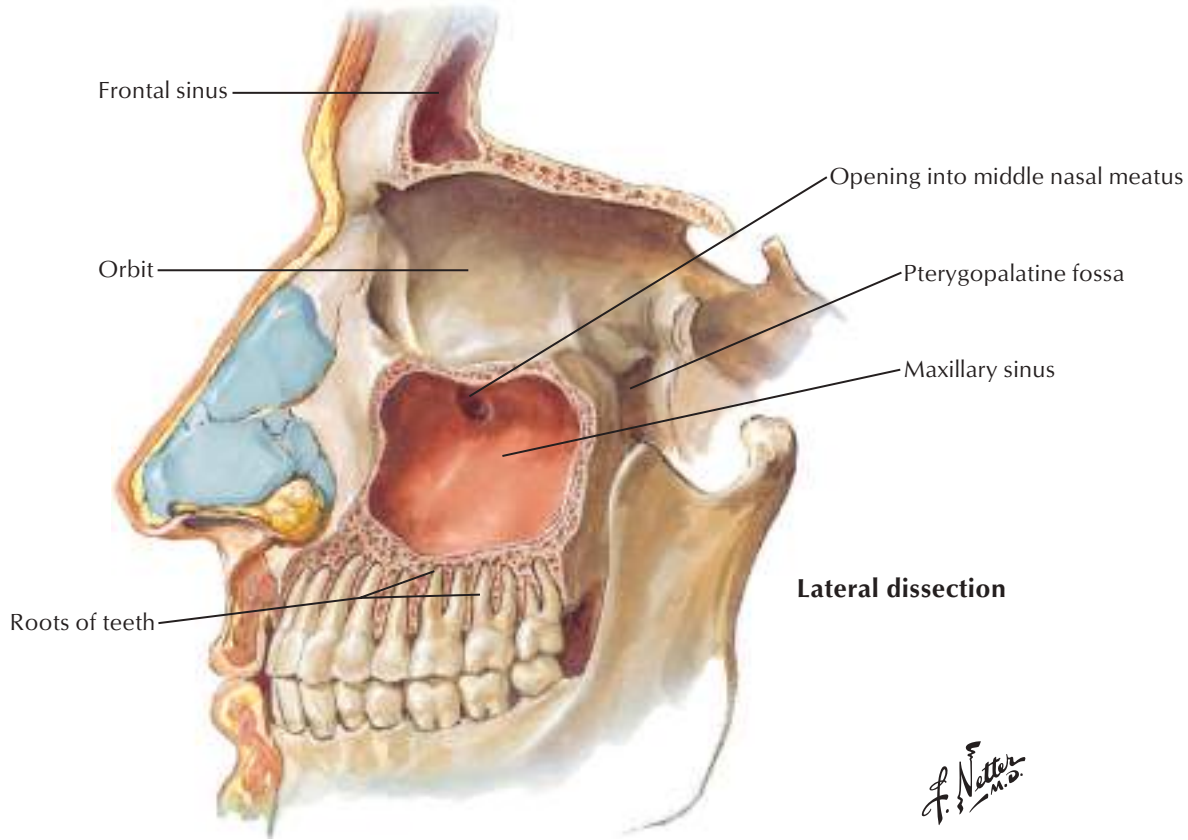


Nose and Maxillary Sinus: Transverse Section

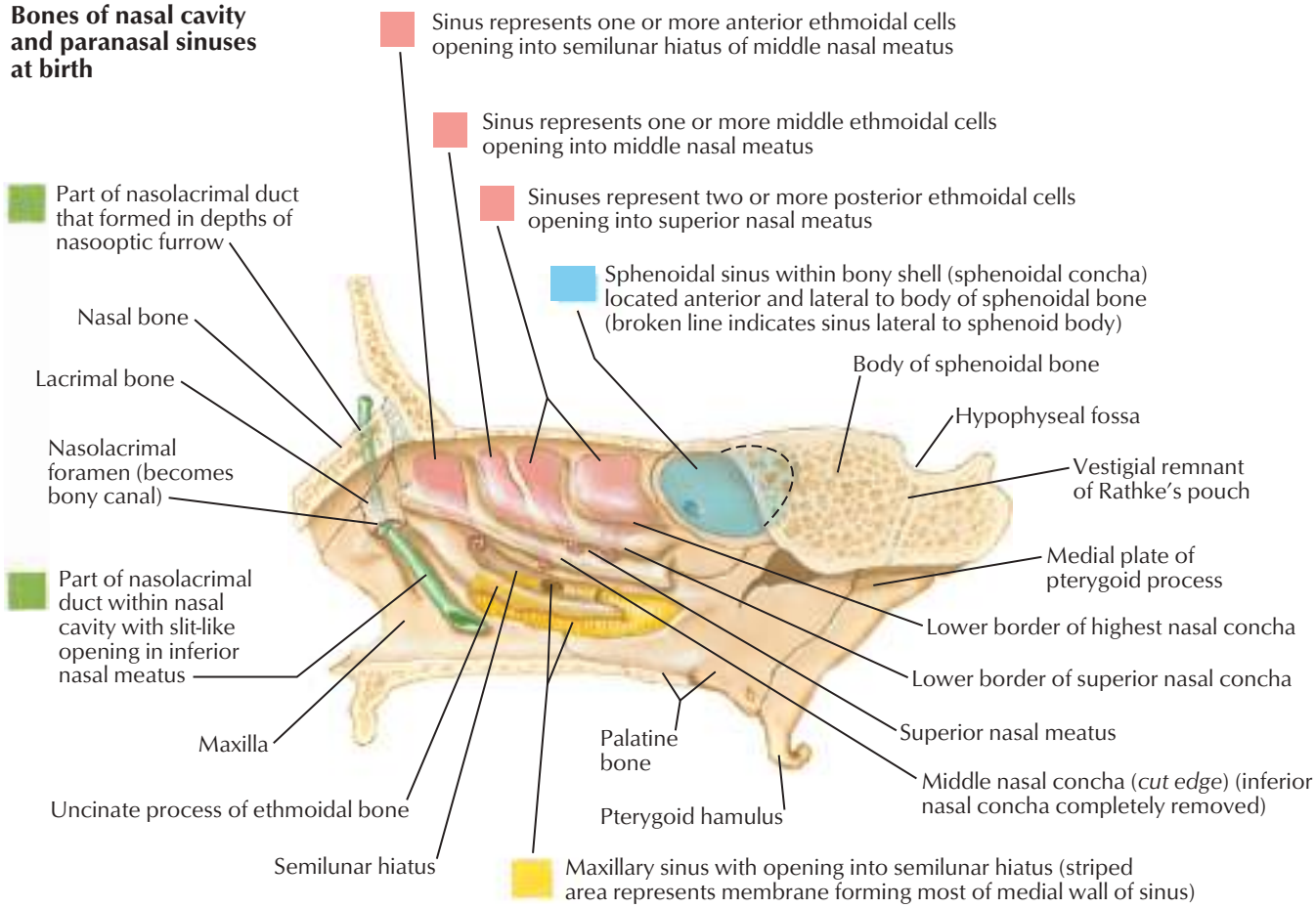



Coronal section
Falx cerebri
Brain
Nasal cavities
Nasal septum
Middle nasal concha
Middle nasal meatus
Maxillary sinus
Inferior nasal meatus
Inferior nasal concha
Hard palate
Oral cavity
Genioglossus muscle
Mylohyoid muscle
Geniohyoid muscle
Olfactory bulbs
Frontal sinus
Orbital fat
Ethmoidal cells
Opening of maxillary sinus
Infra-orbital
Zygomatic
Alveolar
Recesses of maxillary sinus
Buccinator muscle
Alveolar process of maxilla
Body of tongue
Sublingual gland
Mandible (body)
Anterior belly of digastric muscle
Eyeball
Ethmoidal cells
Orbital fat and muscles
Sphenoidal sinuses
Optic chiasm
Nasal cavities
Nasal septum
Medial wall of orbit
Optic nerve (II)
Brain
Horizontal section

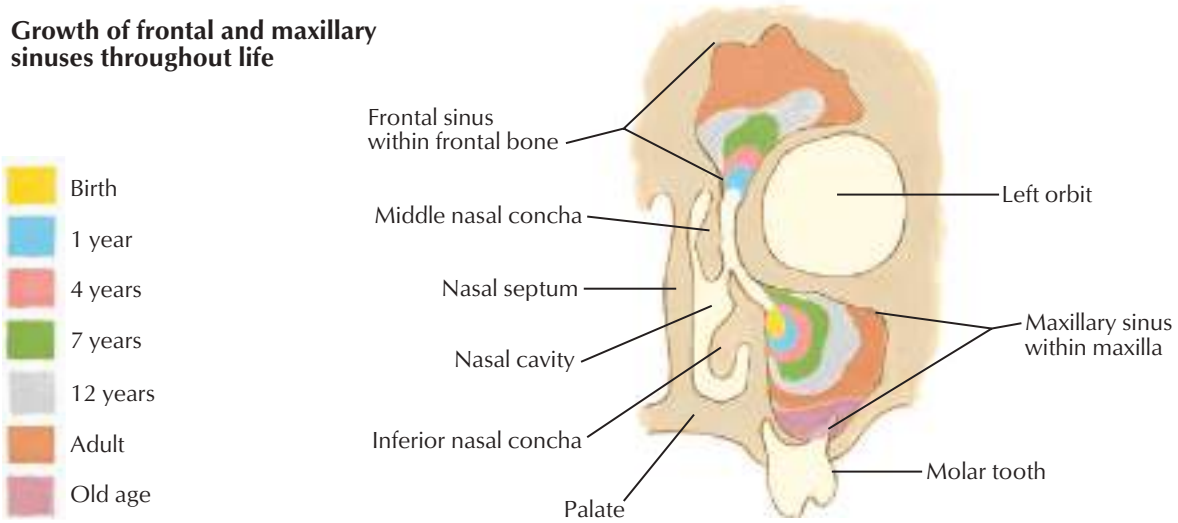

Sagittal section
Ethmoidal air cells (sinuses)
Frontal sinus
Opening of sphenoidal sinus
Opening of frontonasal duct
Sphenoidal sinus
Semilunar hiatus (osteomeatal unit)
Middle nasal concha (cut away)
Uncinate process
Opening of maxillary sinus
Inferior nasal concha (turbinate)


Frontal sinus
Opening into middle nasal meatus
Orbit
Pterygopalatine fossa
Maxillary sinus
Roots of teeth
Lateral dissection

Bones of nasal cavity and paranasal sinuses at birth

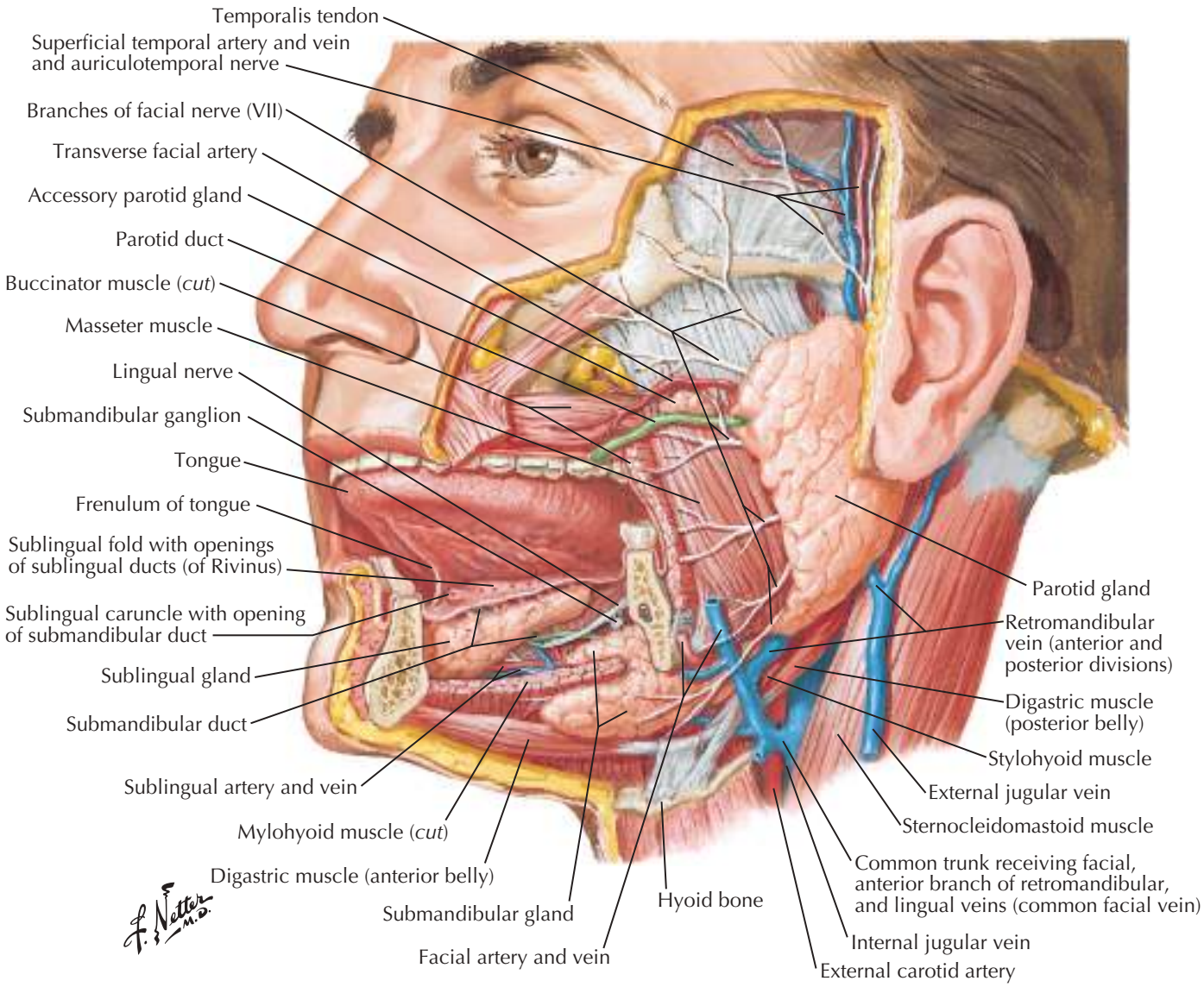


Growth of frontal and maxillary sinuses throughout life

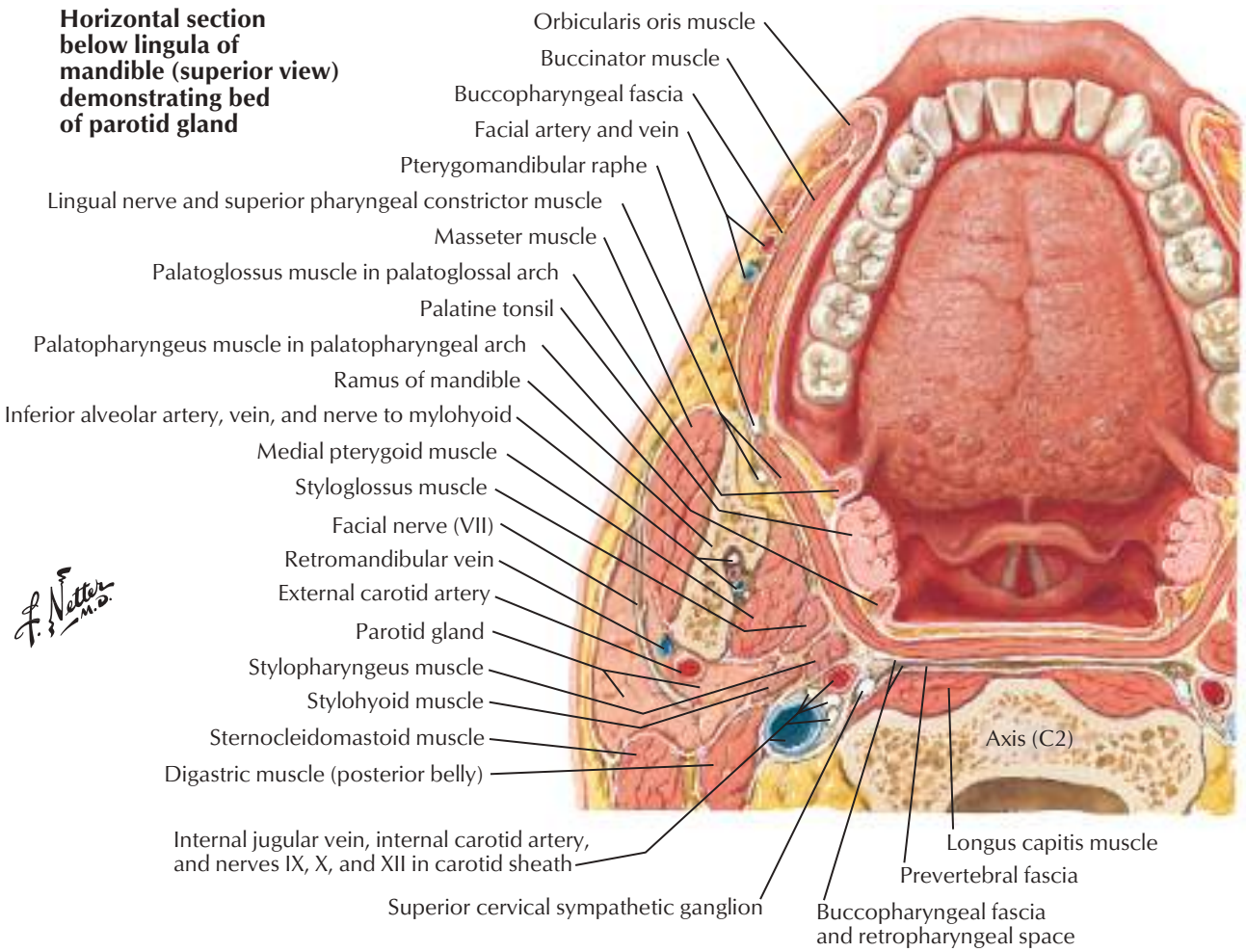


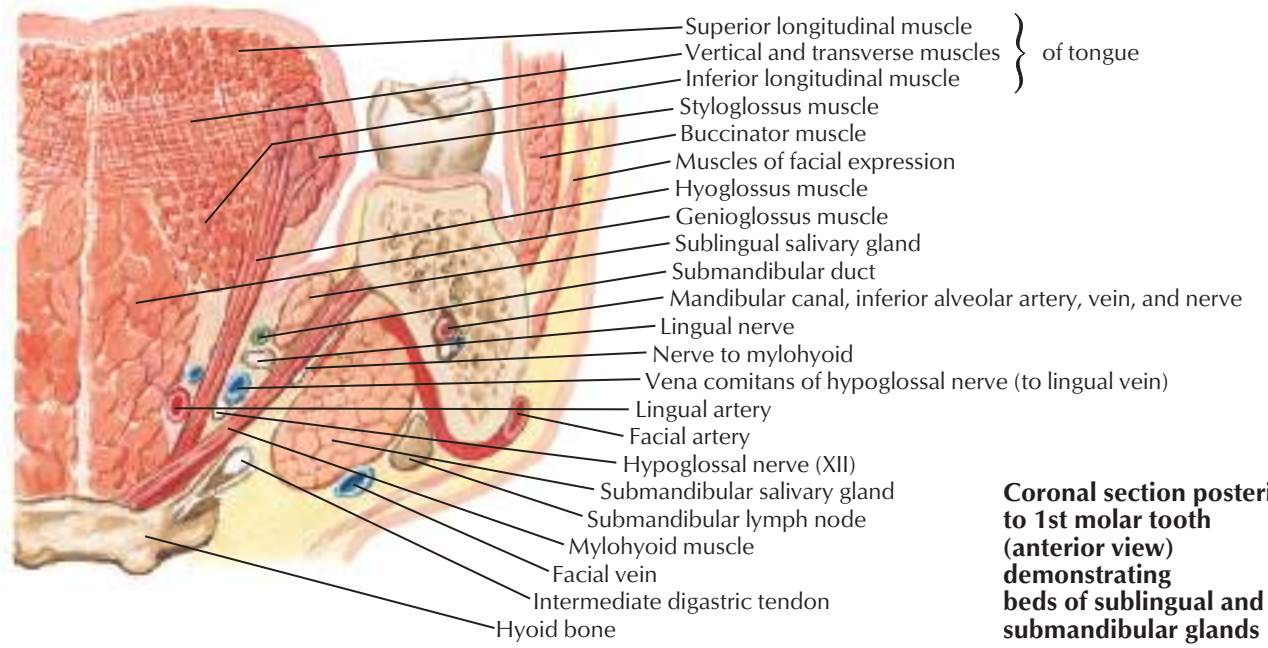
Salivary Glands

See also **Plates 24, 134, 135**



Horizontal section below lingula of mandible (superior view) demonstrating bed of parotid gland

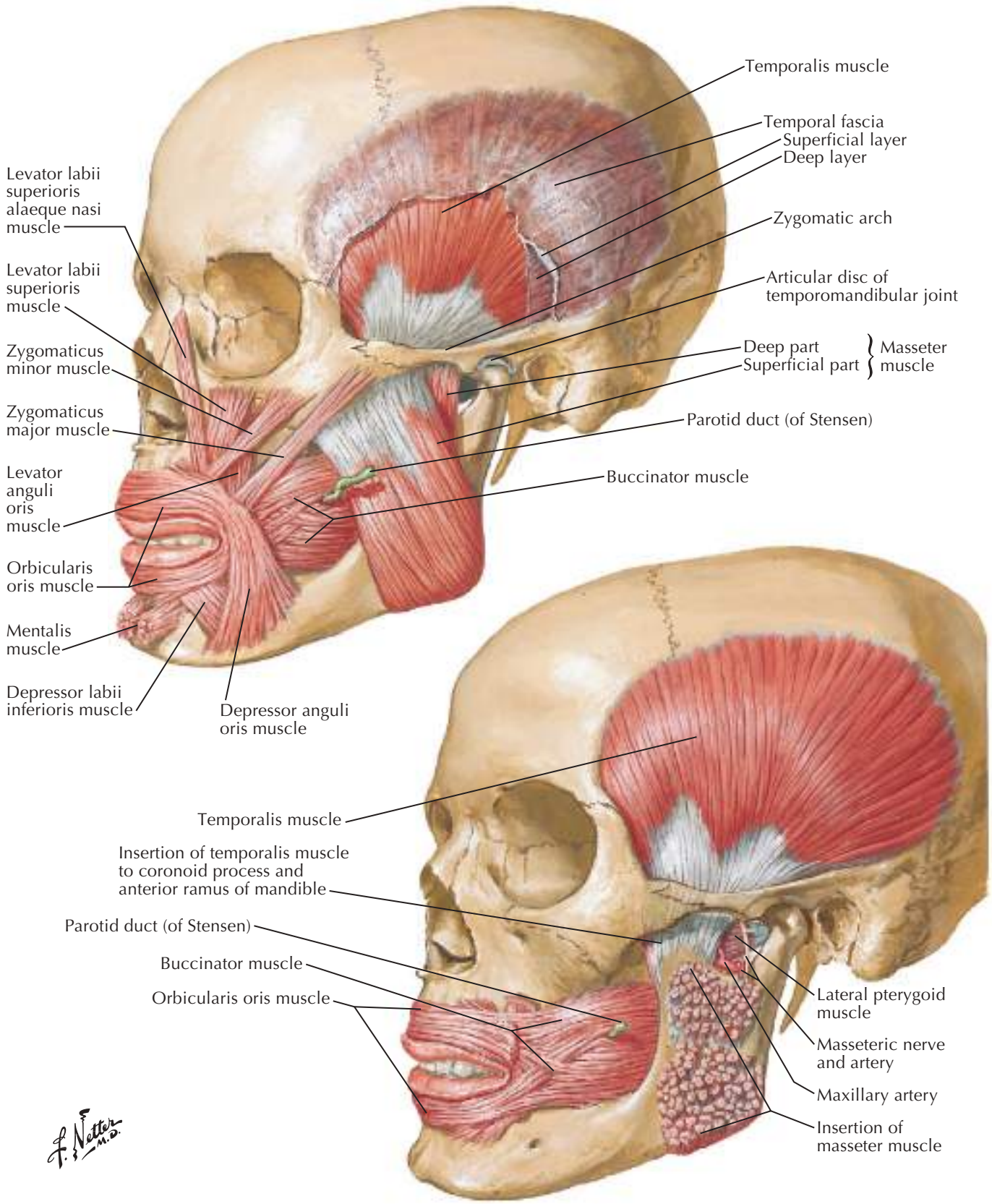


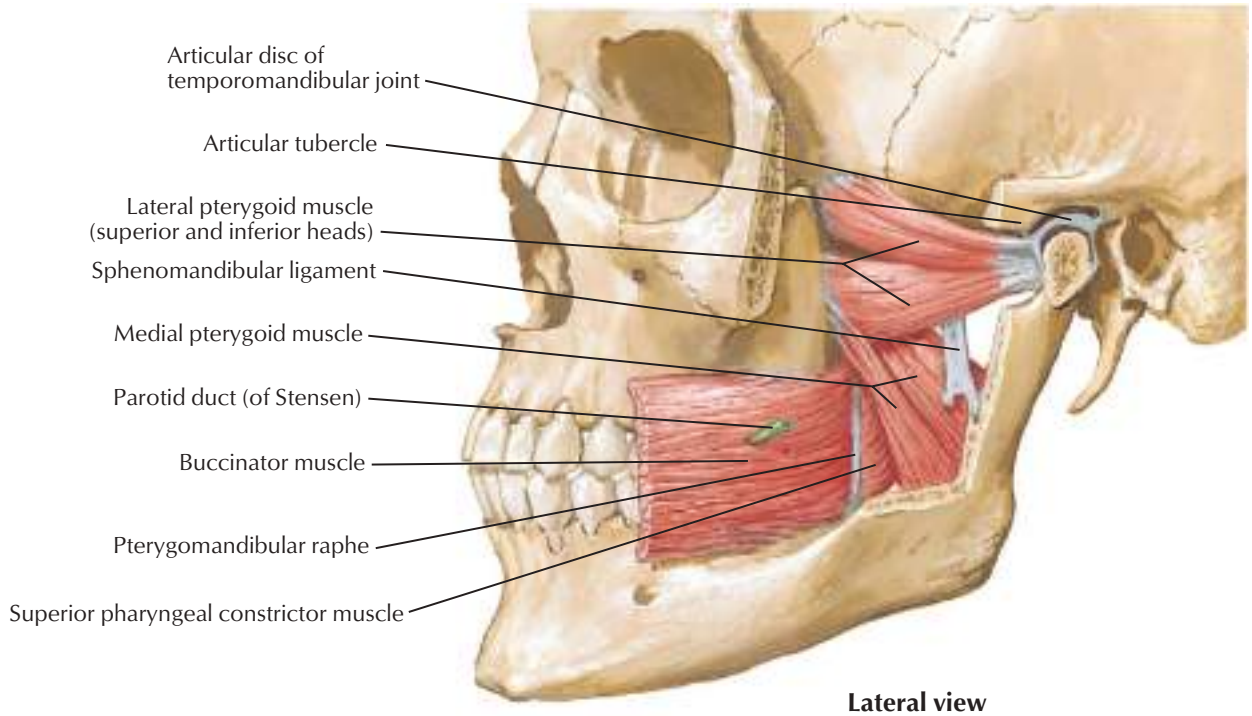


Coronal section posterior to 1st molar tooth (anterior view) demonstrating beds of sublingual and submandibular glands

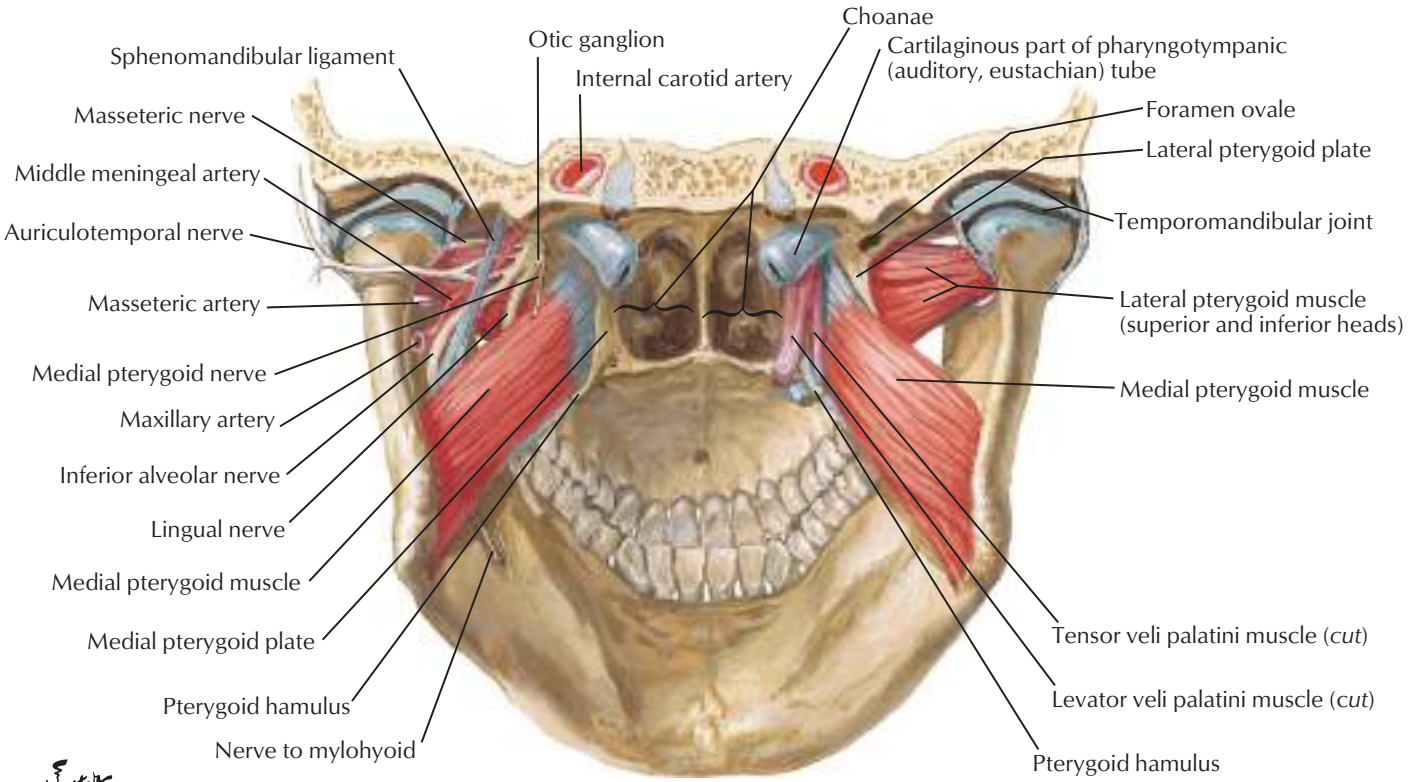
Muscles Involved in Mastication

For facial muscles see Plate 25





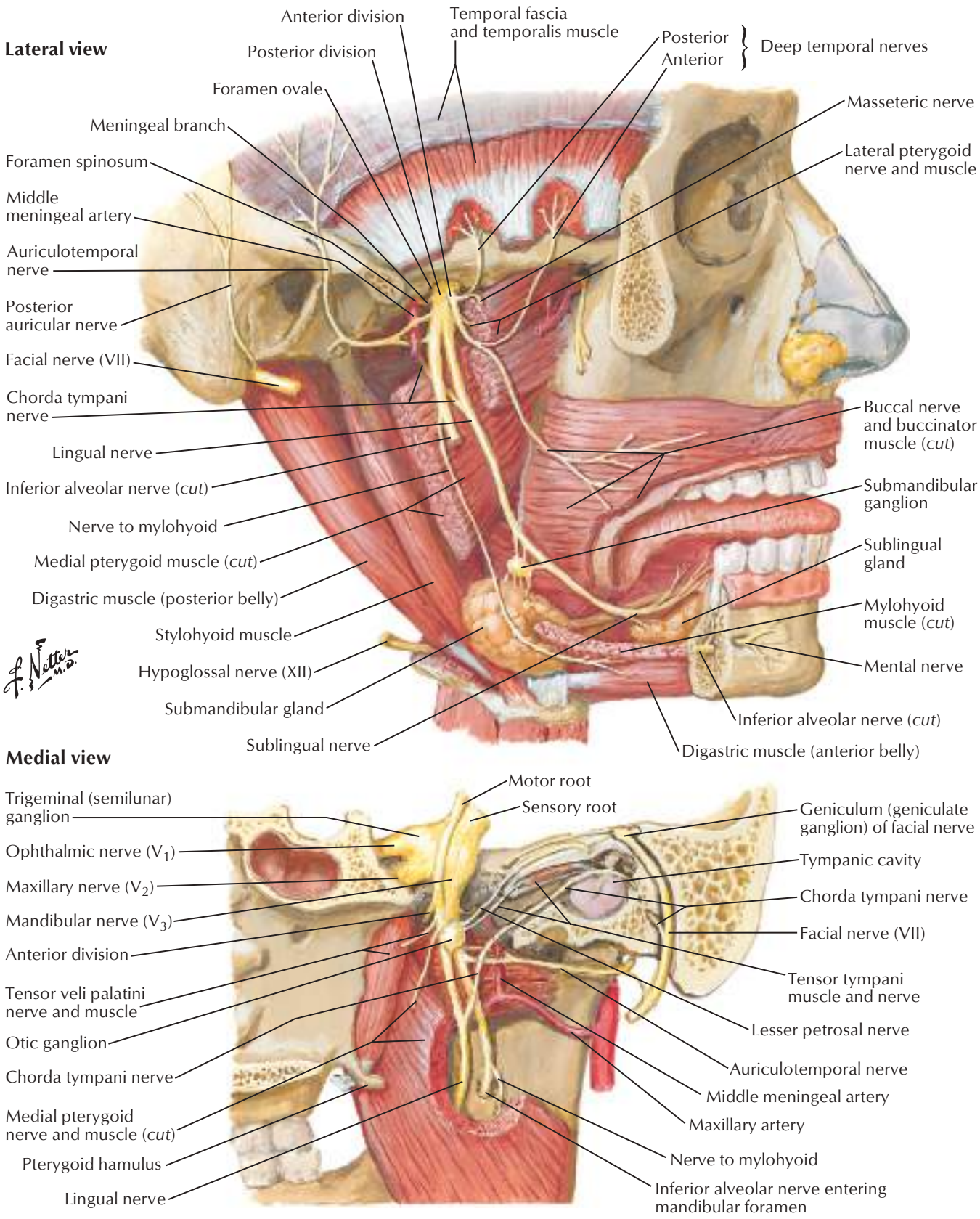
Lateral view



Posterior view

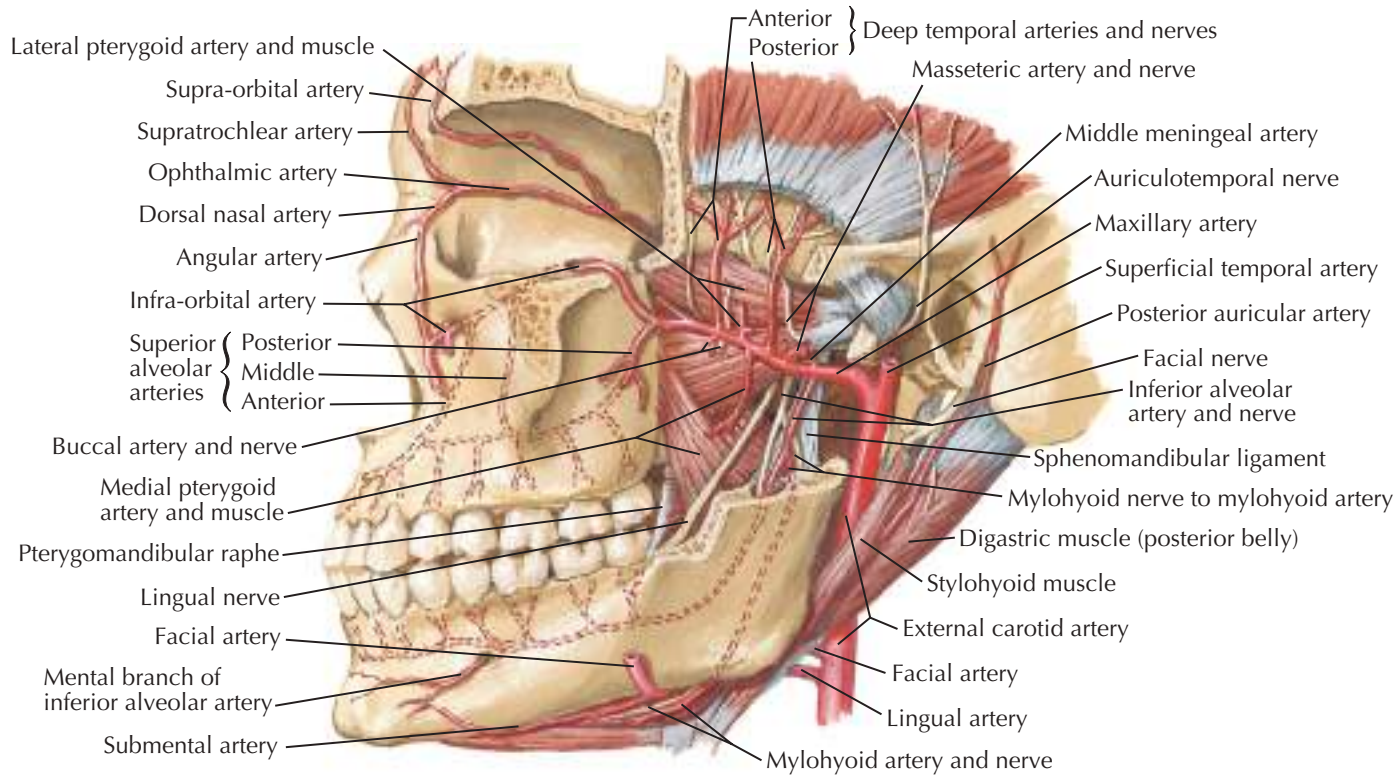
Mandibular Nerve (V_3)

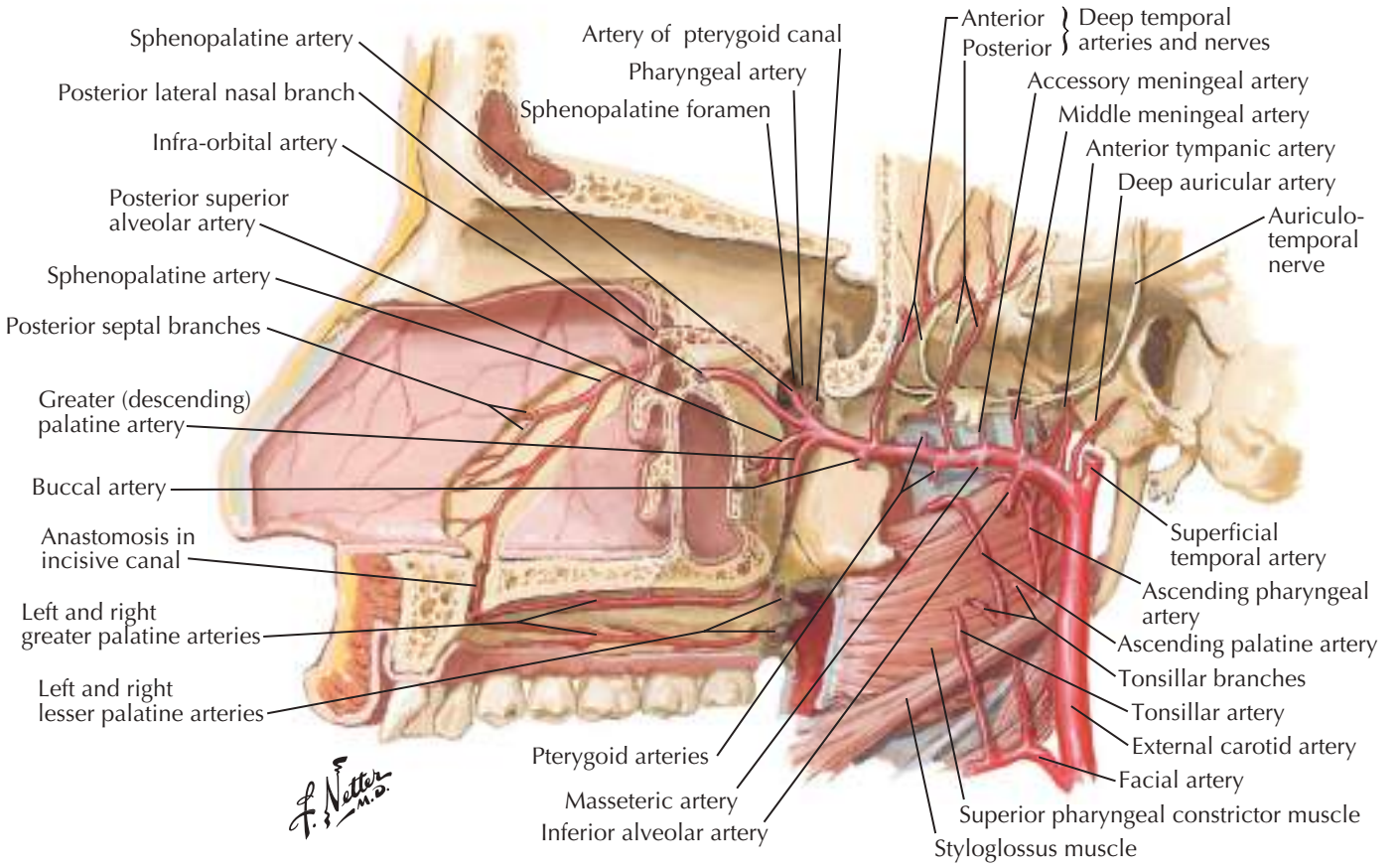
See also Plates 71, 123



Maxillary Artery

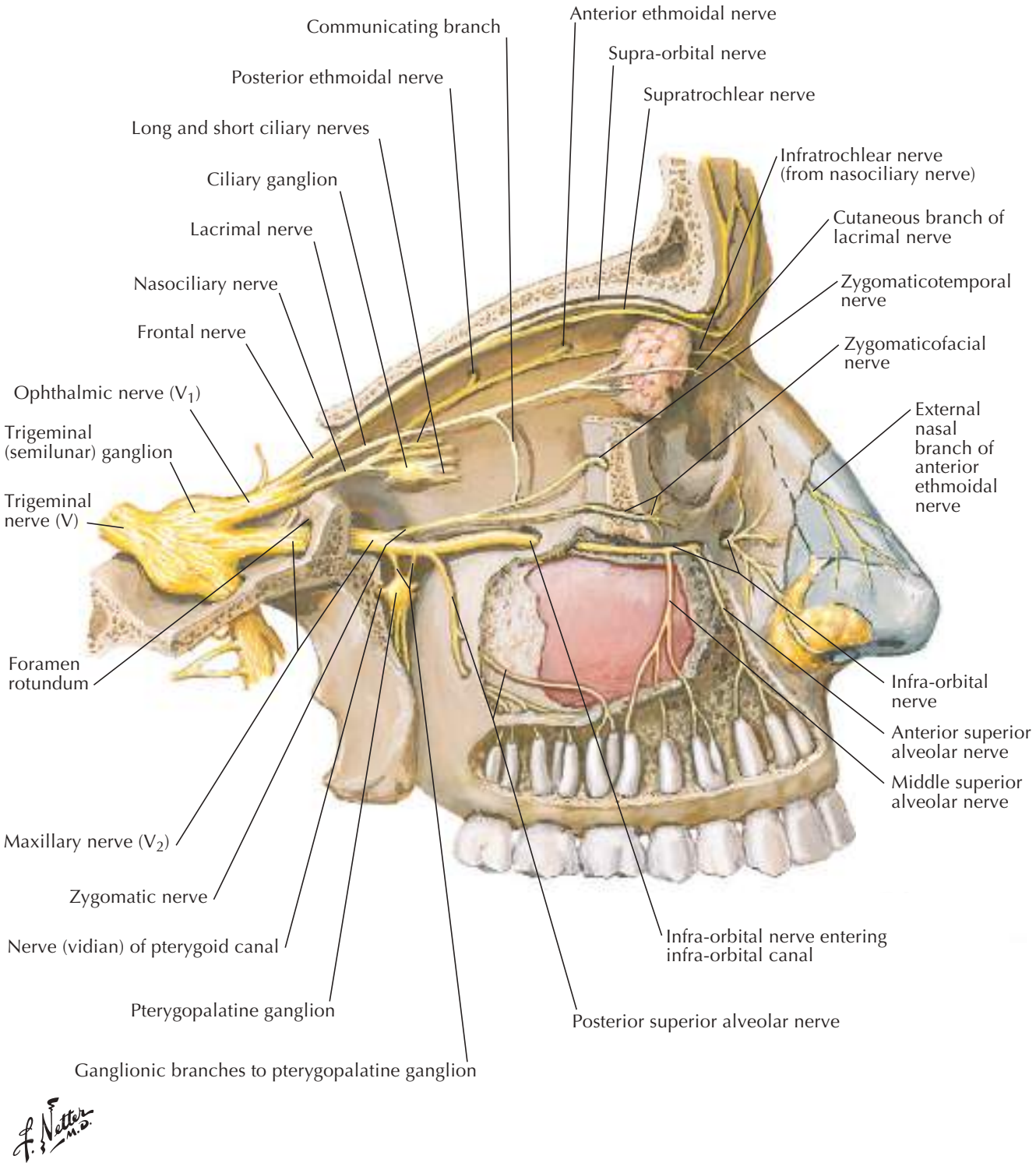
See also Plates 34, 72





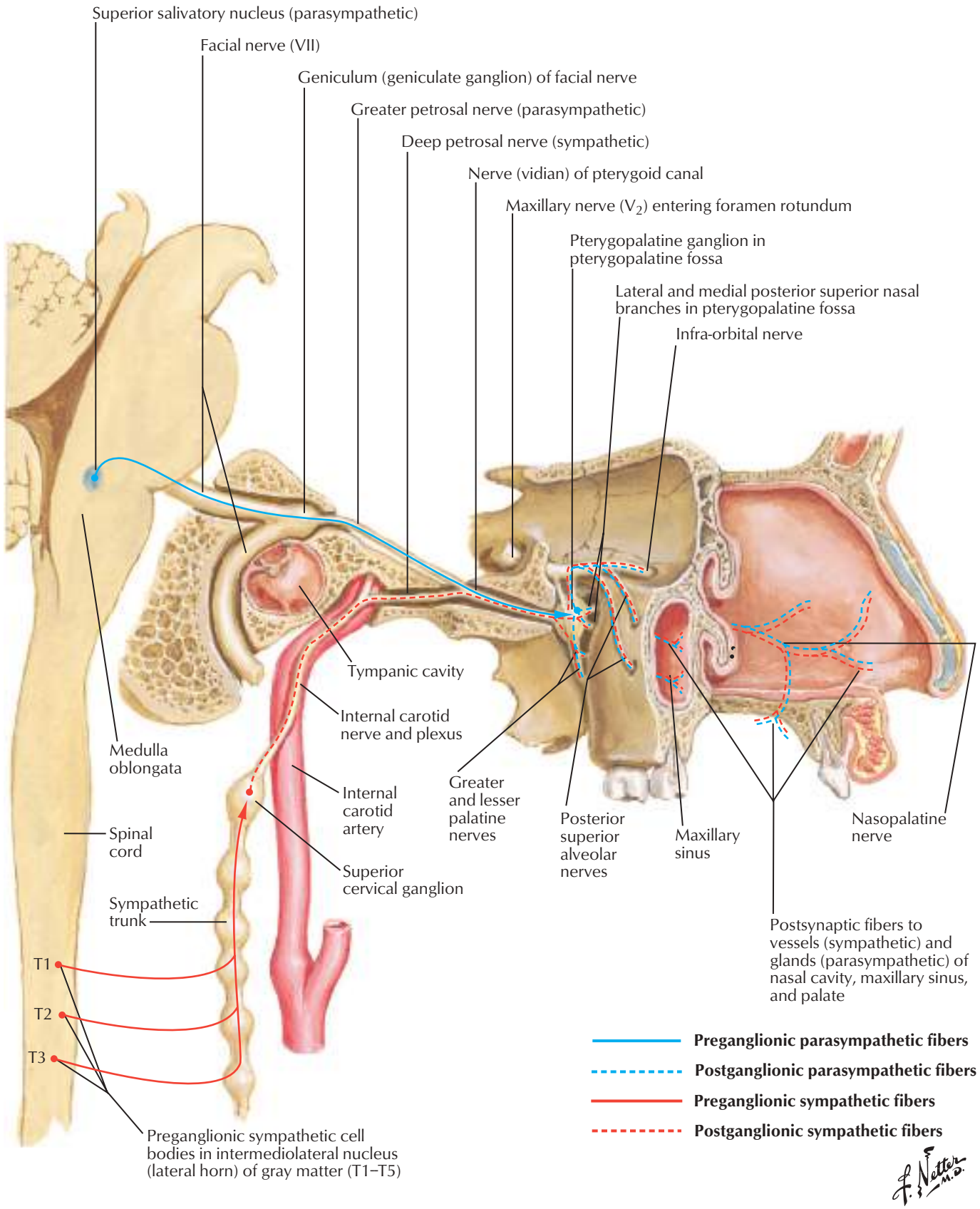
Ophthalmic (V_1) and Maxillary (V_2) Nerves

See also **Plate 44**



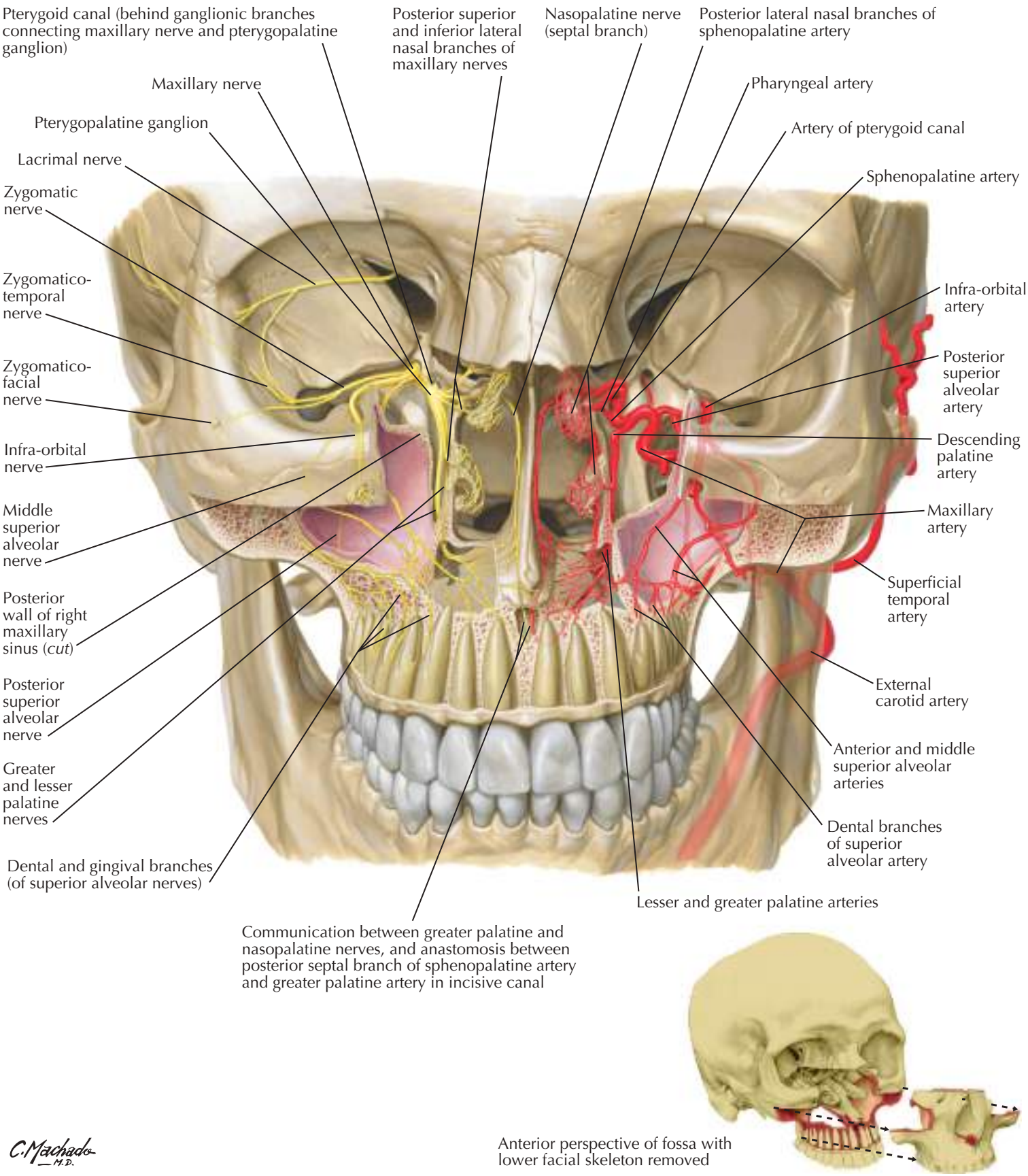
Autonomic Innervation of Nasal Cavity

See also Plates 123, 132, 134



Pterygopalatine Fossa

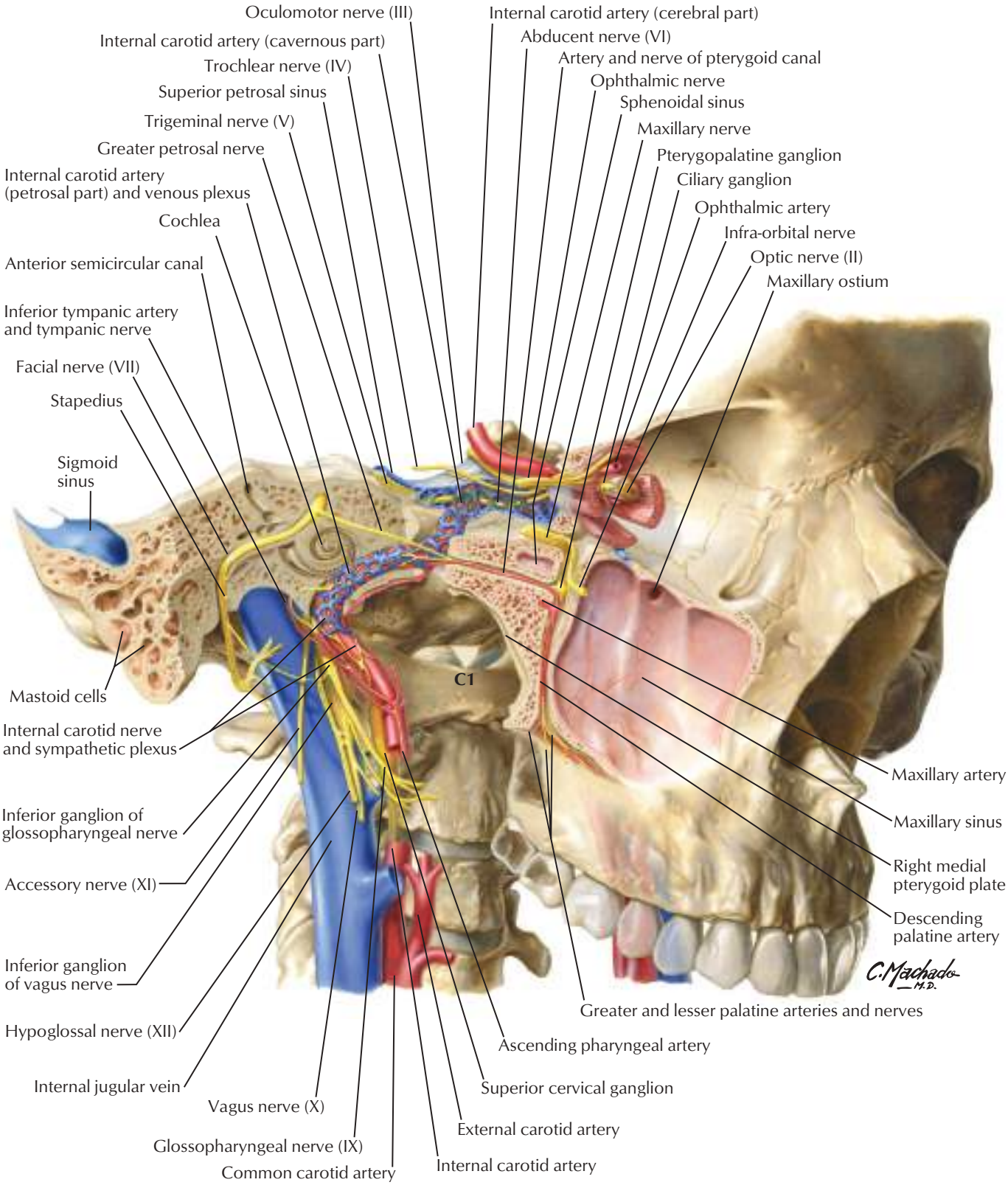
See also Plates 39, 41, 52

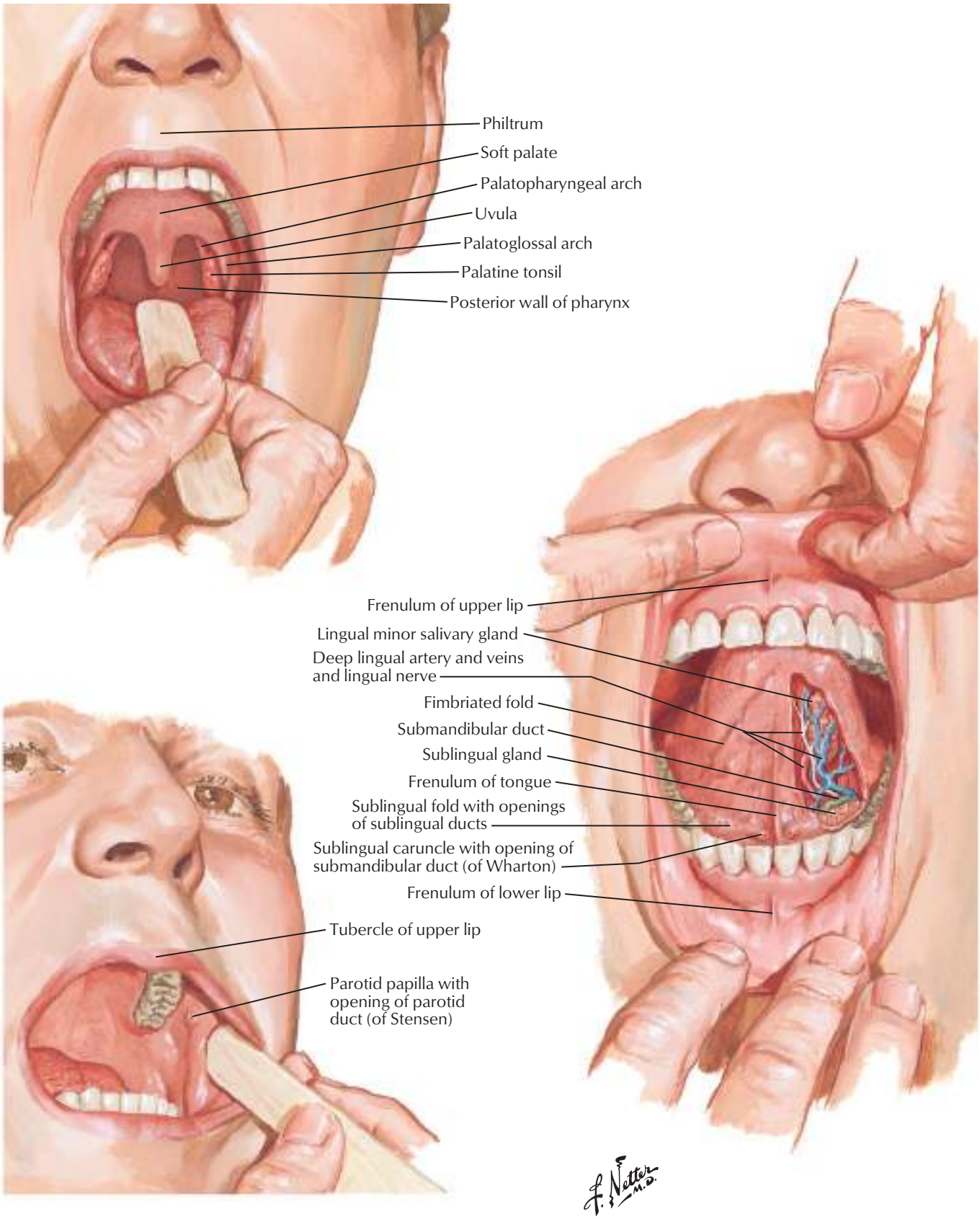


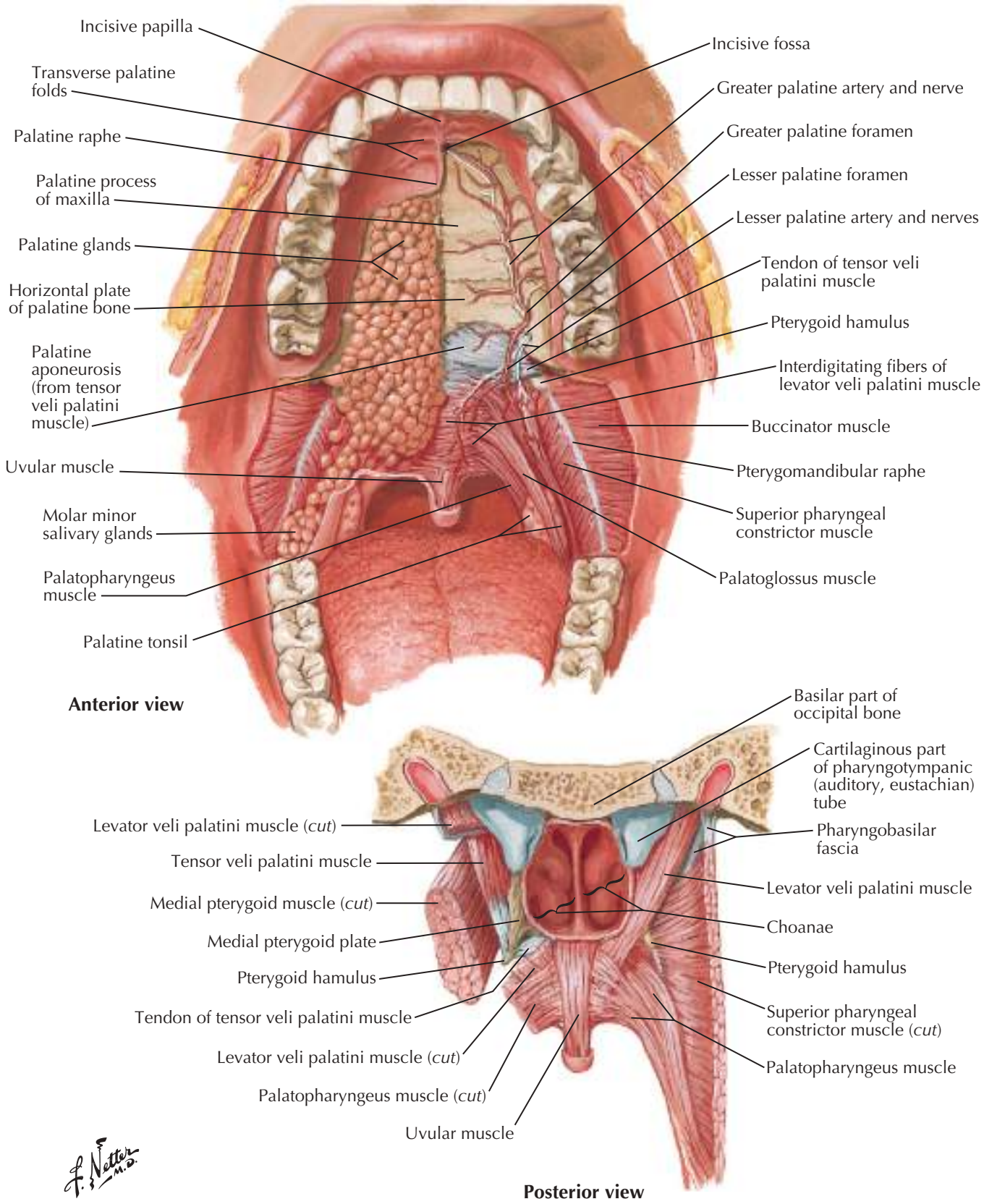
Anterior perspective of fossa with lower facial skeleton removed

Orientation of Nerves and Vessels of the Cranial Base

See also Plates 105, 132, 137

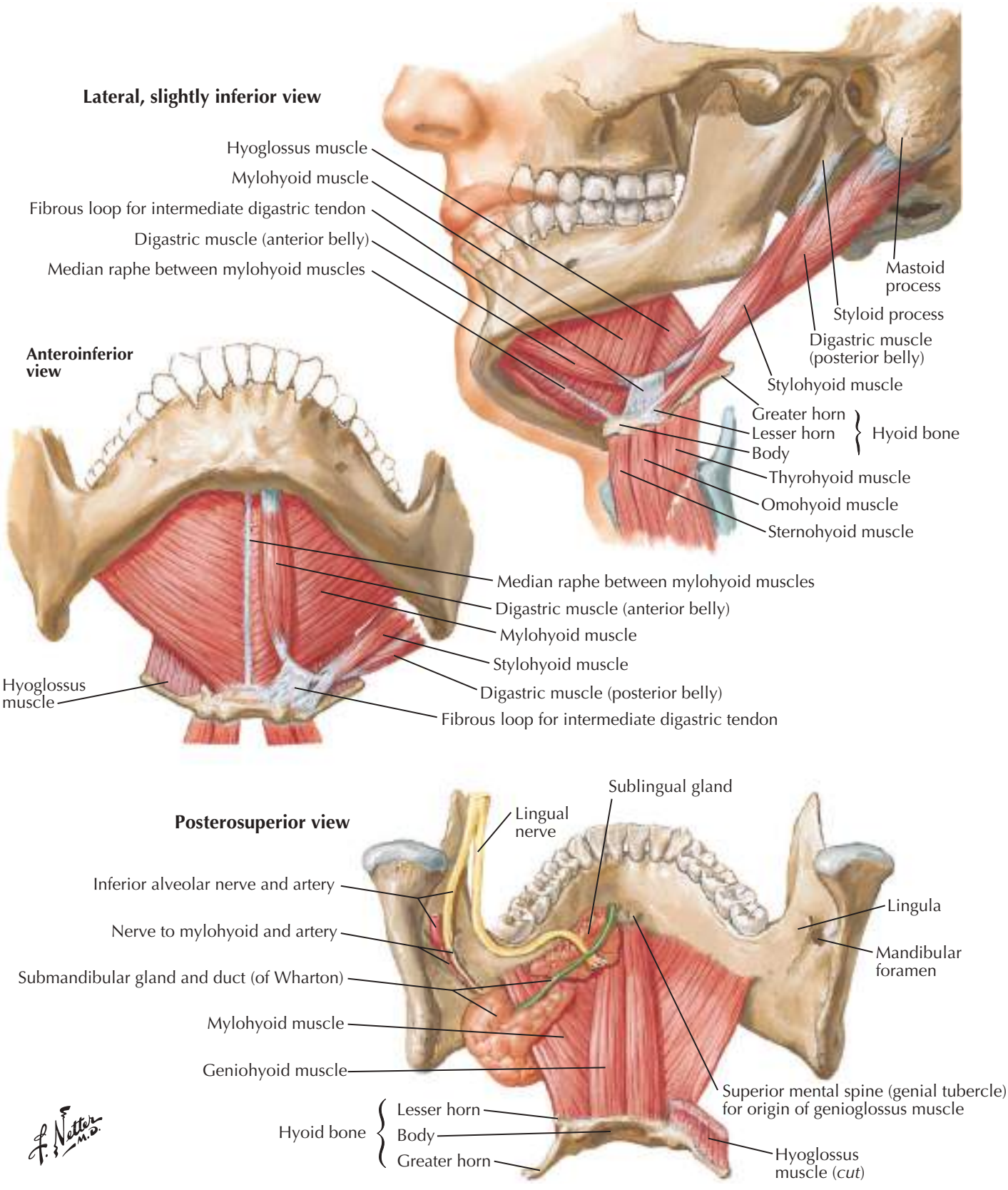


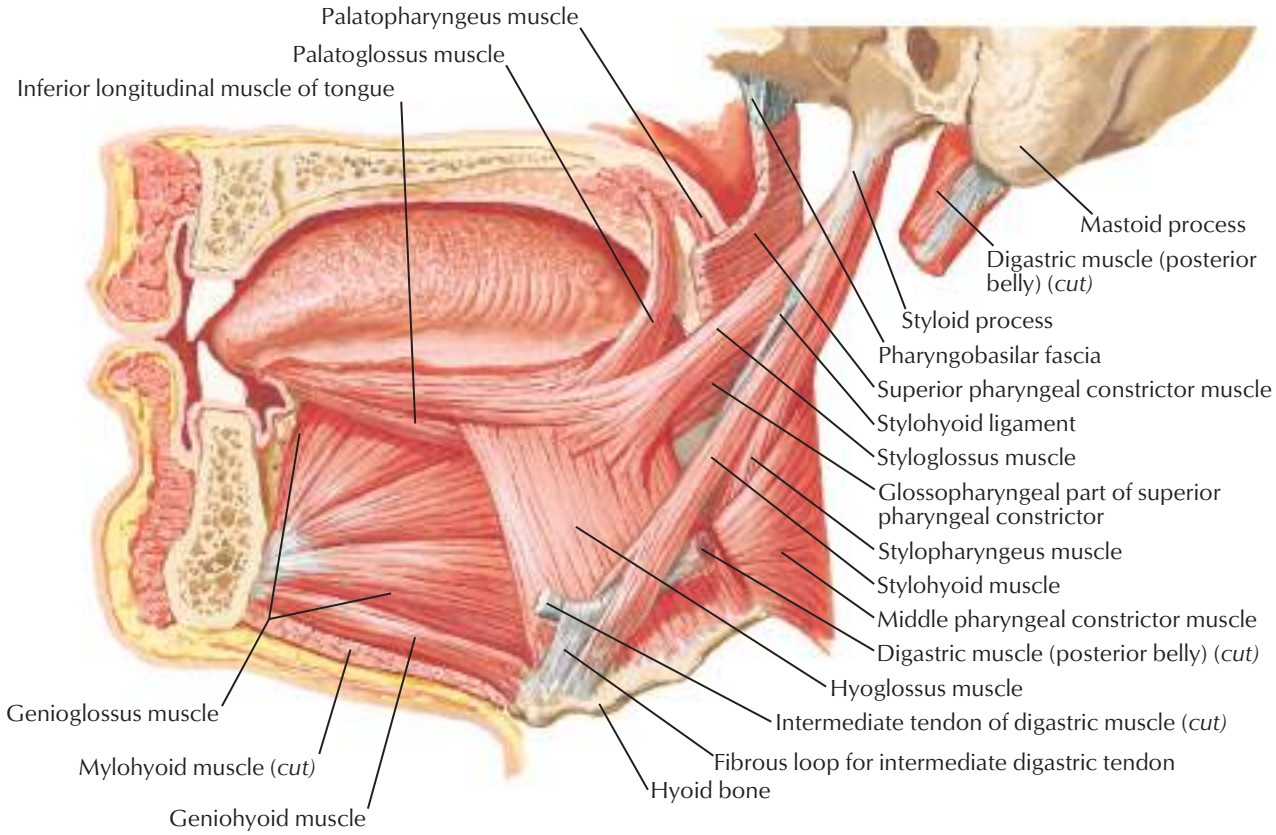

Philtrum
Soft palate
Palatopharyngeal arch
Uvula
Palatoglossal arch
Palatine tonsil
Posterior wall of pharynx
Frenulum of upper lip
Lingual minor salivary gland
Deep lingual artery and veins and lingual nerve
Fimbriated fold
Submandibular duct
Sublingual gland
Frenulum of tongue
Sublingual fold with openings of sublingual ducts
Sublingual caruncle with opening of submandibular duct (of Wharton)
Frenulum of lower lip
Tubercle of upper lip
Parotid papilla with opening of parotid duct (of Stensen)


Incisive papilla
Transverse palatine folds
Palatine raphe
Palatine process of maxilla
Palatine glands
Horizontal plate of palatine bone
Palatine aponeurosis (from tensor veli palatini muscle)
Uvular muscle
Molar minor salivary glands
Palatopharyngeus muscle
Palatine tonsil
Incisive fossa
Greater palatine artery and nerve
Greater palatine foramen
Lesser palatine foramen
Lesser palatine artery and nerves
Tendon of tensor veli palatini muscle
Pterygoid hamulus
Interdigitating fibers of levator veli palatini muscle
Buccinator muscle
Pterygomandibular raphe
Superior pharyngeal constrictor muscle
Palatoglossus muscle
Anterior view
Basilar part of occipital bone
Cartilaginous part of pharyngotympanic (auditory, eustachian) tube
Levator veli palatini muscle (cut)
Tensor veli palatini muscle
Medial pterygoid muscle (cut)
Medial pterygoid plate
Pterygoid hamulus
Tendon of tensor veli palatini muscle
Levator veli palatini muscle (cut)
Palatopharyngeus muscle (cut)
Uvular muscle
Pharyngobasilar fascia
Levator veli palatini muscle
Choanae
Pterygoid hamulus
Superior pharyngeal constrictor muscle (cut)
Palatopharyngeus muscle
Posterior view

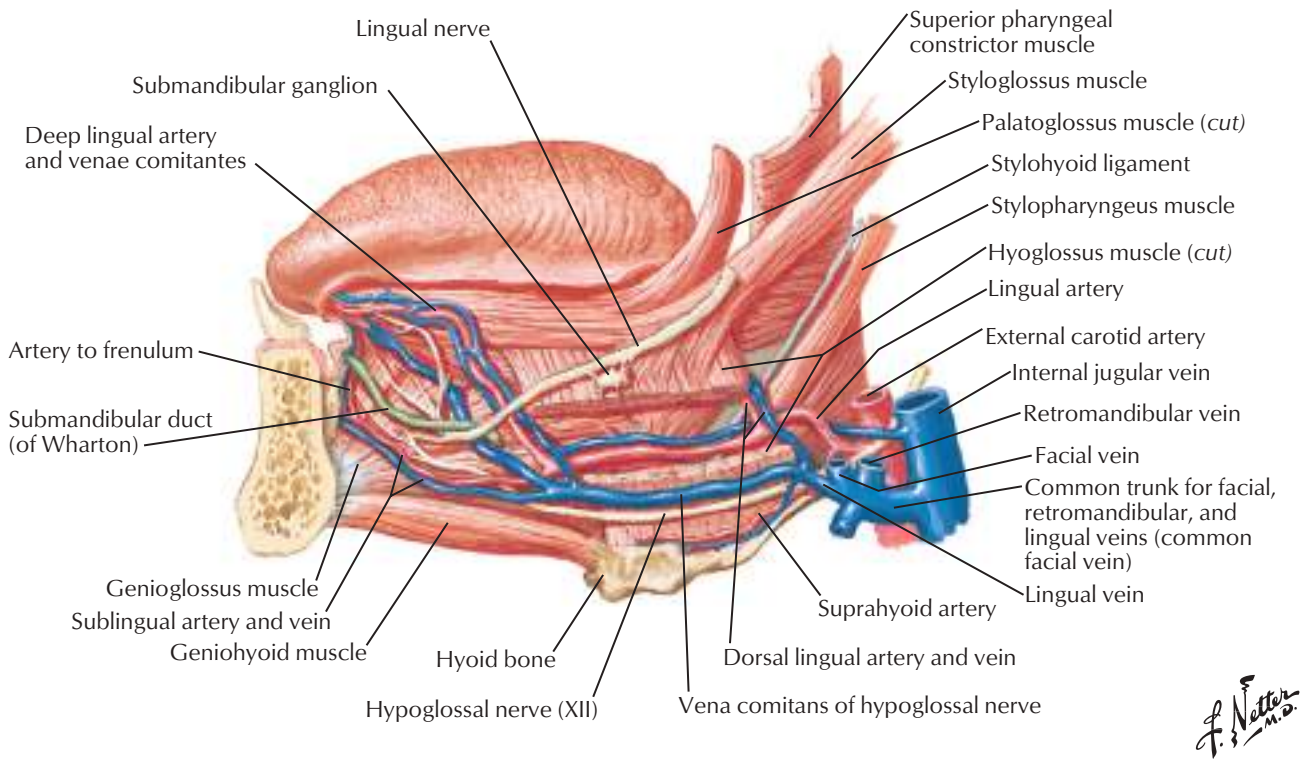
Floor of Oral Cavity

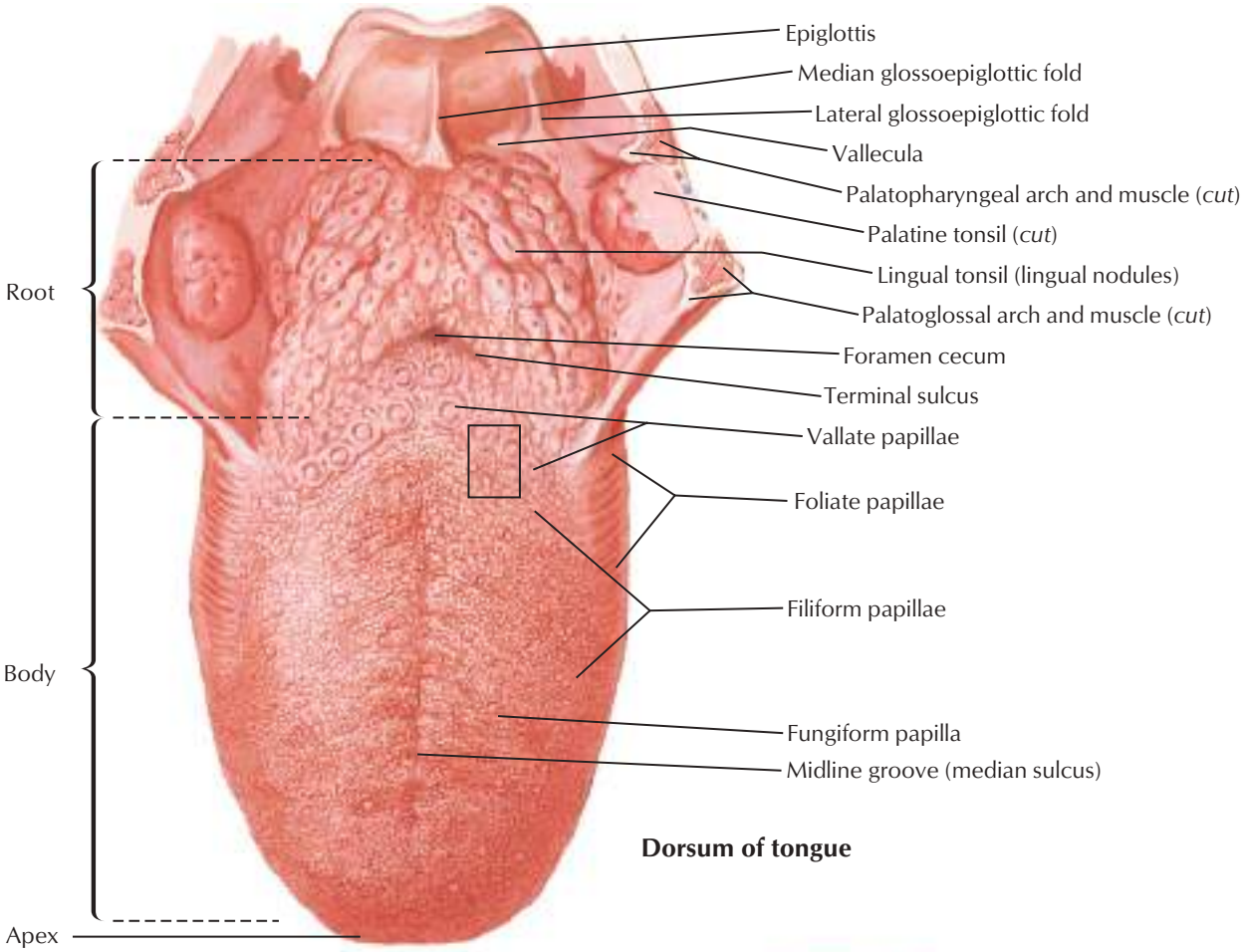
See also Plate 28



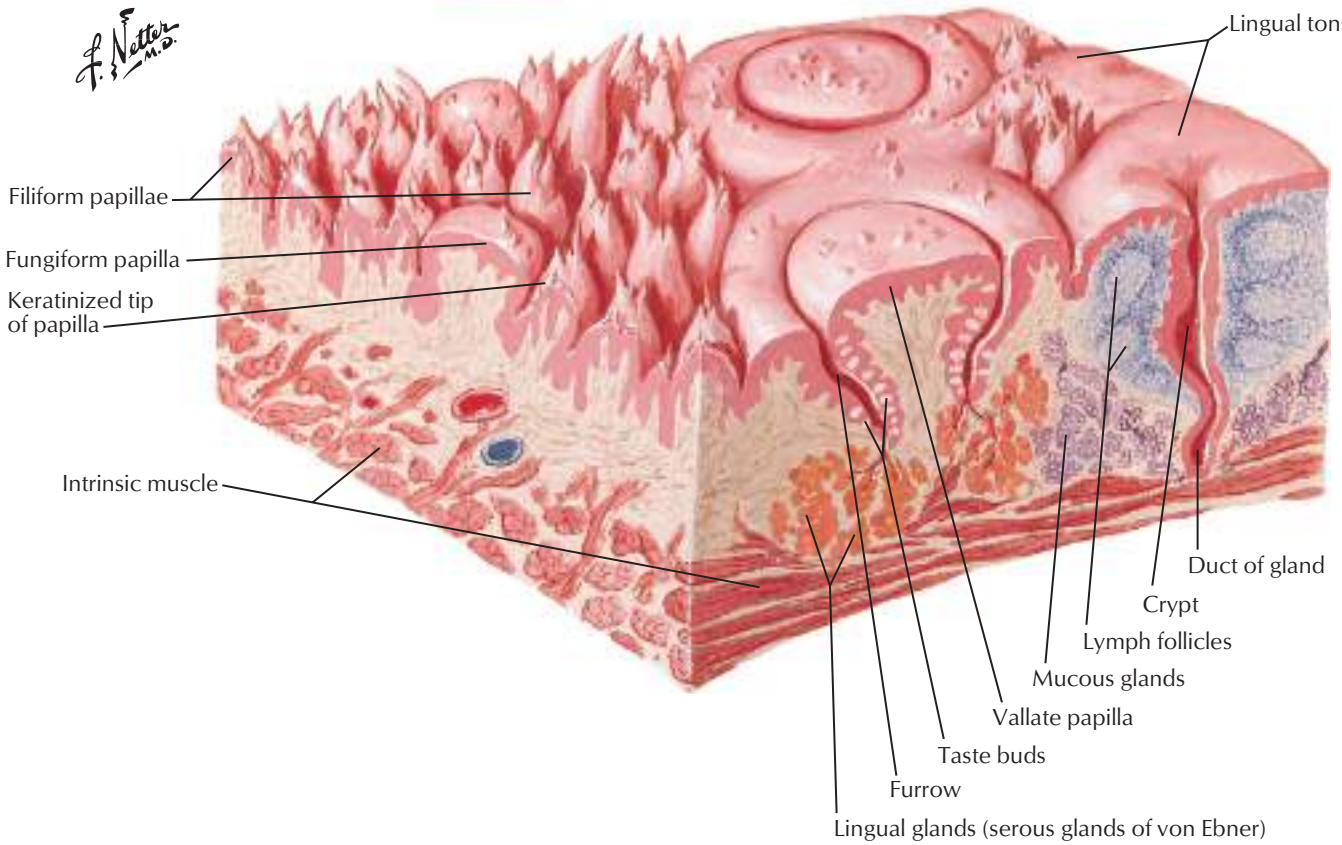


Lateral view





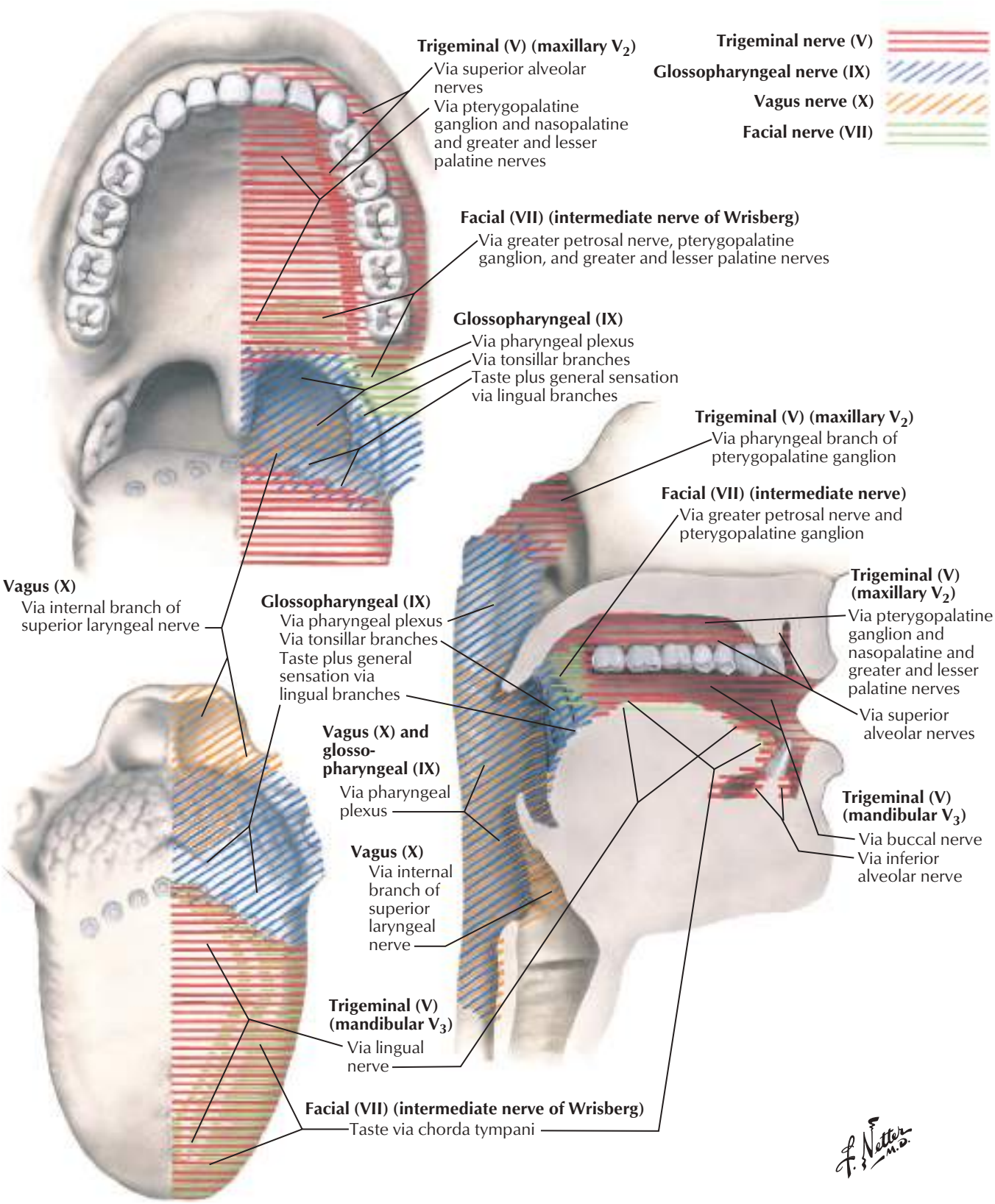
Dorsum of tongue

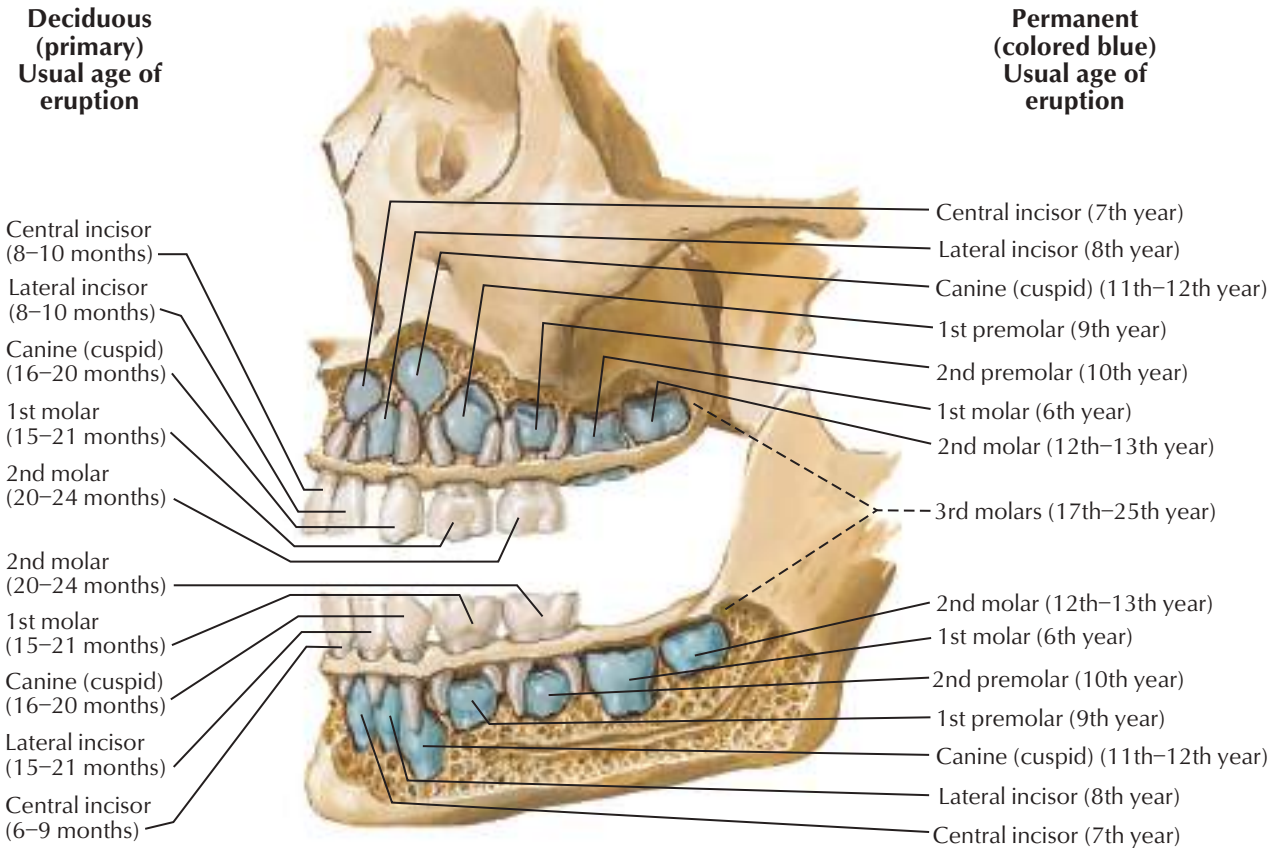


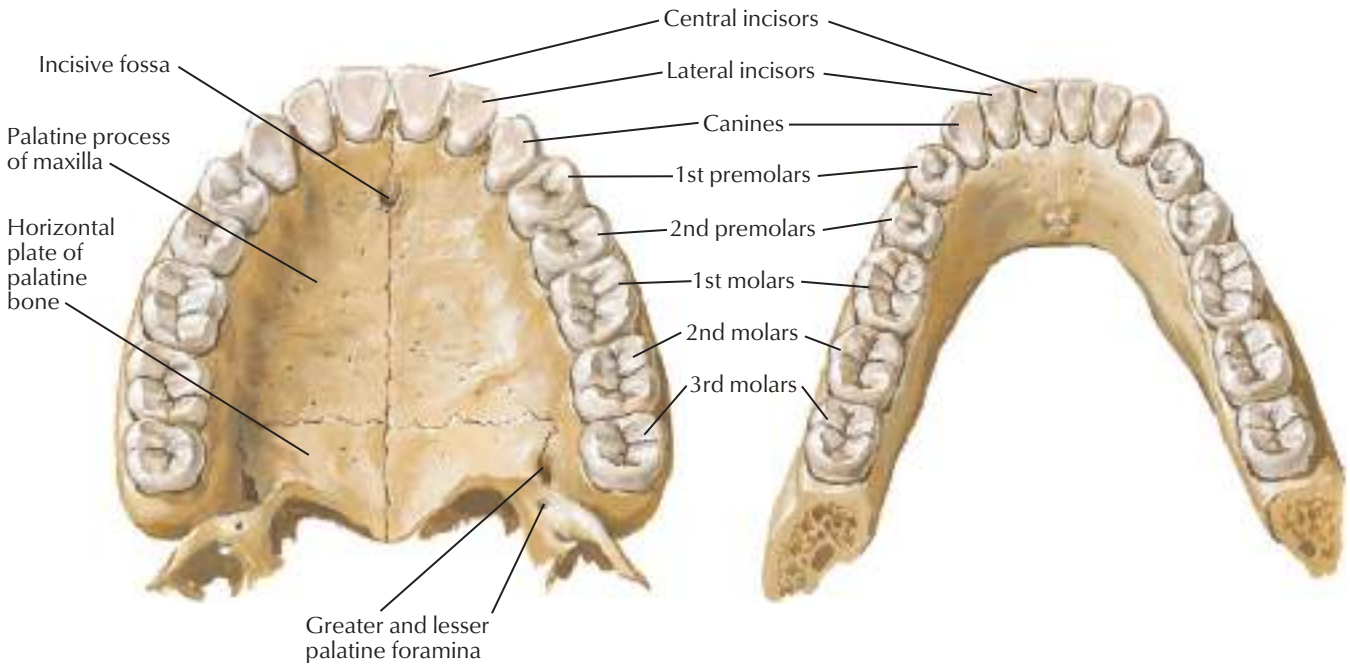
Schematic stereogram: area indicated above

Afferent Innervation of Oral Cavity and Pharynx

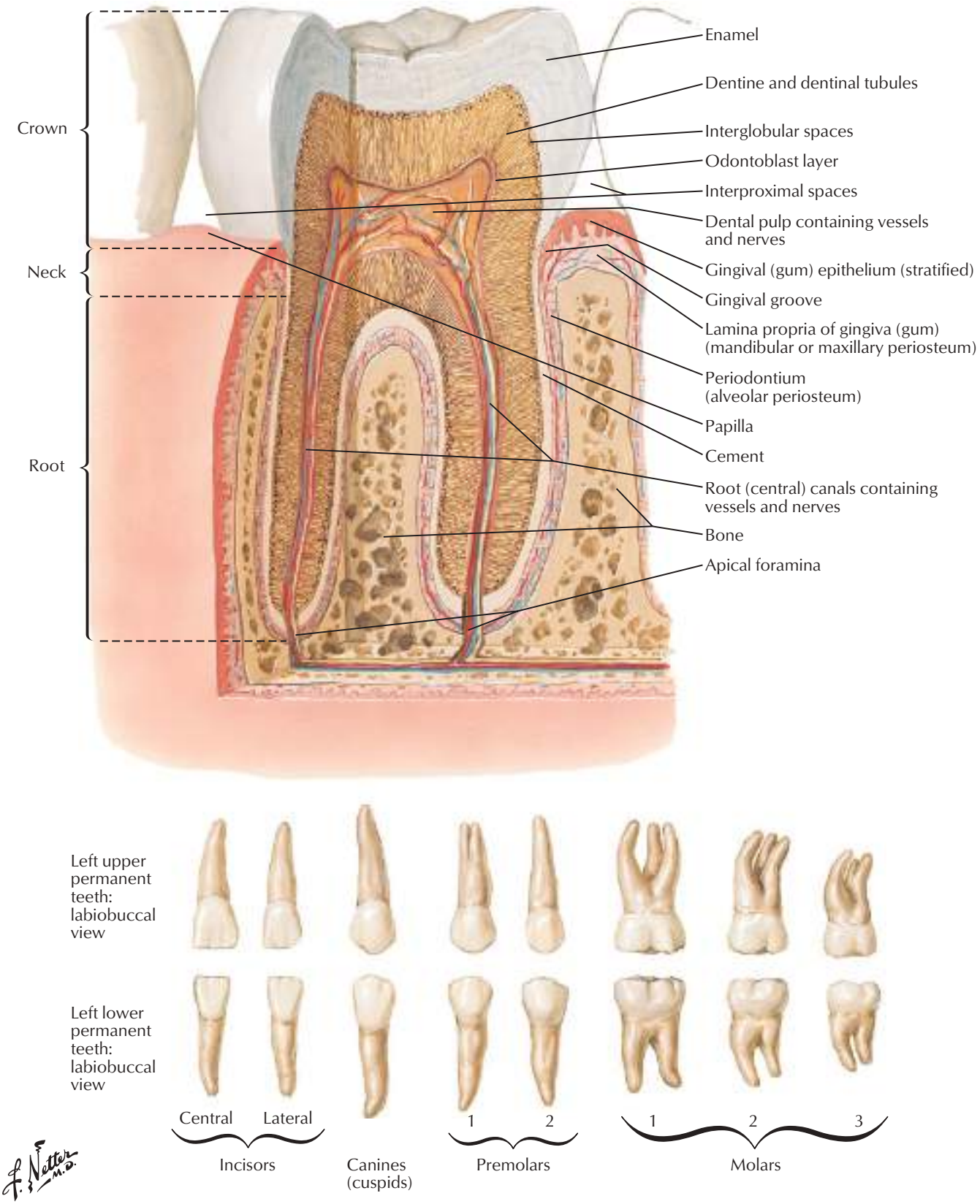
See also Plates 126, 134, 136

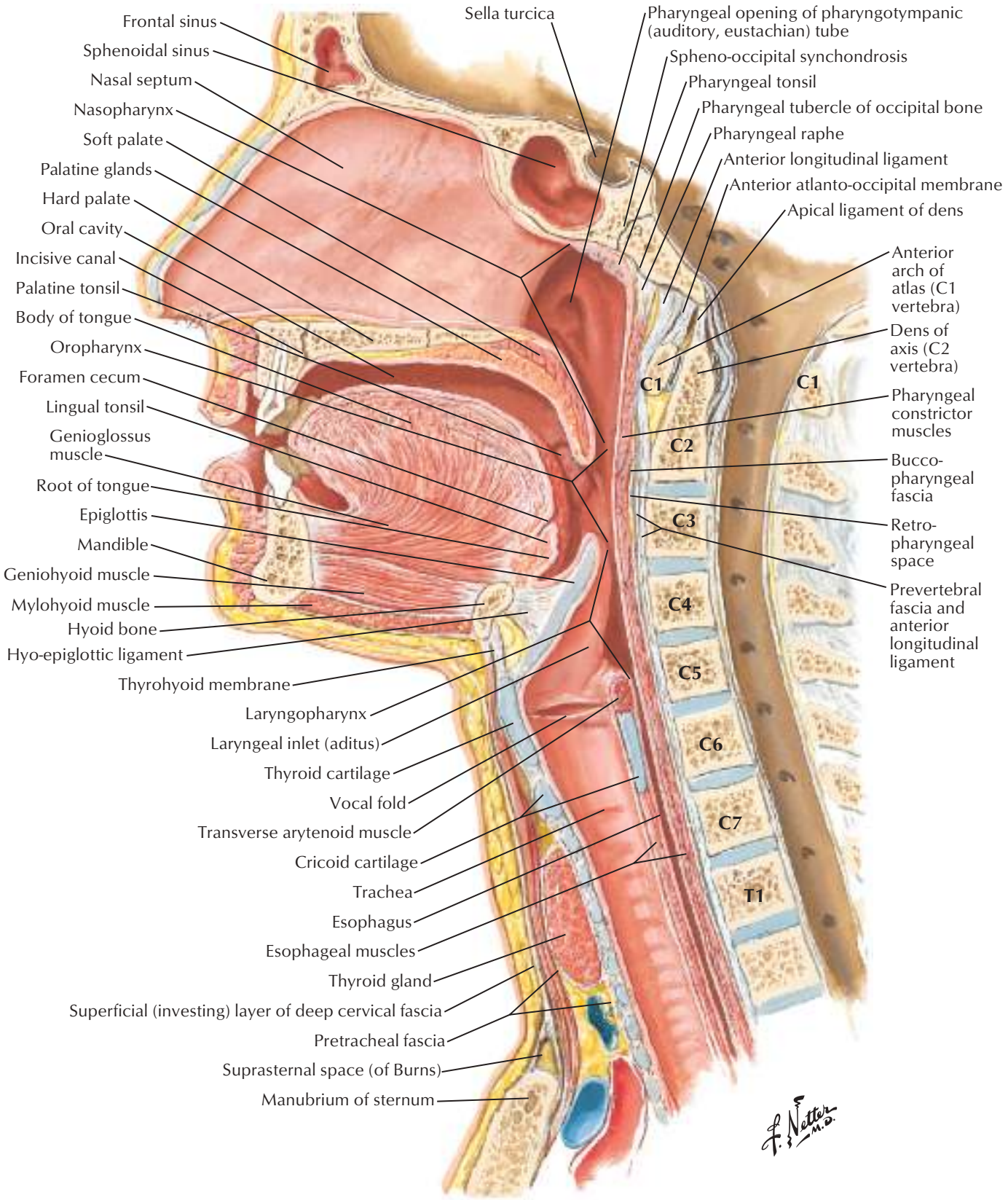


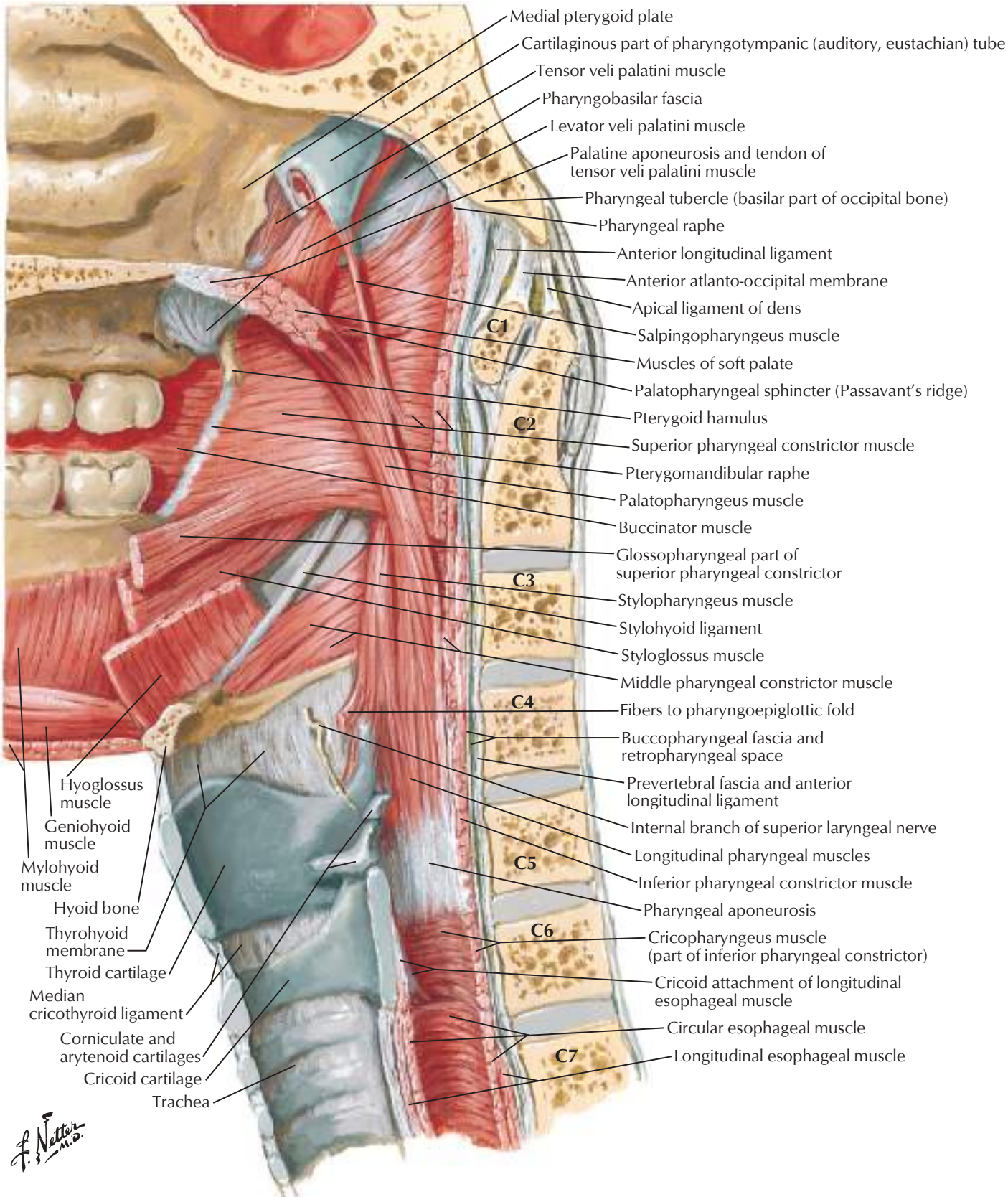




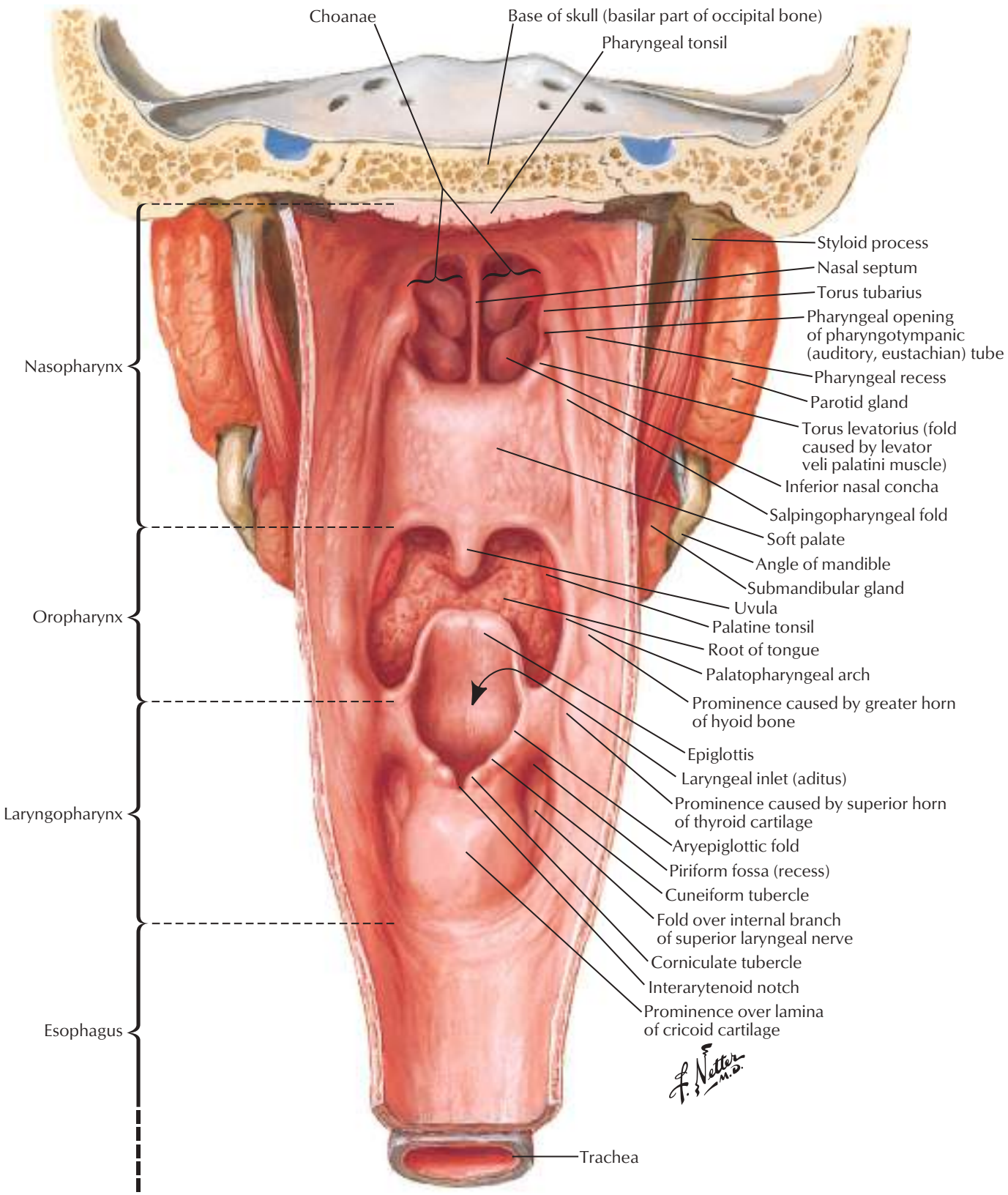
Upper permanent teeth **Lower permanent teeth**


Crown
Neck
Root
Enamel
Dentine and dentinal tubules
Interglobular spaces
Odontoblast layer
Interproximal spaces
Dental pulp containing vessels and nerves
Gingival (gum) epithelium (stratified)
Gingival groove
Lamina propria of gingiva (gum) (mandibular or maxillary periosteum)
Periodontium (alveolar periosteum)
Papilla
Cement
Root (central) canals containing vessels and nerves
Bone
Apical foramina
Left upper permanent teeth: labiobuccal view
Left lower permanent teeth: labiobuccal view
Central
Lateral
1
2
1
2
3
Incisors
Canines (cuspids)
Premolars
Molars


Frontal sinus
Sphenoidal sinus
Nasal septum
Nasopharynx
Soft palate
Palatine glands
Hard palate
Oral cavity
Incisive canal
Palatine tonsil
Body of tongue
Oropharynx
Foramen cecum
Lingual tonsil
Genioglossus muscle
Root of tongue
Epiglottis
Mandible
Geniohyoid muscle
Mylohyoid muscle
Hyoid bone
Hyo-epiglottic ligament
Thyrohyoid membrane
Laryngopharynx
Laryngeal inlet (aditus)
Thyroid cartilage
Vocal fold
Transverse arytenoid muscle
Cricoid cartilage
Trachea
Esophagus
Esophageal muscles
Thyroid gland
Superficial (investing) layer of deep cervical fascia
Pretracheal fascia
Suprasternal space (of Burns)
Manubrium of sternum
Sella turcica
Pharyngeal opening of pharyngotympanic (auditory, eustachian) tube
Spheno-occipital synchondrosis
Pharyngeal tonsil
Pharyngeal tubercle of occipital bone
Pharyngeal raphe
Anterior longitudinal ligament
Anterior atlanto-occipital membrane
Apical ligament of dens
Anterior arch of atlas (C1 vertebra)
Dens of axis (C2 vertebra)
C1
C1
Pharyngeal constrictor muscles
C2
Bucco-pharyngeal fascia
C3
Retro-pharyngeal space
Prevertebral fascia and anterior longitudinal ligament
C4
C5
C6
C7
T1

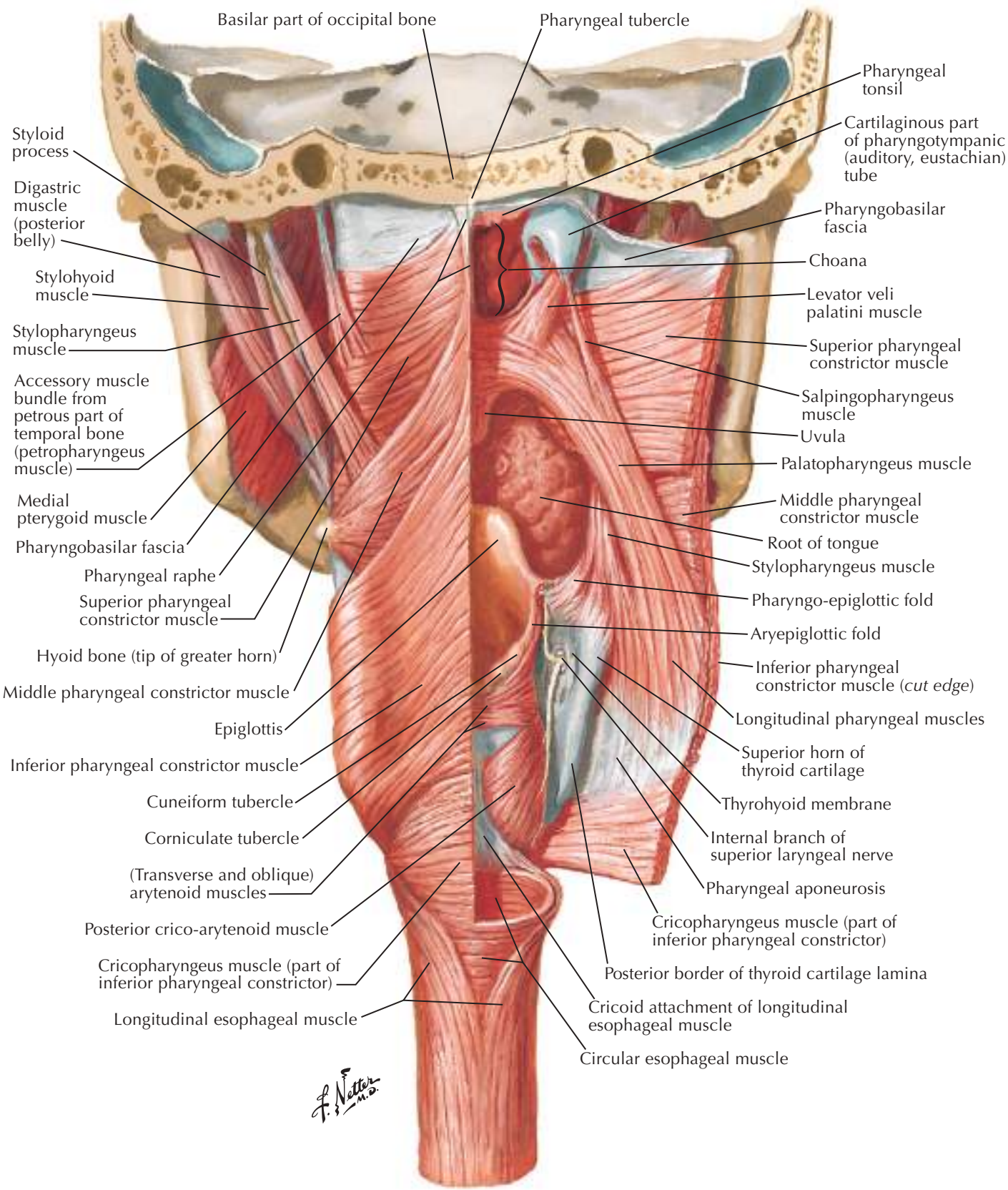

Medial pterygoid plate
Cartilaginous part of pharyngotympanic (auditory, eustachian) tube
Tensor veli palatini muscle
Pharyngobasilar fascia
Levator veli palatini muscle
Palatine aponeurosis and tendon of tensor veli palatini muscle
Pharyngeal tubercle (basilar part of occipital bone)
Pharyngeal raphe
Anterior longitudinal ligament
Anterior atlanto-occipital membrane
Apical ligament of dens
C1
Salpingopharyngeus muscle
Muscles of soft palate
Palatopharyngeal sphincter (Passavant's ridge)
Pterygoid hamulus
C2
Superior pharyngeal constrictor muscle
Pterygomandibular raphe
Palatopharyngeus muscle
Buccinator muscle
Glossopharyngeal part of superior pharyngeal constrictor
C3
Stylopharyngeus muscle
Stylohyoid ligament
Styloglossus muscle
Middle pharyngeal constrictor muscle
C4
Fibers to pharyngoepiglottic fold
Buccopharyngeal fascia and retropharyngeal space
Prevertebral fascia and anterior longitudinal ligament
Internal branch of superior laryngeal nerve
Longitudinal pharyngeal muscles
C5
Inferior pharyngeal constrictor muscle
Pharyngeal aponeurosis
C6
Cricopharyngeus muscle (part of inferior pharyngeal constrictor)
Cricoid attachment of longitudinal esophageal muscle
Circular esophageal muscle
C7
Longitudinal esophageal muscle
Hyoglossus muscle
Geniohyoid muscle
Mylohyoid muscle
Hyoid bone
Thyrohyoid membrane
Thyroid cartilage
Median cricothyroid ligament
Corniculate and arytenoid cartilages
Cricoid cartilage
Trachea

Pharynx: Opened Posterior View

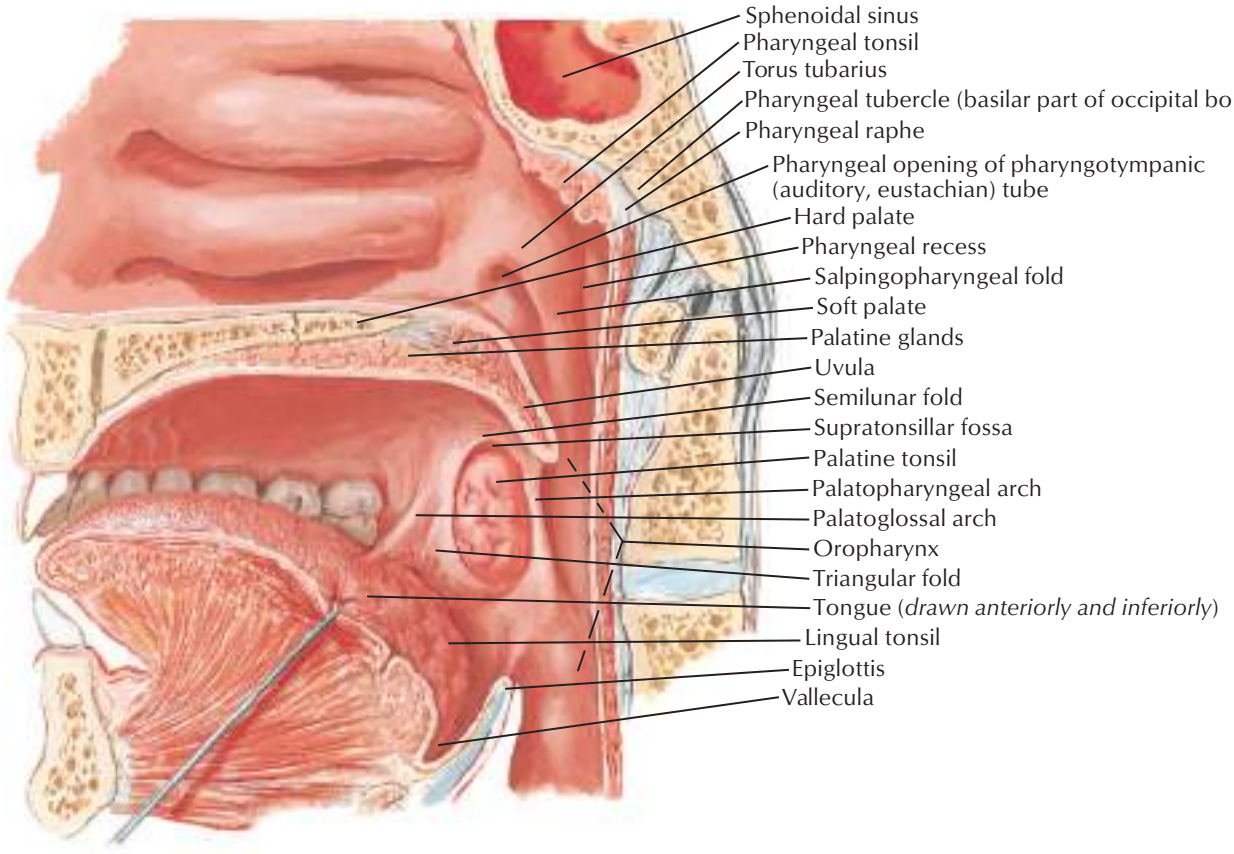


Muscles of Pharynx: Partially Opened Posterior View

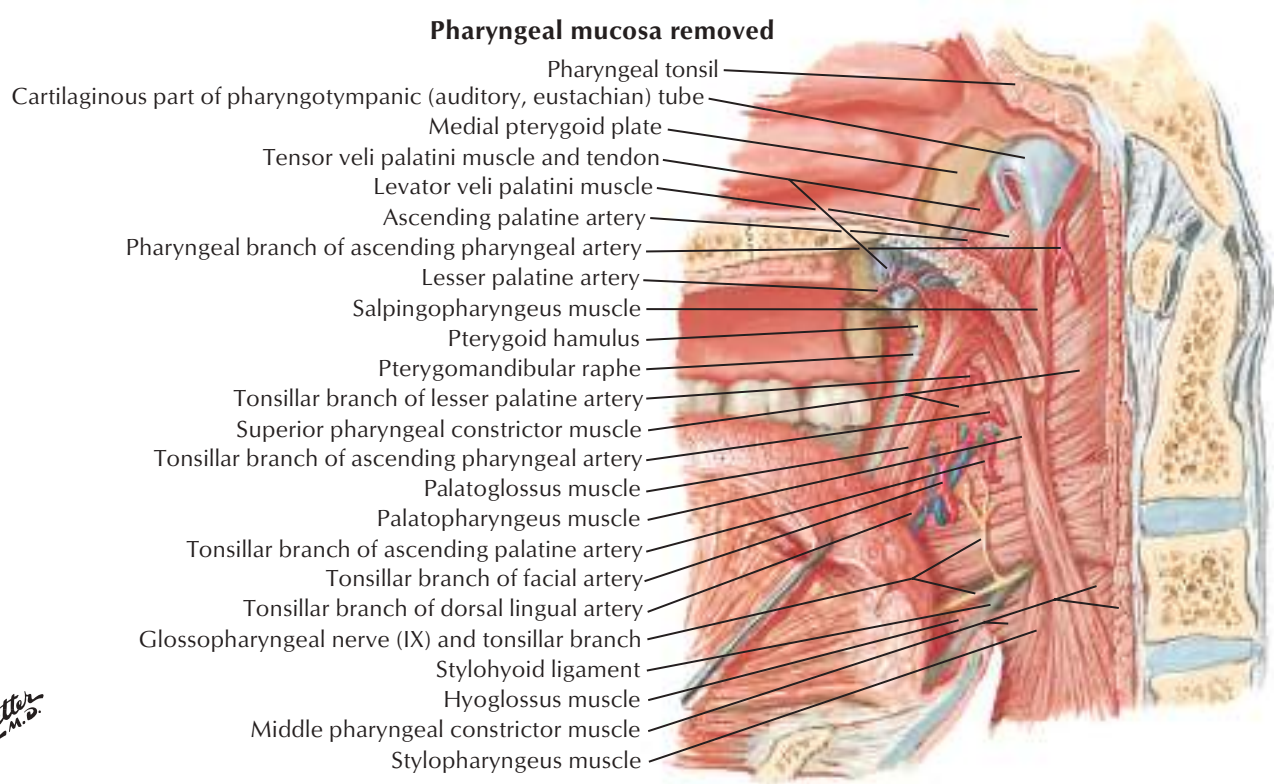
See also Plate 70

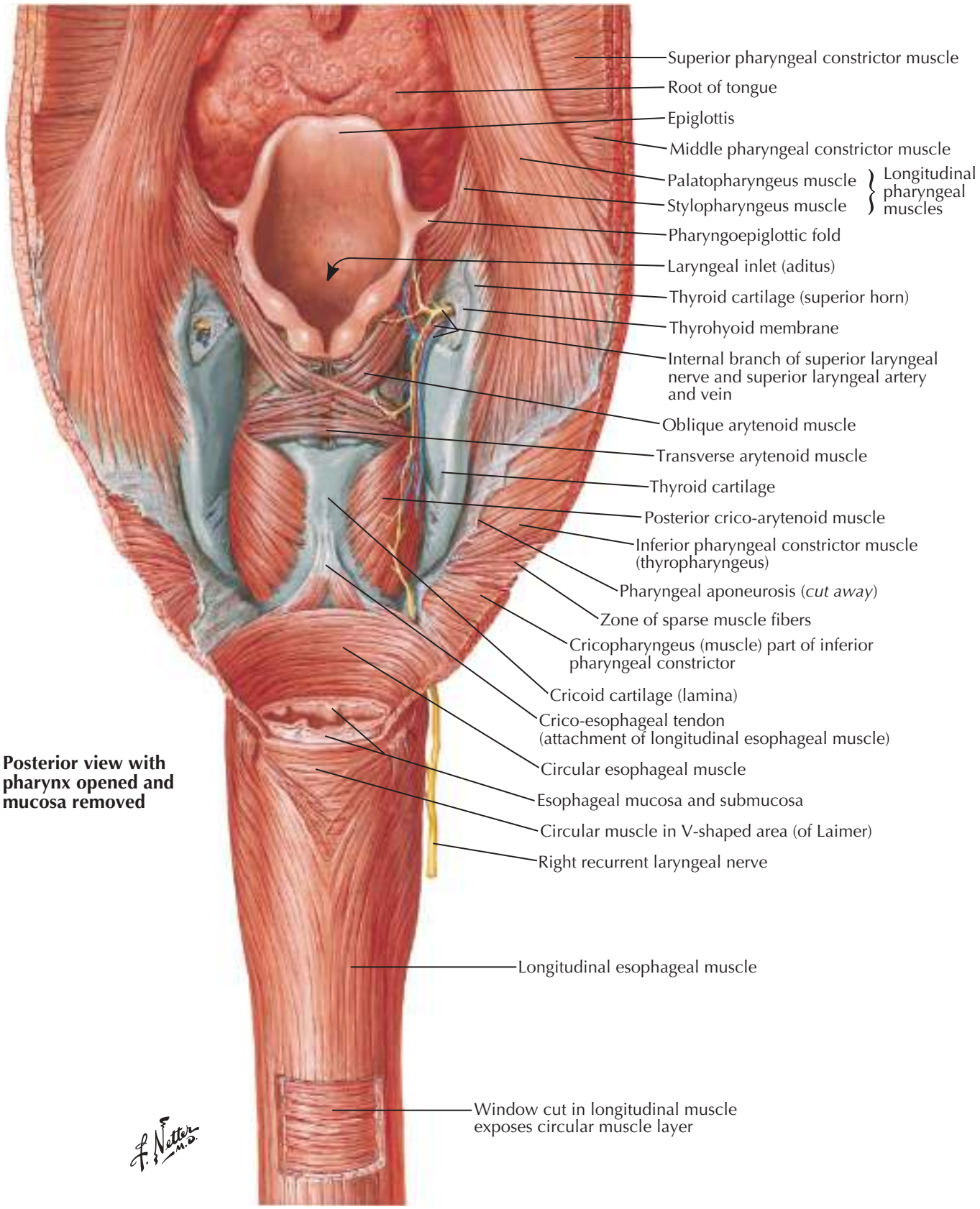


Medial view
sagittal section



Pharyngeal mucosa removed

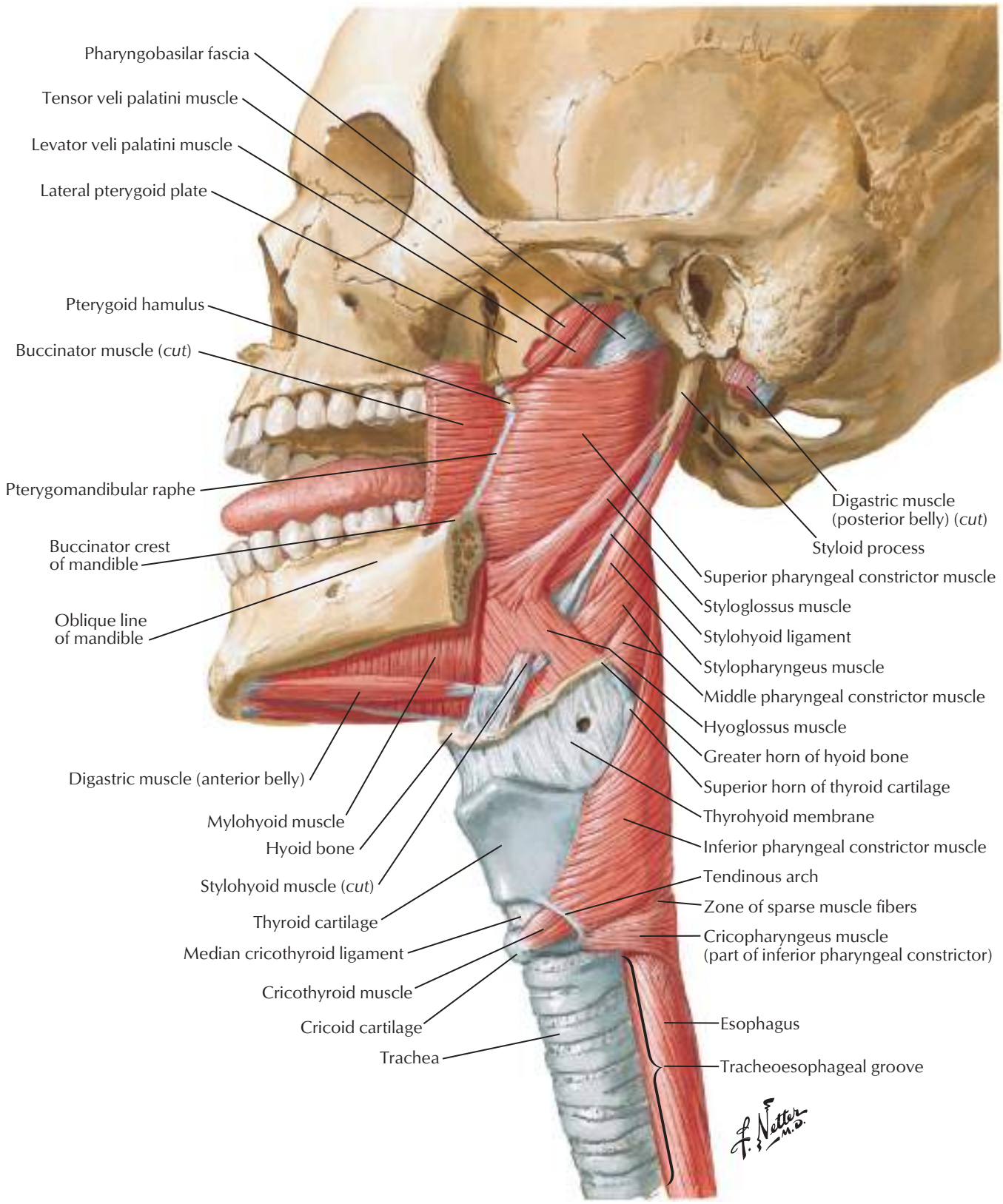


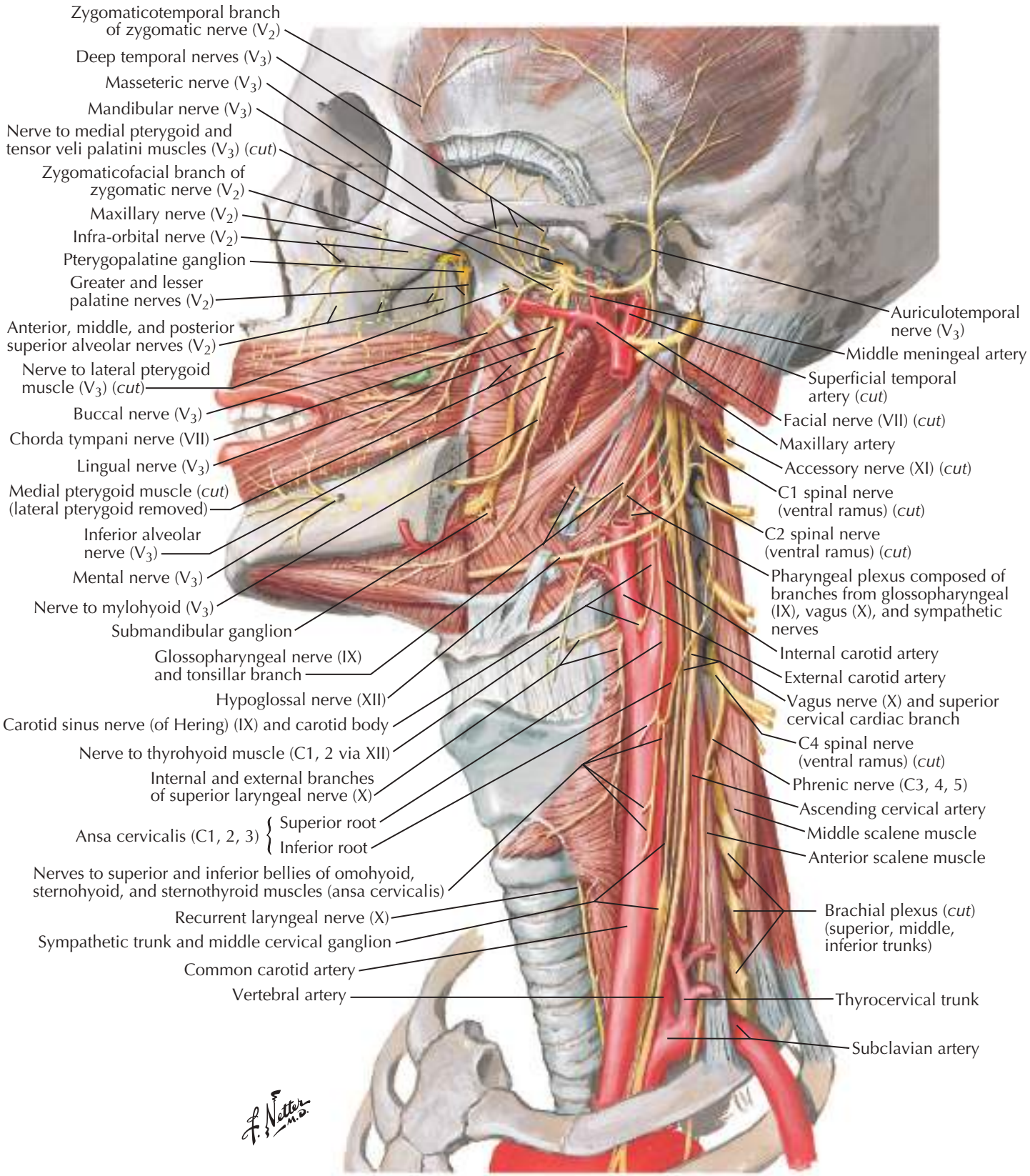


Posterior view with pharynx opened and mucosa removed

Muscles of Pharynx: Lateral View

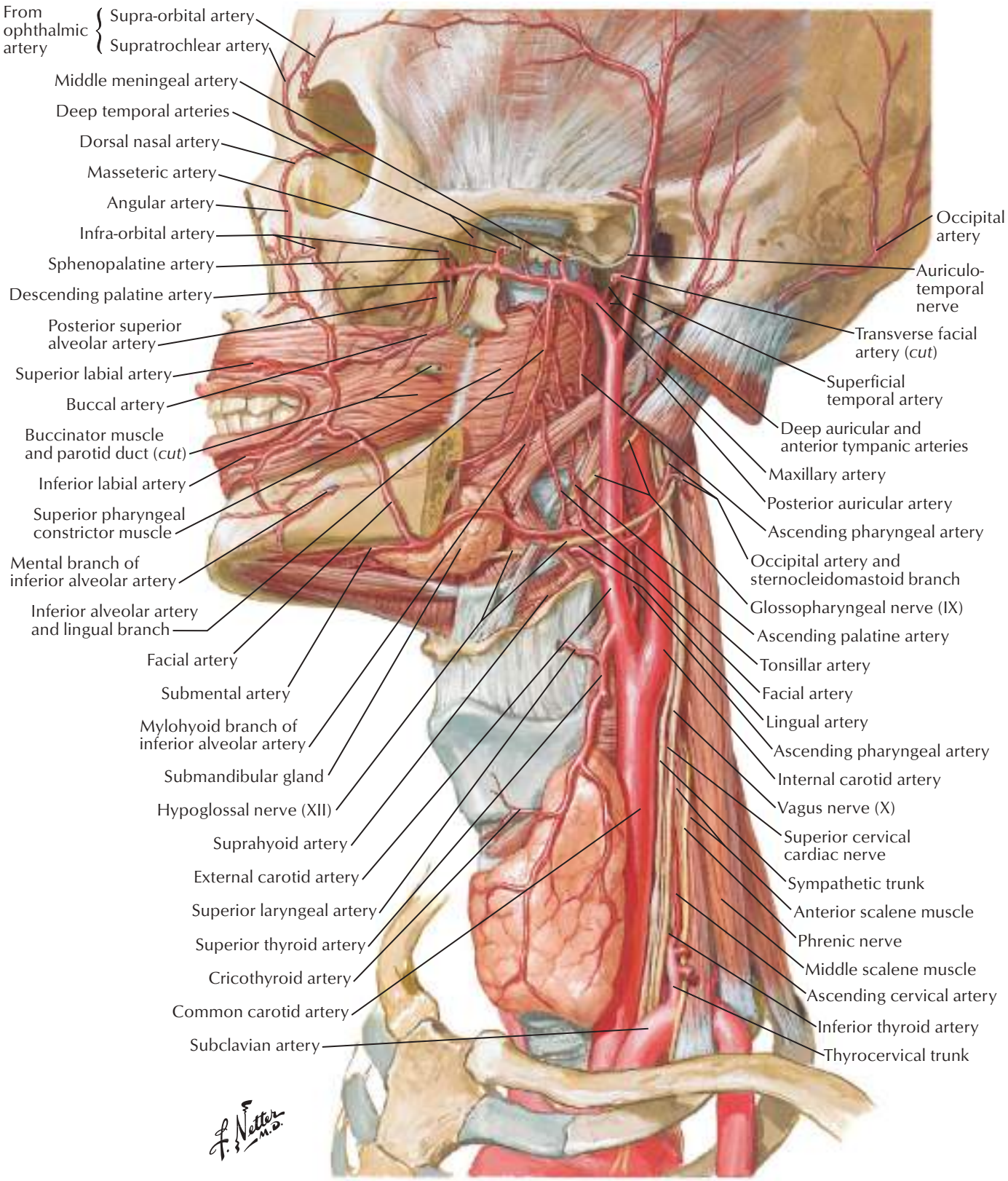
See also **Plate 67**




Zygomaticotemporal branch of zygomatic nerve (V_2)
Deep temporal nerves (V_3)
Masseteric nerve (V_3)
Mandibular nerve (V_3)
Nerve to medial pterygoid and tensor veli palatini muscles (V_3) (*cut*)
Zygomaticofacial branch of zygomatic nerve (V_2)
Maxillary nerve (V_2)
Infra-orbital nerve (V_2)
Pterygopalatine ganglion
Greater and lesser palatine nerves (V_2)
Anterior, middle, and posterior superior alveolar nerves (V_2)
Nerve to lateral pterygoid muscle (V_3) (*cut*)
Buccal nerve (V_3)
Chorda tympani nerve (VII)
Lingual nerve (V_3)
Medial pterygoid muscle (*cut*) (lateral pterygoid removed)
Inferior alveolar nerve (V_3)
Mental nerve (V_3)
Nerve to mylohyoid (V_3)
Submandibular ganglion
Glossopharyngeal nerve (IX) and tonsillar branch
Hypoglossal nerve (XII)
Carotid sinus nerve (of Hering) (IX) and carotid body
Nerve to thyrohyoid muscle (C1, 2 via XII)
Internal and external branches of superior laryngeal nerve (X)
Ansa cervicalis (C1, 2, 3)
Superior root
Inferior root
Nerves to superior and inferior bellies of omohyoid, sternohyoid, and sternothyroid muscles (ansa cervicalis)
Recurrent laryngeal nerve (X)
Sympathetic trunk and middle cervical ganglion
Common carotid artery
Vertebral artery
Auriculotemporal nerve (V_3)
Middle meningeal artery
Superficial temporal artery (*cut*)
Facial nerve (VII) (*cut*)
Maxillary artery
Accessory nerve (XI) (*cut*)
C1 spinal nerve (ventral ramus) (*cut*)
C2 spinal nerve (ventral ramus) (*cut*)
Pharyngeal plexus composed of branches from glossopharyngeal (IX), vagus (X), and sympathetic nerves
Internal carotid artery
External carotid artery
Vagus nerve (X) and superior cervical cardiac branch
C4 spinal nerve (ventral ramus) (*cut*)
Phrenic nerve (C3, 4, 5)
Ascending cervical artery
Middle scalene muscle
Anterior scalene muscle
Brachial plexus (*cut*) (superior, middle, inferior trunks)
Thyrocervical trunk
Subclavian artery
F. Netter M.D.

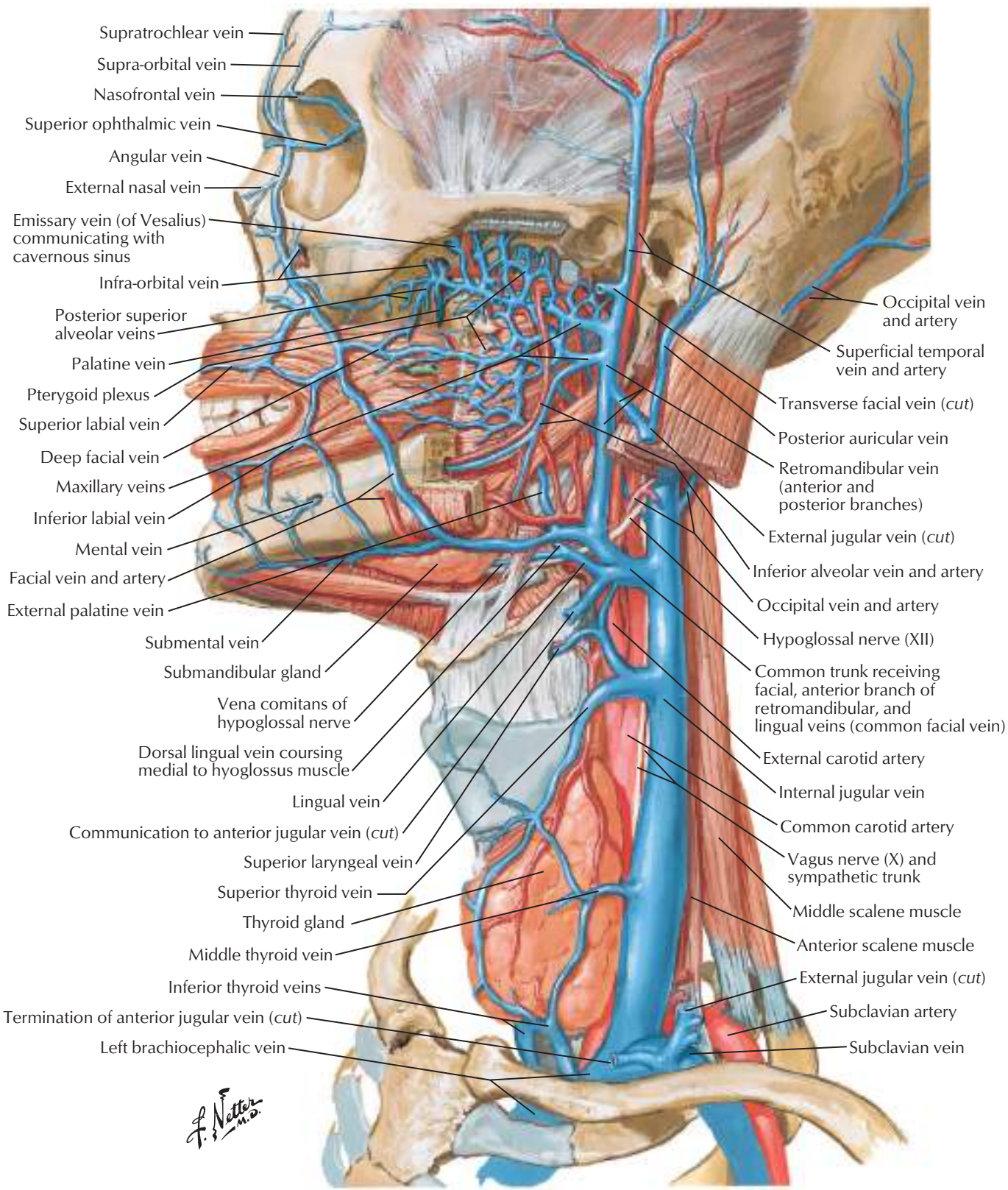
Arteries of Oral and Pharyngeal Regions

See also Plates 34, 51



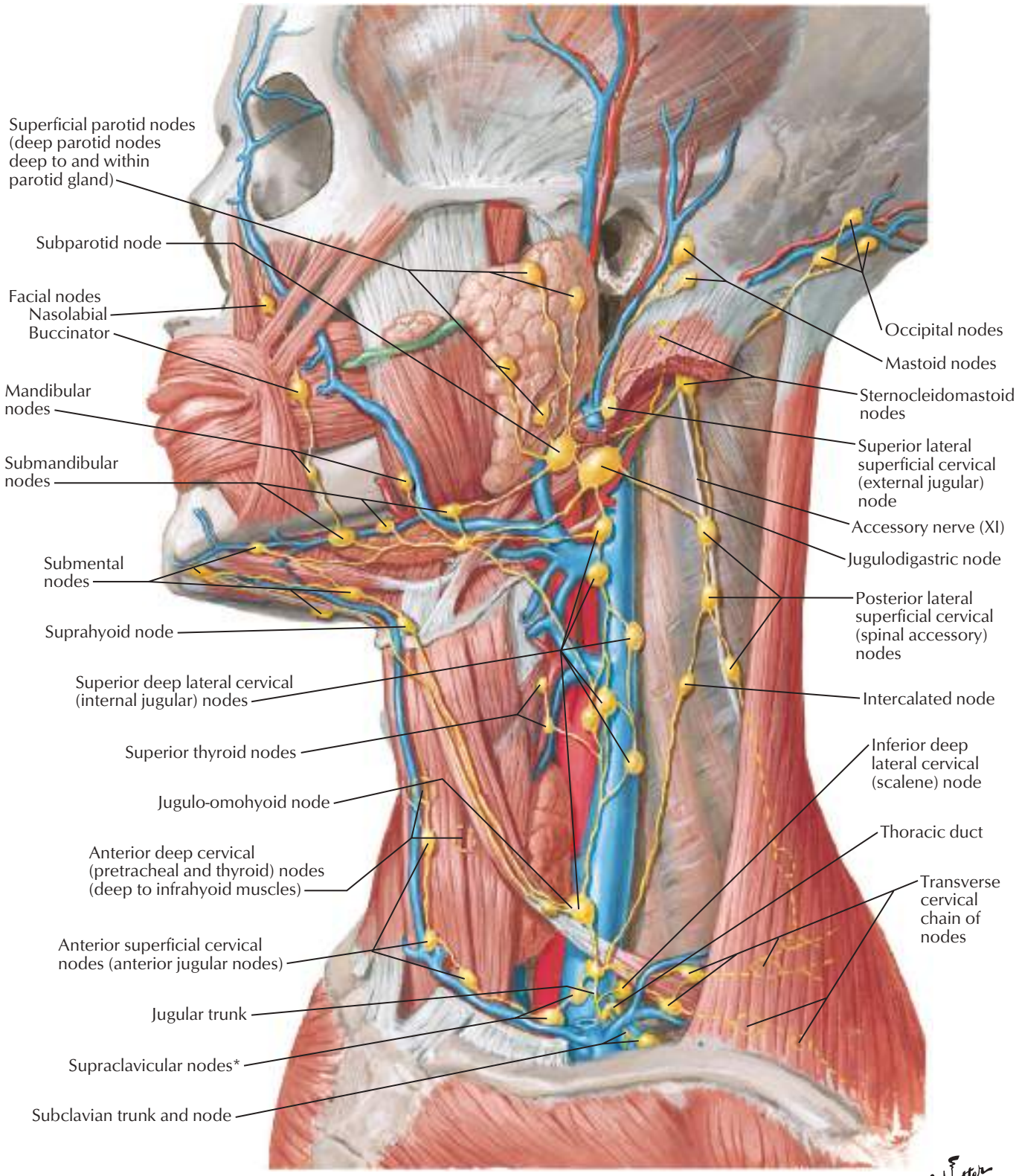
Veins of Oral and Pharyngeal Regions

See also Plate 74

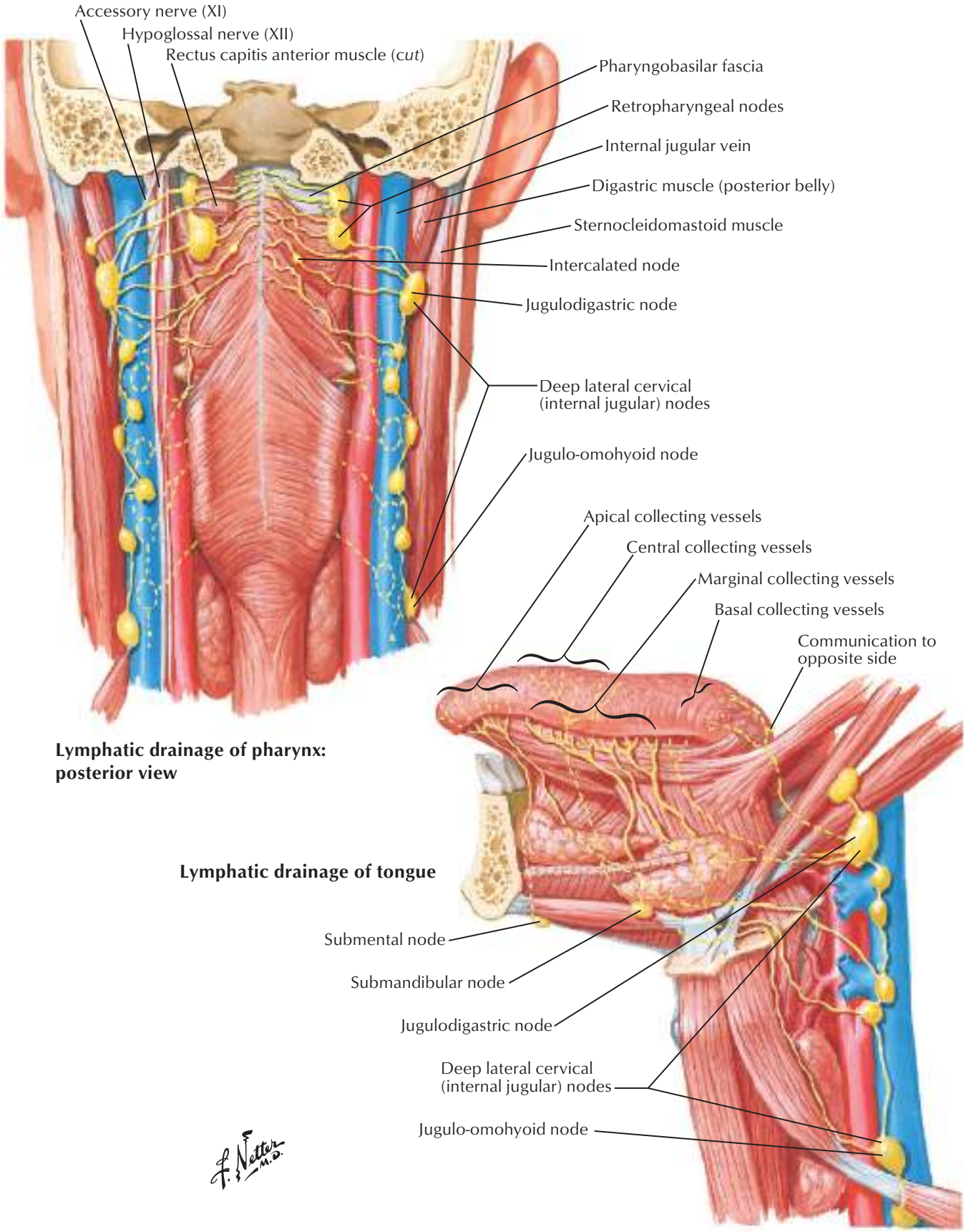


Lymph Vessels and Nodes of Head and Neck

See also Plates 73, 105

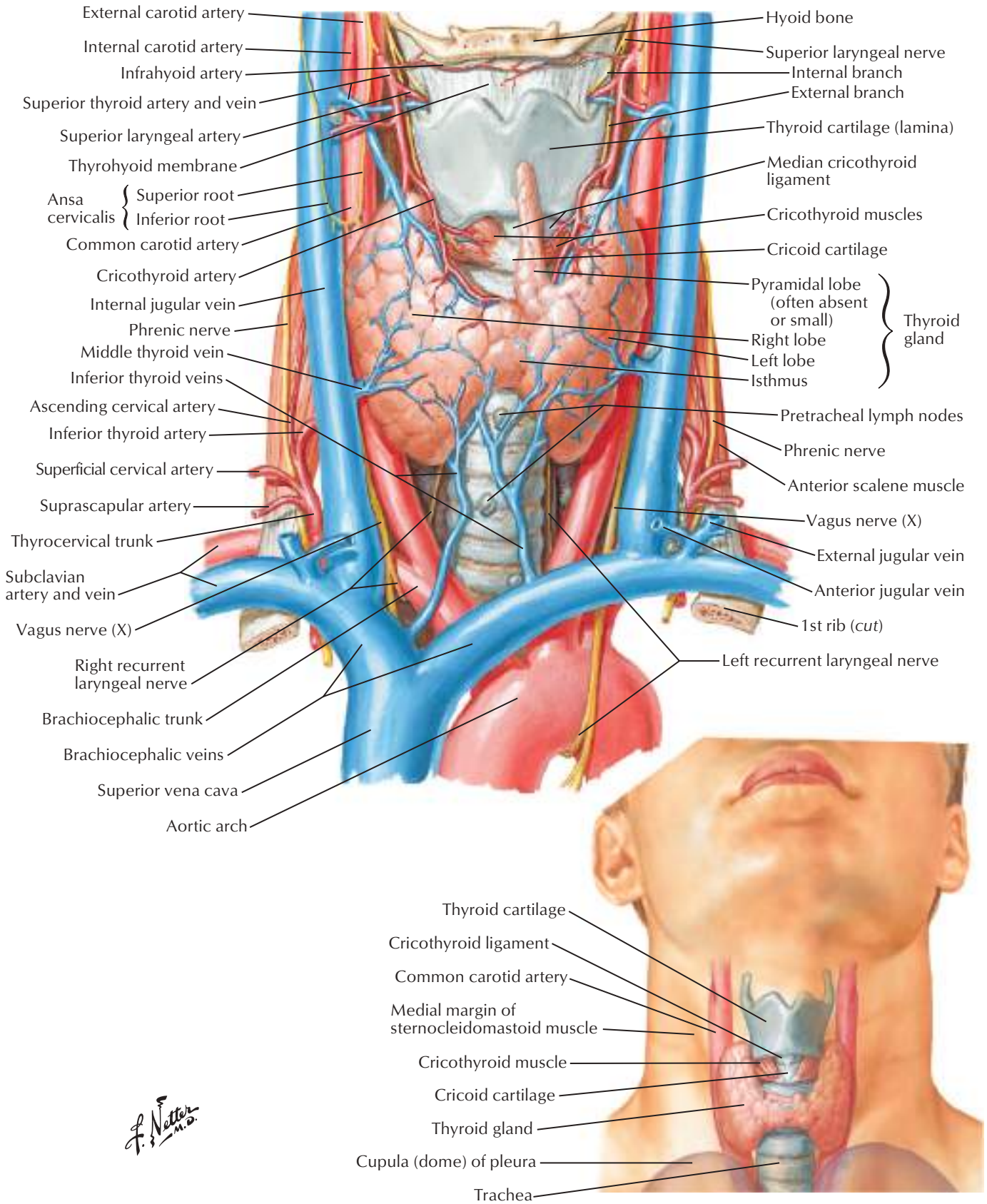


**The supraclavicular group of nodes (also known as the lower deep cervical group), especially on the left, are also sometimes referred to as the signal or sentinel lymph nodes of Virchow or Troisier, especially when sufficiently enlarged and palpable. These nodes (or a single node) are so termed because they may be the first recognized presumptive evidence of malignant disease in the viscera.*



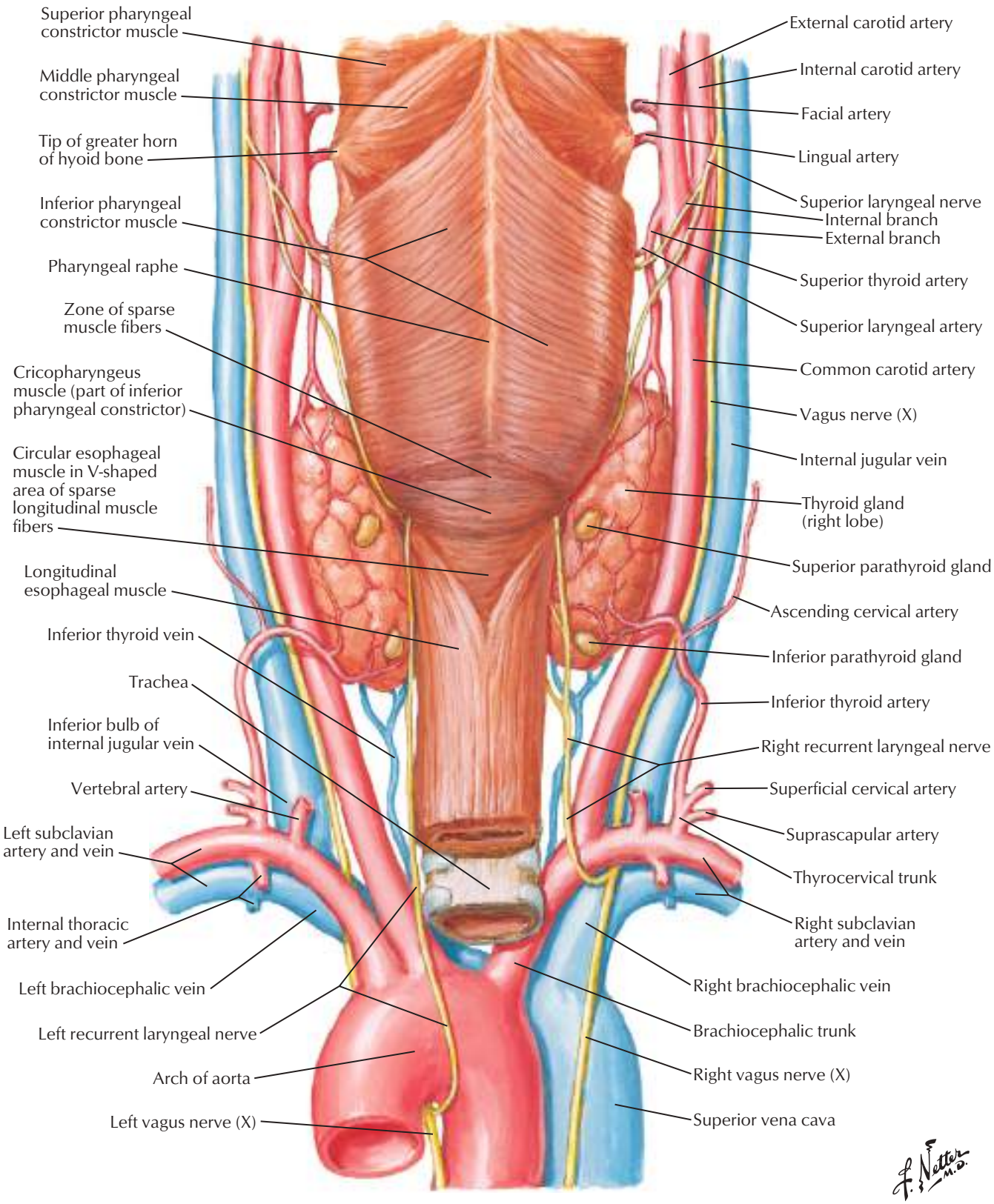
Lymphatic drainage of pharynx: posterior view

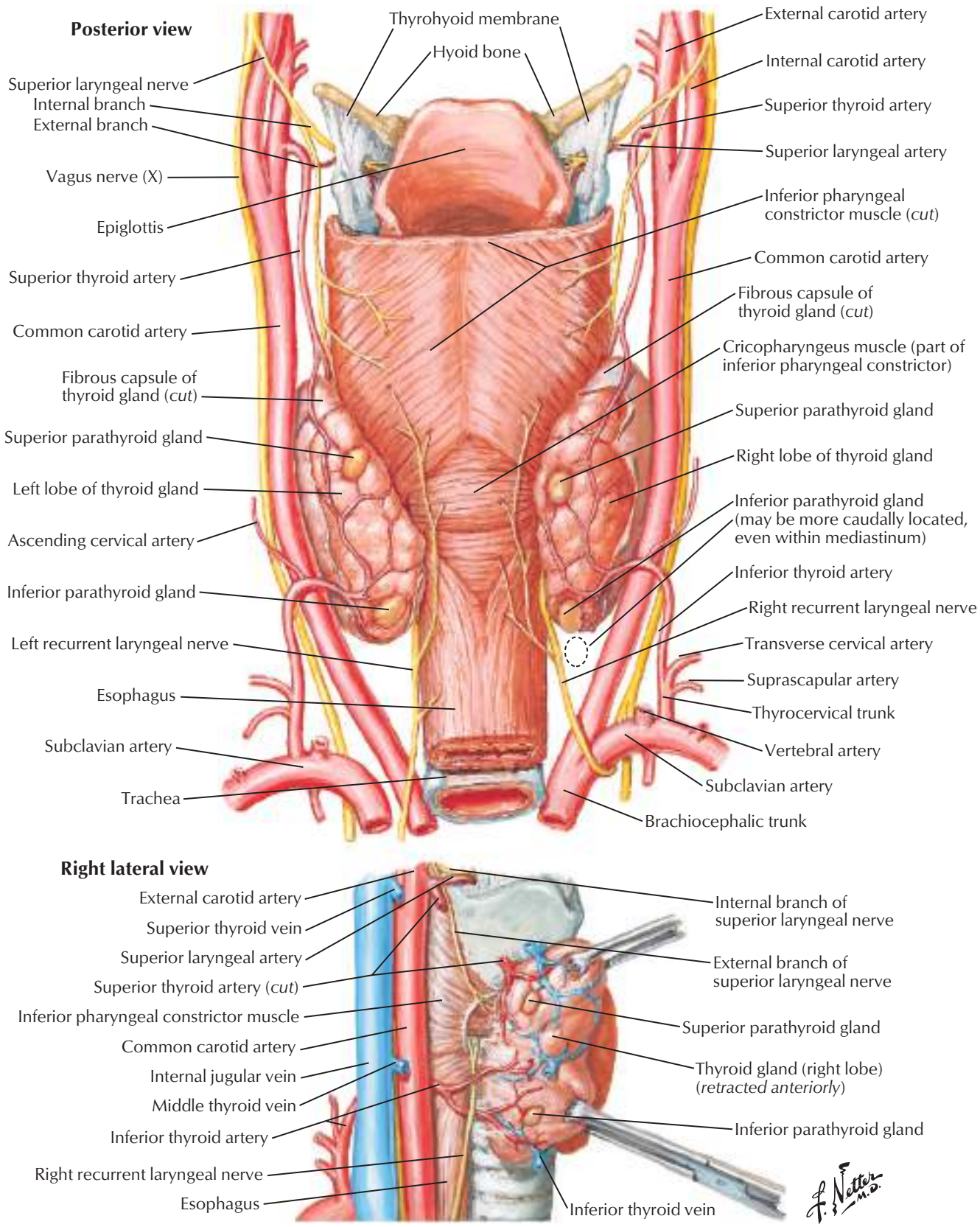
Lymphatic drainage of tongue

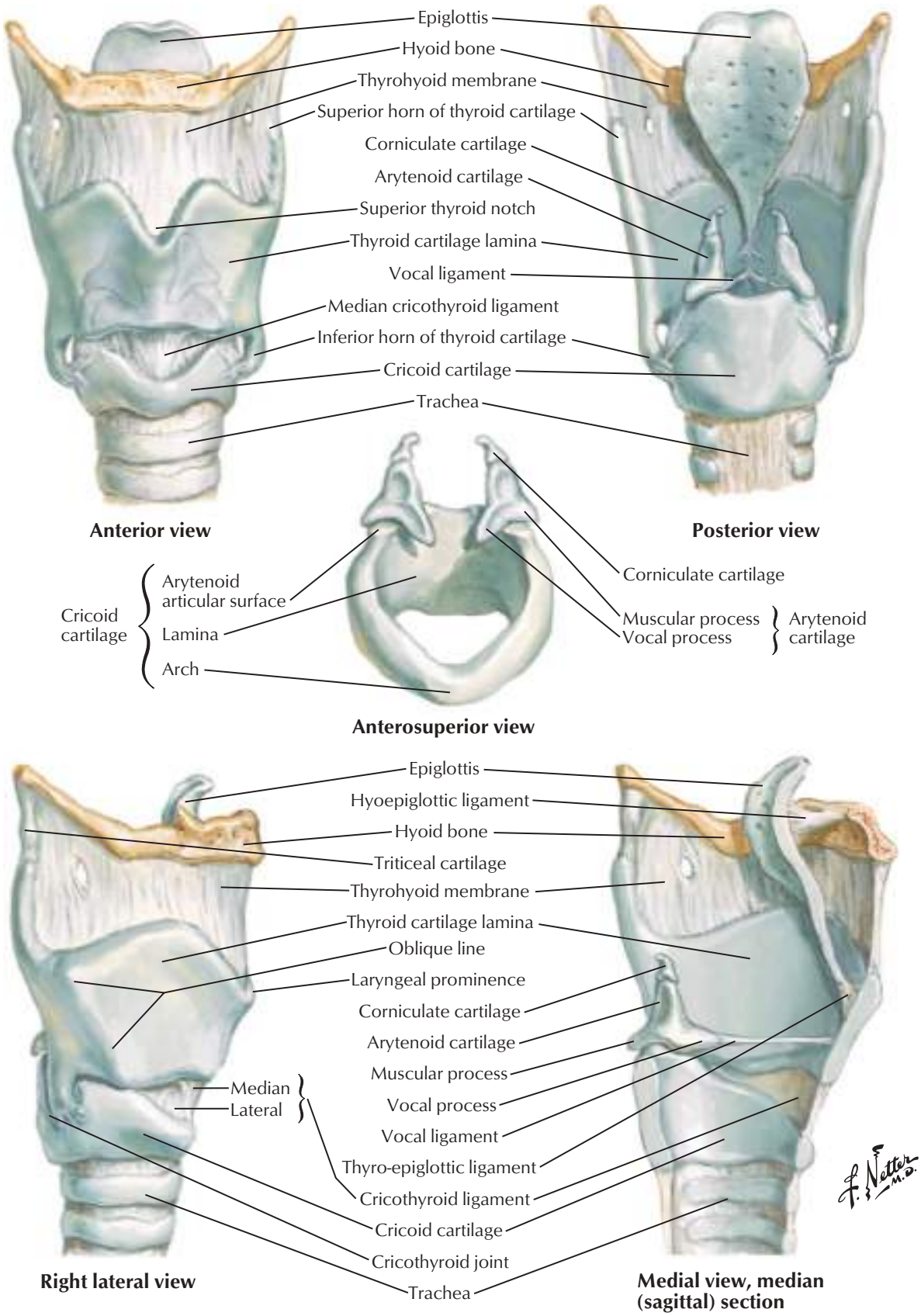

External carotid artery
Internal carotid artery
Infrahyoid artery
Superior thyroid artery and vein
Superior laryngeal artery
Thyrohyoid membrane
Ansa cervicalis
Superior root
Inferior root
Common carotid artery
Cricothyroid artery
Internal jugular vein
Phrenic nerve
Middle thyroid vein
Inferior thyroid veins
Ascending cervical artery
Inferior thyroid artery
Superficial cervical artery
Suprascapular artery
Thyrocervical trunk
Subclavian artery and vein
Vagus nerve (X)
Right recurrent laryngeal nerve
Brachiocephalic trunk
Brachiocephalic veins
Superior vena cava
Aortic arch
Hyoid bone
Superior laryngeal nerve
Internal branch
External branch
Thyroid cartilage (lamina)
Median cricothyroid ligament
Cricothyroid muscles
Cricoid cartilage
Pyramidal lobe (often absent or small)
Right lobe
Left lobe
Isthmus
Thyroid gland
Pretracheal lymph nodes
Phrenic nerve
Anterior scalene muscle
Vagus nerve (X)
External jugular vein
Anterior jugular vein
1st rib (cut)
Left recurrent laryngeal nerve
Thyroid cartilage
Cricothyroid ligament
Common carotid artery
Medial margin of sternocleidomastoid muscle
Cricothyroid muscle
Cricoid cartilage
Thyroid gland
Cupula (dome) of pleura
Trachea

Thyroid Gland and Pharynx: Posterior View

See also Plate 78

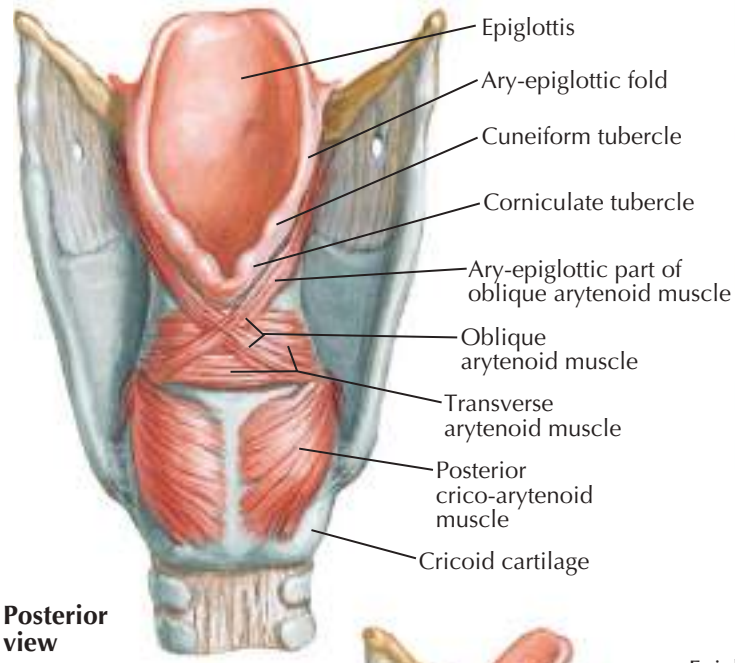



Posterior view
Thyrohyoid membrane
Hyoid bone
External carotid artery
Internal carotid artery
Superior thyroid artery
Superior laryngeal artery
Inferior pharyngeal constrictor muscle (cut)
Common carotid artery
Fibrous capsule of thyroid gland (cut)
Cricopharyngeus muscle (part of inferior pharyngeal constrictor)
Superior parathyroid gland
Right lobe of thyroid gland
Inferior parathyroid gland (may be more caudally located, even within mediastinum)
Inferior thyroid artery
Right recurrent laryngeal nerve
Transverse cervical artery
Suprascapular artery
Thyrocervical trunk
Vertebral artery
Subclavian artery
Brachiocephalic trunk
Superior laryngeal nerve
Internal branch
External branch
Vagus nerve (X)
Epiglottis
Superior thyroid artery
Common carotid artery
Fibrous capsule of thyroid gland (cut)
Superior parathyroid gland
Left lobe of thyroid gland
Ascending cervical artery
Inferior parathyroid gland
Left recurrent laryngeal nerve
Esophagus
Subclavian artery
Trachea
Right lateral view
External carotid artery
Superior thyroid vein
Superior laryngeal artery
Superior thyroid artery (cut)
Inferior pharyngeal constrictor muscle
Common carotid artery
Internal jugular vein
Middle thyroid vein
Inferior thyroid artery
Right recurrent laryngeal nerve
Esophagus
Internal branch of superior laryngeal nerve
External branch of superior laryngeal nerve
Superior parathyroid gland
Thyroid gland (right lobe) (retracted anteriorly)
Inferior parathyroid gland
Inferior thyroid vein

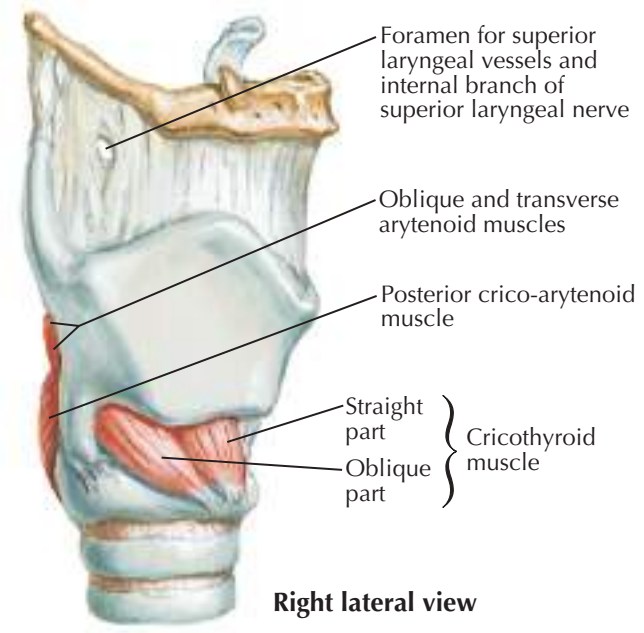

Epiglottis
Hyoid bone
Thyrohyoid membrane
Superior horn of thyroid cartilage
Corniculate cartilage
Arytenoid cartilage
Superior thyroid notch
Thyroid cartilage lamina
Vocal ligament
Median cricothyroid ligament
Inferior horn of thyroid cartilage
Cricoid cartilage
Trachea
Anterior view
Posterior view
Cricoid cartilage
Arytenoid articular surface
Lamina
Arch
Corniculate cartilage
Muscular process
Vocal process
Arytenoid cartilage
Anterosuperior view
Epiglottis
Hyoepiglottic ligament
Hyoid bone
Triticeal cartilage
Thyrohyoid membrane
Thyroid cartilage lamina
Oblique line
Laryngeal prominence
Corniculate cartilage
Arytenoid cartilage
Muscular process
Vocal process
Vocal ligament
Thyro-epiglottic ligament
Cricothyroid ligament
Cricoid cartilage
Cricothyroid joint
Trachea
Median
Lateral
Right lateral view
Medial view, median (sagittal) section

Intrinsic Muscles of Larynx

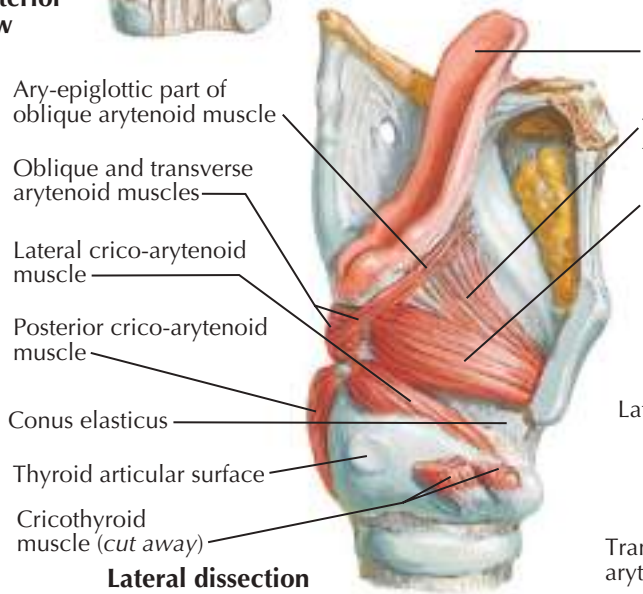
See also Plates 79, 81, 82



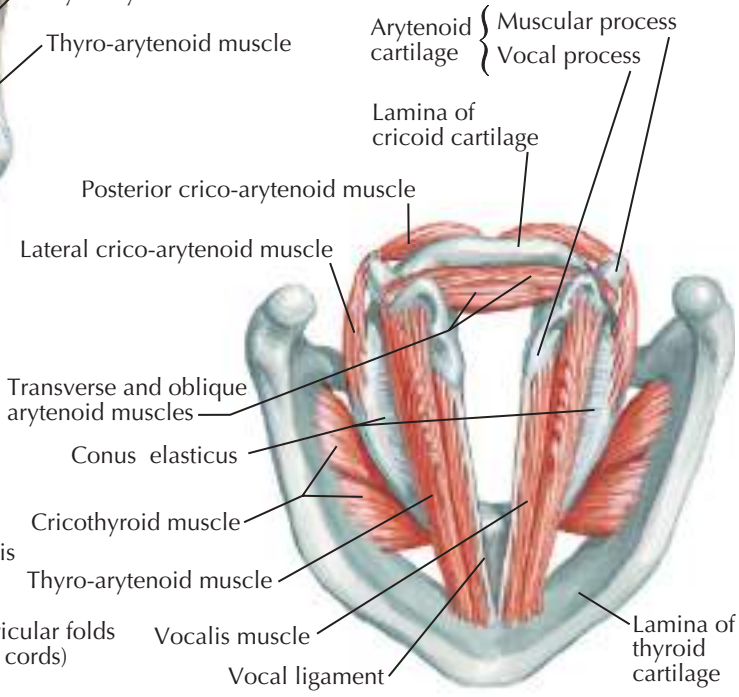
Posterior view



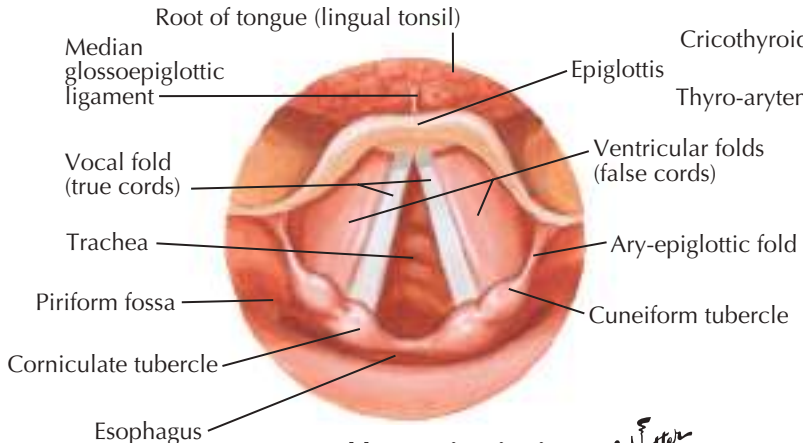
Right lateral view



Lateral dissection



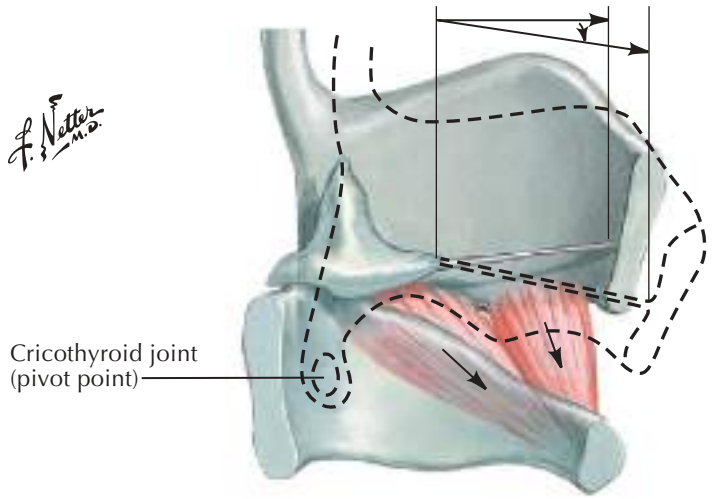
Superior view



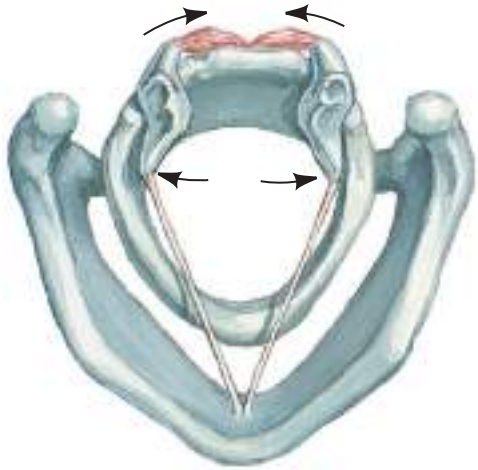
Normal larynx: inspiration

Action of Intrinsic Muscles of Larynx

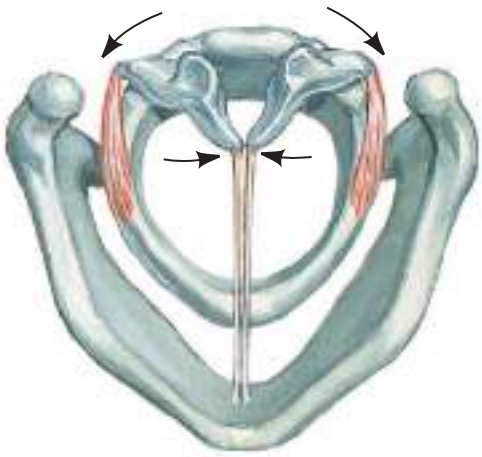
See also Plates 79, 80, 82



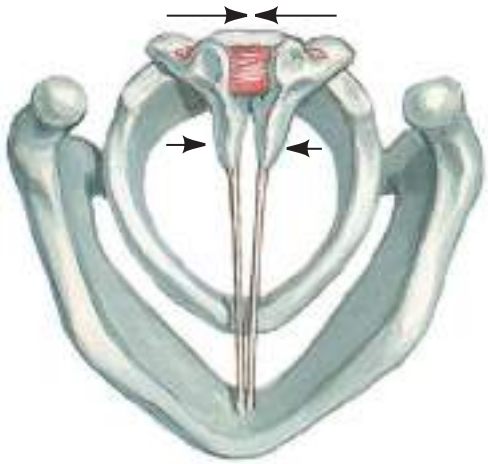
Action of cricothyroid muscles
Lengthening (increasing tension) of vocal ligaments



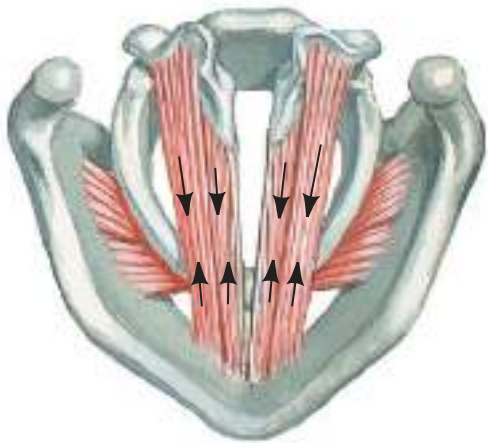
Action of posterior crico-arytenoid muscles
Abduction of vocal ligaments



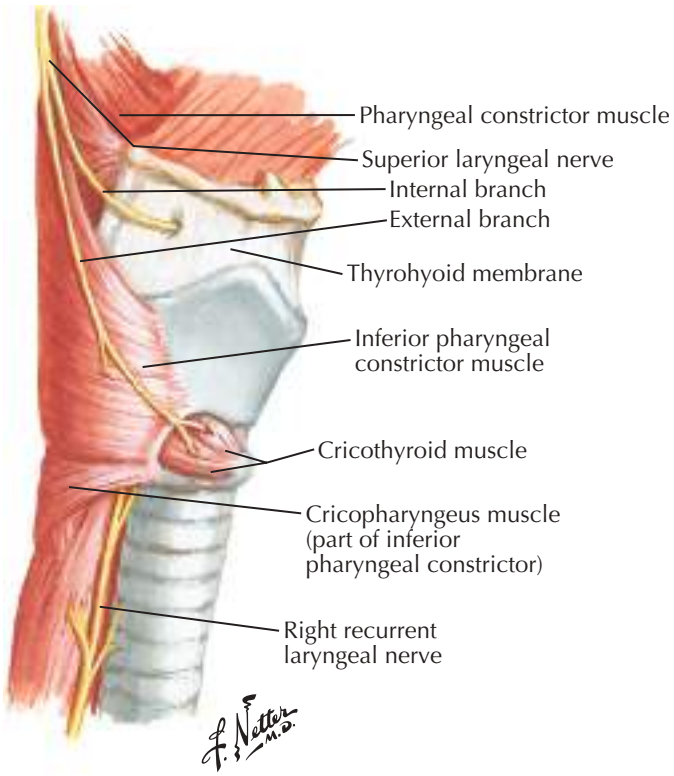
Action of lateral crico-arytenoid muscles
Adduction of vocal ligaments

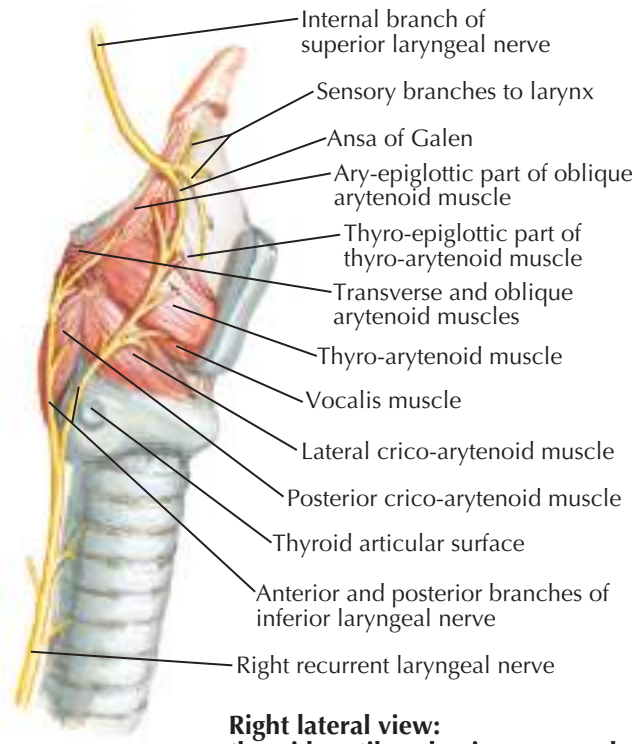


Action of transverse and oblique arytenoid muscles
Adduction of vocal ligaments



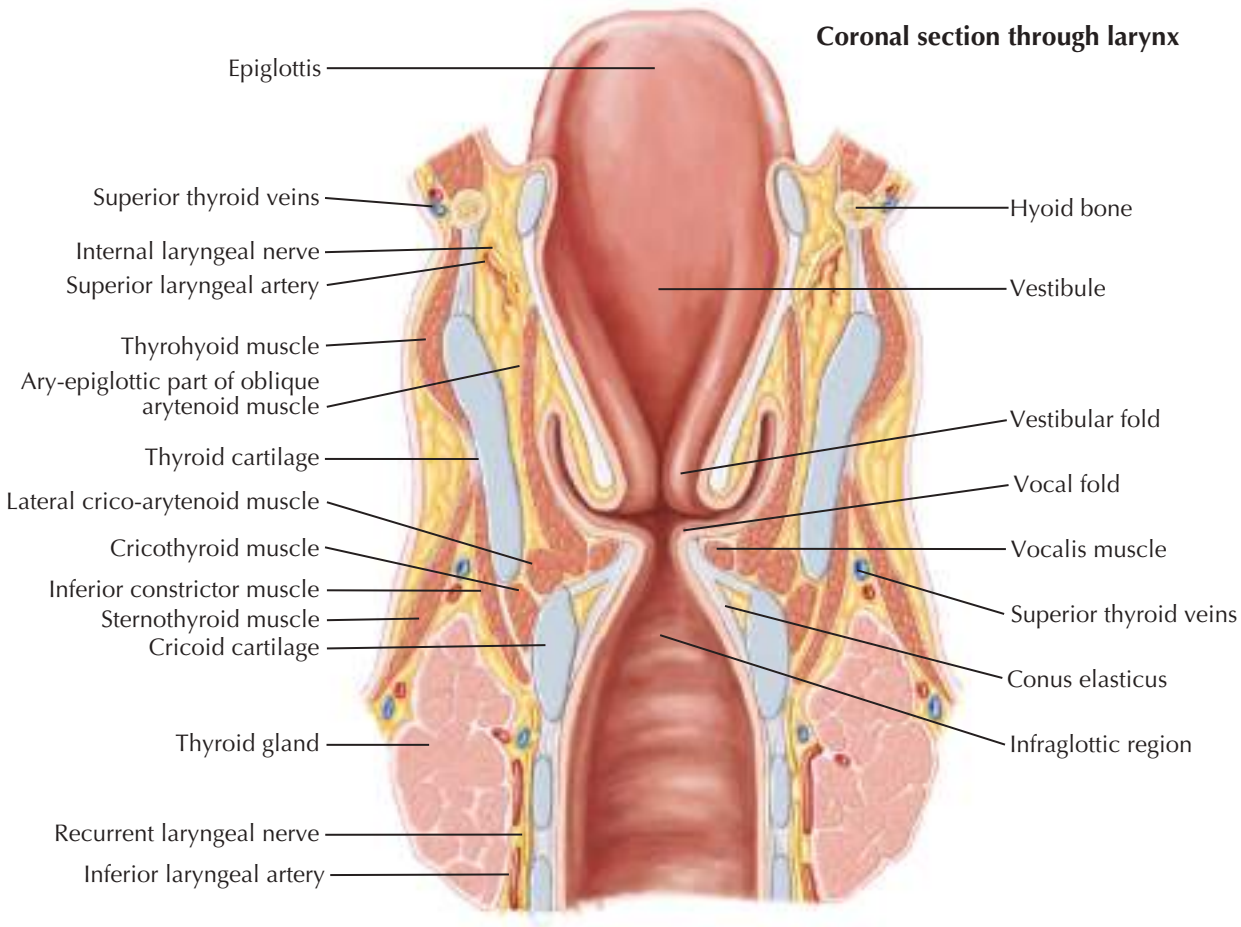
Action of vocalis and thyro-arytenoid muscles
Shortening (relaxation) of vocal ligaments

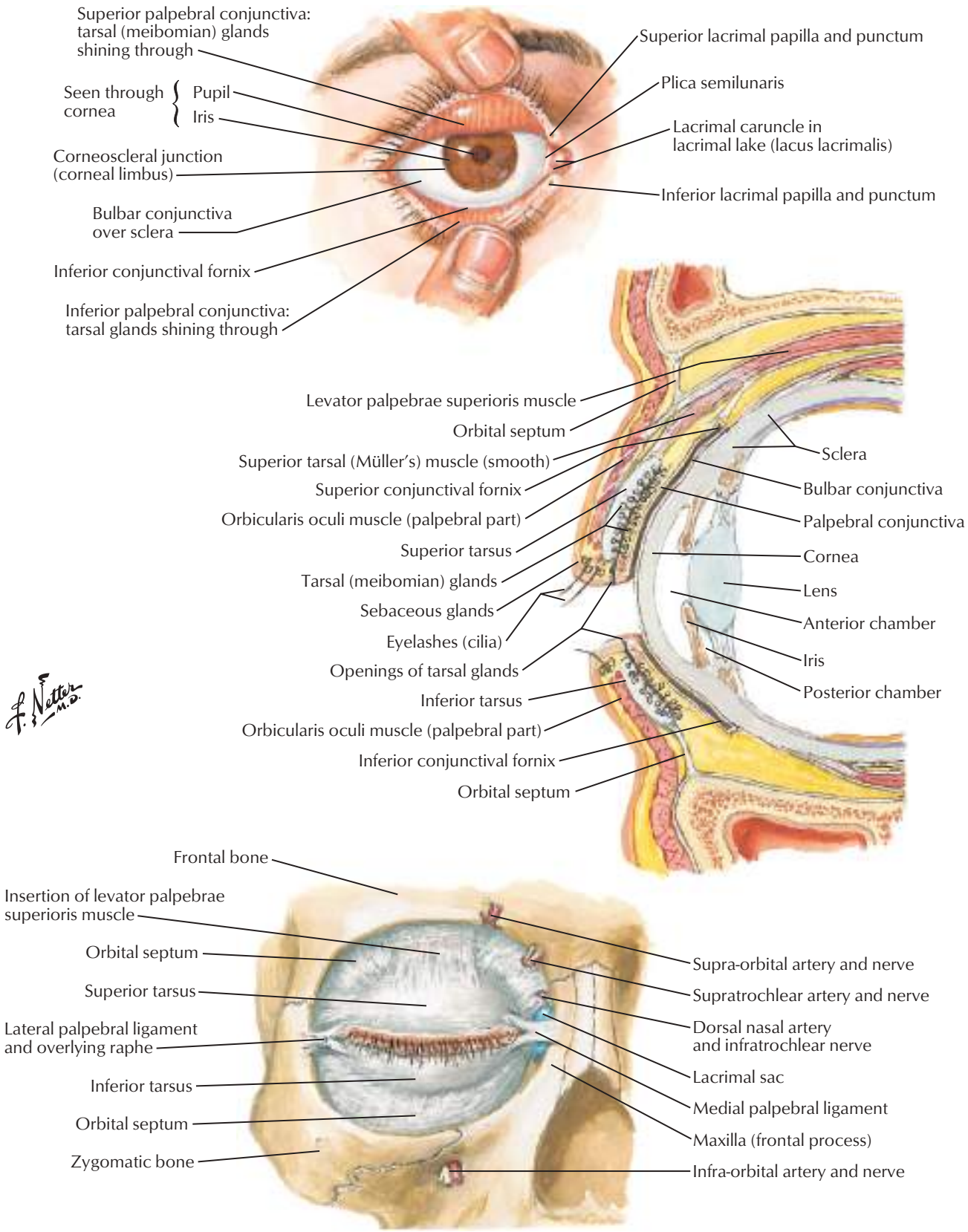




Right lateral view: thyroid cartilage lamina removed

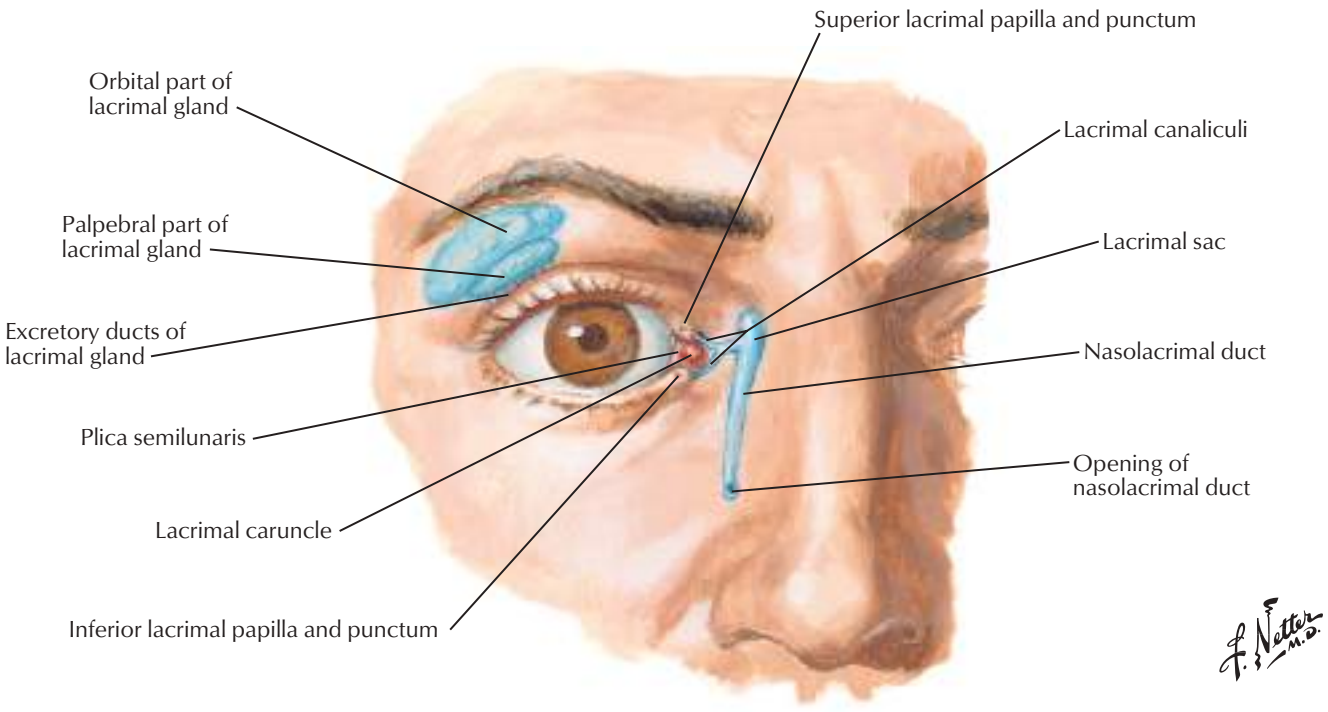
Coronal section through larynx

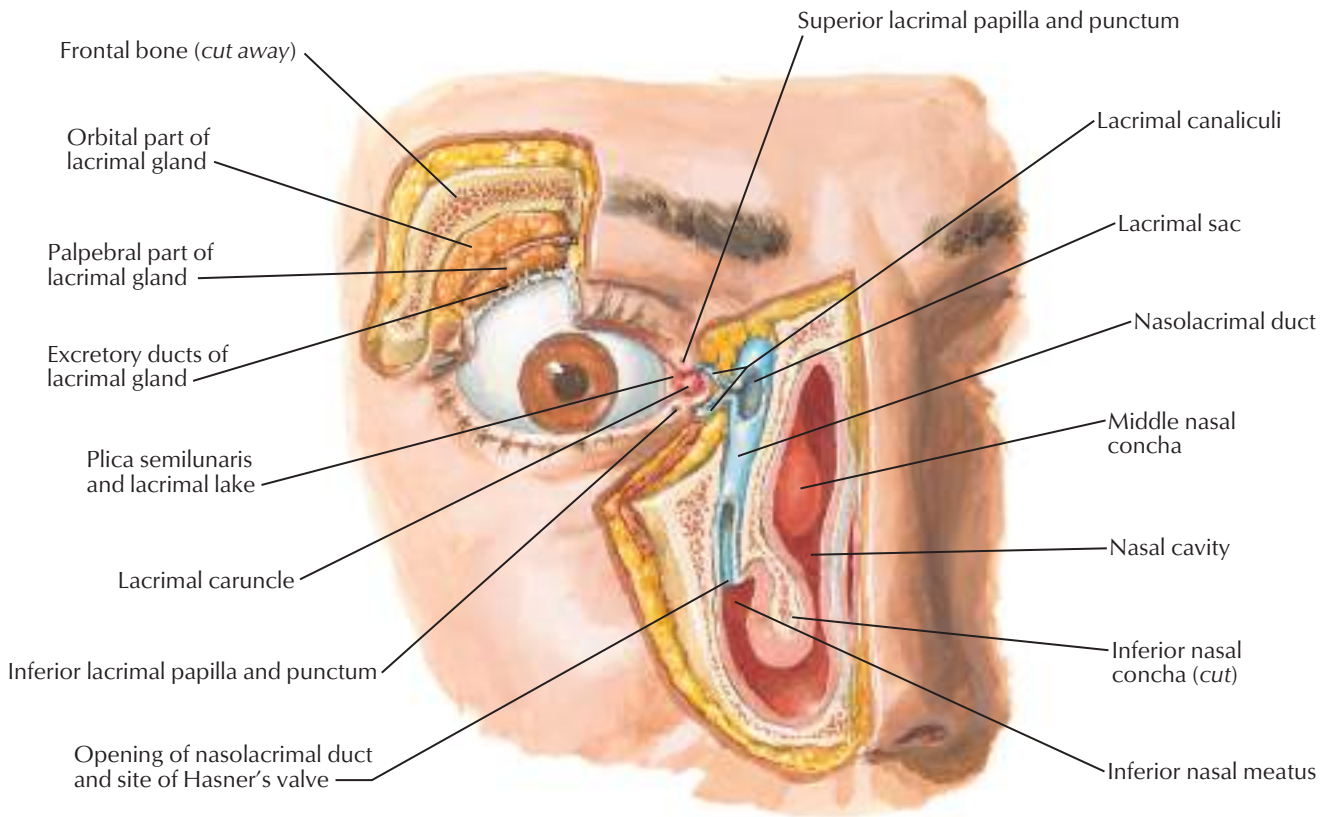


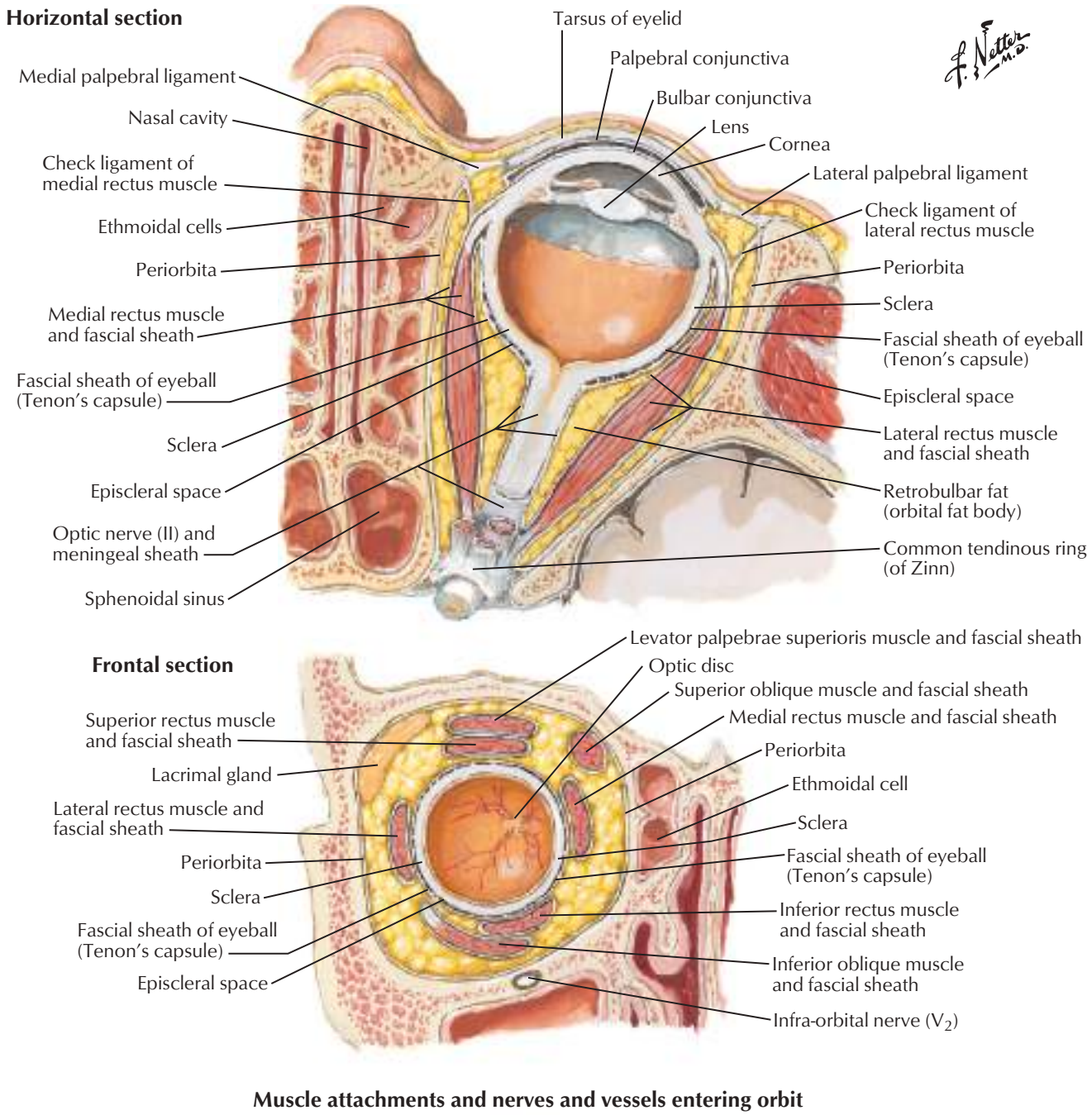

Superior palpebral conjunctiva: tarsal (meibomian) glands shining through
Seen through cornea
Pupil
Iris
Corneoscleral junction (corneal limbus)
Bulbar conjunctiva over sclera
Inferior conjunctival fornix
Inferior palpebral conjunctiva: tarsal glands shining through
Superior lacrimal papilla and punctum
Plica semilunaris
Lacrimal caruncle in lacrimal lake (lacus lacrimalis)
Inferior lacrimal papilla and punctum
Levator palpebrae superioris muscle
Orbital septum
Superior tarsal (Müller's) muscle (smooth)
Superior conjunctival fornix
Orbicularis oculi muscle (palpebral part)
Superior tarsus
Tarsal (meibomian) glands
Sebaceous glands
Eyelashes (cilia)
Openings of tarsal glands
Inferior tarsus
Orbicularis oculi muscle (palpebral part)
Inferior conjunctival fornix
Orbital septum
Sclera
Bulbar conjunctiva
Palpebral conjunctiva
Cornea
Lens
Anterior chamber
Iris
Posterior chamber
F. Netter M.D.
Frontal bone
Insertion of levator palpebrae superioris muscle
Orbital septum
Superior tarsus
Lateral palpebral ligament and overlying raphe
Inferior tarsus
Orbital septum
Zygomatic bone
Supra-orbital artery and nerve
Supratrochlear artery and nerve
Dorsal nasal artery and infratrochlear nerve
Lacrimal sac
Medial palpebral ligament
Maxilla (frontal process)
Infra-orbital artery and nerve

Lacrimal Apparatus

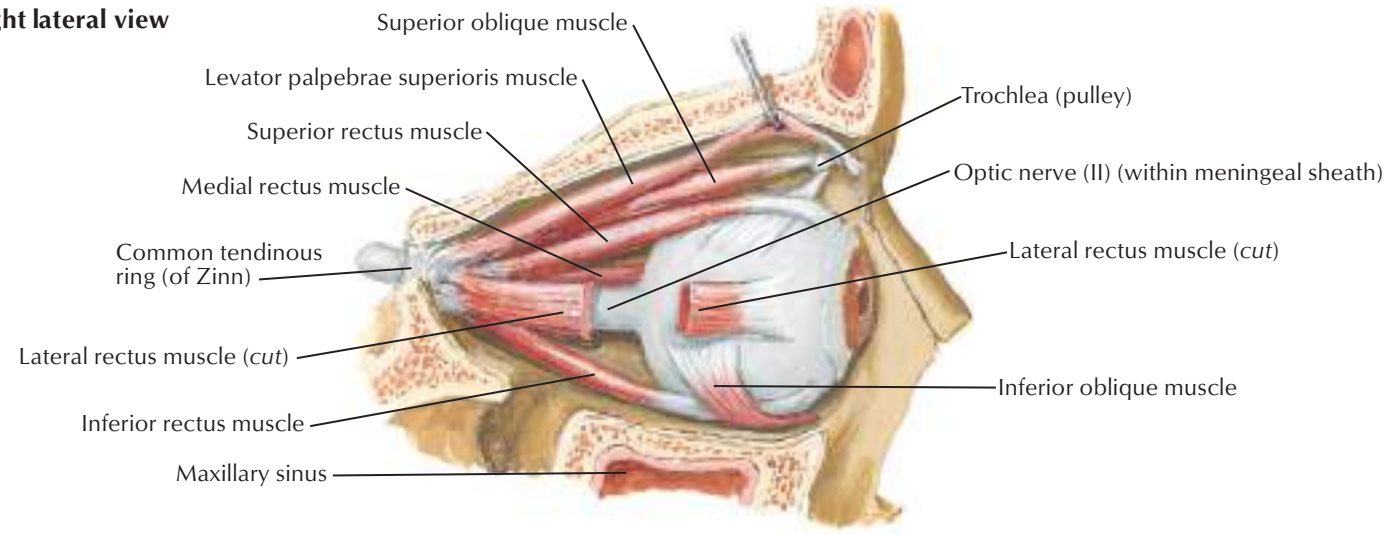
See also **Plate 134**



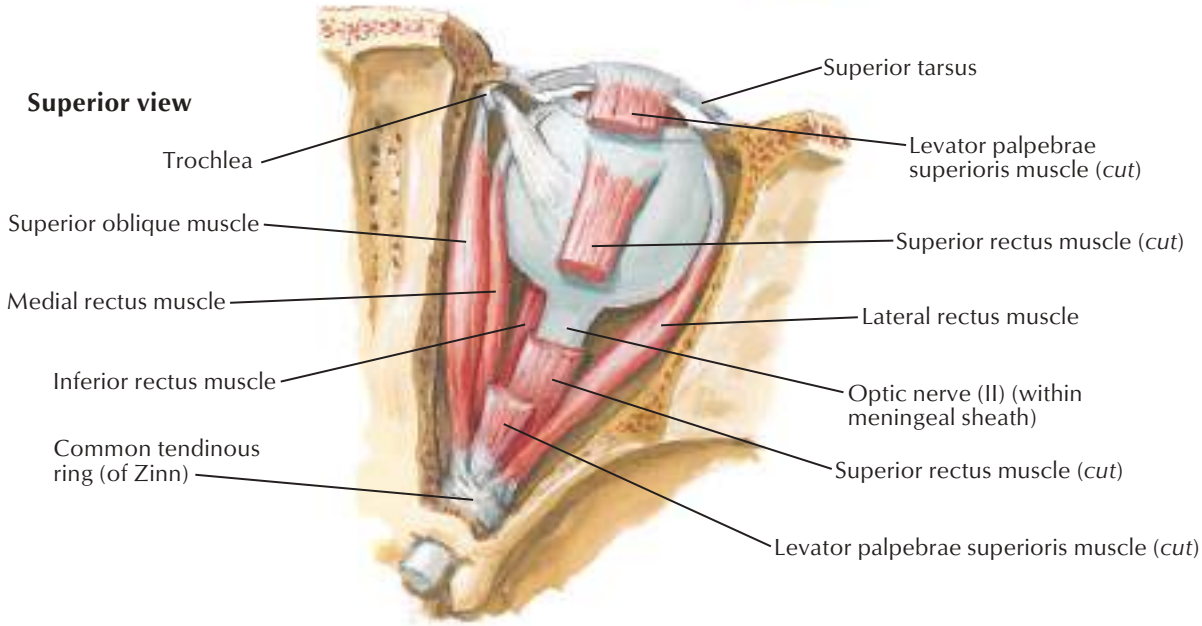



Horizontal section
Tarsus of eyelid
Palpebral conjunctiva
Bulbar conjunctiva
Lens
Cornea
Lateral palpebral ligament
Check ligament of lateral rectus muscle
Periorbita
Sclera
Fascial sheath of eyeball (Tenon's capsule)
Episcleral space
Lateral rectus muscle and fascial sheath
Retrobulbar fat (orbital fat body)
Common tendinous ring (of Zinn)
Medial palpebral ligament
Nasal cavity
Check ligament of medial rectus muscle
Ethmoidal cells
Periorbita
Medial rectus muscle and fascial sheath
Fascial sheath of eyeball (Tenon's capsule)
Sclera
Episcleral space
Optic nerve (II) and meningeal sheath
Sphenoidal sinus
Frontal section
Levator palpebrae superioris muscle and fascial sheath
Optic disc
Superior oblique muscle and fascial sheath
Medial rectus muscle and fascial sheath
Periorbita
Ethmoidal cell
Sclera
Fascial sheath of eyeball (Tenon's capsule)
Inferior rectus muscle and fascial sheath
Inferior oblique muscle and fascial sheath
Infra-orbital nerve (V2)
Superior rectus muscle and fascial sheath
Lacrimal gland
Lateral rectus muscle and fascial sheath
Periorbita
Sclera
Fascial sheath of eyeball (Tenon's capsule)
Episcleral space
Muscle attachments and nerves and vessels entering orbit
Superior orbital fissure
Lacrimal nerve (V1)
Frontal nerve (V1)
Trochlear nerve (IV)
Superior ophthalmic vein
Lateral rectus muscle
Superior branch of oculomotor nerve (III)
Inferior orbital fissure
Abducent nerve (VI)
Nasociliary nerve (V1)
Levator palpebrae superioris muscle
Superior oblique muscle
Superior rectus muscle
Medial rectus muscle
Optic nerve (II)
Ophthalmic artery
in optic canal
Inferior rectus muscle
Inferior branch of oculomotor nerve (III)

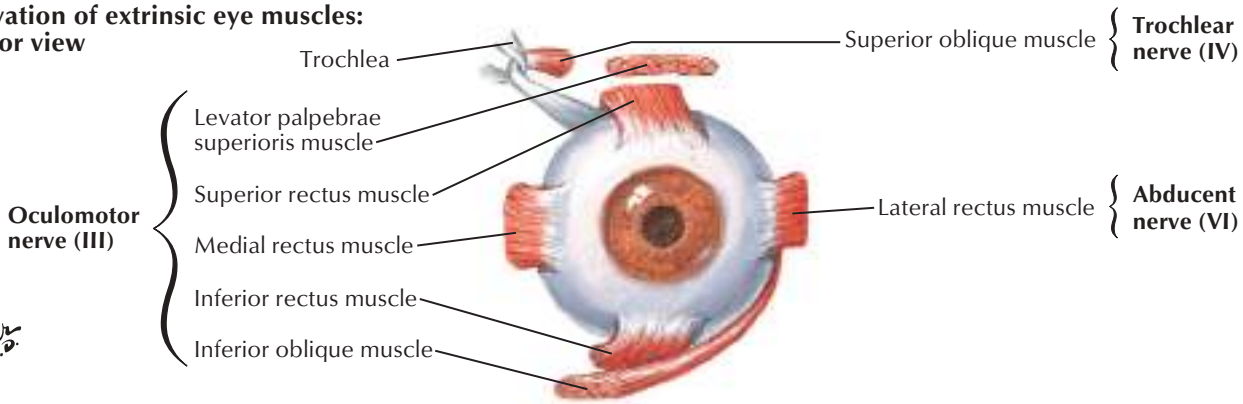
Right lateral view

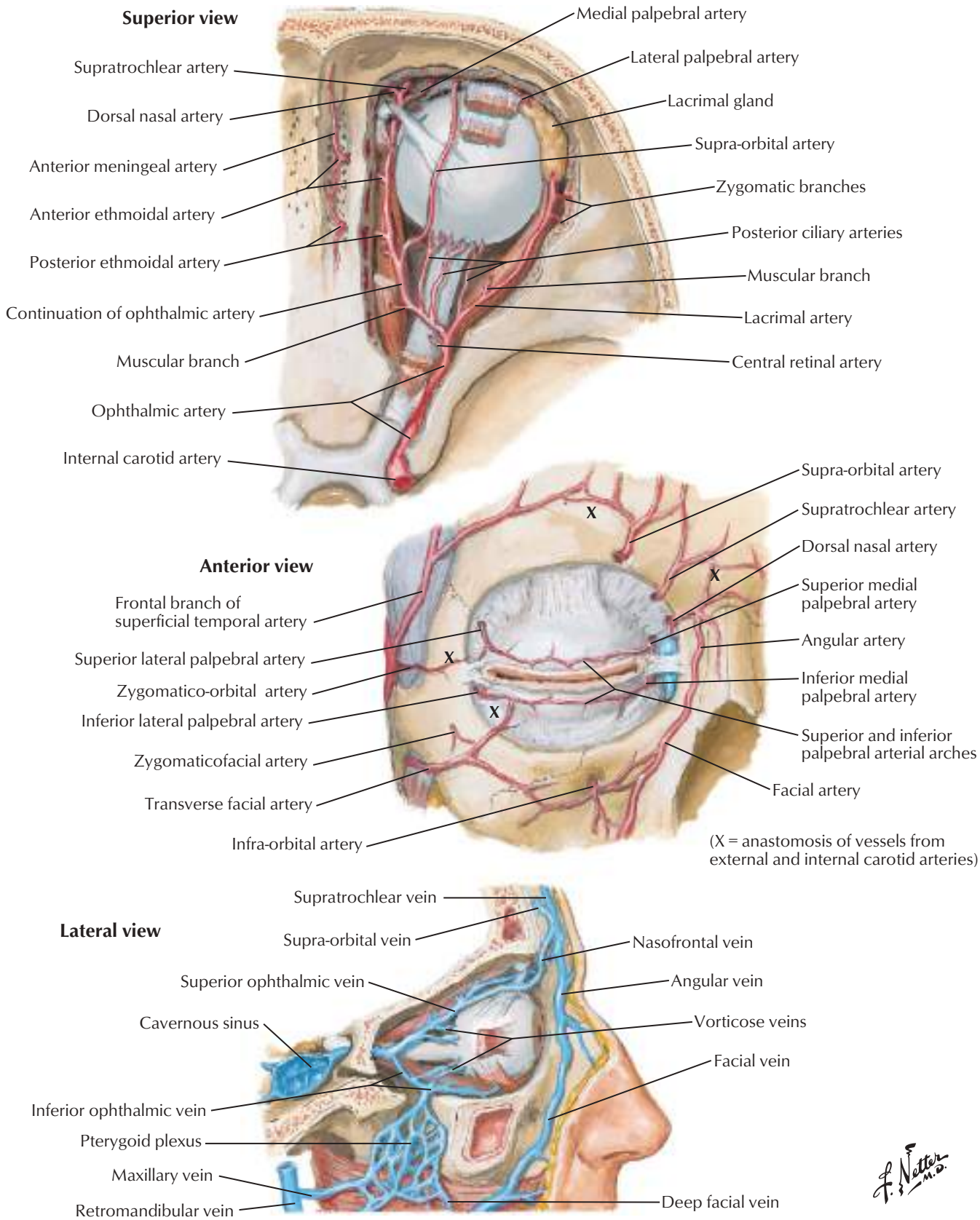


Superior view



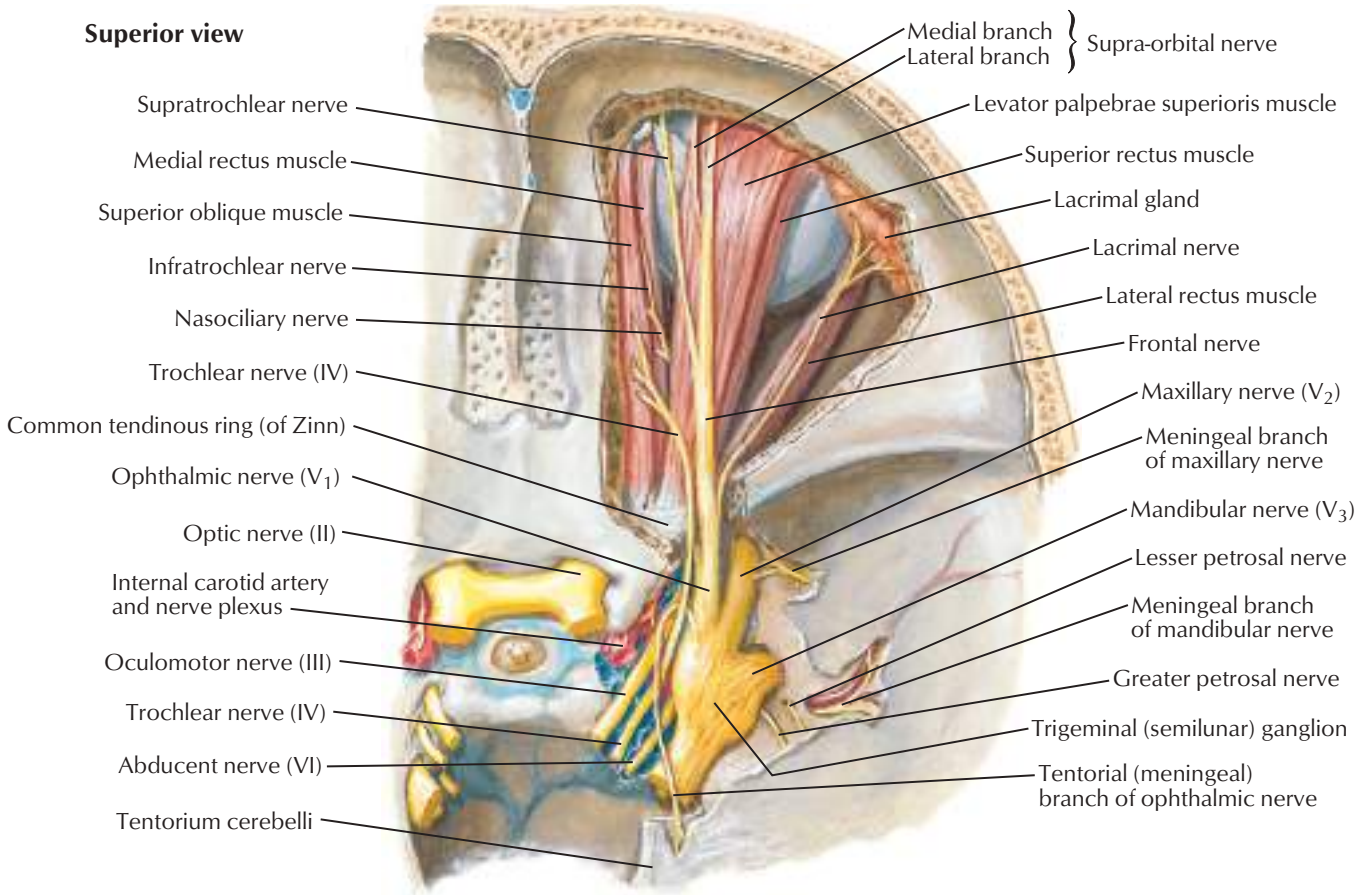
Innervation of extrinsic eye muscles: anterior view

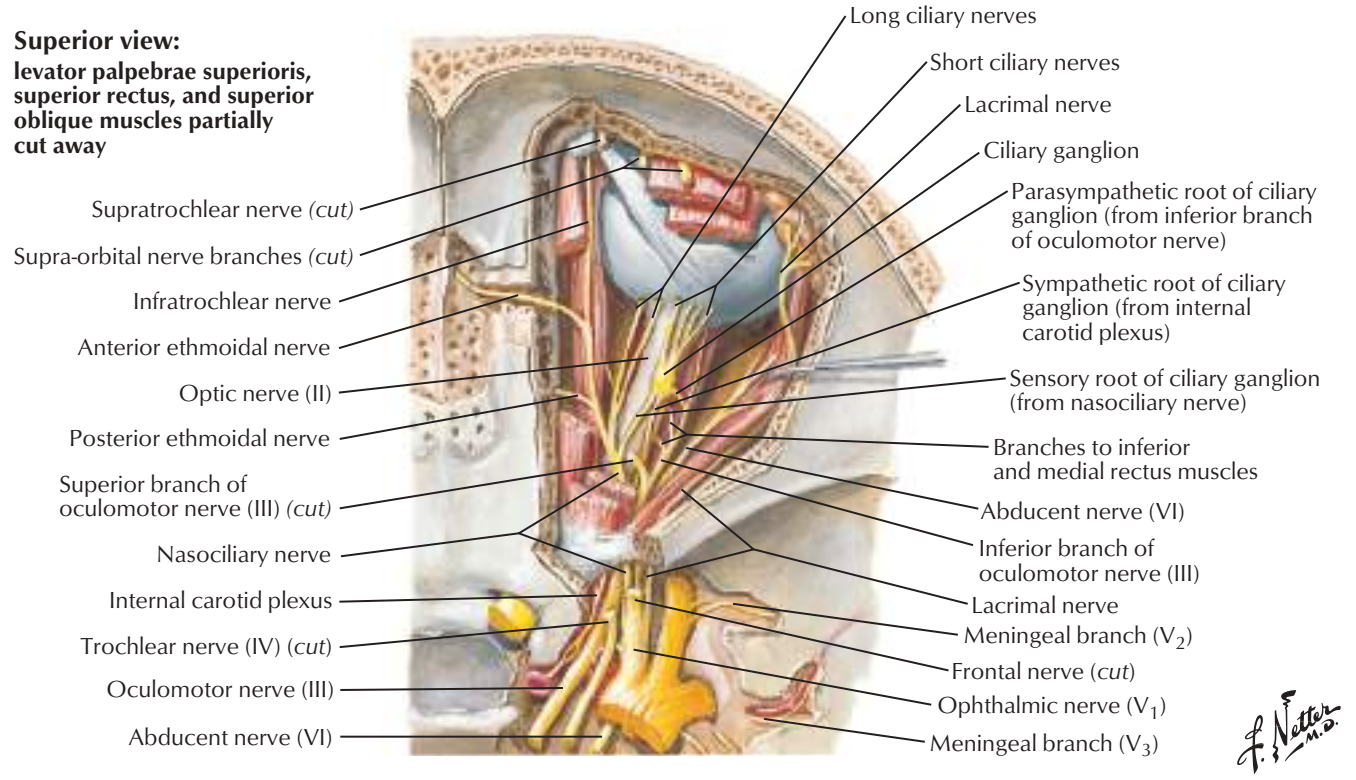


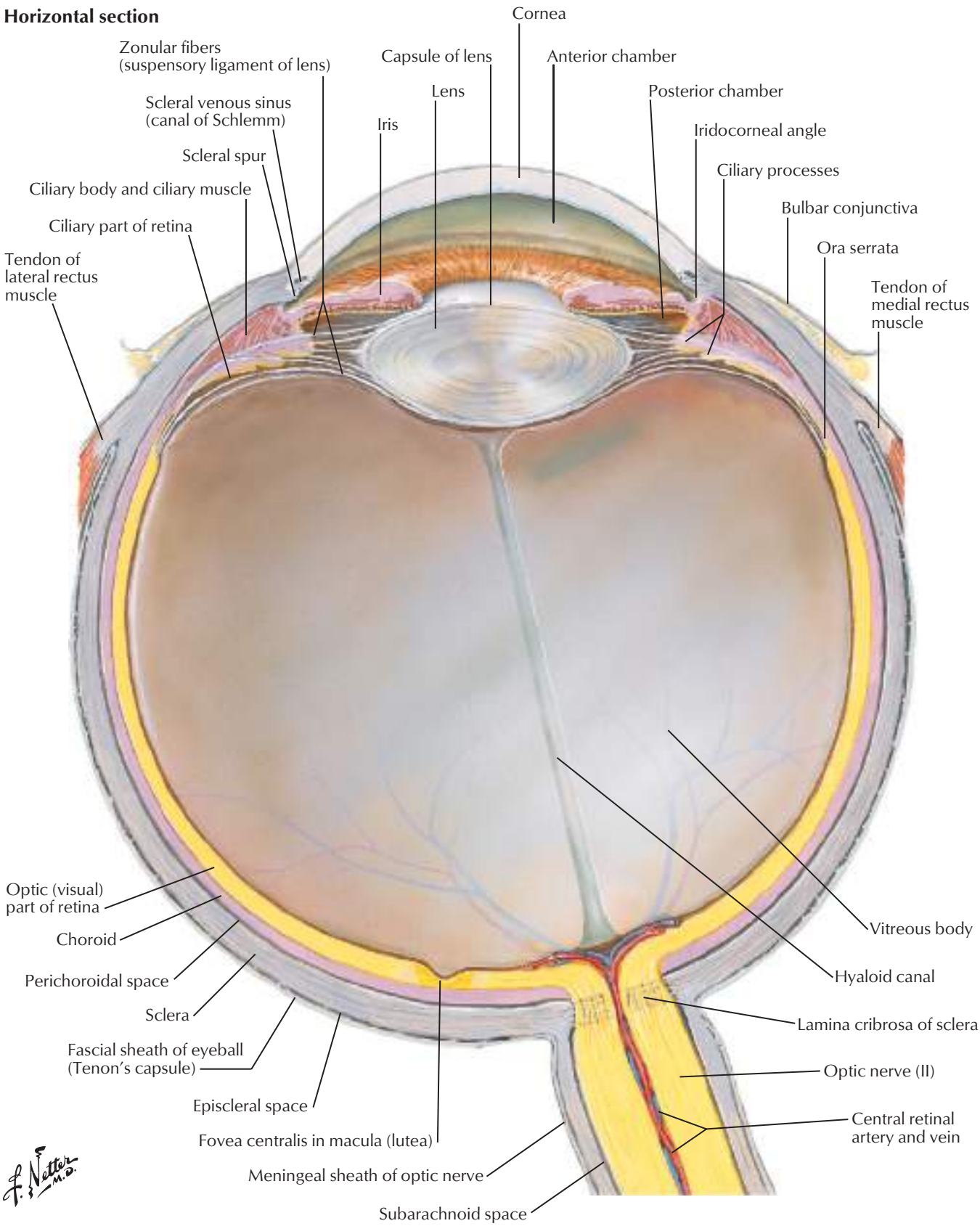

Superior view
Supratrochlear artery
Dorsal nasal artery
Anterior meningeal artery
Anterior ethmoidal artery
Posterior ethmoidal artery
Continuation of ophthalmic artery
Muscular branch
Ophthalmic artery
Internal carotid artery
Medial palpebral artery
Lateral palpebral artery
Lacrimal gland
Supra-orbital artery
Zygomatic branches
Posterior ciliary arteries
Muscular branch
Lacrimal artery
Central retinal artery
Anterior view
Frontal branch of superficial temporal artery
Superior lateral palpebral artery
Zygomatico-orbital artery
Inferior lateral palpebral artery
Zygomaticofacial artery
Transverse facial artery
Infra-orbital artery
X
X
X
Supra-orbital artery
Supratrochlear artery
Dorsal nasal artery
Superior medial palpebral artery
Angular artery
Inferior medial palpebral artery
Superior and inferior palpebral arterial arches
Facial artery
(X = anastomosis of vessels from external and internal carotid arteries)
Lateral view
Supratrochlear vein
Supra-orbital vein
Superior ophthalmic vein
Cavernous sinus
Inferior ophthalmic vein
Pterygoid plexus
Maxillary vein
Retromandibular vein
Nasofrontal vein
Angular vein
Vorticose veins
Facial vein
Deep facial vein

Nerves of Orbit

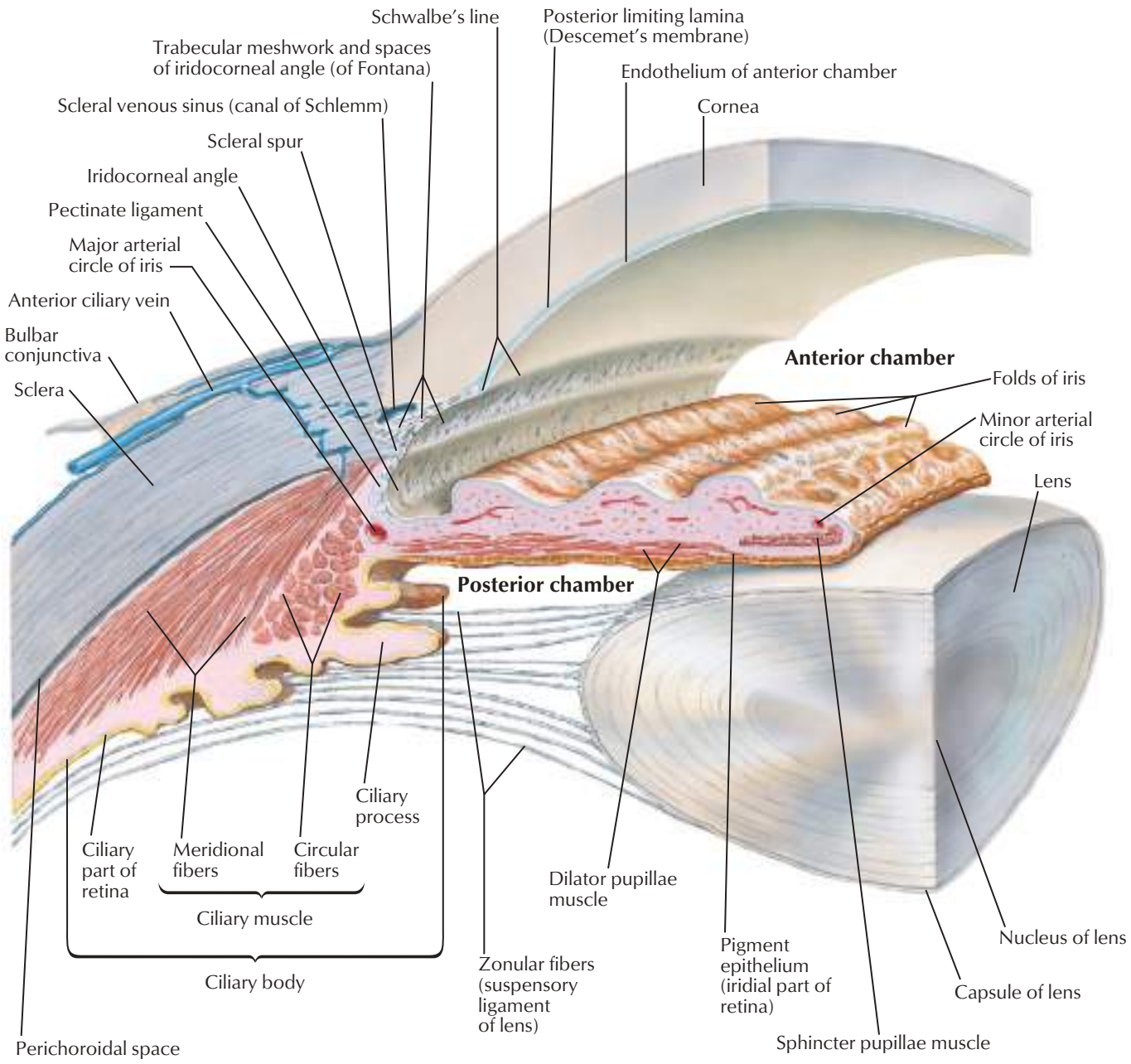
See also Plates 52, 122, 123



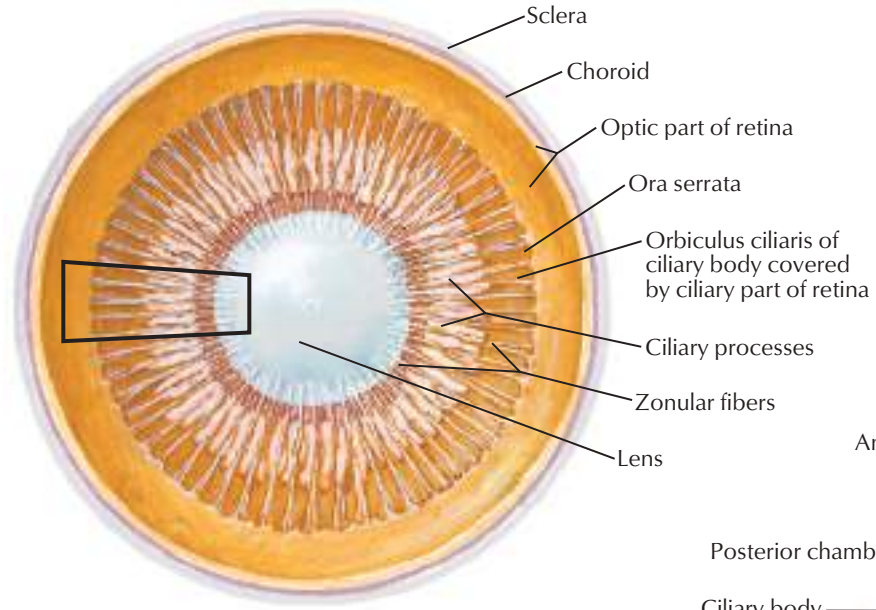



Horizontal section
Cornea
Zonular fibers
(suspensory ligament of lens)
Capsule of lens
Anterior chamber
Lens
Posterior chamber
Scleral venous sinus
(canal of Schlemm)
Iris
Iridocorneal angle
Scleral spur
Ciliary processes
Ciliary body and ciliary muscle
Bulbar conjunctiva
Ciliary part of retina
Ora serrata
Tendon of
lateral rectus
muscle
Tendon of
medial rectus
muscle
Optic (visual)
part of retina
Vitreous body
Choroid
Hyaloid canal
Perichoroidal space
Lamina cribrosa of sclera
Sclera
Optic nerve (II)
Fascial sheath of eyeball
(Tenon's capsule)
Central retinal
artery and vein
Episcleral space
Fovea centralis in macula (lutea)
Meningeal sheath of optic nerve
Subarachnoid space

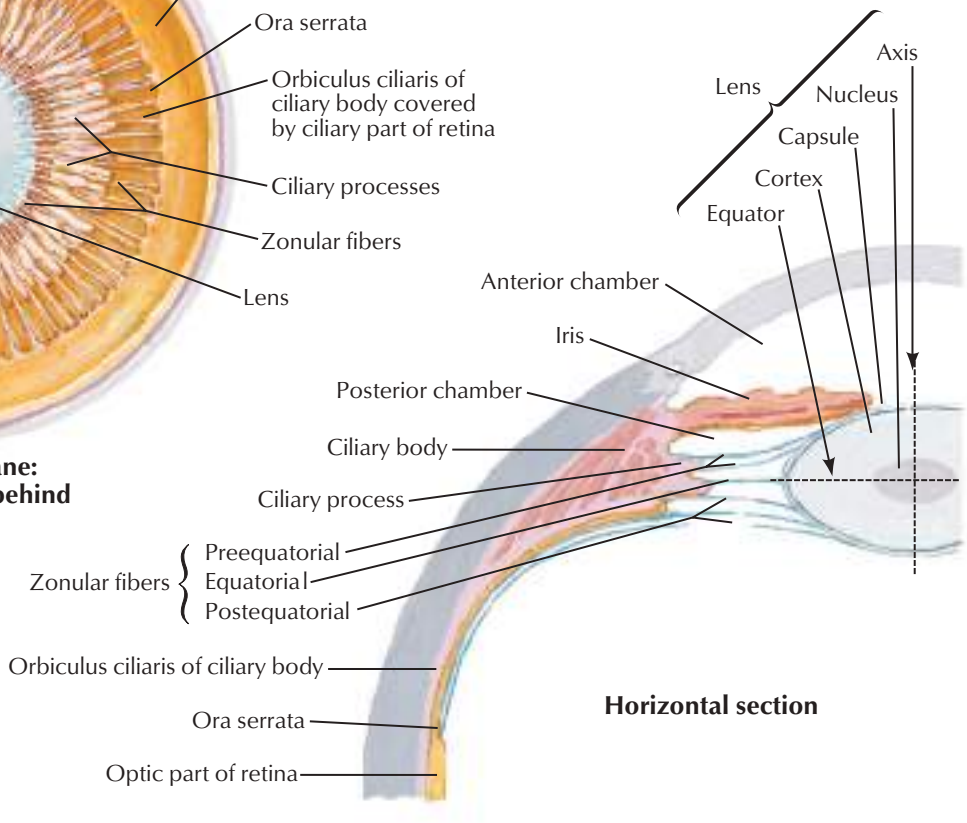
Anterior and Posterior Chambers of Eye



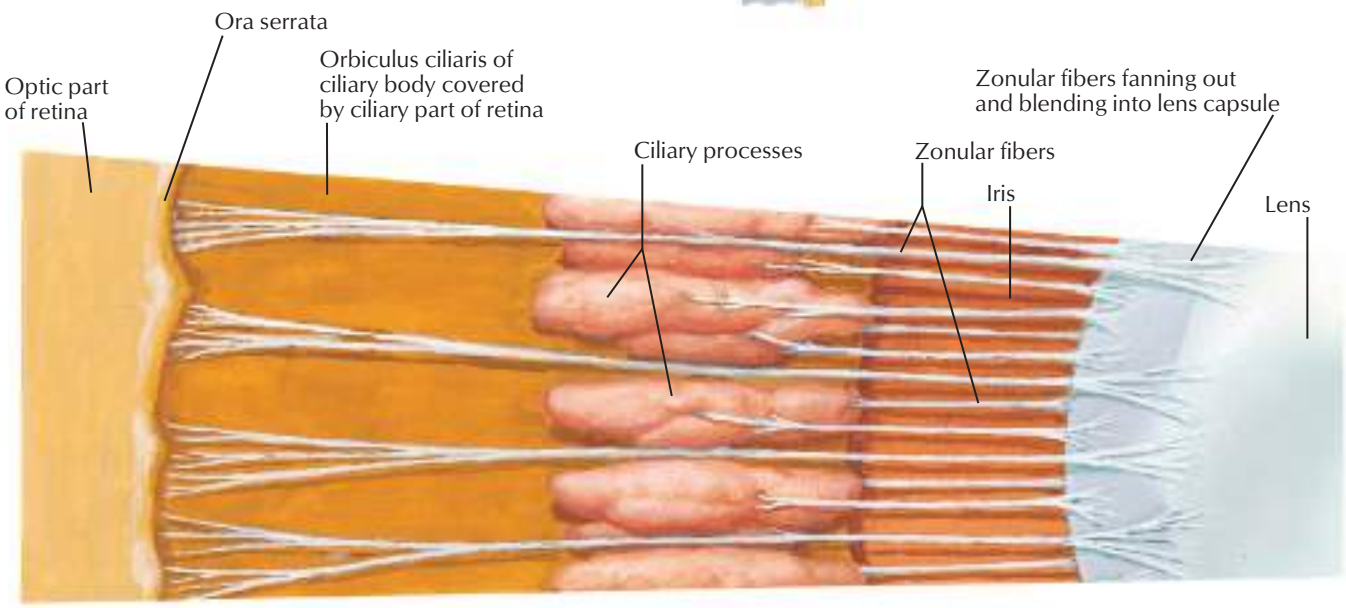
Note: For clarity, only single plane of zonular fibers shown; actually, fibers surround entire circumference of lens.



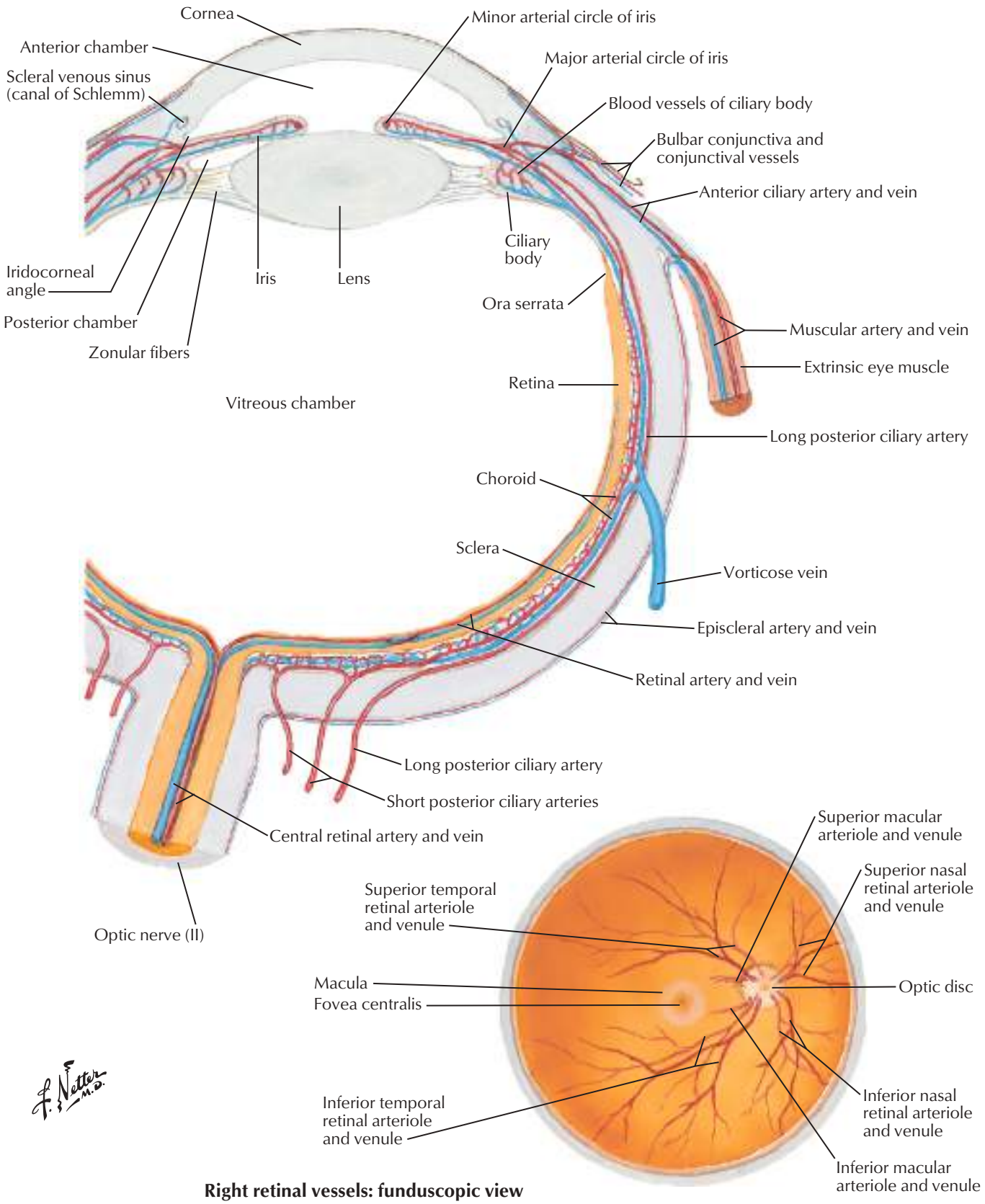
Eyeball sectioned in coronal plane: anterior segment viewed from behind



Horizontal section

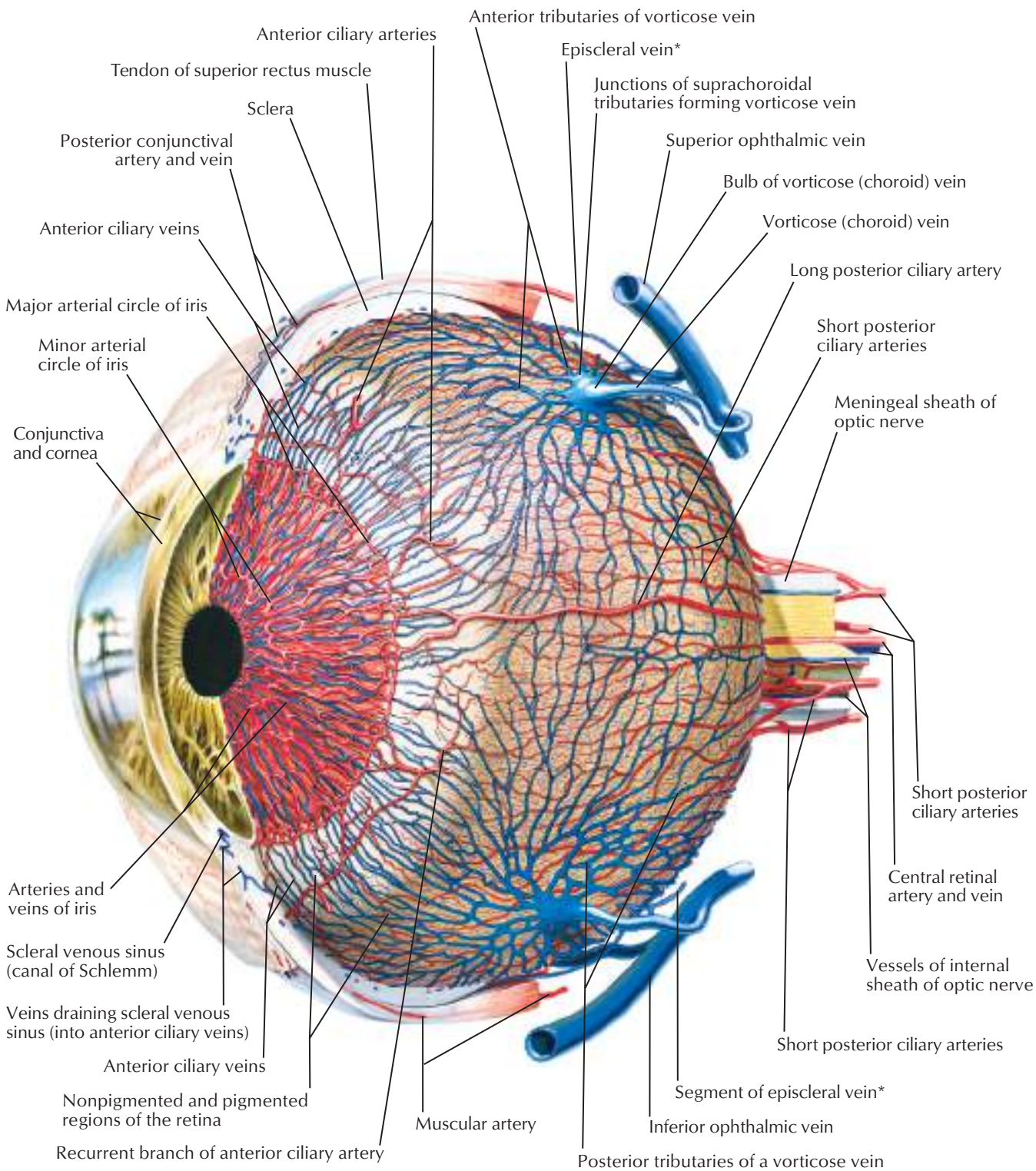


Enlargement of segment outlined in top illustration (semischematic)



Right retinal vessels: funduscopic view

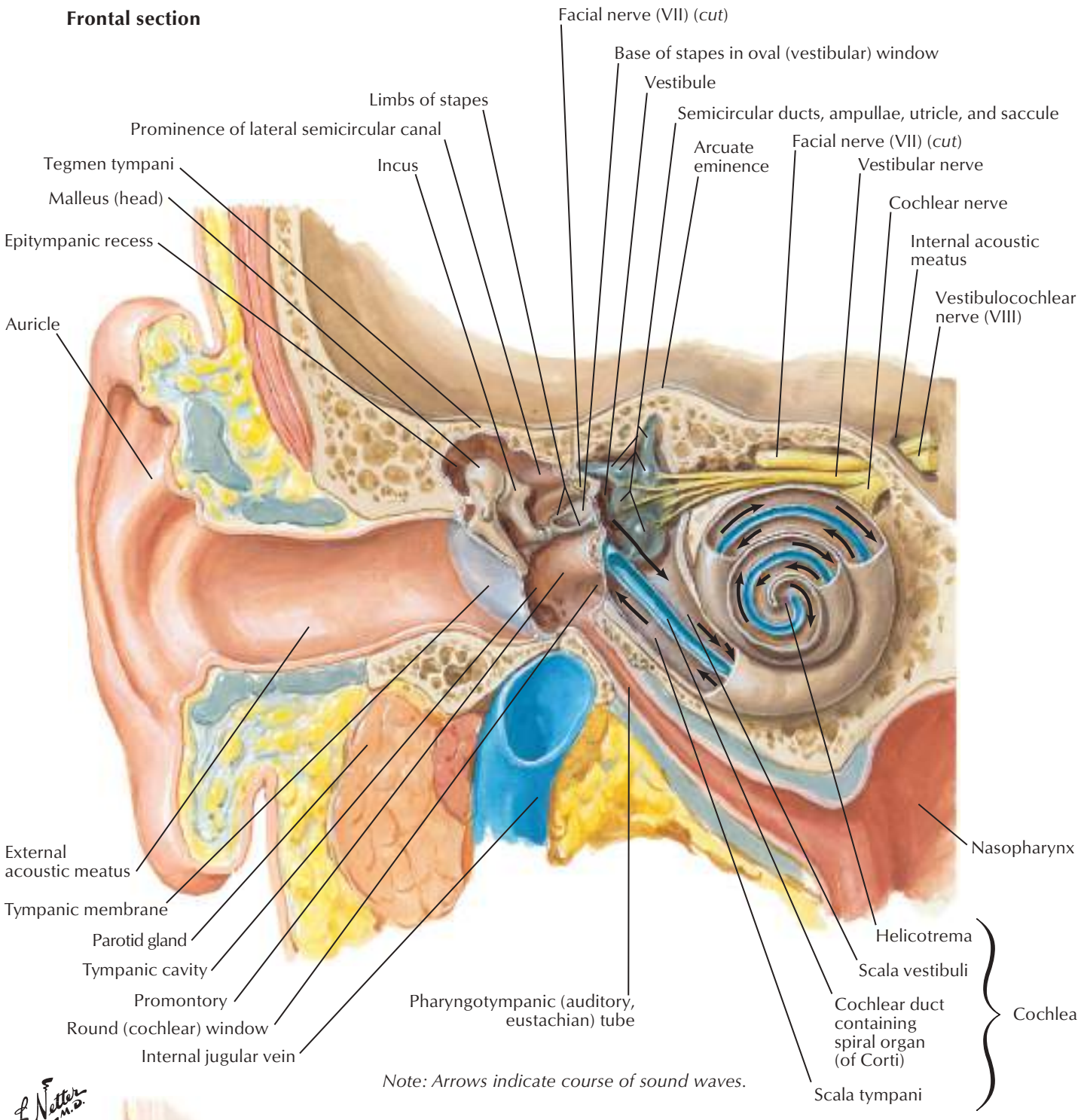
Vascular arrangements within the choroid (vascular tunic) of the eyeball



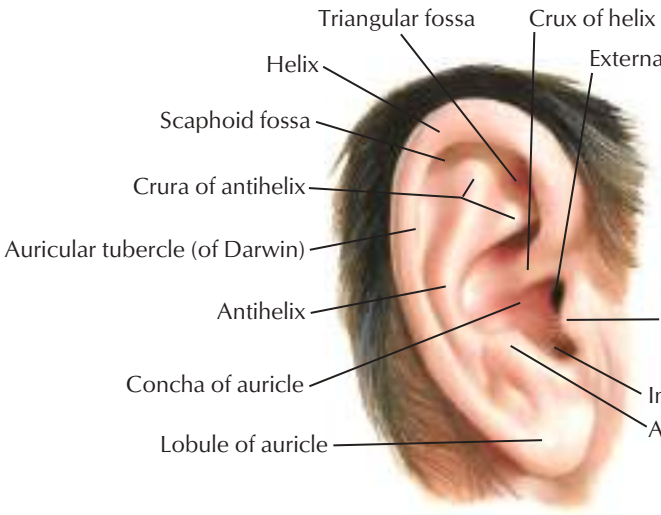
**The episcleral veins are shown here anastomosing with the vorticose veins, which they do; however, they also drain into the anterior ciliary veins.*

C. Machado M.D.

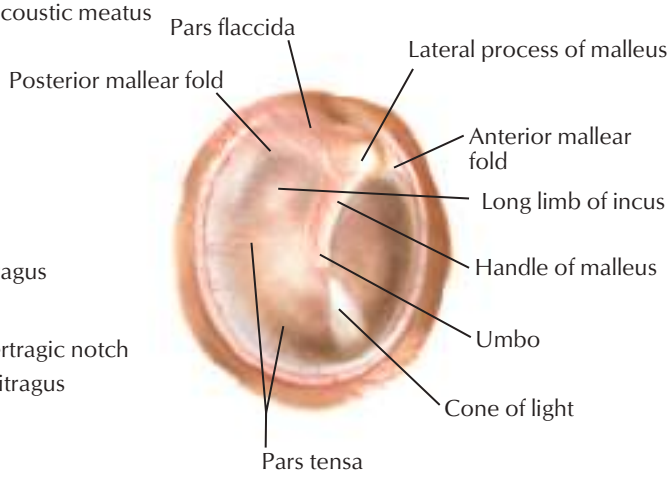
Pathway of Sound Reception



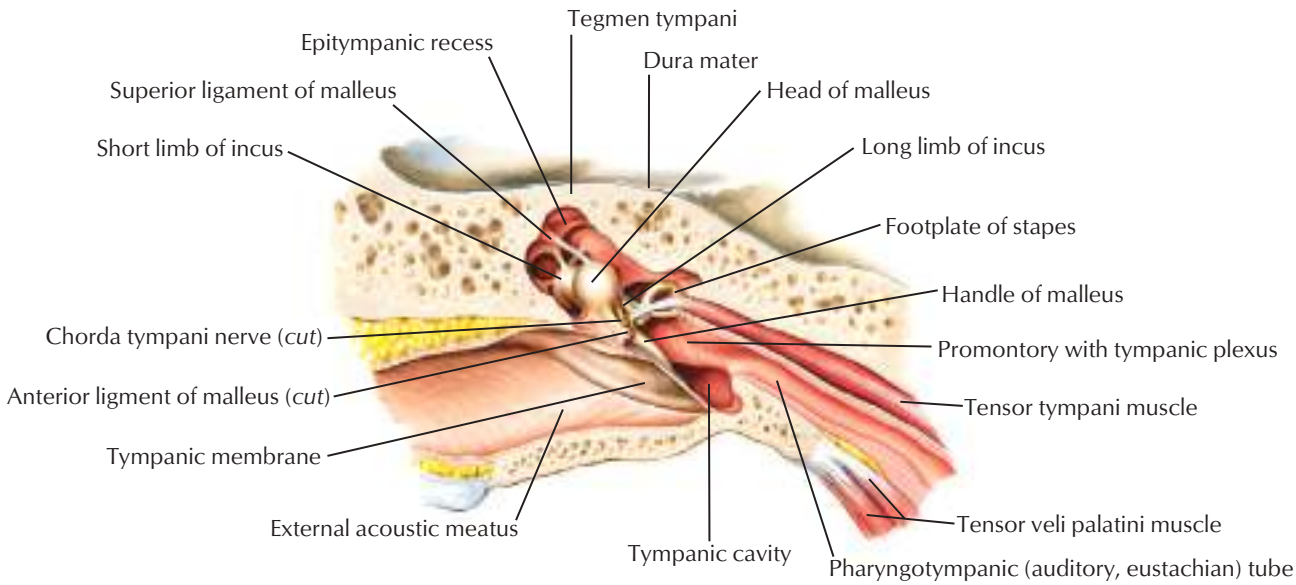
Right auricle (pinna)



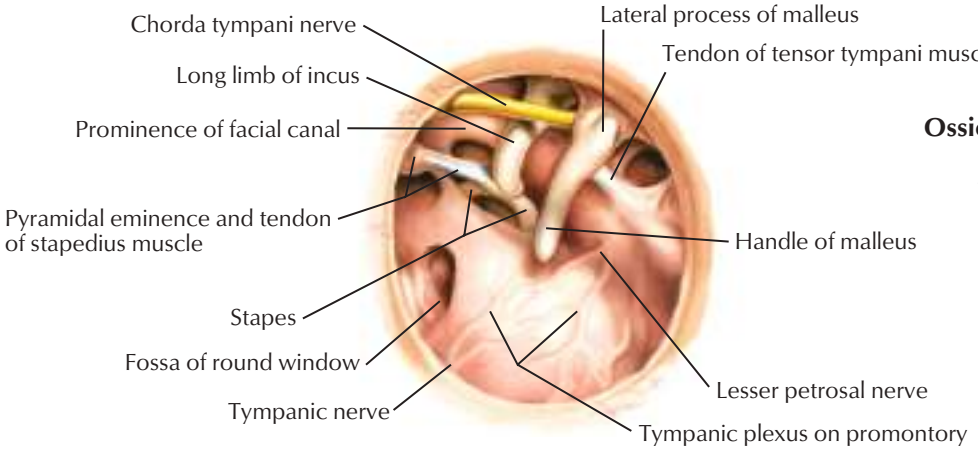
Otoscopic view of right tympanic membrane



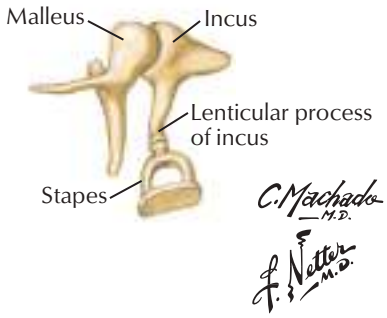
Coronal oblique section of external acoustic meatus and middle ear (tympanic cavity)



Right tympanic cavity after removal of tympanic membrane (lateral view)

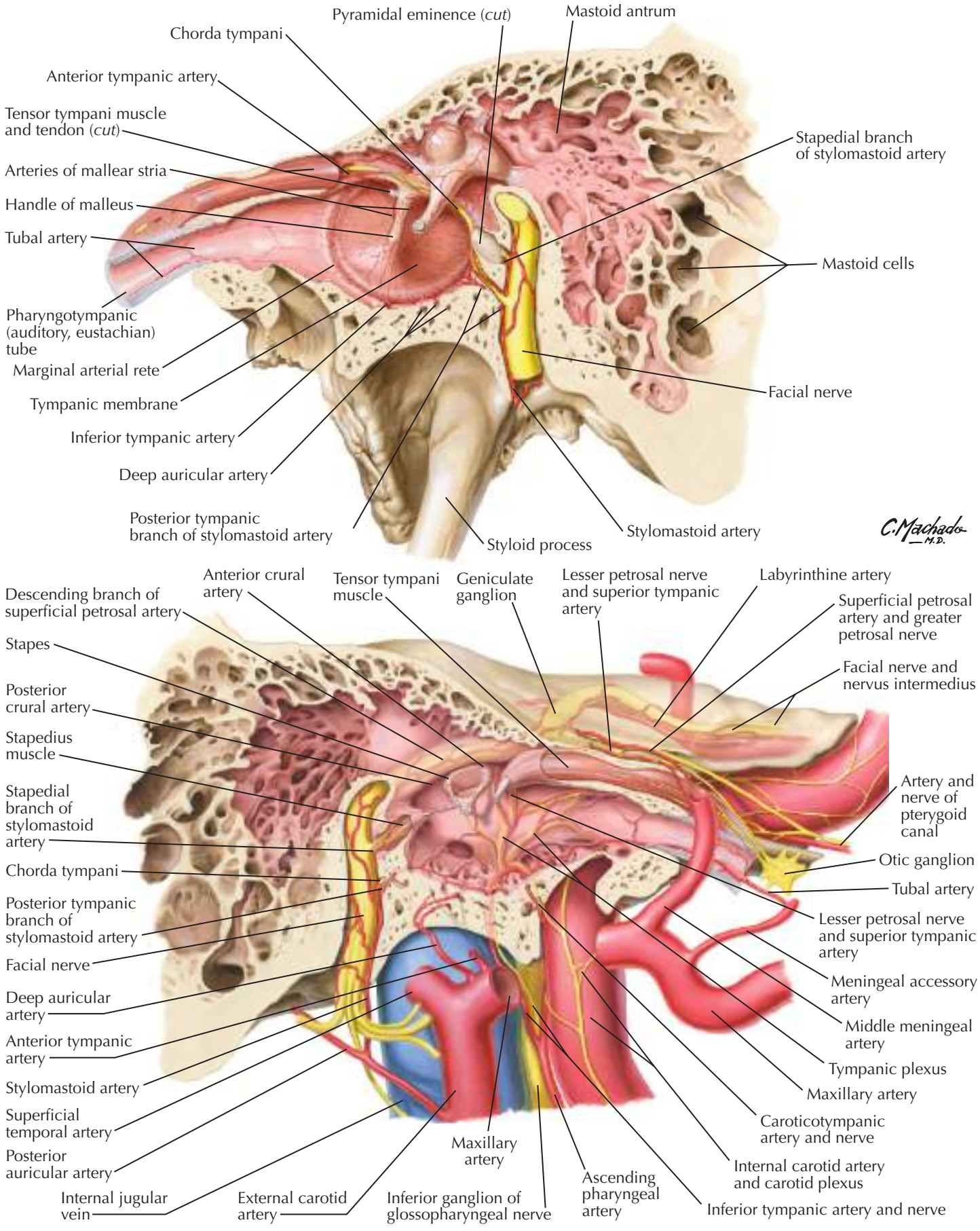


Ossicles articulated: medial view

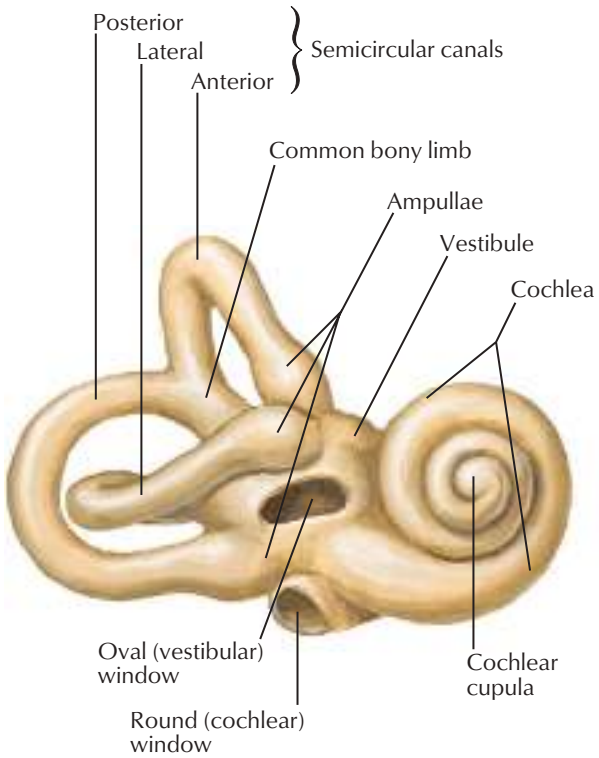


Tympanic Cavity

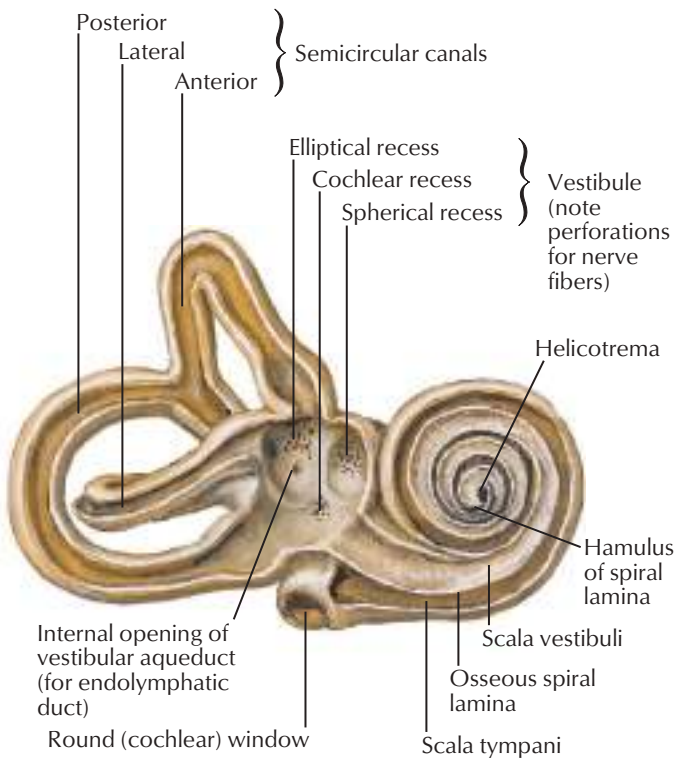
See also **Plates 50, 124, 136**



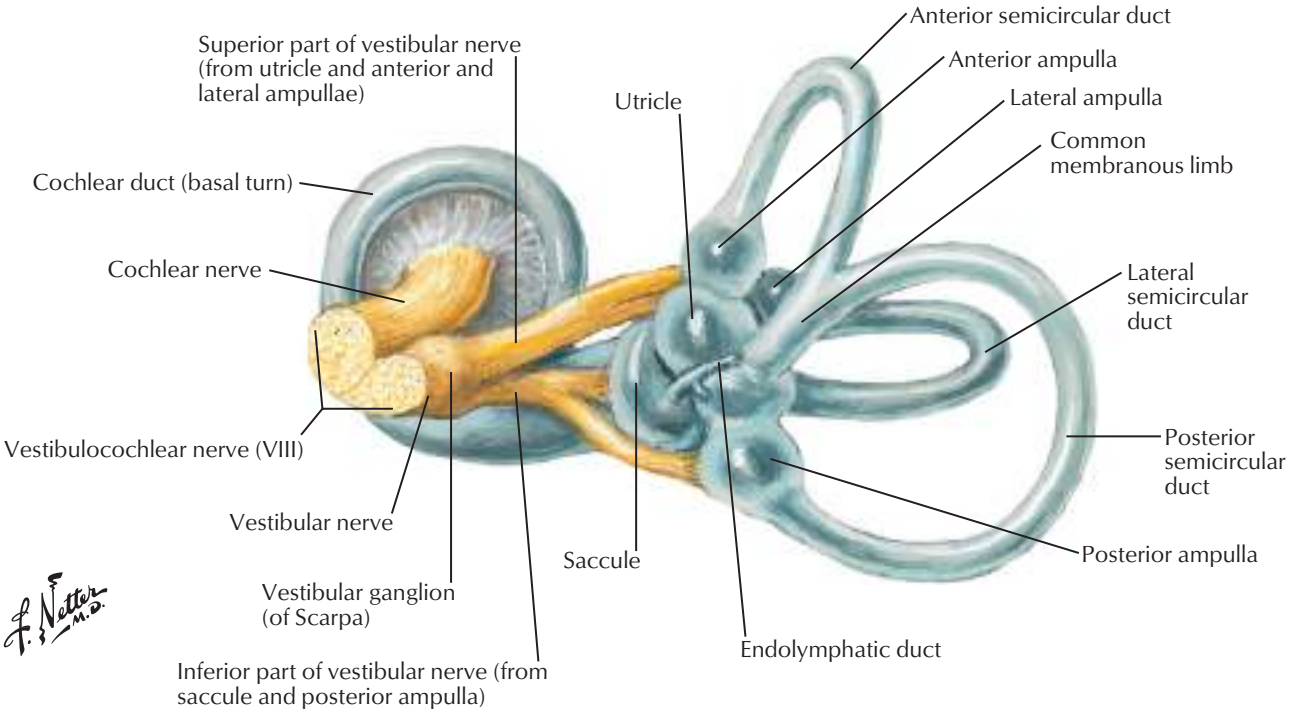
Right bony labyrinth (otic capsule), anterolateral view: surrounding cancellous bone removed



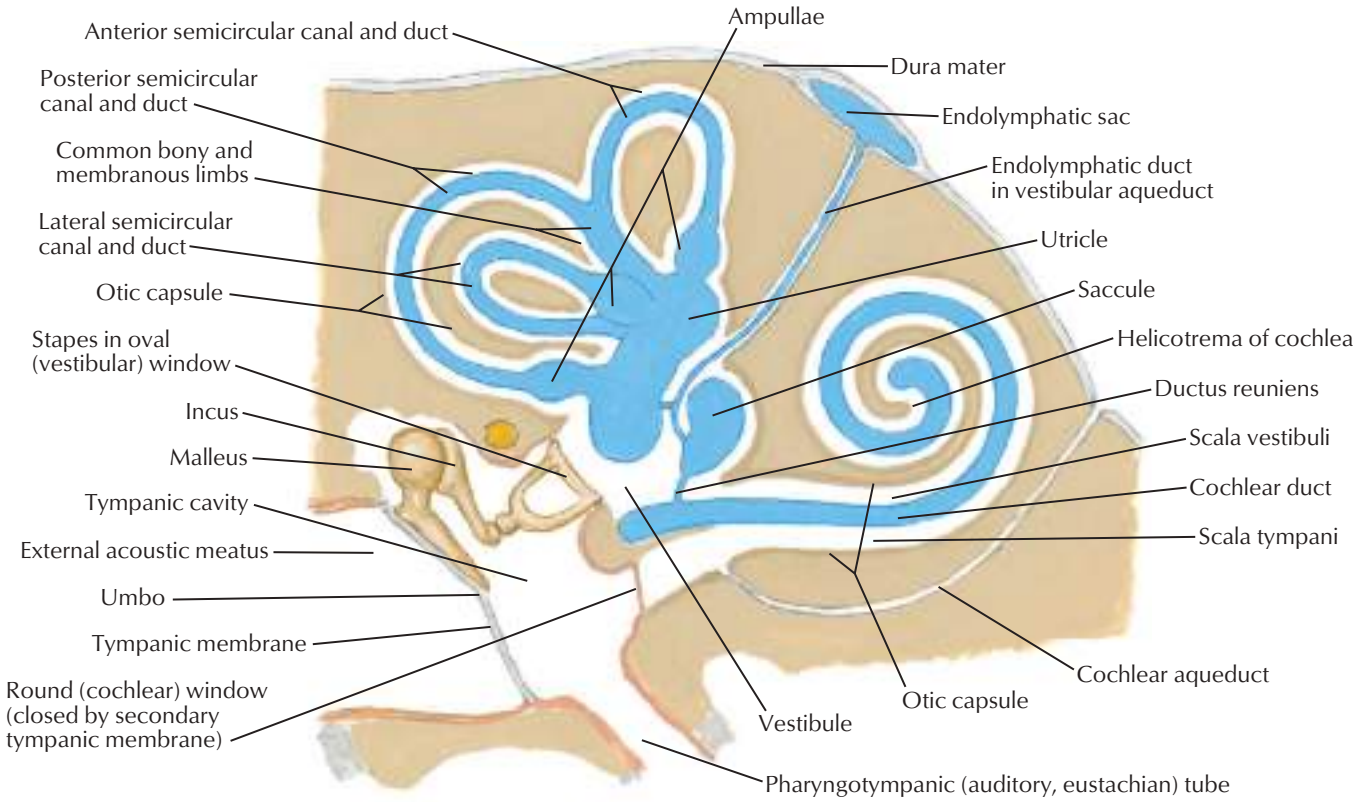
Dissected right bony labyrinth (otic capsule): membranous labyrinth removed



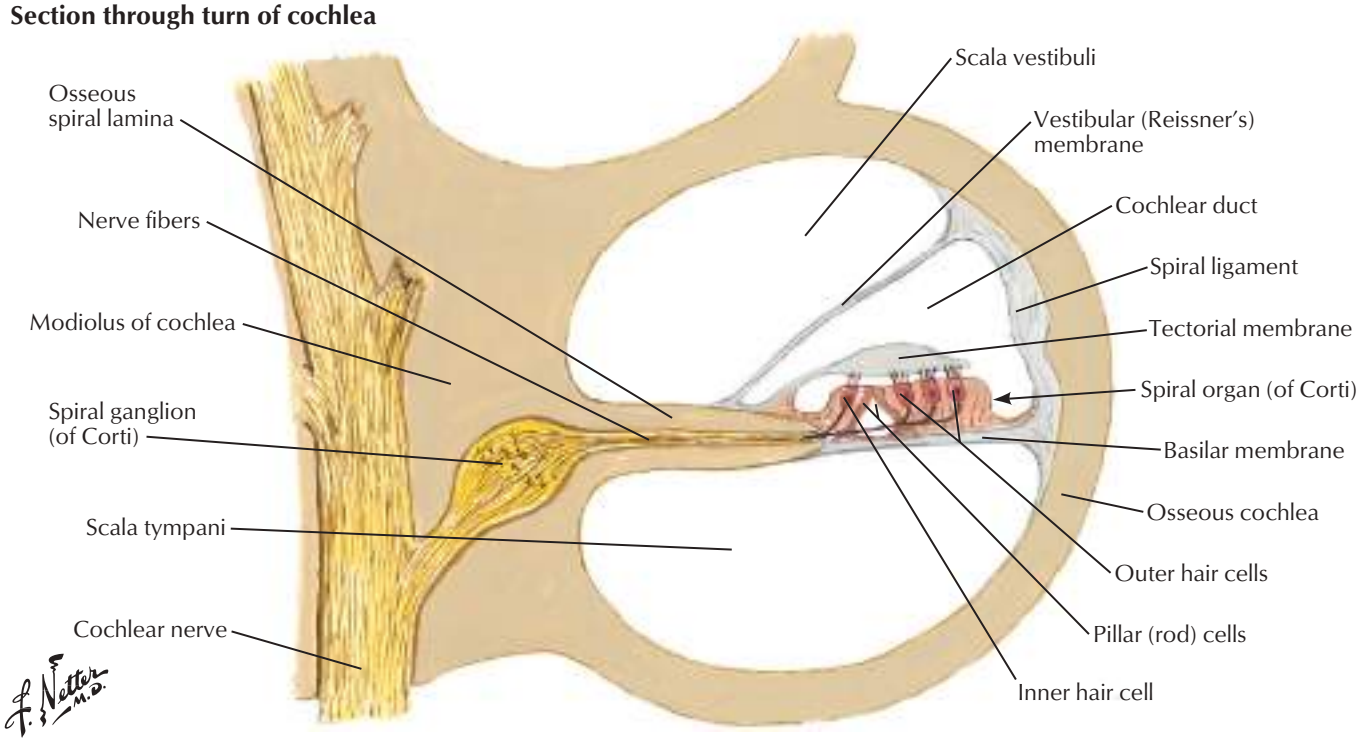
Right membranous labyrinth with nerves: medial view



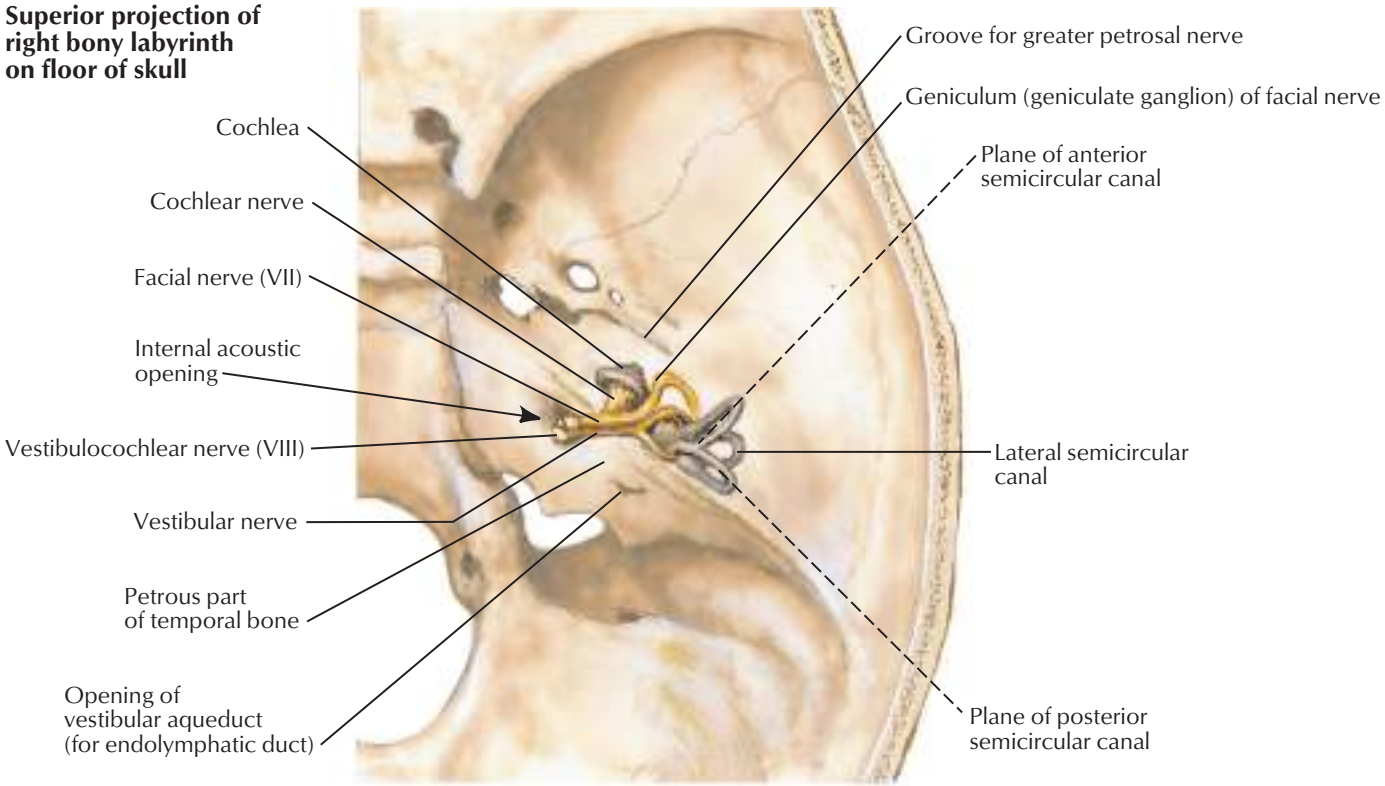
Bony and membranous labyrinths: schema



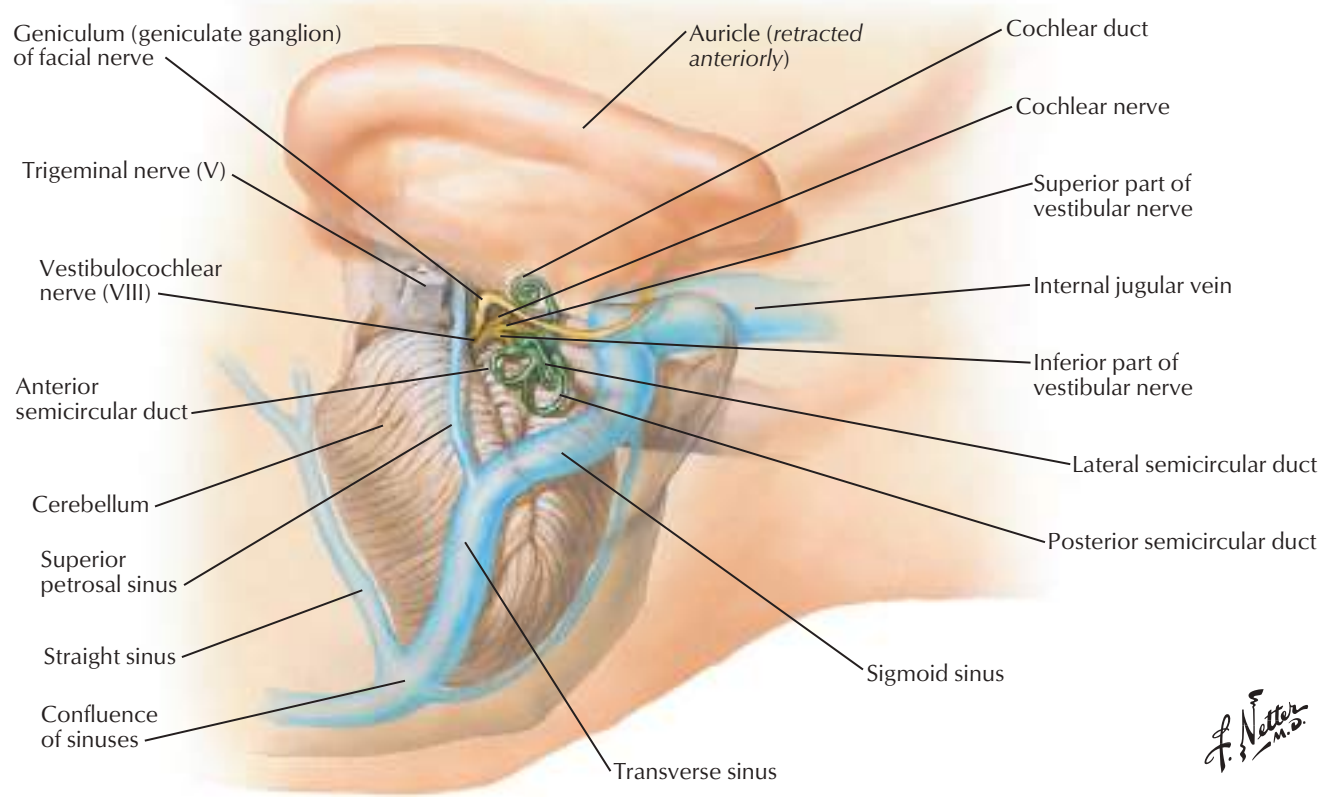
Section through turn of cochlea



Superior projection of right bony labyrinth on floor of skull



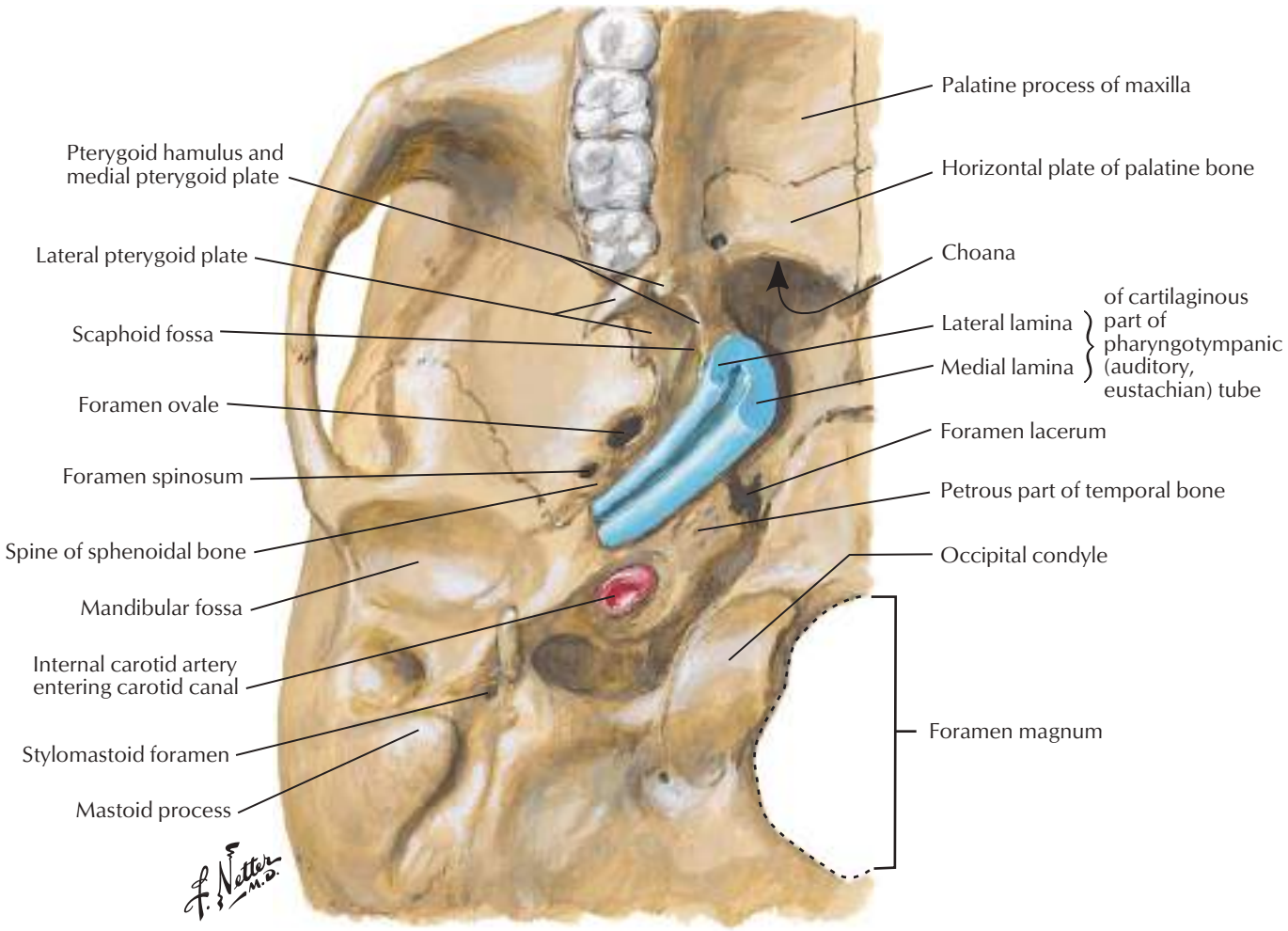
Lateral projection of right membranous labyrinth

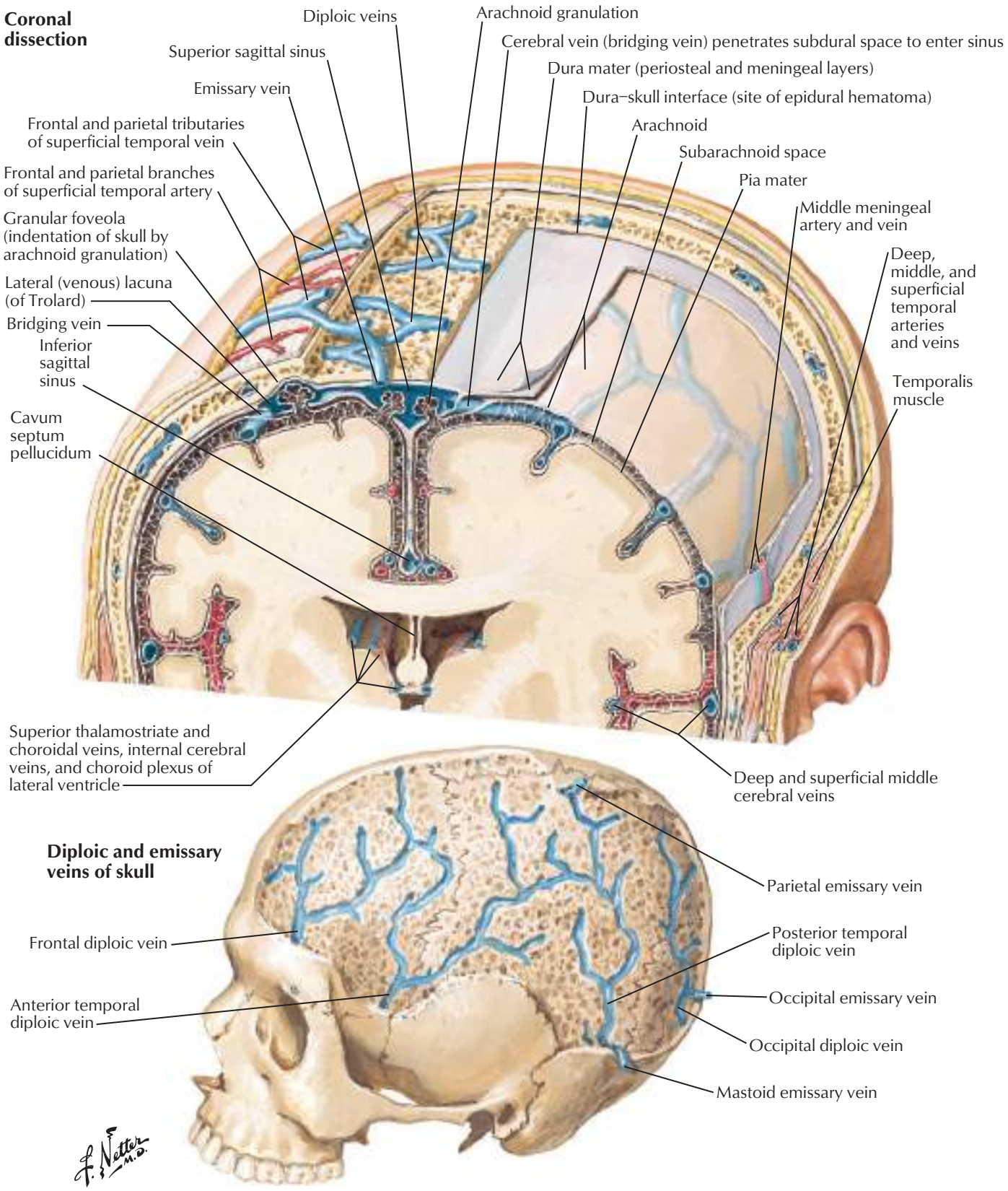


Pharyngotympanic (Auditory, Eustachian) Tube

See also **Plate 49**

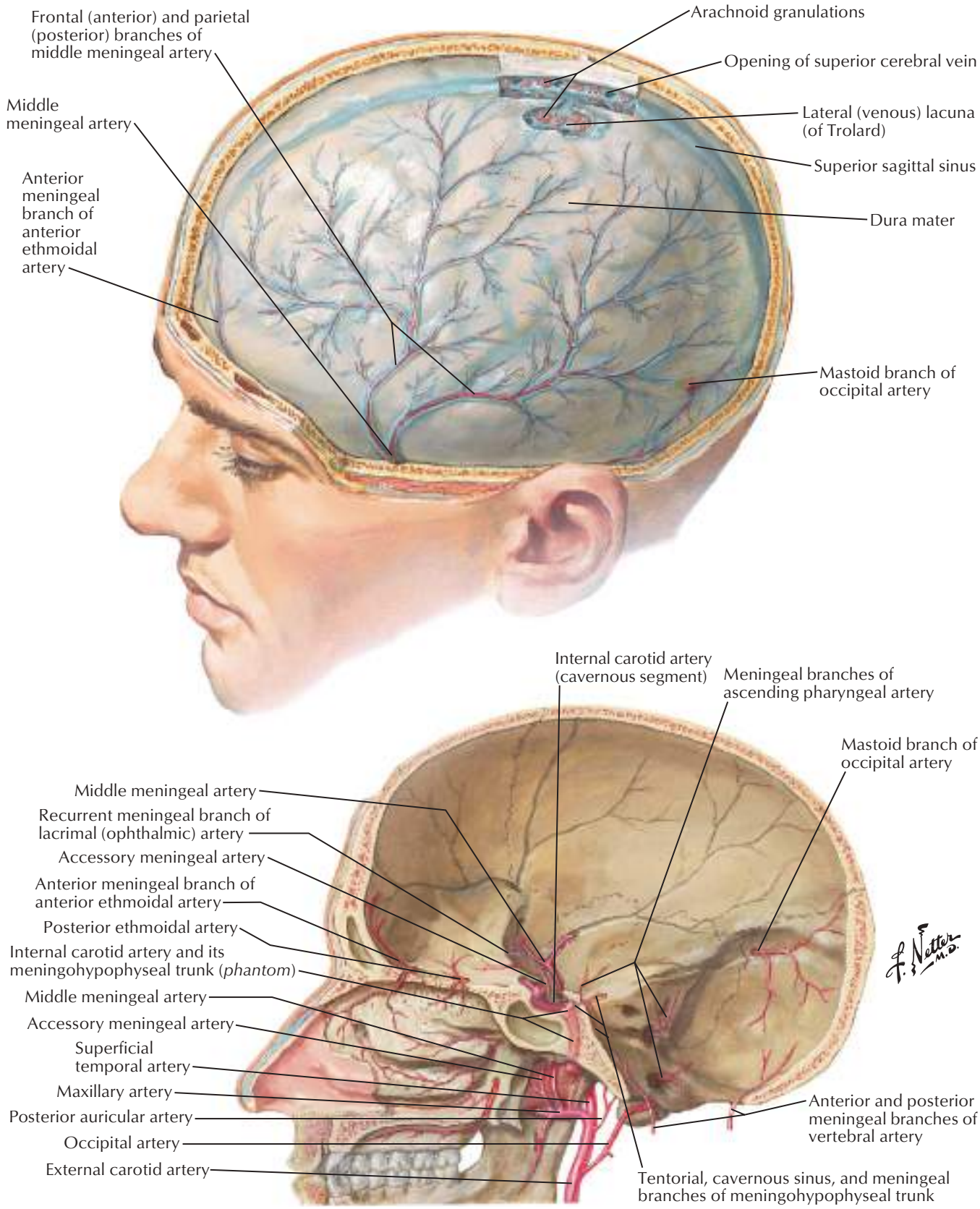
Cartilaginous part of pharyngotympanic (auditory, eustachian) tube at base of skull: inferior view

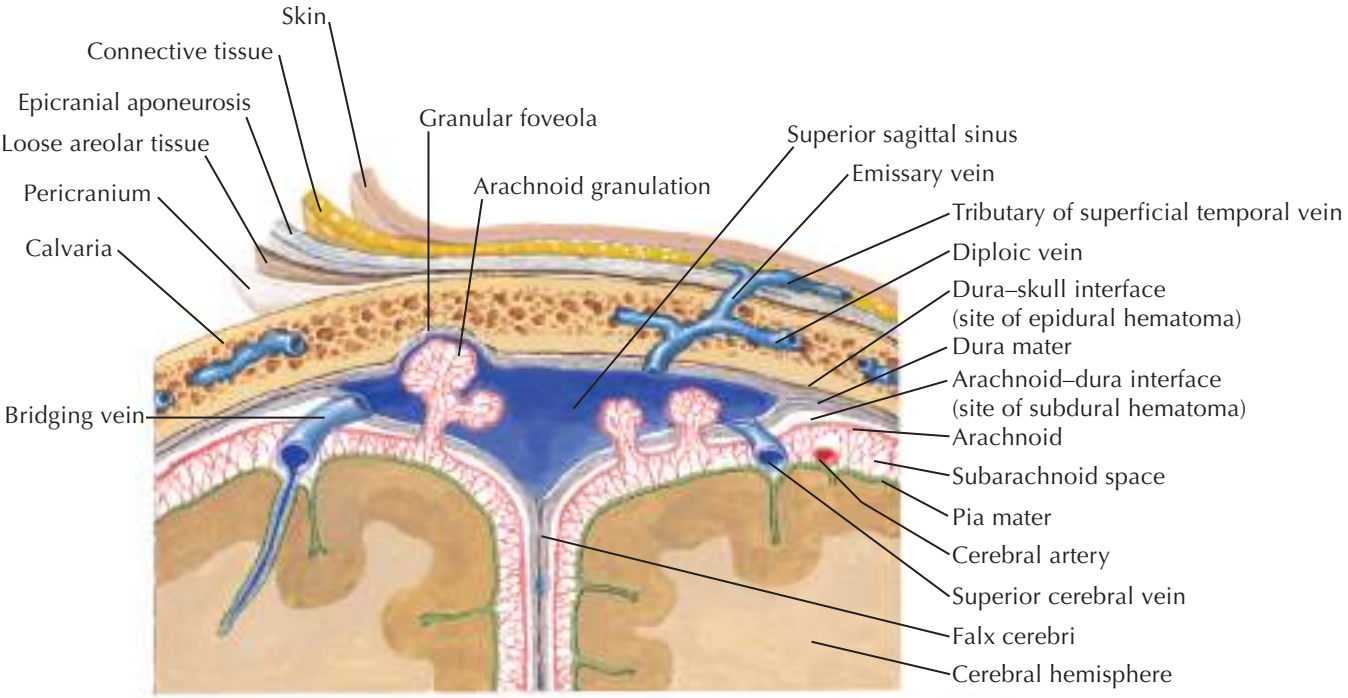


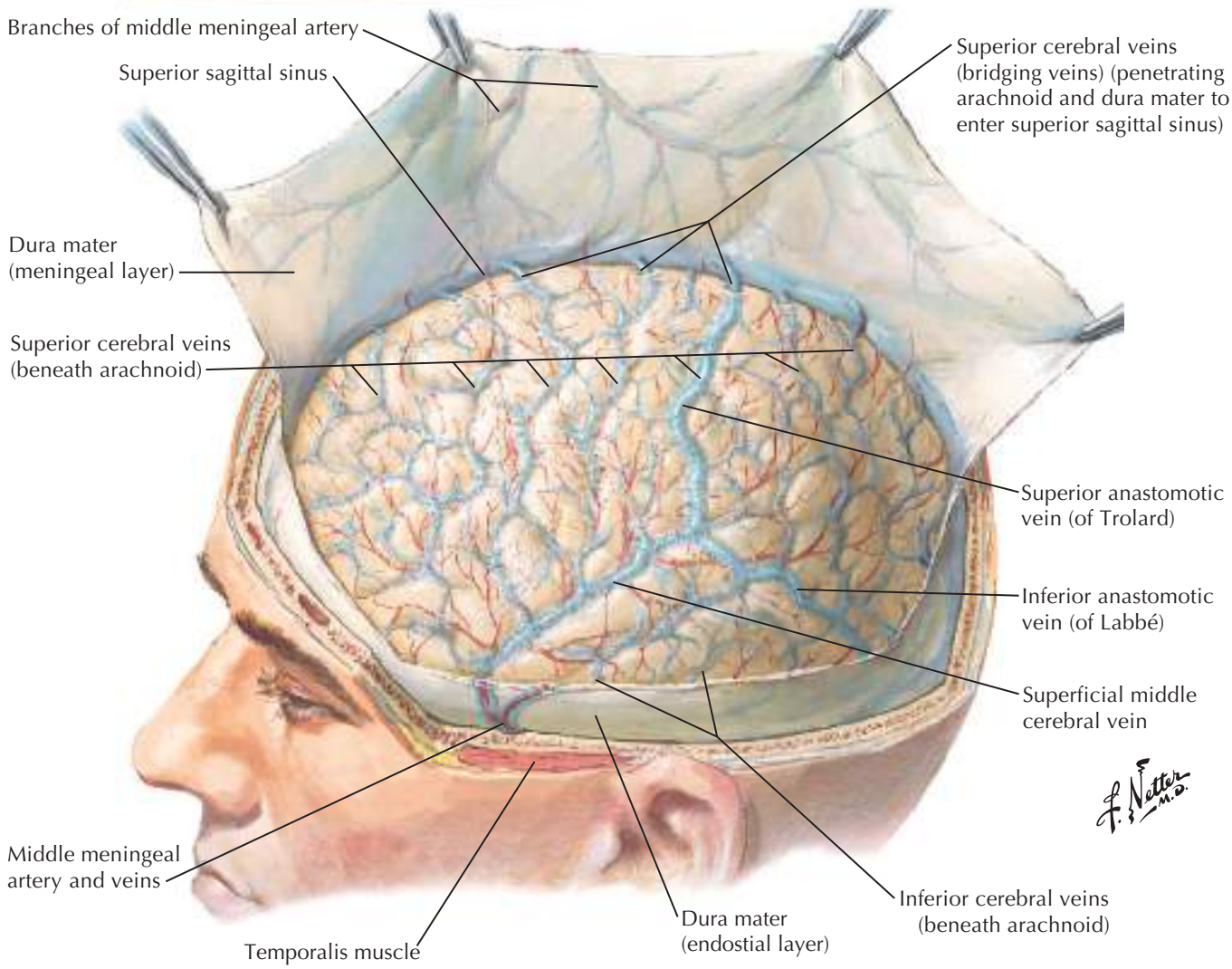

Coronal dissection
Diploic veins
Arachnoid granulation
Superior sagittal sinus
Cerebral vein (bridging vein) penetrates subdural space to enter sinus
Dura mater (periosteal and meningeal layers)
Emissary vein
Dura–skull interface (site of epidural hematoma)
Frontal and parietal tributaries of superficial temporal vein
Arachnoid
Subarachnoid space
Frontal and parietal branches of superficial temporal artery
Pia mater
Middle meningeal artery and vein
Granular foveola (indentation of skull by arachnoid granulation)
Deep, middle, and superficial temporal arteries and veins
Lateral (venous) lacuna (of Trolard)
Bridging vein
Inferior sagittal sinus
Temporalis muscle
Cavum septum pellucidum
Superior thalamostriate and choroidal veins, internal cerebral veins, and choroid plexus of lateral ventricle
Deep and superficial middle cerebral veins
Diploic and emissary veins of skull
Parietal emissary vein
Frontal diploic vein
Posterior temporal diploic vein
Anterior temporal diploic vein
Occipital emissary vein
Occipital diploic vein
Mastoid emissary vein

Meningeal Arteries

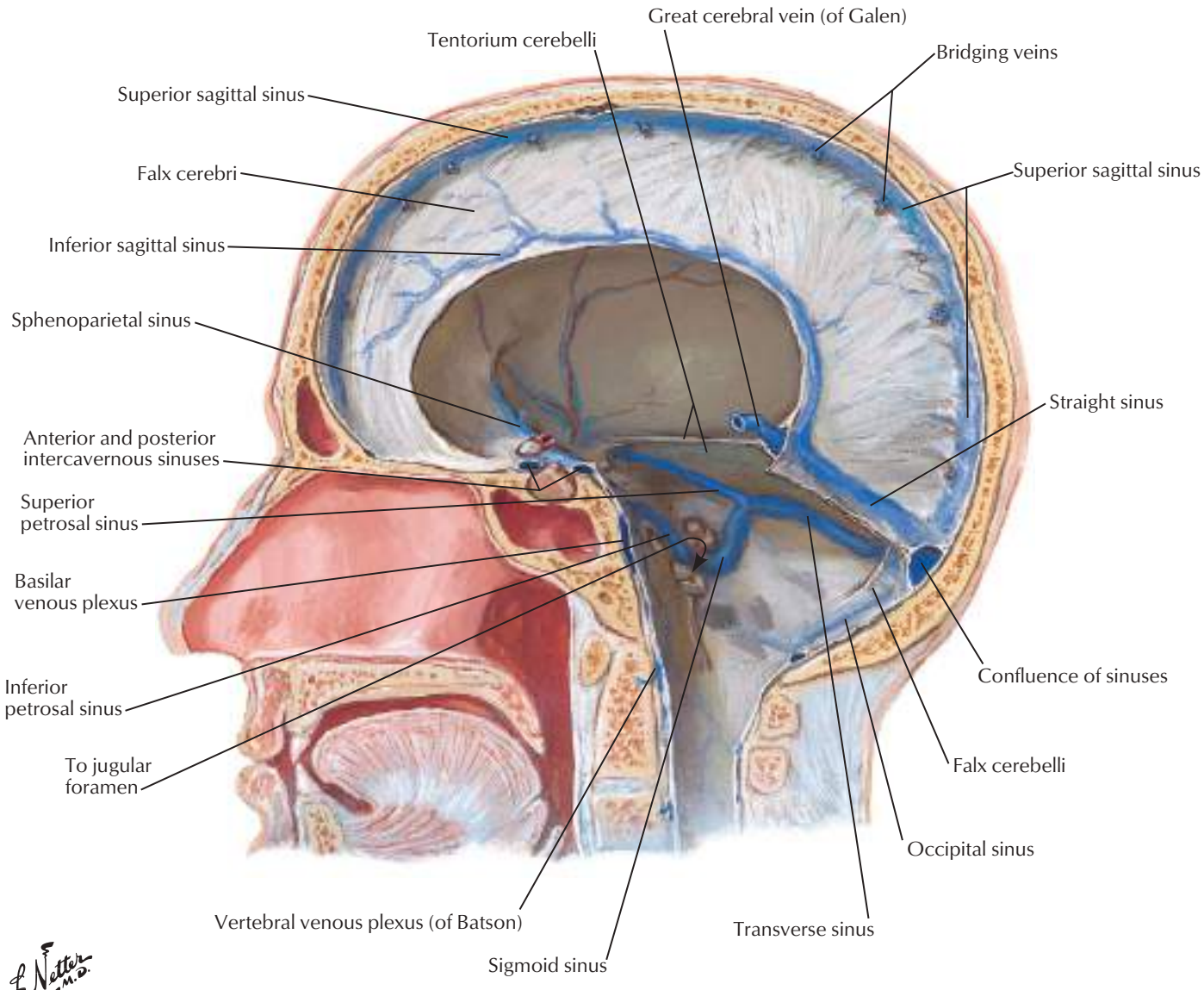
See also Plates 9, 51, 137



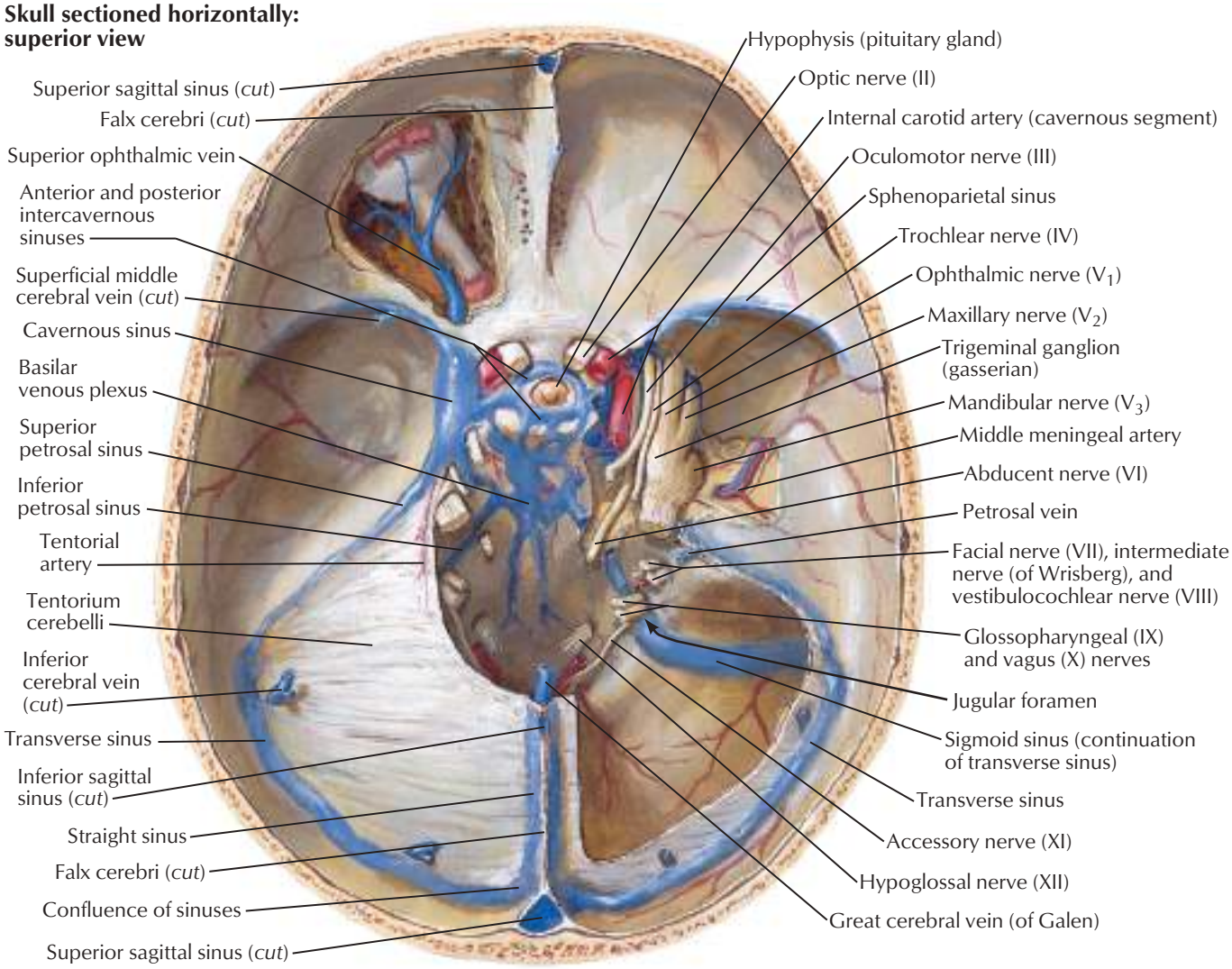

Skin
Connective tissue
Epicranial aponeurosis
Loose areolar tissue
Pericranium
Calvaria
Granular foveola
Arachnoid granulation
Superior sagittal sinus
Emissary vein
Tributary of superficial temporal vein
Diploic vein
Dura–skull interface
(site of epidural hematoma)
Dura mater
Arachnoid–dura interface
(site of subdural hematoma)
Arachnoid
Subarachnoid space
Pia mater
Cerebral artery
Superior cerebral vein
Falx cerebri
Cerebral hemisphere
Bridging vein

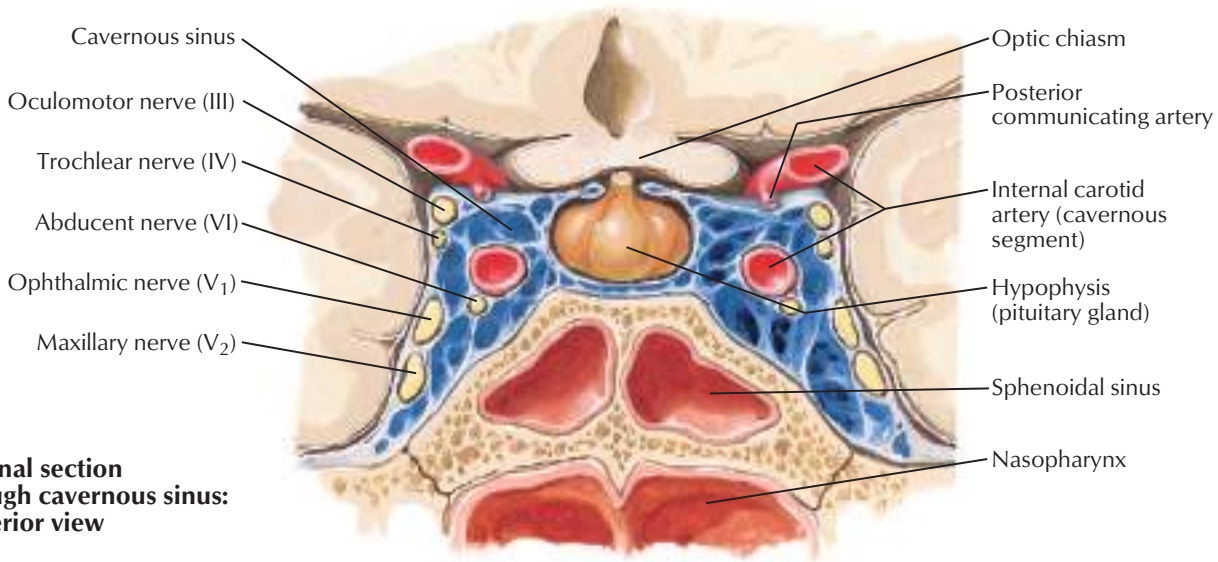

Branches of middle meningeal artery
Superior sagittal sinus
Superior cerebral veins
(bridging veins) (penetrating
arachnoid and dura mater to
enter superior sagittal sinus)
Dura mater
(meningeal layer)
Superior cerebral veins
(beneath arachnoid)
Superior anastomotic
vein (of Trolard)
Inferior anastomotic
vein (of Labbé)
Superficial middle
cerebral vein
Middle meningeal
artery and veins
Temporalis muscle
Dura mater
(endostial layer)
Inferior cerebral veins
(beneath arachnoid)

Sagittal section

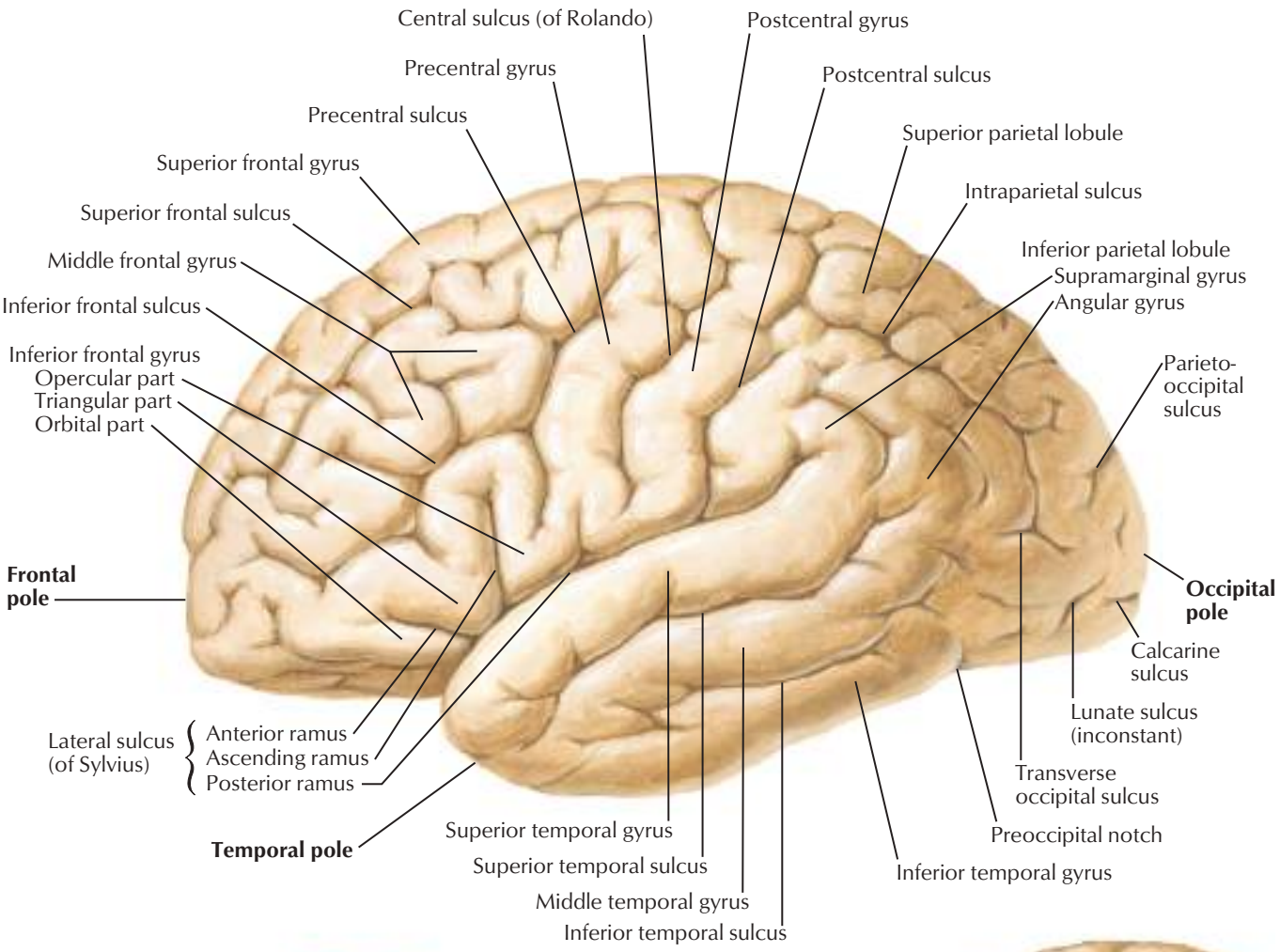


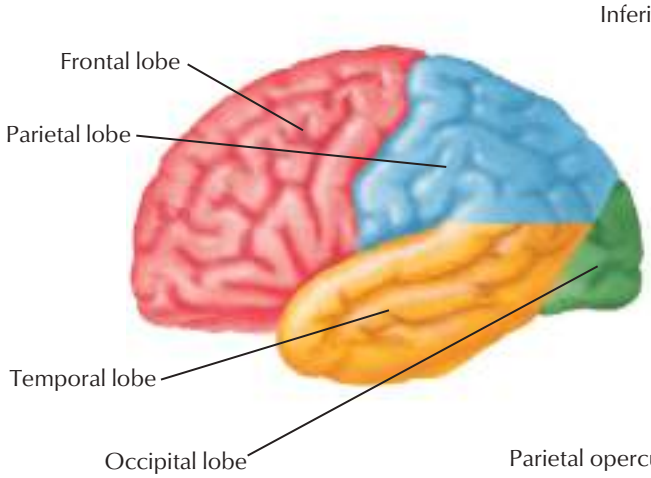
Skull sectioned horizontally: superior view

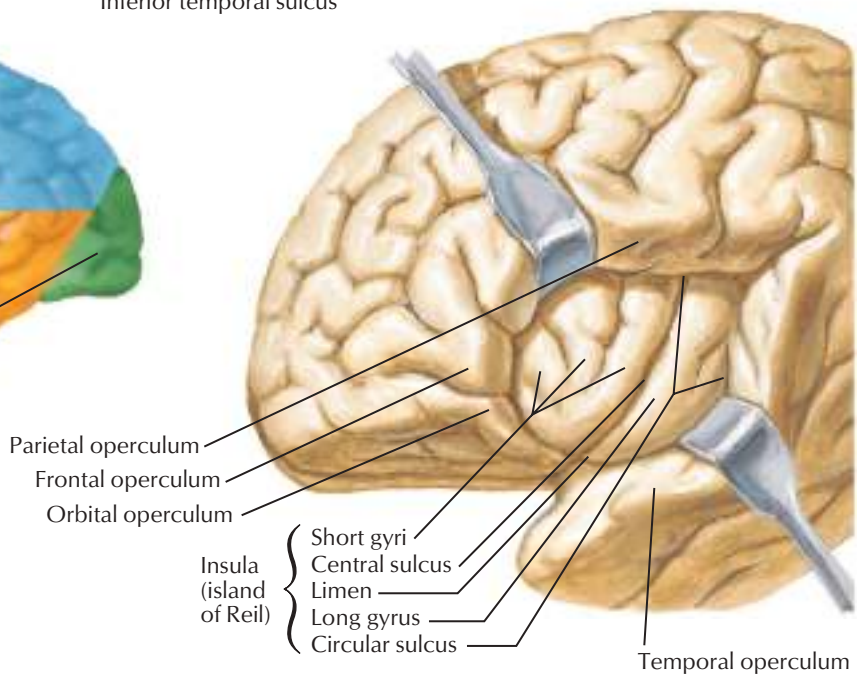




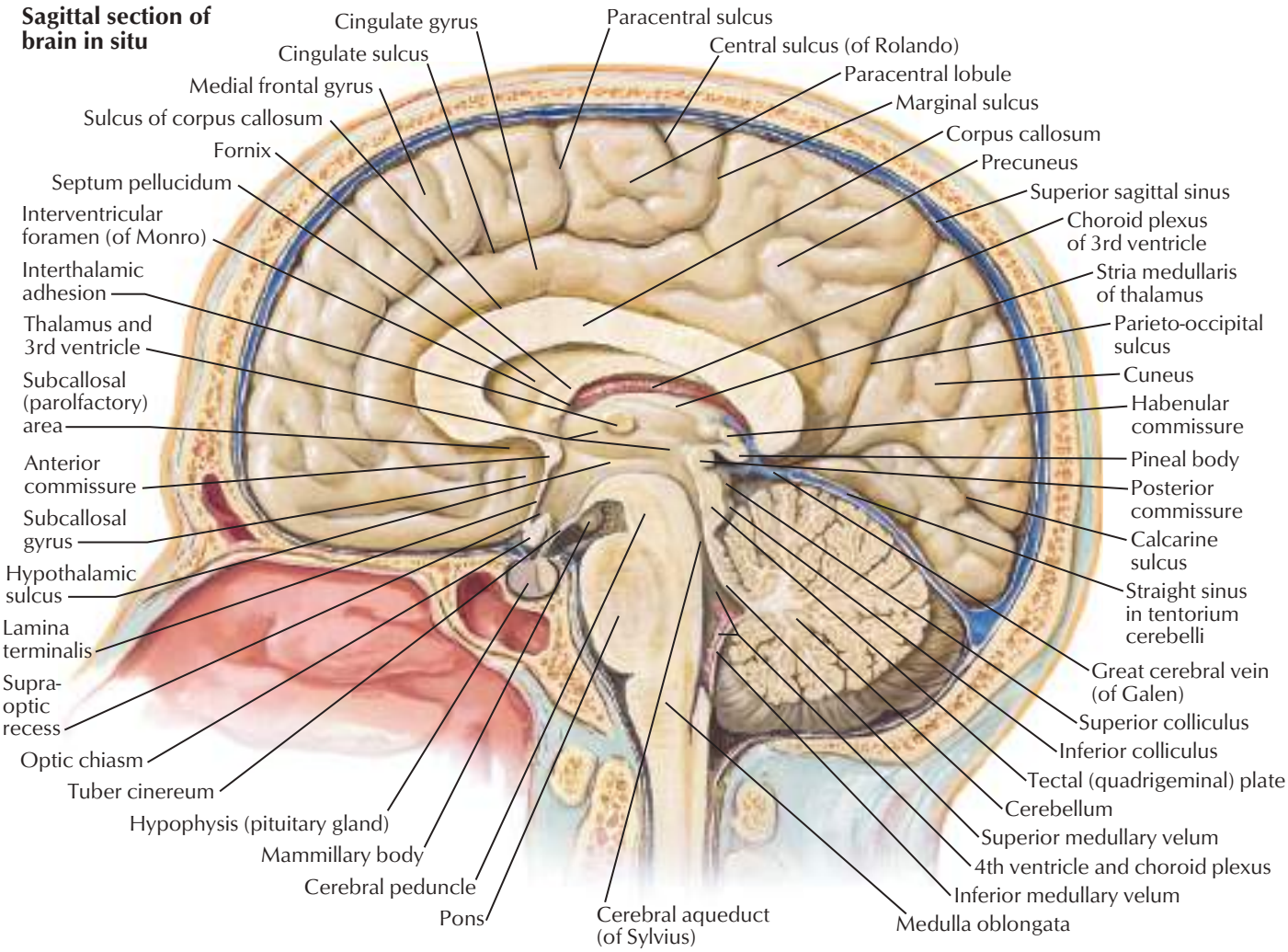
Coronal section through cavernous sinus: posterior view


Central sulcus (of Rolando)
Postcentral gyrus
Precentral gyrus
Postcentral sulcus
Precentral sulcus
Superior parietal lobule
Superior frontal gyrus
Intraparietal sulcus
Superior frontal sulcus
Inferior parietal lobule
Middle frontal gyrus
Supramarginal gyrus
Inferior frontal sulcus
Angular gyrus
Inferior frontal gyrus
Opercular part
Triangular part
Orbital part
Parieto-occipital sulcus
Frontal pole
Occipital pole
Calcarine sulcus
Lateral sulcus (of Sylvius)
Anterior ramus
Ascending ramus
Posterior ramus
Lunate sulcus (inconstant)
Transverse occipital sulcus
Temporal pole
Superior temporal gyrus
Preoccipital notch
Superior temporal sulcus
Inferior temporal gyrus
Middle temporal gyrus
Inferior temporal sulcus

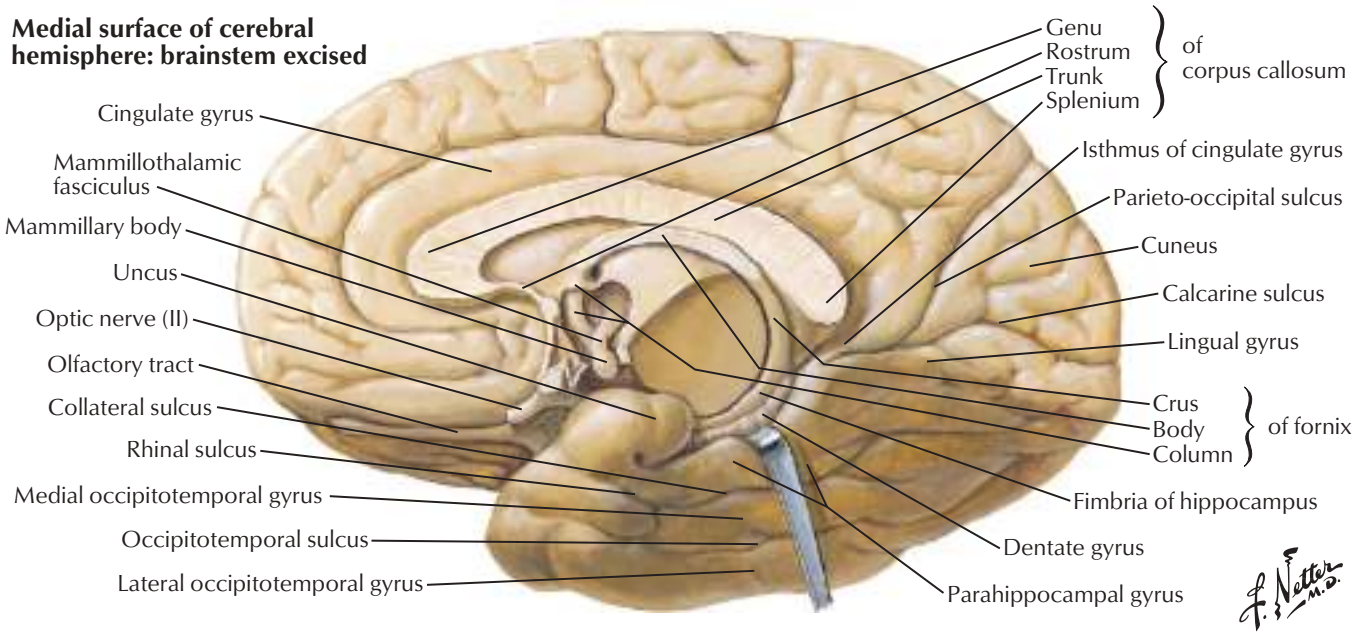

Frontal lobe
Parietal lobe
Temporal lobe
Occipital lobe


Parietal operculum
Frontal operculum
Orbital operculum
Insula (island of Reil)
Short gyri
Central sulcus
Limen
Long gyrus
Circular sulcus
Temporal operculum

Sagittal section of brain in situ

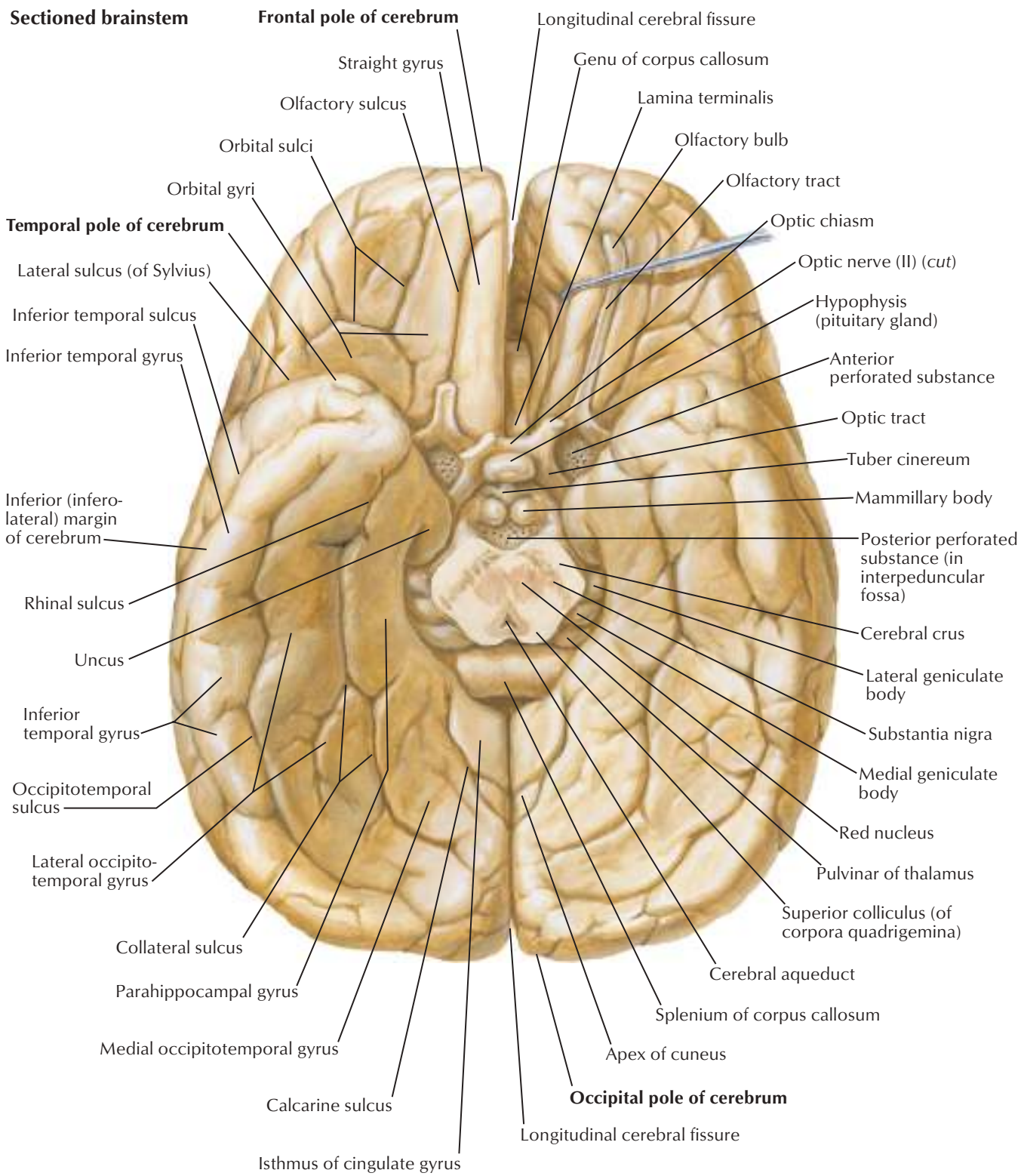


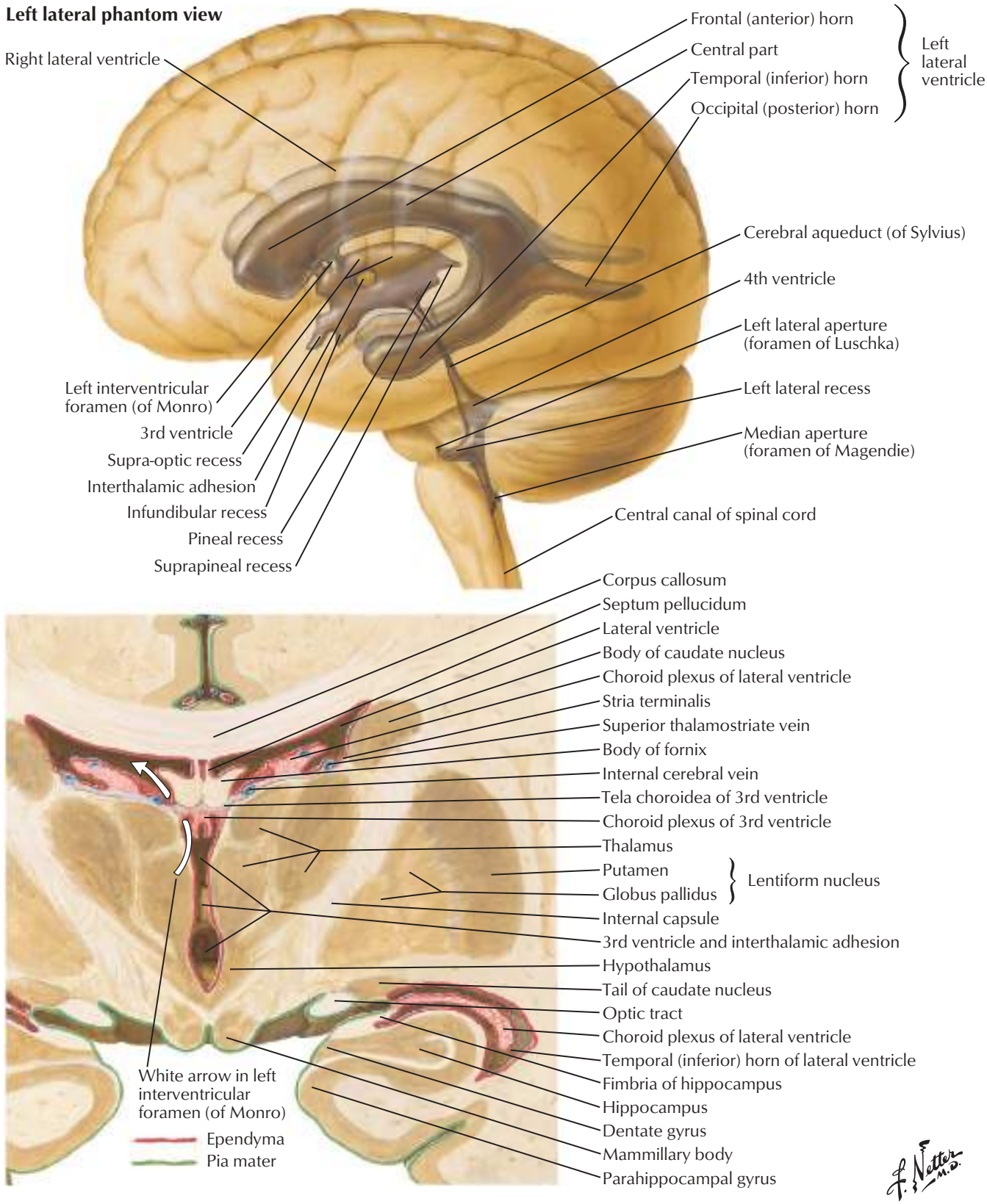
Medial surface of cerebral hemisphere: brainstem excised



Cerebrum: Inferior View

See also **Plate 148**

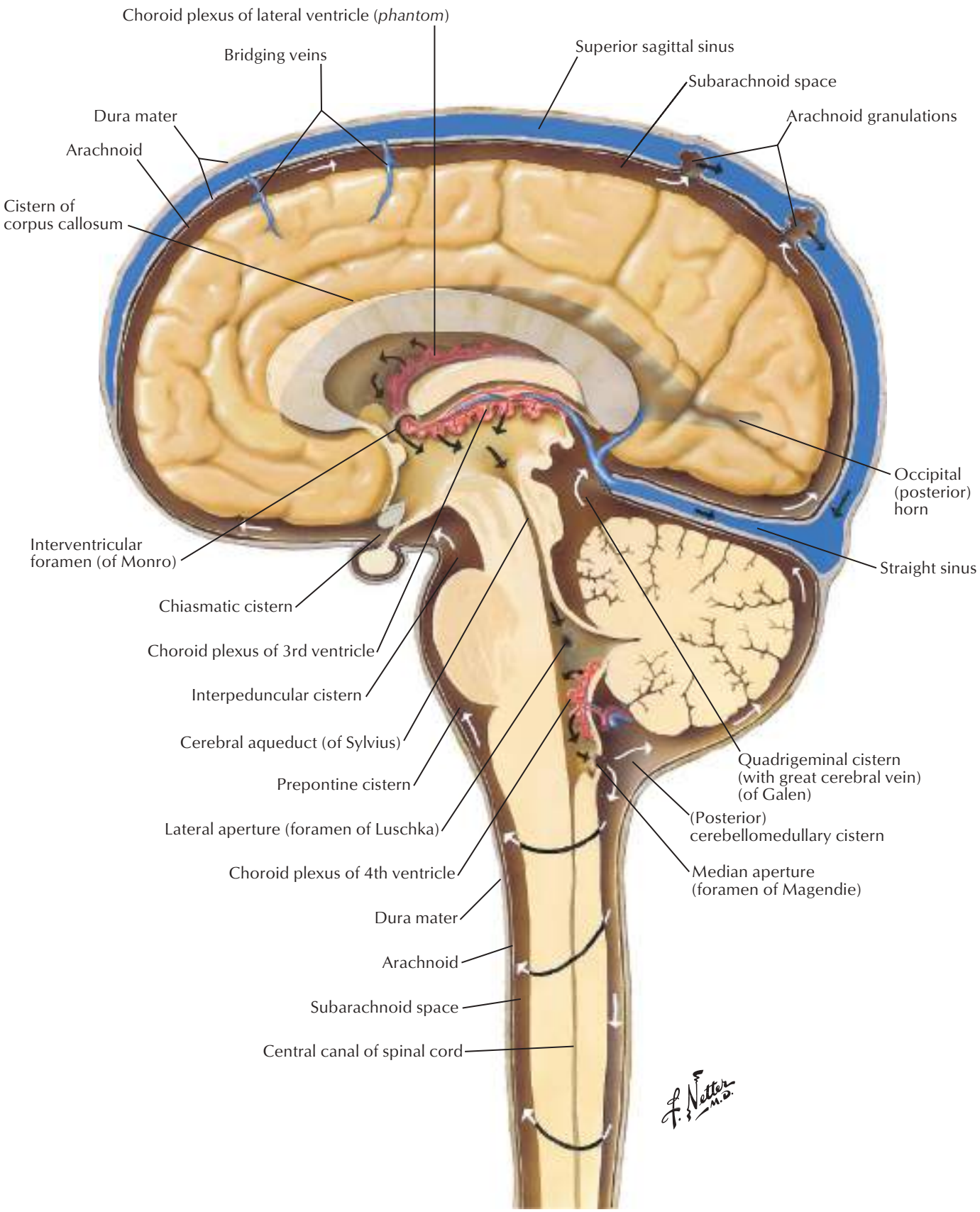




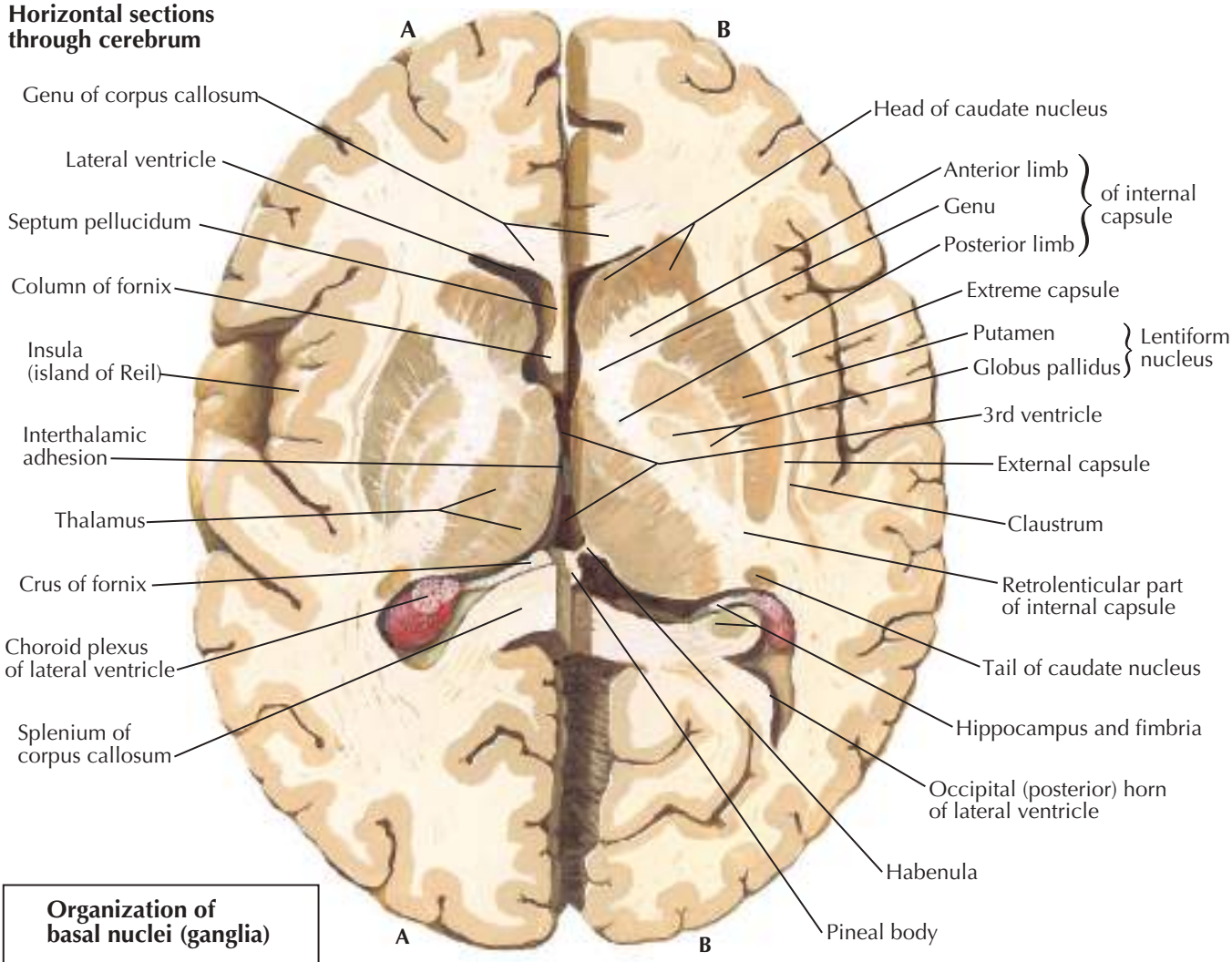
Coronal section of brain: posterior view

Circulation of Cerebrospinal Fluid

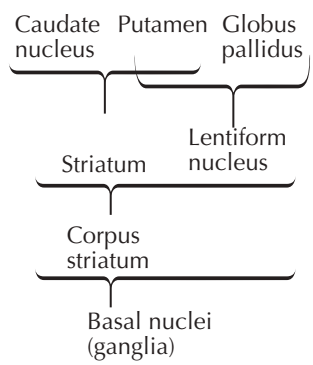
See also Plates 109, 147

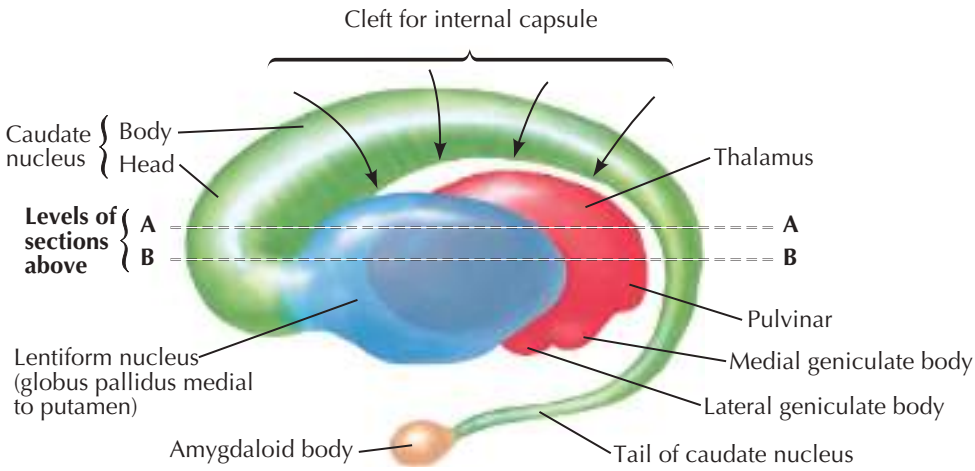


Horizontal sections through cerebrum

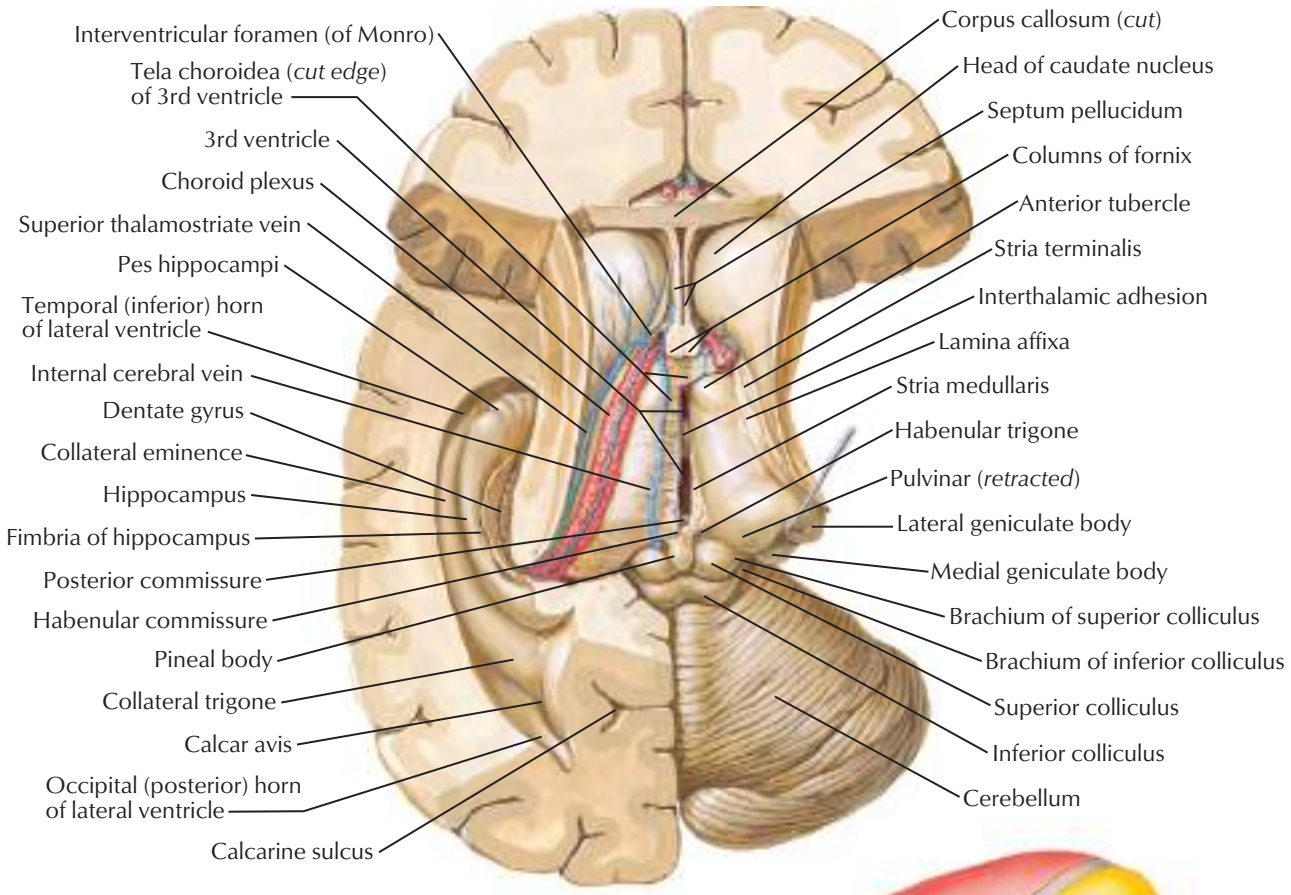


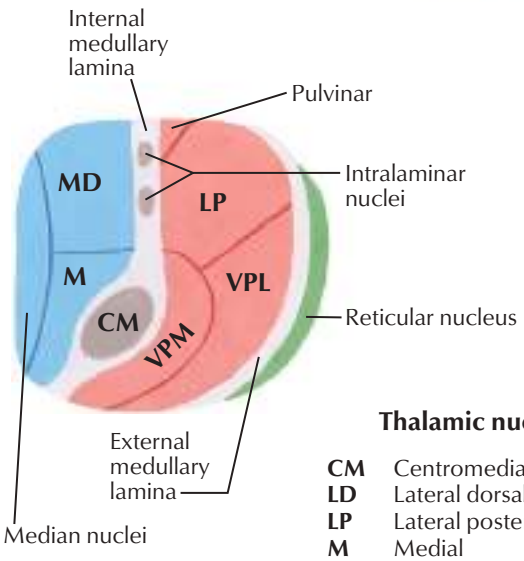
Organization of basal nuclei (ganglia)





Interrelationship of thalamus, lentiform nucleus, caudate nucleus, and amygdaloid body (schema): left lateral view

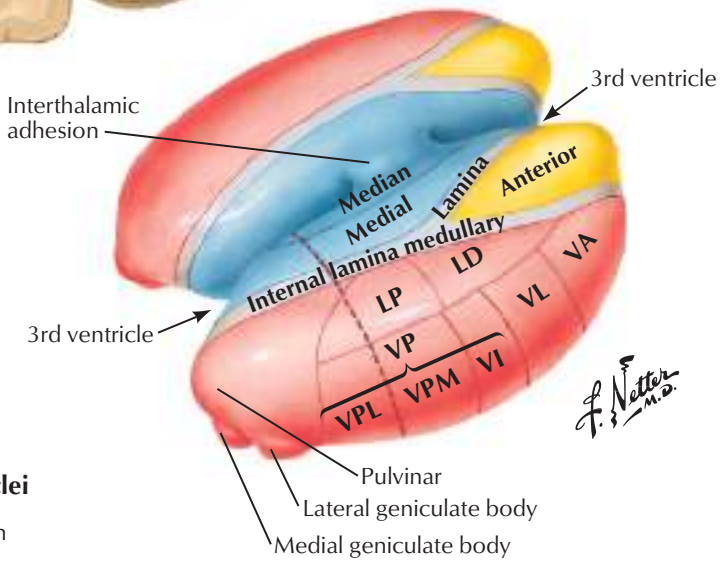




Schematic section through thalamus
(at level of broken line shown in figure at right)

Thalamic nuclei

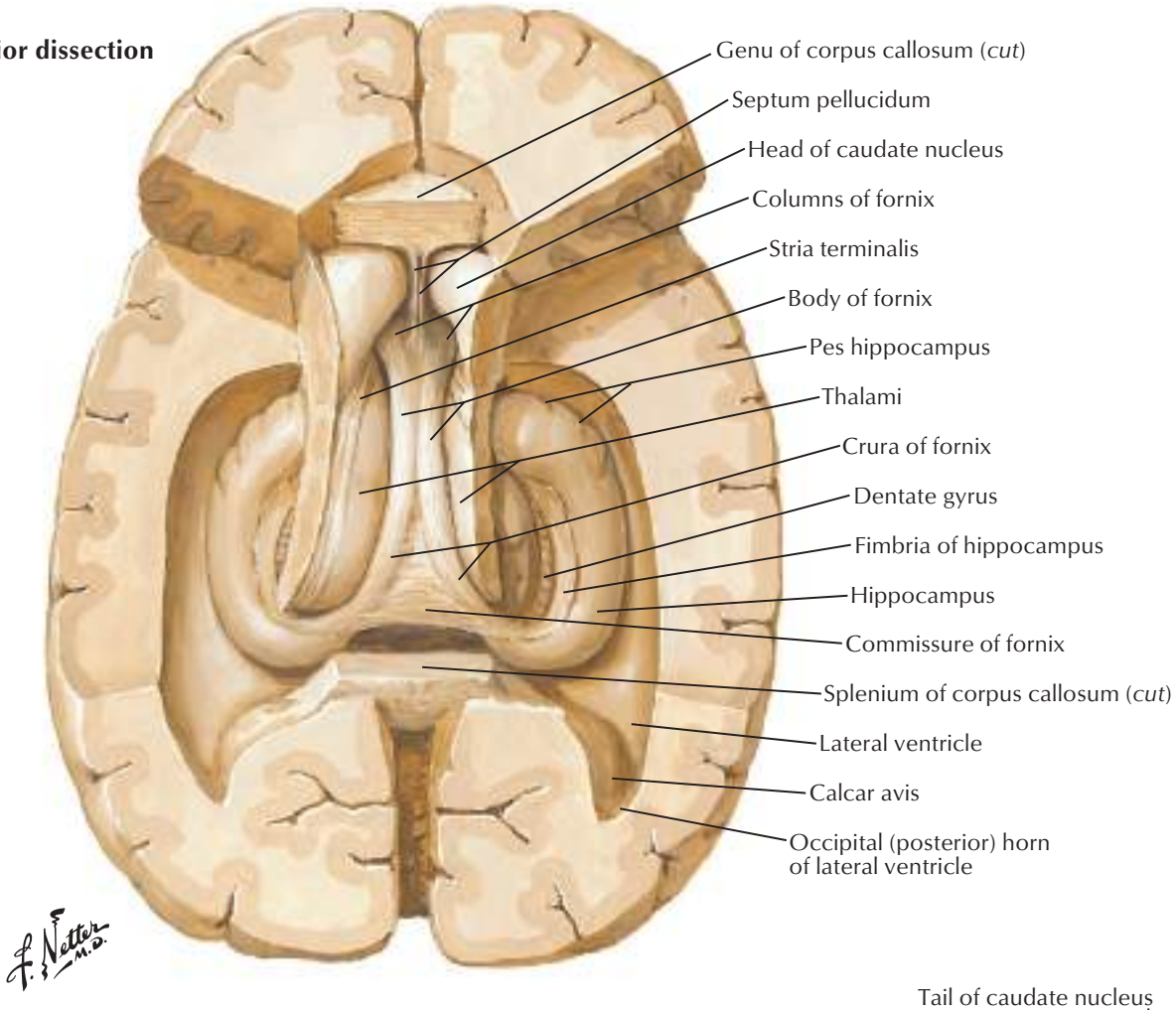
CM	Centromedian
LD	Lateral dorsal
LP	Lateral posterior
M	Medial
MD	Medial dorsal
VA	Ventral anterior
VI	Ventral intermedial
VL	Ventral lateral
VP	Ventral posterior
VPL	Ventral posterolateral
VPM	Ventral posteromedial

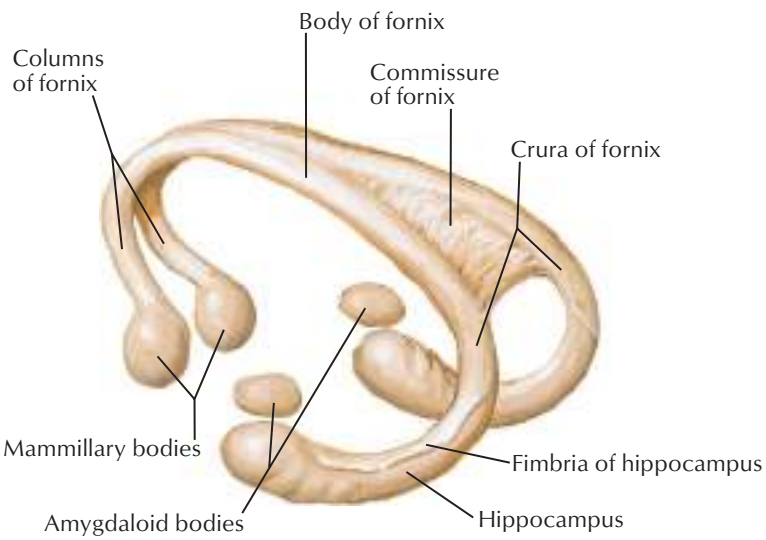


Schematic representation of thalamus
(external medullary lamina and reticular nuclei removed)

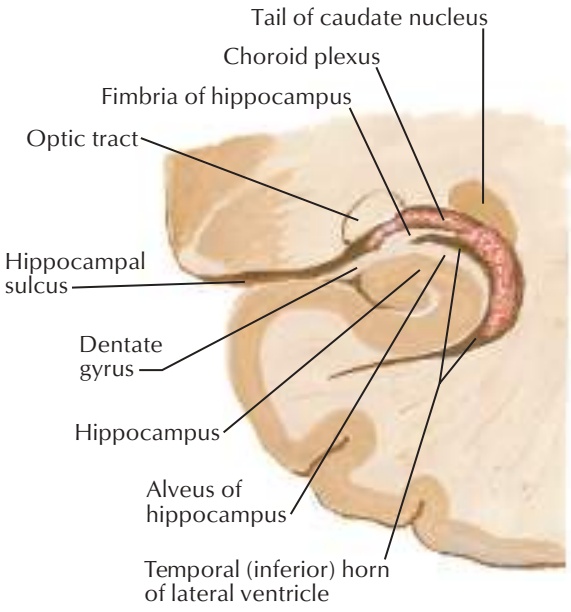
Lateral nuclei
Medial nuclei
Anterior nuclei

Superior dissection

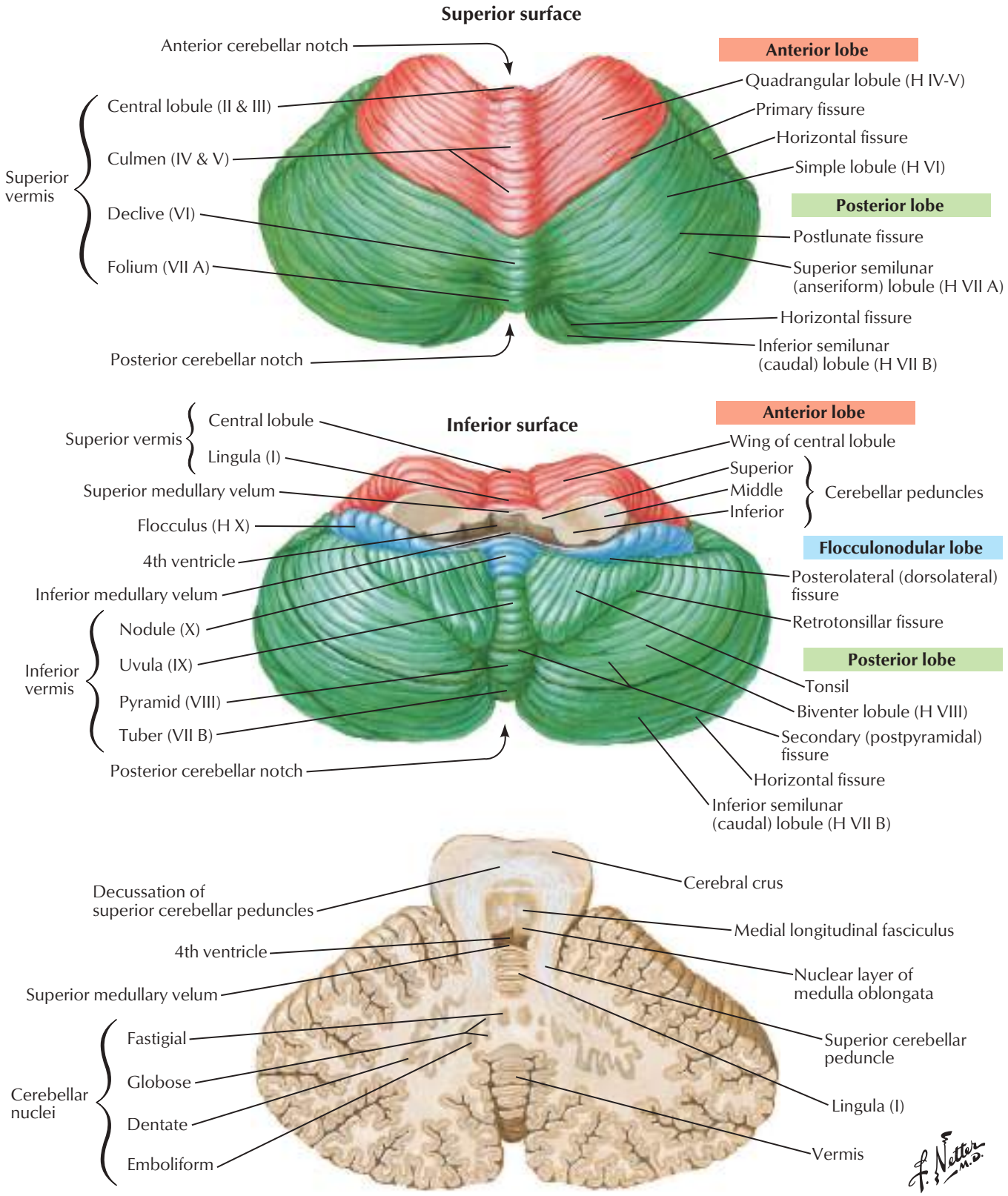




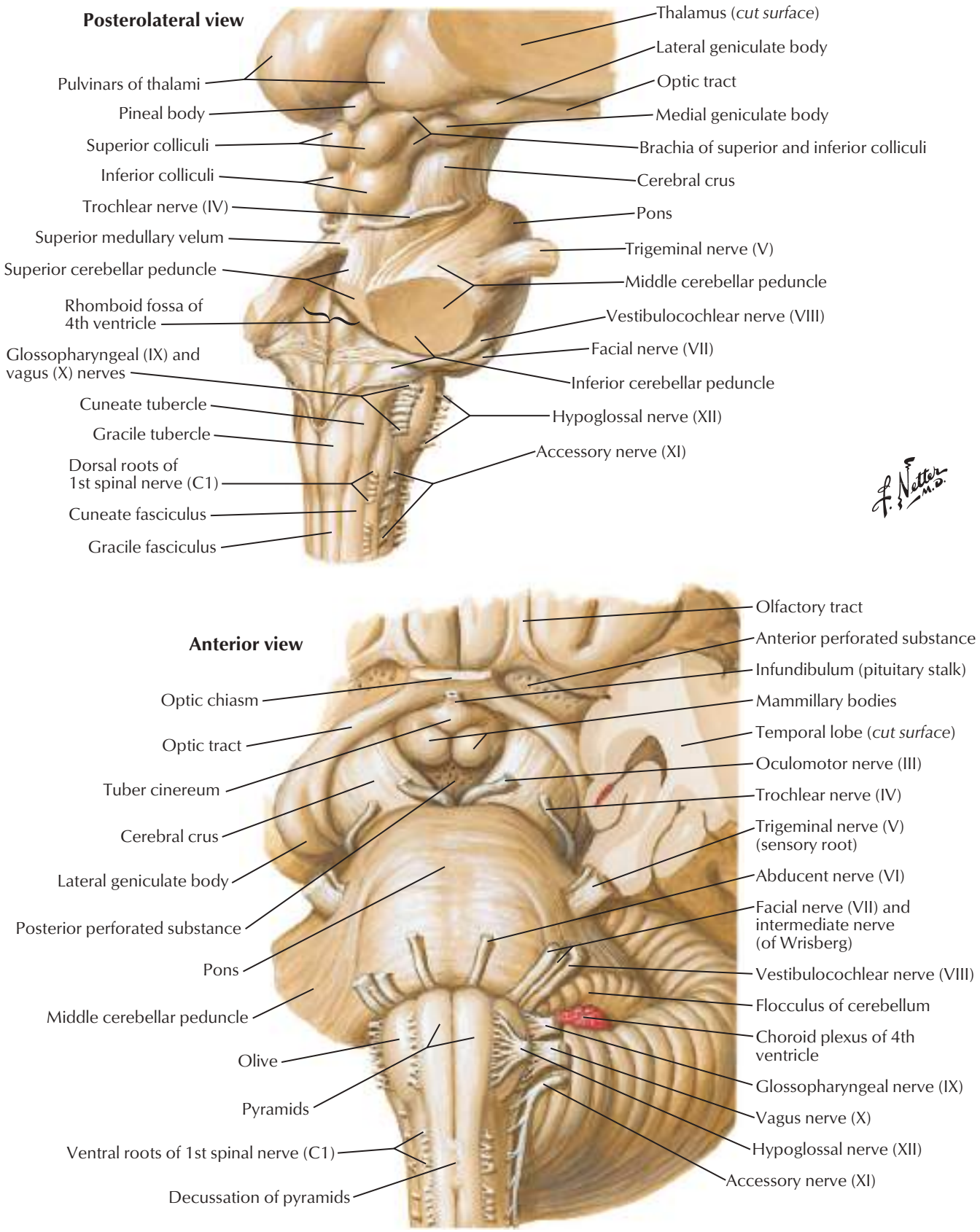
Fornix: schema



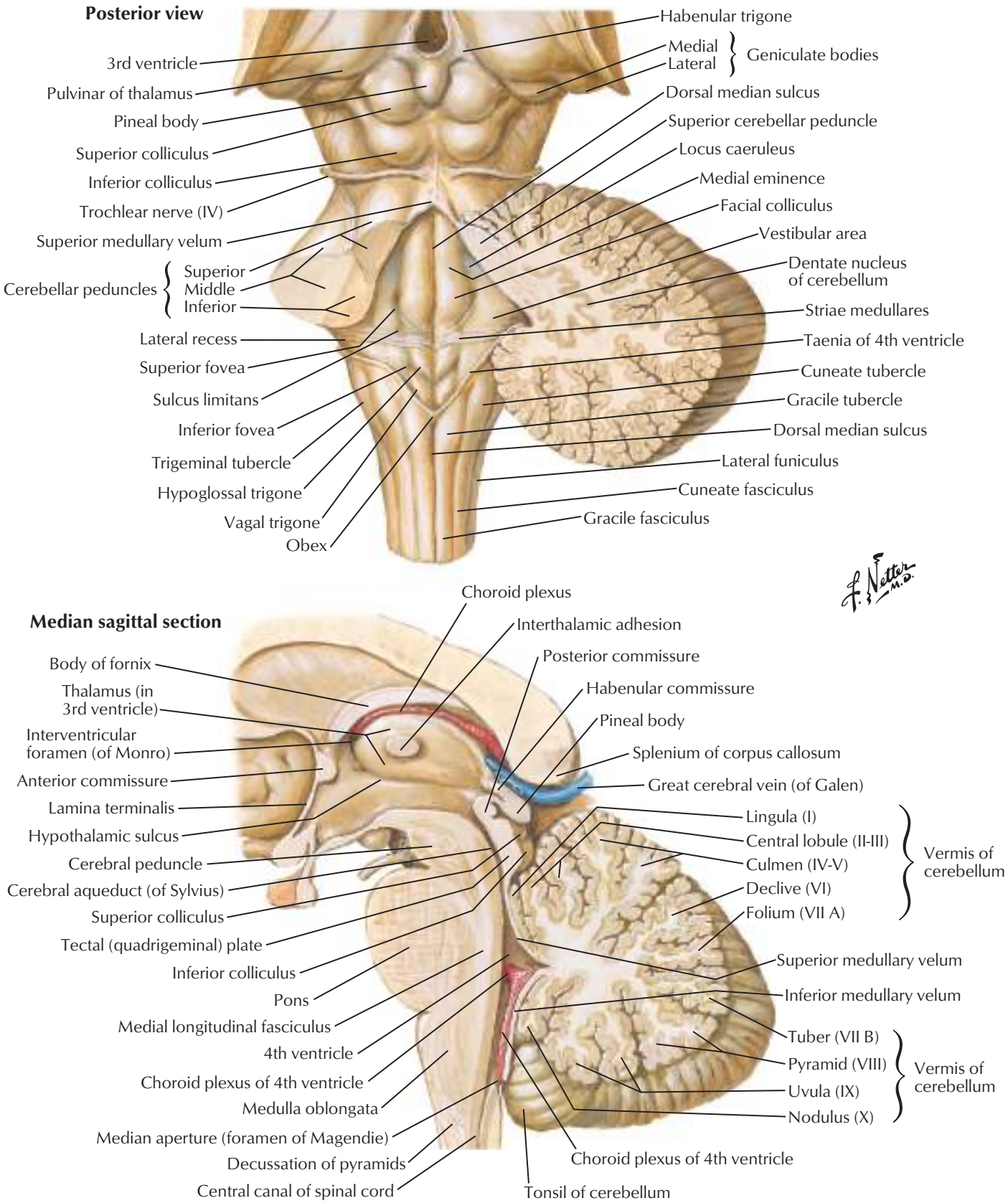
Coronal section: posterior view

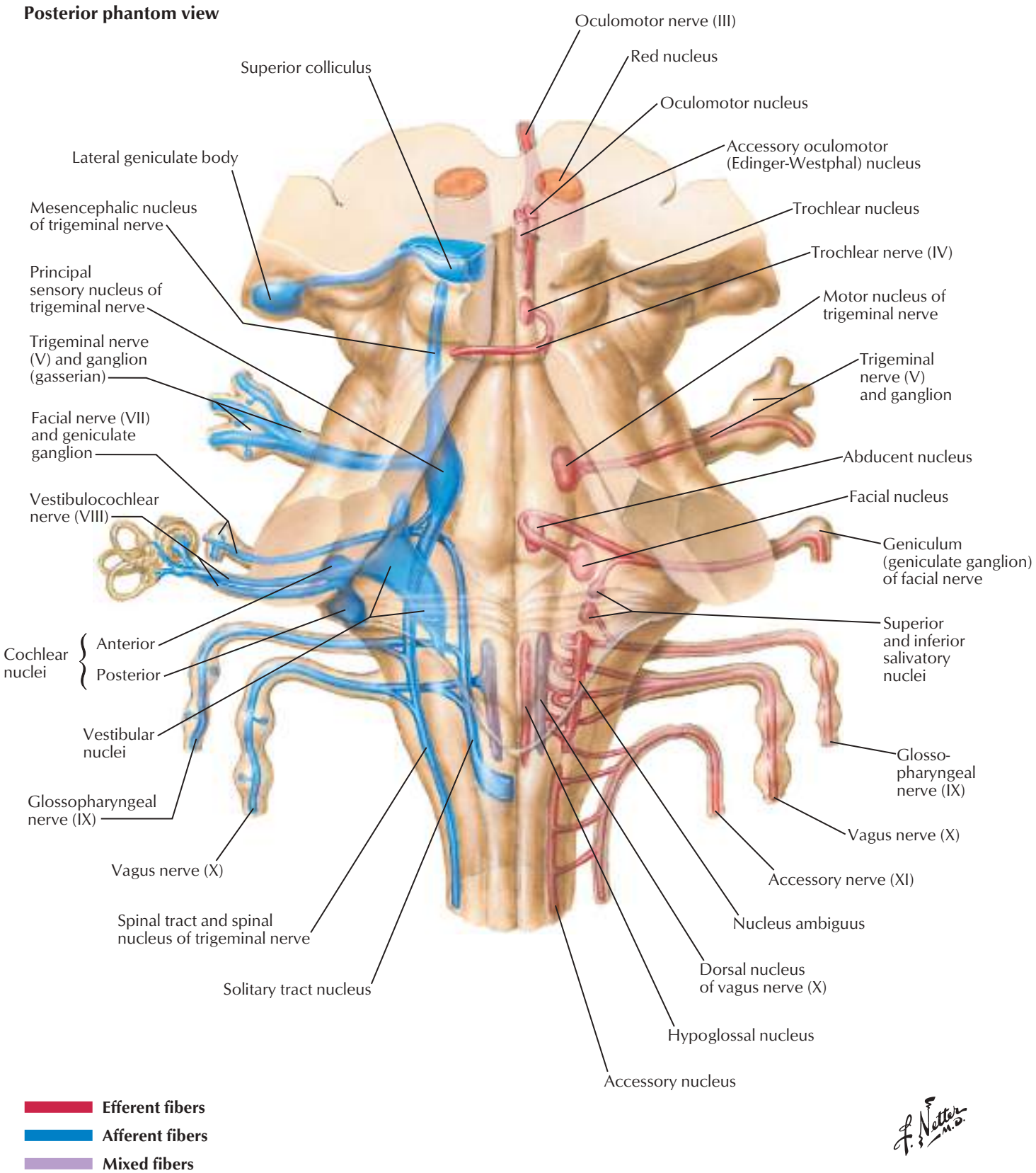


Section in plane of superior cerebellar peduncle

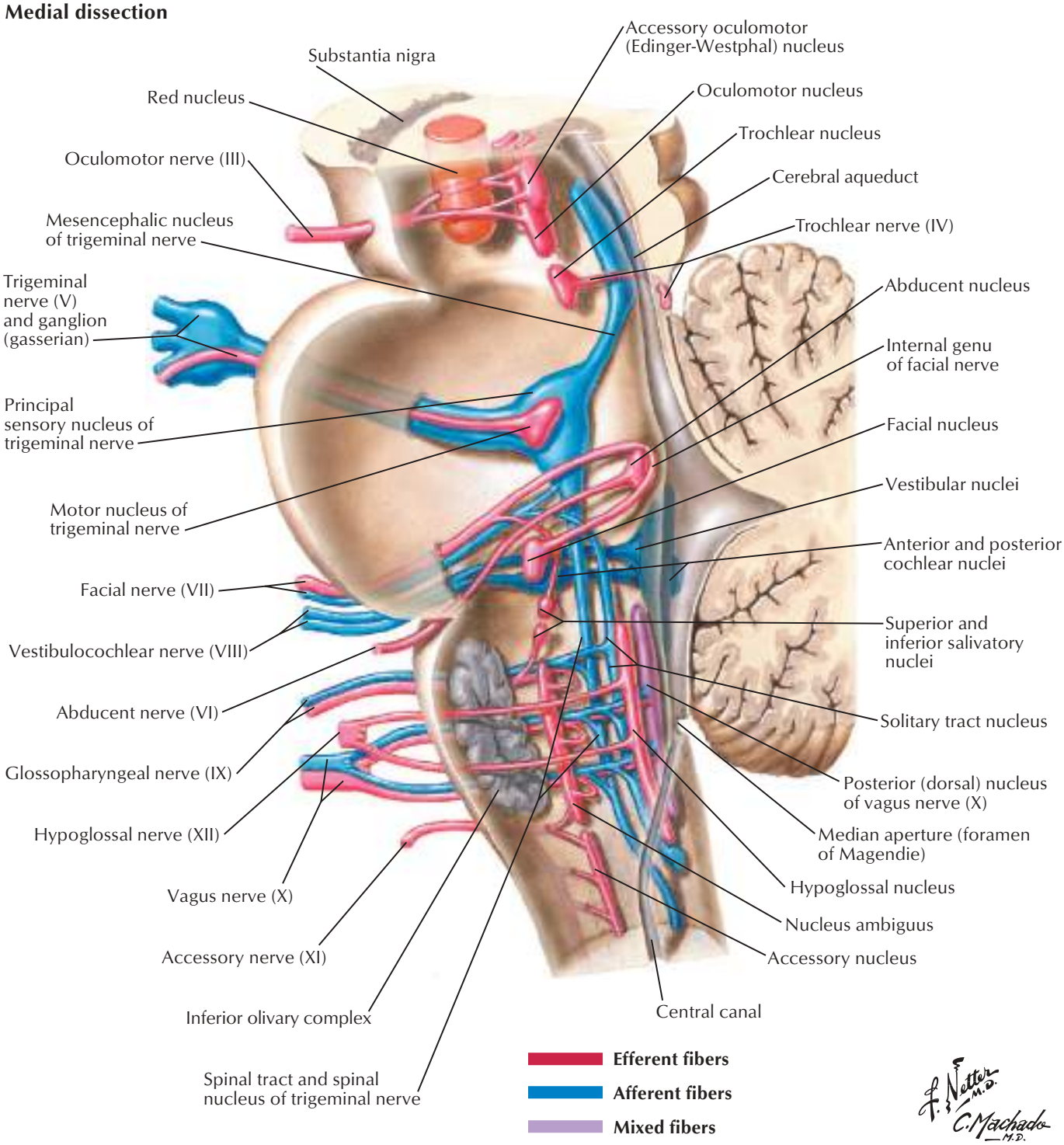

Posterolateral view
Thalamus (cut surface)
Lateral geniculate body
Optic tract
Medial geniculate body
Brachia of superior and inferior colliculi
Cerebral crus
Pons
Trigeminal nerve (V)
Middle cerebellar peduncle
Vestibulocochlear nerve (VIII)
Facial nerve (VII)
Inferior cerebellar peduncle
Hypoglossal nerve (XII)
Accessory nerve (XI)
Pulvinars of thalami
Pineal body
Superior colliculi
Inferior colliculi
Trochlear nerve (IV)
Superior medullary velum
Superior cerebellar peduncle
Rhomboid fossa of 4th ventricle
Glossopharyngeal (IX) and vagus (X) nerves
Cuneate tubercle
Gracile tubercle
Dorsal roots of 1st spinal nerve (C1)
Cuneate fasciculus
Gracile fasciculus
F. Netter M.D.
Anterior view
Olfactory tract
Anterior perforated substance
Infundibulum (pituitary stalk)
Mammillary bodies
Temporal lobe (cut surface)
Oculomotor nerve (III)
Trochlear nerve (IV)
Trigeminal nerve (V) (sensory root)
Abducent nerve (VI)
Facial nerve (VII) and intermediate nerve (of Wrisberg)
Vestibulocochlear nerve (VIII)
Flocculus of cerebellum
Choroid plexus of 4th ventricle
Glossopharyngeal nerve (IX)
Vagus nerve (X)
Hypoglossal nerve (XII)
Accessory nerve (XI)
Optic chiasm
Optic tract
Tuber cinereum
Cerebral crus
Lateral geniculate body
Posterior perforated substance
Pons
Middle cerebellar peduncle
Olive
Pyramids
Ventral roots of 1st spinal nerve (C1)
Decussation of pyramids

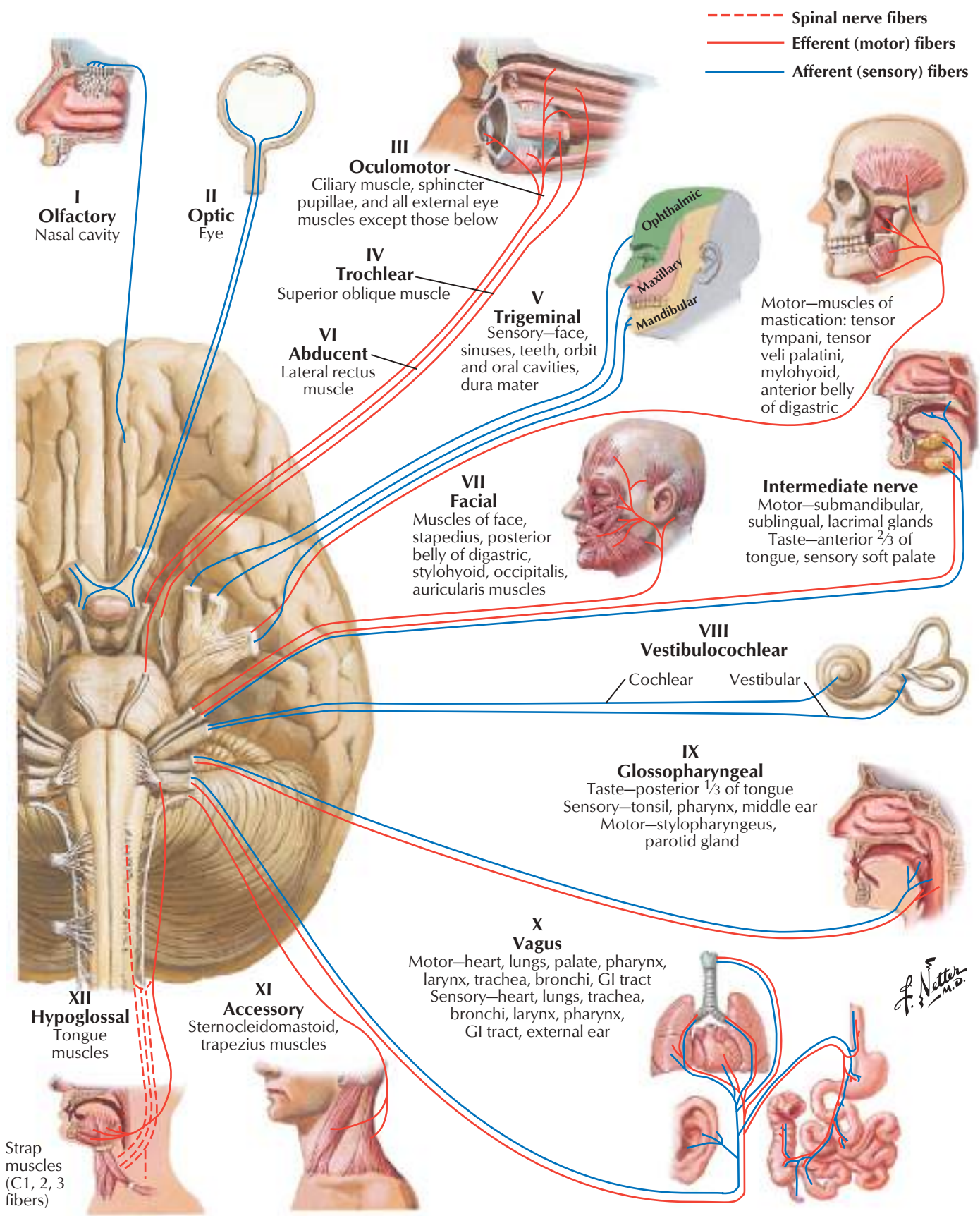
See also Plate 114




Posterior phantom view
Oculomotor nerve (III)
Red nucleus
Superior colliculus
Oculomotor nucleus
Lateral geniculate body
Accessory oculomotor (Edinger-Westphal) nucleus
Mesencephalic nucleus of trigeminal nerve
Trochlear nucleus
Trochlear nerve (IV)
Principal sensory nucleus of trigeminal nerve
Motor nucleus of trigeminal nerve
Trigeminal nerve (V) and ganglion (gasserian)
Trigeminal nerve (V) and ganglion
Facial nerve (VII) and geniculate ganglion
Abducent nucleus
Vestibulocochlear nerve (VIII)
Facial nucleus
Geniculum (geniculate ganglion) of facial nerve
Cochlear nuclei
Anterior
Posterior
Superior and inferior salivatory nuclei
Vestibular nuclei
Glossopharyngeal nerve (IX)
Glossopharyngeal nerve (IX)
Vagus nerve (X)
Vagus nerve (X)
Accessory nerve (XI)
Spinal tract and spinal nucleus of trigeminal nerve
Nucleus ambiguus
Dorsal nucleus of vagus nerve (X)
Solitary tract nucleus
Hypoglossal nucleus
Accessory nucleus
Efferent fibers
Afferent fibers
Mixed fibers

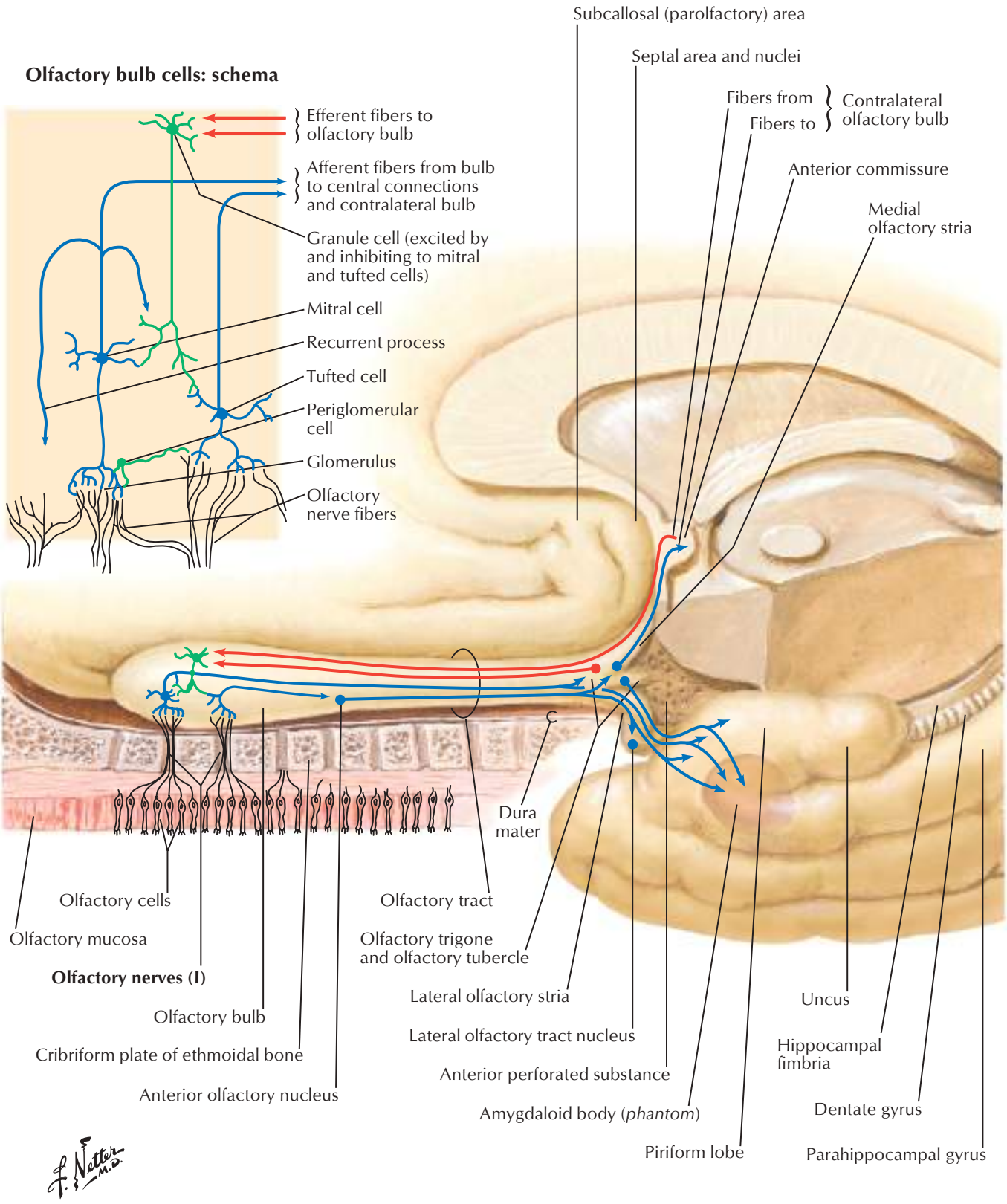
Medial dissection

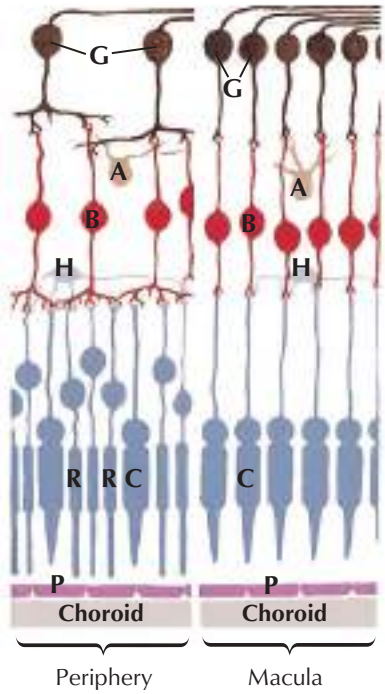



Spinal nerve fibers
Efferent (motor) fibers
Afferent (sensory) fibers
I
Olfactory
Nasal cavity
II
Optic
Eye
III
Oculomotor
Ciliary muscle, sphincter pupillae, and all external eye muscles except those below
IV
Trochlear
Superior oblique muscle
VI
Abducent
Lateral rectus muscle
V
Trigeminal
Sensory—face, sinuses, teeth, orbit and oral cavities, dura mater
Ophthalmic
Maxillary
Mandibular
Motor—muscles of mastication: tensor tympani, tensor veli palatini, mylohyoid, anterior belly of digastric
VII
Facial
Muscles of face, stapedius, posterior belly of digastric, stylohyoid, occipitalis, auricularis muscles
Intermediate nerve
Motor—submandibular, sublingual, lacrimal glands
Taste—anterior 2/3 of tongue, sensory soft palate
VIII
Vestibulocochlear
Cochlear
Vestibular
IX
Glossopharyngeal
Taste—posterior 1/3 of tongue
Sensory—tonsil, pharynx, middle ear
Motor—stylopharyngeus, parotid gland
X
Vagus
Motor—heart, lungs, palate, pharynx, larynx, trachea, bronchi, GI tract
Sensory—heart, lungs, trachea, bronchi, larynx, pharynx, GI tract, external ear
XI
Accessory
Sternocleidomastoid, trapezius muscles
XII
Hypoglossal
Tongue muscles
Strap muscles (C1, 2, 3 fibers)
F. Netter M.D.

Olfactory Nerve (I): Schema

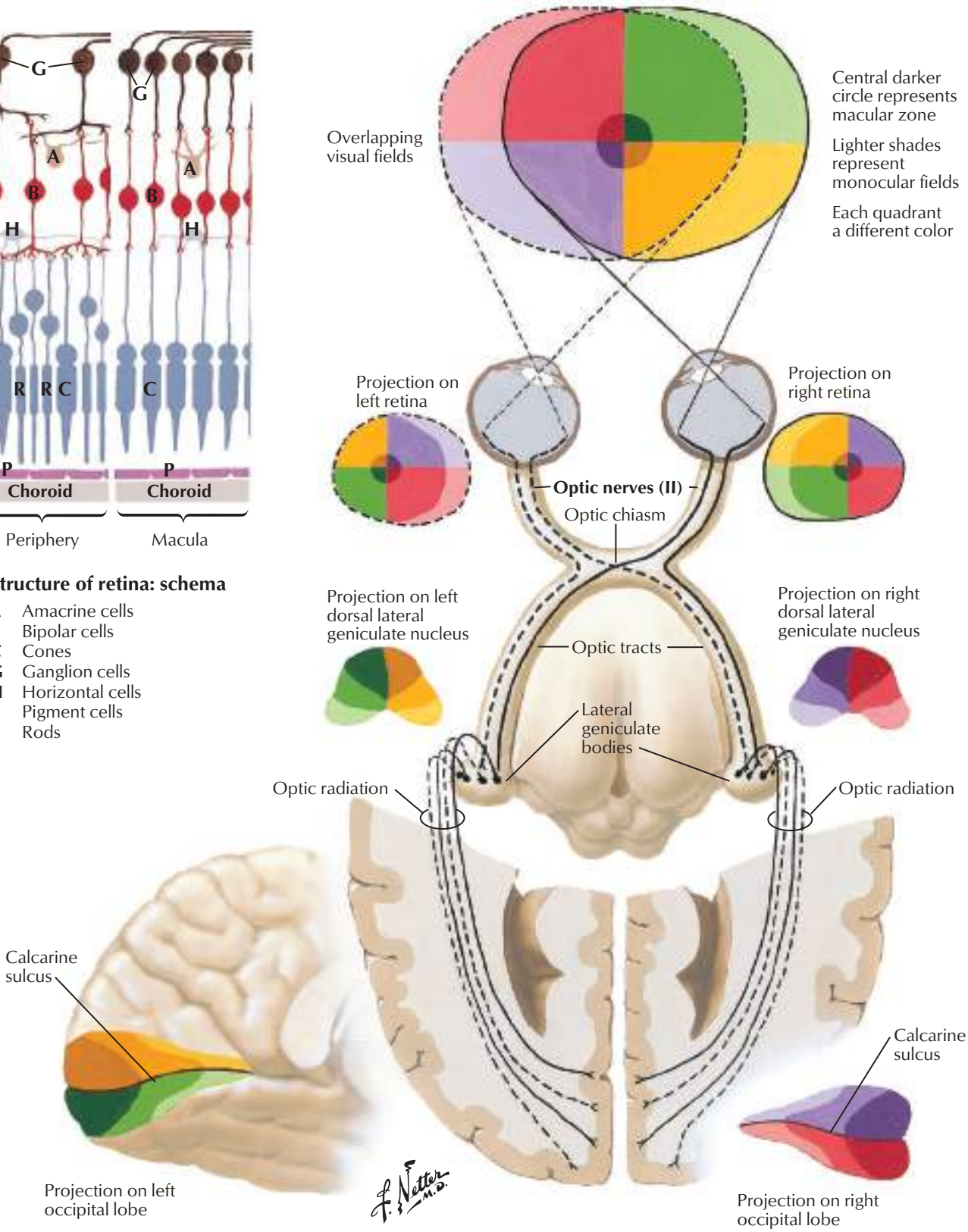
See also Plate 39





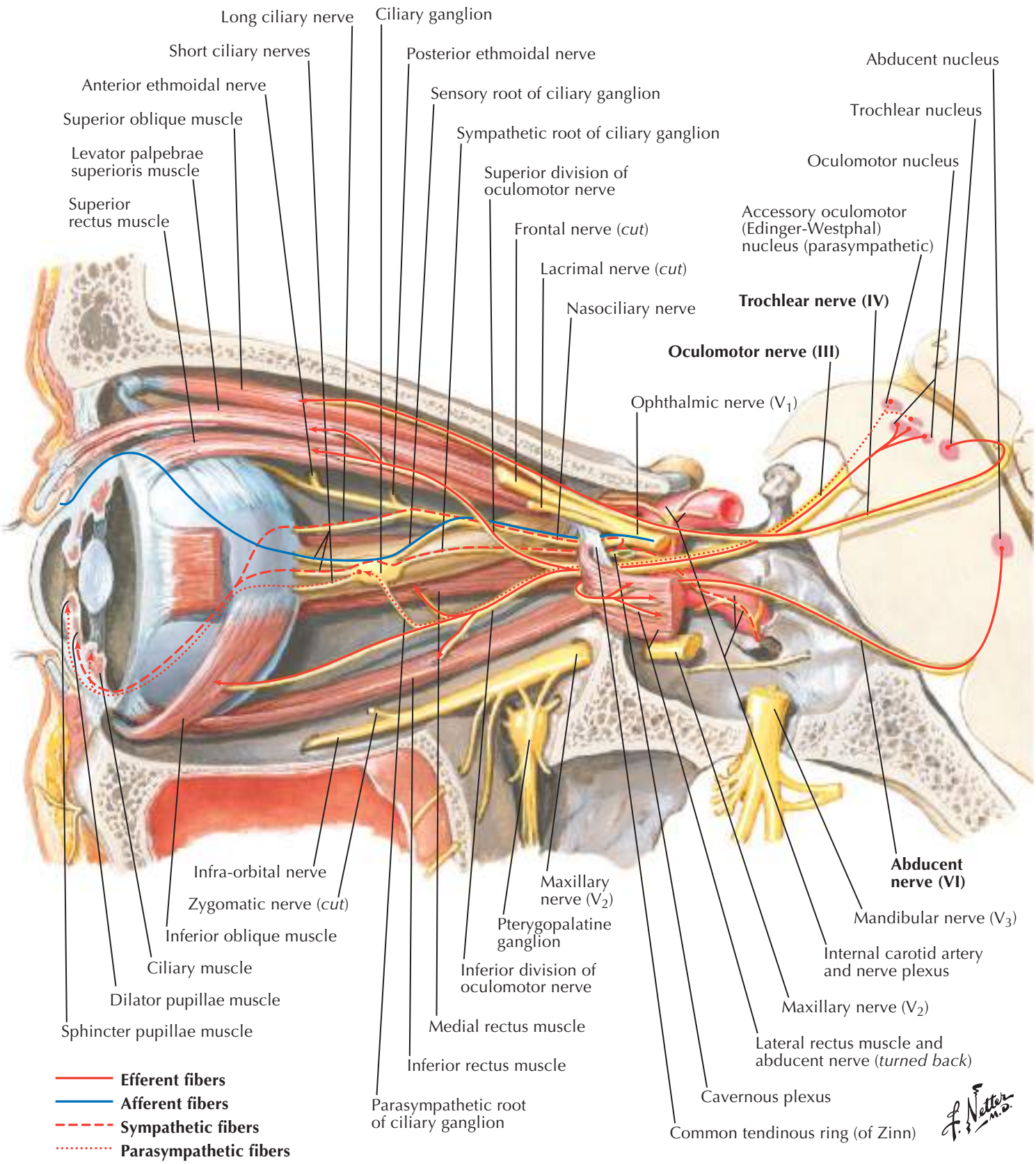
Structure of retina: schema

- **A** Amacrine cells
- **B** Bipolar cells
- **C** Cones
- **G** Ganglion cells
- **H** Horizontal cells
- **P** Pigment cells
- **R** Rods



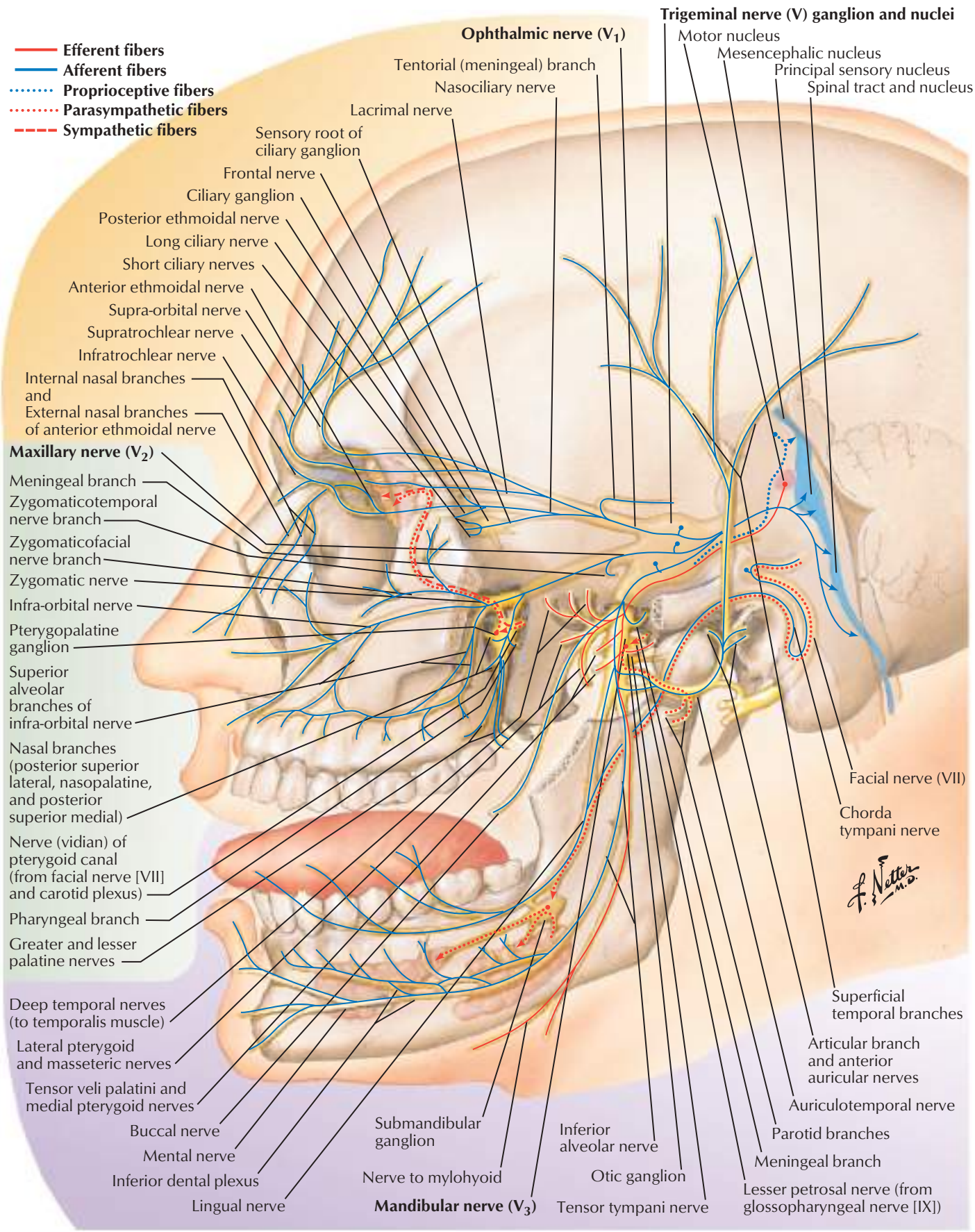
Oculomotor (III), Trochlear (IV), and Abducent (VI) Nerves: Schema

See also Plates 88, 133



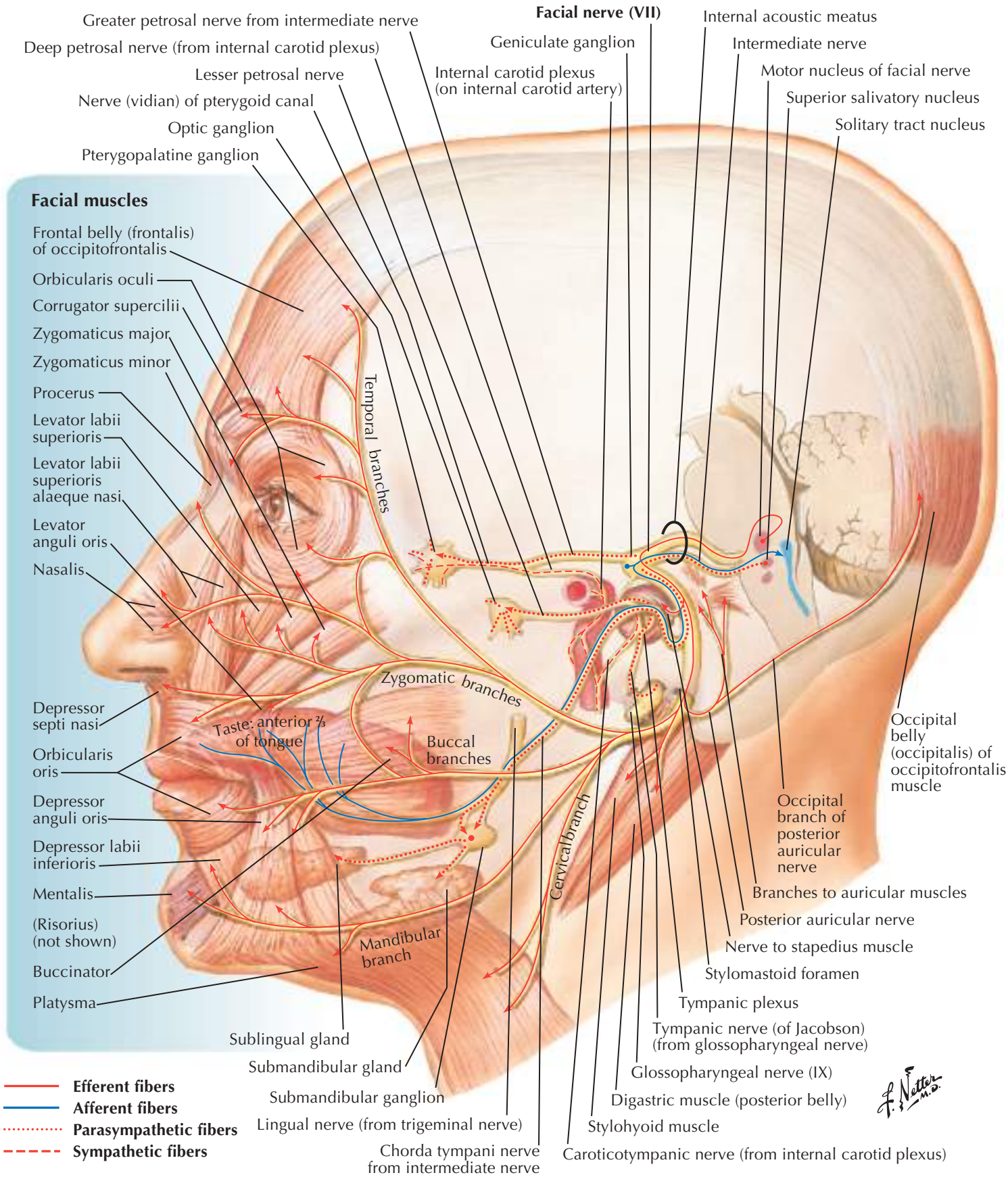
Trigeminal Nerve (V): Schema

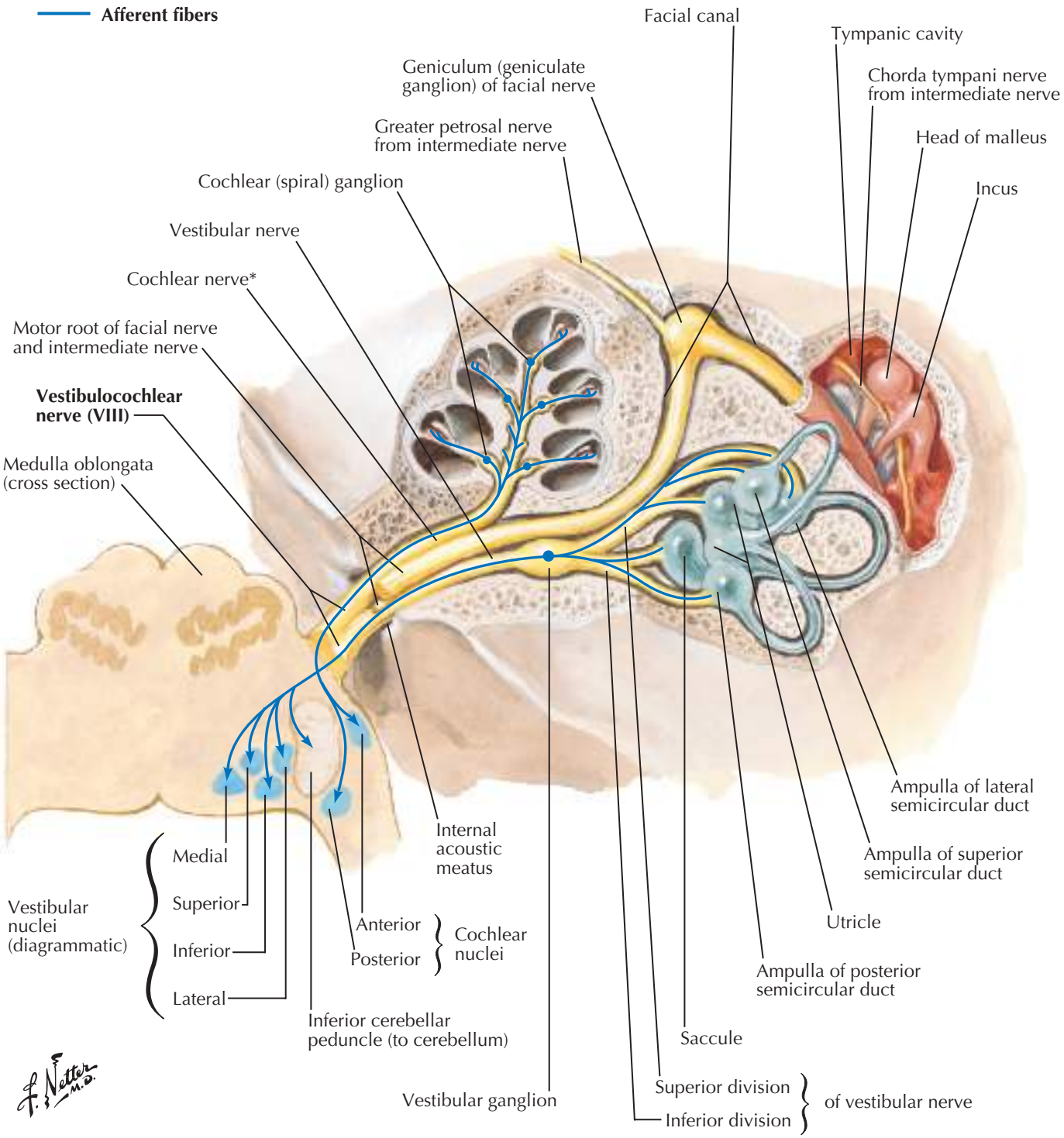
See also Plates 2, 50, 52



Facial Nerve (VII): Schema

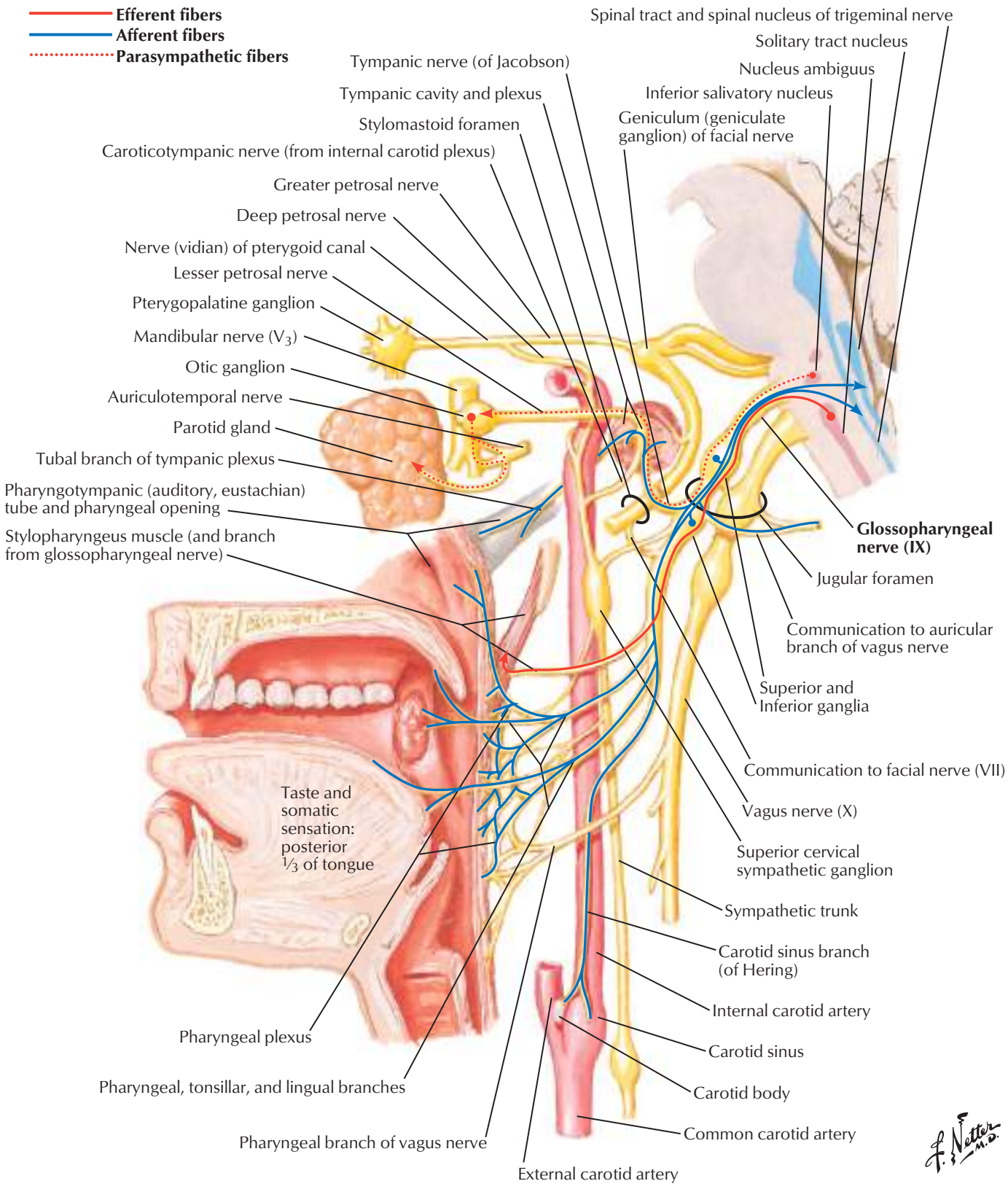
See also Plate 24

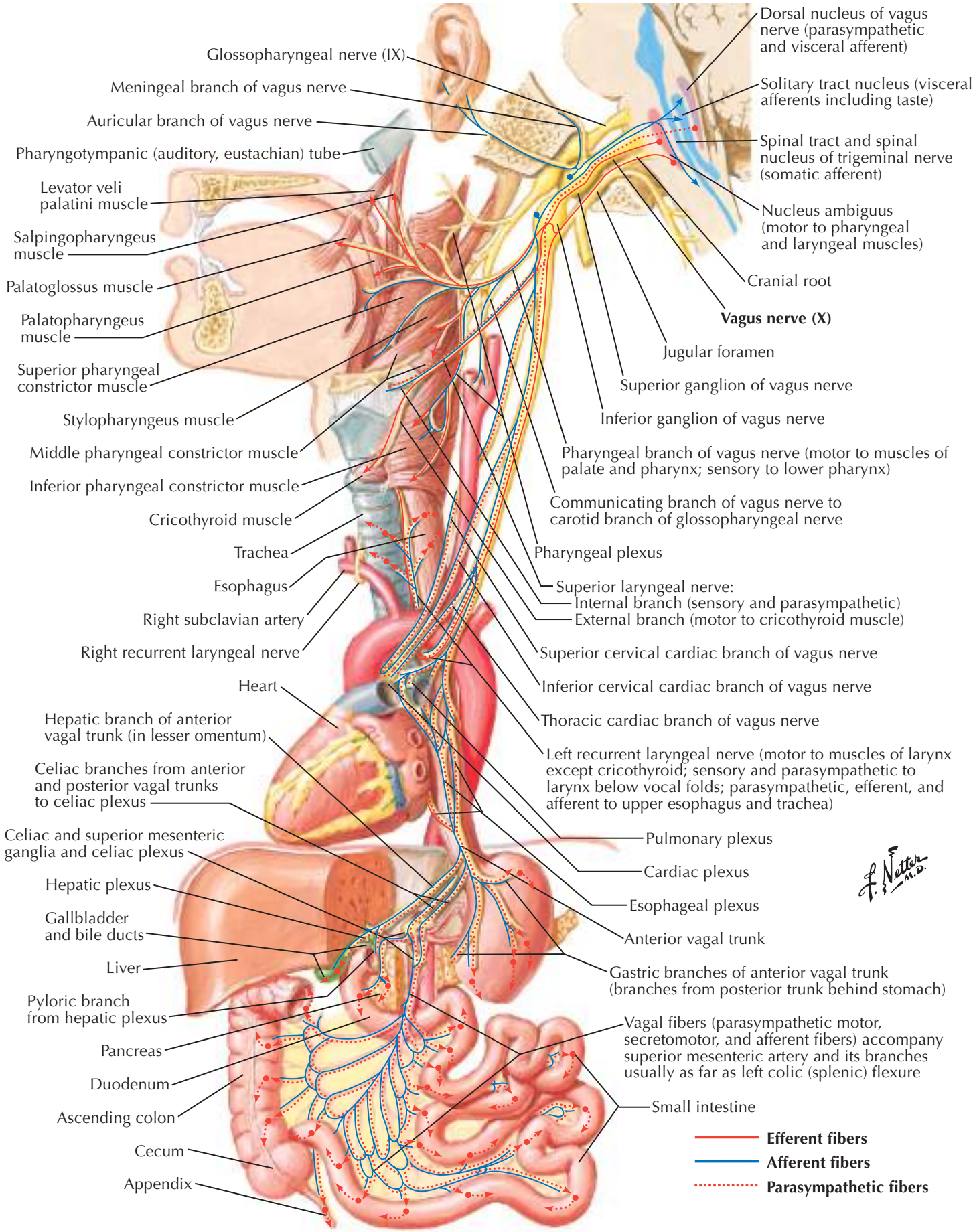




*Note: The cochlear nerve also contains efferent fibers to the sensory epithelium. These fibers are derived from the vestibular nerve while in the internal auditory meatus.

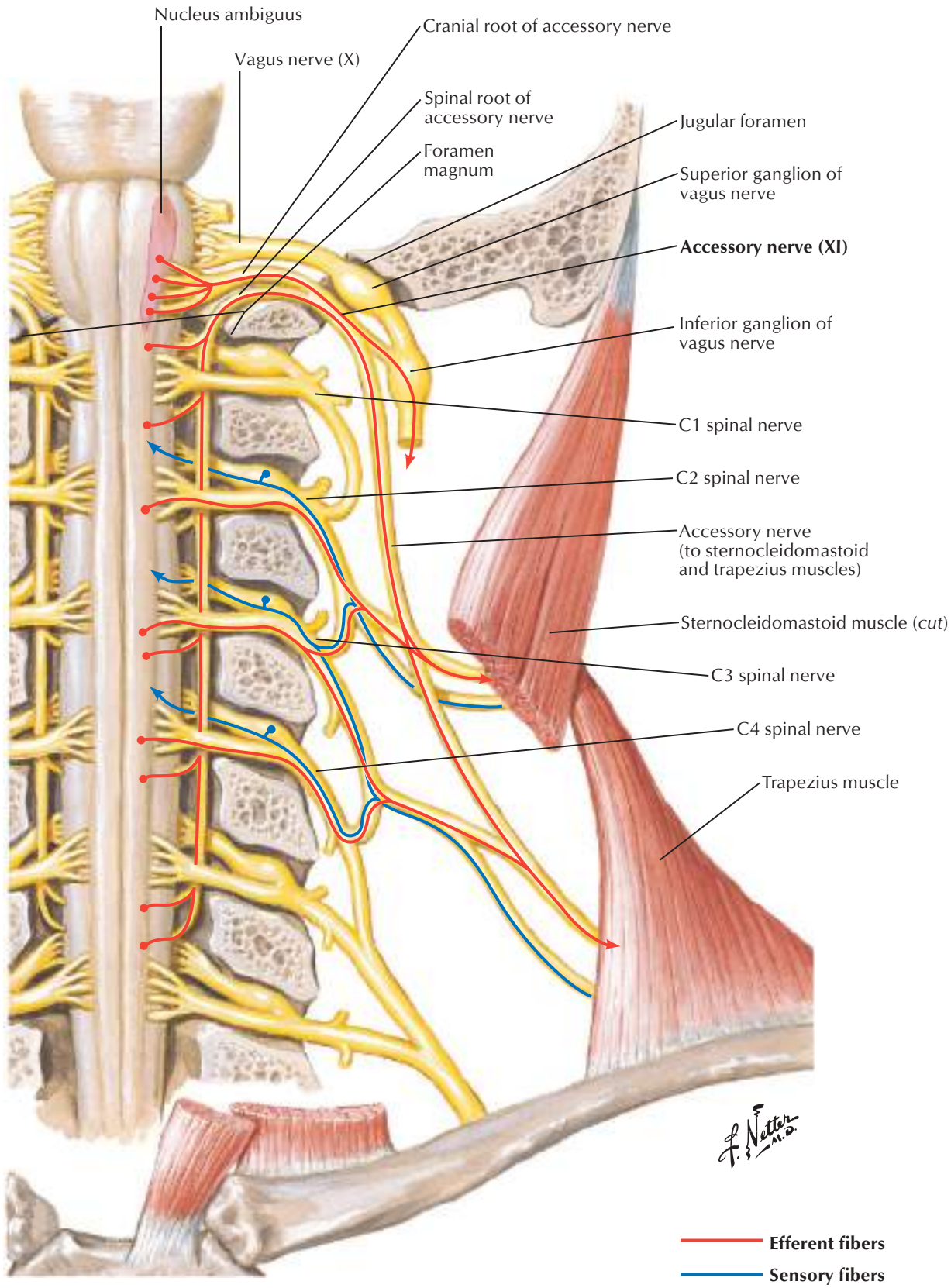
Glossopharyngeal Nerve (IX): Schema




Glossopharyngeal nerve (IX)
Meningeal branch of vagus nerve
Auricular branch of vagus nerve
Pharyngotympanic (auditory, eustachian) tube
Levator veli palatini muscle
Salpingopharyngeus muscle
Palatoglossus muscle
Palatopharyngeus muscle
Superior pharyngeal constrictor muscle
Stylopharyngeus muscle
Middle pharyngeal constrictor muscle
Inferior pharyngeal constrictor muscle
Cricothyroid muscle
Trachea
Esophagus
Right subclavian artery
Right recurrent laryngeal nerve
Heart
Hepatic branch of anterior vagal trunk (in lesser omentum)
Celiac branches from anterior and posterior vagal trunks to celiac plexus
Celiac and superior mesenteric ganglia and celiac plexus
Hepatic plexus
Gallbladder and bile ducts
Liver
Pyloric branch from hepatic plexus
Pancreas
Duodenum
Ascending colon
Cecum
Appendix
Dorsal nucleus of vagus nerve (parasympathetic and visceral afferent)
Solitary tract nucleus (visceral afferents including taste)
Spinal tract and spinal nucleus of trigeminal nerve (somatic afferent)
Nucleus ambiguus (motor to pharyngeal and laryngeal muscles)
Cranial root
Vagus nerve (X)
Jugular foramen
Superior ganglion of vagus nerve
Inferior ganglion of vagus nerve
Pharyngeal branch of vagus nerve (motor to muscles of palate and pharynx; sensory to lower pharynx)
Communicating branch of vagus nerve to carotid branch of glossopharyngeal nerve
Pharyngeal plexus
Superior laryngeal nerve:
Internal branch (sensory and parasympathetic)
External branch (motor to cricothyroid muscle)
Superior cervical cardiac branch of vagus nerve
Inferior cervical cardiac branch of vagus nerve
Thoracic cardiac branch of vagus nerve
Left recurrent laryngeal nerve (motor to muscles of larynx except cricothyroid; sensory and parasympathetic to larynx below vocal folds; parasympathetic, efferent, and afferent to upper esophagus and trachea)
Pulmonary plexus
Cardiac plexus
Esophageal plexus
Anterior vagal trunk
Gastric branches of anterior vagal trunk (branches from posterior trunk behind stomach)
Vagal fibers (parasympathetic motor, secretomotor, and afferent fibers) accompany superior mesenteric artery and its branches usually as far as left colic (splenic) flexure
Small intestine
Efferent fibers
Afferent fibers
Parasympathetic fibers

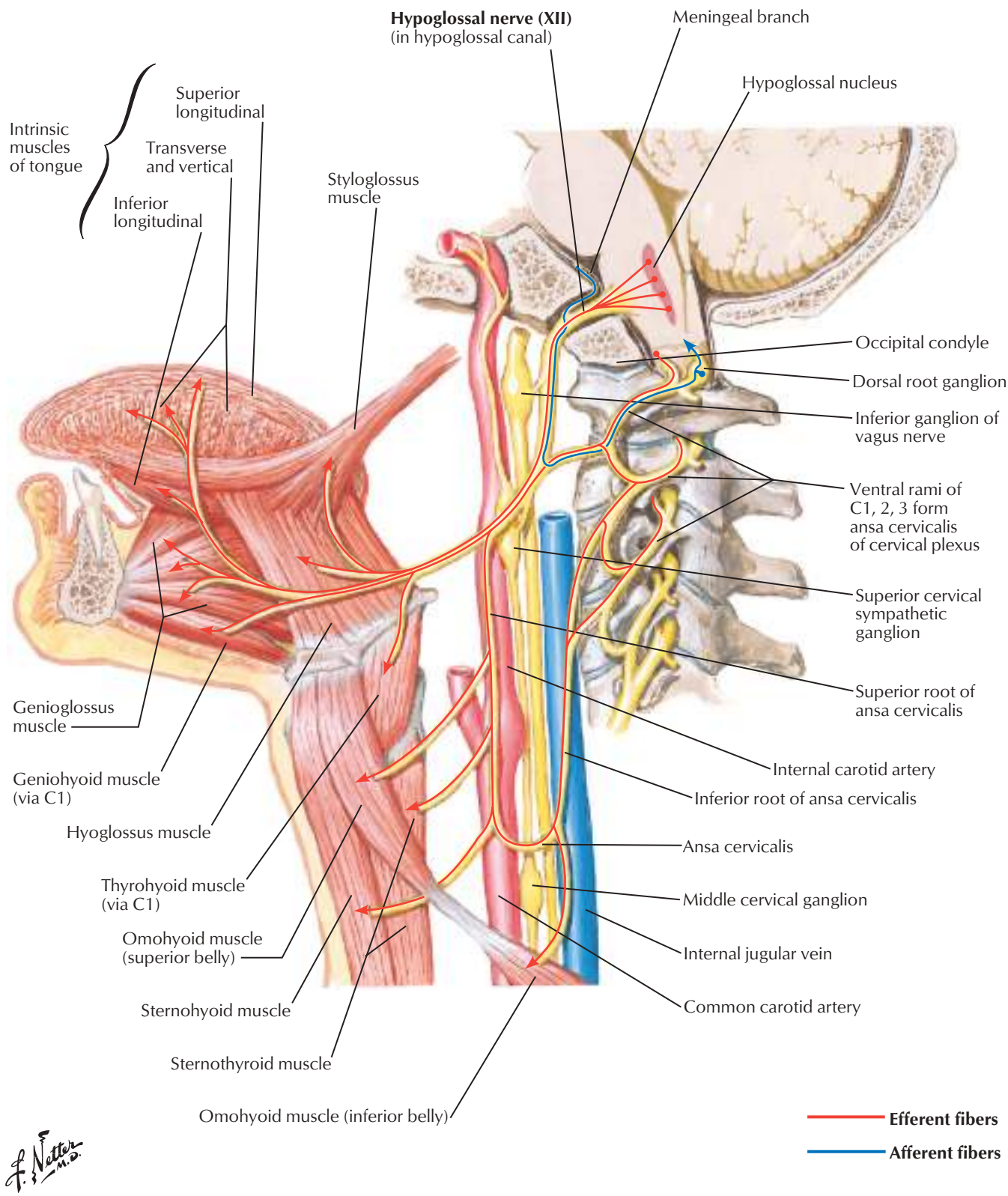
Accessory Nerve (XI): Schema

See also Plate 32



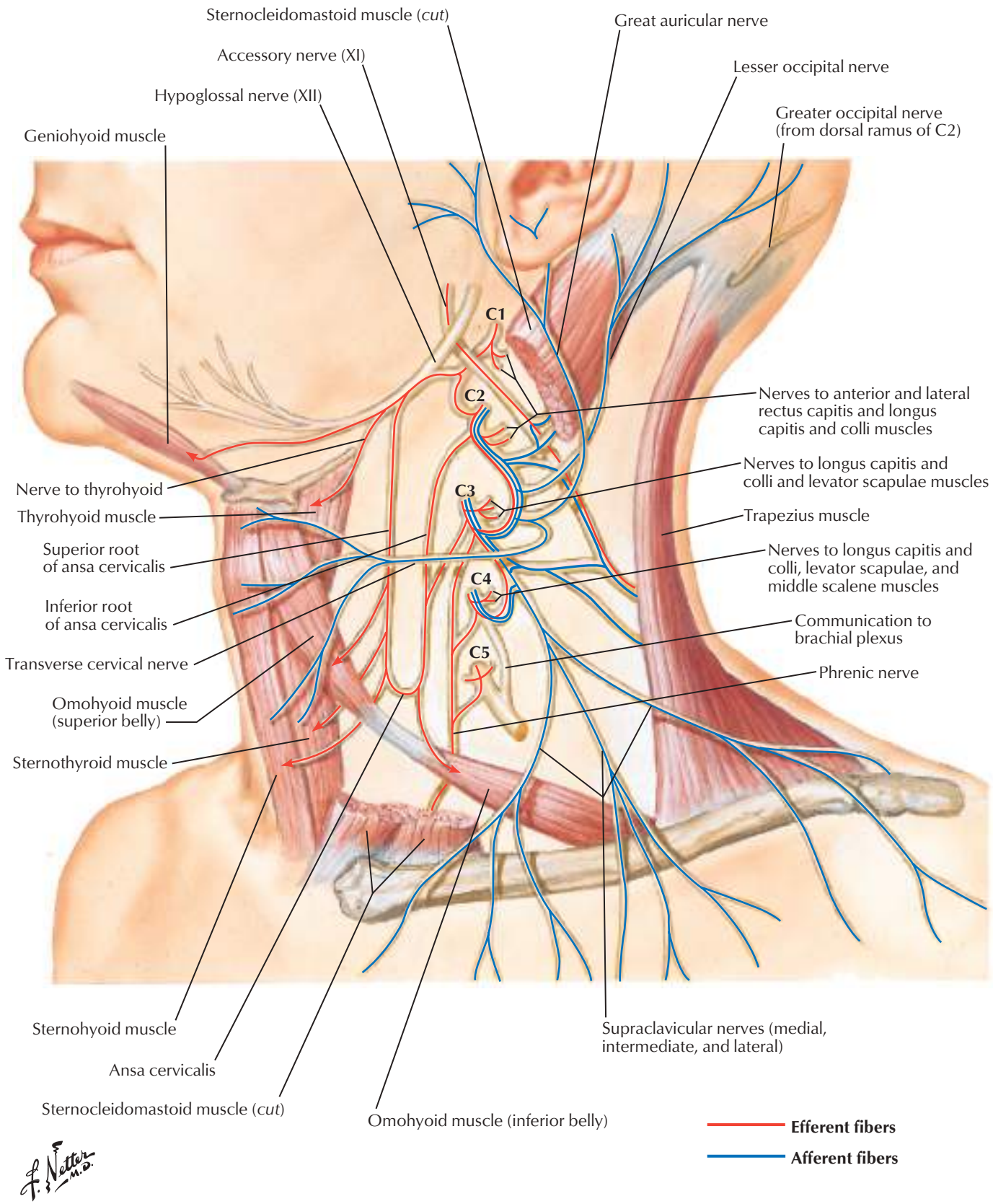
Hypoglossal Nerve (XII): Schema

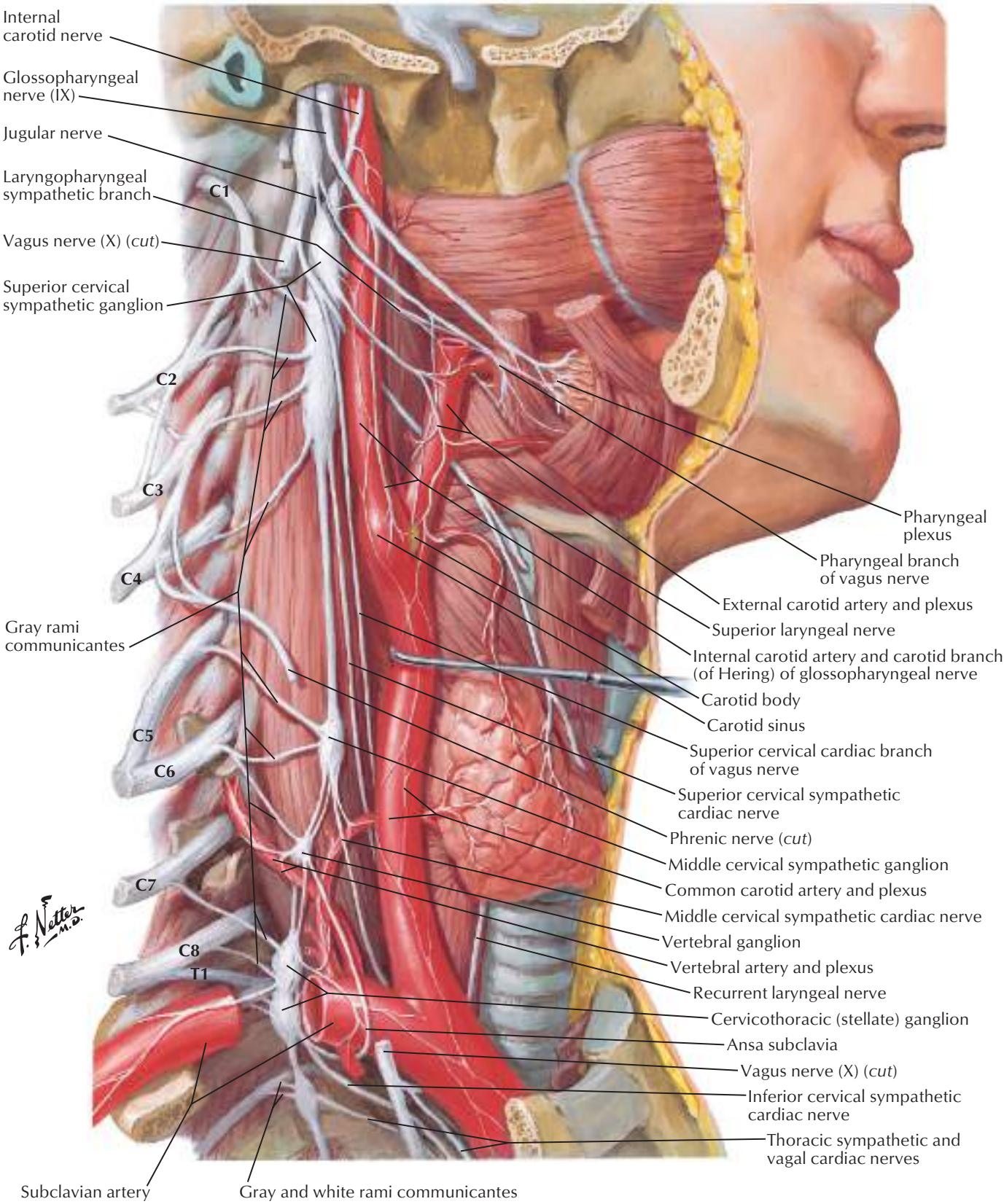
See also Plate 32



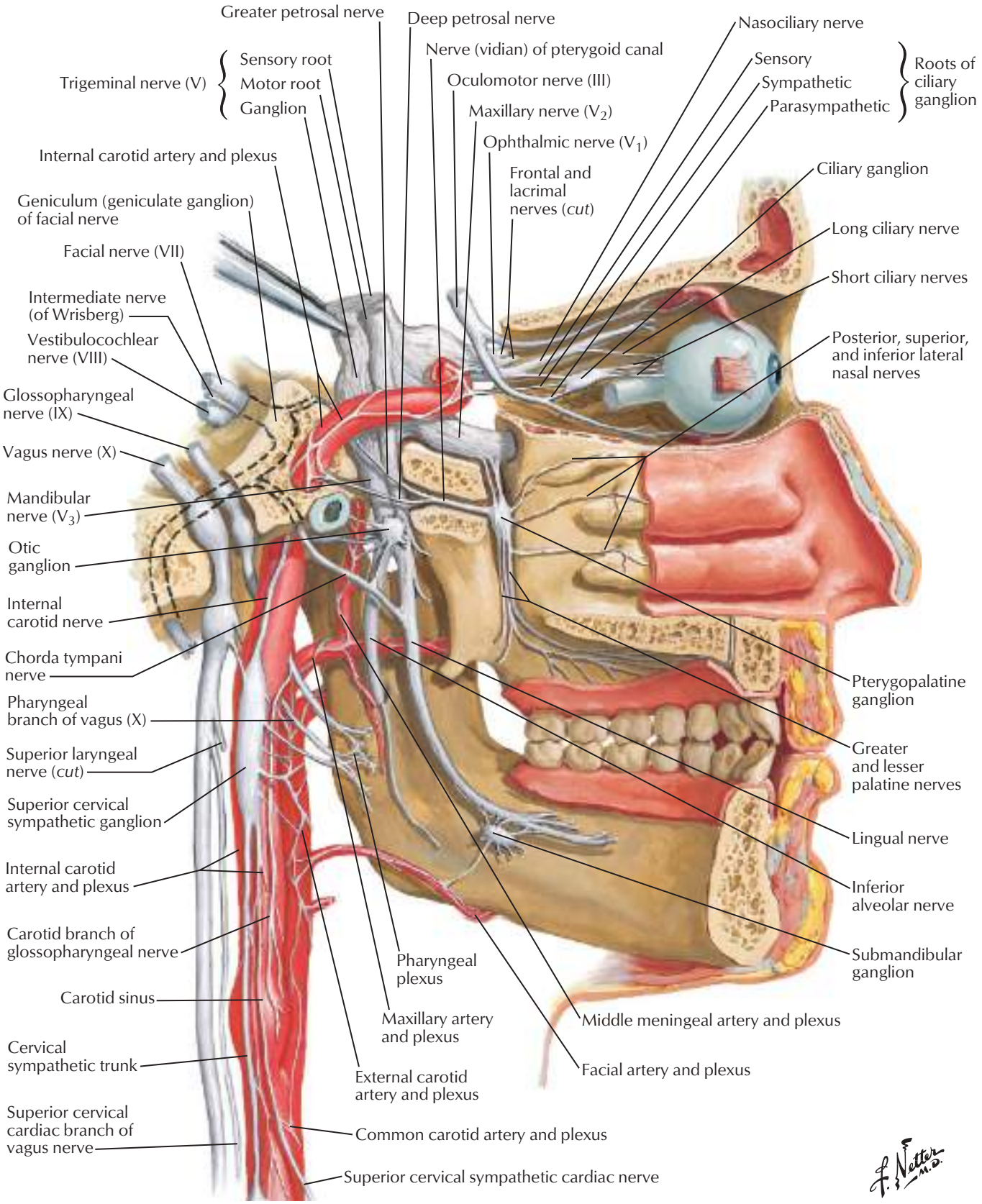
Cervical Plexus: Schema

See also Plates 32, 33



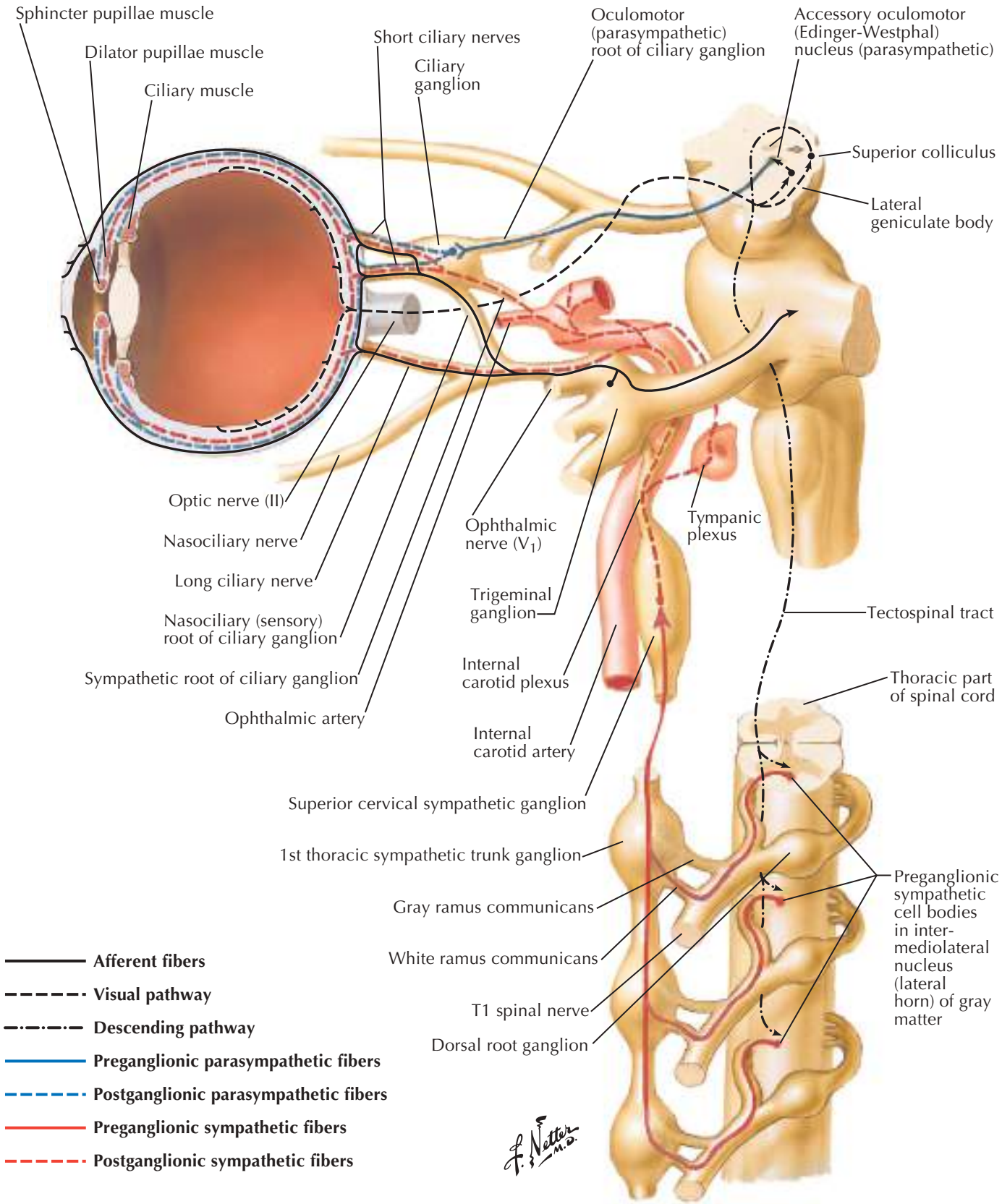

Internal carotid nerve
Glossopharyngeal nerve (IX)
Jugular nerve
Laryngopharyngeal sympathetic branch
Vagus nerve (X) (cut)
Superior cervical sympathetic ganglion
C1
C2
C3
C4
C5
C6
C7
C8
T1
Gray rami communicantes
Subclavian artery
Gray and white rami communicantes
Pharyngeal plexus
Pharyngeal branch of vagus nerve
External carotid artery and plexus
Superior laryngeal nerve
Internal carotid artery and carotid branch (of Hering) of glossopharyngeal nerve
Carotid body
Carotid sinus
Superior cervical cardiac branch of vagus nerve
Superior cervical sympathetic cardiac nerve
Phrenic nerve (cut)
Middle cervical sympathetic ganglion
Common carotid artery and plexus
Middle cervical sympathetic cardiac nerve
Vertebral ganglion
Vertebral artery and plexus
Recurrent laryngeal nerve
Cervicothoracic (stellate) ganglion
Ansa subclavia
Vagus nerve (X) (cut)
Inferior cervical sympathetic cardiac nerve
Thoracic sympathetic and vagal cardiac nerves

See also Plates 53, 123, 134



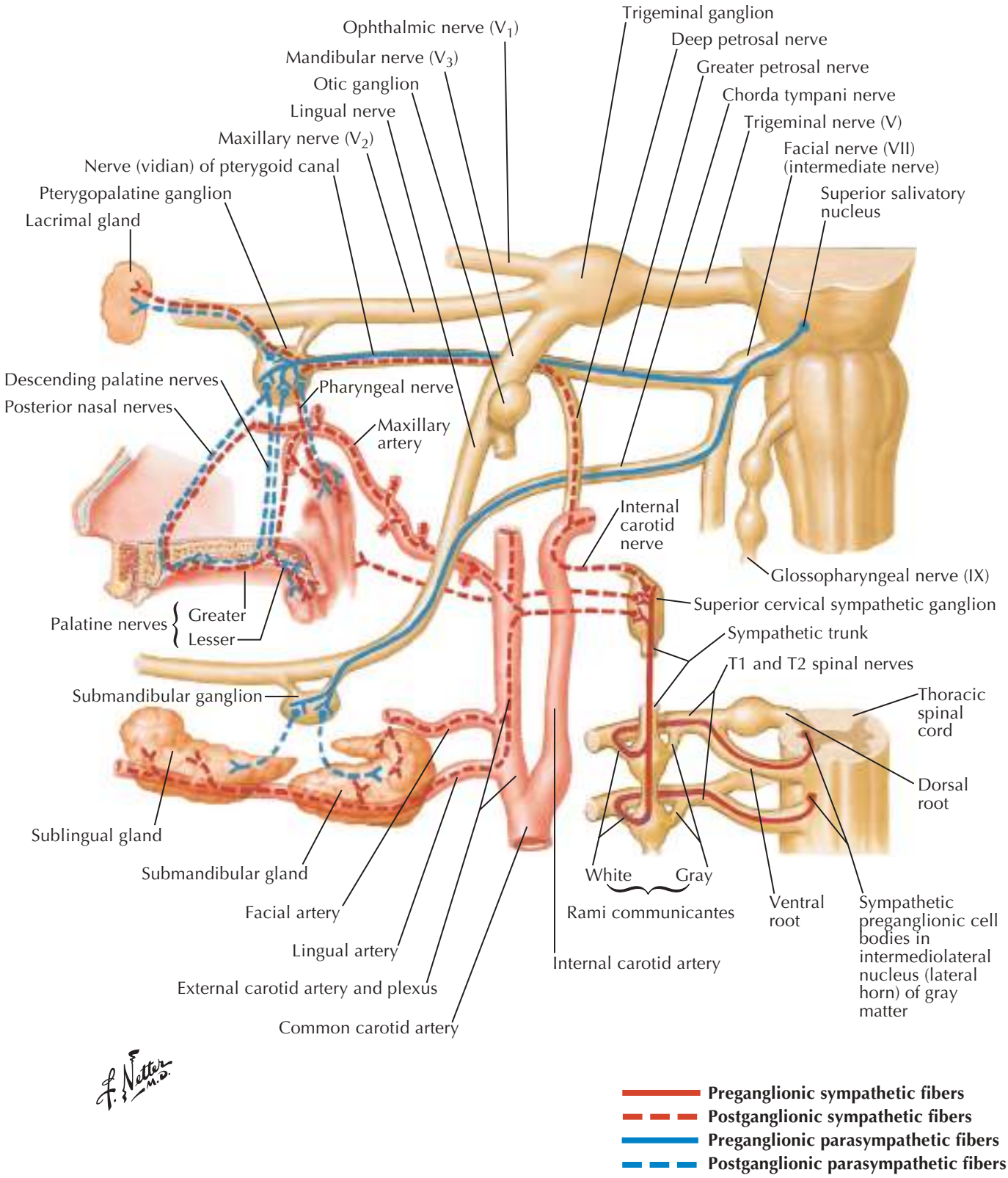
Ciliary Ganglion: Schema

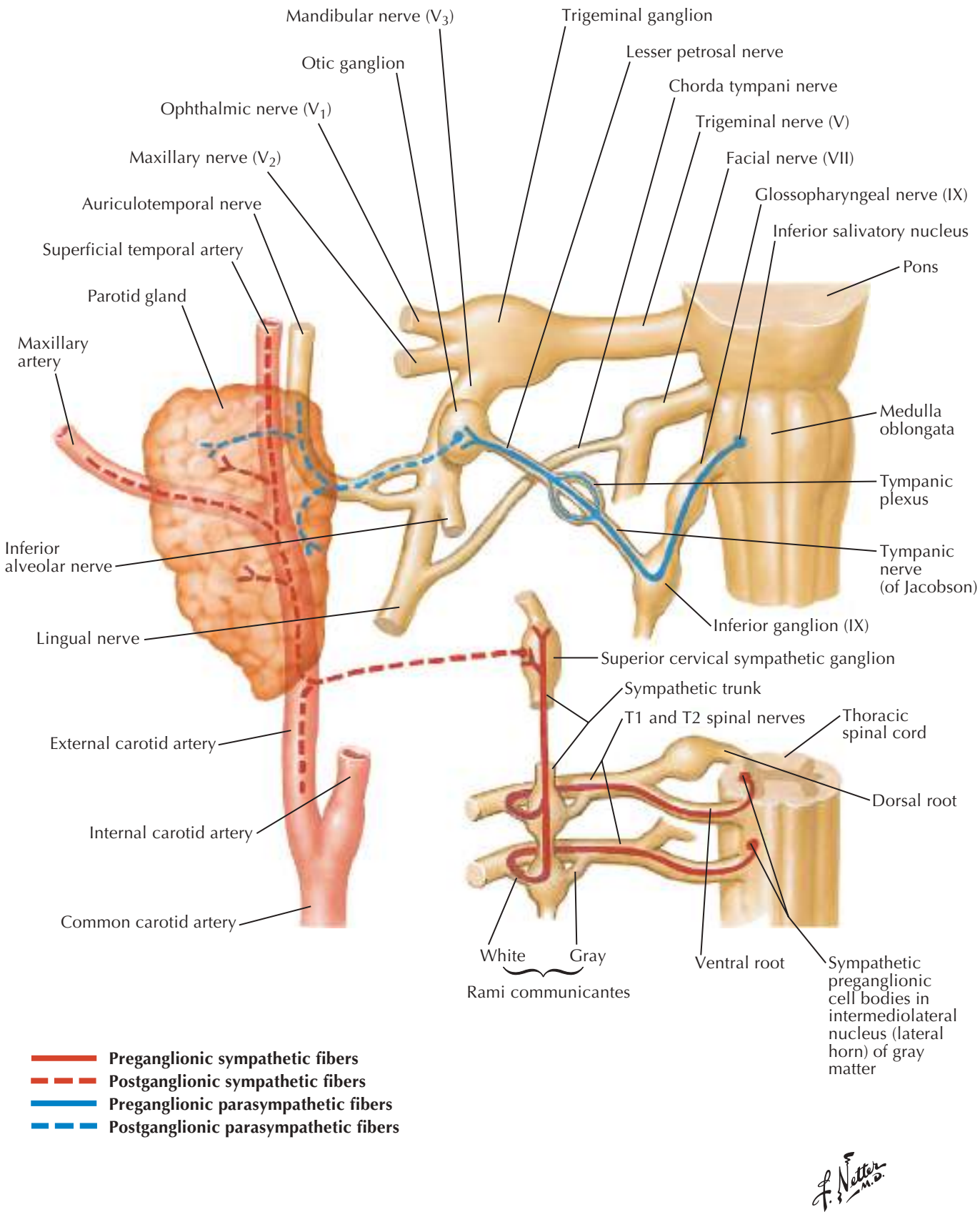
See also Plate 53



Pterygopalatine and Submandibular Ganglia: Schema

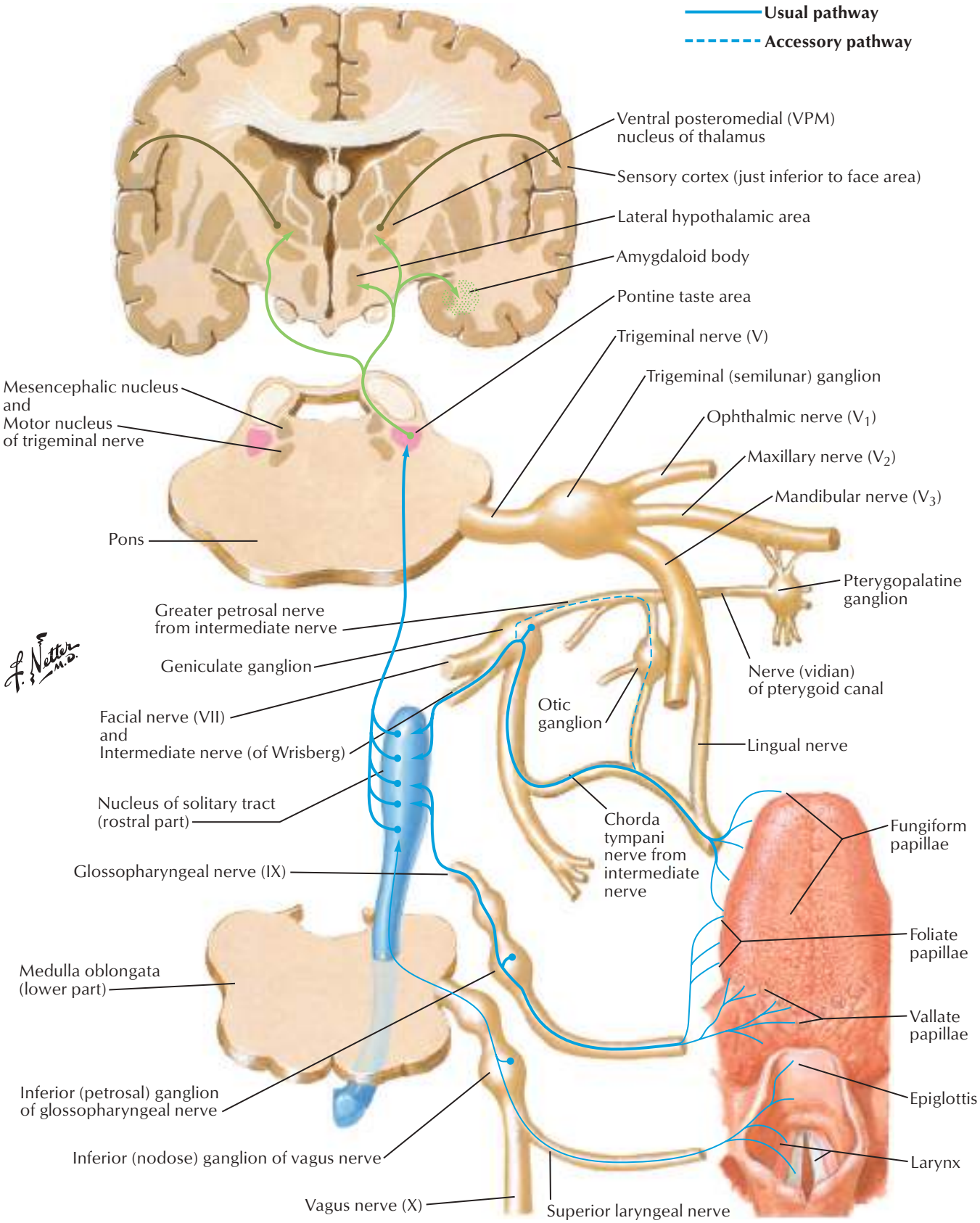
See also Plate 84

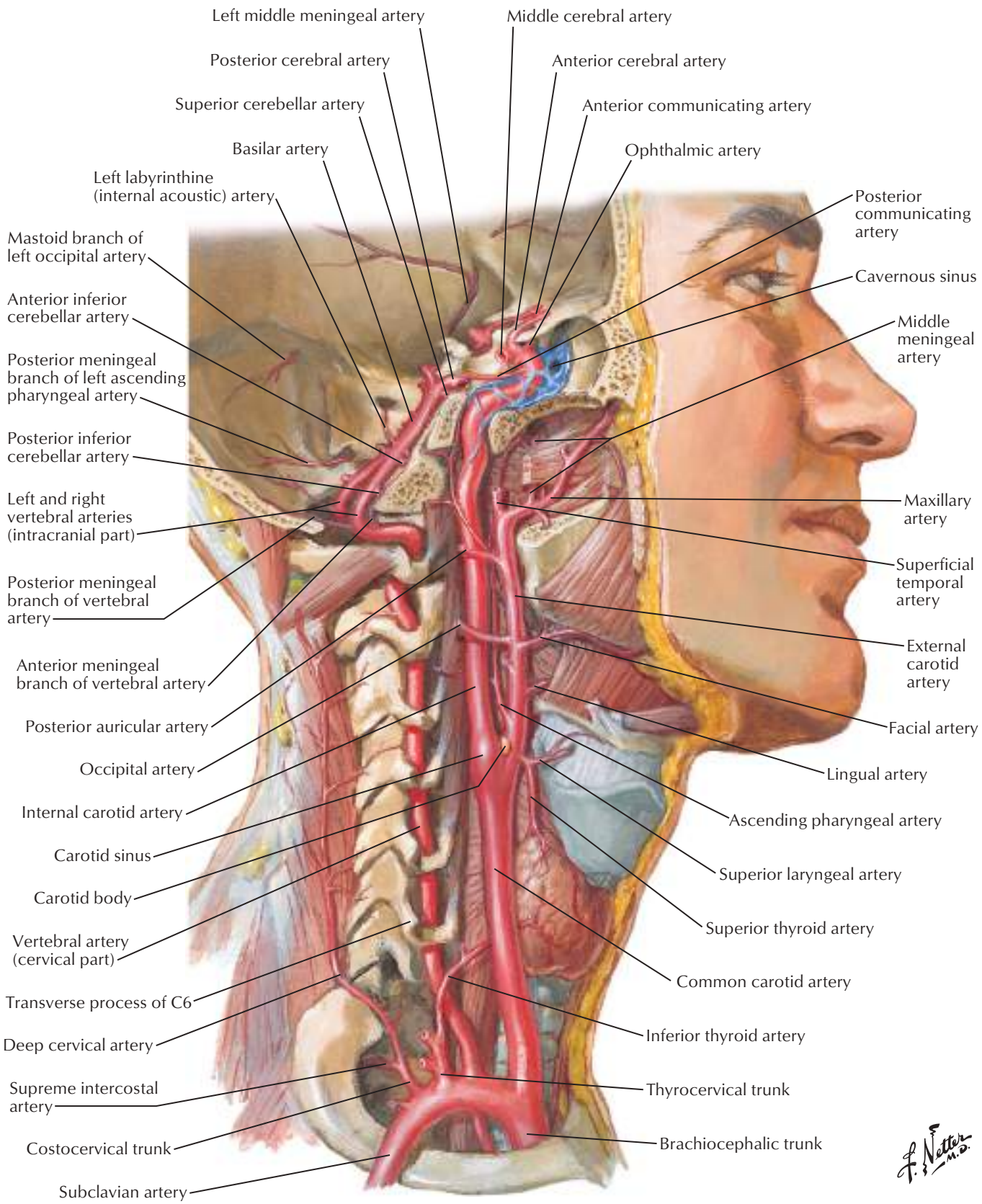



Mandibular nerve (V_3)
Trigeminal ganglion
Otic ganglion
Lesser petrosal nerve
Chorda tympani nerve
Ophthalmic nerve (V_1)
Trigeminal nerve (V)
Maxillary nerve (V_2)
Facial nerve (VII)
Auriculotemporal nerve
Glossopharyngeal nerve (IX)
Inferior salivatory nucleus
Superficial temporal artery
Pons
Parotid gland
Maxillary artery
Medulla oblongata
Tympanic plexus
Inferior alveolar nerve
Tympanic nerve (of Jacobson)
Inferior ganglion (IX)
Lingual nerve
Superior cervical sympathetic ganglion
Sympathetic trunk
T1 and T2 spinal nerves
Thoracic spinal cord
External carotid artery
Dorsal root
Internal carotid artery
Common carotid artery
White
Gray
Rami communicantes
Ventral root
Sympathetic preganglionic cell bodies in intermediolateral nucleus (lateral horn) of gray matter
Preganglionic sympathetic fibers
Postganglionic sympathetic fibers
Preganglionic parasympathetic fibers
Postganglionic parasympathetic fibers

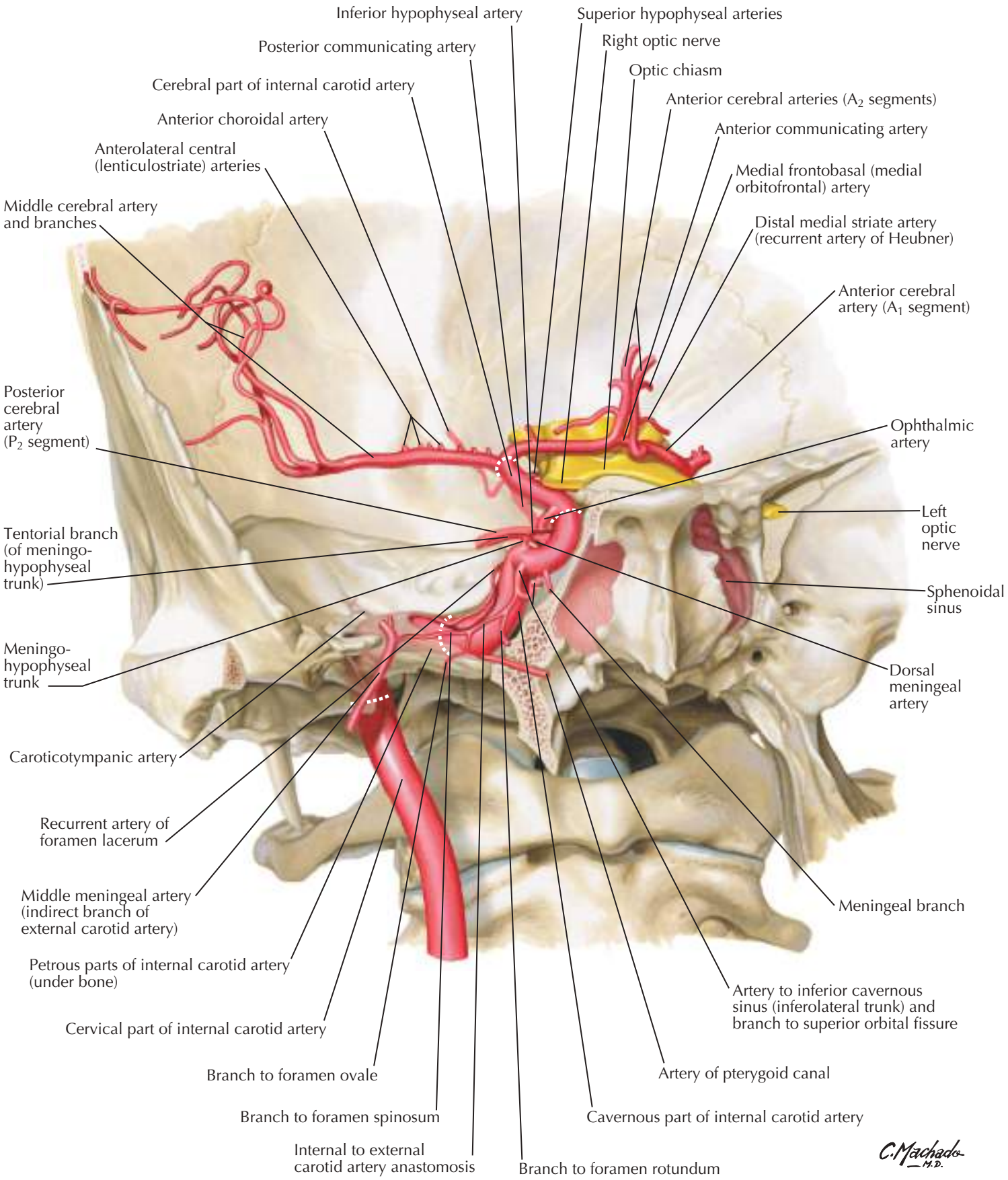
Taste Pathways: Schema

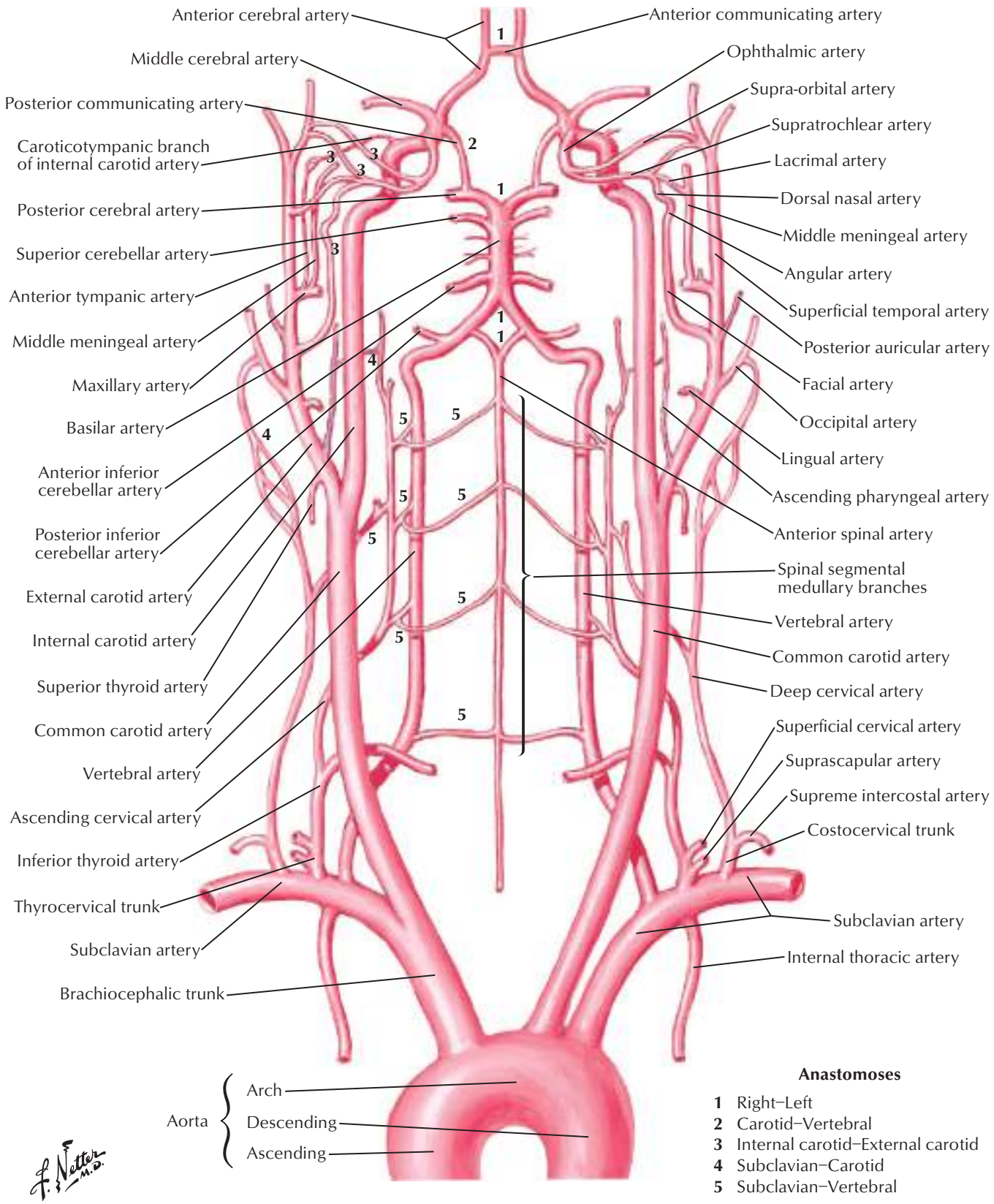
See also Plates 124, 126, 127

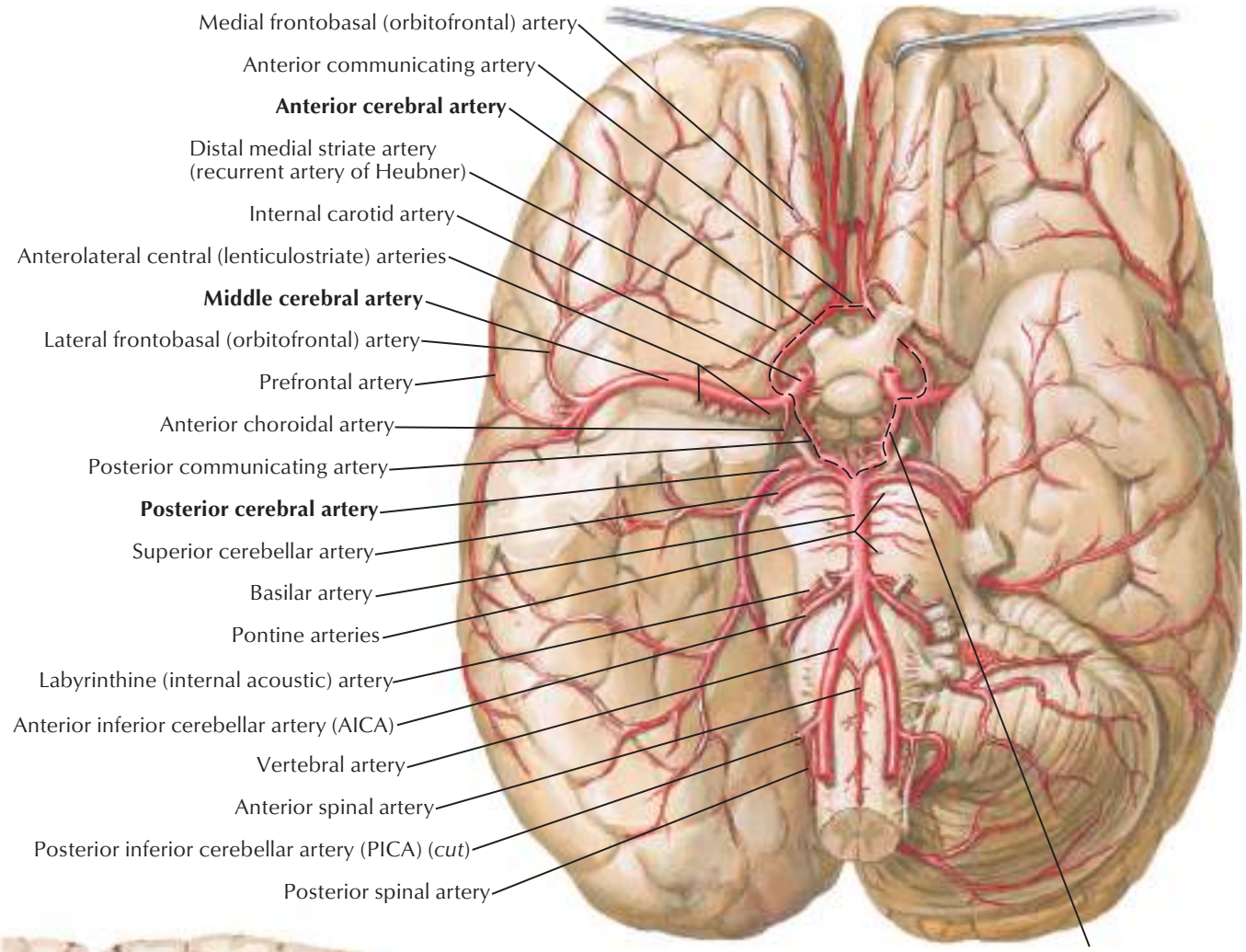


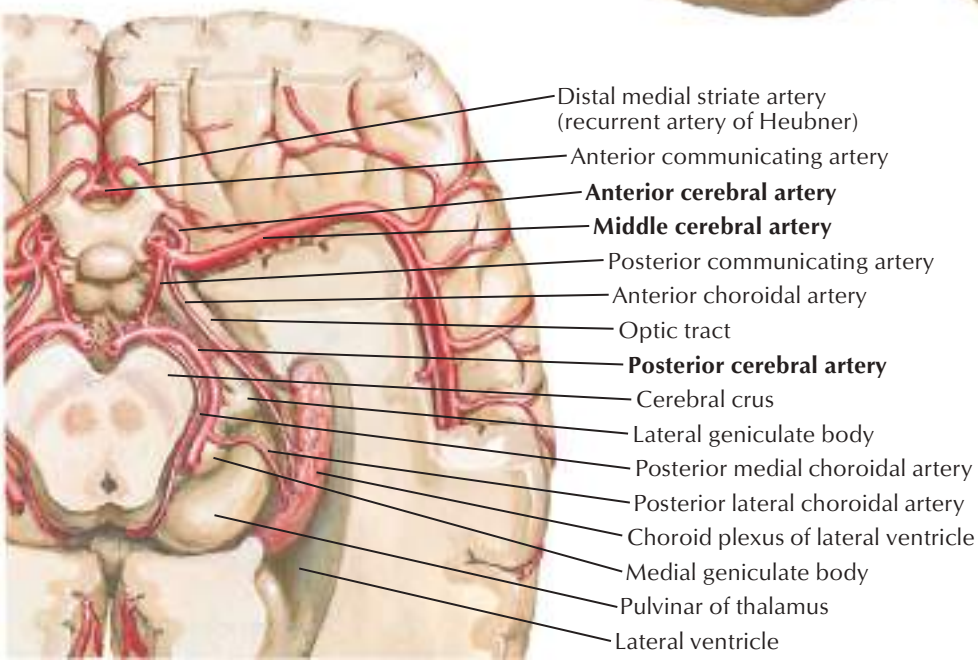

Left middle meningeal artery
Middle cerebral artery
Posterior cerebral artery
Anterior cerebral artery
Superior cerebellar artery
Anterior communicating artery
Basilar artery
Ophthalmic artery
Left labyrinthine (internal acoustic) artery
Posterior communicating artery
Mastoid branch of left occipital artery
Cavernous sinus
Anterior inferior cerebellar artery
Middle meningeal artery
Posterior meningeal branch of left ascending pharyngeal artery
Posterior inferior cerebellar artery
Left and right vertebral arteries (intracranial part)
Maxillary artery
Superficial temporal artery
Posterior meningeal branch of vertebral artery
External carotid artery
Anterior meningeal branch of vertebral artery
Facial artery
Posterior auricular artery
Lingual artery
Occipital artery
Ascending pharyngeal artery
Internal carotid artery
Superior laryngeal artery
Carotid sinus
Superior thyroid artery
Carotid body
Common carotid artery
Vertebral artery (cervical part)
Inferior thyroid artery
Transverse process of C6
Thyrocervical trunk
Deep cervical artery
Brachiocephalic trunk
Supreme intercostal artery
Costocervical trunk
Subclavian artery
F. Netter M.D.

Internal Carotid Artery in Petrous Part of Temporal Bone




Anterior cerebral artery
Middle cerebral artery
Posterior communicating artery
Caroticotympanic branch of internal carotid artery
Posterior cerebral artery
Superior cerebellar artery
Anterior tympanic artery
Middle meningeal artery
Maxillary artery
Basilar artery
Anterior inferior cerebellar artery
Posterior inferior cerebellar artery
External carotid artery
Internal carotid artery
Superior thyroid artery
Common carotid artery
Vertebral artery
Ascending cervical artery
Inferior thyroid artery
Thyrocervical trunk
Subclavian artery
Brachiocephalic trunk
Aorta
Arch
Descending
Ascending
Anterior communicating artery
Ophthalmic artery
Supra-orbital artery
Supratrochlear artery
Lacrimal artery
Dorsal nasal artery
Middle meningeal artery
Angular artery
Superficial temporal artery
Posterior auricular artery
Facial artery
Occipital artery
Lingual artery
Ascending pharyngeal artery
Anterior spinal artery
Spinal segmental medullary branches
Vertebral artery
Common carotid artery
Deep cervical artery
Superficial cervical artery
Suprascapular artery
Supreme intercostal artery
Costocervical trunk
Subclavian artery
Internal thoracic artery
1
2
3
4
5
Anastomoses
1 Right–Left
2 Carotid–Vertebral
3 Internal carotid–External carotid
4 Subclavian–Carotid
5 Subclavian–Vertebral

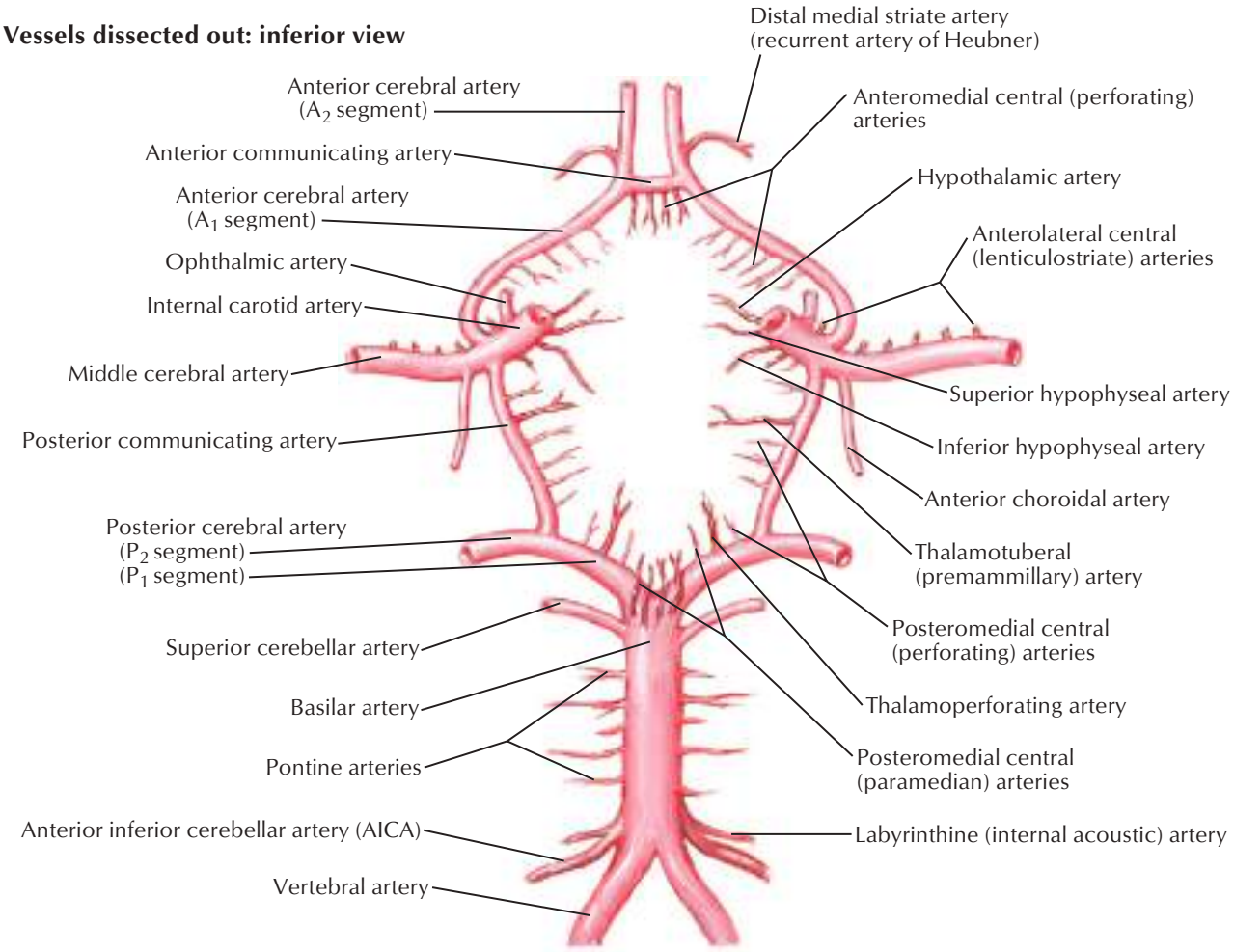

Medial frontobasal (orbitofrontal) artery
Anterior communicating artery
Anterior cerebral artery
Distal medial striate artery (recurrent artery of Heubner)
Internal carotid artery
Anterolateral central (lenticulostriate) arteries
Middle cerebral artery
Lateral frontobasal (orbitofrontal) artery
Prefrontal artery
Anterior choroidal artery
Posterior communicating artery
Posterior cerebral artery
Superior cerebellar artery
Basilar artery
Pontine arteries
Labyrinthine (internal acoustic) artery
Anterior inferior cerebellar artery (AICA)
Vertebral artery
Anterior spinal artery
Posterior inferior cerebellar artery (PICA) (cut)
Posterior spinal artery
Cerebral arterial circle (of Willis) (broken line)


Distal medial striate artery (recurrent artery of Heubner)
Anterior communicating artery
Anterior cerebral artery
Middle cerebral artery
Posterior communicating artery
Anterior choroidal artery
Optic tract
Posterior cerebral artery
Cerebral crus
Lateral geniculate body
Posterior medial choroidal artery
Posterior lateral choroidal artery
Choroid plexus of lateral ventricle
Medial geniculate body
Pulvinar of thalamus
Lateral ventricle

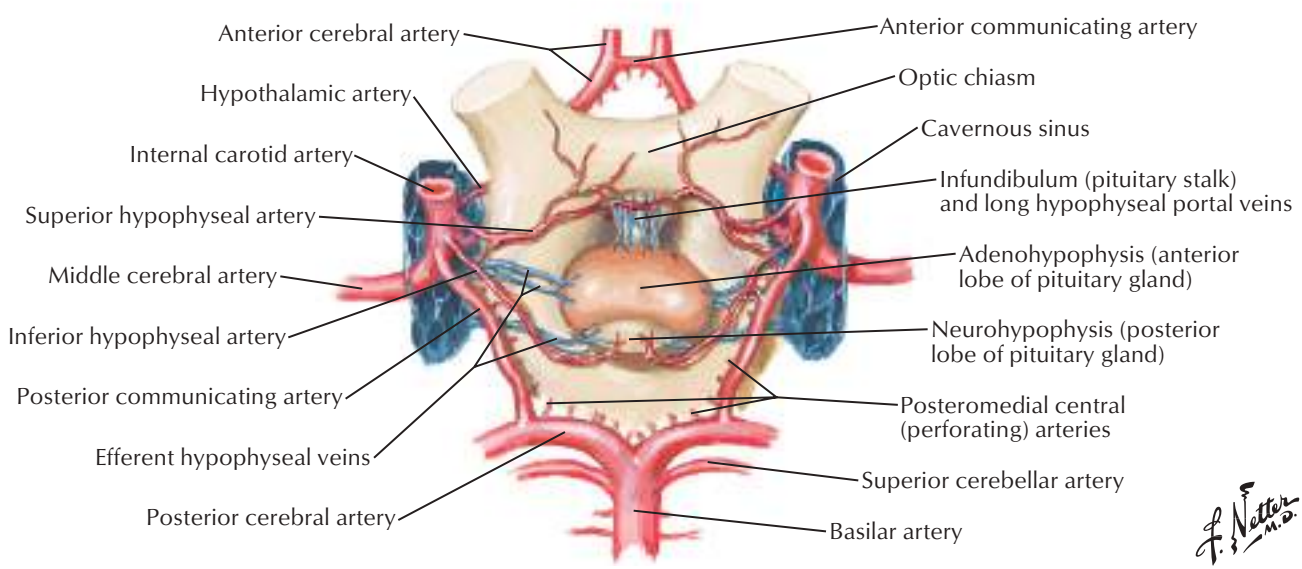
Cerebral Arterial Circle (of Willis)

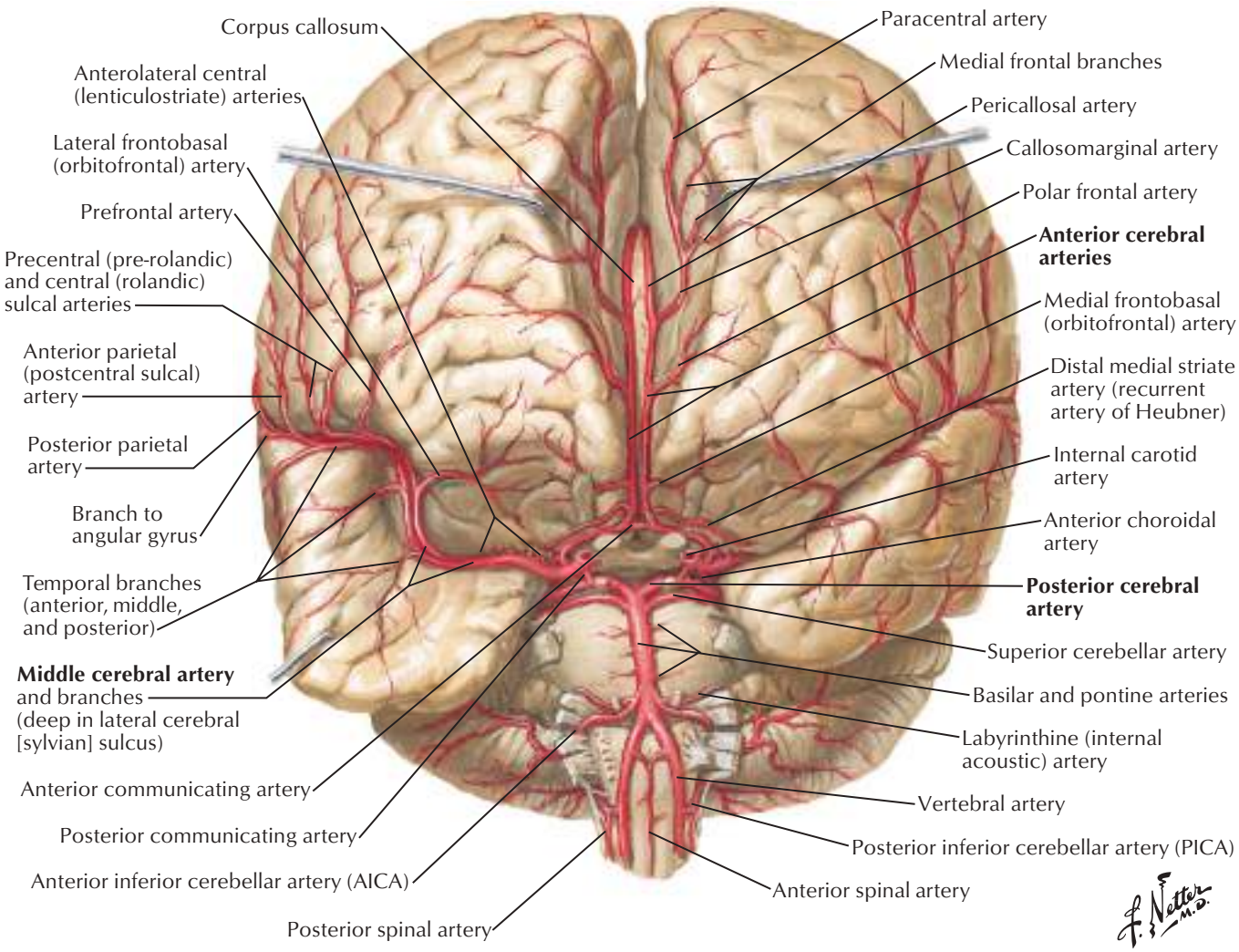
For hypophyseal arteries see **Plate 149**

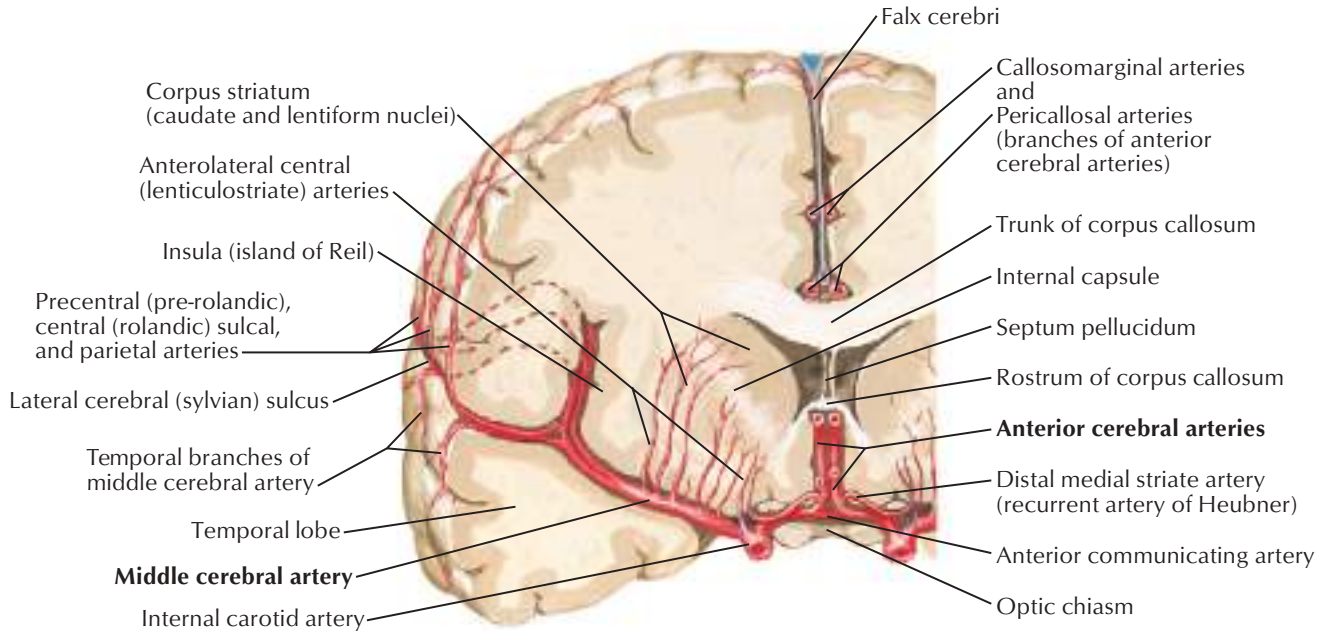
Vessels dissected out: inferior view

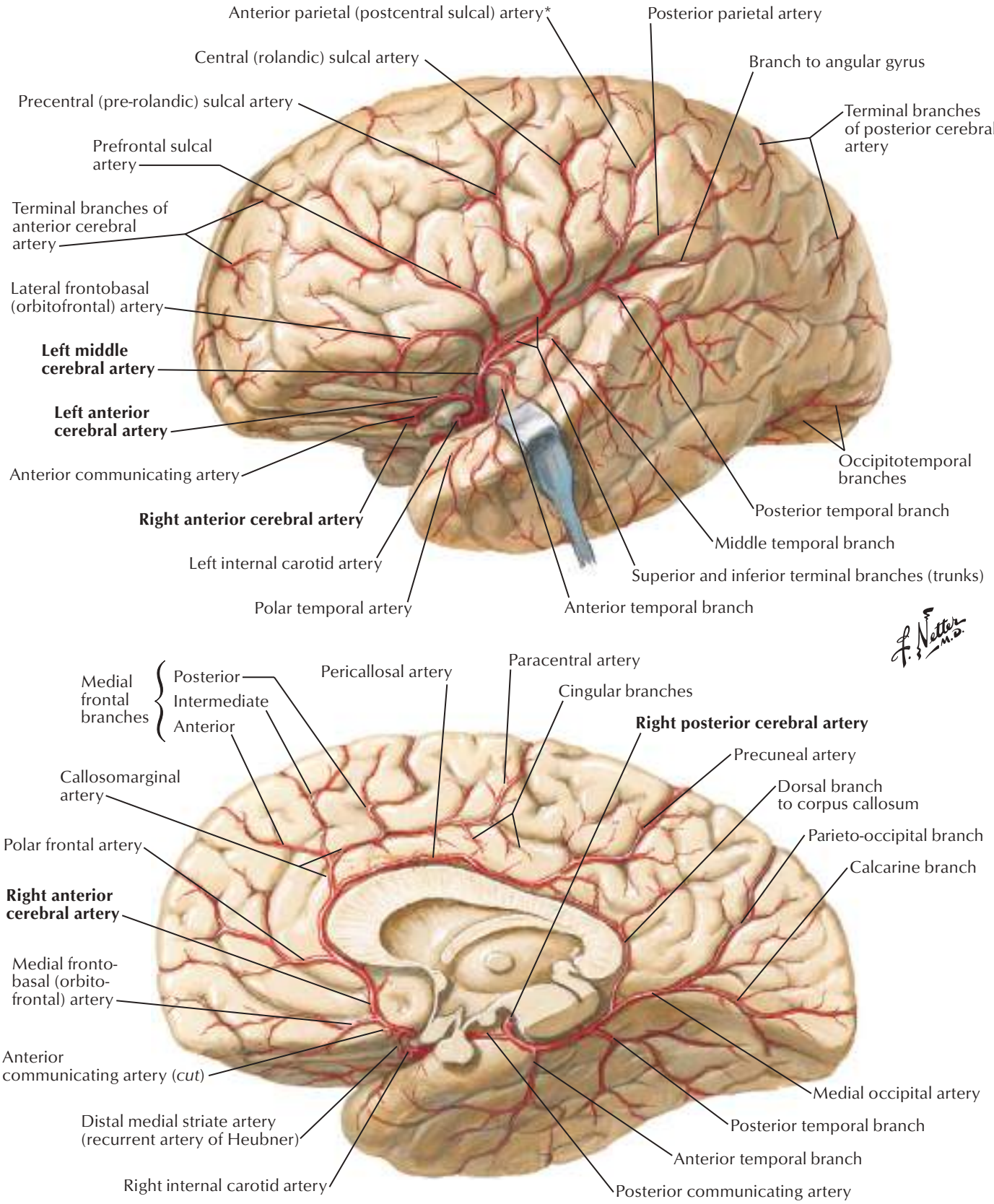


Vessels in situ: inferior view

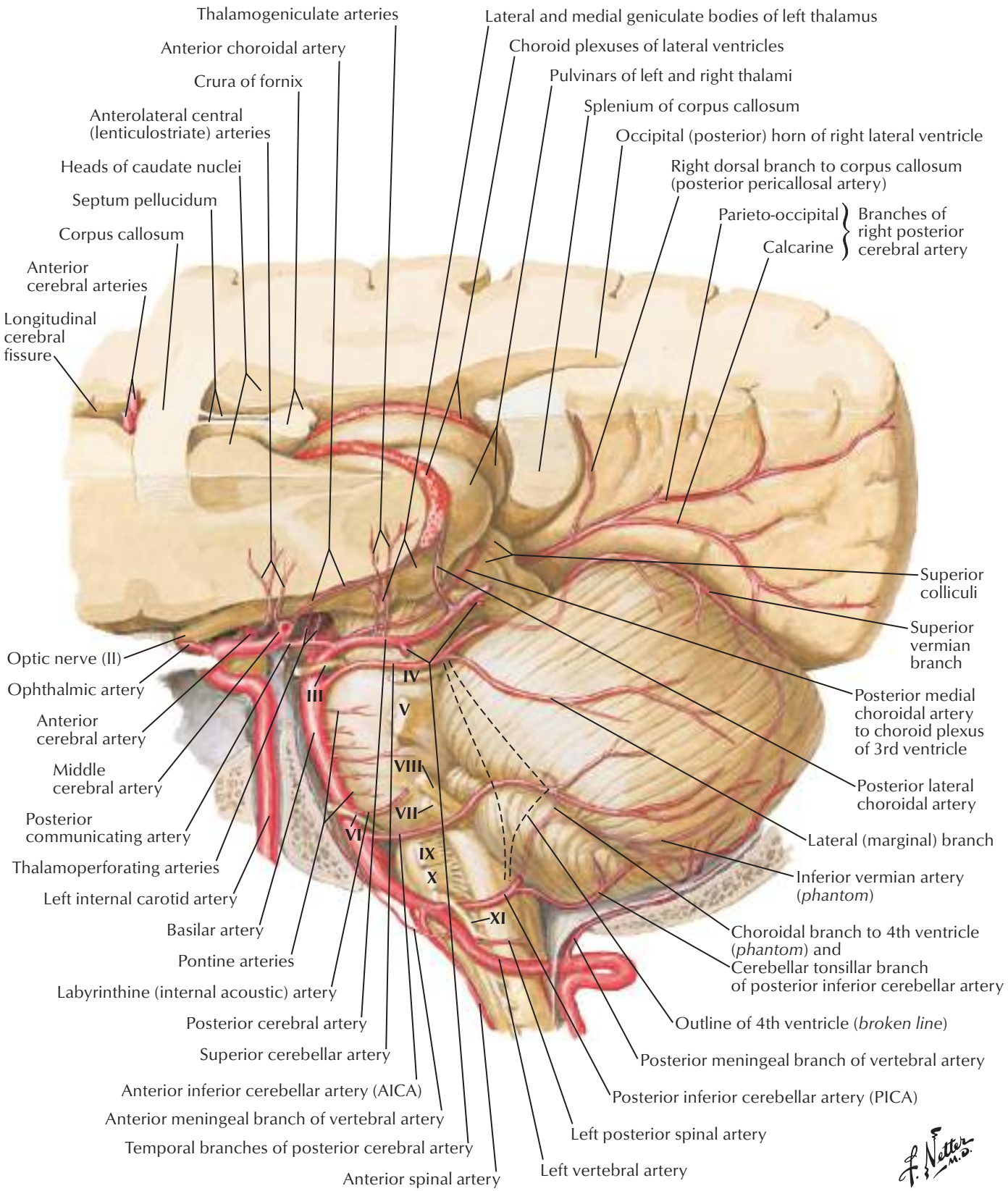


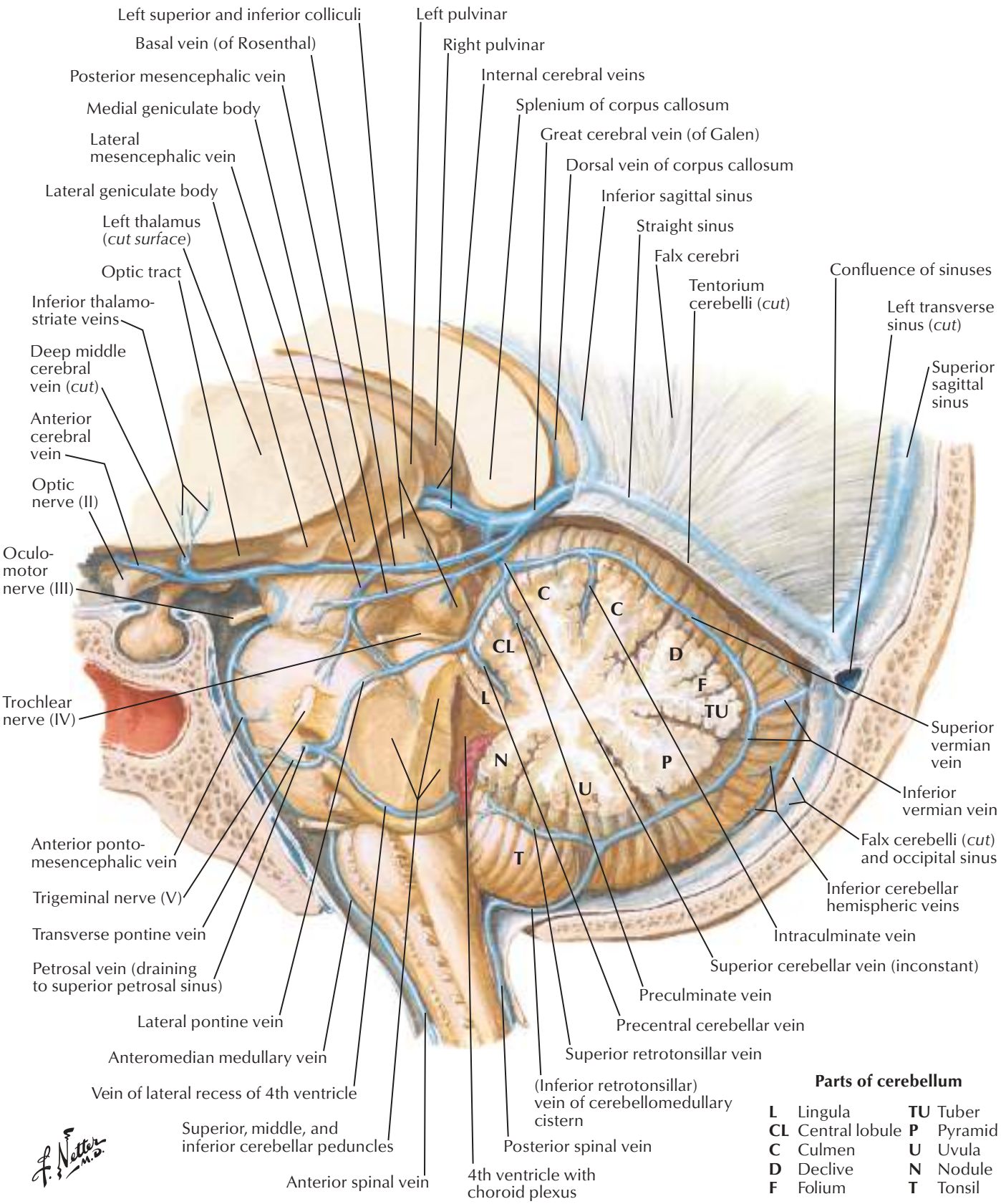

Corpus callosum
Anterolateral central (lenticulostriate) arteries
Lateral frontobasal (orbitofrontal) artery
Prefrontal artery
Precentral (pre-rolandic) and central (rolandic) sulcal arteries
Anterior parietal (postcentral sulcal) artery
Posterior parietal artery
Branch to angular gyrus
Temporal branches (anterior, middle, and posterior)
Middle cerebral artery and branches (deep in lateral cerebral [sylvian] sulcus)
Anterior communicating artery
Posterior communicating artery
Anterior inferior cerebellar artery (AICA)
Posterior spinal artery
Paracentral artery
Medial frontal branches
Pericallosal artery
Callosomarginal artery
Polar frontal artery
Anterior cerebral arteries
Medial frontobasal (orbitofrontal) artery
Distal medial striate artery (recurrent artery of Heubner)
Internal carotid artery
Anterior choroidal artery
Posterior cerebral artery
Superior cerebellar artery
Basilar and pontine arteries
Labyrinthine (internal acoustic) artery
Vertebral artery
Posterior inferior cerebellar artery (PICA)
Anterior spinal artery


Falx cerebri
Corpus striatum (caudate and lentiform nuclei)
Anterolateral central (lenticulostriate) arteries
Insula (island of Reil)
Precentral (pre-rolandic), central (rolandic) sulcal, and parietal arteries
Lateral cerebral (sylvian) sulcus
Temporal branches of middle cerebral artery
Temporal lobe
Middle cerebral artery
Internal carotid artery
Callosomarginal arteries and Pericallosal arteries (branches of anterior cerebral arteries)
Trunk of corpus callosum
Internal capsule
Septum pellucidum
Rostrum of corpus callosum
Anterior cerebral arteries
Distal medial striate artery (recurrent artery of Heubner)
Anterior communicating artery
Optic chiasm



*Note: Anterior parietal (postcentral sulcal) artery also occurs as separate anterior parietal and postcentral sulcal arteries.


Thalamogeniculate arteries
Anterior choroidal artery
Crura of fornix
Anterolateral central (lenticulostriate) arteries
Heads of caudate nuclei
Septum pellucidum
Corpus callosum
Anterior cerebral arteries
Longitudinal cerebral fissure
Lateral and medial geniculate bodies of left thalamus
Choroid plexuses of lateral ventricles
Pulvinars of left and right thalami
Splenium of corpus callosum
Occipital (posterior) horn of right lateral ventricle
Right dorsal branch to corpus callosum (posterior pericallosal artery)
Parieto-occipital
Calcarine
Branches of right posterior cerebral artery
Superior colliculi
Superior vermian branch
Posterior medial choroidal artery to choroid plexus of 3rd ventricle
Posterior lateral choroidal artery
Lateral (marginal) branch
Inferior vermian artery (phantom)
Choroidal branch to 4th ventricle (phantom) and Cerebellar tonsillar branch of posterior inferior cerebellar artery
Outline of 4th ventricle (broken line)
Posterior meningeal branch of vertebral artery
Posterior inferior cerebellar artery (PICA)
Left posterior spinal artery
Left vertebral artery
Optic nerve (II)
Ophthalmic artery
Anterior cerebral artery
Middle cerebral artery
Posterior communicating artery
Thalamoperforating arteries
Left internal carotid artery
Basilar artery
Pontine arteries
Labyrinthine (internal acoustic) artery
Posterior cerebral artery
Superior cerebellar artery
Anterior inferior cerebellar artery (AICA)
Anterior meningeal branch of vertebral artery
Temporal branches of posterior cerebral artery
Anterior spinal artery
III
IV
V
VI
VII
VIII
IX
X
XI

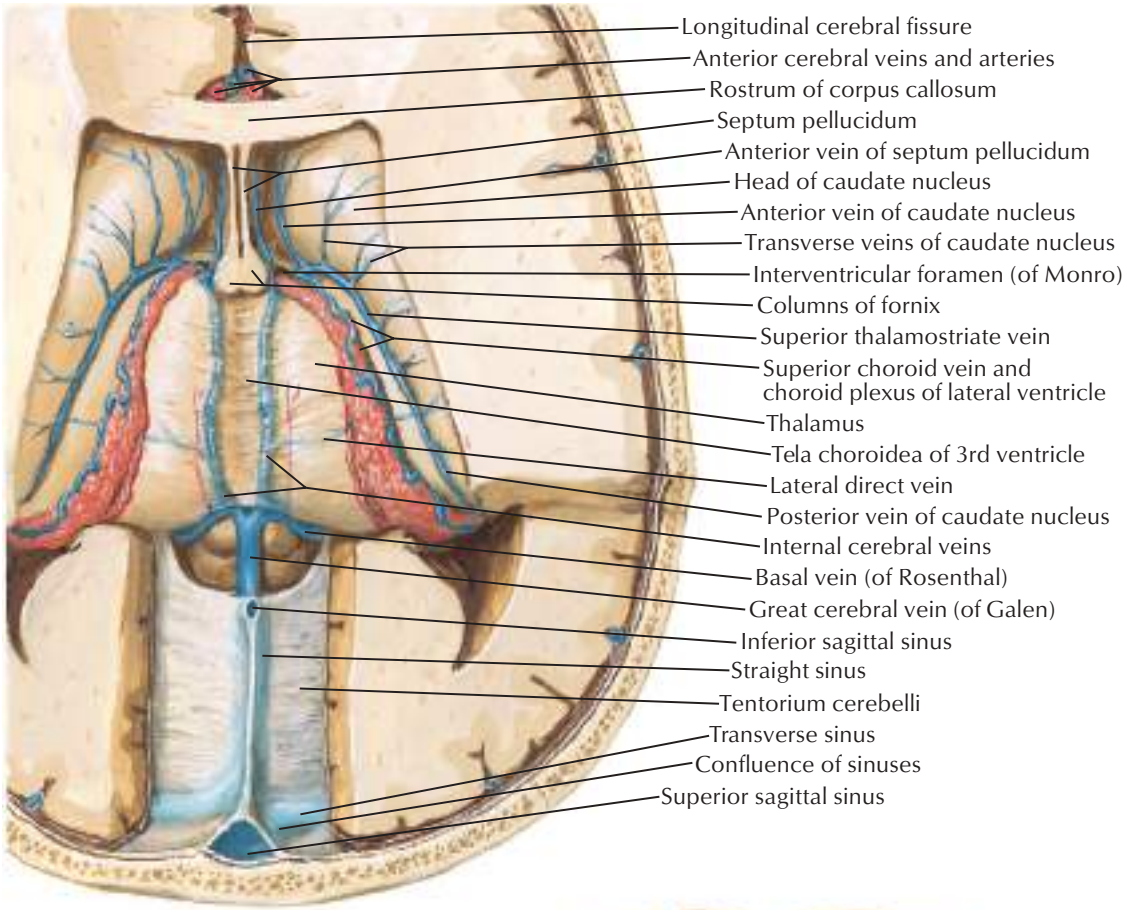


Parts of cerebellum

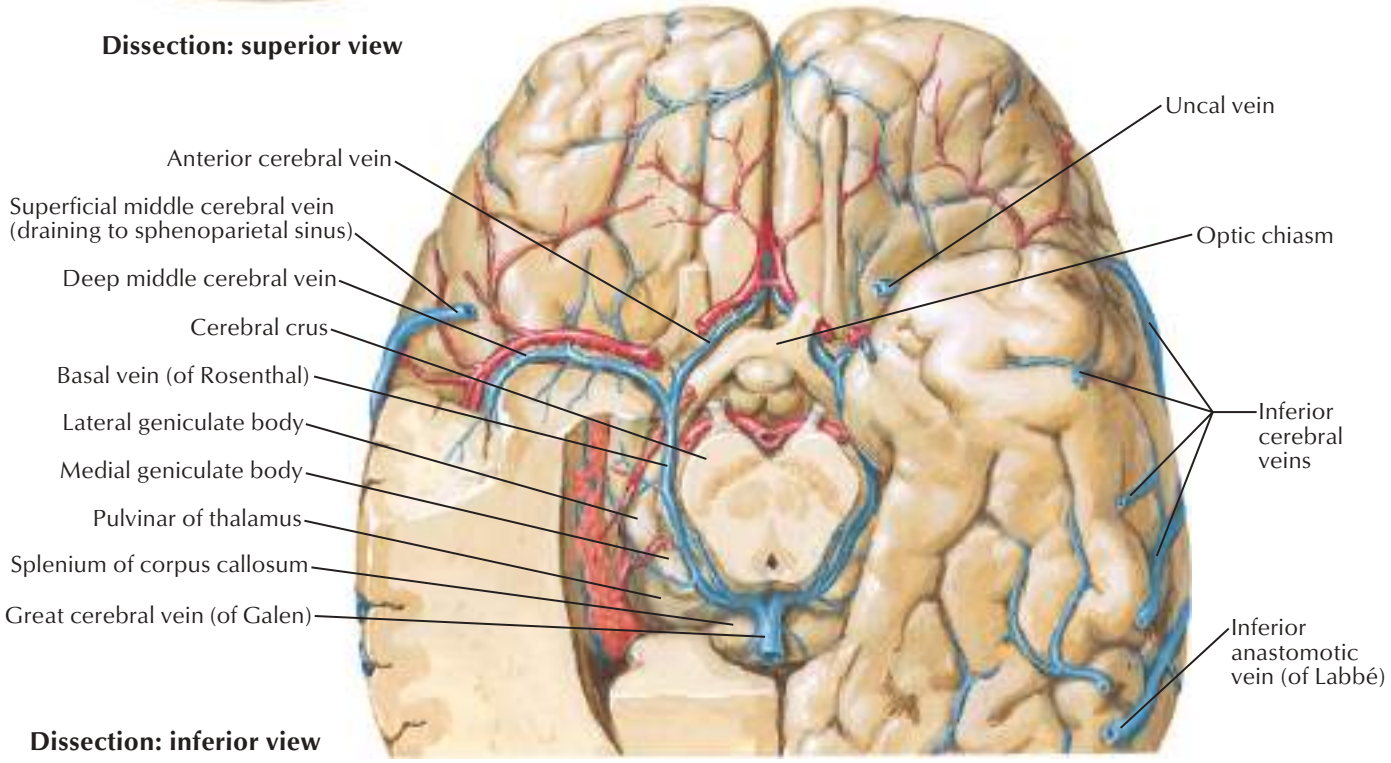
L	Lingula	**TU**	Tuber
CL	Central lobule	**P**	Pyramid
C	Culmen	**U**	Uvula
D	Declive	**N**	Nodule
F	Folium	**T**	Tonsil

Deep Veins of Brain

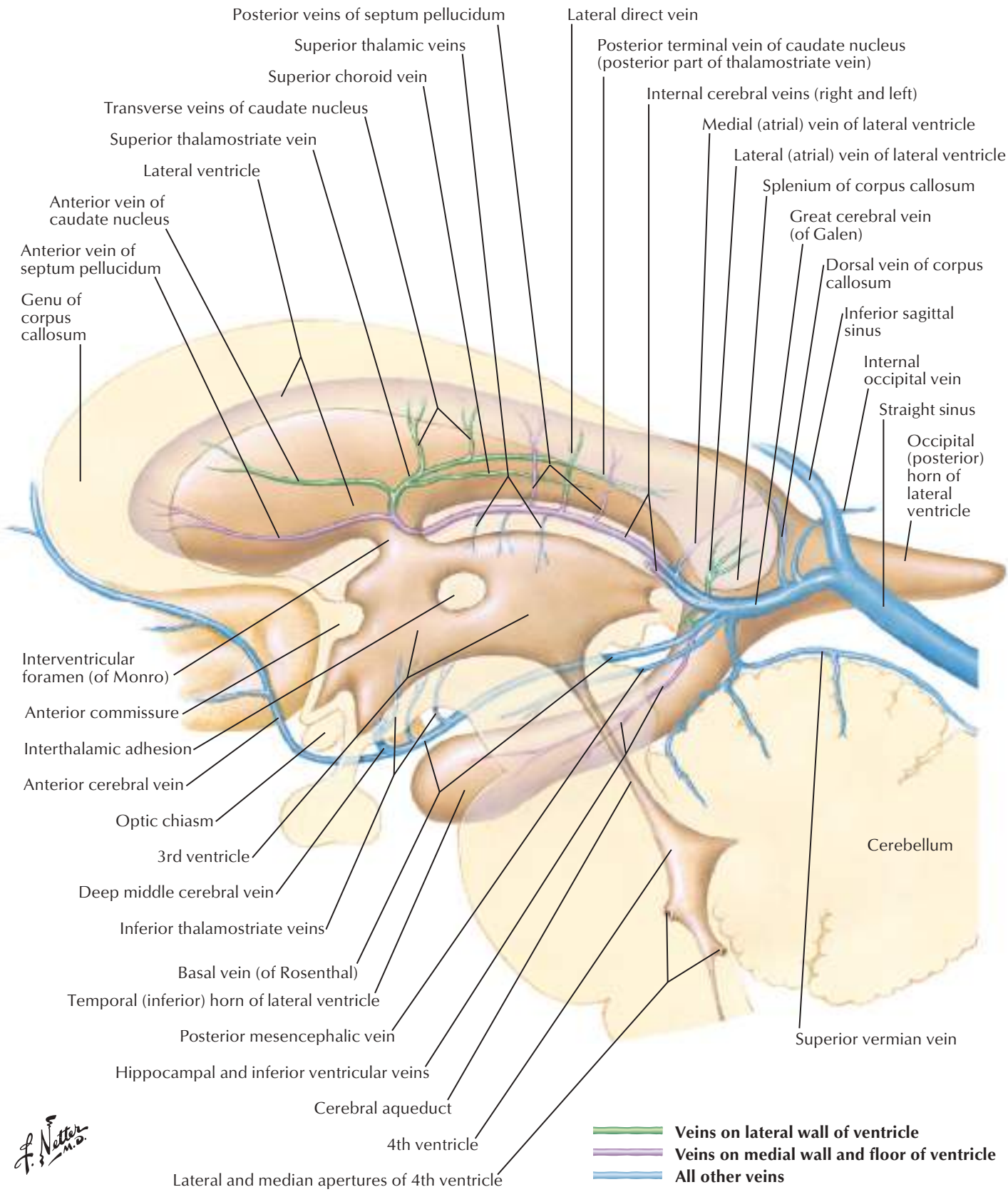
For superficial veins of brain see **Plate 103**

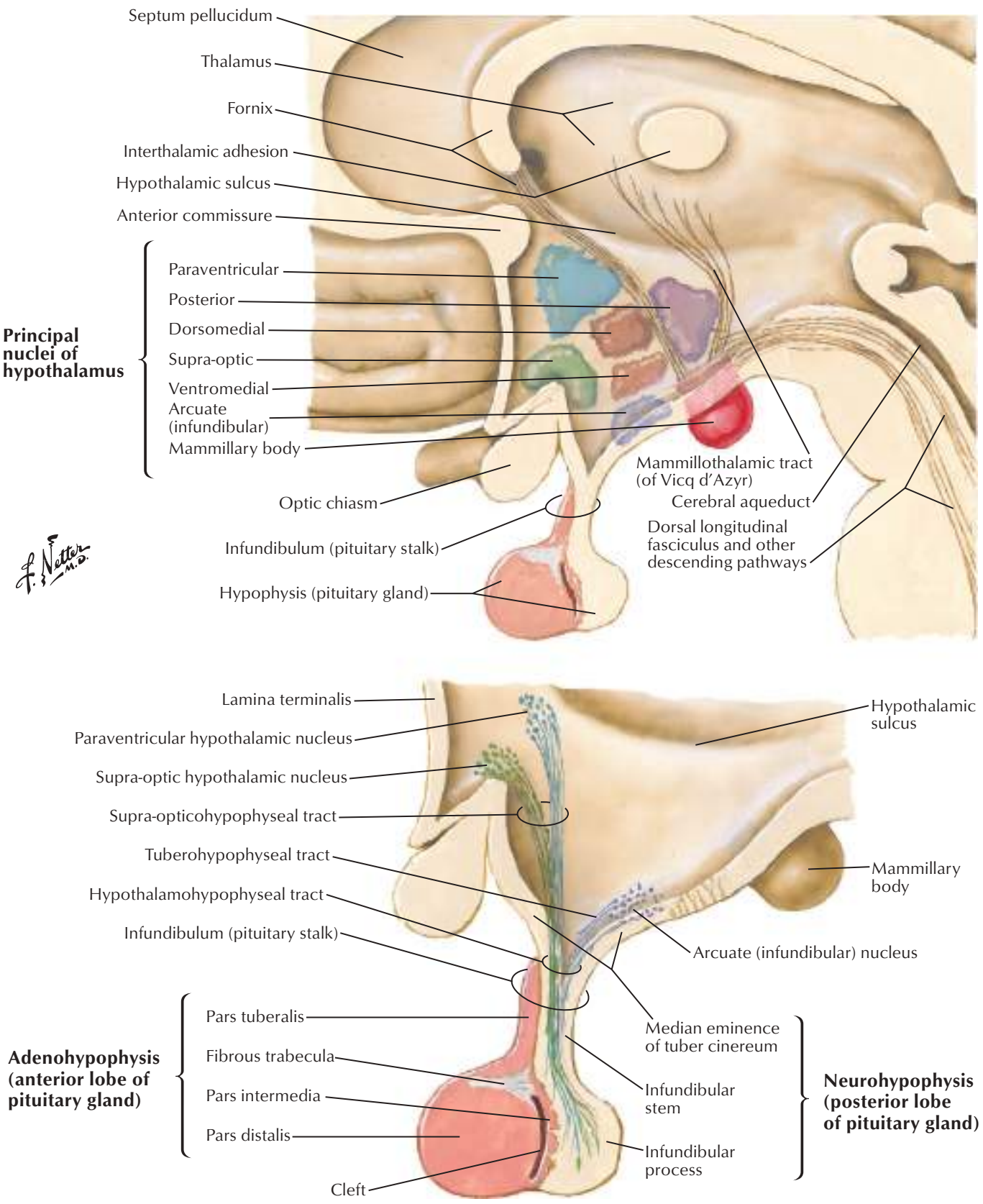


Dissection: superior view



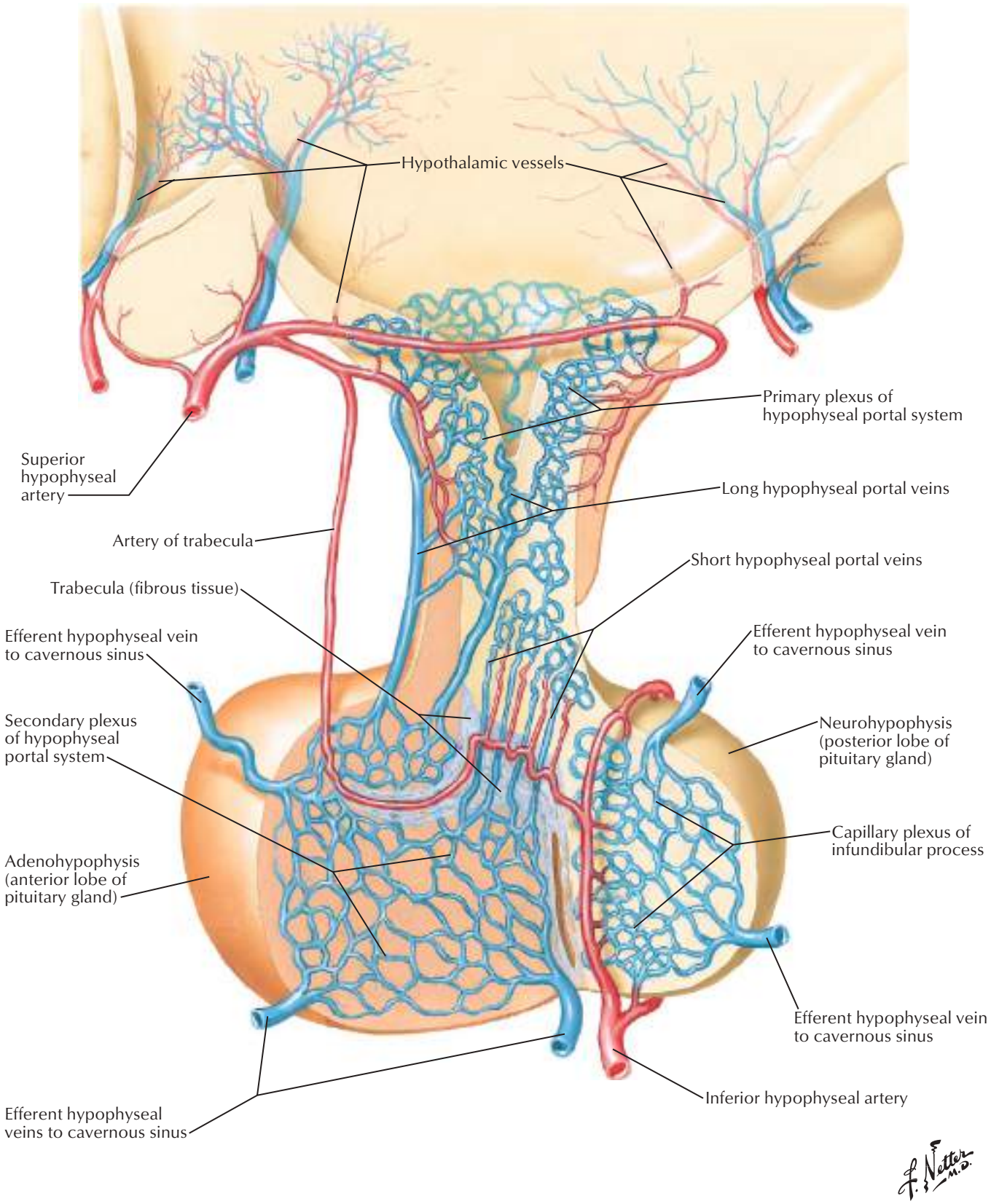
Dissection: inferior view


Posterior veins of septum pellucidum
Superior thalamic veins
Superior choroid vein
Transverse veins of caudate nucleus
Superior thalamostriate vein
Lateral ventricle
Anterior vein of caudate nucleus
Anterior vein of septum pellucidum
Genu of corpus callosum
Lateral direct vein
Posterior terminal vein of caudate nucleus (posterior part of thalamostriate vein)
Internal cerebral veins (right and left)
Medial (atrial) vein of lateral ventricle
Lateral (atrial) vein of lateral ventricle
Splenium of corpus callosum
Great cerebral vein (of Galen)
Dorsal vein of corpus callosum
Inferior sagittal sinus
Internal occipital vein
Straight sinus
Occipital (posterior) horn of lateral ventricle
Interventricular foramen (of Monro)
Anterior commissure
Interthalamic adhesion
Anterior cerebral vein
Optic chiasm
3rd ventricle
Deep middle cerebral vein
Inferior thalamostriate veins
Basal vein (of Rosenthal)
Temporal (inferior) horn of lateral ventricle
Posterior mesencephalic vein
Hippocampal and inferior ventricular veins
Cerebral aqueduct
4th ventricle
Lateral and median apertures of 4th ventricle
Cerebellum
Superior vermian vein
Veins on lateral wall of ventricle
Veins on medial wall and floor of ventricle
All other veins


Septum pellucidum
Thalamus
Fornix
Interthalamic adhesion
Hypothalamic sulcus
Anterior commissure
Principal nuclei of hypothalamus
Paraventricular
Posterior
Dorsomedial
Supra-optic
Ventromedial
Arcuate (infundibular)
Mammillary body
Optic chiasm
Infundibulum (pituitary stalk)
Hypophysis (pituitary gland)
Mammillothalamic tract (of Vicq d'Azyr)
Cerebral aqueduct
Dorsal longitudinal fasciculus and other descending pathways
Lamina terminalis
Paraventricular hypothalamic nucleus
Supra-optic hypothalamic nucleus
Supra-opticohypophyseal tract
Tuberohypophyseal tract
Hypothalamohypophyseal tract
Infundibulum (pituitary stalk)
Hypothalamic sulcus
Mammillary body
Arcuate (infundibular) nucleus
Adenohypophysis (anterior lobe of pituitary gland)
Pars tuberalis
Fibrous trabecula
Pars intermedia
Pars distalis
Cleft
Median eminence of tuber cinereum
Infundibular stem
Infundibular process
Neurohypophysis (posterior lobe of pituitary gland)

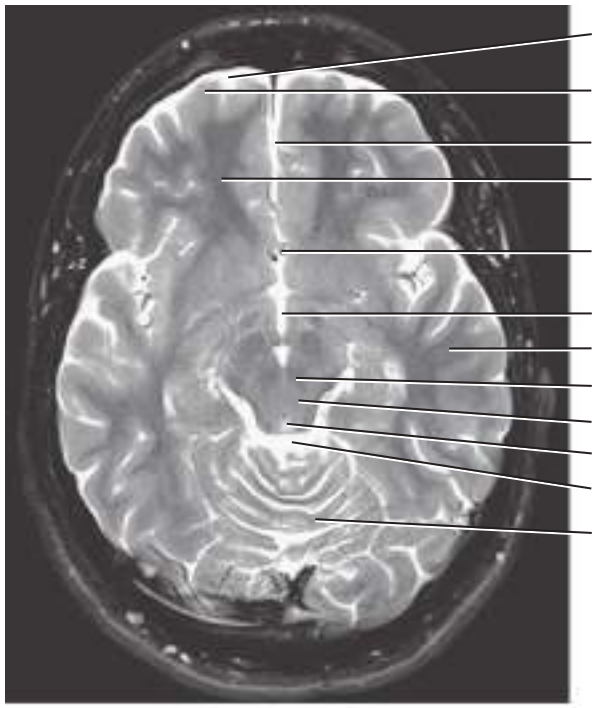
Arteries and Veins of Hypothalamus and Hypophysis

See also Plate 141

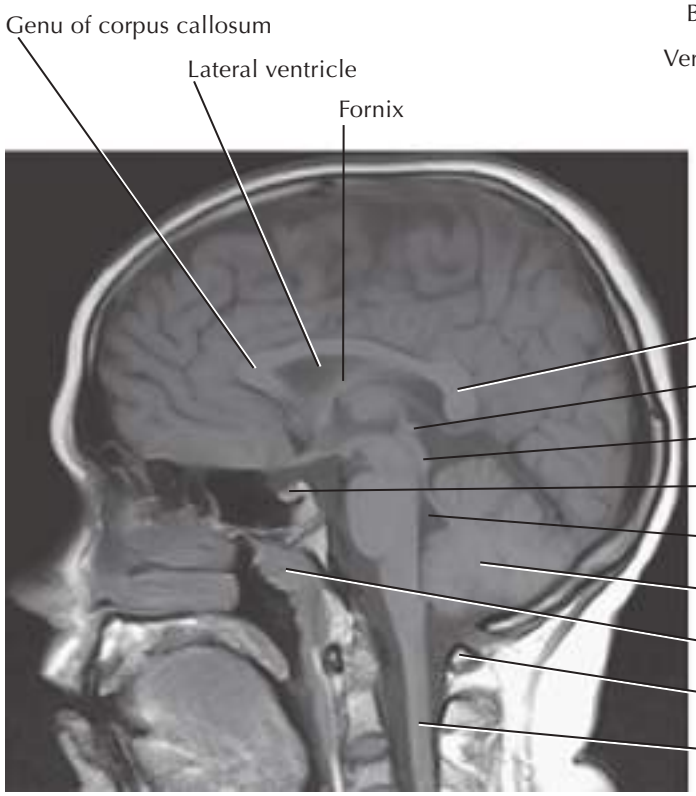


Bridging vein
Superior sagittal sinus
Internal cerebral vein
Great cerebral vein (of Galen)
Straight sinus
Transverse sinus
Sigmoid sinus
Internal jugular vein

Anterior cerebral artery
Anterior communicating artery
Middle cerebral artery
Posterior communicating artery
Posterior cerebral artery
Basilar artery
Internal carotid artery
Vertebral artery


Subarachnoid space
Gray matter
Longitudinal fissure
White matter
Anterior cerebral artery
Third ventricle
Temporal lobe
Red nucleus
Midbrain
Cerebral aqueduct
Quadrigeminal cistern
Cerebellum

Superior sagittal sinus
Corpus callosum
Head of caudate
Lateral ventricle
Third ventricle
Pons
Basilar artery
Vertebral artery


Genu of corpus callosum
Lateral ventricle
Fornix
Splenium of corpus callosum
Pineal gland
Tectum
Pituitary gland
Fourth ventricle
Cerebellum
Pharyngeal tonsil
Posterior arch of atlas
Spinal cord

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Auricularis anterior	Temporal fascia, epicranial aponeurosis	Anterior part of medial surface of helix of ear	Posterior auricular and temporal branches of facial nerve	Elevates and draws ear forward	Auricular branch of posterior auricular artery, parietal branch of superficial temporal artery	External ear
Auricularis posterior	Base of mastoid process	Lower part of cranial surface of auricle	Posterior auricular and temporal branches of facial nerve	Retracts and elevates ear	Auricular branch of posterior auricular artery, parietal branch of superficial temporal artery	External ear
Auricularis superior	Temporal fascia, epicranial aponeurosis	Upper part of medial surface of auricle	Posterior auricular and temporal branches of facial nerve	Retracts and elevates ear	Auricular branch of posterior auricular artery, parietal branch of superficial temporal artery	External ear
Buccinator	Posterior portion of alveolar process of maxilla and mandible opposite sockets of molar teeth, anterior border of pterygomandibular raphe	Angle of mouth	Buccal branches of facial nerve	Compresses cheeks, expels air between lips, aids in mastication	Muscular branches of facial artery, buccal branch of maxillary artery	Facial expression
Ciliary	Corneoscleral junction	Ciliary body	Parasympathetic fibers via short ciliary nerves (CN III)	Constricts ciliary body and lens rounds up (accommodation)	Ophthalmic artery	Intrinsic eye
Corrugator supercilii	Medial part of supra-orbital margin	Skin of medial half of eyebrow	Zygomatic and temporal branches of facial nerve	Draws eyebrows downward and medially, produces wrinkles in frowning	Zygomatic and anterior branches of superficial temporal artery	Facial expression
Cricothyroid	Anterior cricoid cartilage	Inferior border of thyroid cartilage and its inferior horn	External branch of superior laryngeal nerve	Lengthens and tenses vocal ligaments	Superior and inferior thyroid arteries	Laryngeal
Depressor anguli oris	Continuous with platysma on oblique line of mandible	Angle of mouth into orbicularis and skin	Mandibular and buccal branches of facial nerve	Depresses angle of mouth	Inferior labial branch of facial artery	Facial expression
Depressor labii inferioris	Lateral surface of mandible between symphysis and mental foramen deep to depressor anguli oris	Skin to lower lip, mingling with orbicularis oris, medial fibers joining those of opposite side	Mandibular and buccal branches of facial nerve	Depresses lower lip and draws it lateralward	Inferior labial branch of facial artery	Facial expression
Depressor septi nasi	Incisive fossa of maxilla	Septum and posterior part of ala of nose	Zygomatic and buccal branches of facial nerve	Narrows nostril, draws septum downward	Superior labial branch of facial artery	Facial expression
Digastric	*Anterior belly:* digastric fossa of mandible *Posterior belly*: mastoid notch of temporal bone	Intermediate tendon attached to body of hyoid	*Anterior belly:* nerve to mylohyoid *Posterior belly:* facial nerve	Raises hyoid bone and base of tongue, steadies hyoid bone, opens mouth by lowering mandible	*Anterior belly*: branches of submental artery *Posterior belly:* muscular branches of posterior auricular artery, muscular branches of occipital artery	Suprahyoid
Dilator pupillae	Radial fibers in iris	Blends with sphincter pupillae fibers	Sympathetic fibers from SCG	Dilates pupil	Ophthalmic artery	Intrinsic eye
Frontal belly of occipitofrontalis	Epicranial aponeurosis at level of coronal suture	Skin of frontal region, epicranial aponeurosis	Temporal branches of facial nerve	Wrinkles forehead skin, raises eyebrows	Frontal branch of superficial temporal artery	Facial expression

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

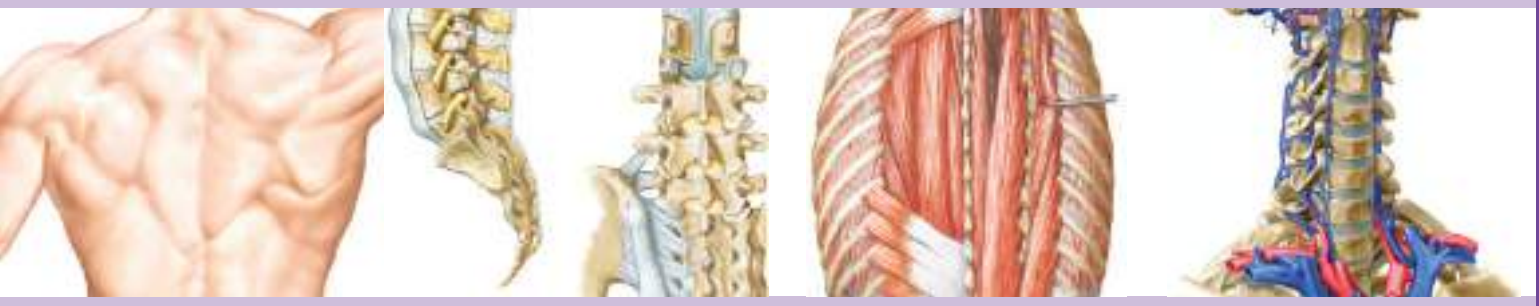
MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Genioglossus	Mental spine of mandible	Dorsum of tongue, hyoid bone	Hypoglossal nerve (CN XII)	Depresses and protrudes tongue	Sublingual and submental arteries	Extrinsic tongue
Geniohyoid	Inferior genial tubercle on back of symphysis of mandible	Anterior surface of body of hyoid bone	Branch of C1 through hypoglossal nerve (CN XII)	Elevates hyoid bone and depresses mandible	Sublingual branch of lingual artery	Suprahyoid
Hyoglossus	Body and greater horn of hyoid bone	Lateral and inferior aspect of tongue	Hypoglossal nerve (CN XII)	Depresses and retracts tongue	Sublingual and submental arteries	Extrinsic tongue
Inferior longitudinal muscle of tongue	Under surface of tongue between genioglossus and hyoglossus	Tip of tongue blending with styloglossus	Hypoglossal nerve (CN XII)	Shortens tongue, turns tip and sides downward	Deep lingual branch of lingual artery, branches from facial artery	Intrinsic tongue
Inferior oblique	Anterior floor of orbit lateral to nasolacrimal canal	Lateral sclera deep to lateral rectus	Oculomotor nerve (CN III), inferior division	Abducts, elevates, and laterally rotates eyeball	Ophthalmic artery	Extra-ocular
Inferior pharyngeal constrictor	Oblique line of thyroid cartilage and cricoid cartilage	Median raphe of pharynx	Vagus nerve via pharyngeal plexus	Constricts wall of pharynx during swallowing	Ascending pharyngeal artery, branches of superior thyroid artery	Circular pharyngeal
Inferior rectus	Common tendinous ring	Inferior aspect of eyeball, posterior to corneoscleral junction	Oculomotor nerve (CN III), inferior division	Depresses, adducts, and laterally rotates eyeball	Ophthalmic artery	Extra-ocular
Lateral crico-arytenoid	Arch of cricoid cartilage	Muscular process of arytenoid cartilage	Recurrent laryngeal nerve	Adducts vocal folds	Superior and inferior thyroid arteries	Laryngeal
Lateral pterygoid	*Superior head:* infratemporal surface of greater wing of sphenoid *Inferior head:* lateral pterygoid plate	Pterygoid fovea, capsule of temporomandibular joint, articular disc	Mandibular nerve ($CN V_3$), muscular branches from anterior division	*Bilaterally:* protrude mandible *Unilaterally and alternately:* produces side-to-side grinding	Muscular branches of maxillary artery	Mastication
Lateral rectus	Common tendinous ring	Lateral aspect of eyeball, posterior to corneoscleral junction	Abducent nerve (CN VI)	Abducts eyeball	Ophthalmic artery	Extra-ocular
Levator anguli oris	Canine fossa of maxilla immediately below infra-orbital foramen and under cover of zygomatic head of levator labii superioris	Angle of mouth; fibers intermingle with orbicularis oris, depressor anguli oris, zygomaticus	Zygomatic and buccal branches of facial nerve	Elevates angle of mouth	Superior labial branch of facial artery	Facial expression
Levator labii superioris alaeque nasi	*Angular head:* upper part of frontal process of maxilla *Infra-orbital head:* orbit above infra-orbital foramen *Zygomatic head:* malar surface of zygomatic bone	*Angular head:* into greater alar cartilage, skin of nose, lateral upper lip *Infra-orbital head:* into muscular substance of upper lip between angular head and caninus *Zygomatic head:* into skin of nasolabial groove and upper lip	Zygomatic and buccal branches of facial nerve	*Angular head:* elevates upper lip and dilates nostril *Infra-orbital head:* raises angle of mouth *Zygomatic head*: elevates upper lip laterally	Superior labial branch and angular branches of facial artery	Facial expression

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Levator labii superioris	Maxilla above infra-orbital foramen	Skin of upper lip	Zygomatic and buccal branches of facial nerve	Elevates upper lip, dilates nares	Superior labial artery and angular branches of facial artery	Facial expression
Levator palpebrae superioris	Lesser wing of sphenoid, anterior to optic canal	Superior tarsal plate	Oculomotor nerve (CN III), superior division	Raises upper eyelid	Ophthalmic artery	Extra-ocular; eyelid
Levator veli palatini	Temporal bone (petrous portion)	Palatine aponeurosis	Vagus nerve via pharyngeal plexus	Elevates soft palate during swallowing	Ascending palatine artery branch of facial artery, descending palatine artery branch of maxillary artery	Palatal
Longus capitis	Anterior tubercles of transverse processes of C3–C6	Inferior surface of basilar part of occipital bone	Ventral rami of cervical nerves (C1–C4)	Flexes and assists in rotating cervical vertebrae and head	Ascending cervical branch of inferior thyroid artery, ascending pharyngeal artery, muscular branches of vertebral artery	Prevertebral
Longus colli	*Vertical portion:* C5–T3 vertebrae *Inferior oblique portion:* T1–T3 vertebrae *Superior oblique portion*: anterior tubercles of transverse processes of C3–C5 vertebrae	*Vertical portion:* into C2–C4 vertebrae *Inferior oblique portion* on anterior tubercles of transverse processes of C5–C6 vertebrae *Superior oblique portion:* tubercle of anterior arch of atlas	Ventral primary rami of cervical nerves (C2–C8)	*Bilaterally*: flex and assist in rotating cervical vertebrae and head *Unilaterally:* flexes vertebral column laterally	Prevertebral branches of ascending pharyngeal artery, muscular branches of ascending cervical and vertebral arteries	Prevertebral
Masseter	Zygomatic arch	Ramus of mandible, coronoid process	Mandibular nerve (CN V_3), via masseteric nerve	Elevates and protrudes mandible; deep fibers retrude it	Transverse facial artery; masseteric branch of maxillary and facial arteries	Mastication
Medial pterygoid	Medial surface of lateral plate of pterygoid, pyramidal process of palatine bone, maxillary tuberosity	Medial surface of ramus and angle of mandible inferior to mandibular foramen	Mandibular nerve (V_3), nerve to medial pterygoid	*Bilaterally:* protrude and elevate mandible *Unilaterally and alternately:* produces side-to-side movements	Facial and maxillary arteries	Mastication
Medial rectus	Common tendinous ring	Medial aspect of eyeball, posterior to corneoscleral junction	Oculomotor nerve (CN III), inferior division	Adducts eyeball	Ophthalmic artery	Extra-ocular
Mentalis	Incisive fossa of mandible	Skin of chin	Mandibular branch of facial nerve	Raises and protrudes lower lip	Inferior labial branch of facial artery	Facial expression
Middle pharyngeal constrictor	Stylohyoid ligament and horns of hyoid bone	Median raphe of pharynx	Vagus nerve via pharyngeal plexus	Constricts wall of pharynx during swallowing	Ascending pharyngeal artery, ascending palatine and tonsillar branches of facial artery, dorsal lingual branches of lingual artery	Circular pharyngeal
Mylohyoid	Mylohyoid line of mandible	Median raphe and body of hyoid bone	Nerve to mylohyoid nerve (branch of trigeminal nerve)	Elevates hyoid bone, base of tongue, floor of mouth; depresses mandible	Sublingual branch of lingual artery, submental branch of facial artery	Suprahyoid

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Nasalis	Canine eminence above and lateral to incisive fossa of maxilla	Aponeurosis on nasal cartilages	Zygomatic and buccal branches of facial nerve	Draws ala of nose toward septum, compresses nostrils; alar part opens nostrils	Superior labial, septal, and lateral nasal branches of facial artery	Facial expression
Occipital belly (occipitalis) of epicranius	Lateral 2/3 of superior nuchal line and mastoid process	Skin of occipital region, epicranial aponeurosis	Posterior auricular branches of facial nerve	Moves scalp backward	Occipital branch of posterior auricular artery, descending branch of occipital artery	Facial expression
Omohyoid	*Inferior belly:* from upper border of scapula and suprascapular ligament, ending in tendon under sternocleidomastoid muscle *Superior belly:* from this tendon	*Inferior belly:* to intermediate tendon *Superior belly:* to body of hyoid bone	Ansa cervicalis	Steadies hyoid bone and depresses hyoid	Hyoid branch of lingual artery, sternocleidomastoid branch of superior thyroid artery	Infrahyoid
Orbicularis oculi	Medial orbital margin, palpebral ligament, lacrimal bone	Skin around orbit, palpebral ligament, upper and lower eyelids	Facial nerve (CN VII)	Closes eyelids	Facial and superficial temporal arteries	Facial expression
Orbicularis oris	Maxilla above incisor teeth	Skin around lips	Zygomatic, buccal, and mandibular branches of facial nerve	Compression, contraction, and protrusion of lips	Inferior and superior labial branches of facial artery	Facial expression
Palatoglossus	Palatine aponeurosis of soft palate	Lateral aspect of tongue	Vagus nerve via pharyngeal plexus	Elevates posterior tongue, depresses palate	Ascending pharyngeal arteries, palatine branches of facial and maxillary arteries	Palatal
Palatopharyngeus	Hard palate, superior palatine aponeurosis	Lateral pharyngeal wall	Vagus nerve via pharyngeal plexus	Tenses soft palate; pulls walls of pharynx superiorly, anteriorly, and medially during swallowing	Ascending palatine artery branch of facial artery, descending palatine artery branch of maxillary artery	Longitudinal pharyngeal
Platysma	Skin below clavicle, upper thorax	Mandible, oral muscles	Facial nerve	Tenses skin of neck	Submental and suprascapular arteries	Facial expression
Posterior crico-arytenoid	Posterior surface of lamina of cricoid cartilage	Muscular process of arytenoid cartilage	Recurrent laryngeal nerve	Abducts vocal folds	Superior and inferior thyroid arteries	Laryngeal
Procerus	Fascia covering lower parts of nasal bone and upper part of lateral nasal cartilage	Skin between and above eyebrow	Temporal and zygomatic branches of facial nerve	Draws down medial angle of eyebrows, produces transverse wrinkles over bridge of nose	Angular and lateral nasal branches of facial artery	Facial expression
Rectus capitis anterior	Lateral mass of atlas	Base of occipital bone in front of foramen magnum	Ventral rami of cervical nerves (C1–C2)	Flexes head	Muscular branches of vertebral artery, ascending pharyngeal artery	Prevertebral
Rectus capitis lateralis	Upper surface of transverse process of atlas	Inferior surface of jugular process of occipital bone	Ventral rami of cervical nerves (C1–C2)	Flexes head laterally to same side	Muscular branches of vertebral artery, occipital artery, ascending pharyngeal artery	Prevertebral
Risorius	Fascia over masseter superficial to platysma	Skin at angle of mouth	Zygomatic and buccal branches of facial nerve	Retracts angle of mouth	Superior labial branch of facial artery	Facial expression
Salpingopharyngeus	Pharyngotympanic (auditory, eustachian) tube	Side of pharyngeal wall	Vagus nerve via pharyngeal plexus	Elevates pharynx and larynx during swallowing and speaking	Pharyngeal branch of ascending pharyngeal artery	Longitudinal pharyngeal

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Scalene (anterior)	Anterior tubercles of transverse processes of C3–C6	Scalene tubercle on 1st rib	Anterior rami of cervical nerves (C5–C8)	Elevates 1st rib, bends neck	Ascending cervical branch of inferior thyroid artery	Prevertebral
Scalene (medius)	Posterior tubercles of transverse processes of C2–C7	Upper surface of 1st rib (behind subclavian groove)	Anterior rami of cervical nerves (C3–C7)	Elevates 1st rib, bends neck	Muscular branches of ascending cervical artery	Prevertebral
Scalene (posterior)	Posterior tubercles of transverse processes of C4–C6	Outer surface of 2nd rib (behind attachment of serratus anterior)	Anterior rami of lower four cervical nerves	Elevates 2nd rib, bends neck	Muscular branches of ascending cervical division of inferior thyroid artery, superficial branch of transverse cervical artery	Prevertebral
Sphincter pupillae	Circular smooth muscle of iris that passes around pupil	Blends with dilator pupillae fibers	Parasympathetic fibers via oculomotor nerve (CN III)	Constricts pupil	Ophthalmic artery	Intrinsic eye
Stapedius	Pyramidal eminence of temporal bone	Stapes	Facial nerve	Pulls stapes posteriorly to lessen oscillation of tympanic membrane	Posterior auricular, anterior tympanic, and middle meningeal arteries	Middle ear
Sternocleidomastoid	*Sternal head:* anterior surface of manubrium *Clavicular head:* upper surface of medial 1/3 of clavicle	Lateral surface of mastoid process; lateral half of superior nuchal line of occipital bone	Accessory nerve (CN XI)	*Bilaterally:* flex head, raise thorax *Unilaterally:* turns face toward opposite side	Sternocleidomastoid branch of superior thyroid and occipital arteries, muscular branch of suprascapular artery, occipital branch of posterior auricular artery	Neck
Sternohyoid	Posterior surface of manubrium sterni, posterior sternoclavicular ligament, medial end of clavicle	Medial part of lower border of body of hyoid bone	Ansa cervicalis	Depresses larynx and hyoid bone, steadies hyoid bone	Sternocleidomastoid and hyoid branches of superior thyroid artery, hyoid branch of lingual artery	Infrahyoid
Sternothyroid	Posterior surface of manubrium sterni below and deep to origin of sternohyoid, edge of first costal cartilage	Oblique line on lamina of thyroid cartilage	Ansa cervicalis	Depresses larynx and thyroid cartilage	Cricothyroid branch of superior thyroid artery	Infrahyoid
Styloglossus	Styloid process and stylohyoid ligament	Lateral and inferior aspect of tongue	Hypoglossal nerve (CN XII)	Retracts tongue and draws it up for swallowing	Sublingual artery	Extrinsic tongue
Stylohyoid	Posterior border of styloid process	Body of hyoid bone at junction with greater horn	Facial nerve	Elevates hyoid bone and base of tongue	Muscular branches of facial artery, muscular branches of occipital artery	Suprahyoid
Stylopharyngeus	Medial aspect of styloid process	Pharyngeal wall	Glossopharyngeal nerve (CN IX)	Elevates pharynx and larynx during swallowing and speaking	Ascending pharyngeal artery, ascending palatine and tonsillar branches of facial artery, dorsal branches of lingual artery	Longitudinal pharyngeal
Subclavius	Upper border of 1st rib and its cartilage	Inferior surface of middle third of clavicle	Nerve to subclavius	Anchors and depresses clavicle	Clavicular branch of thoraco-acromial artery	Neck
Superior longitudinal muscle of tongue	Submucous fibers at back of tongue	Tip of tongue; unites with muscle of opposite side	Hypoglossal nerve (CN XII)	Shortens tongue, turns tip and sides upward	Deep lingual branch of lingual artery, branches from facial artery	Intrinsic tongue
Superior oblique	Body of sphenoid (above optic foramen), medial to origin of superior rectus	Passes through trochlea, attaches to superior sclera between superior and lateral recti	Trochlear nerve (CN IV)	Abducts, depresses, and medially rotates eyeball	Ophthalmic artery	Extra-ocular

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Superior pharyngeal constrictor	Hamulus, pterygomandibular raphe, mylohyoid line of mandible	Median raphe of pharynx	Vagus nerve via pharyngeal plexus	Constricts wall of pharynx during swallowing	Ascending pharyngeal artery, ascending palatine and tonsillar branches of facial artery, dorsal branches of lingual artery	Circular pharyngeal
Superior rectus	Common tendinous ring	Superior aspect of eyeball, posterior to the corneoscleral junction	Oculomotor nerve (CN III), superior division	Elevates, adducts, and medially rotates eyeball	Ophthalmic artery	Extra-ocular
Temporalis	Floor of temporal fossa, deep temporal fascia	Coronoid process and ramus of mandible	Mandibular nerve (CN V_3),deep temporal nerves	Elevates mandible; posterior fibers retrude mandible	Superficial temporal and maxillary arteries, middle, anterior, and posterior deep temporal arteries	Mastication
Tensor tympani	Cartilage of pharyngotympanic (auditory, eustachian) tube	Handle of malleus	Mandibular branch of trigeminal nerve (CN V_3)	Tenses tympanic membrane by drawing it medially	Superior tympanic branch of middle meningeal division of maxillary artery	Middle ear
Tensor veli palatini	Scaphoid fossa of medial pterygoid plate, spine of sphenoid, pharyngotympanic (auditory, eustachian) tube	Palatine aponeurosis	Mandibular nerve	Tenses soft palate, opens pharyngotympanic (auditory, eustachian) tube during swallowing and yawning	Ascending palatine artery branch of facial artery, descending palatine artery branch of maxillary artery	Palatal
Thyro-arytenoid	Posterior aspect of thyroid cartilage	Muscular process of arytenoid cartilage	Recurrent laryngeal nerve	Shortens and relaxes vocal cords, sphincter of vestibule	Superior and inferior thyroid arteries	Laryngeal
Thyrohyoid	Oblique line on lamina of thyroid cartilage	Lower border of body and greater horn of hyoid bone	Thyrohyoid branch of C1 nerve via hypoglossal nerve (CN XII)	Depresses larynx and hyoid bone, elevates thyroid cartilage	Hyoid branch of superior thyroid artery	Infrahyoid
Transverse and oblique arytenoid	Arytenoid cartilage	Opposite arytenoid cartilage	Recurrent laryngeal nerve	Closes intercartilaginous portion of rima glottides	Superior and inferior thyroid arteries	Laryngeal
Transverse (tongue)	Median fibrous septum of tongue	Dorsum and sides of tongue	Hypoglossal nerve (CN XII)	Narrows and elongates tongue	Deep lingual branch of lingual artery, branches from facial artery	Intrinsic tongue
Uvular muscle	Nasal spine, palatine aponeurosis	Mucosa of uvula	Vagus nerve via pharyngeal plexus	Shortens, elevates, and retracts uvula	Ascending palatine artery branch of facial artery, descending palatine artery branch of maxillary artery	Palatal
Vertical (tongue)	Mucous membrane on dorsum of forepart of tongue	Fibers extend from dorsum to undersurface of tongue	Hypoglossal nerve (CN XII)	Flattens and broadens tongue	Deep lingual branch of lingual artery, branches from facial artery	Intrinsic tongue
Vocalis	Vocal process of arytenoid cartilage	Vocal ligament	Recurrent laryngeal nerve	Tenses anterior vocal ligament, relaxes posterior vocal ligament	Superior and inferior thyroid arteries	Laryngeal
Zygomaticus major	Zygomatic arch	Angle of mouth	Zygomatic and buccal branches of facial nerve	Draws angle of mouth backward and upward	Superior labial branch of facial artery	Facial expression
Zygomaticus minor	Zygomatic arch	Angle of mouth, upper lip	Zygomatic and buccal branches of facial nerve	Elevates upper lip	Superior labial branch of facial artery	Facial expression



Section

2 BACK AND SPINAL CORD

Topographic Anatomy

Plate 152

152 Back: Surface Anatomy

Bones and Ligaments

Plates 153–159

153 Vertebral Column
154 Thoracic Vertebrae
155 Lumbar Vertebrae
156 Vertebrae: Radiology
157 Sacrum and Coccyx
158 Vertebral Ligaments: Lumbosacral Region
159 Vertebral Ligaments: Lumbar Region

Spinal Cord

Plates 160–170

160 Spinal Cord and Ventral Rami in Situ
161 Relation of Spinal Nerve Roots to Vertebrae
162 Dermatomes
163 Sympathetic Nervous System: Schema
164 Parasympathetic Nervous System: Schema
165 Spinal Membranes and Nerve Roots
166 Spinal Nerve Origin: Cross Sections
167 Arteries of Spinal Cord: Schema
168 Arteries of Spinal Cord: Intrinsic Distribution
169 Veins of Spinal Cord and Vertebral Column
170 Veins of Vertebral Column: Vertebral Veins

Muscles and Nerves

Plates 171–175

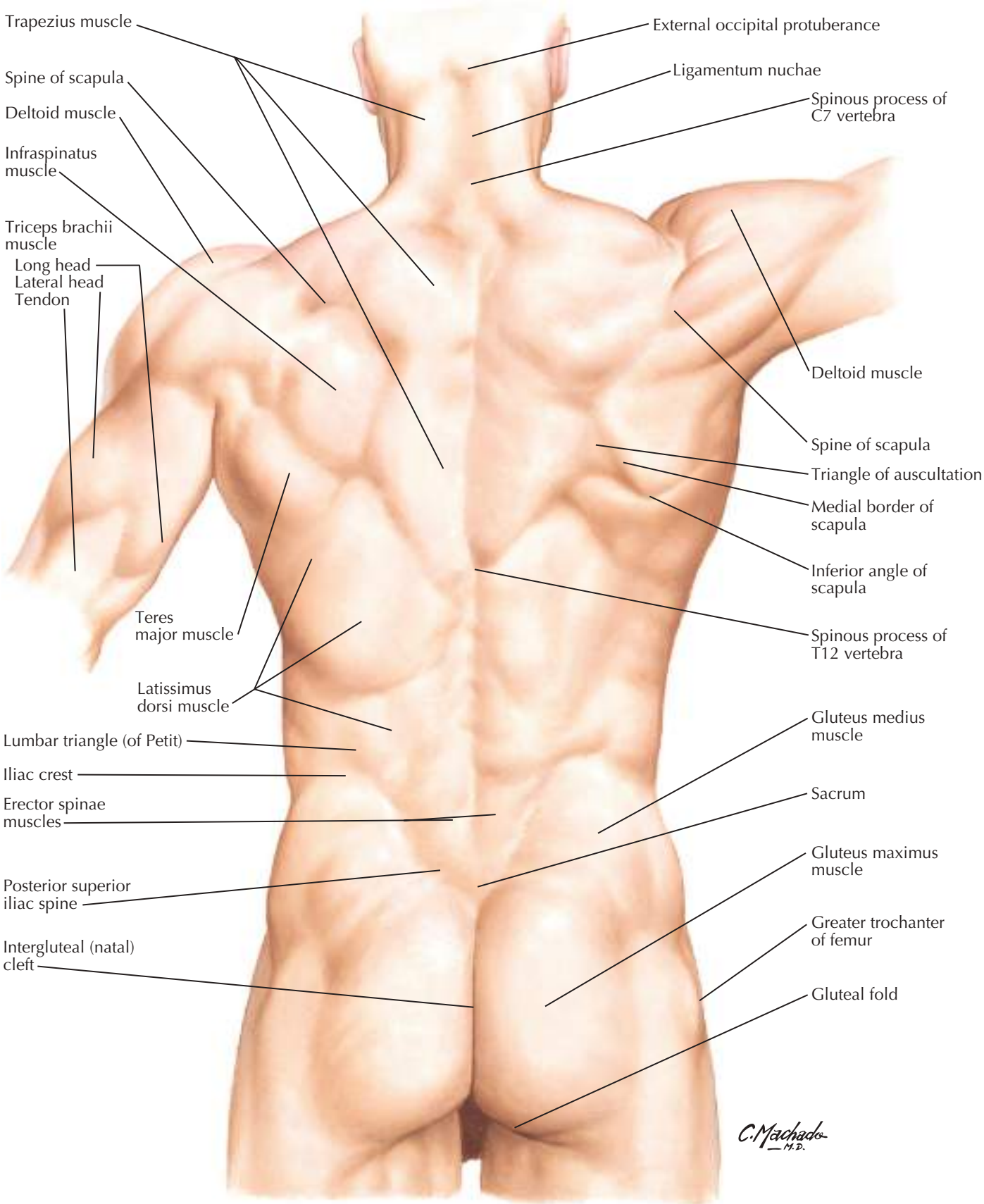
171 Muscles of Back: Superficial Layers
172 Muscles of Back: Intermediate Layers
173 Muscles of Back: Deep Layers
174 Nerves of Back
175 Suboccipital Triangle

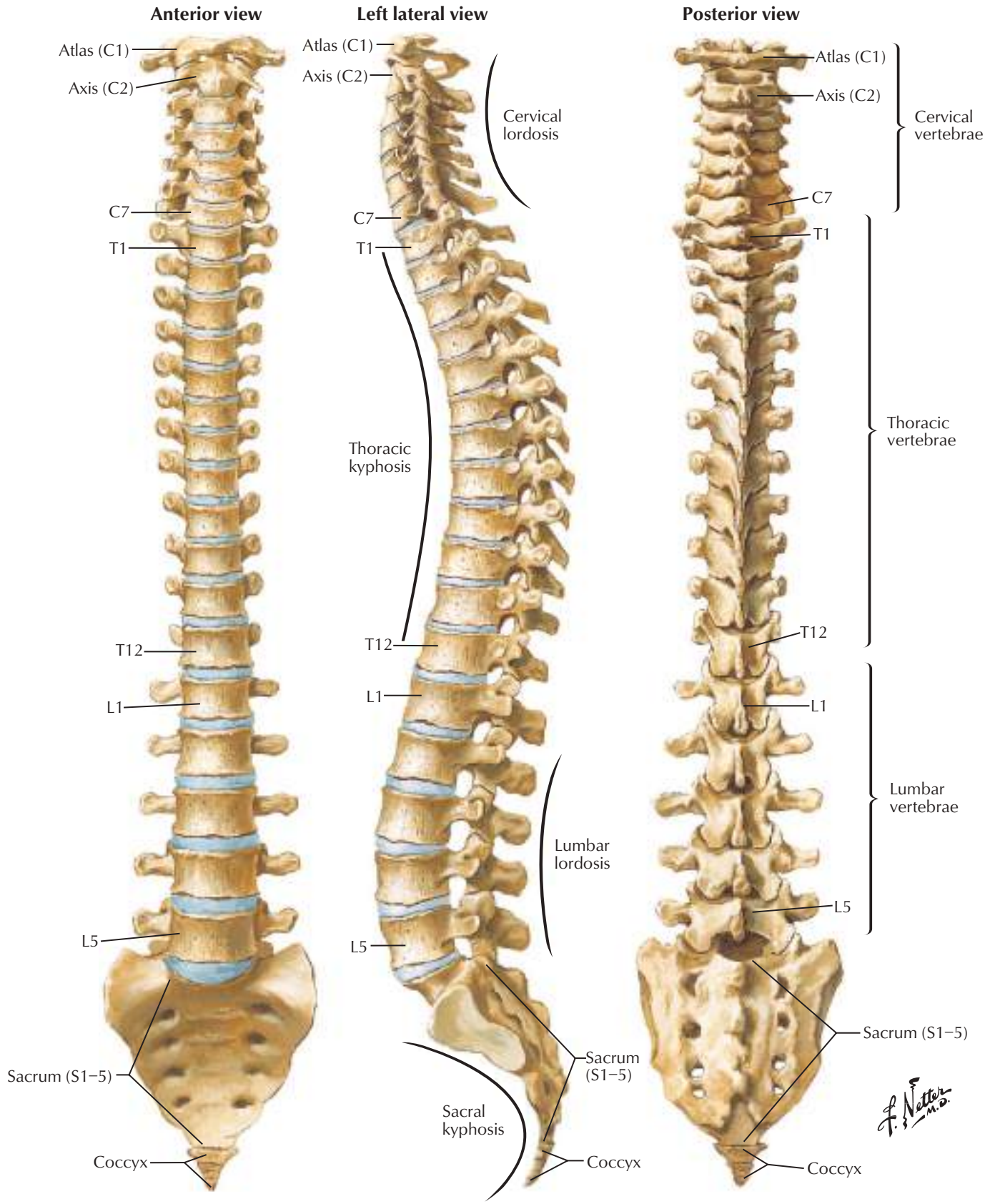
Cross-Sectional Anatomy

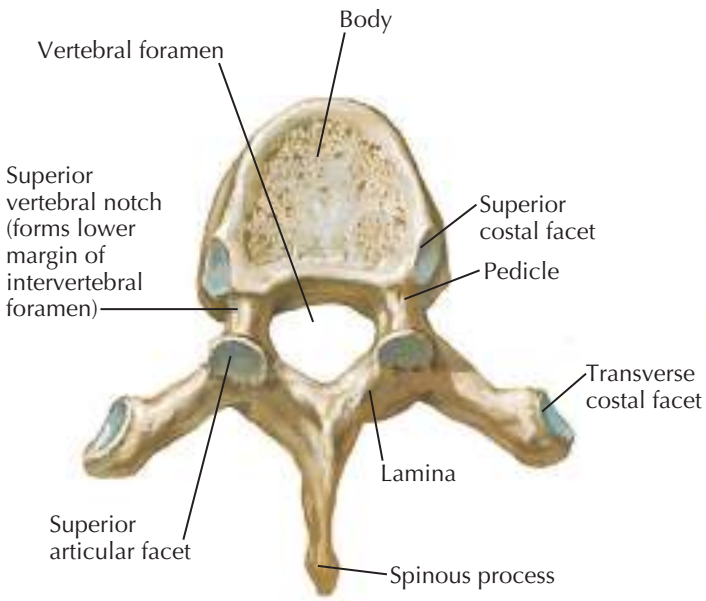
Plates 176–177

176 Lumbar Region of Back: Cross Section
177 Typical Thoracic Spinal Nerve: Cross Section

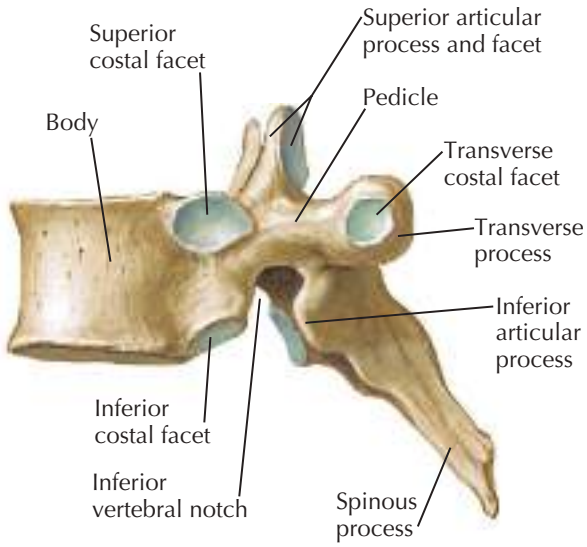
Muscle Tables


Trapezius muscle
Spine of scapula
Deltoid muscle
Infraspinatus muscle
Triceps brachii muscle
Long head
Lateral head
Tendon
Teres major muscle
Latissimus dorsi muscle
Lumbar triangle (of Petit)
Iliac crest
Erector spinae muscles
Posterior superior iliac spine
Intergluteal (natal) cleft
External occipital protuberance
Ligamentum nuchae
Spinous process of C7 vertebra
Deltoid muscle
Spine of scapula
Triangle of auscultation
Medial border of scapula
Inferior angle of scapula
Spinous process of T12 vertebra
Gluteus medius muscle
Sacrum
Gluteus maximus muscle
Greater trochanter of femur
Gluteal fold
C. Machado M.D.

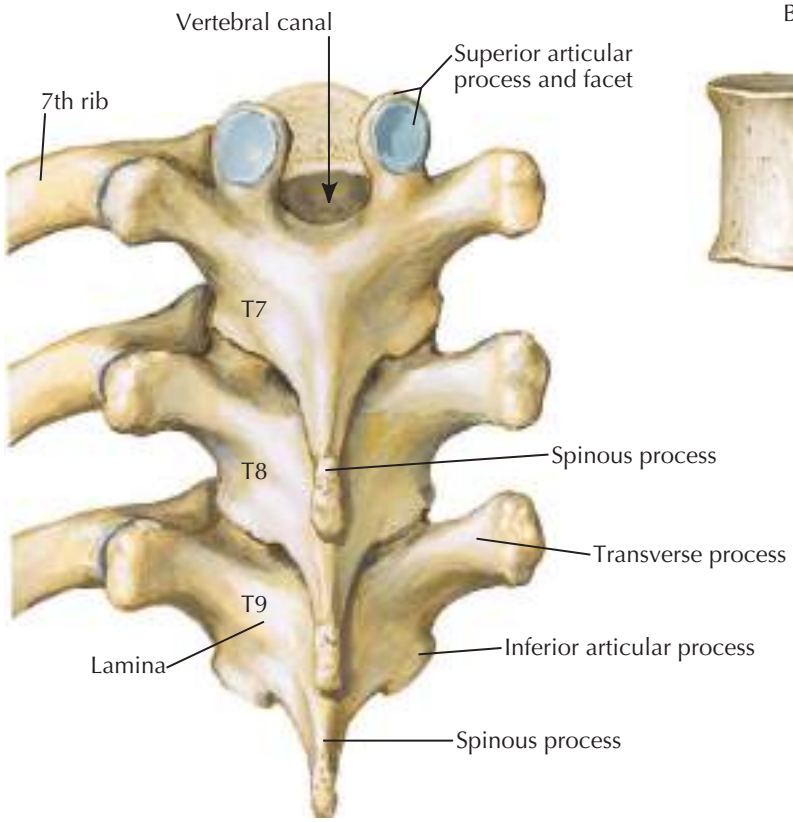

Anterior view
Left lateral view
Posterior view
Atlas (C1)
Axis (C2)
C7
T1
T12
L1
L5
Sacrum (S1–5)
Coccyx
Cervical lordosis
Thoracic kyphosis
Lumbar lordosis
Sacral kyphosis
Cervical vertebrae
Thoracic vertebrae
Lumbar vertebrae



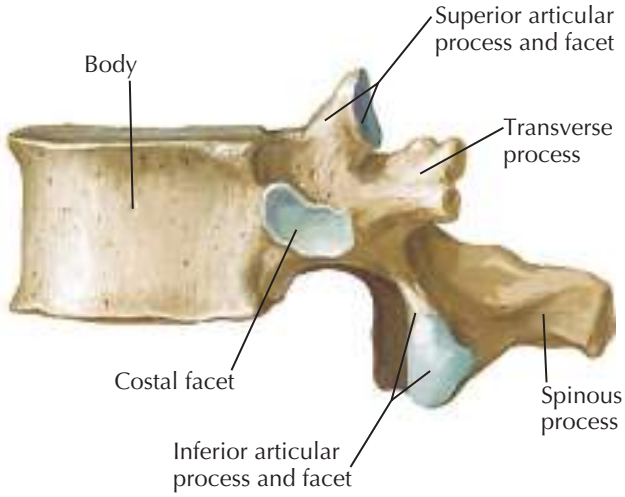
T6 vertebra: superior view



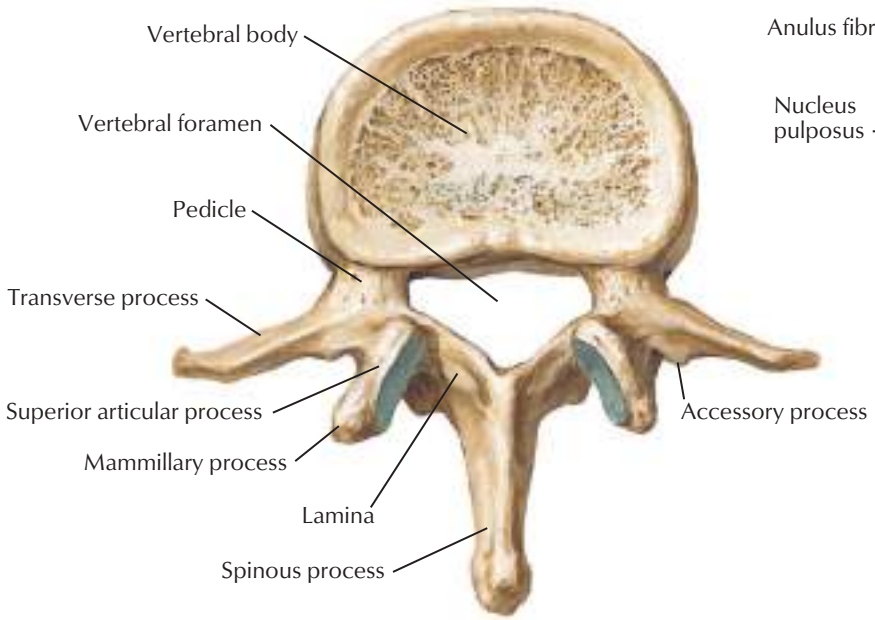
T6 vertebra: lateral view



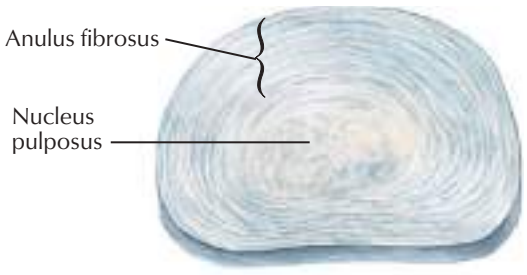
T7, T8, and T9 vertebrae: posterior view



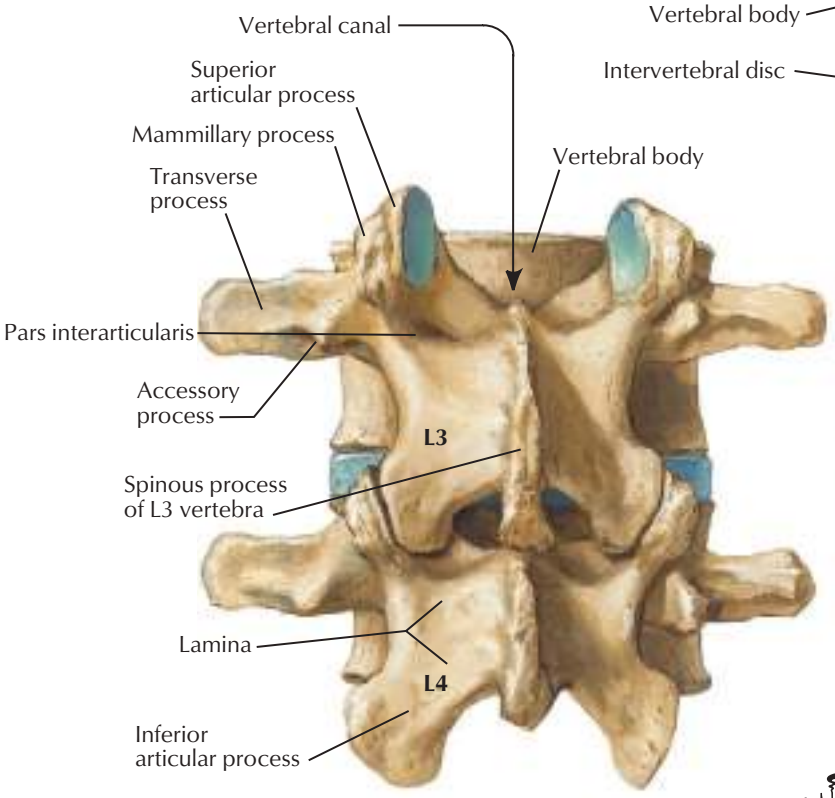
T12 vertebra: lateral view



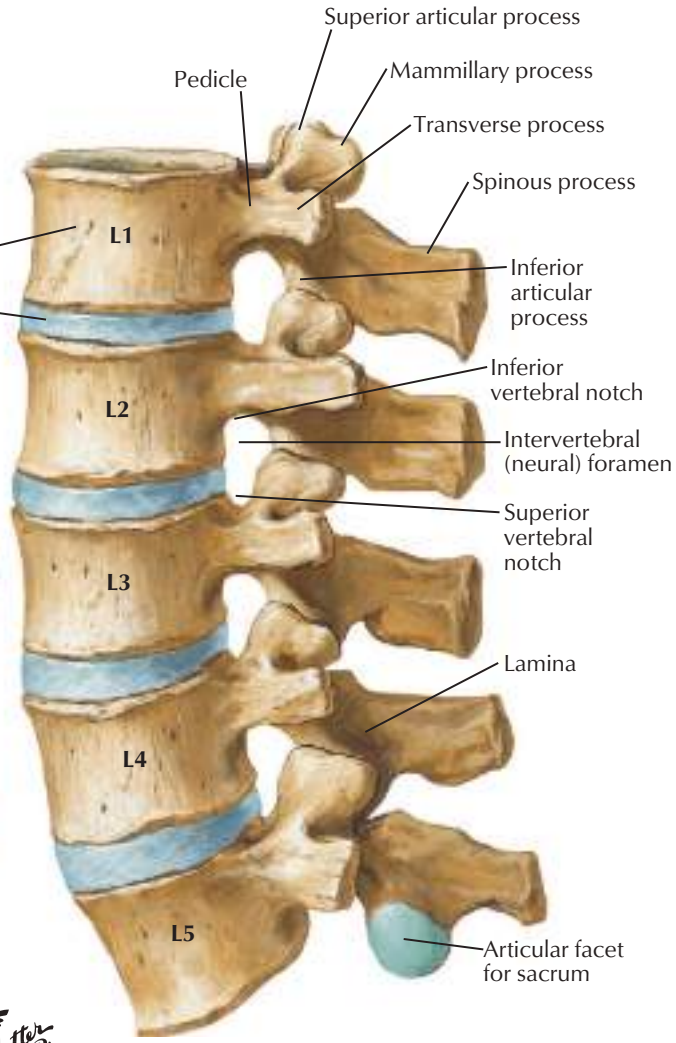
L2 vertebra: superior view



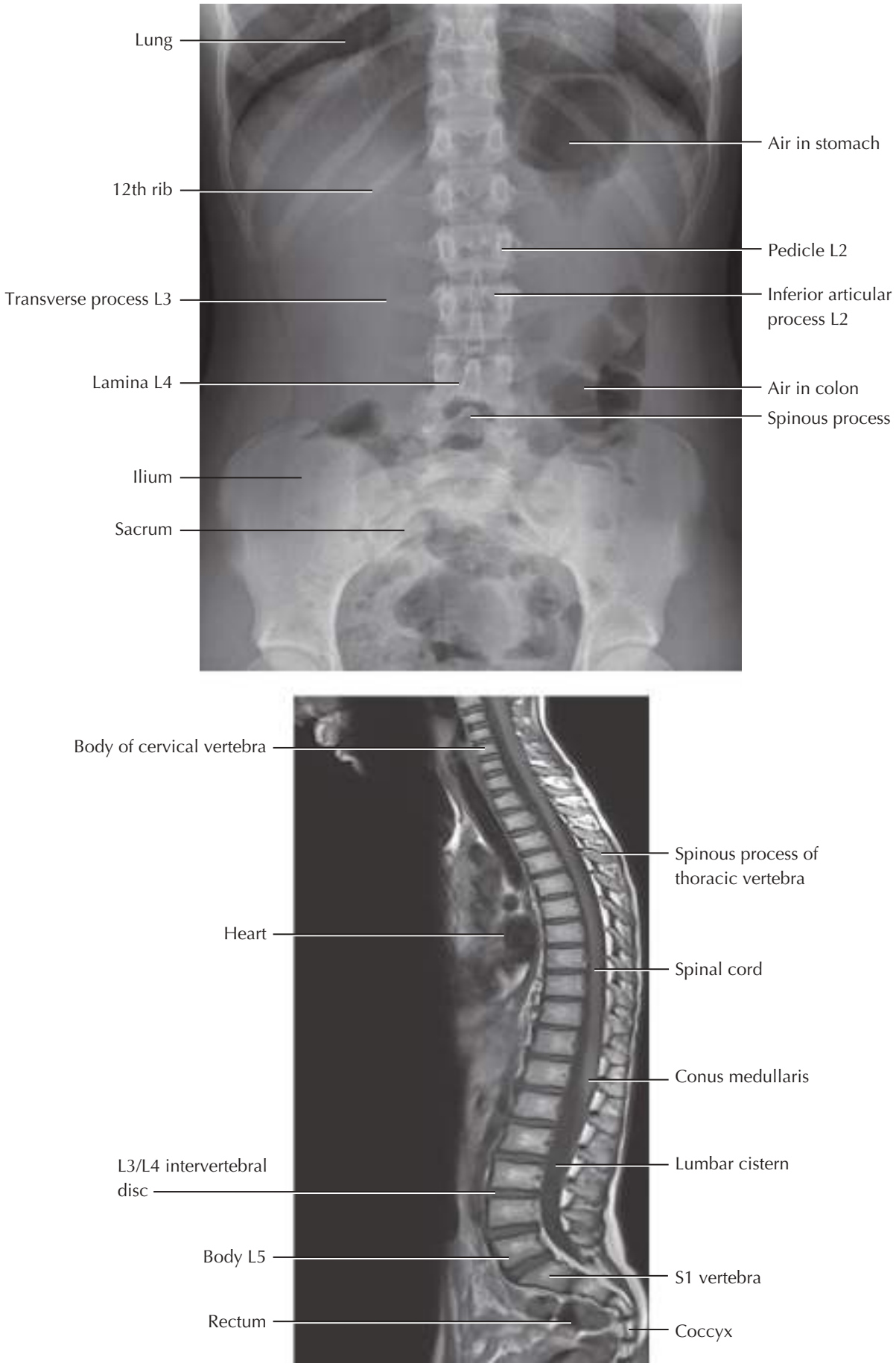
Intervertebral disc

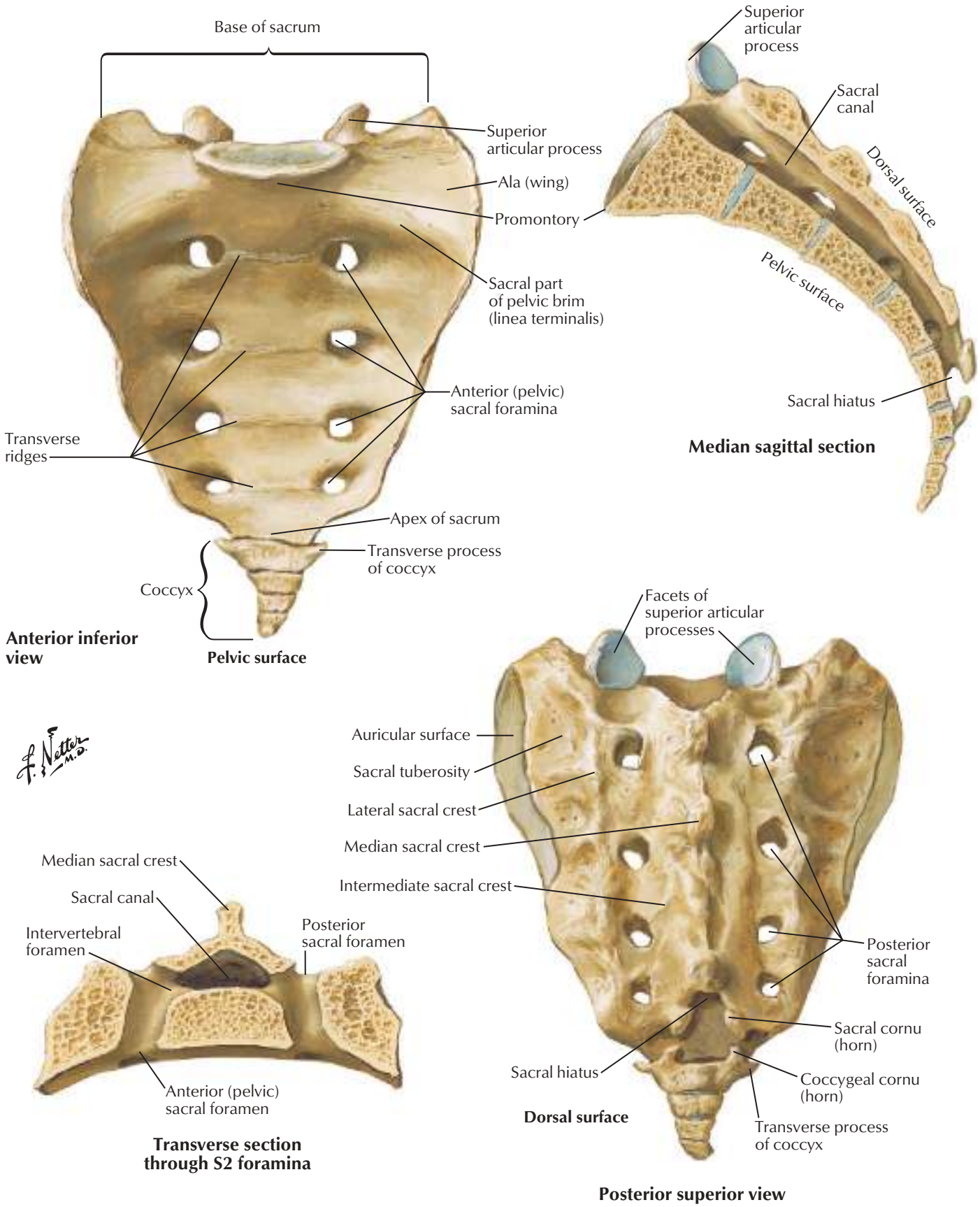


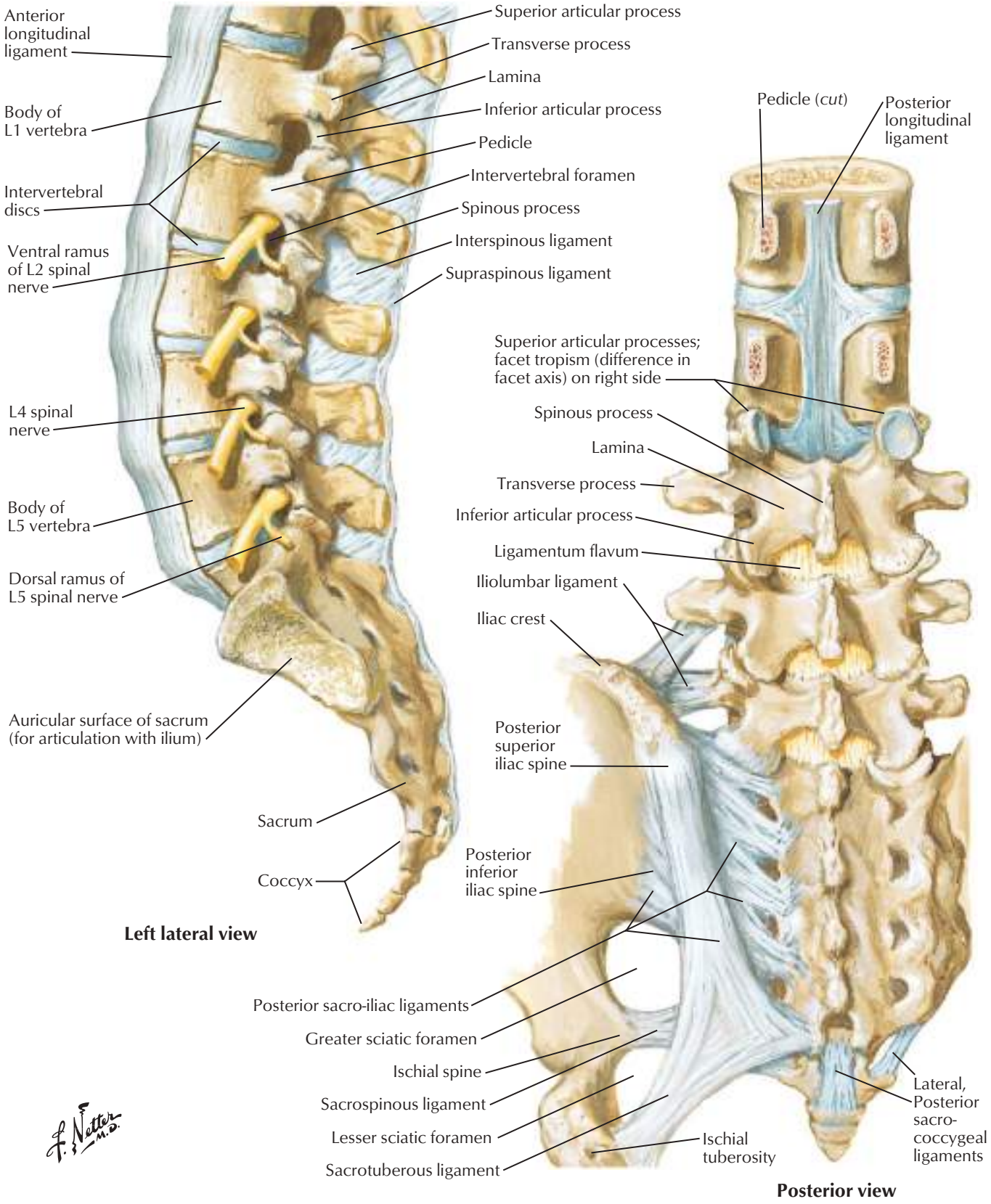
L3 and L4 vertebrae: posterior view



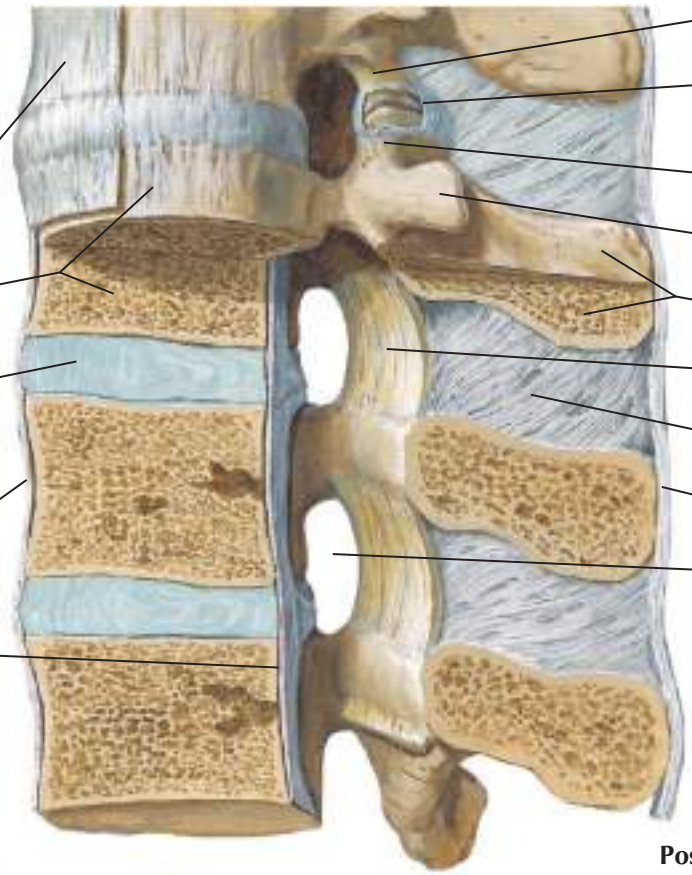
Lumbar vertebrae, articulated: left lateral view

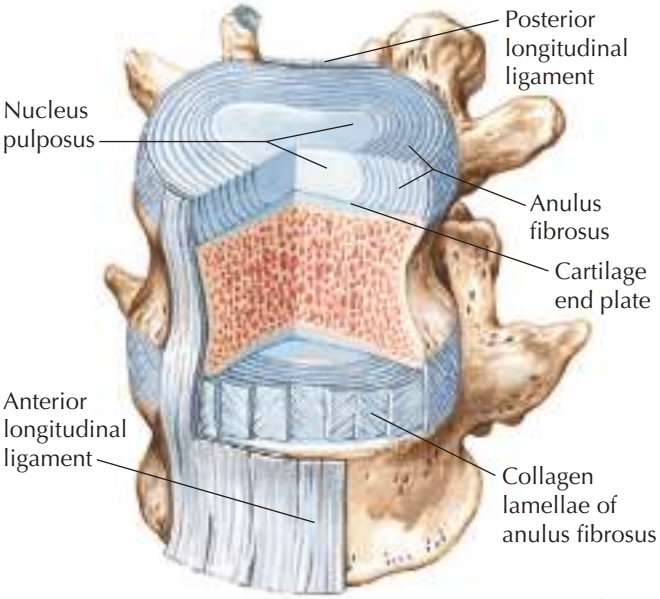

Lung
Air in stomach
12th rib
Pedicle L2
Transverse process L3
Inferior articular process L2
Lamina L4
Air in colon
Spinous process
Ilium
Sacrum
Body of cervical vertebra
Spinous process of thoracic vertebra
Heart
Spinal cord
Conus medullaris
L3/L4 intervertebral disc
Lumbar cistern
Body L5
S1 vertebra
Rectum
Coccyx


Base of sacrum
Superior articular process
Ala (wing)
Promontory
Sacral part of pelvic brim (linea terminalis)
Anterior (pelvic) sacral foramina
Transverse ridges
Apex of sacrum
Transverse process of coccyx
Coccyx
Anterior inferior view
Pelvic surface
Superior articular process
Sacral canal
Dorsal surface
Pelvic surface
Sacral hiatus
Median sagittal section
Facets of superior articular processes
Auricular surface
Sacral tuberosity
Lateral sacral crest
Median sacral crest
Intermediate sacral crest
Posterior sacral foramina
Sacral cornu (horn)
Sacral hiatus
Coccygeal cornu (horn)
Transverse process of coccyx
Dorsal surface
Posterior superior view
Median sacral crest
Sacral canal
Intervertebral foramen
Posterior sacral foramen
Anterior (pelvic) sacral foramen
Transverse section through S2 foramina


Anterior longitudinal ligament
Body of L1 vertebra
Intervertebral discs
Ventral ramus of L2 spinal nerve
L4 spinal nerve
Body of L5 vertebra
Dorsal ramus of L5 spinal nerve
Auricular surface of sacrum (for articulation with ilium)
Sacrum
Coccyx
Superior articular process
Transverse process
Lamina
Inferior articular process
Pedicle
Intervertebral foramen
Spinous process
Interspinous ligament
Supraspinous ligament
Left lateral view
Pedicle (cut)
Posterior longitudinal ligament
Superior articular processes; facet tropism (difference in facet axis) on right side
Spinous process
Lamina
Transverse process
Inferior articular process
Ligamentum flavum
Iliolumbar ligament
Iliac crest
Posterior superior iliac spine
Posterior inferior iliac spine
Posterior sacro-iliac ligaments
Greater sciatic foramen
Ischial spine
Sacrospinous ligament
Lesser sciatic foramen
Sacrotuberous ligament
Ischial tuberosity
Lateral, Posterior sacro-coccygeal ligaments
Posterior view

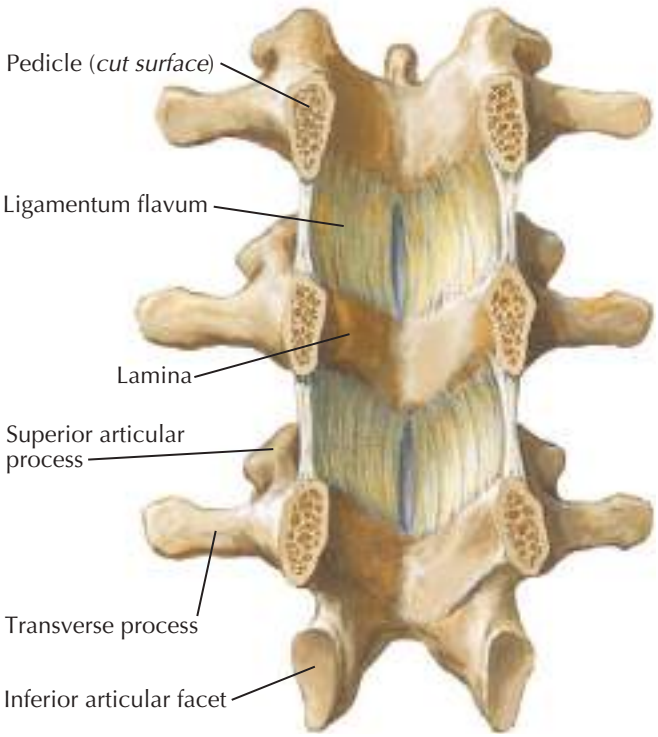
Left lateral view (*partially sectioned in median plane*)

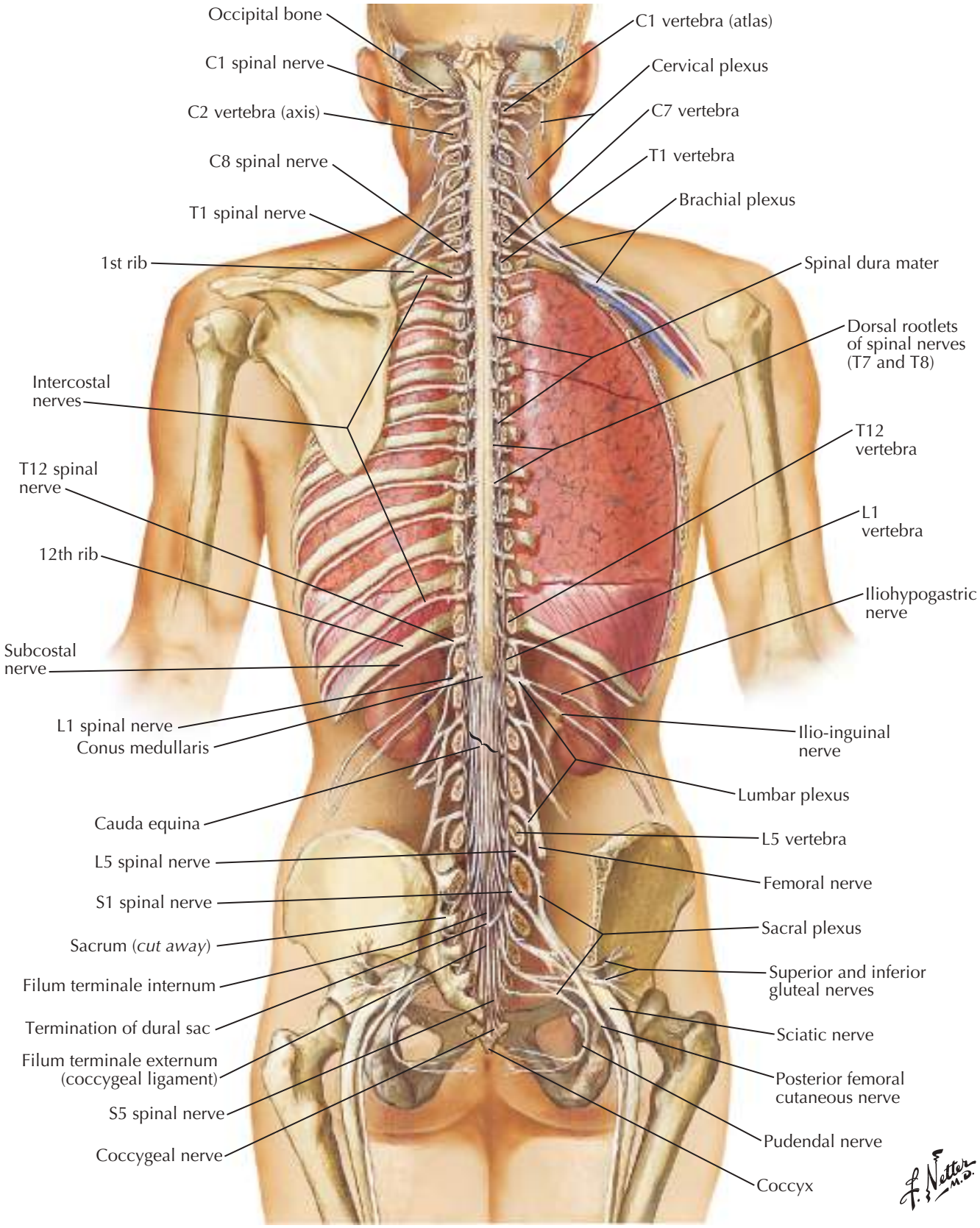


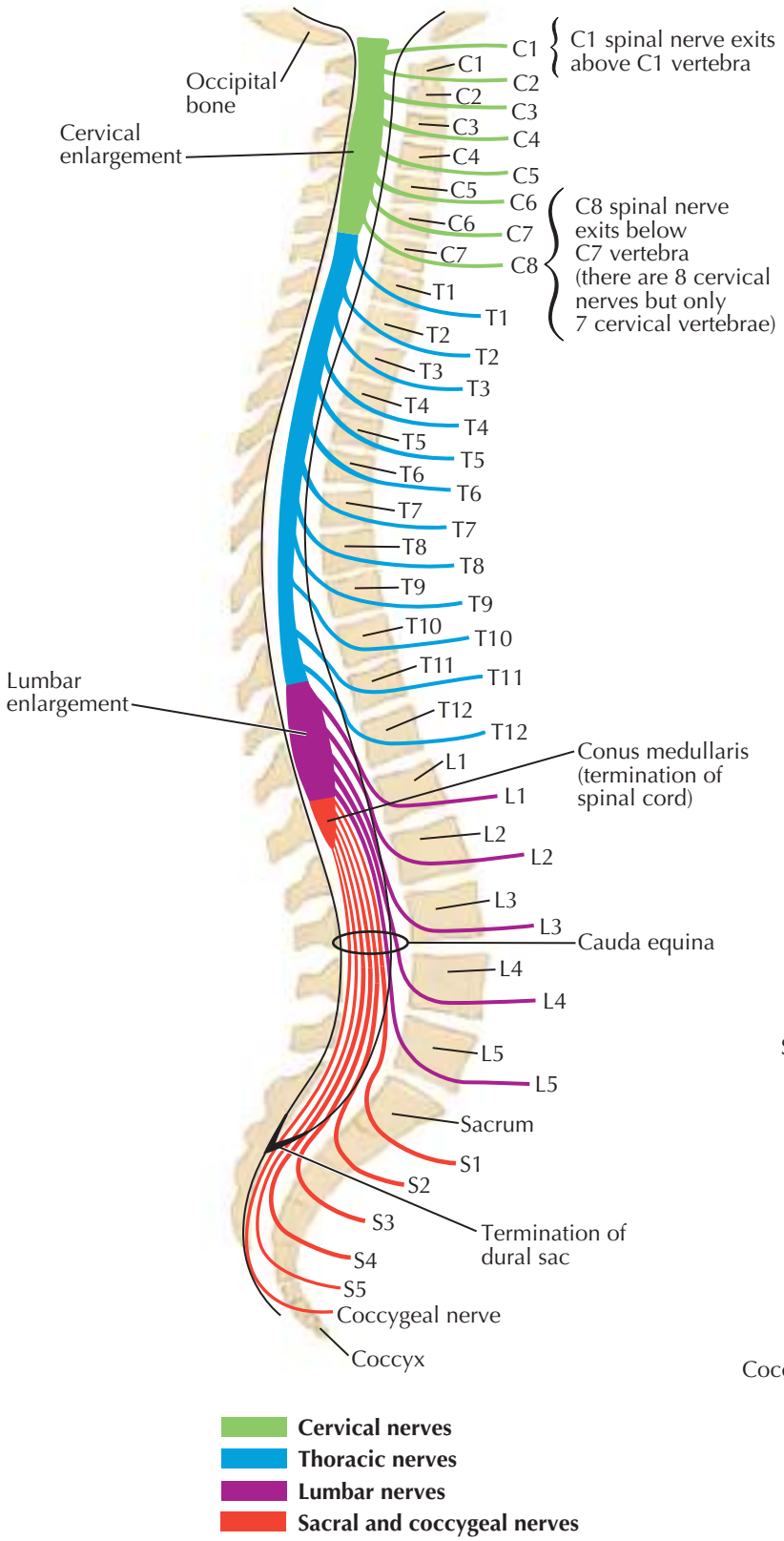


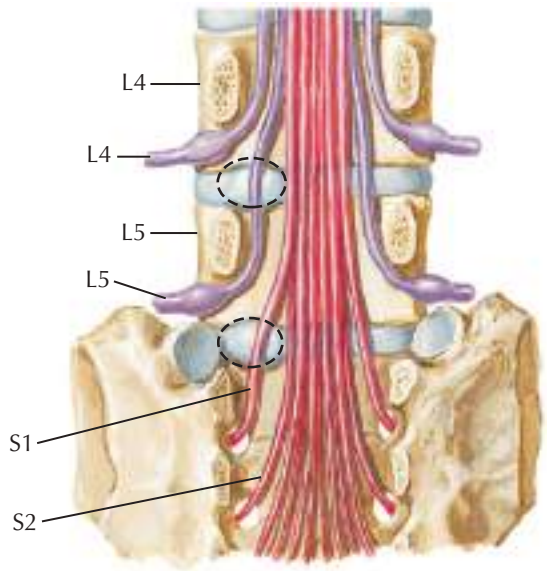
Intervertebral disc composed of central nuclear zone of collagen and hydrated proteoglycans surrounded by concentric lamellae of collagen fibers

Posterior vertebral arches: anterior view

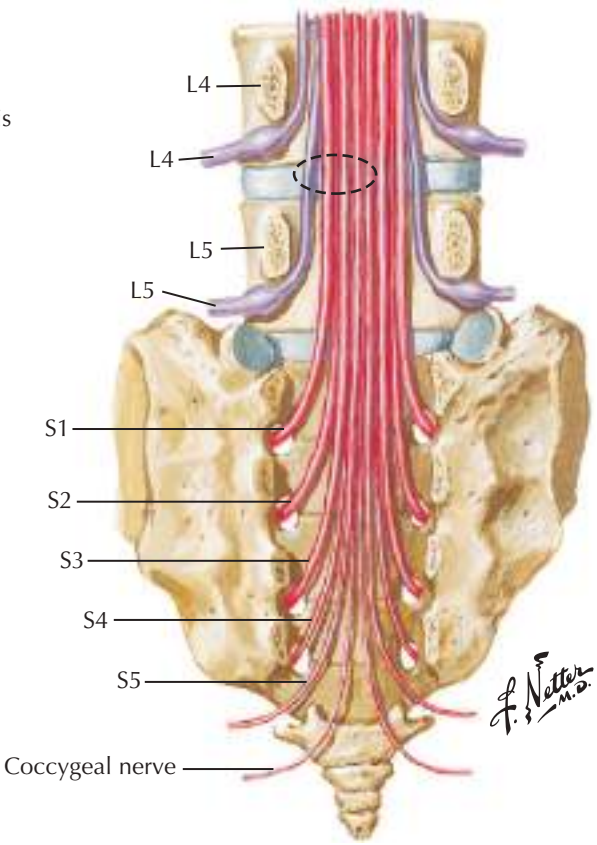



Occipital bone
C1 spinal nerve
C2 vertebra (axis)
C8 spinal nerve
T1 spinal nerve
1st rib
Intercostal nerves
T12 spinal nerve
12th rib
Subcostal nerve
L1 spinal nerve
Conus medullaris
Cauda equina
L5 spinal nerve
S1 spinal nerve
Sacrum (*cut away*)
Filum terminale internum
Termination of dural sac
Filum terminale externum (coccygeal ligament)
S5 spinal nerve
Coccygeal nerve
C1 vertebra (atlas)
Cervical plexus
C7 vertebra
T1 vertebra
Brachial plexus
Spinal dura mater
Dorsal rootlets of spinal nerves (T7 and T8)
T12 vertebra
L1 vertebra
Iliohypogastric nerve
Ilio-inguinal nerve
Lumbar plexus
L5 vertebra
Femoral nerve
Sacral plexus
Superior and inferior gluteal nerves
Sciatic nerve
Posterior femoral cutaneous nerve
Pudendal nerve
Coccyx

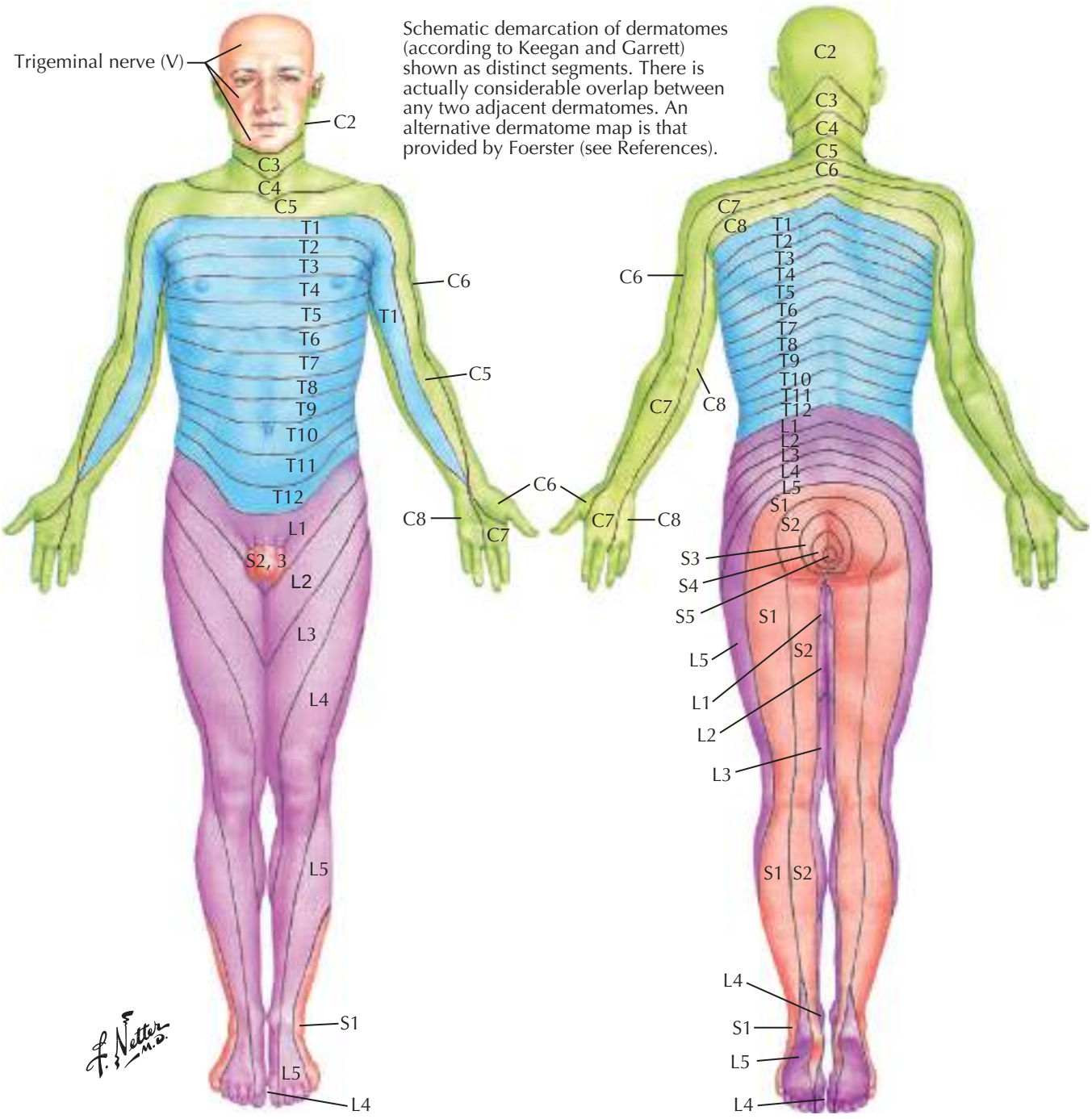




Lumbar disc protrusion (*dashed ovals*) does not usually affect nerve exiting above disc. Lateral protrusion at disc level L4–5 affects L5 spinal nerve, not L4 spinal nerve. Protrusion at disc level L5–S1 affects S1 spinal nerve, not L5 spinal nerve.



Medial protrusion at disc level L4–5 (*dashed oval*) rarely affects L4 spinal nerve but may affect L5 spinal nerve and sometimes S1–4 spinal nerves.



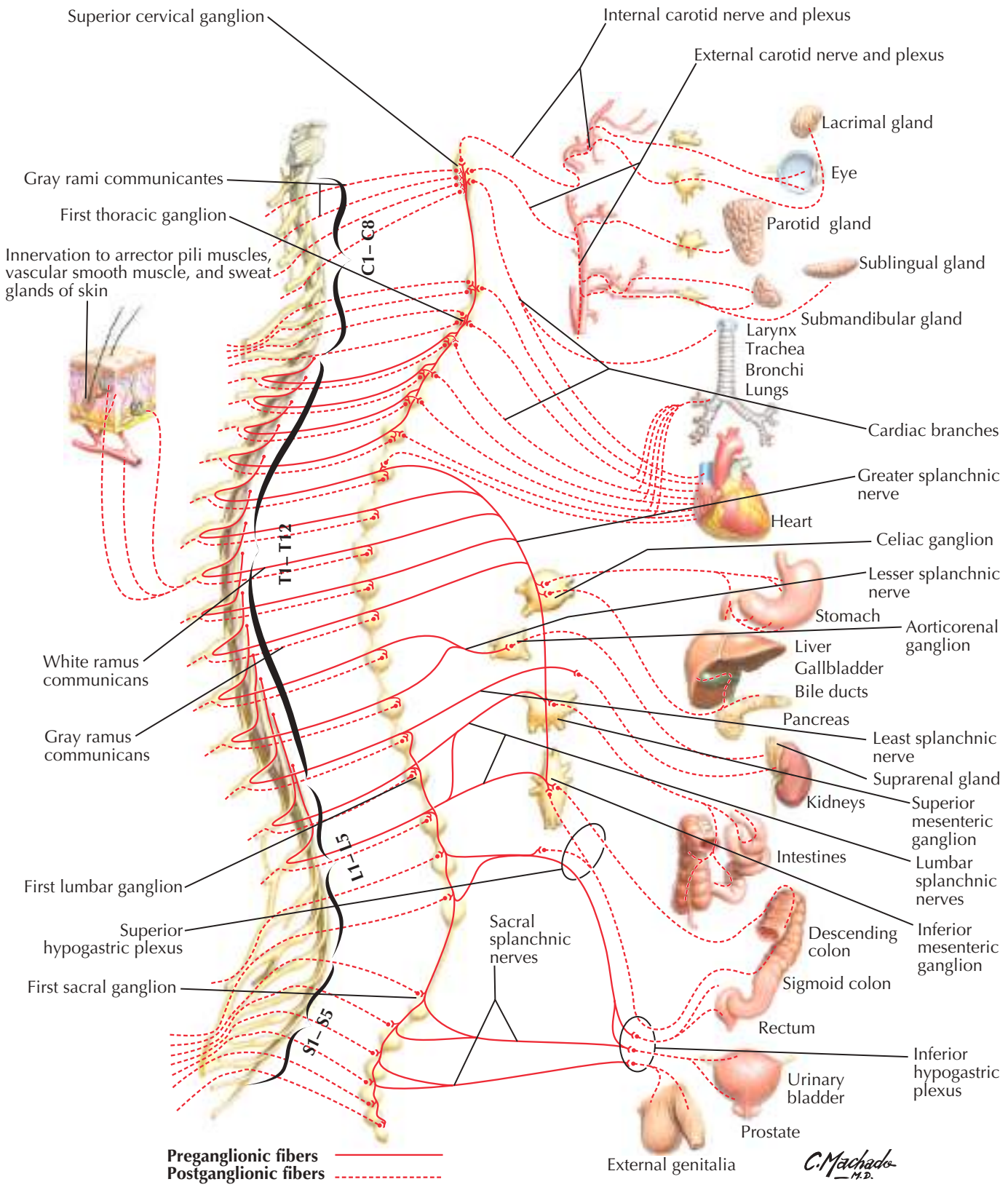
Schematic demarcation of dermatomes (according to Keegan and Garrett) shown as distinct segments. There is actually considerable overlap between any two adjacent dermatomes. An alternative dermatome map is that provided by Foerster (see References).

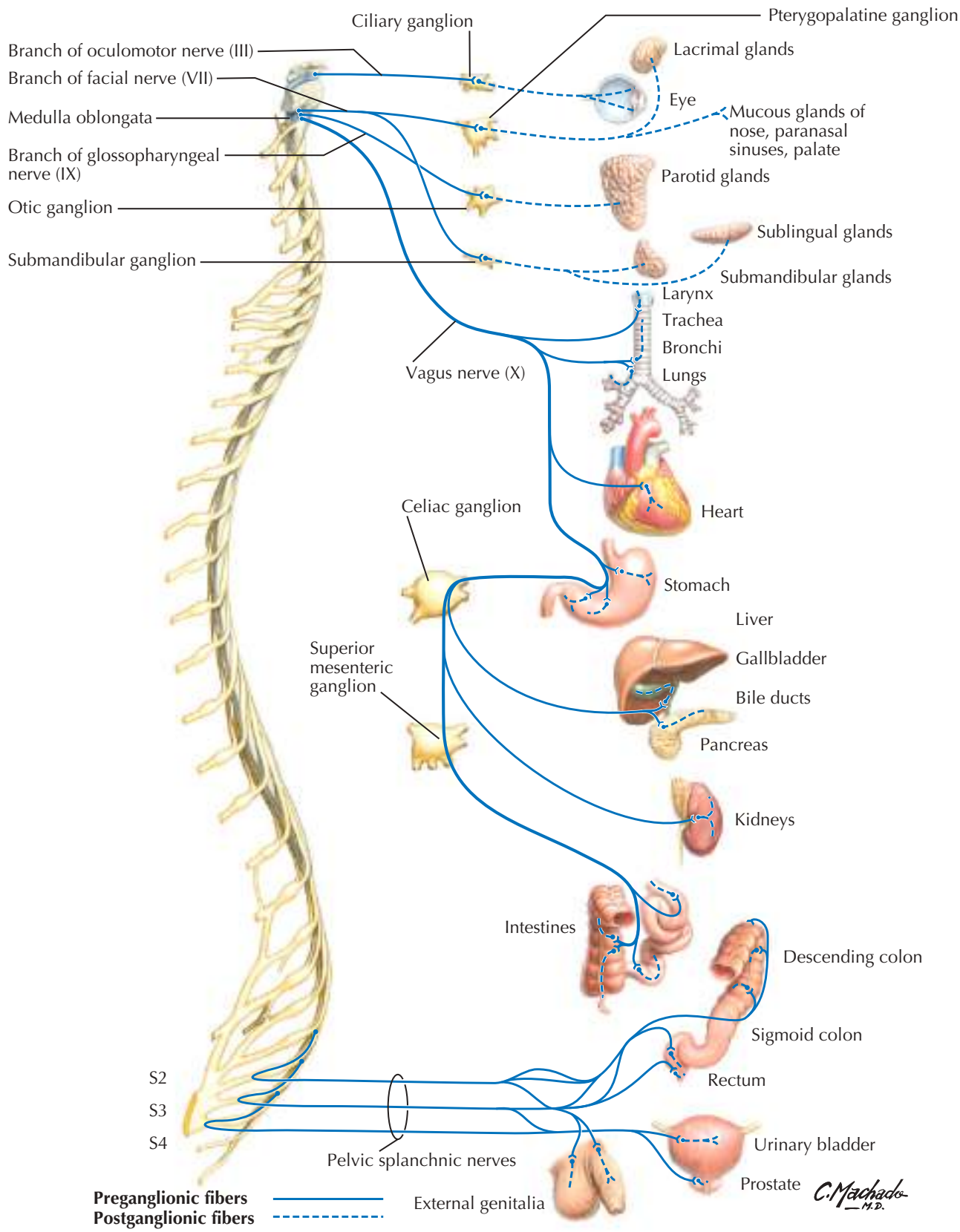
Levels of principal dermatomes

C5	Clavicles
C5, 6	Lateral sides of upper limbs
C8, T1	Medial sides of upper limbs
C6	Digit I (thumb)
C6, 7, 8	Hand
C8	Digits IV and V (ring and little fingers)
T4	Level of nipples
T10	Level of umbilicus
L1	Inguinal region
L1, 2, 3, 4	Anterior and inner surfaces of lower limbs
L4, 5, S1	Foot
L4	Medial side digit I (great toe)
L5, S1, 2	Lateral and posterior surfaces of lower limbs
S1	Lateral margin of foot and digit V (little toe)
S2, 3, 4	Perineum

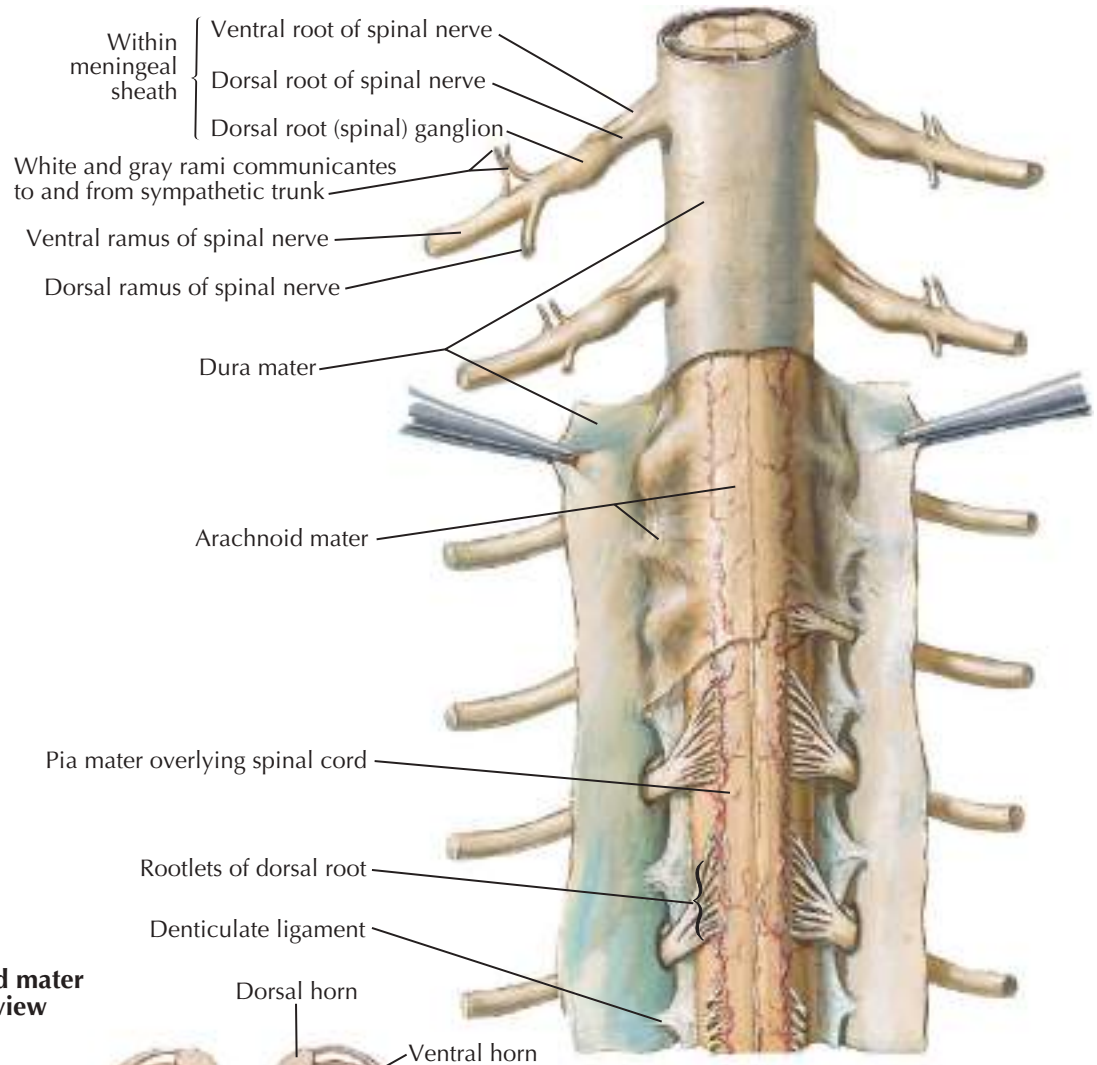
Sympathetic Nervous System: Schema

See also Plates 206, 317, 319

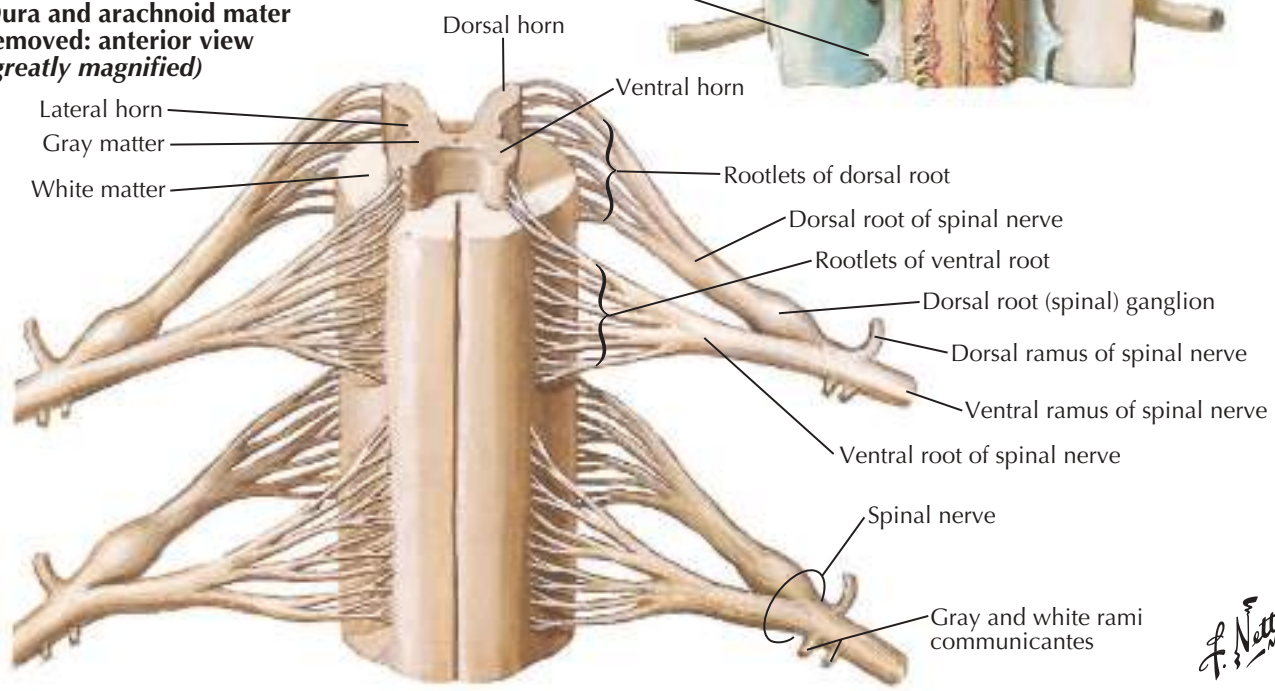



Ciliary ganglion
Pterygopalatine ganglion
Branch of oculomotor nerve (III)
Branch of facial nerve (VII)
Medulla oblongata
Branch of glossopharyngeal nerve (IX)
Otic ganglion
Submandibular ganglion
Lacrimal glands
Eye
Mucous glands of nose, paranasal sinuses, palate
Parotid glands
Sublingual glands
Submandibular glands
Larynx
Trachea
Bronchi
Lungs
Vagus nerve (X)
Heart
Celiac ganglion
Stomach
Liver
Gallbladder
Bile ducts
Superior mesenteric ganglion
Pancreas
Kidneys
Intestines
Descending colon
Sigmoid colon
Rectum
S2
S3
S4
Urinary bladder
Prostate
Pelvic splanchnic nerves
External genitalia
Preganglionic fibers
Postganglionic fibers
C. Machado M.D.

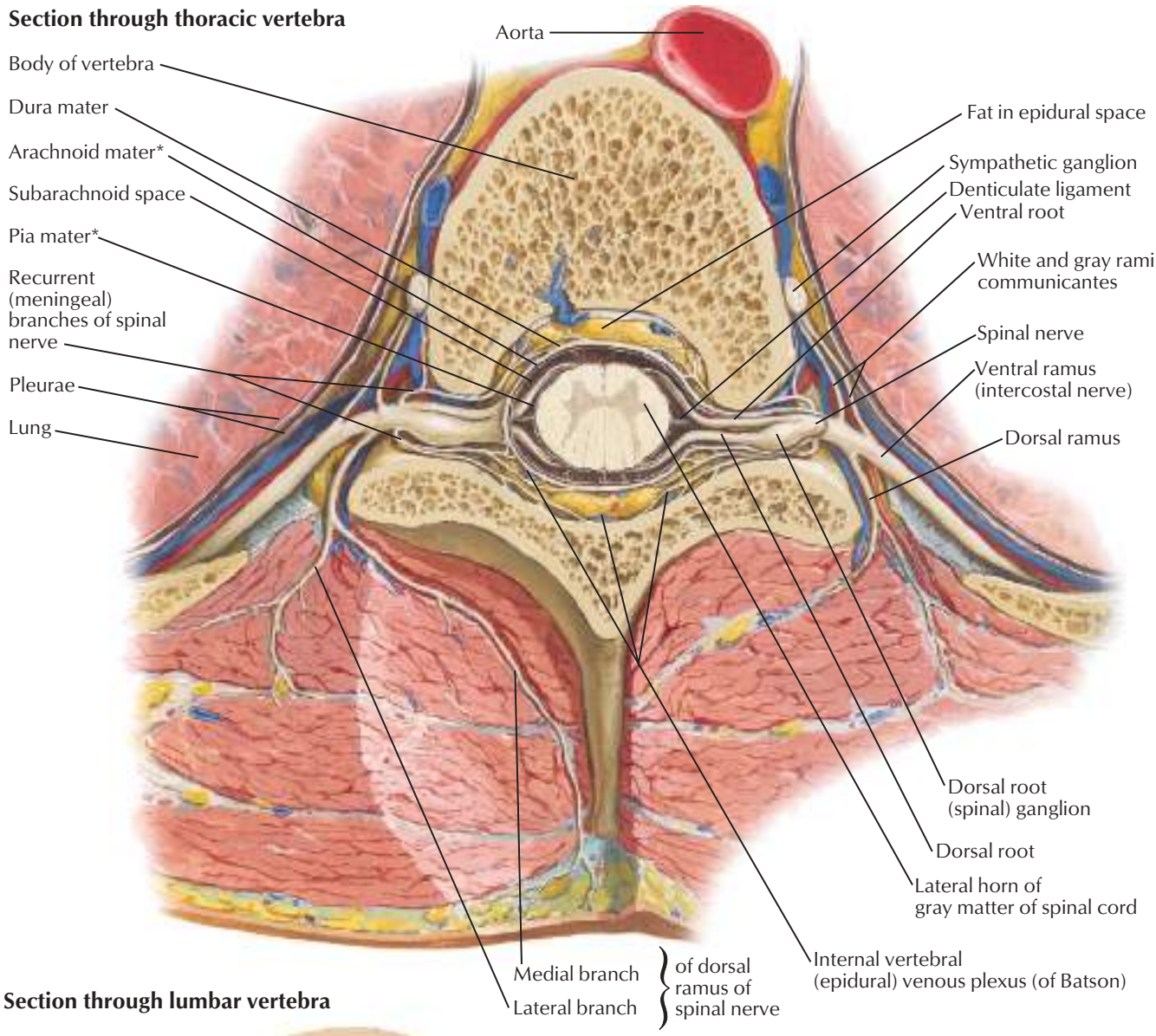
Posterior view



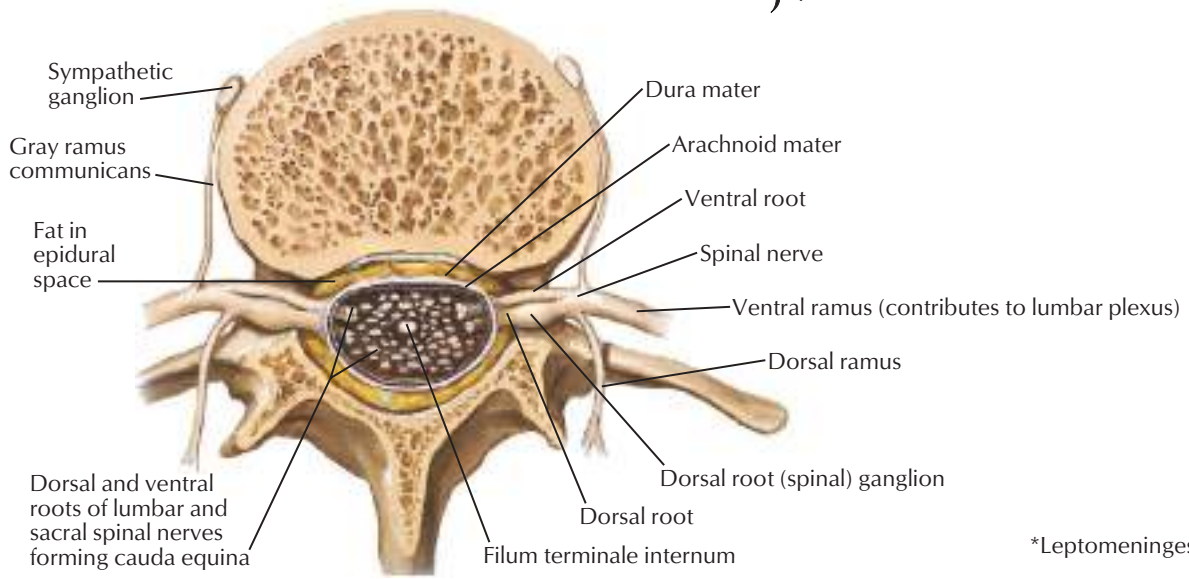
Dura and arachnoid mater removed: anterior view *(greatly magnified)*



Section through thoracic vertebra

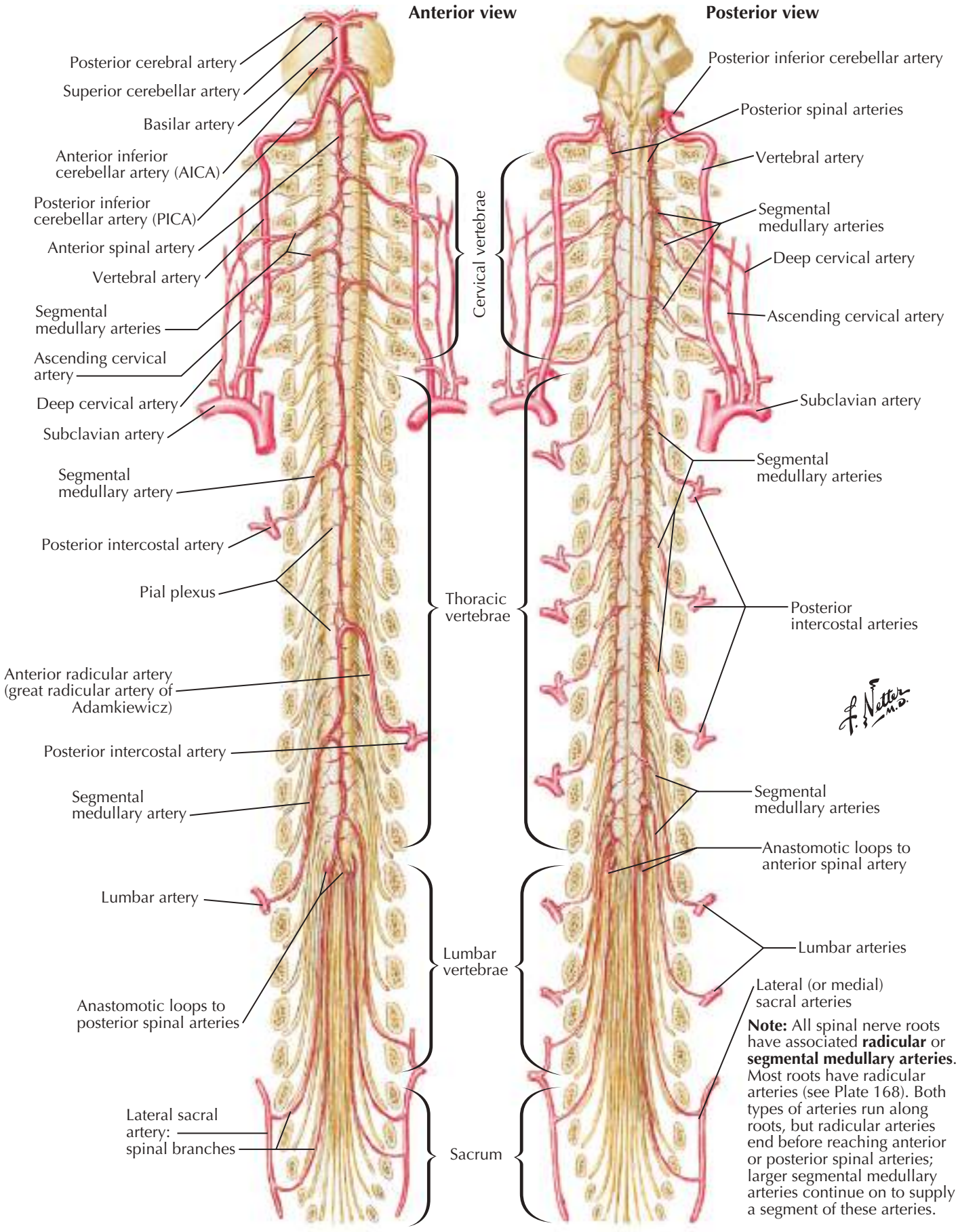


Section through lumbar vertebra



*Leptomeninges

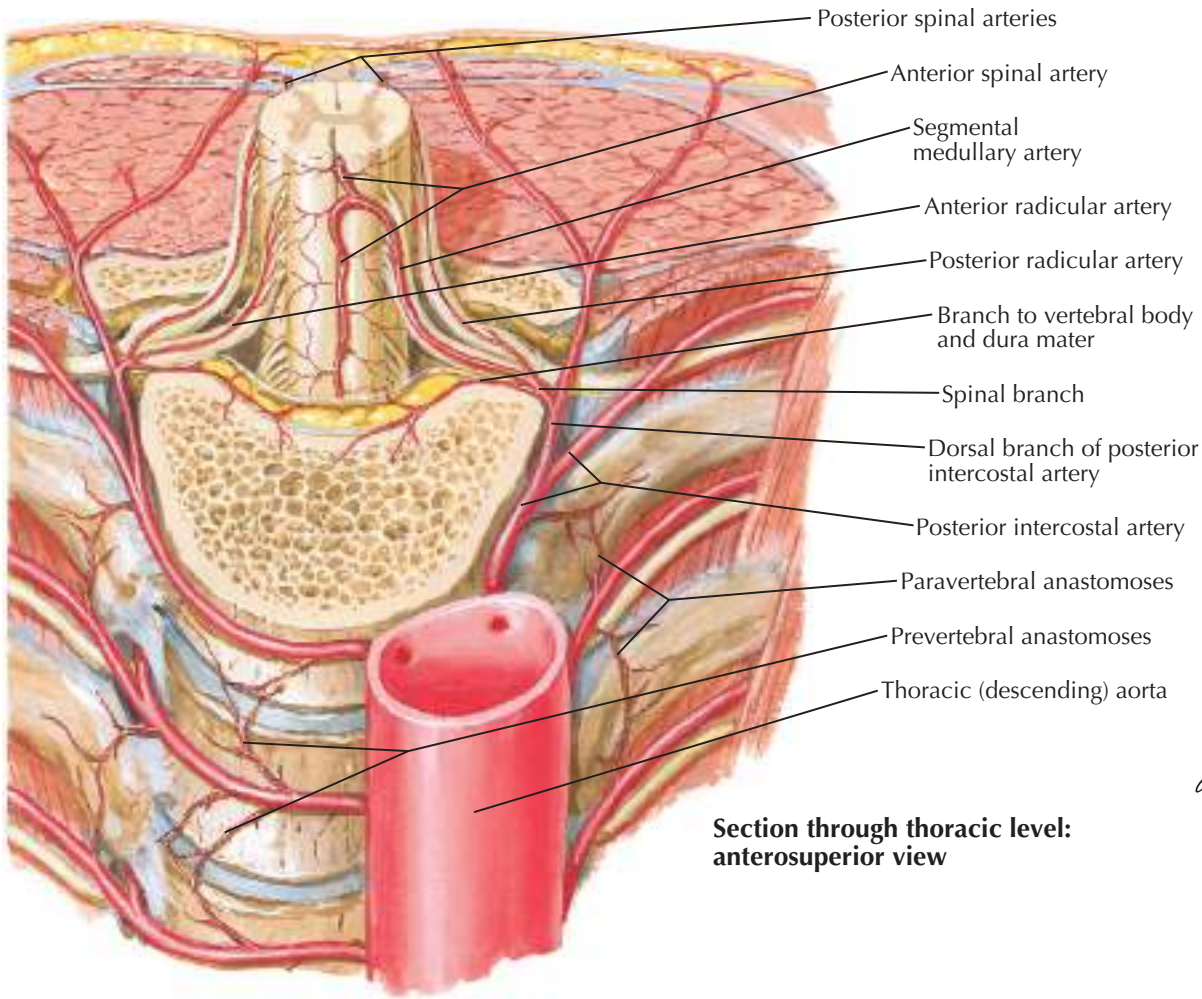
Arteries of Spinal Cord: Schema



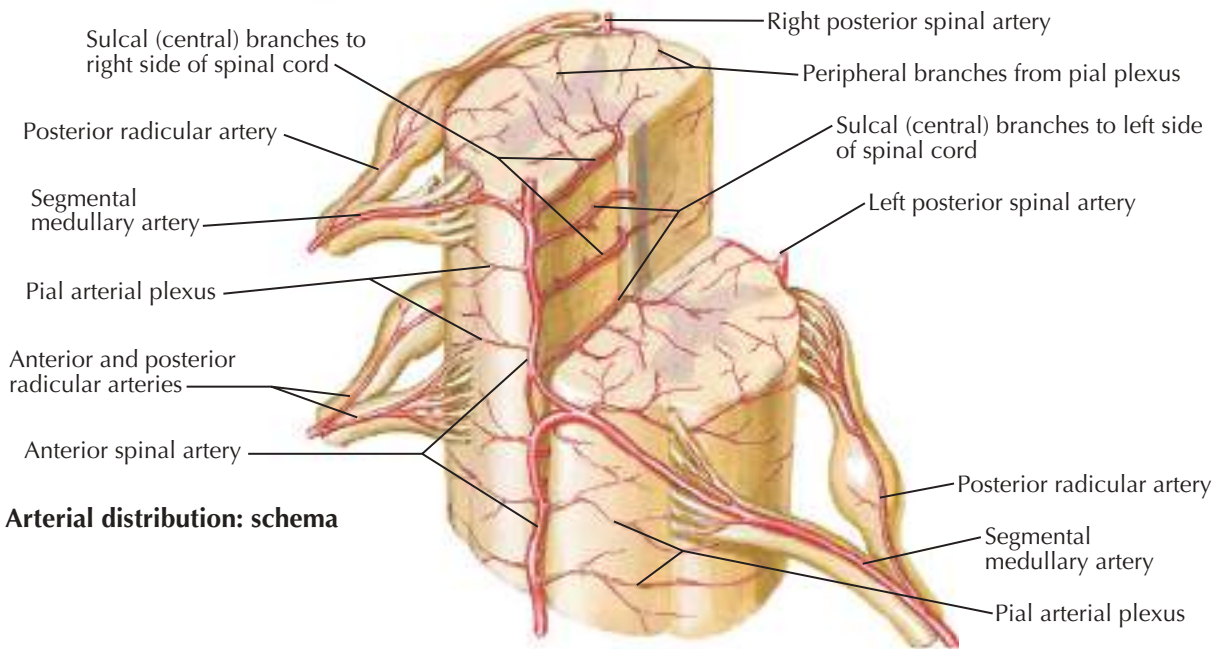
Note: All spinal nerve roots have associated **radicular** or **segmental medullary arteries**. Most roots have radicular arteries (see Plate 168). Both types of arteries run along roots, but radicular arteries end before reaching anterior or posterior spinal arteries; larger segmental medullary arteries continue on to supply a segment of these arteries.

Arteries of Spinal Cord: Intrinsic Distribution

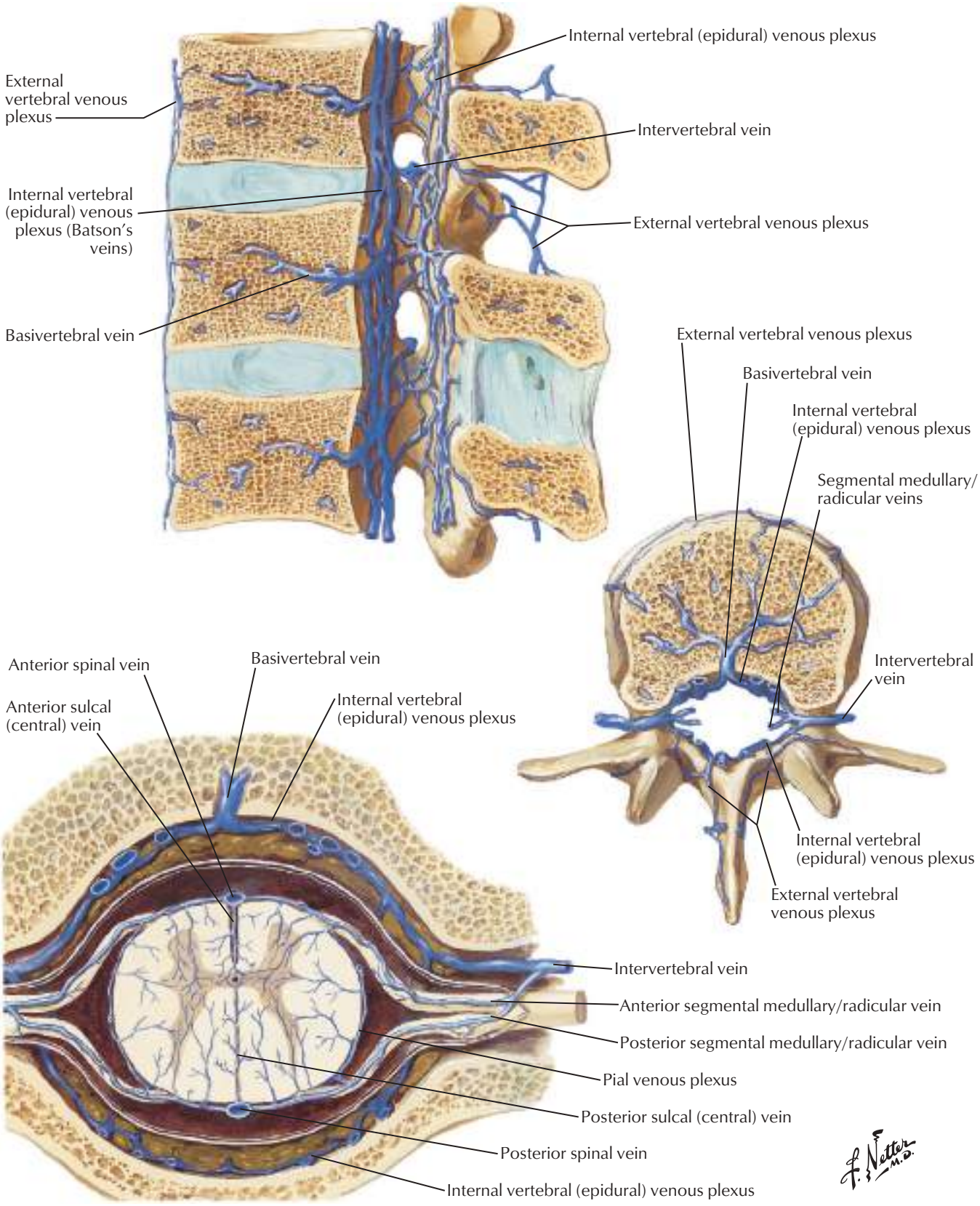
See also Plate 188

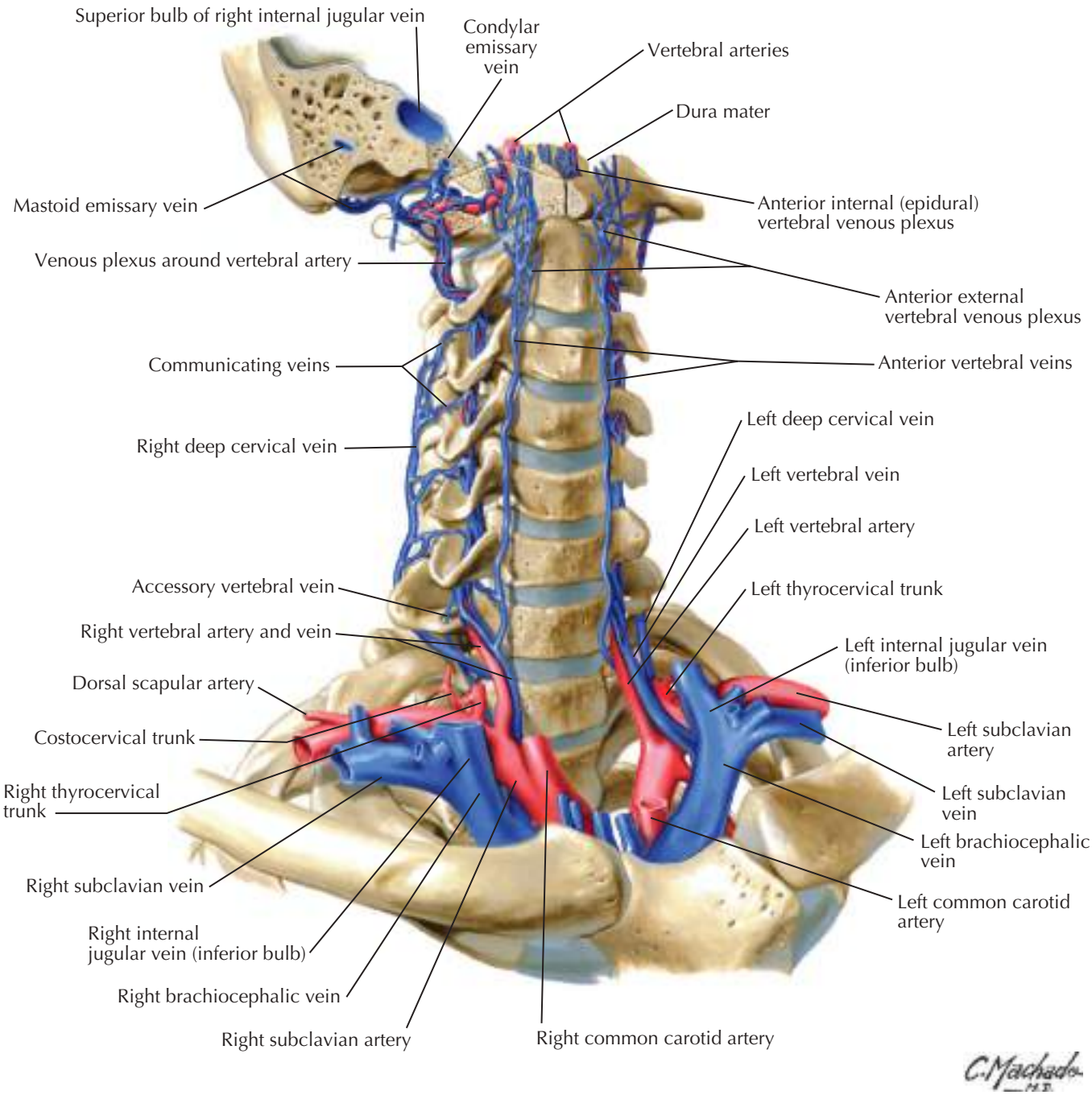


Section through thoracic level: anterosuperior view



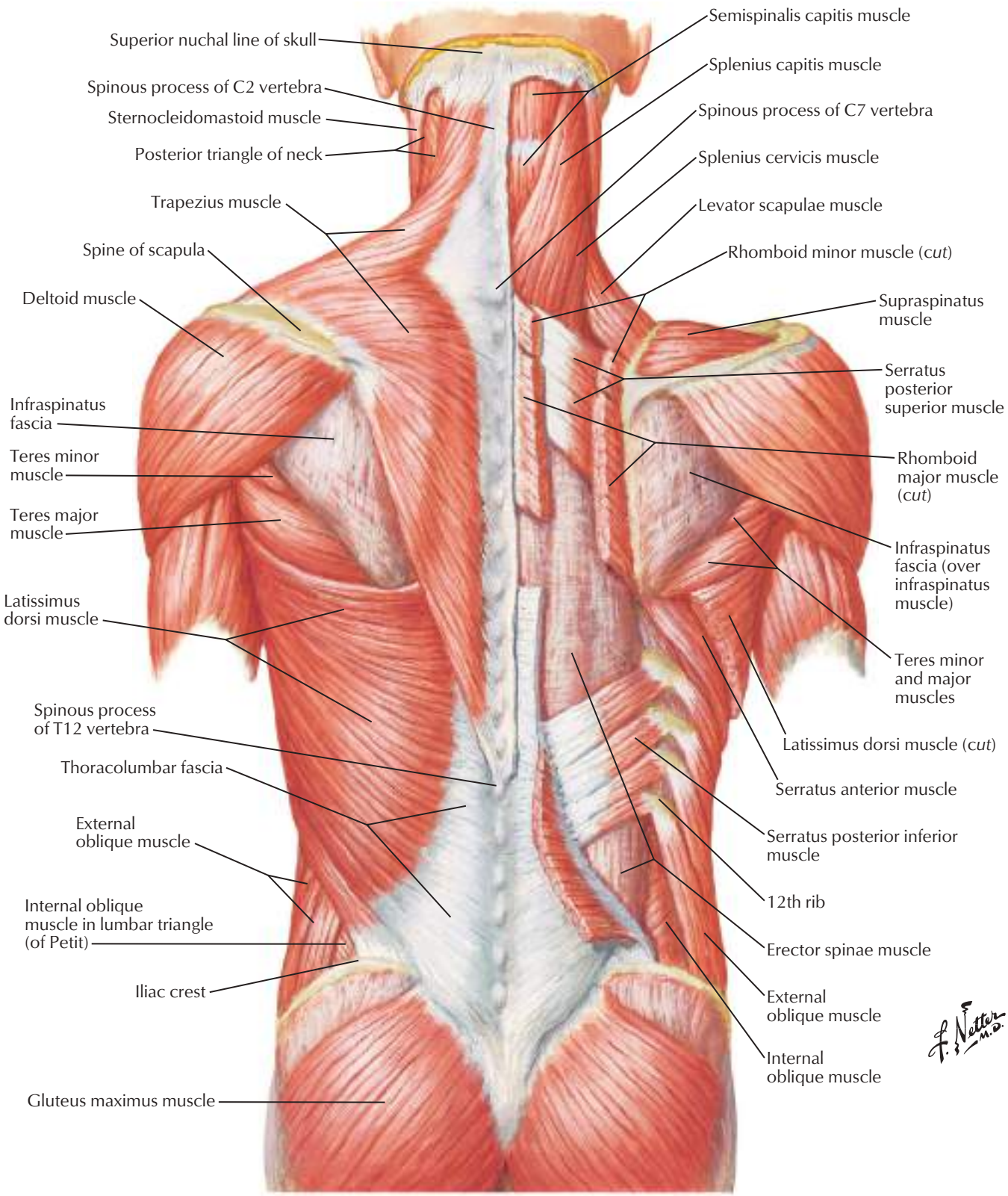
Arterial distribution: schema

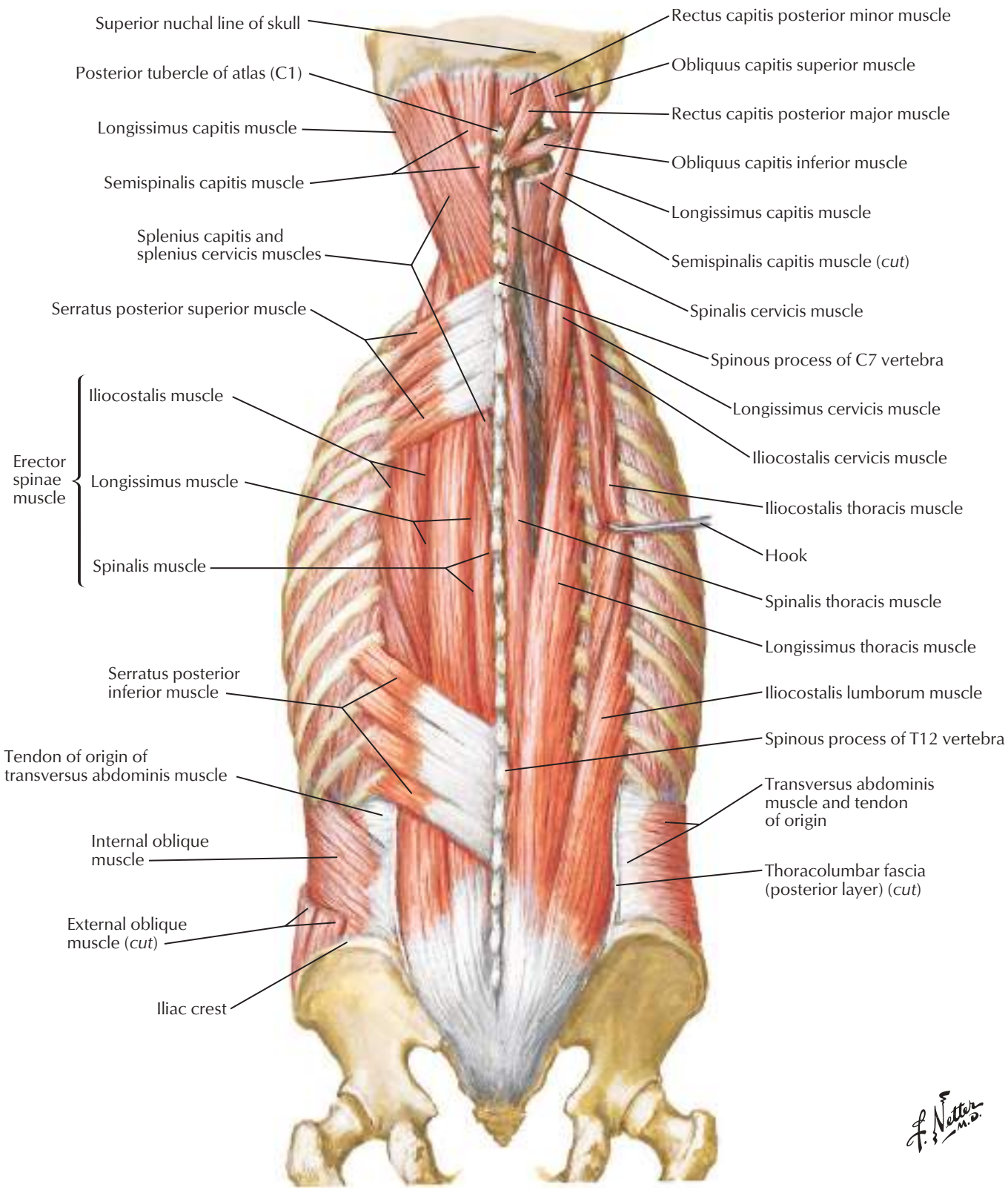

Internal vertebral (epidural) venous plexus
External vertebral venous plexus
Intervertebral vein
Internal vertebral (epidural) venous plexus (Batson's veins)
External vertebral venous plexus
Basivertebral vein
External vertebral venous plexus
Basivertebral vein
Internal vertebral (epidural) venous plexus
Segmental medullary/ radicular veins
Intervertebral vein
Internal vertebral (epidural) venous plexus
External vertebral venous plexus
Anterior spinal vein
Basivertebral vein
Anterior sulcal (central) vein
Internal vertebral (epidural) venous plexus
Intervertebral vein
Anterior segmental medullary/radicular vein
Posterior segmental medullary/radicular vein
Pial venous plexus
Posterior sulcal (central) vein
Posterior spinal vein
Internal vertebral (epidural) venous plexus

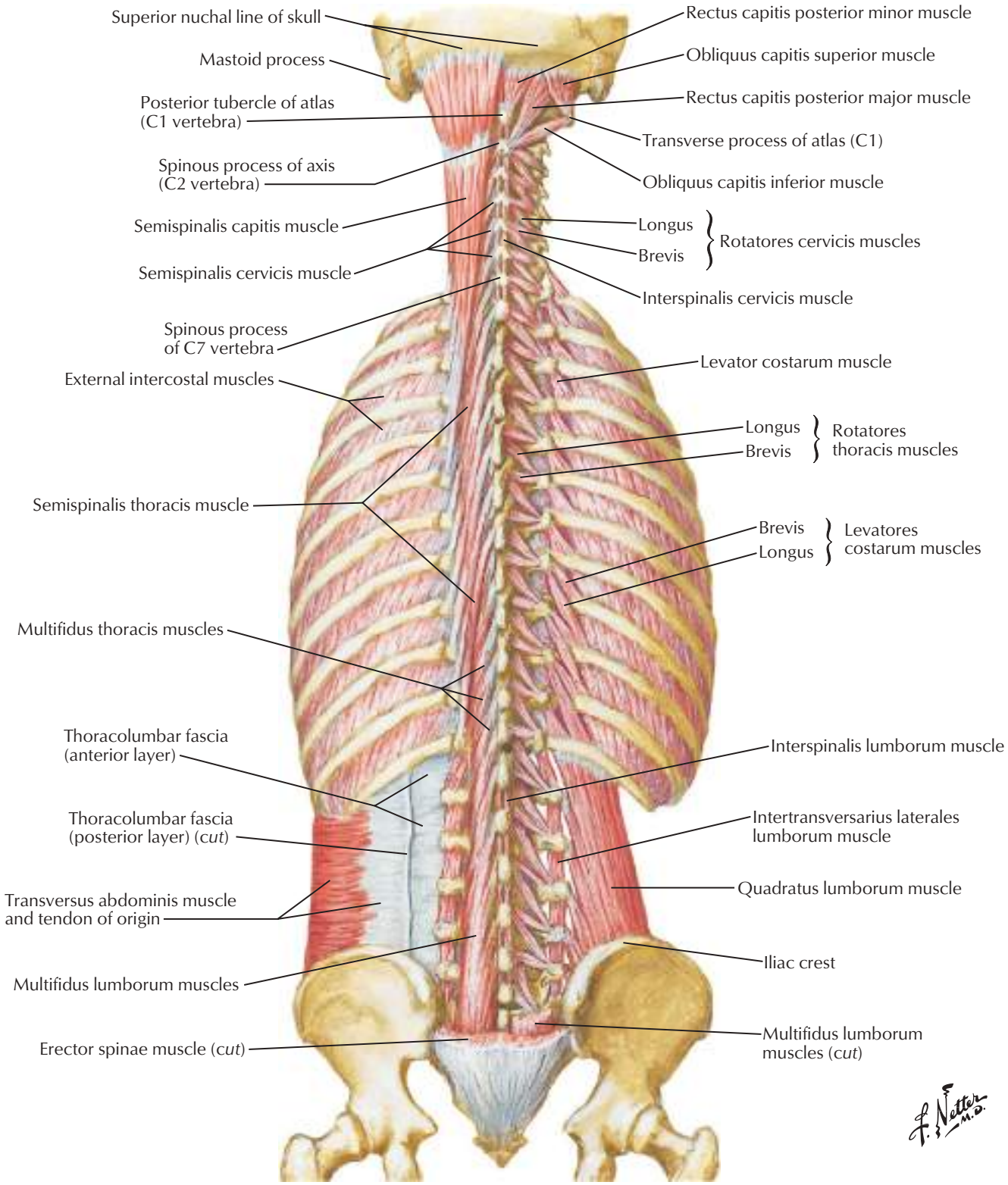

Superior bulb of right internal jugular vein
Condylar emissary vein
Vertebral arteries
Dura mater
Mastoid emissary vein
Anterior internal (epidural) vertebral venous plexus
Venous plexus around vertebral artery
Anterior external vertebral venous plexus
Communicating veins
Anterior vertebral veins
Left deep cervical vein
Right deep cervical vein
Left vertebral vein
Left vertebral artery
Accessory vertebral vein
Left thyrocervical trunk
Right vertebral artery and vein
Left internal jugular vein (inferior bulb)
Dorsal scapular artery
Left subclavian artery
Costocervical trunk
Left subclavian vein
Right thyrocervical trunk
Left brachiocephalic vein
Right subclavian vein
Left common carotid artery
Right internal jugular vein (inferior bulb)
Right brachiocephalic vein
Right subclavian artery
Right common carotid artery
C. Machado

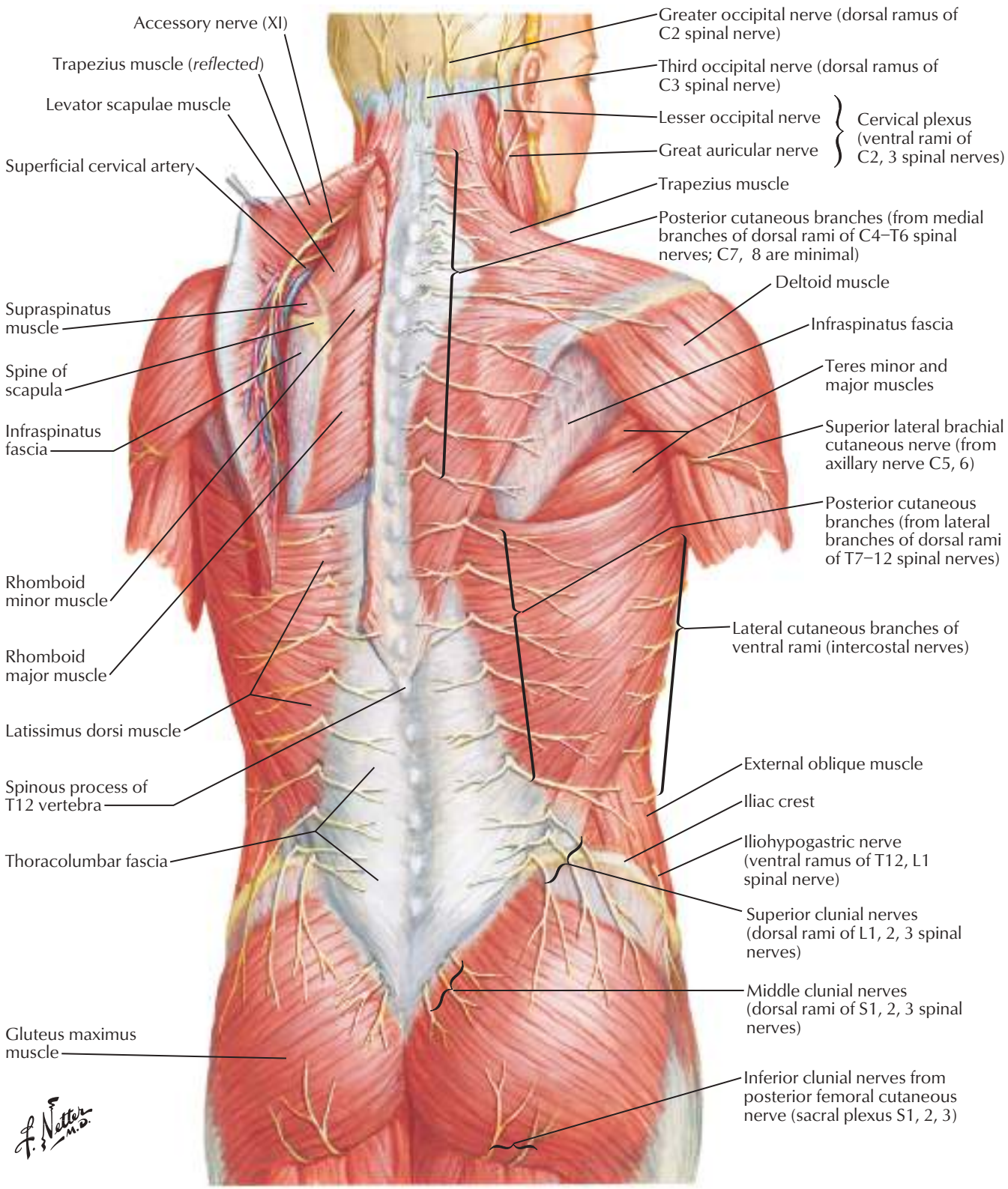
Muscles of Back: Superficial Layers

See also Plates 29, 250



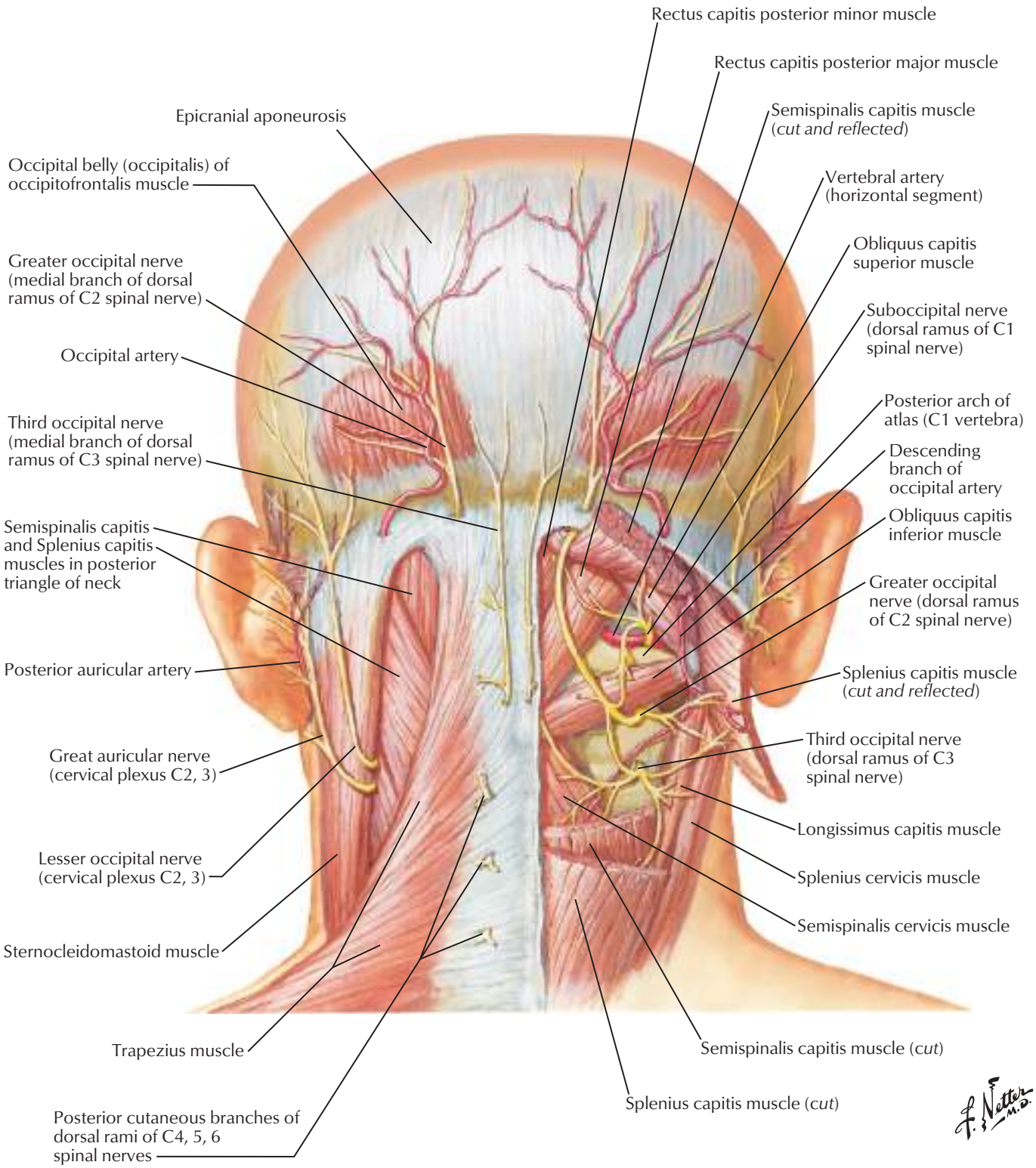

Superior nuchal line of skull
Posterior tubercle of atlas (C1)
Longissimus capitis muscle
Semispinalis capitis muscle
Splenius capitis and splenius cervicis muscles
Serratus posterior superior muscle
Erector spinae muscle
Iliocostalis muscle
Longissimus muscle
Spinalis muscle
Serratus posterior inferior muscle
Tendon of origin of transversus abdominis muscle
Internal oblique muscle
External oblique muscle (cut)
Iliac crest
Rectus capitis posterior minor muscle
Obliquus capitis superior muscle
Rectus capitis posterior major muscle
Obliquus capitis inferior muscle
Longissimus capitis muscle
Semispinalis capitis muscle (cut)
Spinalis cervicis muscle
Spinous process of C7 vertebra
Longissimus cervicis muscle
Iliocostalis cervicis muscle
Iliocostalis thoracis muscle
Hook
Spinalis thoracis muscle
Longissimus thoracis muscle
Iliocostalis lumborum muscle
Spinous process of T12 vertebra
Transversus abdominis muscle and tendon of origin
Thoracolumbar fascia (posterior layer) (cut)

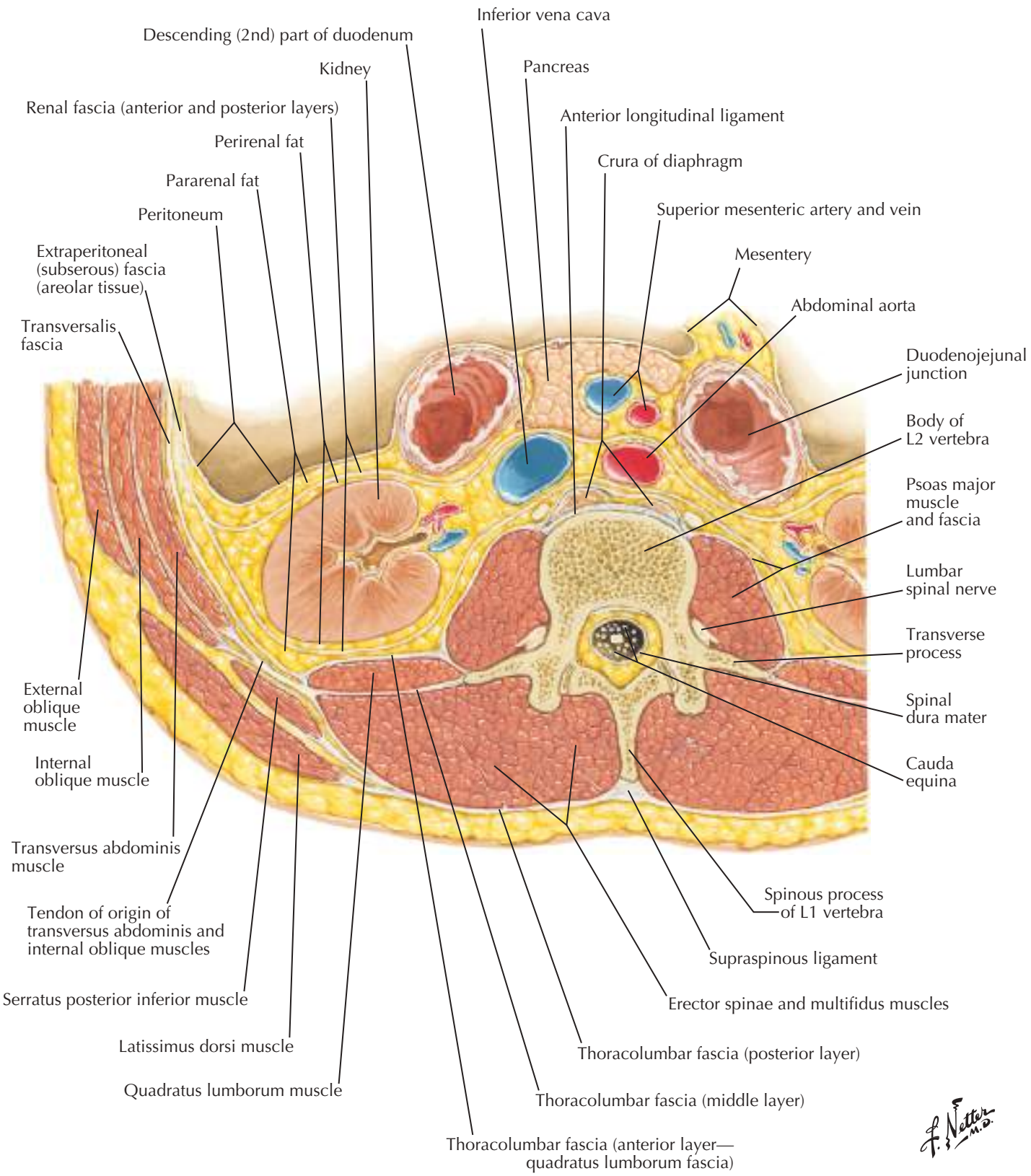

Superior nuchal line of skull
Mastoid process
Posterior tubercle of atlas (C1 vertebra)
Spinous process of axis (C2 vertebra)
Semispinalis capitis muscle
Semispinalis cervicis muscle
Spinous process of C7 vertebra
External intercostal muscles
Semispinalis thoracis muscle
Multifidus thoracis muscles
Thoracolumbar fascia (anterior layer)
Thoracolumbar fascia (posterior layer) (cut)
Transversus abdominis muscle and tendon of origin
Multifidus lumborum muscles
Erector spinae muscle (cut)
Rectus capitis posterior minor muscle
Obliquus capitis superior muscle
Rectus capitis posterior major muscle
Transverse process of atlas (C1)
Obliquus capitis inferior muscle
Longus
Brevis
Rotatores cervicis muscles
Interspinalis cervicis muscle
Levator costarum muscle
Longus
Brevis
Rotatores thoracis muscles
Brevis
Longus
Levatores costarum muscles
Interspinalis lumborum muscle
Intertransversarius laterales lumborum muscle
Quadratus lumborum muscle
Iliac crest
Multifidus lumborum muscles (cut)


Accessory nerve (XI)
Trapezius muscle (*reflected*)
Levator scapulae muscle
Superficial cervical artery
Supraspinatus muscle
Spine of scapula
Infraspinatus fascia
Rhomboid minor muscle
Rhomboid major muscle
Latissimus dorsi muscle
Spinous process of T12 vertebra
Thoracolumbar fascia
Gluteus maximus muscle
Greater occipital nerve (dorsal ramus of C2 spinal nerve)
Third occipital nerve (dorsal ramus of C3 spinal nerve)
Lesser occipital nerve
Great auricular nerve
Cervical plexus (ventral rami of C2, 3 spinal nerves)
Trapezius muscle
Posterior cutaneous branches (from medial branches of dorsal rami of C4–T6 spinal nerves; C7, 8 are minimal)
Deltoid muscle
Infraspinatus fascia
Teres minor and major muscles
Superior lateral brachial cutaneous nerve (from axillary nerve C5, 6)
Posterior cutaneous branches (from lateral branches of dorsal rami of T7–12 spinal nerves)
Lateral cutaneous branches of ventral rami (intercostal nerves)
External oblique muscle
Iliac crest
Iliohypogastric nerve (ventral ramus of T12, L1 spinal nerve)
Superior clunial nerves (dorsal rami of L1, 2, 3 spinal nerves)
Middle clunial nerves (dorsal rami of S1, 2, 3 spinal nerves)
Inferior clunial nerves from posterior femoral cutaneous nerve (sacral plexus S1, 2, 3)

Suboccipital Triangle

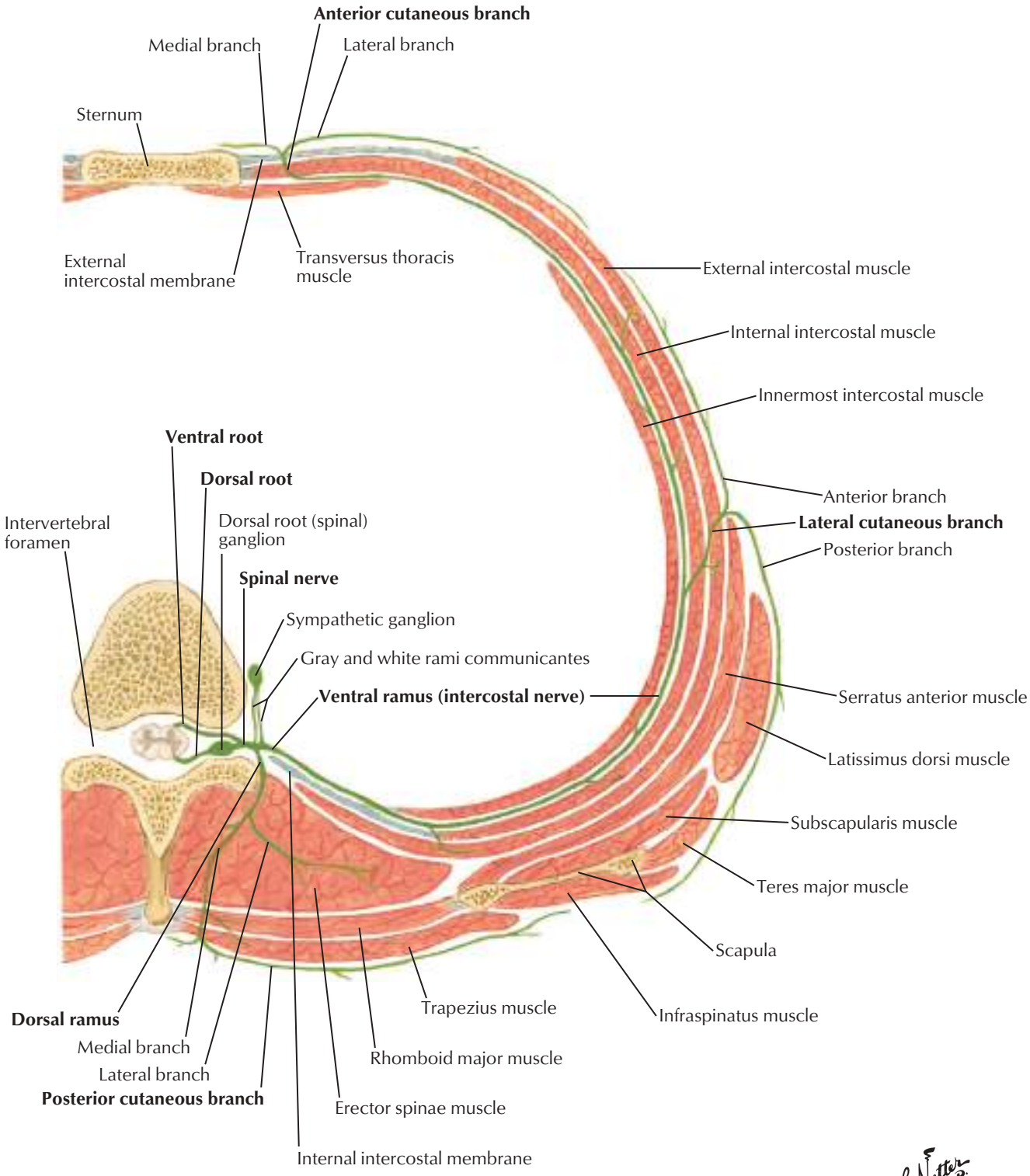
See also Plates 29, 32




Inferior vena cava
Descending (2nd) part of duodenum
Kidney
Pancreas
Renal fascia (anterior and posterior layers)
Anterior longitudinal ligament
Perirenal fat
Crura of diaphragm
Pararenal fat
Superior mesenteric artery and vein
Peritoneum
Mesentery
Extraperitoneal (subserous) fascia (areolar tissue)
Abdominal aorta
Transversalis fascia
Duodenojejunal junction
Body of L2 vertebra
Psoas major muscle and fascia
Lumbar spinal nerve
Transverse process
External oblique muscle
Spinal dura mater
Internal oblique muscle
Cauda equina
Transversus abdominis muscle
Spinous process of L1 vertebra
Tendon of origin of transversus abdominis and internal oblique muscles
Supraspinous ligament
Serratus posterior inferior muscle
Erector spinae and multifidus muscles
Latissimus dorsi muscle
Thoracolumbar fascia (posterior layer)
Quadratus lumborum muscle
Thoracolumbar fascia (middle layer)
Thoracolumbar fascia (anterior layer—quadratus lumborum fascia)

Typical Thoracic Spinal Nerve: Cross Section

See also Plate 254



Note: *In lower thoracic region, lateral branch of dorsal ramus is longer, motor, and cutaneous; medial branch is shorter and motor only.*

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Erector spinae	Posterior sacrum, iliac crest, sacrospinous ligament, supraspinous ligament, spinous processes of lower lumbar and sacral vertebrae	*Iliocostalis:* angles of lower ribs, cervical transverse processes *Longissimus:* between tubercles and angles of ribs, transverse processes of thoracic and cervical vertebrae, mastoid process *Spinalis:* spinous processes of upper thoracic and midcervical vertebrae	Dorsal rami of each region	Extends and laterally bends vertebral column and head	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal, subcostal, and lumbar arteries *Sacral portions:* dorsal branches of lateral sacral arteries	Sacrospinalis
Interspinales (cervical, thoracic, lumbar)	Spinous process	Adjacent spinous process	Dorsal rami of spinal nerves	Aid in extension of vertebral column	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal arteries *Lumbar portions:* dorsal branches of lumbar arteries	Segmental
Intertransversarii (cervical, thoracic, lumbar)	Extend between adjacent transverse processes of vertebrae	Extend between adjacent transverse processes of vertebrae	Dorsal rami of spinal nerves	Assist in lateral flexion of vertebral column	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal, subcostal, and lumbar arteries *Lumbar portions:* dorsal branches of lateral lumbar arteries	Segmental
Latissimus dorsi	Spinous processes of T7–L5, thoracolumbar fascia, iliac crest, and last three ribs	Humerus (intertubercular sulcus)	Thoracodorsal nerve	Extends, adducts, and medially rotates humerus	Thoracodorsal artery, dorsal perforating branches of 9th, 10th, and 11th posterior intercostal, subcostal, and first three lumbar arteries	Superficial back
Levator scapulae	Posterior tubercles of transverse processes of C1–C4	Medial border of scapula from superior angle to spine	Ventral rami of C3–C4 and dorsal scapular nerve	Elevates scapula medially, inferiorly rotates glenoid cavity	Dorsal scapular artery, transverse cervical artery, ascending cervical artery	Superficial back
Multifidus	Sacrum, ilium, transverse processes of T1–T12, and articular processes of C4–C7	Spinous processes of vertebrae above, spanning two to four segments	Dorsal rami of each region	Stabilizes spine	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal, subcostal, and lumbar arteries *Sacral portions:* dorsal branches of lateral sacral arteries	Transversospinalis
Obliquus capitis inferior	Spine of axis	Transverse process of atlas	Suboccipital nerve	Rotates atlas to turn face to same side	Vertebral artery, descending branch of occipital artery	Suboccipital
Obliquus capitis superior	Transverse process of atlas	Occipital bone	Suboccipital nerve	Extends and bends head laterally	Vertebral artery, descending branch of occipital artery	Suboccipital
Rectus capitis posterior major	Spine of axis	Inferior nuchal line	Suboccipital nerve	Extends and rotates head to same side	Vertebral artery, descending branch of occipital artery	Suboccipital

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Rectus capitis posterior minor	Tubercle of posterior arch of atlas	Median inferior nuchal line	Suboccipital nerve	Extends head	Vertebral artery, descending branch of occipital artery	Suboccipital
Rhomboid major	Spinous processes of T2–T5 vertebrae	Medial border of scapula below base of spine of scapula	Dorsal scapular nerve	Fixes scapula to thoracic wall and retracts and rotates it to depress glenoid cavity	Dorsal scapular artery *OR* deep branch of transverse cervical artery, dorsal perforating branches of the upper five or six posterior intercostal arteries	Superficial back
Rhomboid minor	Ligamentum nuchae, spines of C7 and T1 vertebrae	Medial border of scapula at spine of scapula	Dorsal scapular nerve	Fixes scapula to thoracic wall and retracts and rotates it to depress glenoid cavity	Dorsal scapular artery *OR* deep branch of transverse cervical artery, dorsal perforating branches of the upper five or six posterior intercostal arteries	Superficial back
Rotatores	Transverse processes of cervical, thoracic, and lumbar regions	Lamina and transverse process of spine above, spanning one or two segments	Dorsal rami of spinal nerves	Stabilizes, extends, and rotates spine	Dorsal branches of segmental arteries	Transversospinalis
Semispinalis	Transverse processes of C4–T12	Spinous processes of cervical and thoracic regions	Dorsal rami of spinal nerves	Extends head, neck, and thorax and rotates them to opposite side	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal arteries	Transversospinalis
Serratus posterior inferior	Spinous processes of T11–L2	Inferior aspect of ribs 9–12	Ventral rami of lower thoracic nerves	Depresses ribs	Posterior intercostal arteries	Intermediate back
Serratus posterior superior	Ligamentum nuchae, spinous processes of C7–T3	Superior aspect of ribs 2–4	Ventral rami of upper thoracic nerves	Elevates ribs	Posterior intercostal arteries	Intermediate back
Splenius capitis	Nuchal ligament, spinous process of C7–T3	Mastoid process of temporal bone, lateral third of superior nuchal line	Dorsal rami of middle cervical nerves	*Bilaterally:* extend head *Unilaterally*: laterally bends (flexes) and rotates face to same side	Descending branch of occipital artery, deep cervical artery	Spinotransverse
Splenius cervicis	Spinous process of T3–T6	Transverse processes (C1–C3)	Dorsal rami of lower cervical nerves	*Bilaterally*: extend neck *Unilaterally:* laterally bends (flexes) and rotates neck toward same side	Descending branch of occipital artery, deep cervical artery	Spinotransverse
Trapezius	Superior nuchal line, external occipital protuberance, nuchal ligament, spinous processes of C7–T12	Lateral third of clavicle, acromion, spine of scapula	Accessory nerve (CN XI)	Elevates, retracts, and rotates scapula; lower fibers depress scapula	Transverse cervical artery, dorsal perforating branches of posterior intercostal arteries	Superficial back

Section

3 THORAX

Topographic Anatomy
Plate 178

178 Thorax: Surface Anatomy

Mammary Gland
Plates 179–182

179 Mammary Gland

180 Arteries of Mammary Gland

181 Lymph Vessels and Nodes of Mammary Gland

182 Lymphatic Drainage of Breast

Body Wall
Plates 183–192

183 Bony Framework of Thorax

184 Ribs and Associated Joints

185 Anterior Thoracic Wall

186 Anterior Thoracic Wall (continued)

187 Anterior Thoracic Wall: Internal View

188 Intercostal Nerves and Arteries

189 Veins of Internal Thoracic Wall

190 Phrenic Nerve

191 Diaphragm: Thoracic Surface

192 Diaphragm: Abdominal Surface

Lungs
Plates 193–207

193 Topography of Lungs: Anterior View

194 Topography of Lungs: Posterior View

195 Lungs in Situ: Anterior View
196 Lungs: Medial Views
197 Bronchopulmonary Segments
198 Bronchopulmonary Segments (continued)
199 Trachea and Major Bronchi
200 Nomenclature of Bronchi: Schema
201 Intrapulmonary Airways: Schema
202 Intrapulmonary Blood Circulation: Schema
203 Great Vessels of Superior Mediastinum
204 Bronchial Arteries and Veins
205 Lymph Vessels and Nodes of Lung
206 Autonomic Nerves in Thorax
207 Innervation of Tracheobronchial Tree: Schema

Heart

Plates 208–226

208 Heart in Situ
209 Heart: Anterior Exposure
210 Radiology and Auscultation of Heart
211 Heart: Base and Diaphragmatic Surface
212 Pericardial Sac
213 Mediastinum: Cross Section
214 Thorax: Coronal Section of Heart, Ascending Aorta
215 Coronary Arteries and Cardiac Veins
216 Coronary Arteries: Imaging
217 Right Atrium and Ventricle
218 Left Atrium and Ventricle
219 Valves and Fibrous Skeleton of Heart
220 Valves and Fibrous Skeleton of Heart (continued)
221 Atria, Ventricles, and Interventricular Septum
222 Conducting System of Heart
223 Nerves of Heart
224 Innervation of Heart: Schema
225 Innervation of Blood Vessels: Schema
226 Prenatal and Postnatal Circulation

Mediastinum

Plates 227–236

227 Mediastinum: Right Lateral View
228 Mediastinum: Left Lateral View
229 Esophagus in Situ
230 Topography and Constrictions of Esophagus
231 Musculature of Esophagus
232 Esophagogastric Junction
233 Arteries of Esophagus
234 Veins of Esophagus
235 Lymph Vessels and Nodes of Esophagus
236 Nerves of Esophagus

Regional Scans

Plate 237

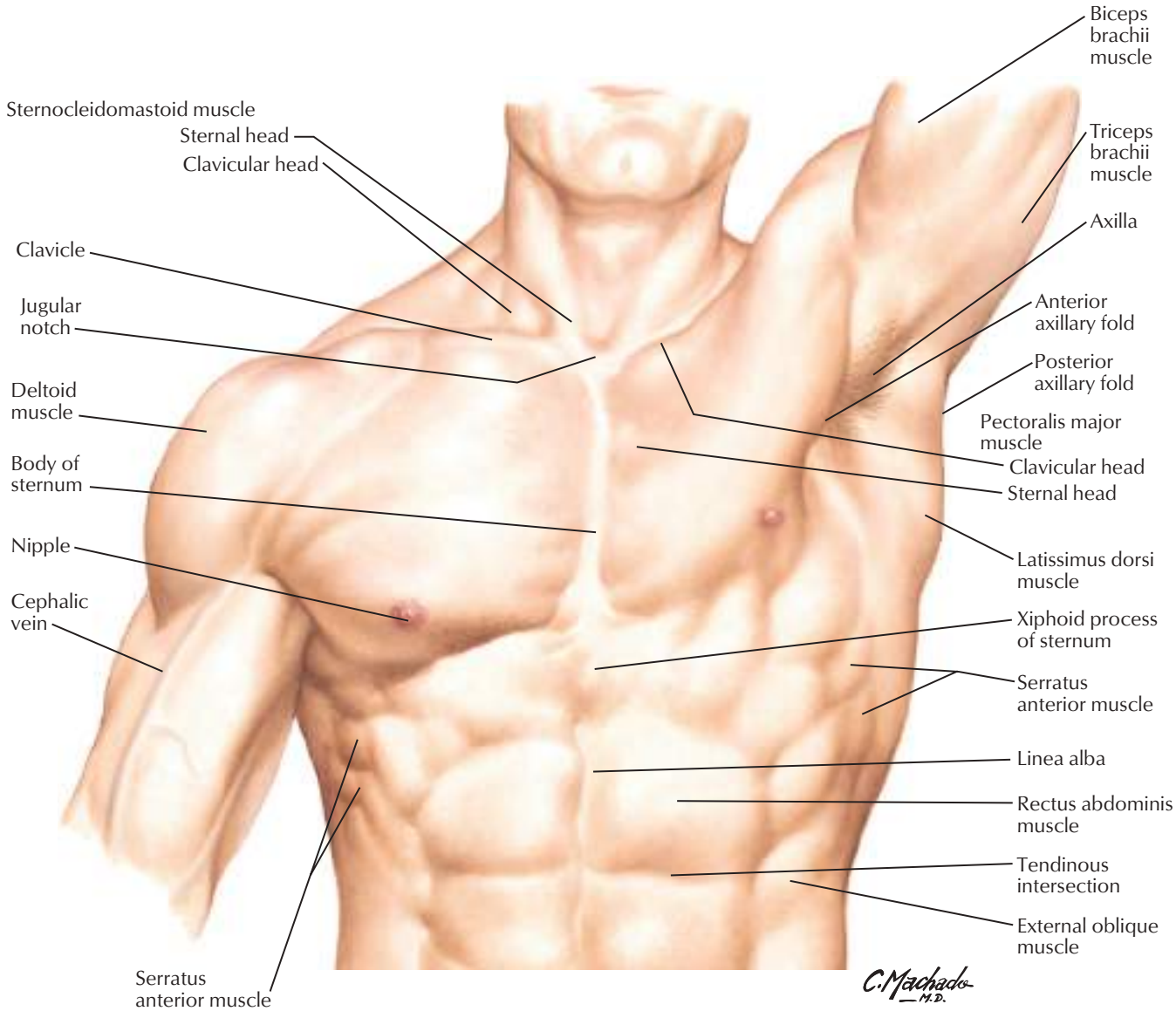
237 Chest Scans: Axial CT Images

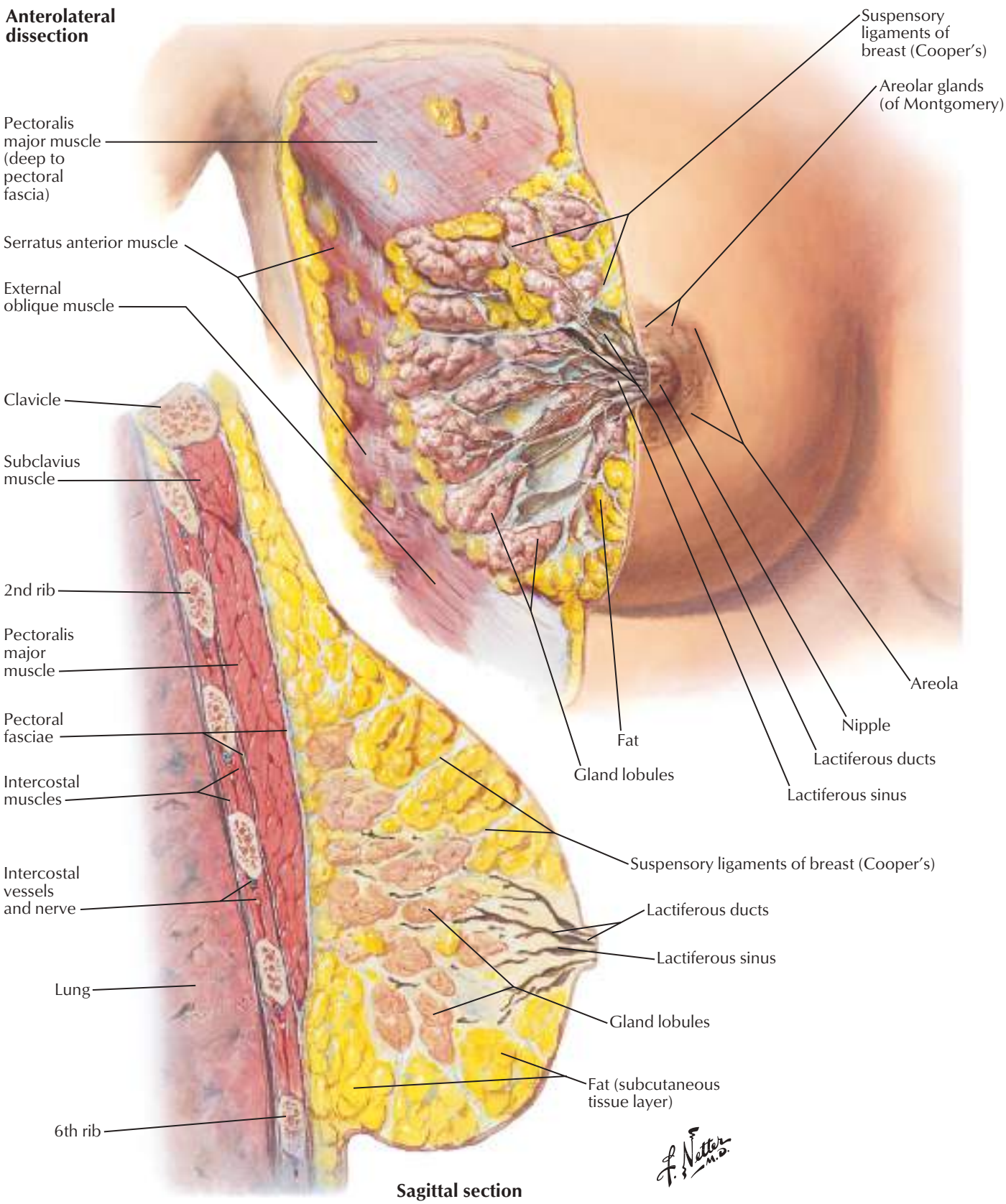
Cross-Sectional Anatomy

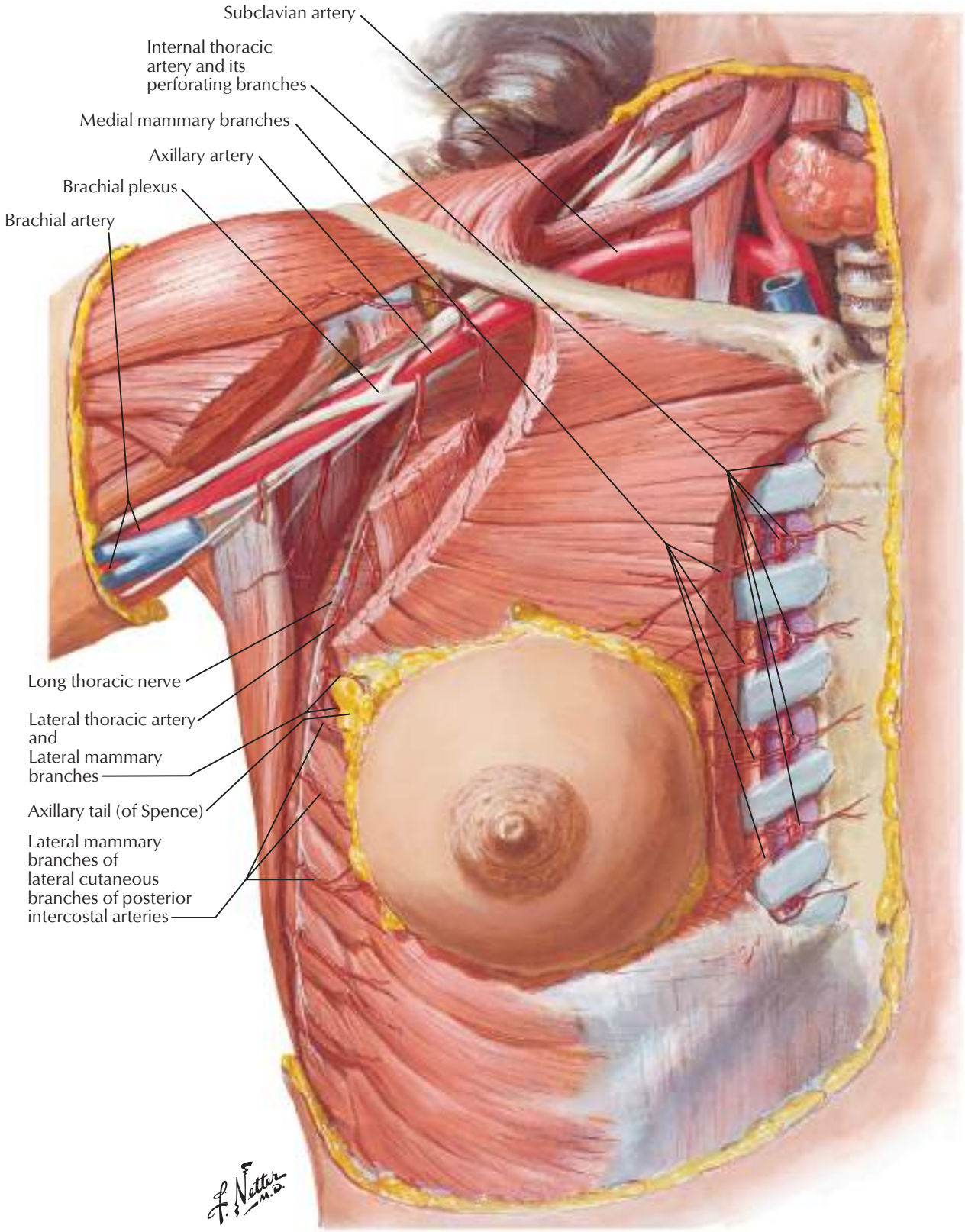
Plates 238–241

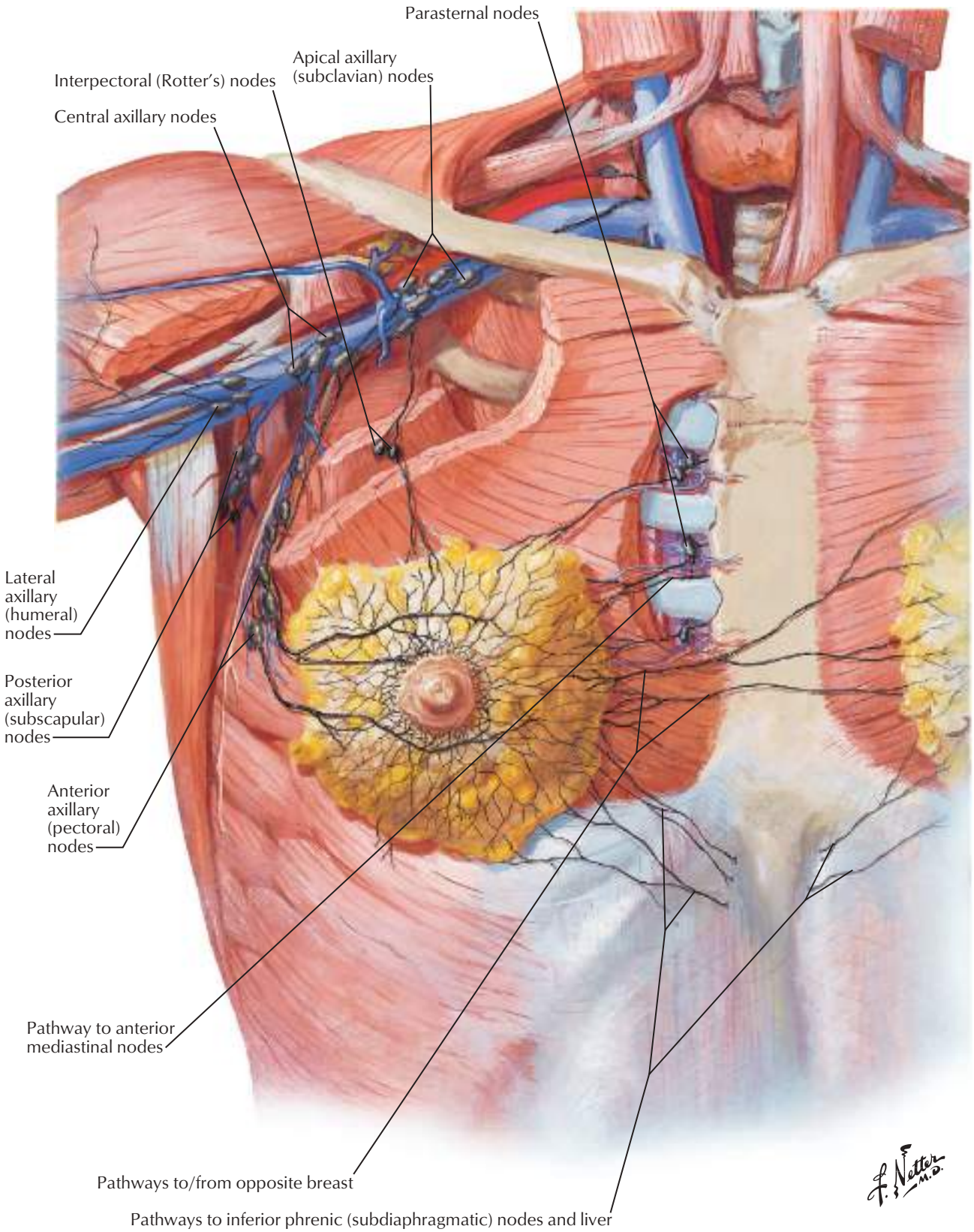
238 Cross Section of Thorax at T3 Level
239 Cross Section of Thorax at T3-4 Disc Level
240 Cross Section of Thorax at T4-5 Disc Level
241 Cross Section of Thorax at T7 Level

Muscle Table


Biceps brachii muscle
Sternocleidomastoid muscle
Sternal head
Clavicular head
Triceps brachii muscle
Axilla
Clavicle
Jugular notch
Anterior axillary fold
Posterior axillary fold
Deltoid muscle
Pectoralis major muscle
Clavicular head
Body of sternum
Sternal head
Nipple
Latissimus dorsi muscle
Cephalic vein
Xiphoid process of sternum
Serratus anterior muscle
Linea alba
Rectus abdominis muscle
Tendinous intersection
External oblique muscle
Serratus anterior muscle
C. Machado M.D.

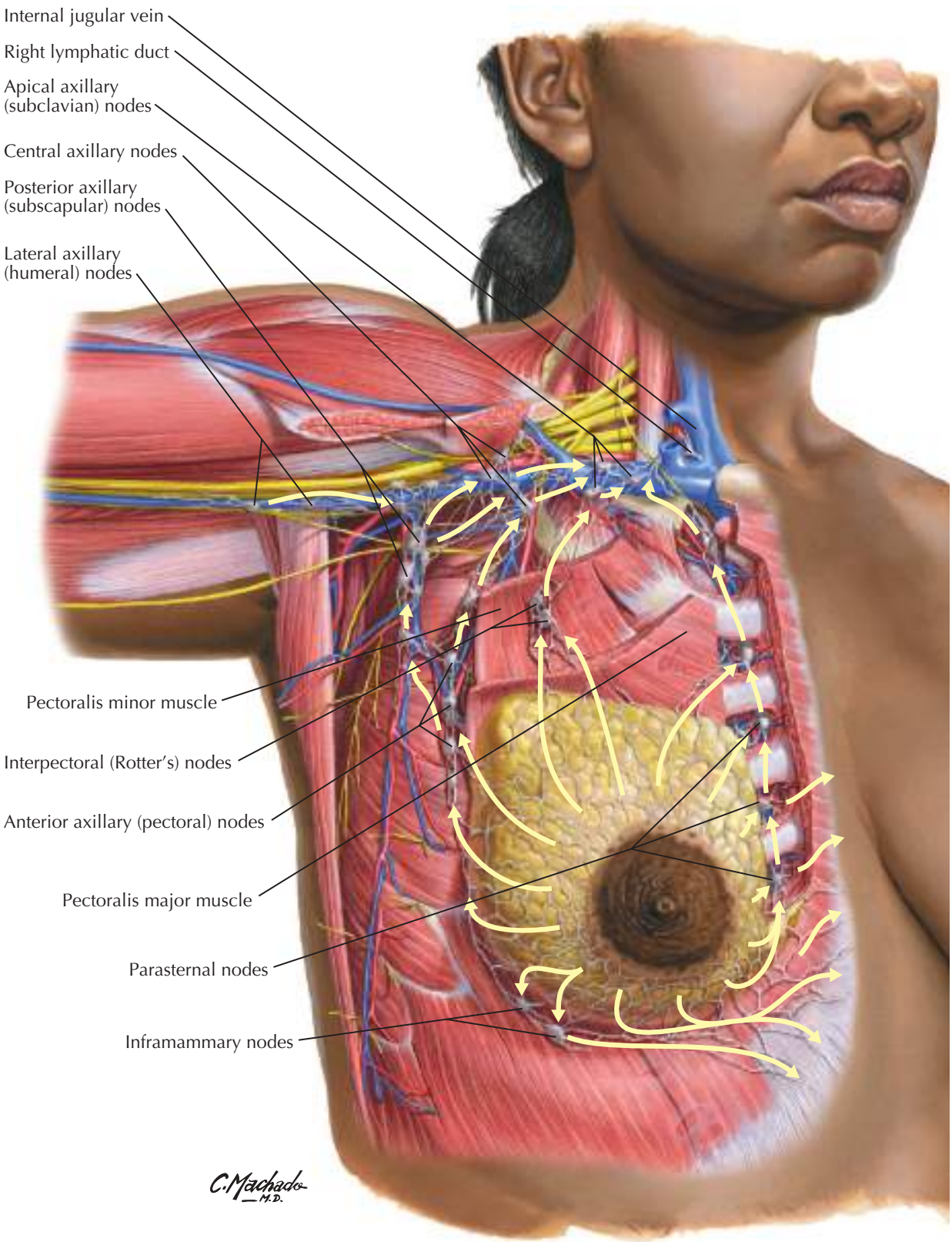

Anterolateral dissection
Pectoralis major muscle (deep to pectoral fascia)
Serratus anterior muscle
External oblique muscle
Clavicle
Subclavius muscle
2nd rib
Pectoralis major muscle
Pectoral fasciae
Intercostal muscles
Intercostal vessels and nerve
Lung
6th rib
Suspensory ligaments of breast (Cooper's)
Areolar glands (of Montgomery)
Areola
Nipple
Lactiferous ducts
Lactiferous sinus
Fat
Gland lobules
Suspensory ligaments of breast (Cooper's)
Lactiferous ducts
Lactiferous sinus
Gland lobules
Fat (subcutaneous tissue layer)
Sagittal section

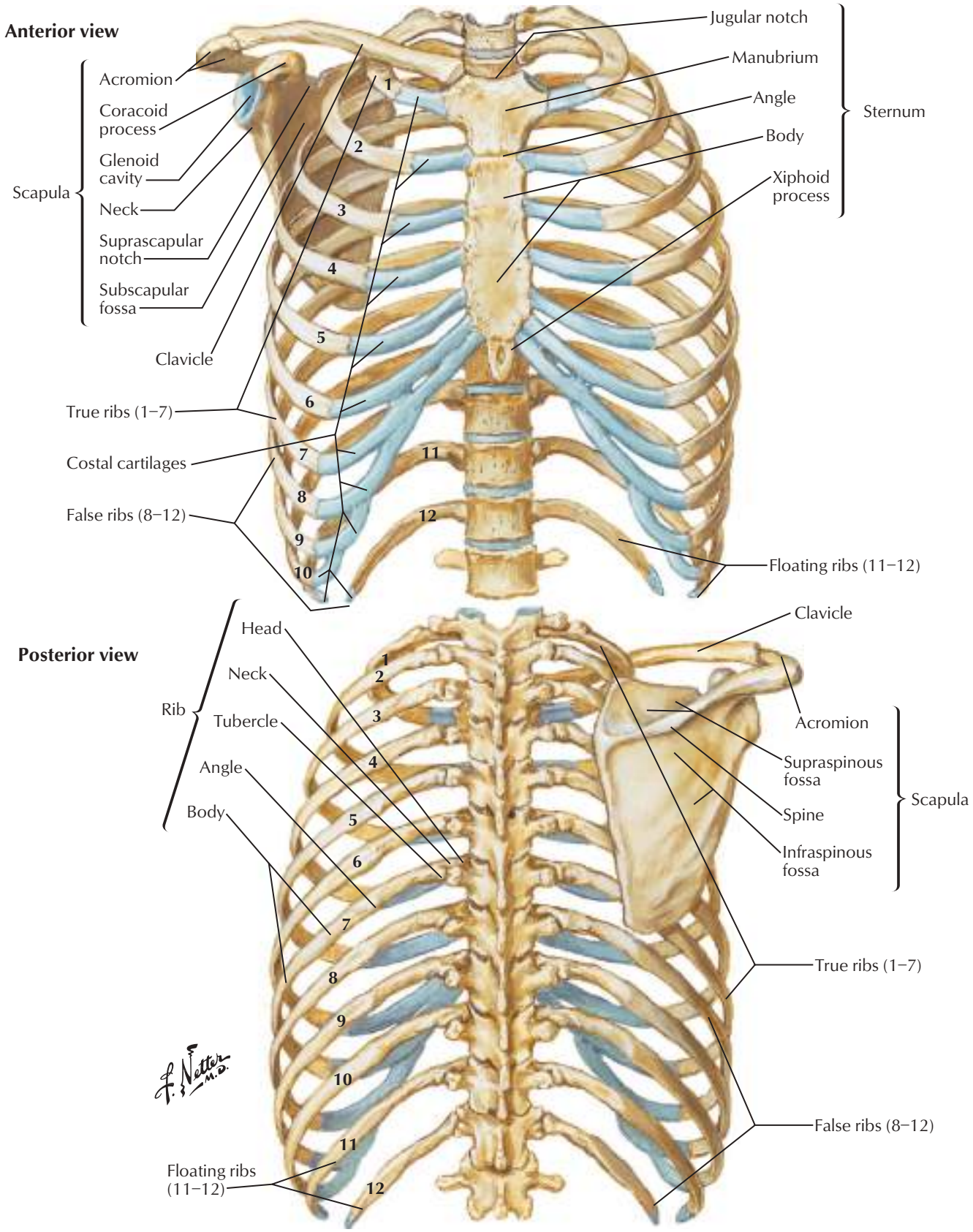

Subclavian artery
Internal thoracic artery and its perforating branches
Medial mammary branches
Axillary artery
Brachial plexus
Brachial artery
Long thoracic nerve
Lateral thoracic artery and Lateral mammary branches
Axillary tail (of Spence)
Lateral mammary branches of lateral cutaneous branches of posterior intercostal arteries
F. Netter M.D.

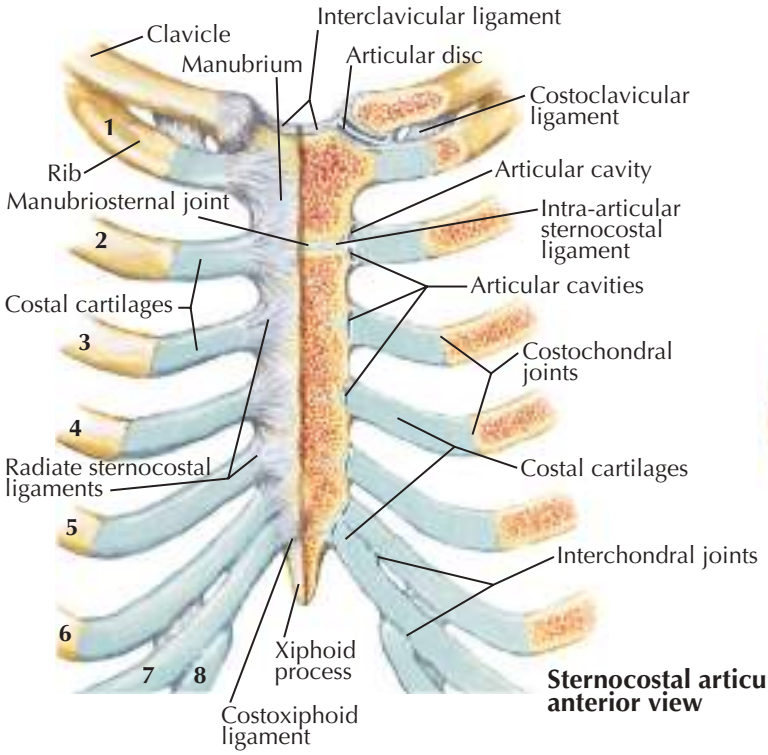

Parasternal nodes
Apical axillary (subclavian) nodes
Interpectoral (Rotter's) nodes
Central axillary nodes
Lateral axillary (humeral) nodes
Posterior axillary (subscapular) nodes
Anterior axillary (pectoral) nodes
Pathway to anterior mediastinal nodes
Pathways to/from opposite breast
Pathways to inferior phrenic (subdiaphragmatic) nodes and liver

Lymphatic Drainage of Breast

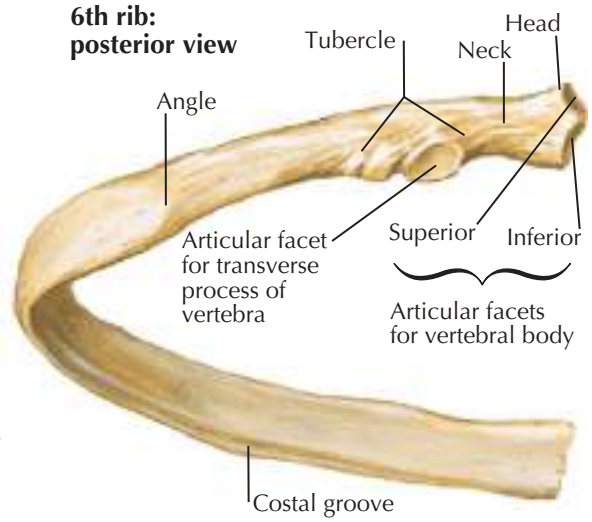
See also Plate 181



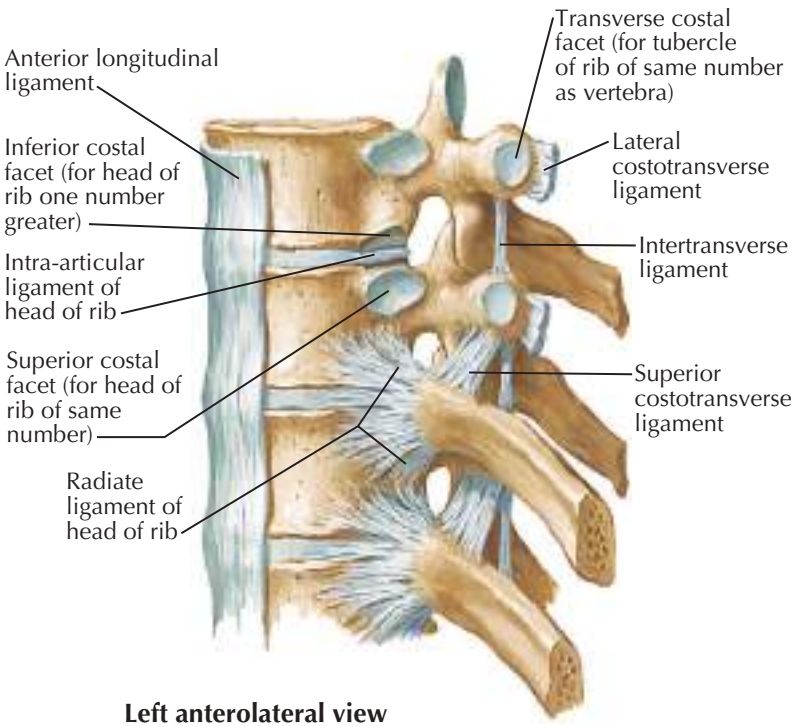

Anterior view
Jugular notch
Manubrium
Angle
Body
Xiphoid process
Sternum
Acromion
Coracoid process
Glenoid cavity
Neck
Suprascapular notch
Subscapular fossa
Scapula
Clavicle
True ribs (1–7)
Costal cartilages
False ribs (8–12)
Floating ribs (11–12)
1
2
3
4
5
6
7
8
9
10
11
12
Posterior view
Head
Neck
Tubercle
Angle
Body
Rib
Clavicle
Acromion
Supraspinous fossa
Spine
Infraspinous fossa
Scapula
True ribs (1–7)
False ribs (8–12)
Floating ribs (11–12)



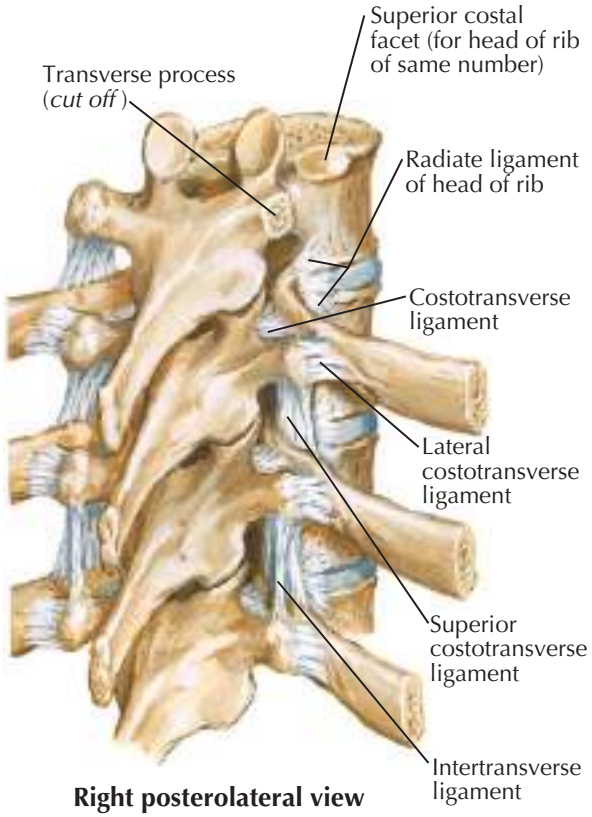
Sternocostal articulations: anterior view



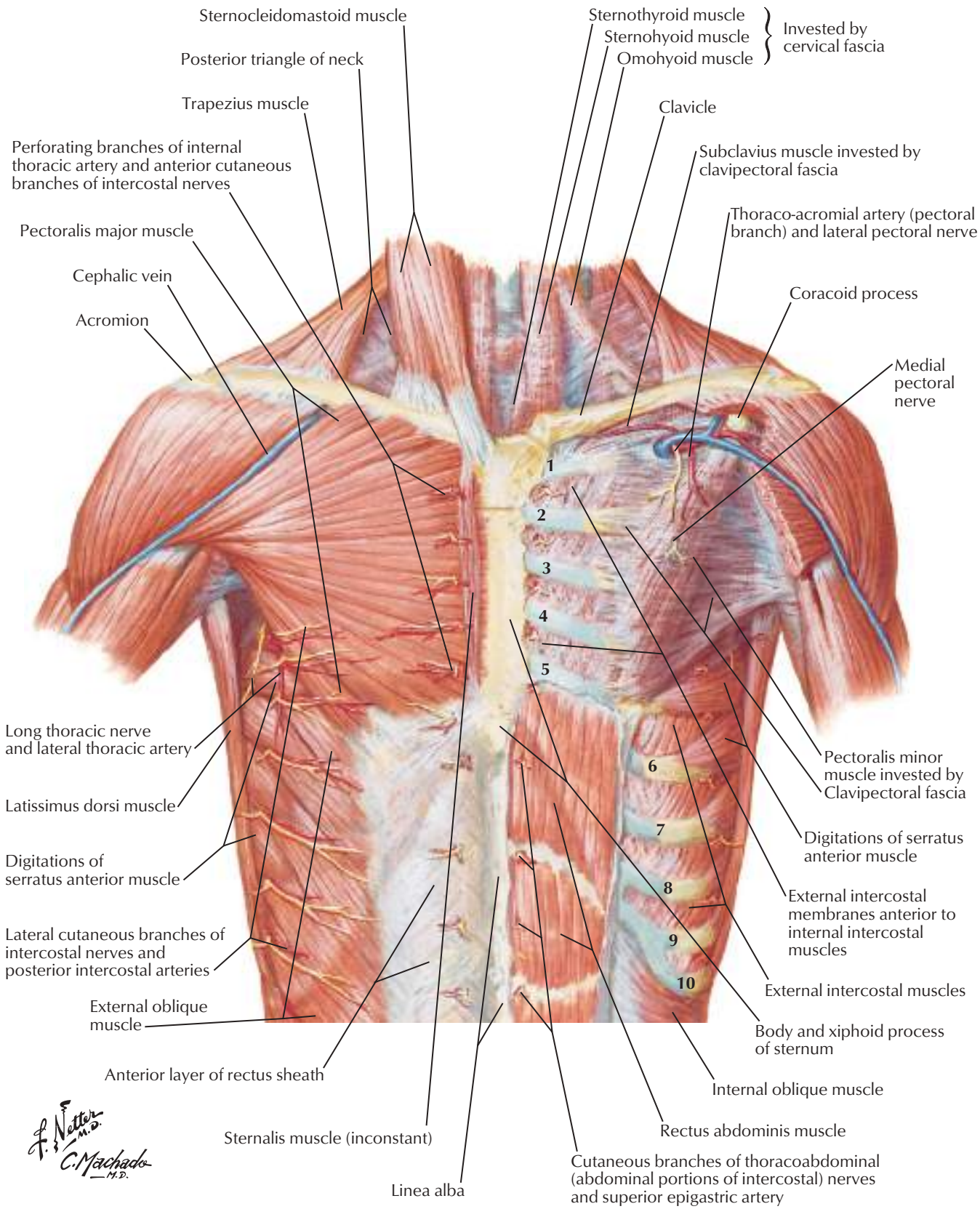
Note: The head of a typical rib articulates with the superior costal facet of the thoracic vertebra of the same number (by its inferior articular facet), the inferior costal facet of the vertebra above (by its superior articular facet), and the intervertebral disc between the two vertebrae. The costal tubercle articulates with the transverse process of the vertebra of the same number.

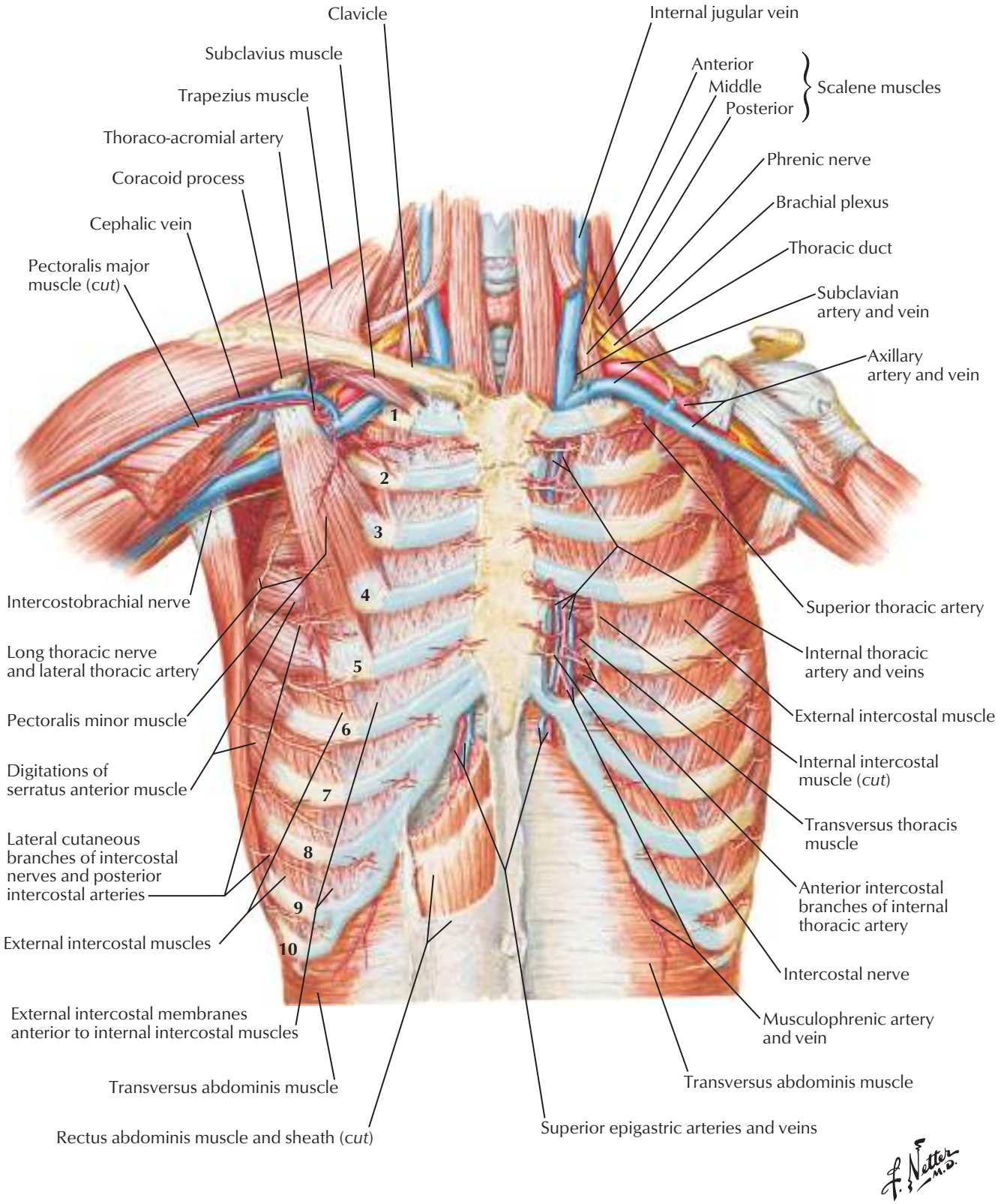


Left anterolateral view

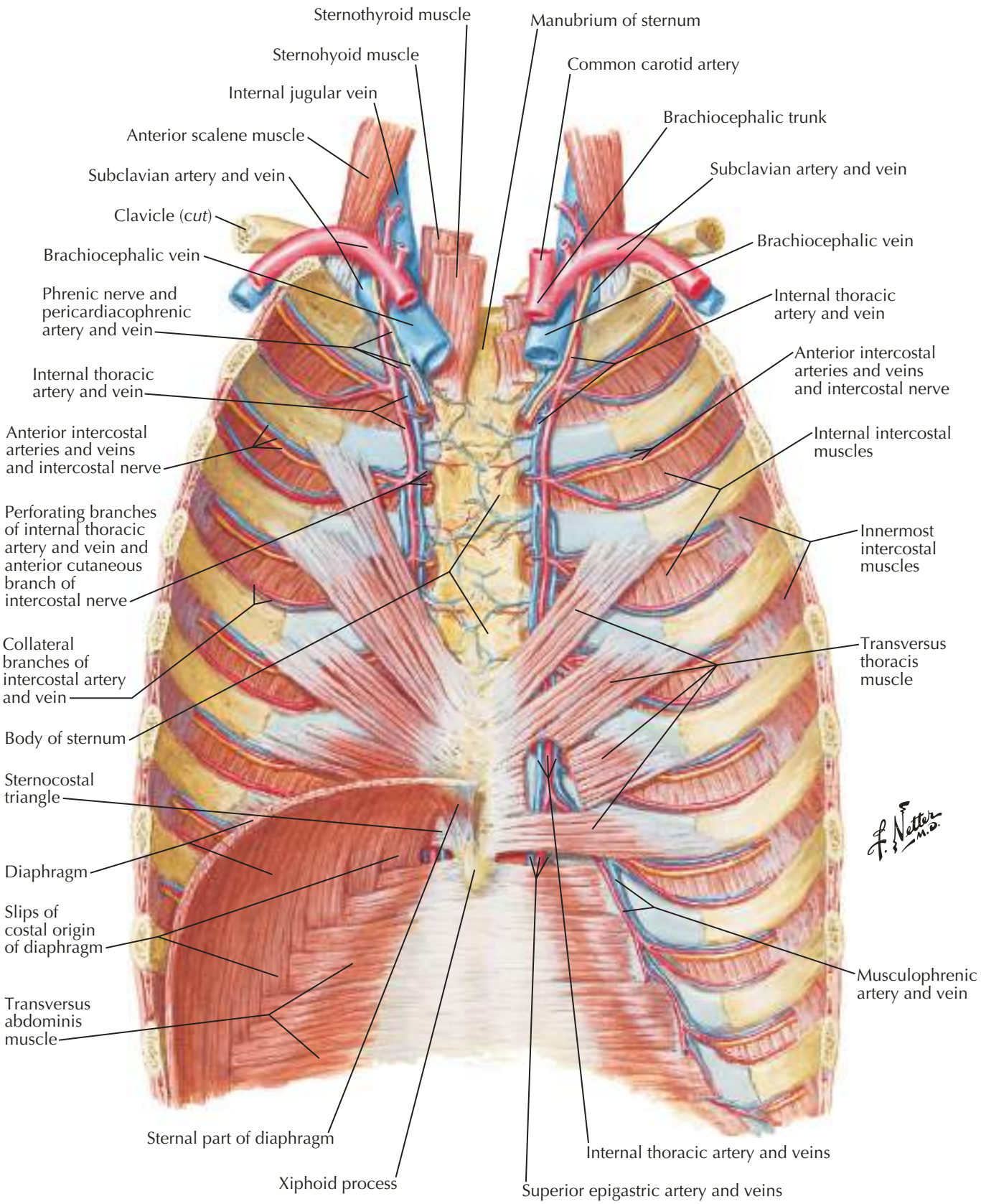


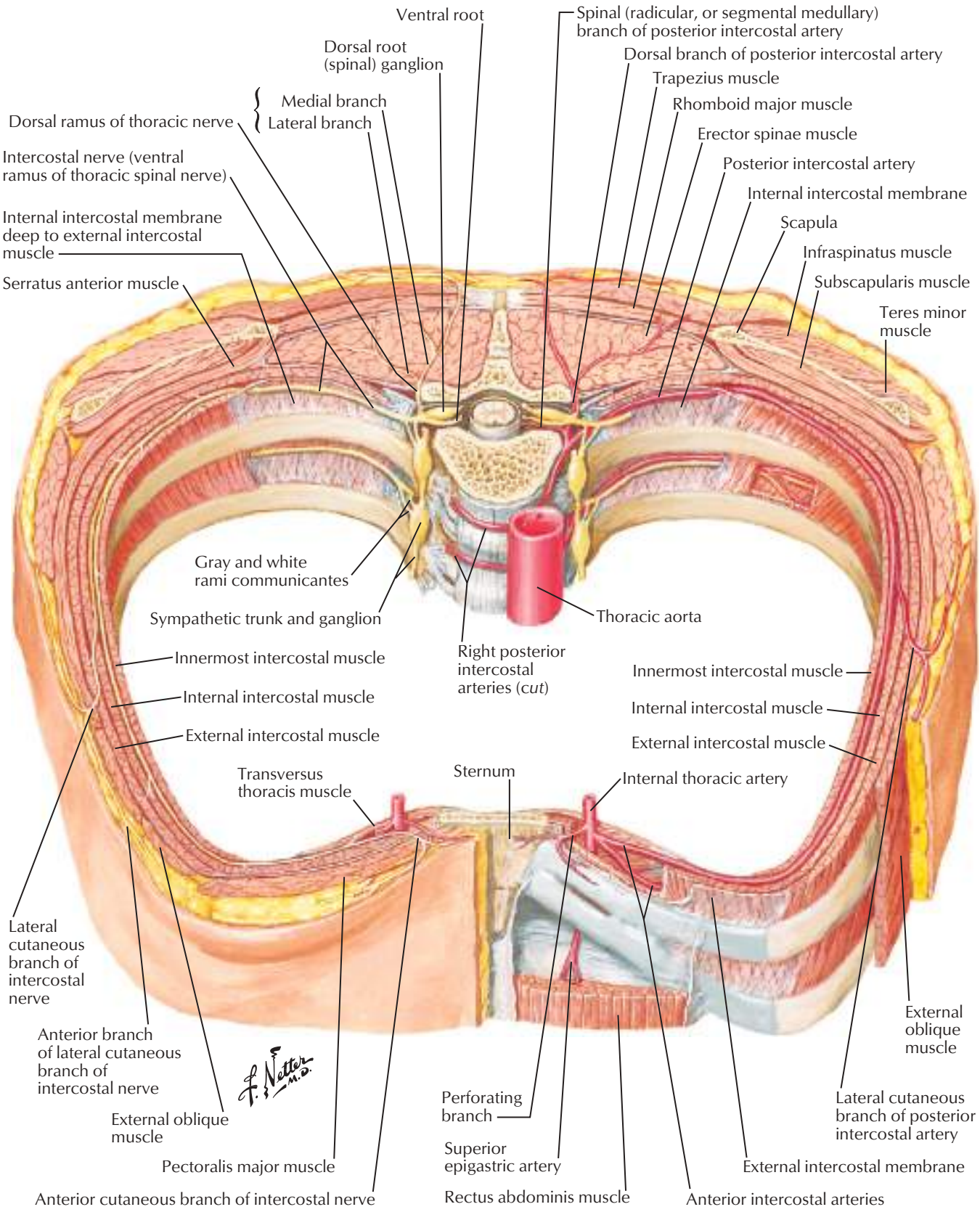
Right posterolateral view


Sternocleidomastoid muscle
Posterior triangle of neck
Trapezius muscle
Perforating branches of internal thoracic artery and anterior cutaneous branches of intercostal nerves
Pectoralis major muscle
Cephalic vein
Acromion
Sternothyroid muscle
Sternohyoid muscle
Omohyoid muscle
Invested by cervical fascia
Clavicle
Subclavius muscle invested by clavipectoral fascia
Thoraco-acromial artery (pectoral branch) and lateral pectoral nerve
Coracoid process
Medial pectoral nerve
1
2
3
4
5
6
7
8
9
10
Long thoracic nerve and lateral thoracic artery
Latissimus dorsi muscle
Digitations of serratus anterior muscle
Lateral cutaneous branches of intercostal nerves and posterior intercostal arteries
External oblique muscle
Anterior layer of rectus sheath
Sternalis muscle (inconstant)
Linea alba
Pectoralis minor muscle invested by Clavipectoral fascia
Digitations of serratus anterior muscle
External intercostal membranes anterior to internal intercostal muscles
External intercostal muscles
Body and xiphoid process of sternum
Internal oblique muscle
Rectus abdominis muscle
Cutaneous branches of thoracoabdominal (abdominal portions of intercostal) nerves and superior epigastric artery


Clavicle
Subclavius muscle
Trapezius muscle
Thoraco-acromial artery
Coracoid process
Cephalic vein
Pectoralis major muscle (cut)
Intercostobrachial nerve
Long thoracic nerve and lateral thoracic artery
Pectoralis minor muscle
Digitations of serratus anterior muscle
Lateral cutaneous branches of intercostal nerves and posterior intercostal arteries
External intercostal muscles
External intercostal membranes anterior to internal intercostal muscles
Transversus abdominis muscle
Rectus abdominis muscle and sheath (cut)
1
2
3
4
5
6
7
8
9
10
Internal jugular vein
Anterior
Middle
Posterior
Scalene muscles
Phrenic nerve
Brachial plexus
Thoracic duct
Subclavian artery and vein
Axillary artery and vein
Superior thoracic artery
Internal thoracic artery and veins
External intercostal muscle
Internal intercostal muscle (cut)
Transversus thoracis muscle
Anterior intercostal branches of internal thoracic artery
Intercostal nerve
Musculophrenic artery and vein
Transversus abdominis muscle
Superior epigastric arteries and veins

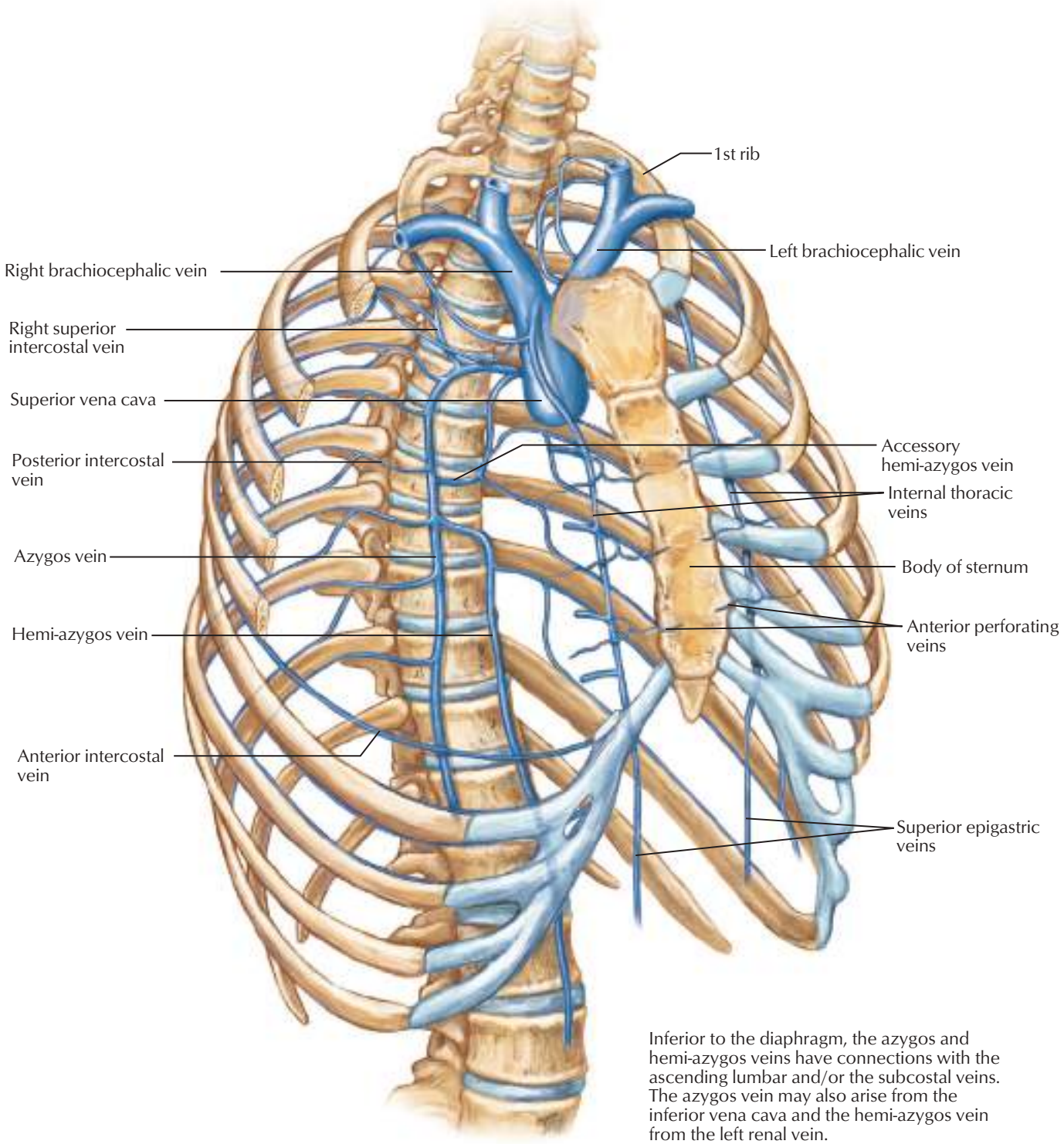
Anterior Thoracic Wall: Internal View



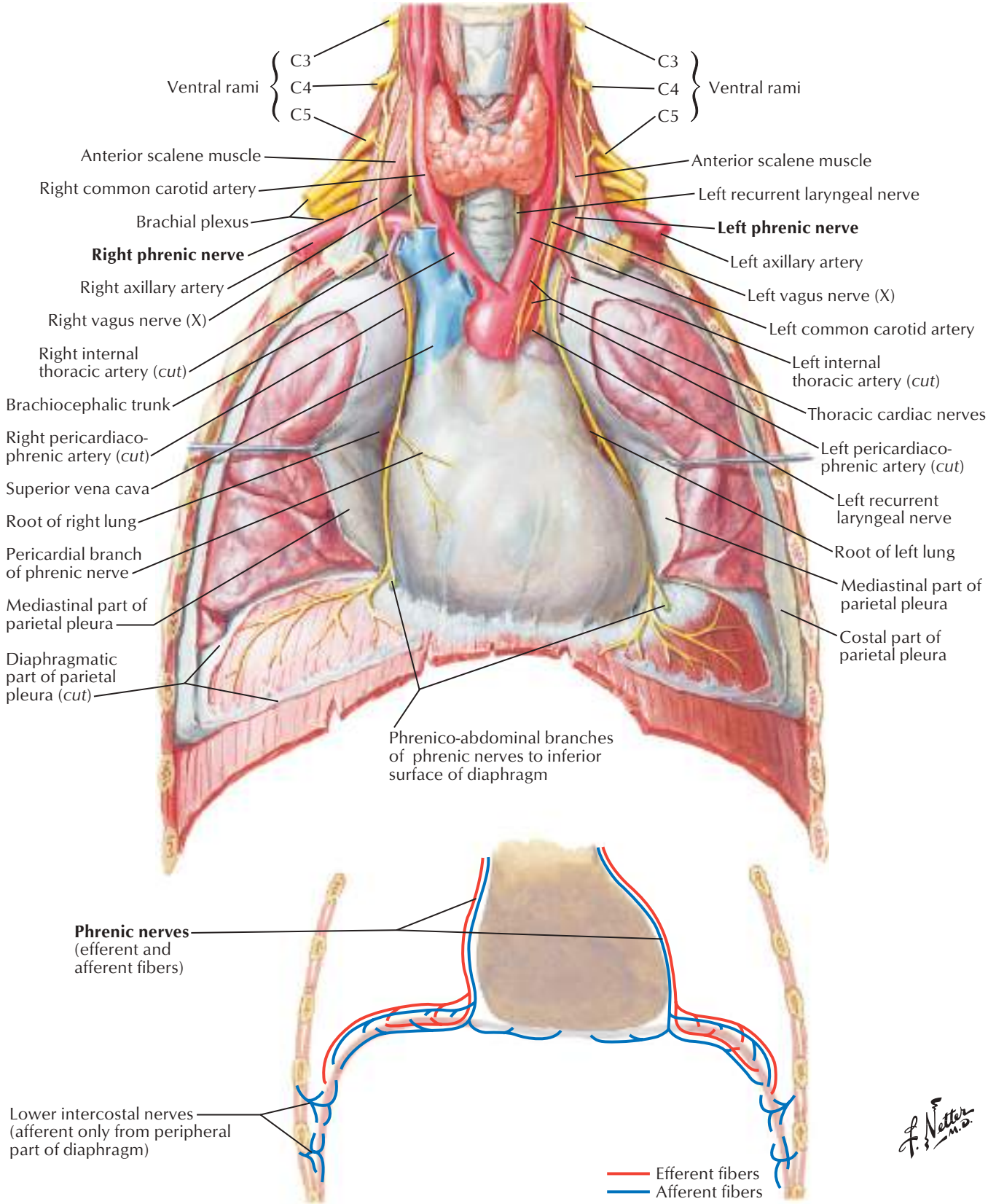

Ventral root
Dorsal root (spinal) ganglion
Spinal (radicular, or segmental medullary) branch of posterior intercostal artery
Dorsal branch of posterior intercostal artery
Trapezius muscle
Rhomboid major muscle
Erector spinae muscle
Posterior intercostal artery
Internal intercostal membrane
Scapula
Infraspinatus muscle
Subscapularis muscle
Teres minor muscle
Medial branch
Lateral branch
Dorsal ramus of thoracic nerve
Intercostal nerve (ventral ramus of thoracic spinal nerve)
Internal intercostal membrane deep to external intercostal muscle
Serratus anterior muscle
Gray and white rami communicantes
Sympathetic trunk and ganglion
Thoracic aorta
Right posterior intercostal arteries (cut)
Innermost intercostal muscle
Internal intercostal muscle
External intercostal muscle
Transversus thoracis muscle
Sternum
Internal thoracic artery
Lateral cutaneous branch of intercostal nerve
Anterior branch of lateral cutaneous branch of intercostal nerve
External oblique muscle
Pectoralis major muscle
Anterior cutaneous branch of intercostal nerve
Perforating branch
Superior epigastric artery
Rectus abdominis muscle
Anterior intercostal arteries
External intercostal membrane
Lateral cutaneous branch of posterior intercostal artery
External oblique muscle

Veins of Internal Thoracic Wall

See also Plates 187, 227, 252

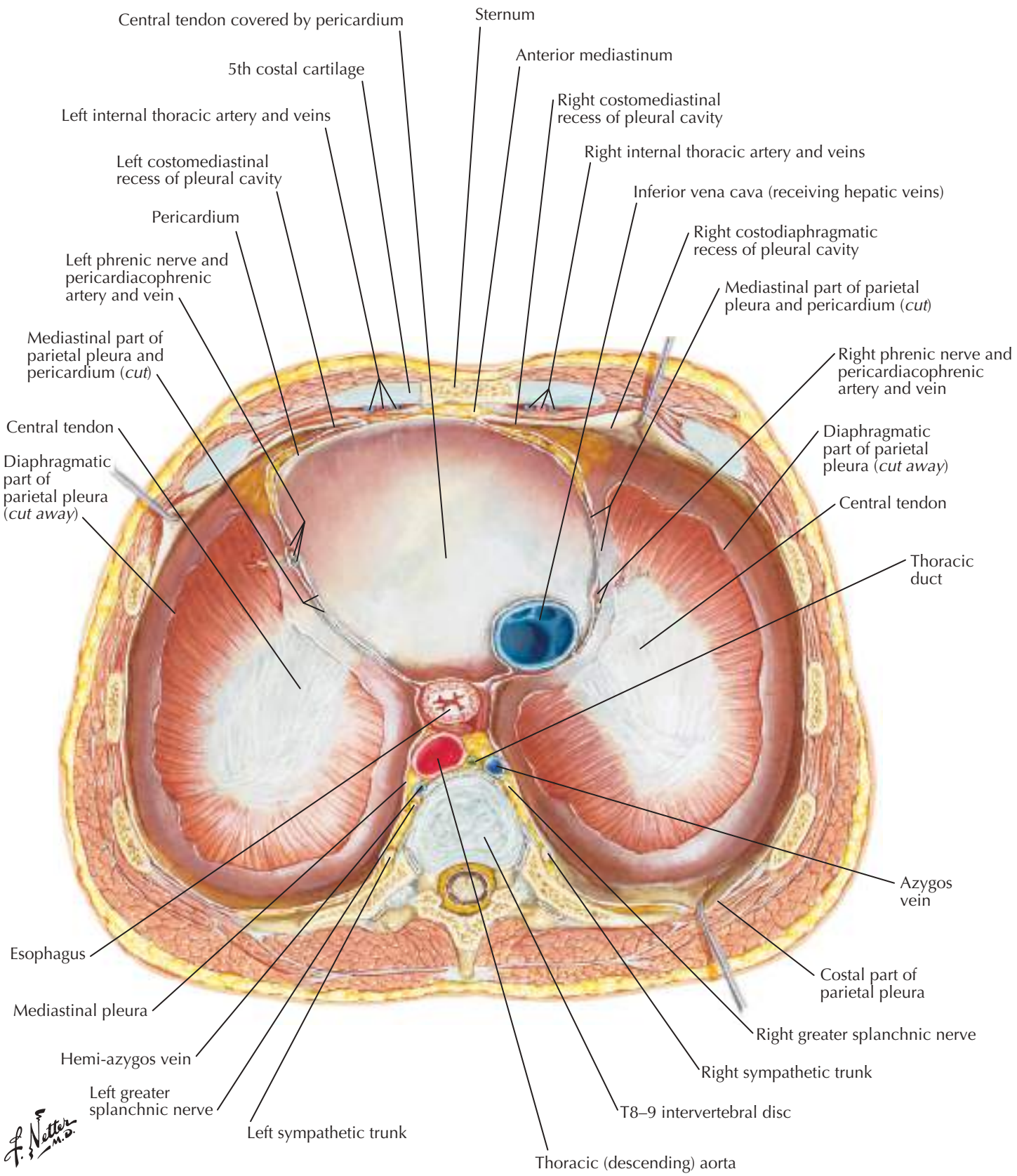


Inferior to the diaphragm, the azygos and hemi-azygos veins have connections with the ascending lumbar and/or the subcostal veins. The azygos vein may also arise from the inferior vena cava and the hemi-azygos vein from the left renal vein.


Ventral rami
C3
C4
C5
C3
C4
C5
Ventral rami
Anterior scalene muscle
Right common carotid artery
Brachial plexus
Right phrenic nerve
Right axillary artery
Right vagus nerve (X)
Right internal thoracic artery (cut)
Brachiocephalic trunk
Right pericardiaco-phrenic artery (cut)
Superior vena cava
Root of right lung
Pericardial branch of phrenic nerve
Mediastinal part of parietal pleura
Diaphragmatic part of parietal pleura (cut)
Anterior scalene muscle
Left recurrent laryngeal nerve
Left phrenic nerve
Left axillary artery
Left vagus nerve (X)
Left common carotid artery
Left internal thoracic artery (cut)
Thoracic cardiac nerves
Left pericardiaco-phrenic artery (cut)
Left recurrent laryngeal nerve
Root of left lung
Mediastinal part of parietal pleura
Costal part of parietal pleura
Phrenico-abdominal branches of phrenic nerves to inferior surface of diaphragm
Phrenic nerves (efferent and afferent fibers)
Lower intercostal nerves (afferent only from peripheral part of diaphragm)
Efferent fibers
Afferent fibers

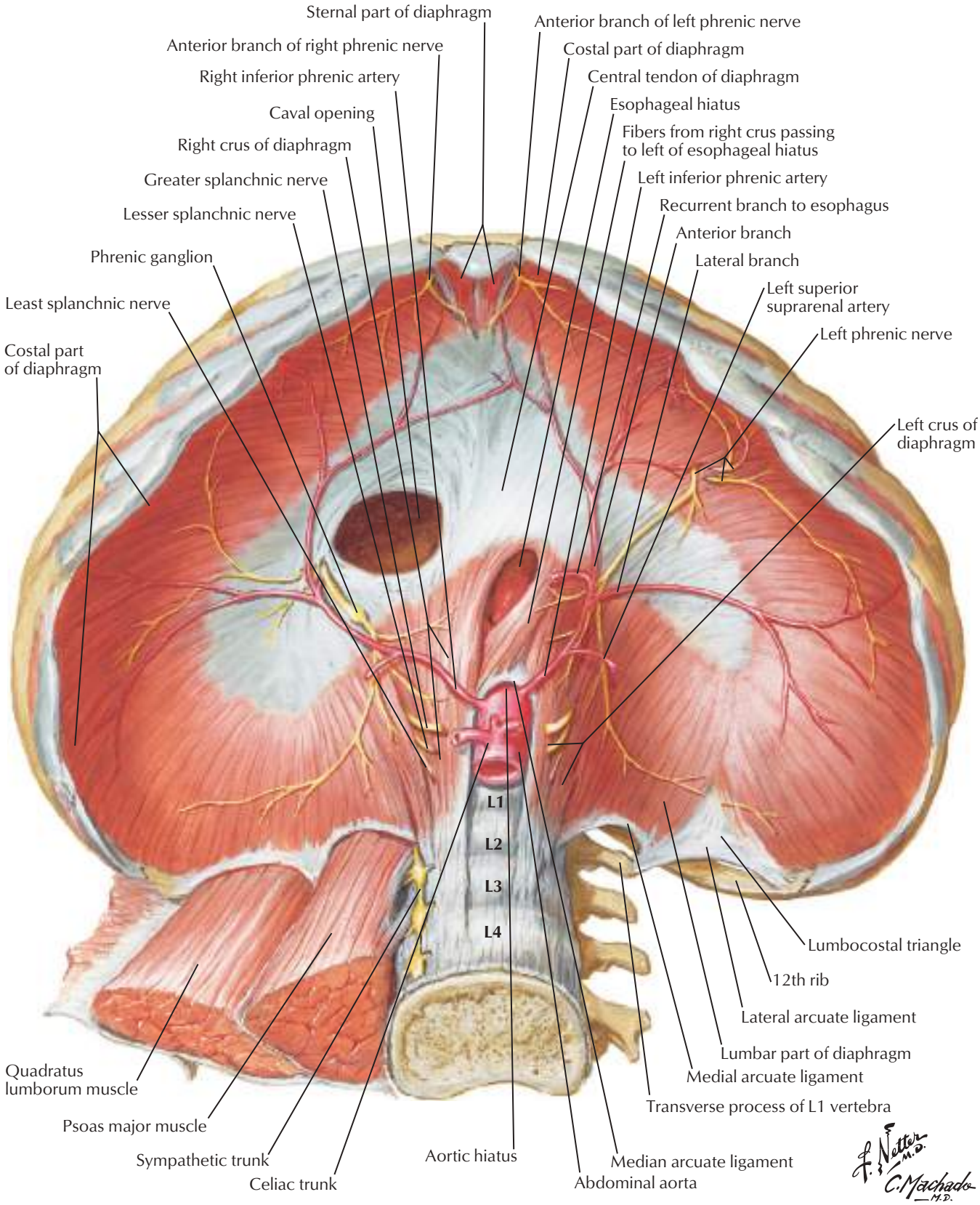
Diaphragm: Thoracic Surface

See also Plate 229

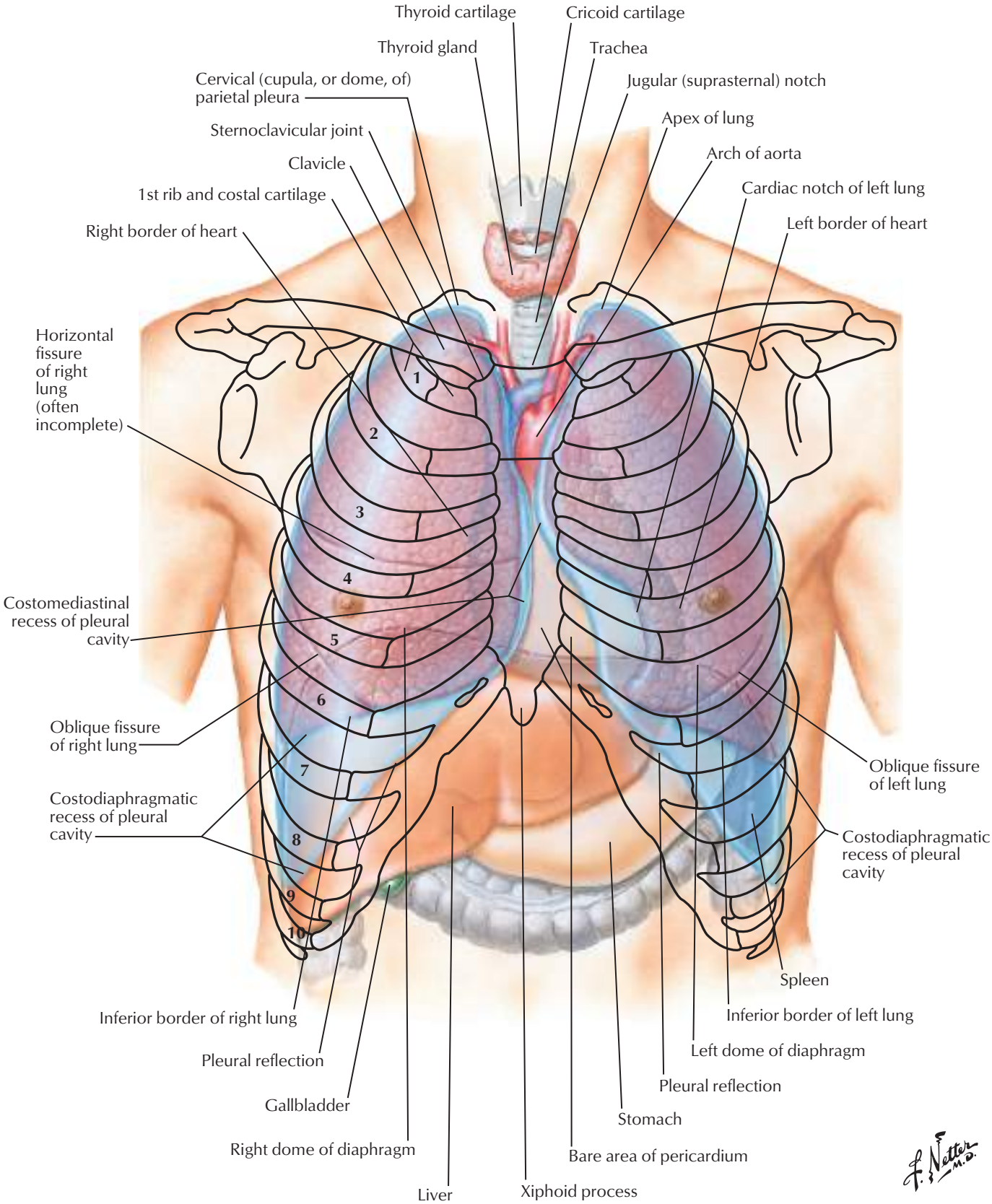


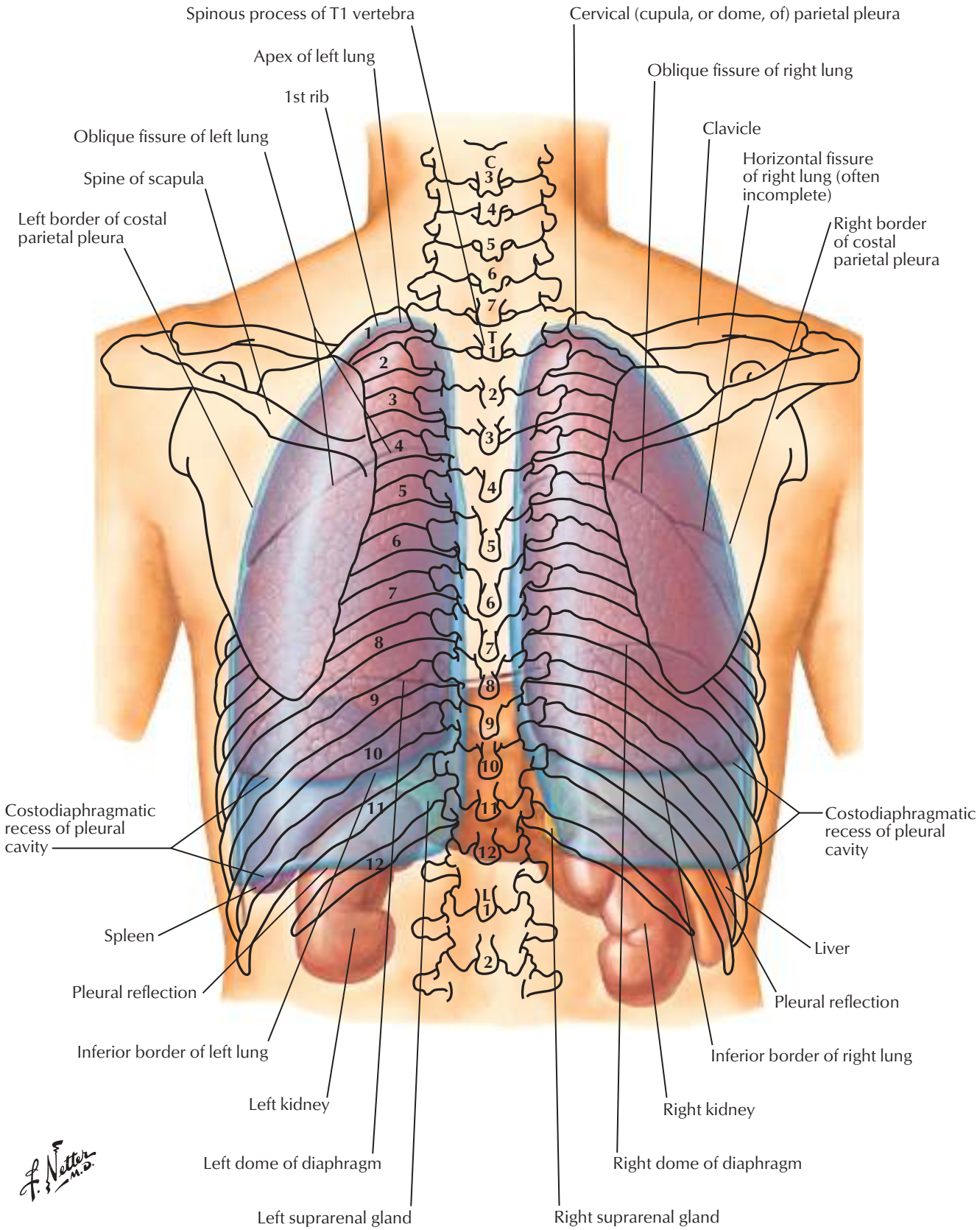
Diaphragm: Abdominal Surface

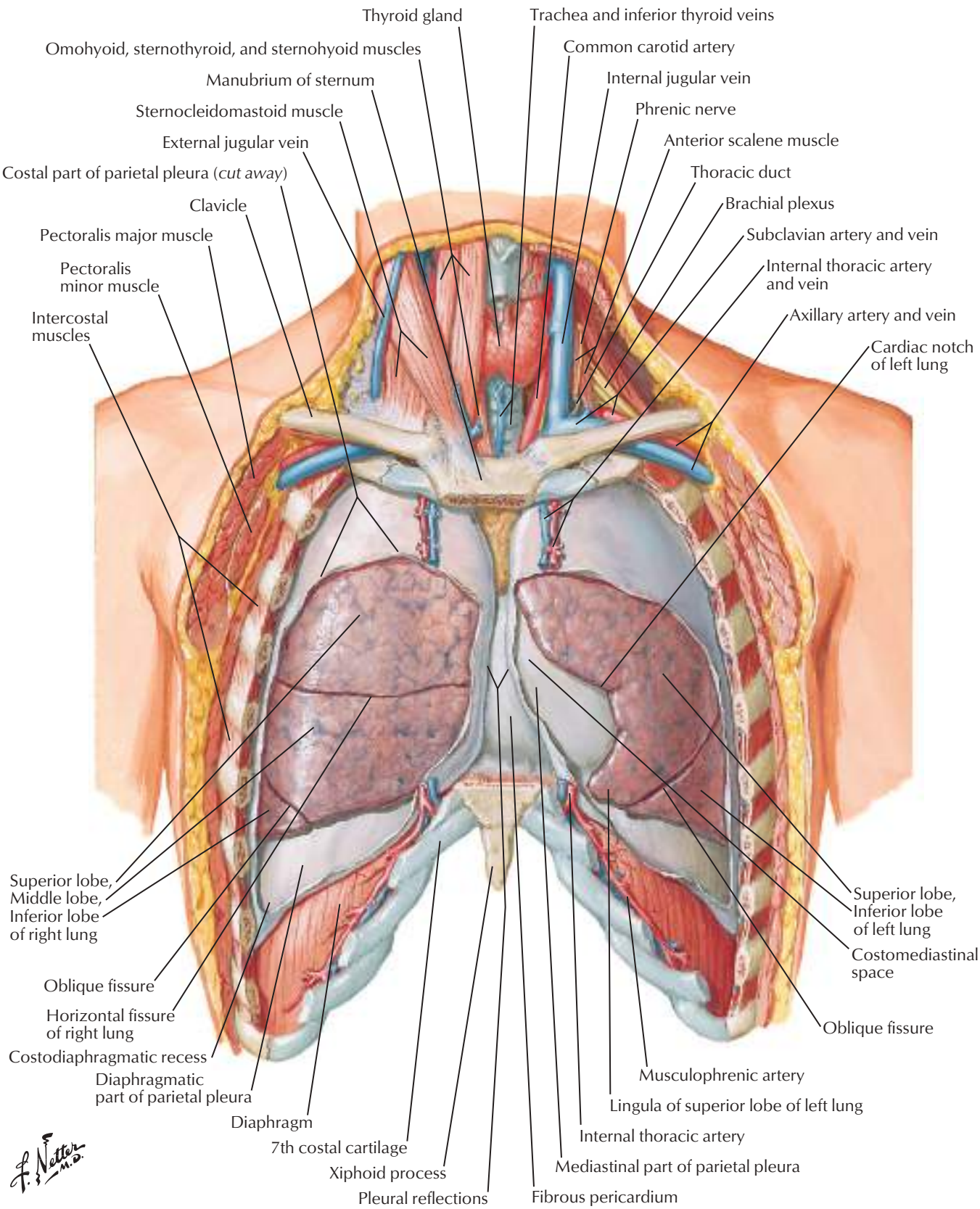
See also Plates 258, 259

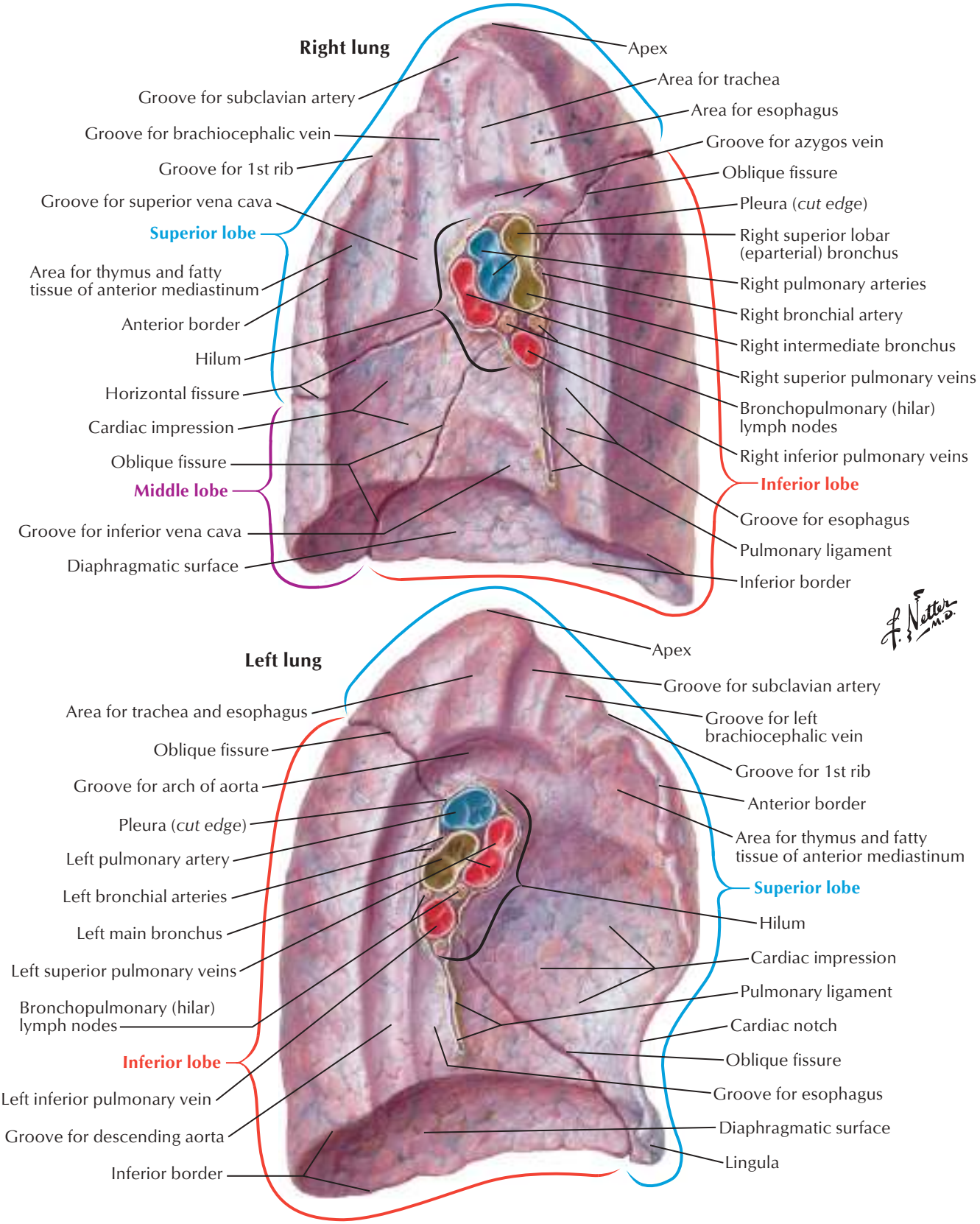


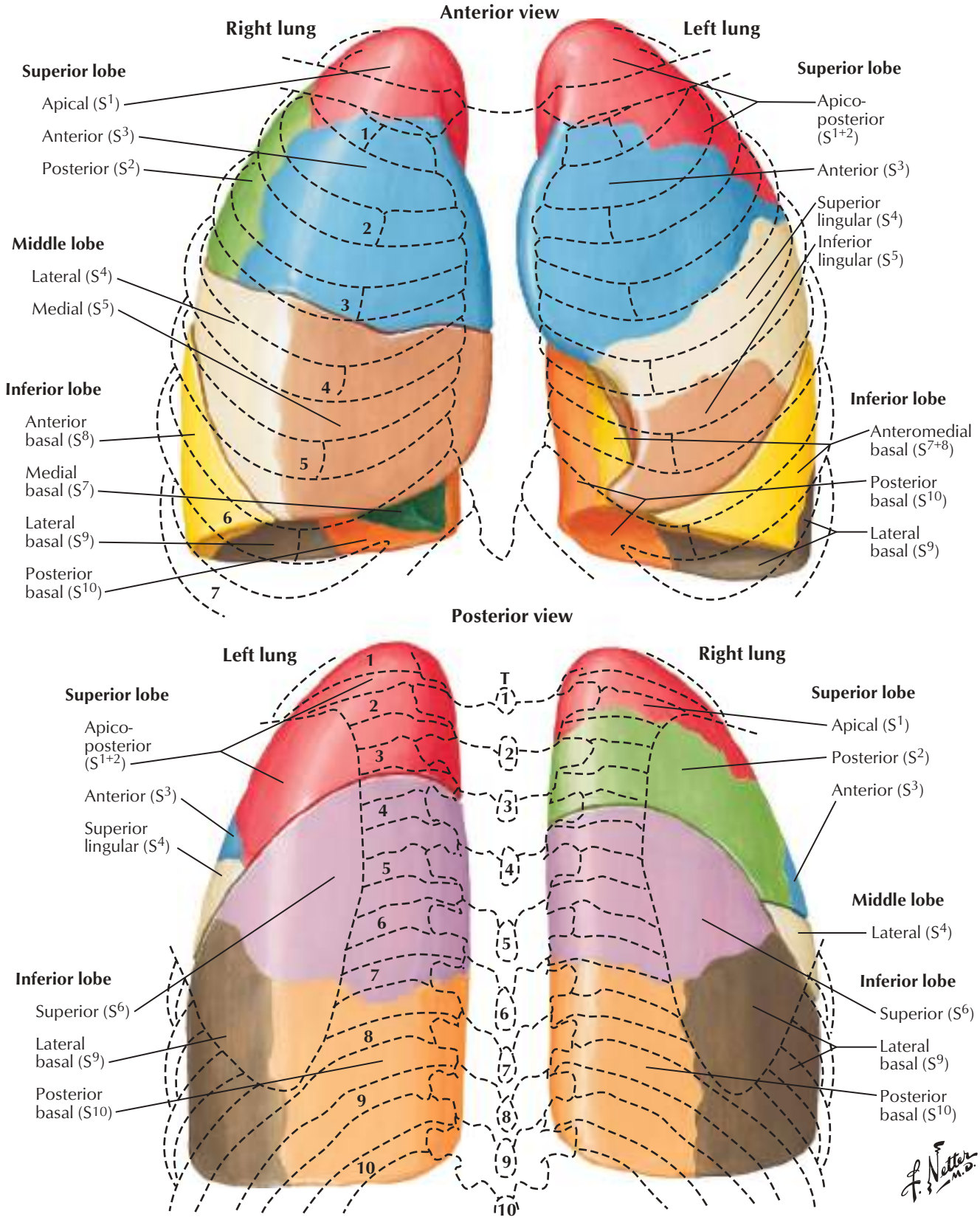
Topography of Lungs: Anterior View



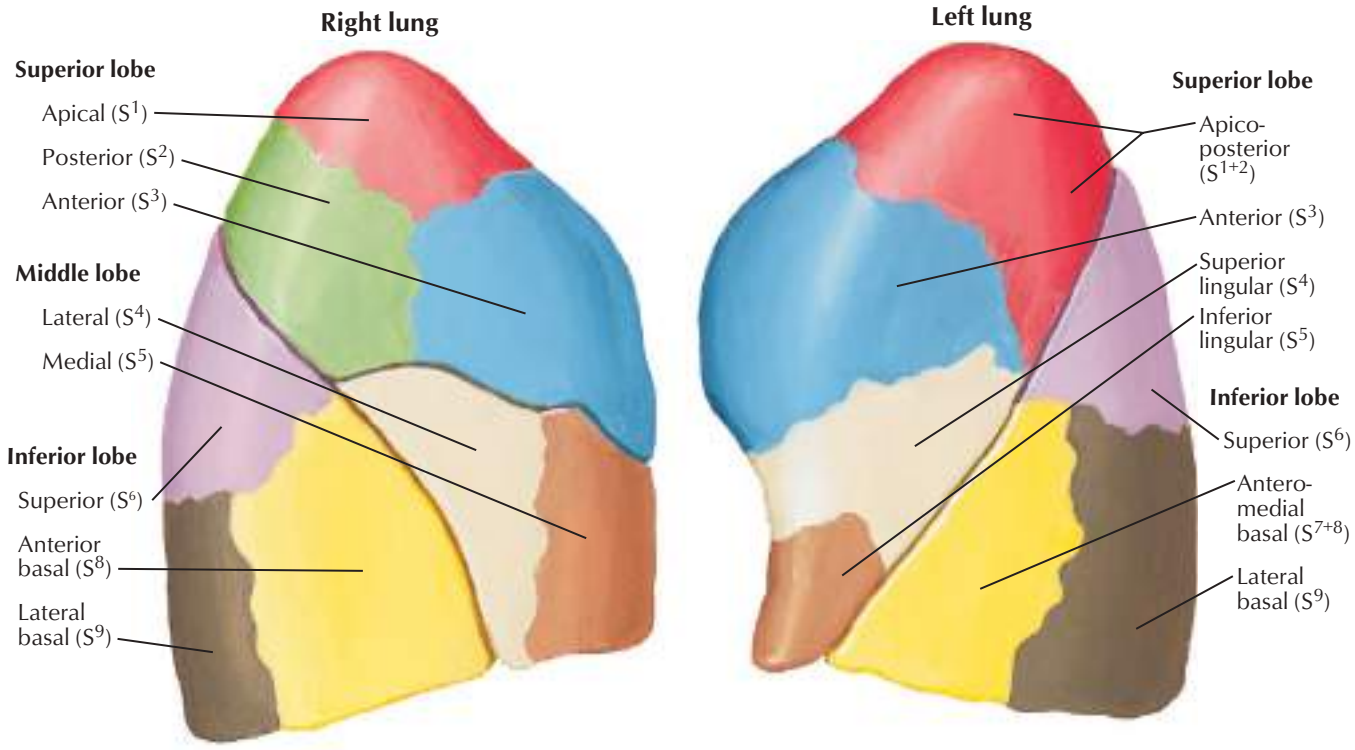

Spinous process of T1 vertebra
Cervical (cupula, or dome, of) parietal pleura
Apex of left lung
Oblique fissure of right lung
1st rib
Clavicle
Oblique fissure of left lung
Horizontal fissure of right lung (often incomplete)
Spine of scapula
Left border of costal parietal pleura
Right border of costal parietal pleura
C 3
4
5
6
7
T 1
2
3
4
5
6
7
8
9
10
11
12
L 1
2
1
2
3
4
5
6
7
8
9
10
11
12
Costodiaphragmatic recess of pleural cavity
Costodiaphragmatic recess of pleural cavity
Spleen
Liver
Pleural reflection
Pleural reflection
Inferior border of left lung
Inferior border of right lung
Left kidney
Right kidney
Left dome of diaphragm
Right dome of diaphragm
Left suprarenal gland
Right suprarenal gland


Thyroid gland
Trachea and inferior thyroid veins
Omohyoid, sternothyroid, and sternohyoid muscles
Common carotid artery
Manubrium of sternum
Internal jugular vein
Sternocleidomastoid muscle
Phrenic nerve
External jugular vein
Anterior scalene muscle
Costal part of parietal pleura (cut away)
Thoracic duct
Clavicle
Brachial plexus
Pectoralis major muscle
Subclavian artery and vein
Pectoralis minor muscle
Internal thoracic artery and vein
Intercostal muscles
Axillary artery and vein
Cardiac notch of left lung
Superior lobe, Middle lobe, Inferior lobe of right lung
Superior lobe, Inferior lobe of left lung
Costomediastinal space
Oblique fissure
Horizontal fissure of right lung
Oblique fissure
Costodiaphragmatic recess
Musculophrenic artery
Diaphragmatic part of parietal pleura
Lingula of superior lobe of left lung
Diaphragm
Internal thoracic artery
7th costal cartilage
Mediastinal part of parietal pleura
Xiphoid process
Pleural reflections
Fibrous pericardium

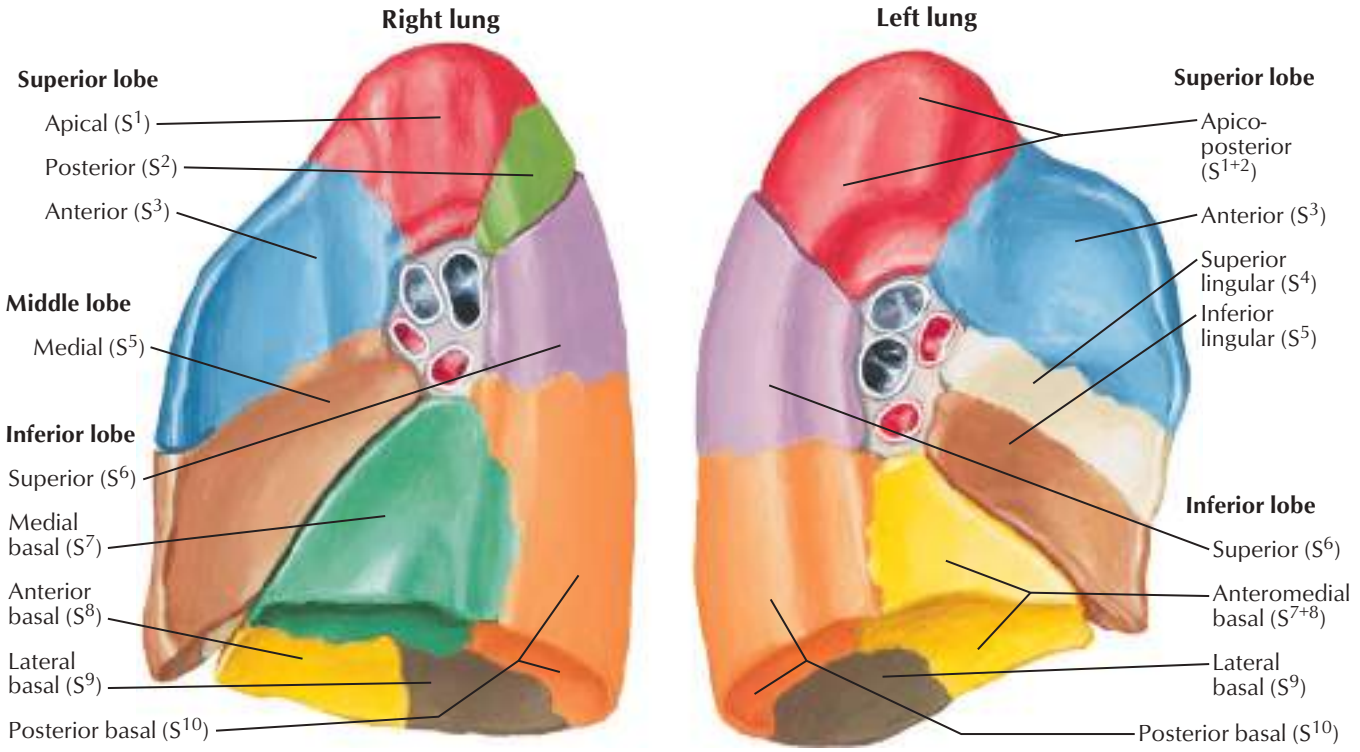

Right lung
Apex
Area for trachea
Area for esophagus
Groove for azygos vein
Oblique fissure
Pleura (cut edge)
Right superior lobar (eparterial) bronchus
Right pulmonary arteries
Right bronchial artery
Right intermediate bronchus
Right superior pulmonary veins
Bronchopulmonary (hilar) lymph nodes
Right inferior pulmonary veins
Inferior lobe
Groove for esophagus
Pulmonary ligament
Inferior border
Groove for subclavian artery
Groove for brachiocephalic vein
Groove for 1st rib
Groove for superior vena cava
Superior lobe
Area for thymus and fatty tissue of anterior mediastinum
Anterior border
Hilum
Horizontal fissure
Cardiac impression
Oblique fissure
Middle lobe
Groove for inferior vena cava
Diaphragmatic surface
F. Netter M.D.
Left lung
Apex
Groove for subclavian artery
Groove for left brachiocephalic vein
Groove for 1st rib
Anterior border
Area for thymus and fatty tissue of anterior mediastinum
Superior lobe
Hilum
Cardiac impression
Pulmonary ligament
Cardiac notch
Oblique fissure
Groove for esophagus
Diaphragmatic surface
Lingula
Area for trachea and esophagus
Oblique fissure
Groove for arch of aorta
Pleura (cut edge)
Left pulmonary artery
Left bronchial arteries
Left main bronchus
Left superior pulmonary veins
Bronchopulmonary (hilar) lymph nodes
Inferior lobe
Left inferior pulmonary vein
Groove for descending aorta
Inferior border

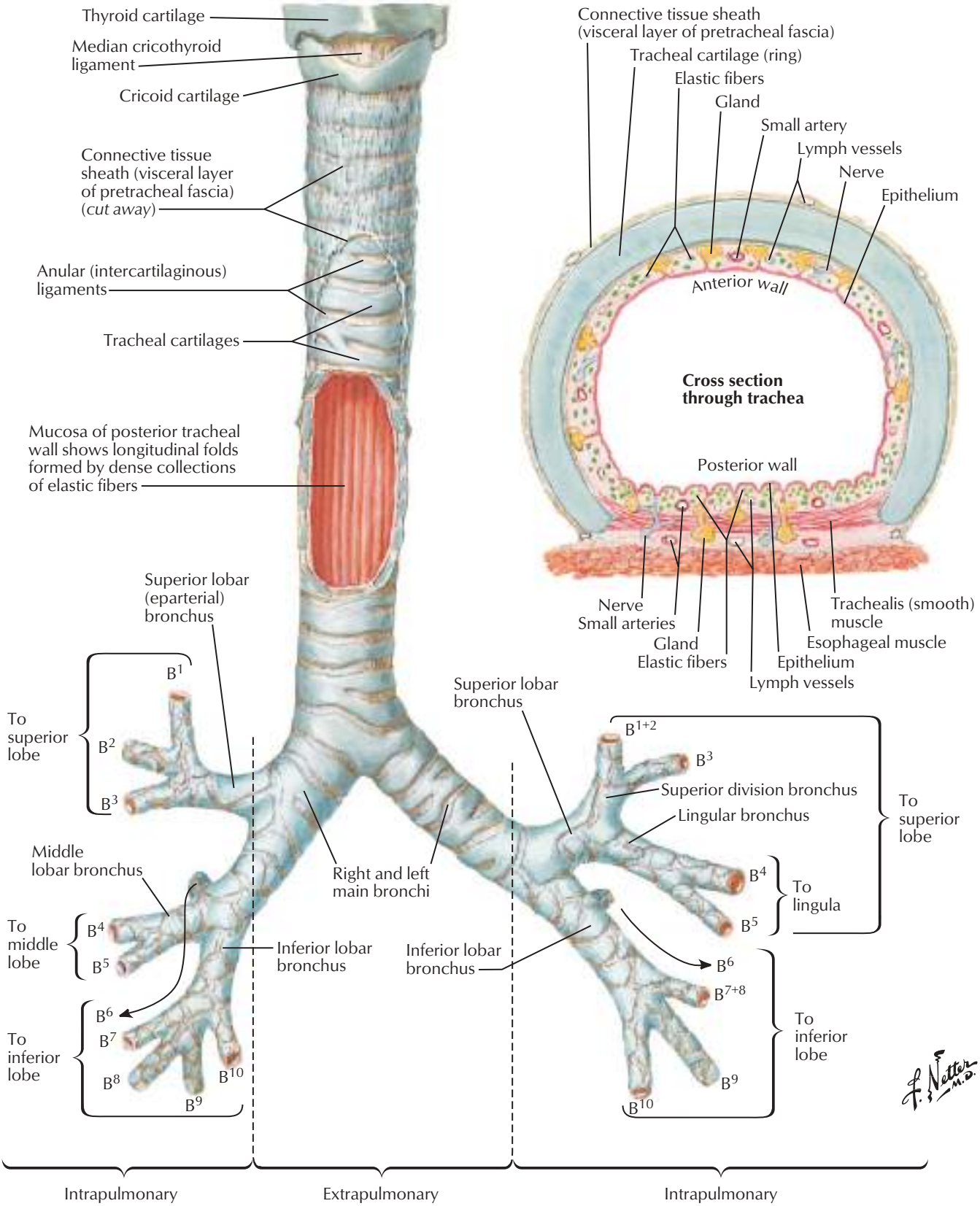

Anterior view
Right lung
Left lung
Superior lobe
Apical (S1)
Anterior (S3)
Posterior (S2)
Middle lobe
Lateral (S4)
Medial (S5)
Inferior lobe
Anterior basal (S8)
Medial basal (S7)
Lateral basal (S9)
Posterior basal (S10)
Superior lobe
Apico-posterior (S1+2)
Anterior (S3)
Superior lingular (S4)
Inferior lingular (S5)
Inferior lobe
Anteromedial basal (S7+8)
Posterior basal (S10)
Lateral basal (S9)
1
2
3
4
5
6
7
Posterior view
Left lung
Right lung
Superior lobe
Apico-posterior (S1+2)
Anterior (S3)
Superior lingular (S4)
Inferior lobe
Superior (S6)
Lateral basal (S9)
Posterior basal (S10)
Apical (S1)
Posterior (S2)
Anterior (S3)
Middle lobe
Lateral (S4)
Inferior lobe
Superior (S6)
Lateral basal (S9)
Posterior basal (S10)
T
1
2
3
4
5
6
7
8
9
10

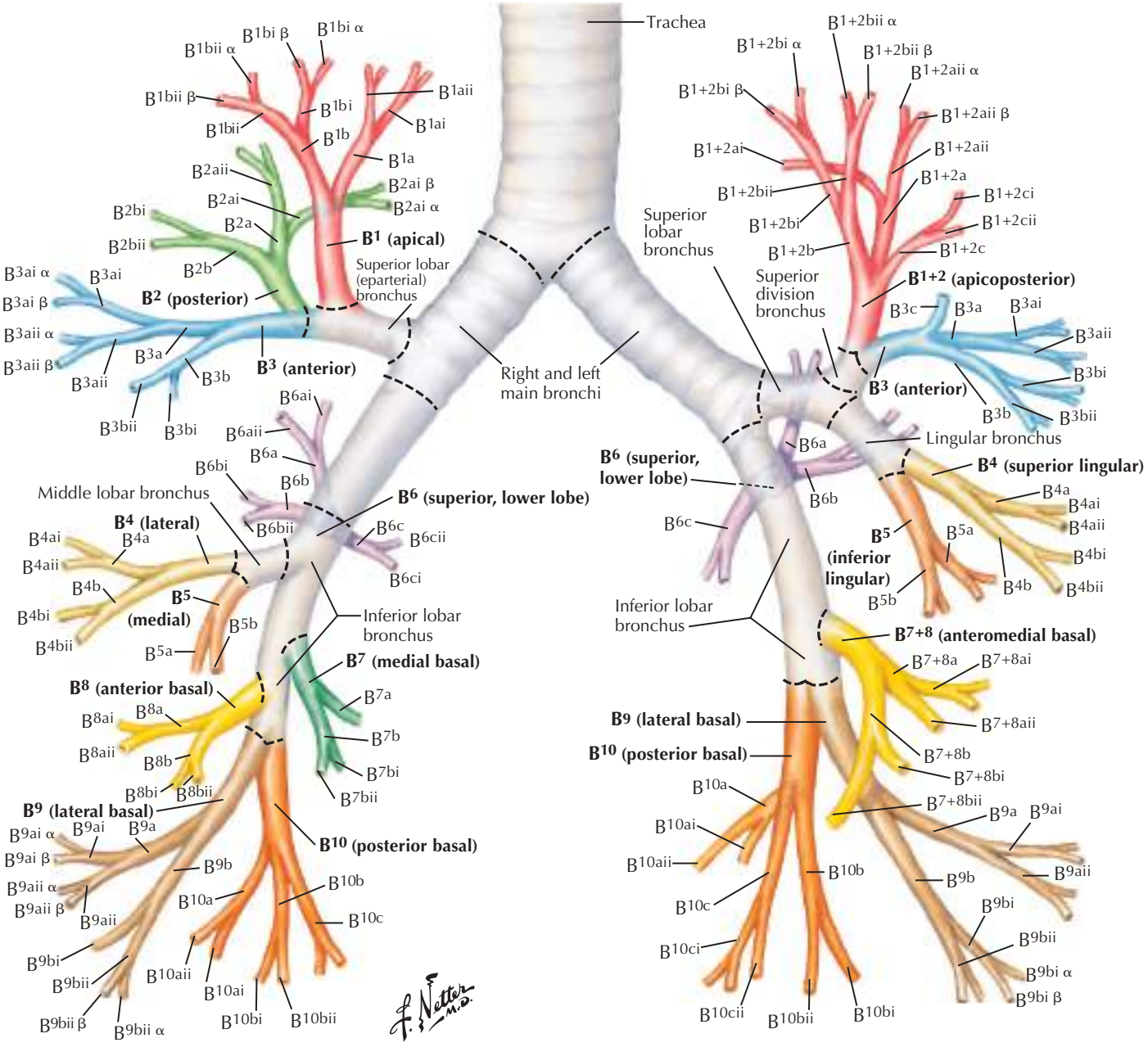
Lateral views



Medial views

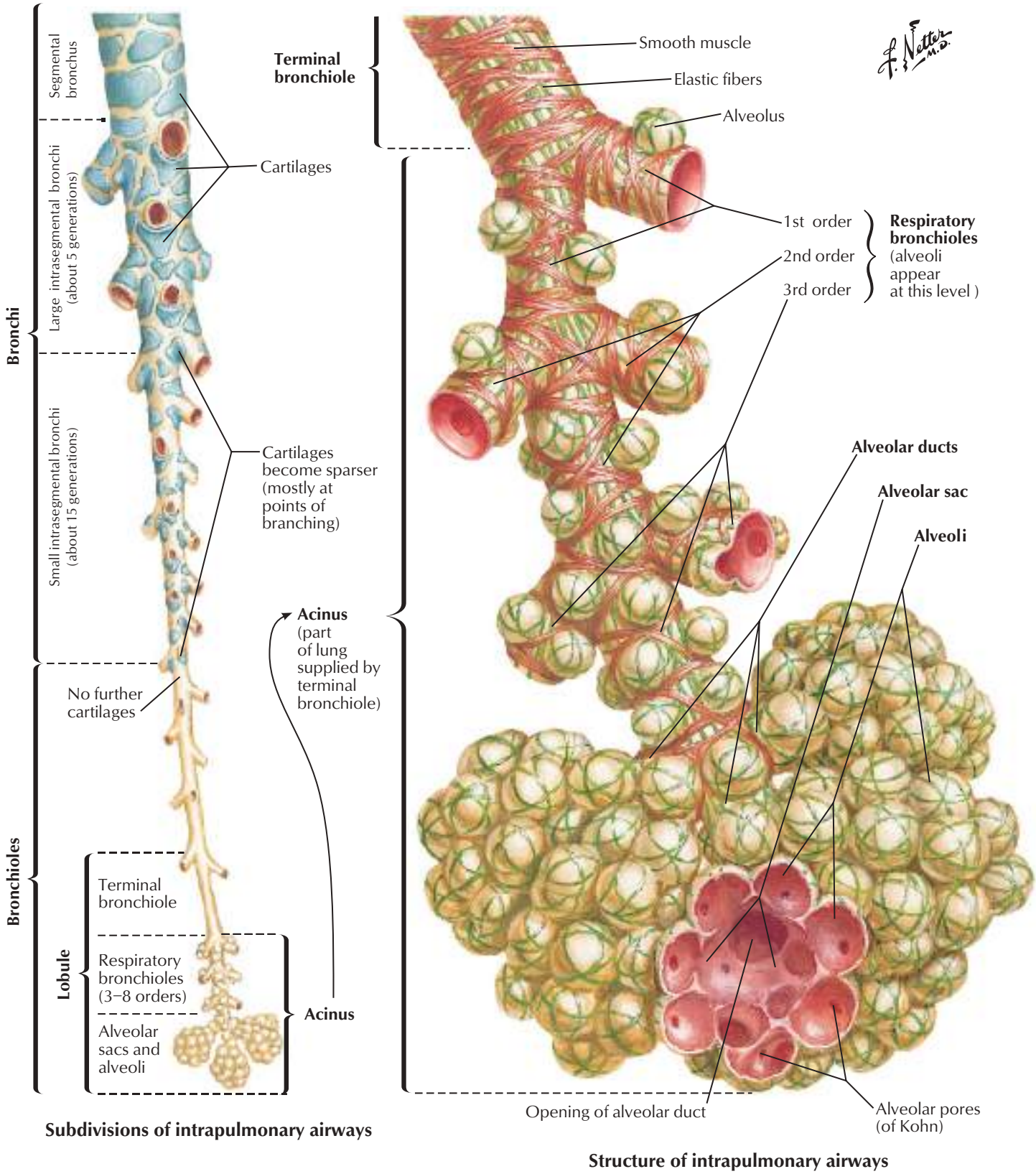



Thyroid cartilage
Median cricothyroid ligament
Cricoid cartilage
Connective tissue sheath (visceral layer of pretracheal fascia) (cut away)
Anular (intercartilaginous) ligaments
Tracheal cartilages
Mucosa of posterior tracheal wall shows longitudinal folds formed by dense collections of elastic fibers
Connective tissue sheath (visceral layer of pretracheal fascia)
Tracheal cartilage (ring)
Elastic fibers
Gland
Small artery
Lymph vessels
Nerve
Epithelium
Anterior wall
Cross section through trachea
Posterior wall
Nerve
Small arteries
Gland
Elastic fibers
Epithelium
Lymph vessels
Trachealis (smooth) muscle
Esophageal muscle
Superior lobar (eparterial) bronchus
B1
To superior lobe
B2
B3
Middle lobar bronchus
To middle lobe
B4
B5
To inferior lobe
B6
B7
B8
B9
B10
Inferior lobar bronchus
Right and left main bronchi
Superior lobar bronchus
B1+2
B3
Superior division bronchus
Lingular bronchus
B4
B5
To lingula
To superior lobe
B6
B7+8
B9
B10
Inferior lobar bronchus
To inferior lobe
Intrapulmonary
Extrapulmonary
Intrapulmonary



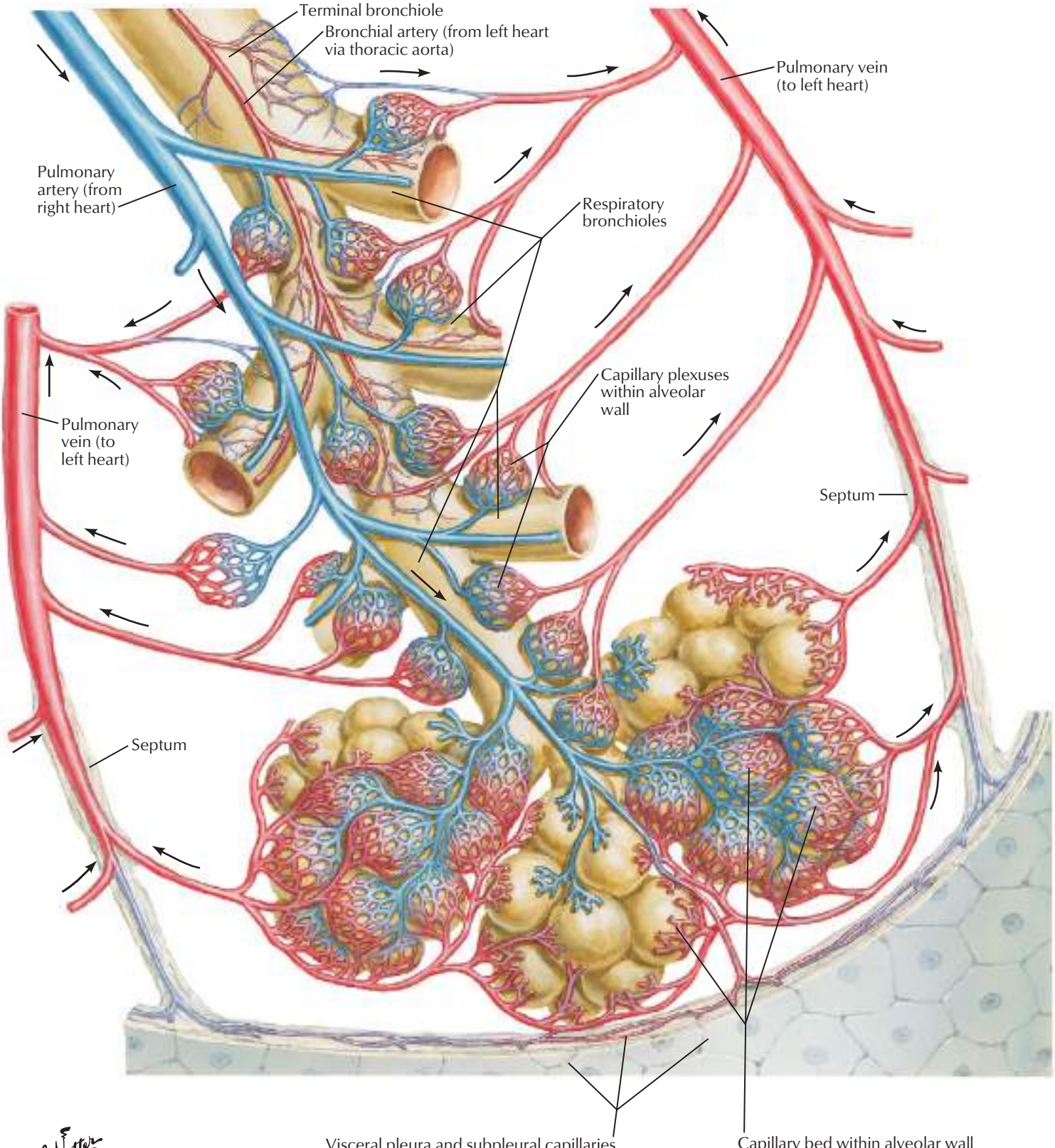
Nomenclature in common usage for bronchopulmonary segments (Plates 197 and 198) is that of Jackson and Huber, and segmental bronchi are named accordingly. Ikeda proposed nomenclature (as demonstrated here) for bronchial subdivisions as far as the 6th generation. For simplification on this illustration, only some bronchial subdivisions are labeled as far as the 5th or 6th generation. Segmental bronchi (B) are numbered from 1 to 10 in each lung, corresponding to pulmonary segments. In the left lung, B^1 and B^2 are combined as are B^7 and B^8. Subsegmental, or 4th order, bronchi are indicated by the addition of lowercase letters a, b, or c when an additional branch is present. Fifth order bronchi are designated by Roman numerals i (anterior) or ii (posterior) and 6th order bronchi by Greek letters α or β. Several texts use alternate numbers (as proposed by Boyden) for segmental bronchi.

Variations of the standard bronchial pattern shown here are common, especially in peripheral airways.

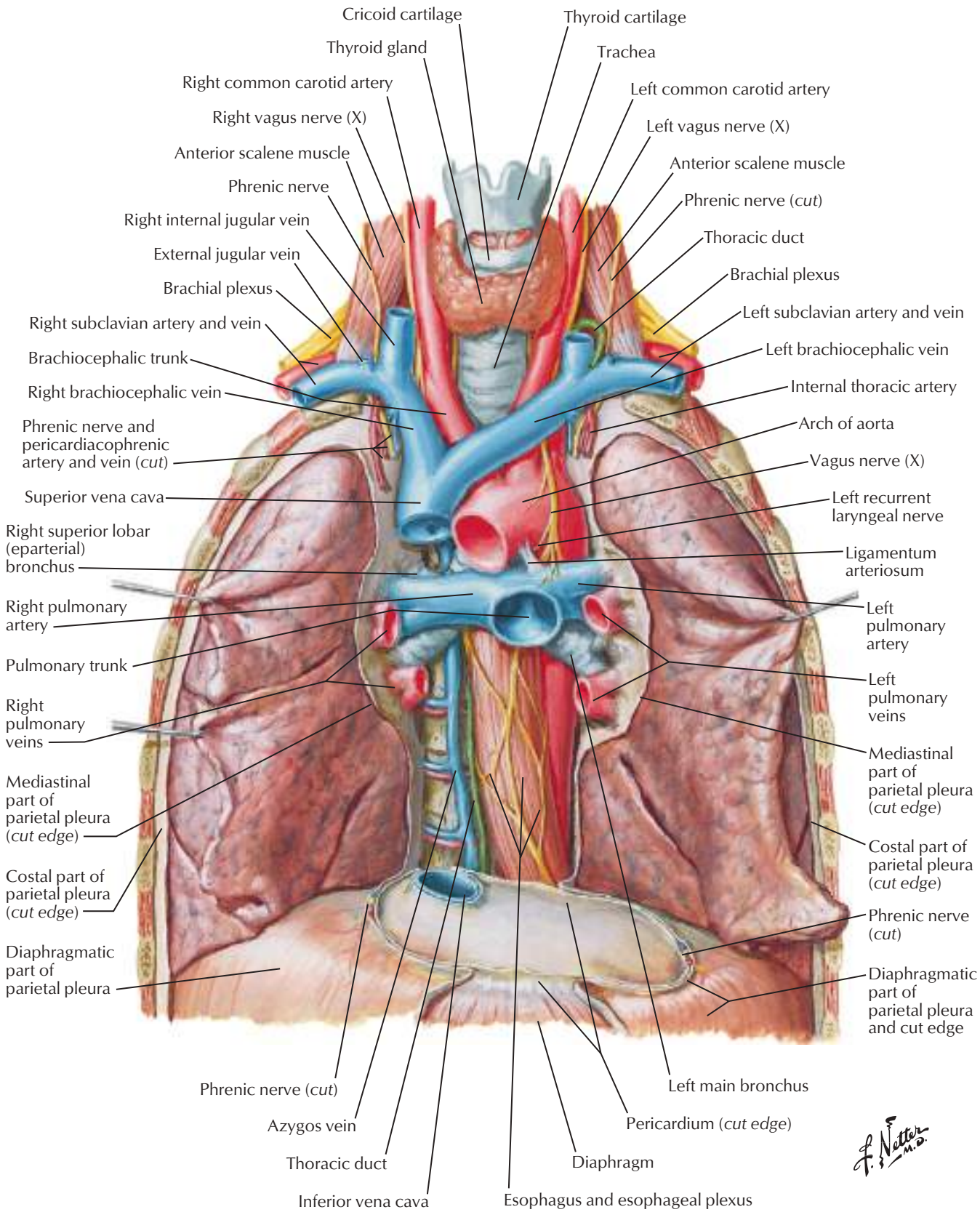


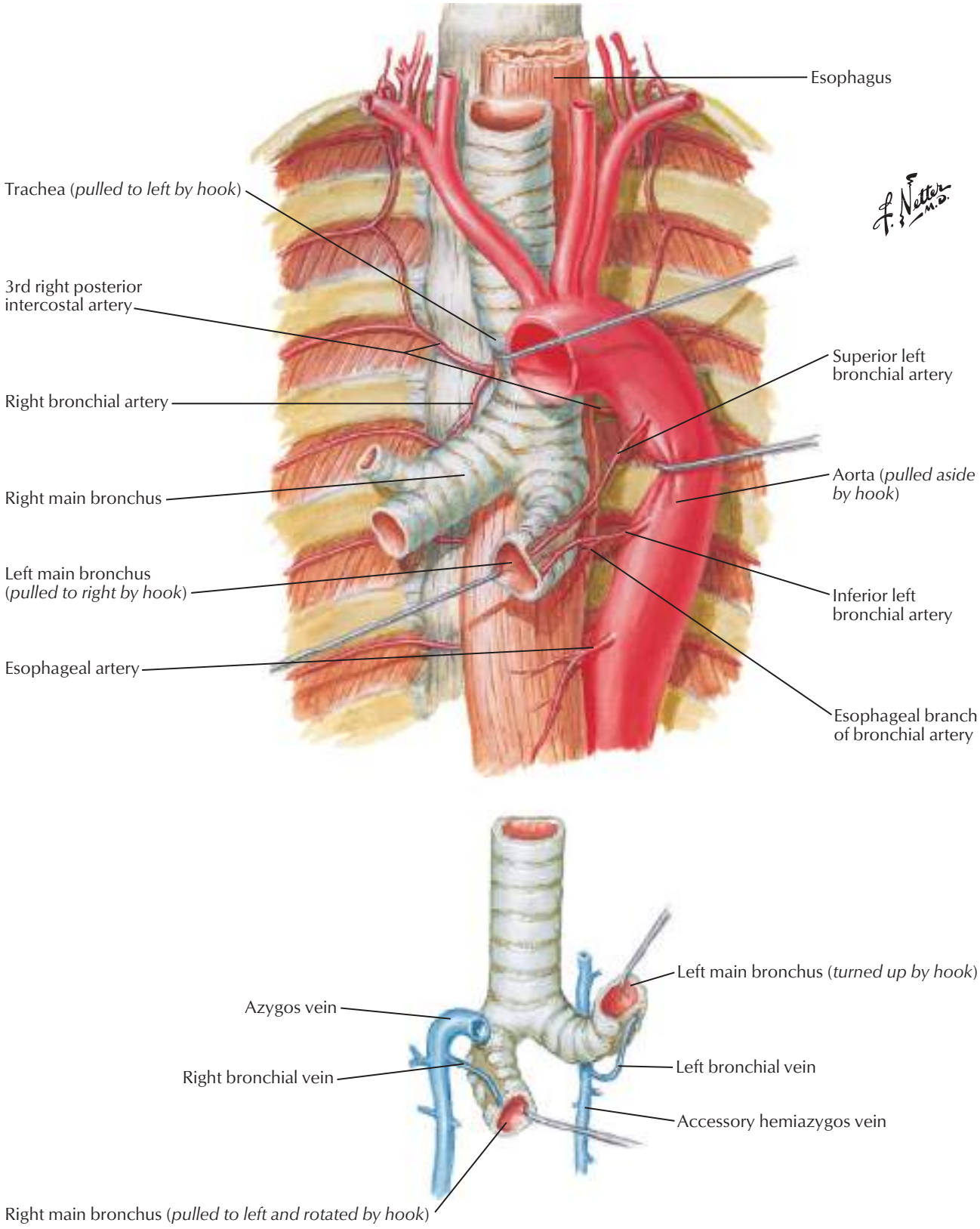
Subdivisions of intrapulmonary airways

Structure of intrapulmonary airways



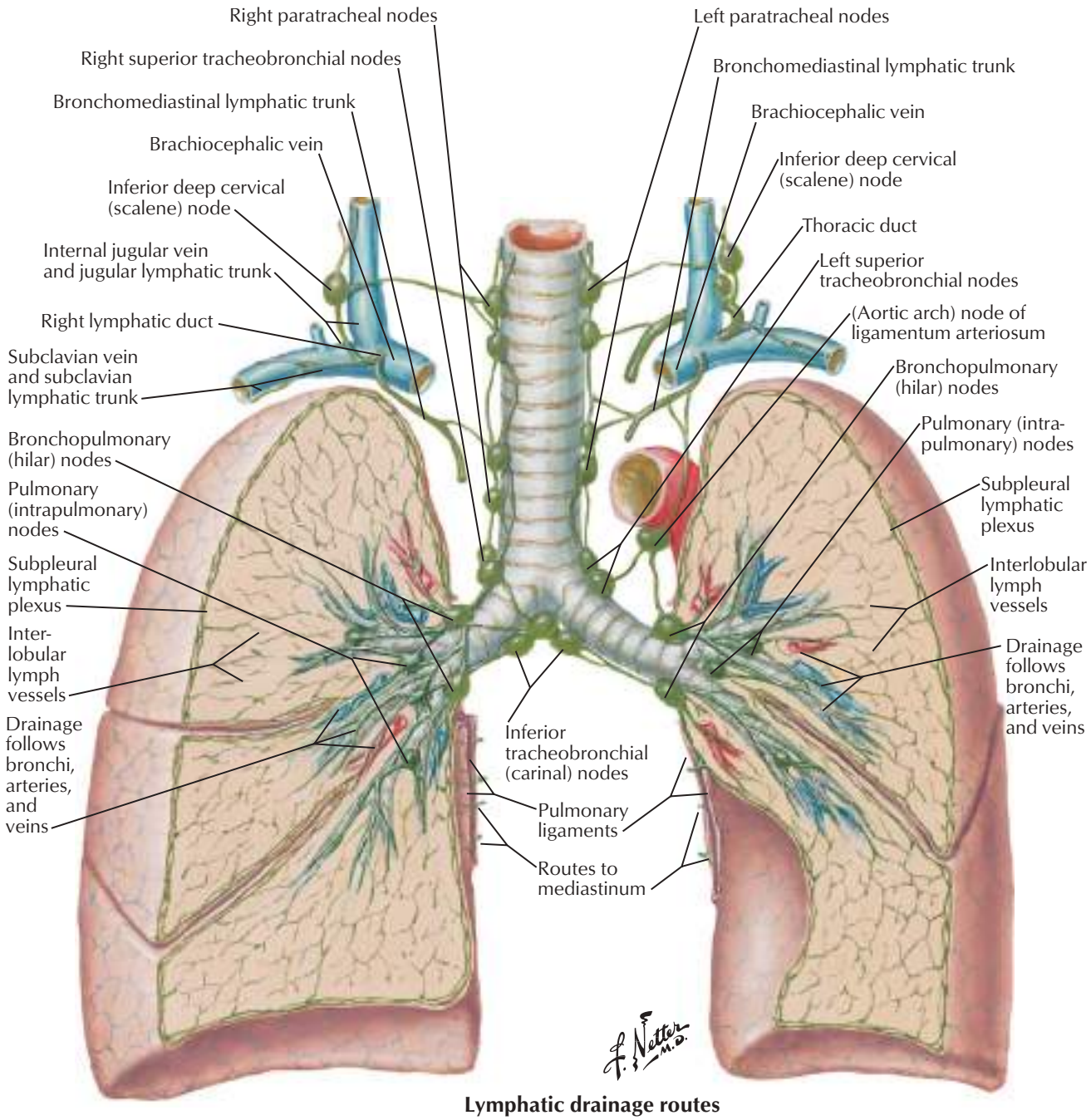
Pulmonary arteries and their branches distribute segmentally with the bronchi. Pulmonary veins and their tributaries drain intersegmentally.


Cricoid cartilage
Thyroid cartilage
Thyroid gland
Trachea
Right common carotid artery
Left common carotid artery
Right vagus nerve (X)
Left vagus nerve (X)
Anterior scalene muscle
Anterior scalene muscle
Phrenic nerve
Phrenic nerve (cut)
Right internal jugular vein
Thoracic duct
External jugular vein
Brachial plexus
Brachial plexus
Right subclavian artery and vein
Left subclavian artery and vein
Brachiocephalic trunk
Left brachiocephalic vein
Right brachiocephalic vein
Internal thoracic artery
Phrenic nerve and pericardiacophrenic artery and vein (cut)
Arch of aorta
Vagus nerve (X)
Superior vena cava
Left recurrent laryngeal nerve
Right superior lobar (eparterial) bronchus
Ligamentum arteriosum
Right pulmonary artery
Left pulmonary artery
Pulmonary trunk
Left pulmonary veins
Right pulmonary veins
Mediastinal part of parietal pleura (cut edge)
Mediastinal part of parietal pleura (cut edge)
Costal part of parietal pleura (cut edge)
Costal part of parietal pleura (cut edge)
Phrenic nerve (cut)
Diaphragmatic part of parietal pleura
Diaphragmatic part of parietal pleura and cut edge
Phrenic nerve (cut)
Left main bronchus
Azygos vein
Pericardium (cut edge)
Thoracic duct
Diaphragm
Inferior vena cava
Esophagus and esophageal plexus


Esophagus
Trachea (*pulled to left by hook*)
3rd right posterior intercostal artery
Right bronchial artery
Right main bronchus
Left main bronchus (*pulled to right by hook*)
Esophageal artery
Superior left bronchial artery
Aorta (*pulled aside by hook*)
Inferior left bronchial artery
Esophageal branch of bronchial artery
Left main bronchus (*turned up by hook*)
Azygos vein
Right bronchial vein
Left bronchial vein
Accessory hemiazygos vein
Right main bronchus (*pulled to left and rotated by hook*)

Lymph Vessels and Nodes of Lung

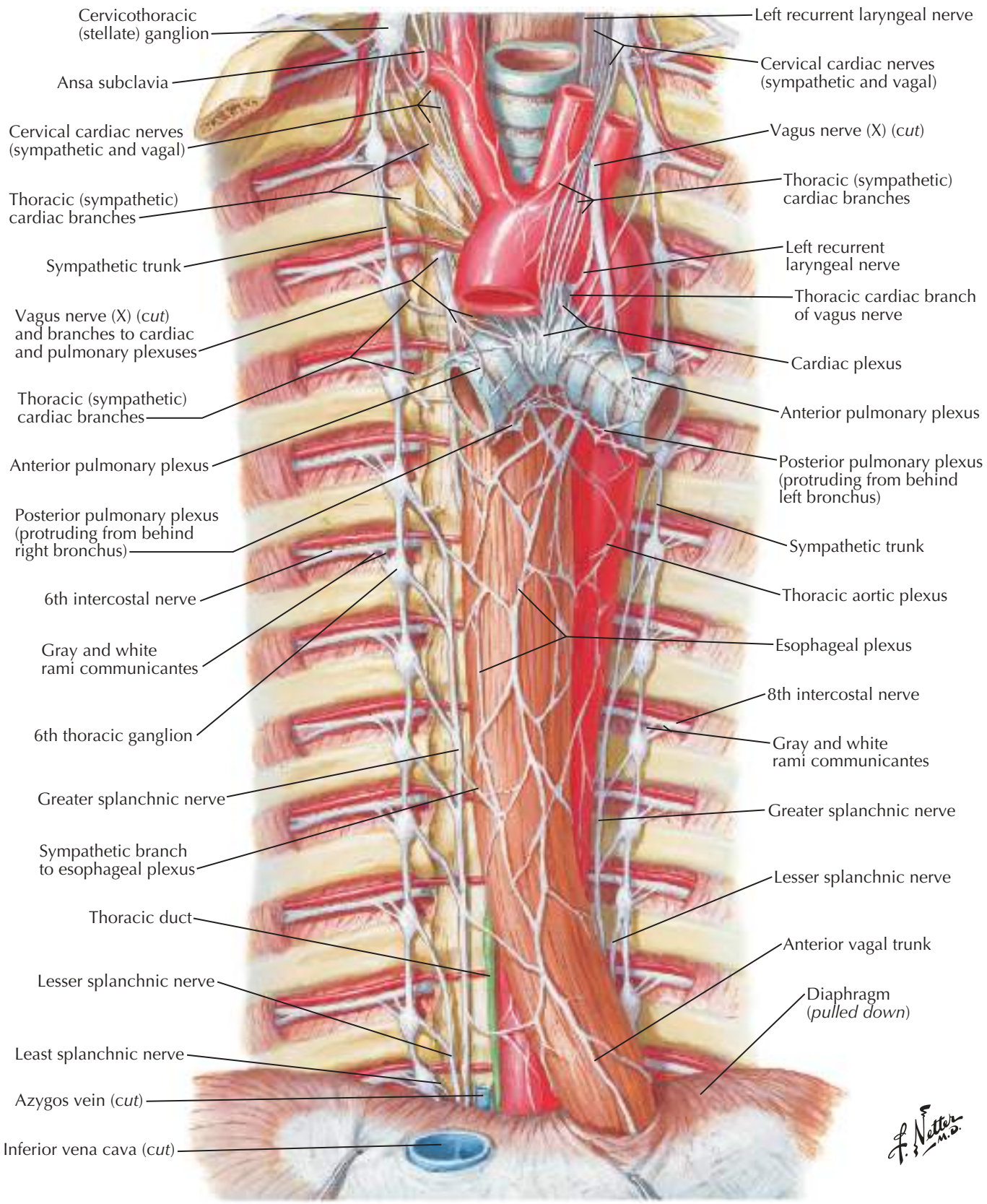
See also Plates 74, 235



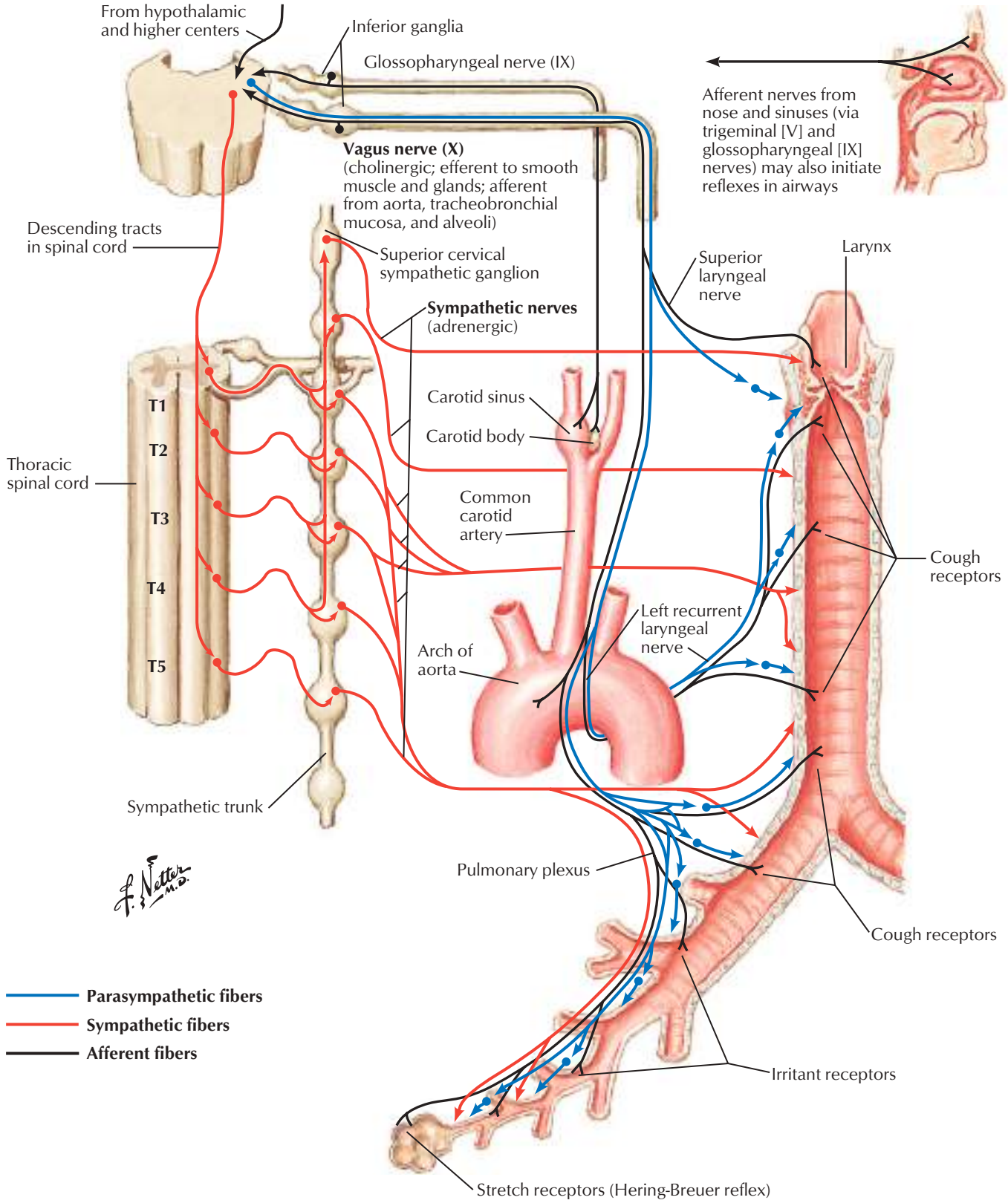
Lymphatic drainage routes

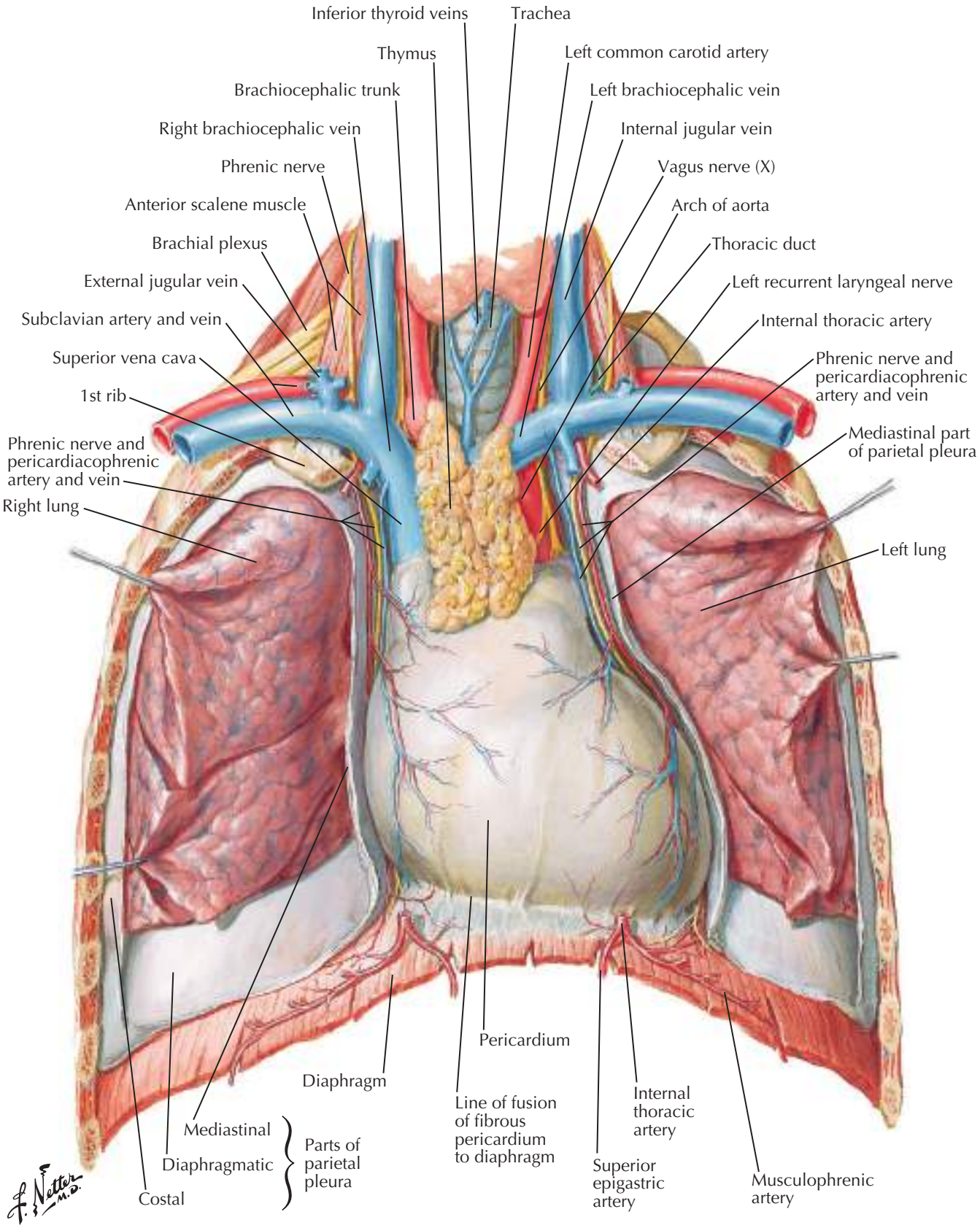
Right lung: All lobes drain to pulmonary and bronchopulmonary (hilar) nodes, then to inferior tracheobronchial (carinal) nodes, right superior tracheobronchial nodes, and right paratracheal nodes on the way to the brachiocephalic vein via the bronchomediastinal lymphatic trunk and/or inferior deep cervical (scalene) node.

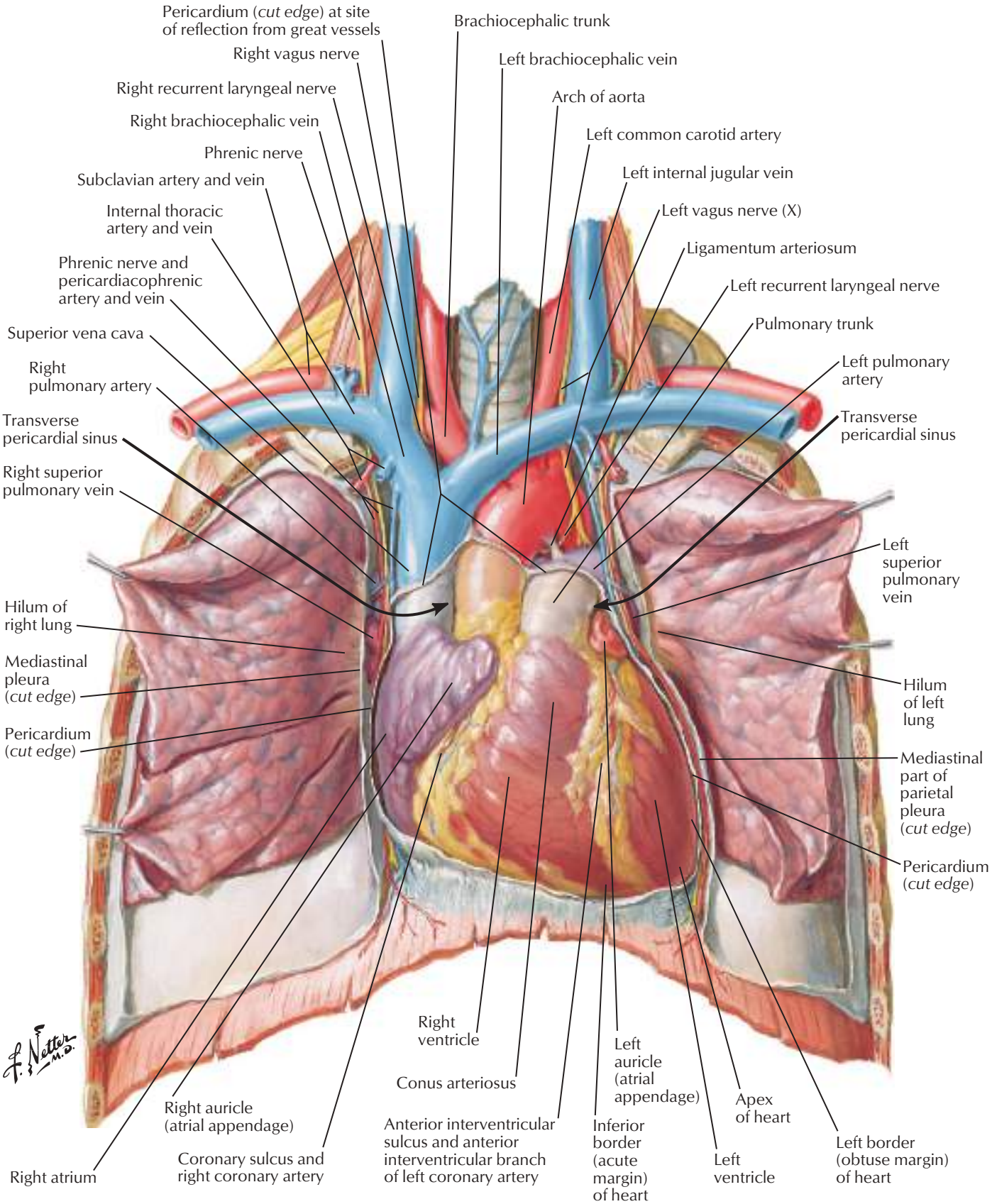
Left lung: The superior lobe drains to pulmonary and bronchopulmonary (hilar) nodes, inferior tracheobronchial (carinal) nodes, left superior tracheobronchial nodes, left paratracheal nodes and/or (aortic arch) node of ligamentum arteriosum, then to the brachiocephalic vein via the left bronchomediastinal trunk and thoracic duct. The left inferior lobe also drains to the pulmonary and bronchopulmonary (hilar) nodes and to inferior tracheobronchial (carinal) nodes, but then mostly to right superior tracheobronchial nodes, where it follows the same route as lymph from the right lung.

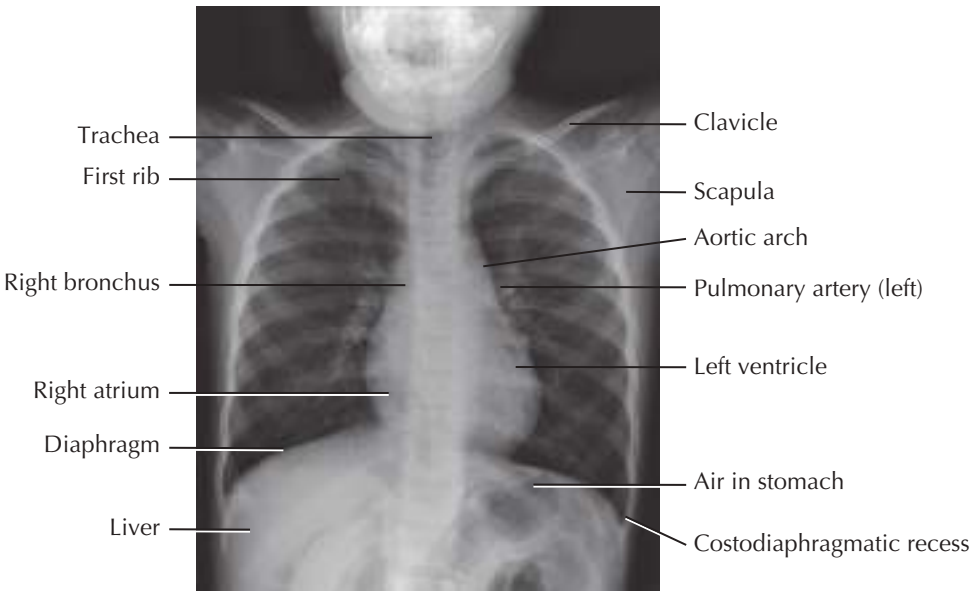

Cervicothoracic (stellate) ganglion
Ansa subclavia
Cervical cardiac nerves (sympathetic and vagal)
Thoracic (sympathetic) cardiac branches
Sympathetic trunk
Vagus nerve (X) (cut) and branches to cardiac and pulmonary plexuses
Thoracic (sympathetic) cardiac branches
Anterior pulmonary plexus
Posterior pulmonary plexus (protruding from behind right bronchus)
6th intercostal nerve
Gray and white rami communicantes
6th thoracic ganglion
Greater splanchnic nerve
Sympathetic branch to esophageal plexus
Thoracic duct
Lesser splanchnic nerve
Least splanchnic nerve
Azygos vein (cut)
Inferior vena cava (cut)
Left recurrent laryngeal nerve
Cervical cardiac nerves (sympathetic and vagal)
Vagus nerve (X) (cut)
Thoracic (sympathetic) cardiac branches
Left recurrent laryngeal nerve
Thoracic cardiac branch of vagus nerve
Cardiac plexus
Anterior pulmonary plexus
Posterior pulmonary plexus (protruding from behind left bronchus)
Sympathetic trunk
Thoracic aortic plexus
Esophageal plexus
8th intercostal nerve
Gray and white rami communicantes
Greater splanchnic nerve
Lesser splanchnic nerve
Anterior vagal trunk
Diaphragm (pulled down)

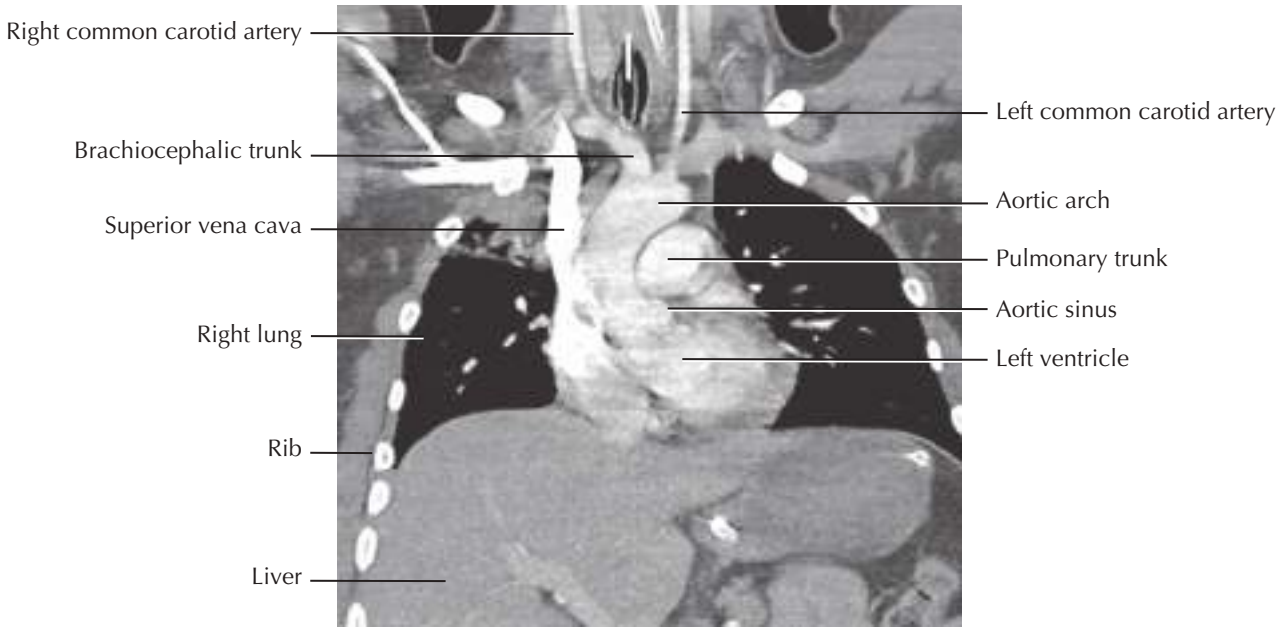
Innervation of Tracheobronchial Tree: Schema



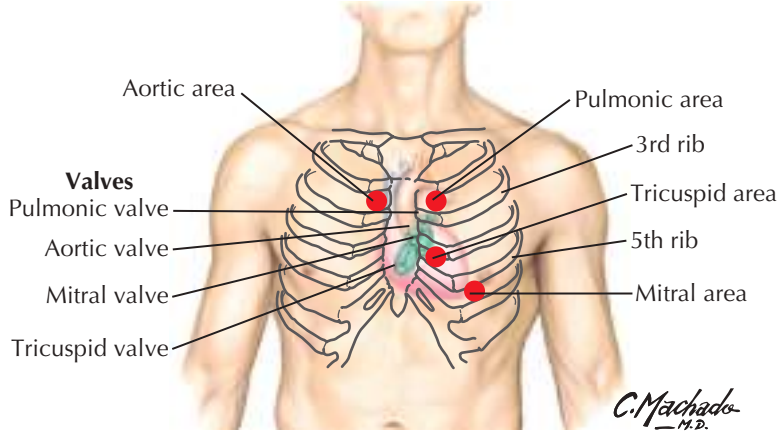

Inferior thyroid veins
Trachea
Thymus
Left common carotid artery
Brachiocephalic trunk
Left brachiocephalic vein
Right brachiocephalic vein
Internal jugular vein
Phrenic nerve
Vagus nerve (X)
Anterior scalene muscle
Arch of aorta
Brachial plexus
Thoracic duct
External jugular vein
Left recurrent laryngeal nerve
Subclavian artery and vein
Internal thoracic artery
Superior vena cava
Phrenic nerve and pericardiacophrenic artery and vein
1st rib
Mediastinal part of parietal pleura
Phrenic nerve and pericardiacophrenic artery and vein
Right lung
Left lung
Pericardium
Diaphragm
Line of fusion of fibrous pericardium to diaphragm
Internal thoracic artery
Mediastinal
Diaphragmatic
Parts of parietal pleura
Costal
Superior epigastric artery
Musculophrenic artery

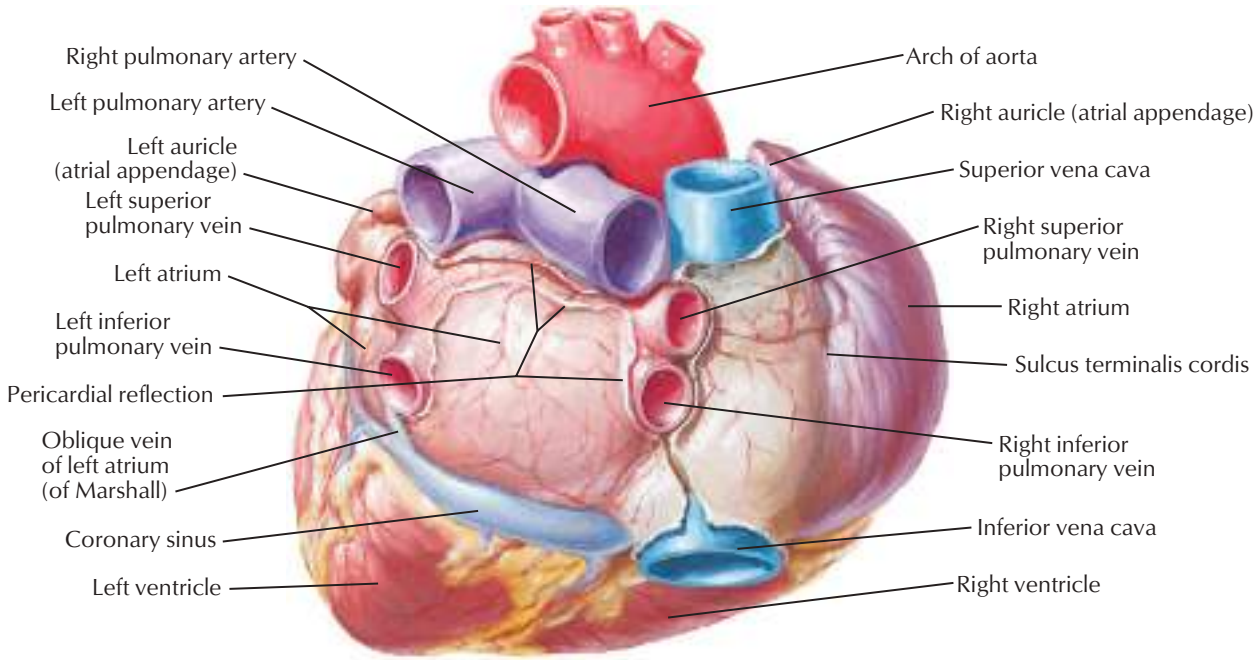

Pericardium (*cut edge*) at site of reflection from great vessels
Right vagus nerve
Right recurrent laryngeal nerve
Right brachiocephalic vein
Phrenic nerve
Subclavian artery and vein
Internal thoracic artery and vein
Phrenic nerve and pericardiacophrenic artery and vein
Superior vena cava
Right pulmonary artery
Transverse pericardial sinus
Right superior pulmonary vein
Hilum of right lung
Mediastinal pleura (*cut edge*)
Pericardium (*cut edge*)
Brachiocephalic trunk
Left brachiocephalic vein
Arch of aorta
Left common carotid artery
Left internal jugular vein
Left vagus nerve (X)
Ligamentum arteriosum
Left recurrent laryngeal nerve
Pulmonary trunk
Left pulmonary artery
Transverse pericardial sinus
Left superior pulmonary vein
Hilum of left lung
Mediastinal part of parietal pleura (*cut edge*)
Pericardium (*cut edge*)
Right ventricle
Conus arteriosus
Left auricle (atrial appendage)
Apex of heart
Left border (obtuse margin) of heart
Left ventricle
Inferior border (acute margin) of heart
Anterior interventricular sulcus and anterior interventricular branch of left coronary artery
Right auricle (atrial appendage)
Coronary sulcus and right coronary artery
Right atrium



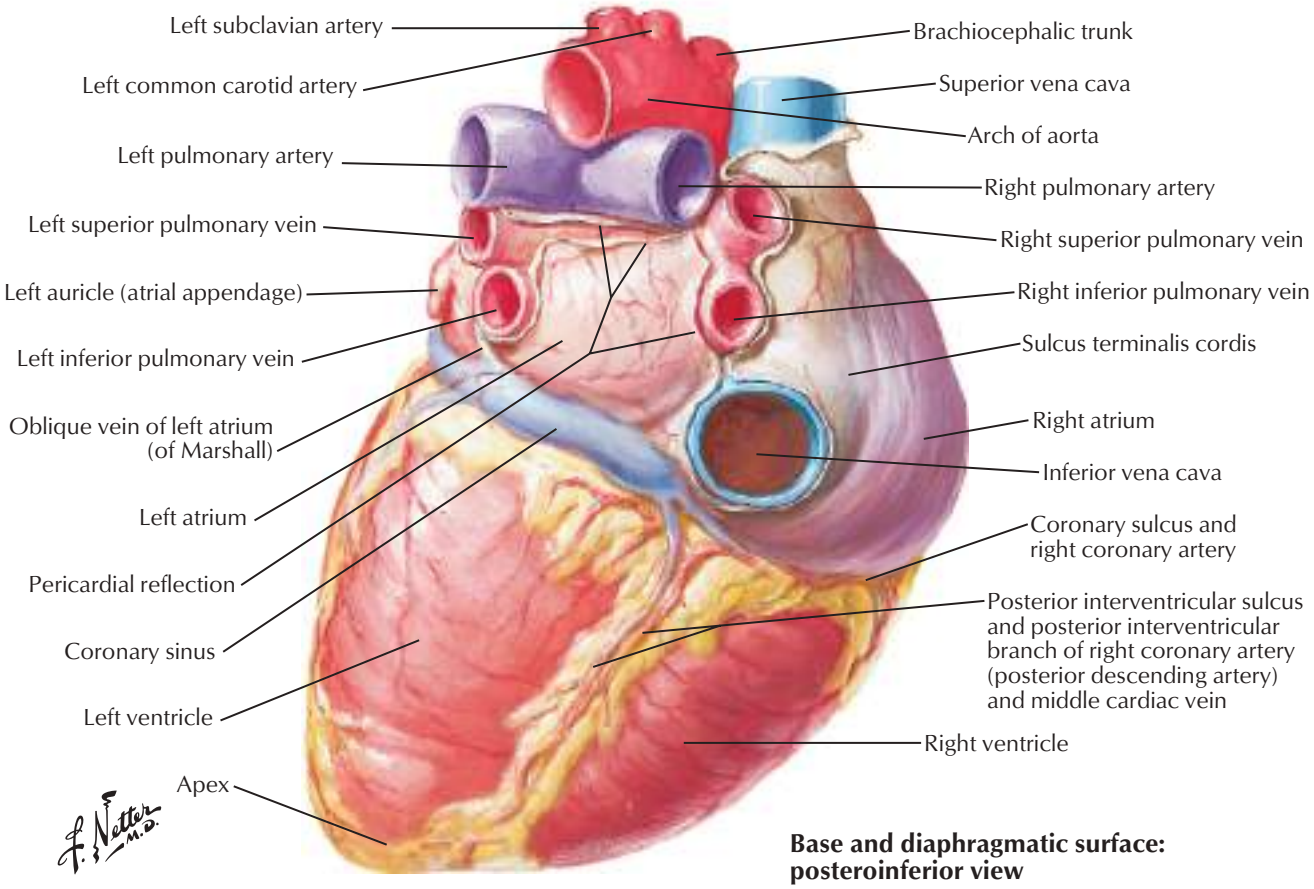


Precordial areas of auscultation

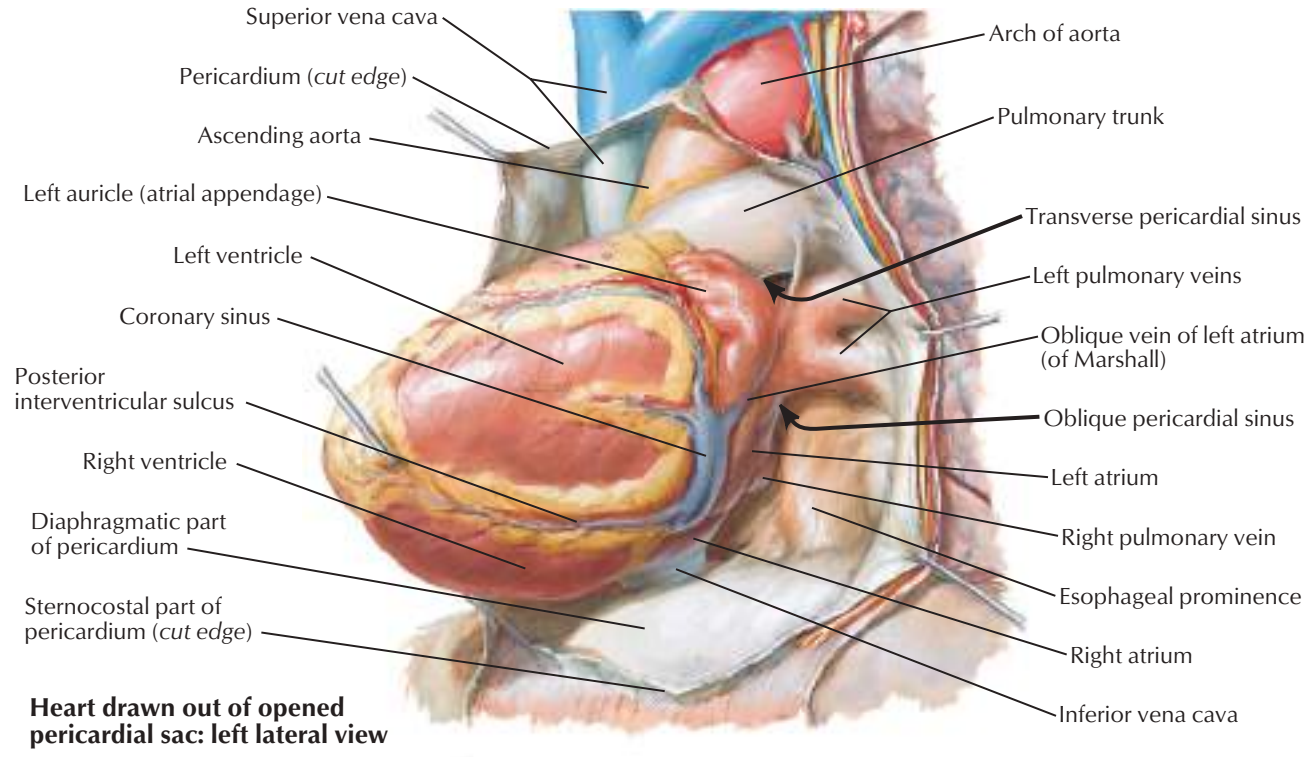




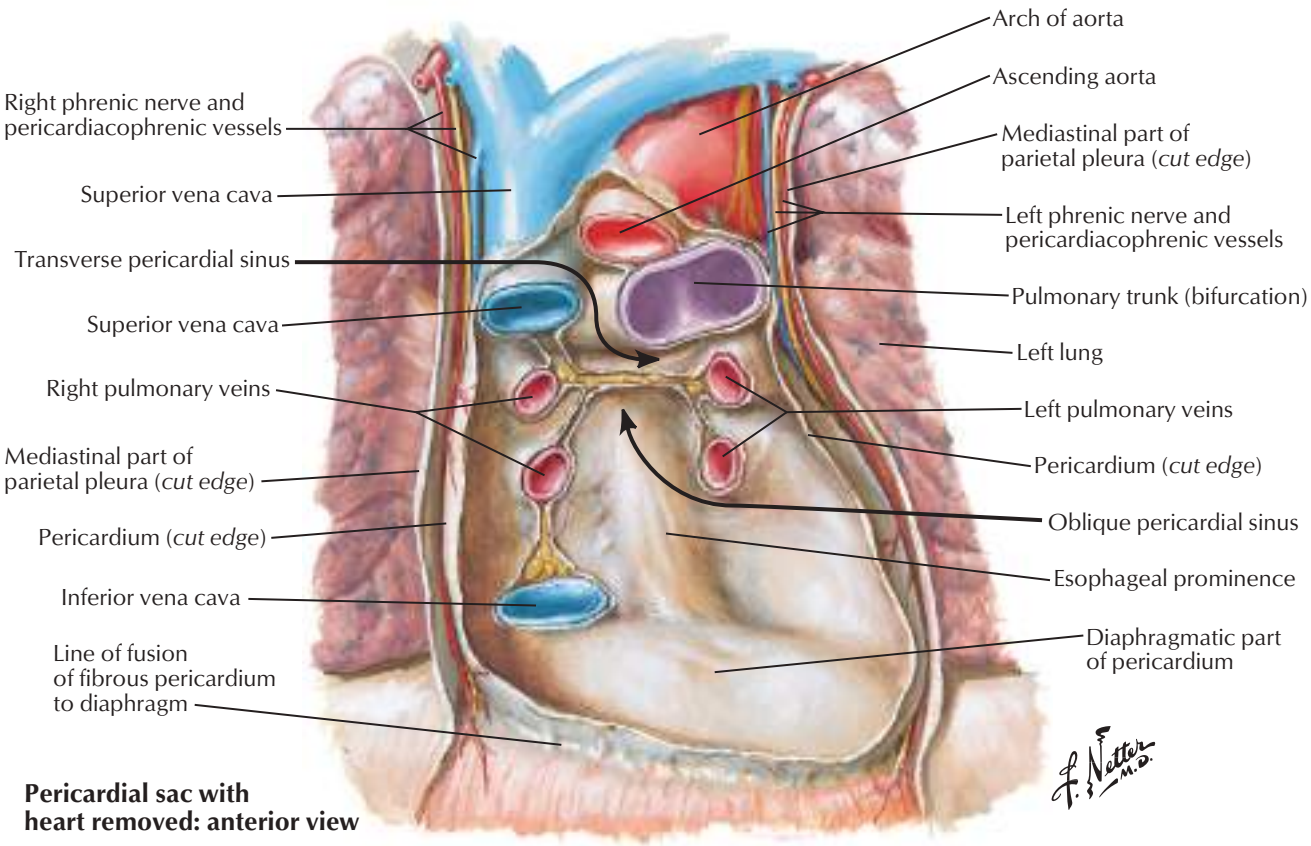
Base of heart: posterior view



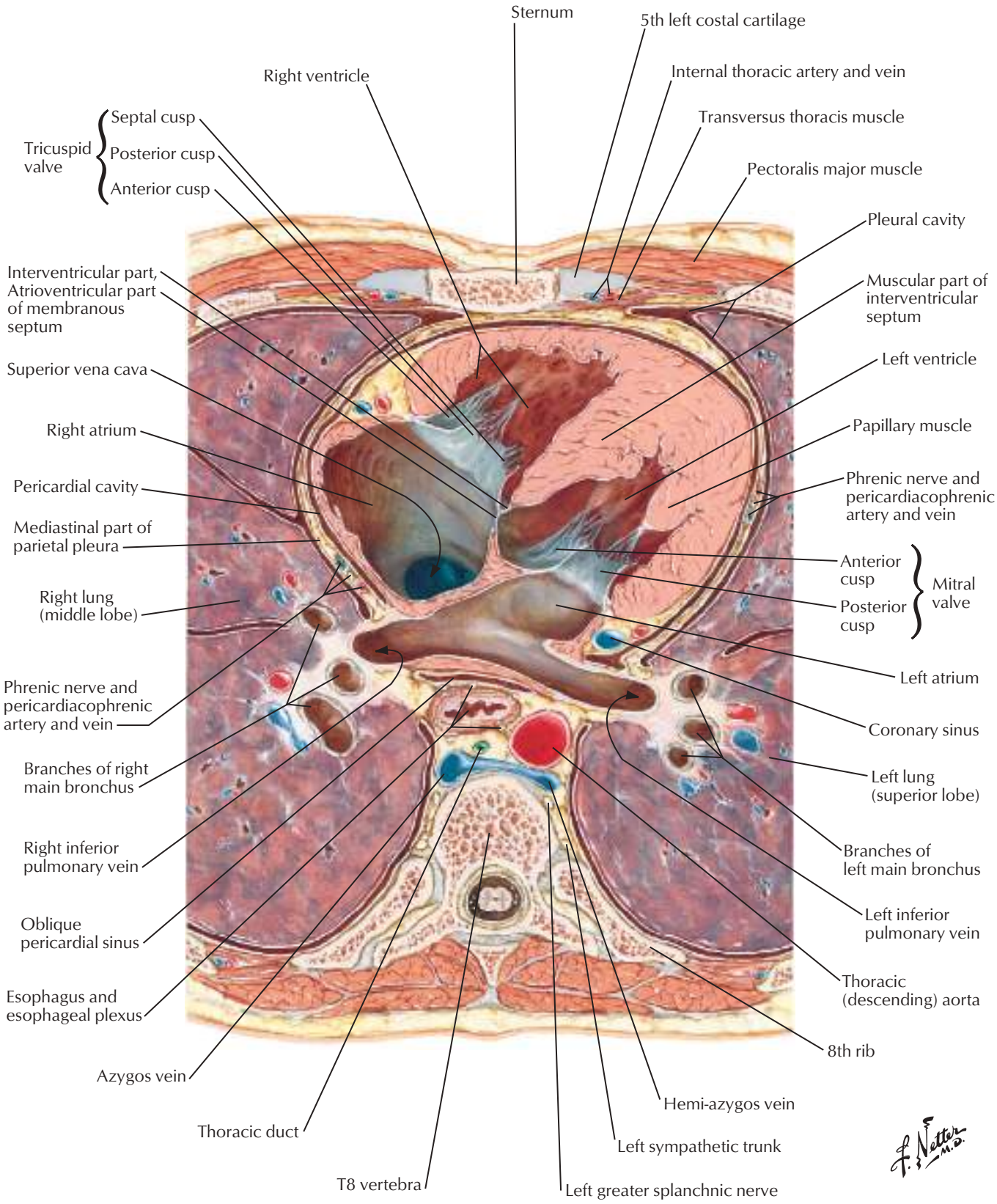
Base and diaphragmatic surface: posteroinferior view

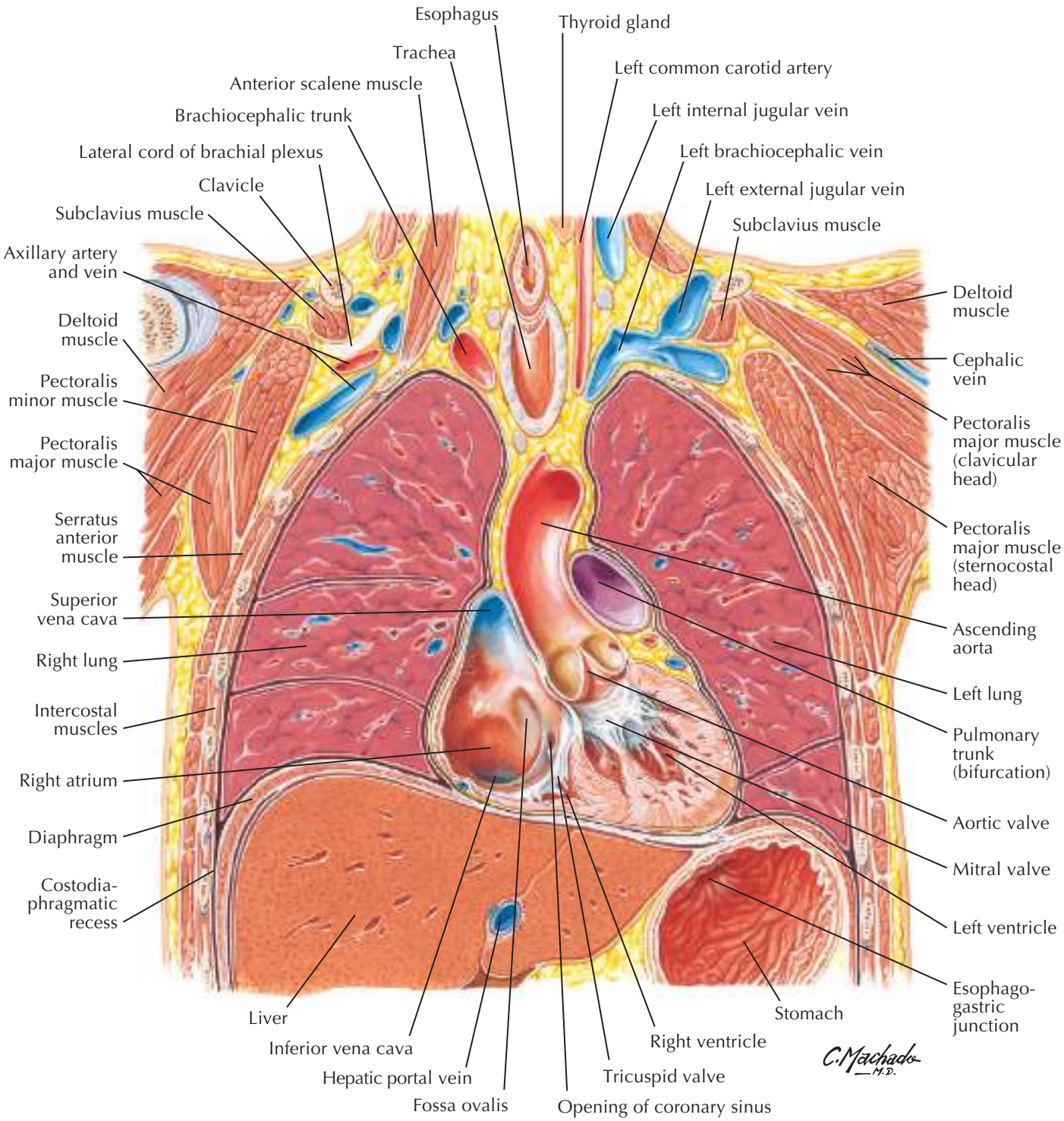


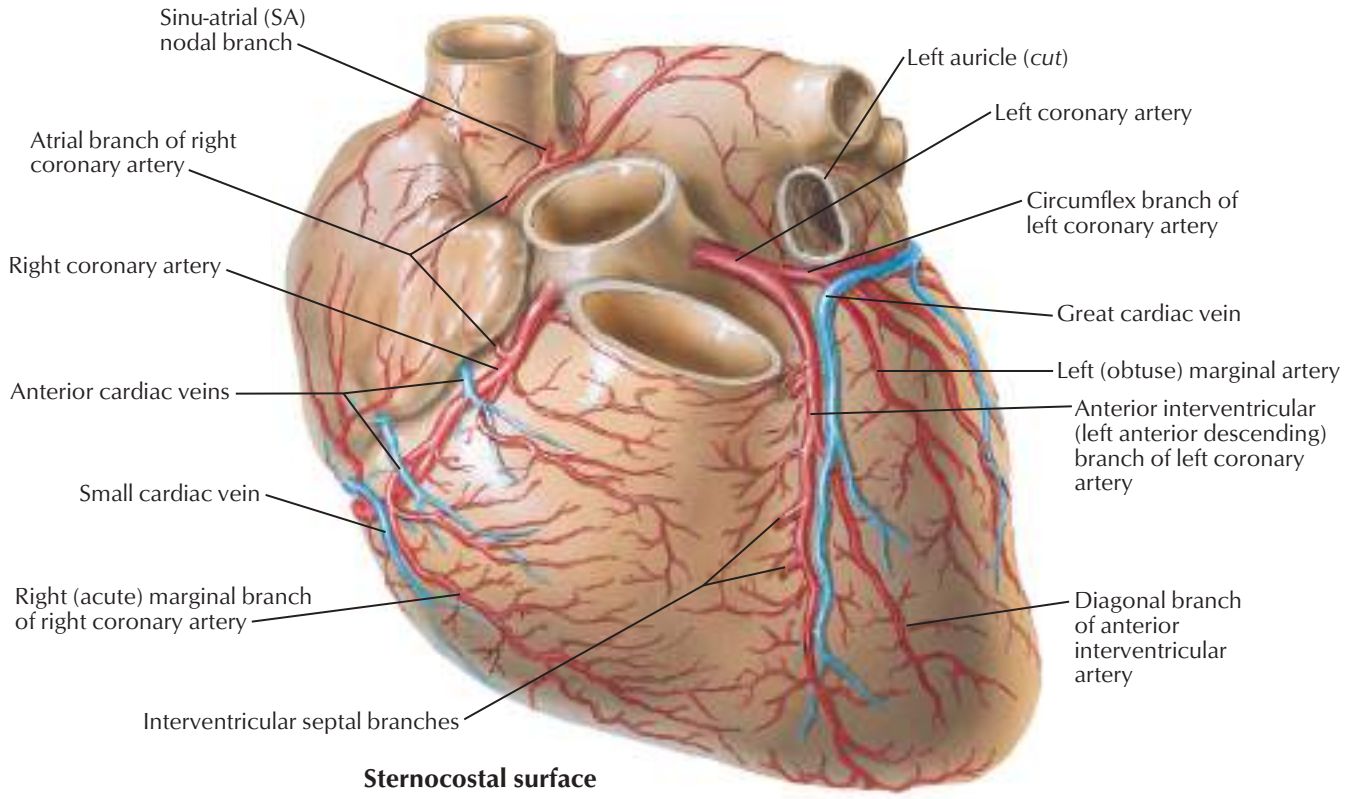
Heart drawn out of opened pericardial sac: left lateral view



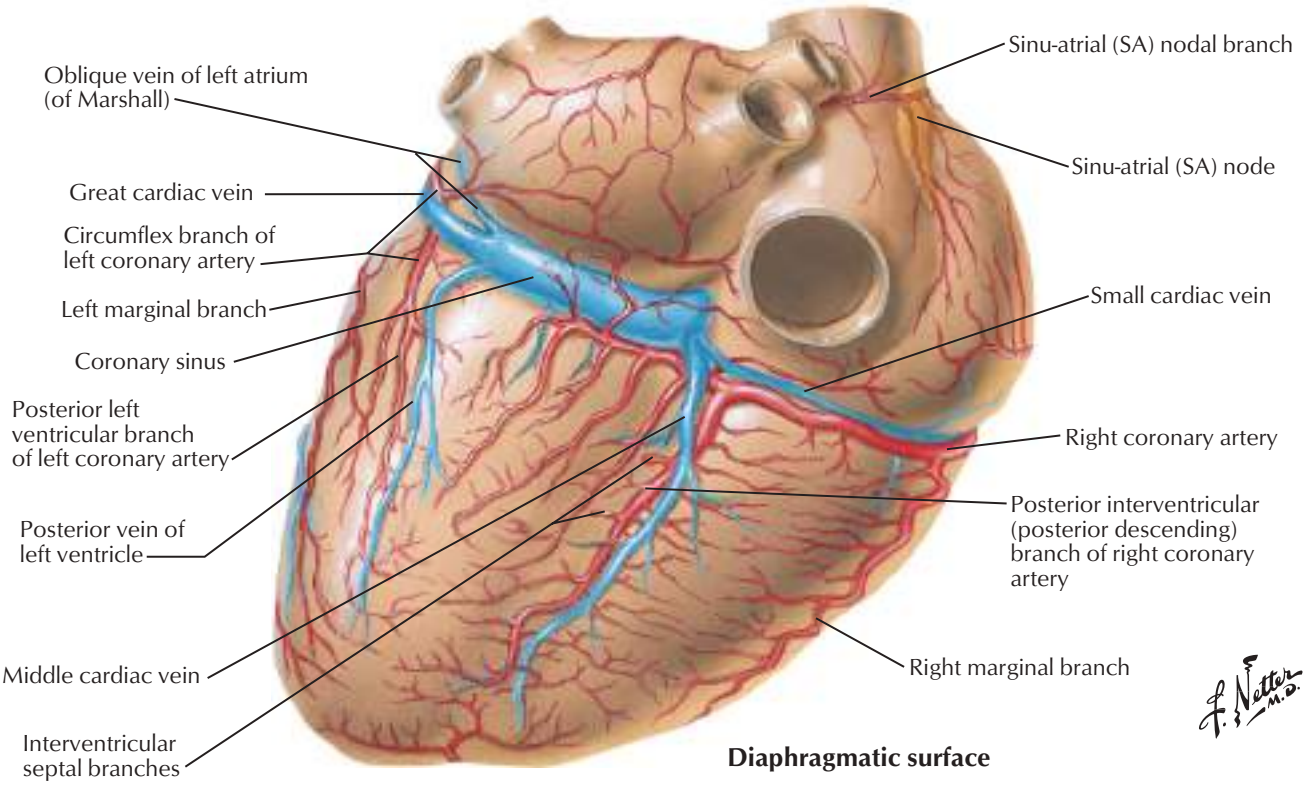
Pericardial sac with heart removed: anterior view


Sternum
5th left costal cartilage
Right ventricle
Internal thoracic artery and vein
Transversus thoracis muscle
Tricuspid valve
Septal cusp
Posterior cusp
Anterior cusp
Pectoralis major muscle
Pleural cavity
Interventricular part, Atrioventricular part of membranous septum
Muscular part of interventricular septum
Superior vena cava
Left ventricle
Right atrium
Papillary muscle
Pericardial cavity
Phrenic nerve and pericardiacophrenic artery and vein
Mediastinal part of parietal pleura
Anterior cusp
Posterior cusp
Mitral valve
Right lung (middle lobe)
Left atrium
Phrenic nerve and pericardiacophrenic artery and vein
Coronary sinus
Branches of right main bronchus
Left lung (superior lobe)
Right inferior pulmonary vein
Branches of left main bronchus
Left inferior pulmonary vein
Oblique pericardial sinus
Thoracic (descending) aorta
Esophagus and esophageal plexus
8th rib
Azygos vein
Hemi-azygos vein
Thoracic duct
Left sympathetic trunk
T8 vertebra
Left greater splanchnic nerve

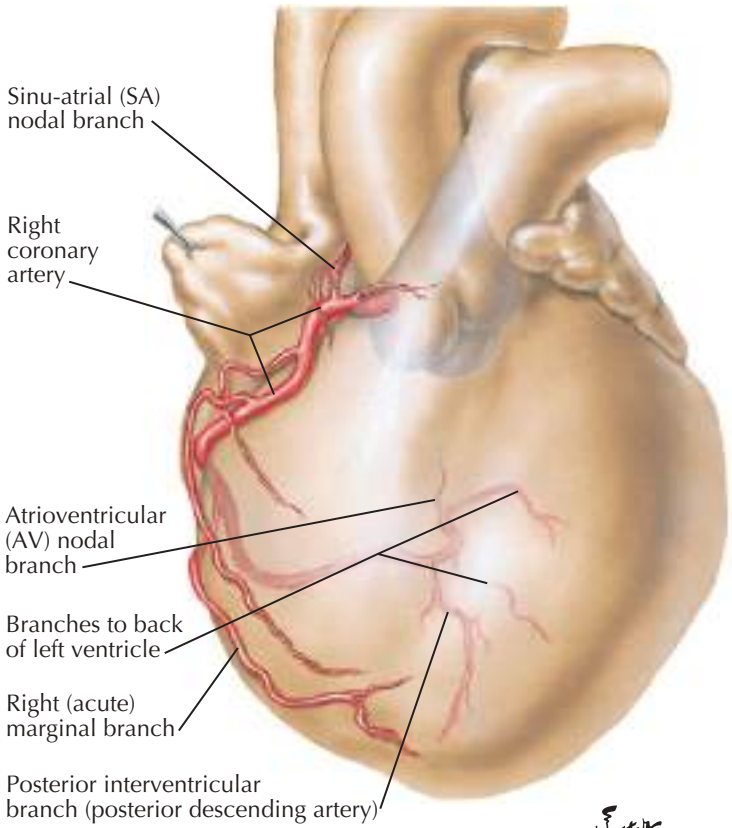

Esophagus
Thyroid gland
Trachea
Left common carotid artery
Anterior scalene muscle
Left internal jugular vein
Brachiocephalic trunk
Left brachiocephalic vein
Lateral cord of brachial plexus
Left external jugular vein
Clavicle
Subclavius muscle
Subclavius muscle
Axillary artery and vein
Deltoid muscle
Deltoid muscle
Cephalic vein
Pectoralis minor muscle
Pectoralis major muscle (clavicular head)
Pectoralis major muscle
Pectoralis major muscle (sternocostal head)
Serratus anterior muscle
Ascending aorta
Superior vena cava
Left lung
Right lung
Pulmonary trunk (bifurcation)
Intercostal muscles
Aortic valve
Right atrium
Mitral valve
Diaphragm
Left ventricle
Costodiaphragmatic recess
Esophagogastric junction
Liver
Stomach
Inferior vena cava
Right ventricle
Hepatic portal vein
Tricuspid valve
Fossa ovalis
Opening of coronary sinus
C. Machado M.D.

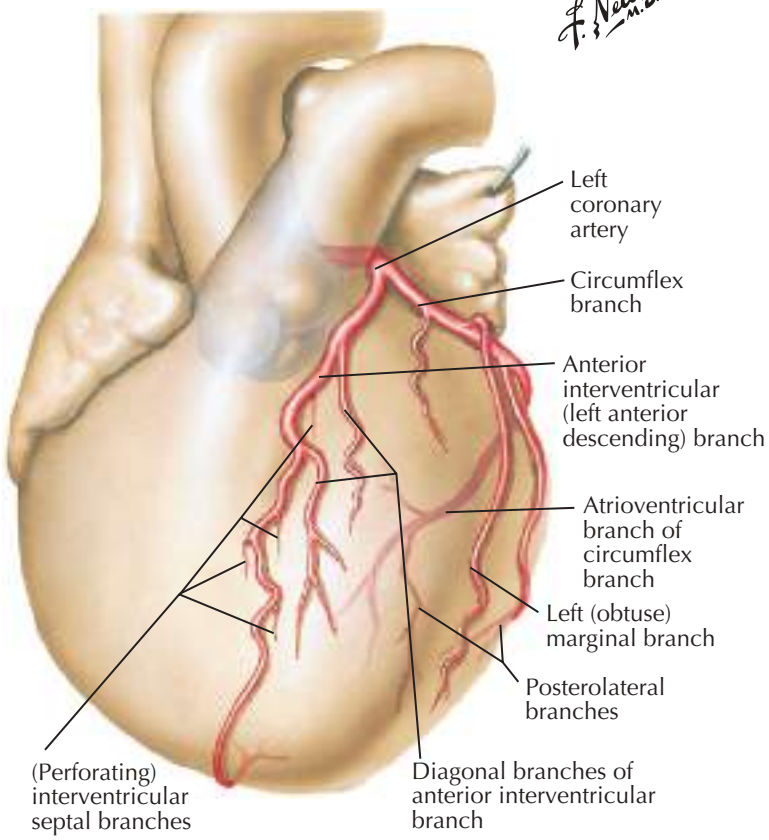


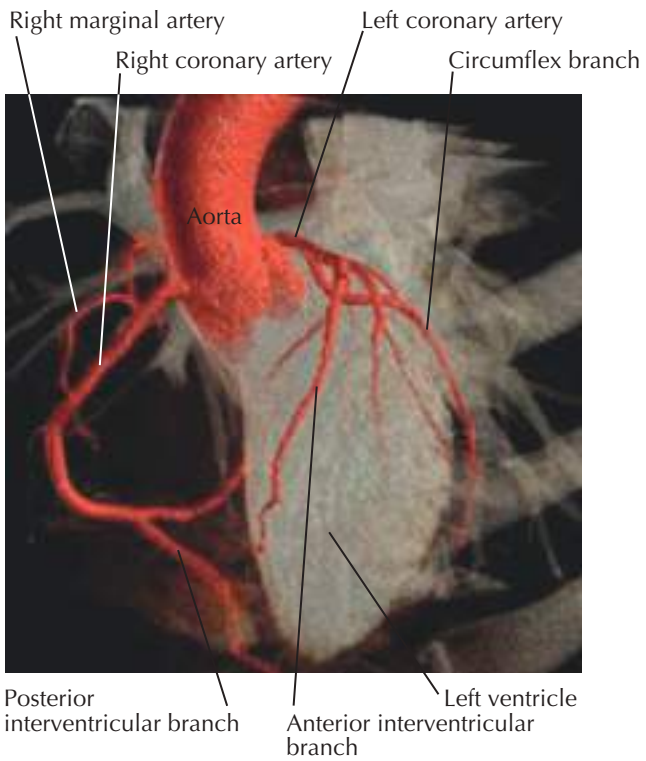
Sternocostal surface

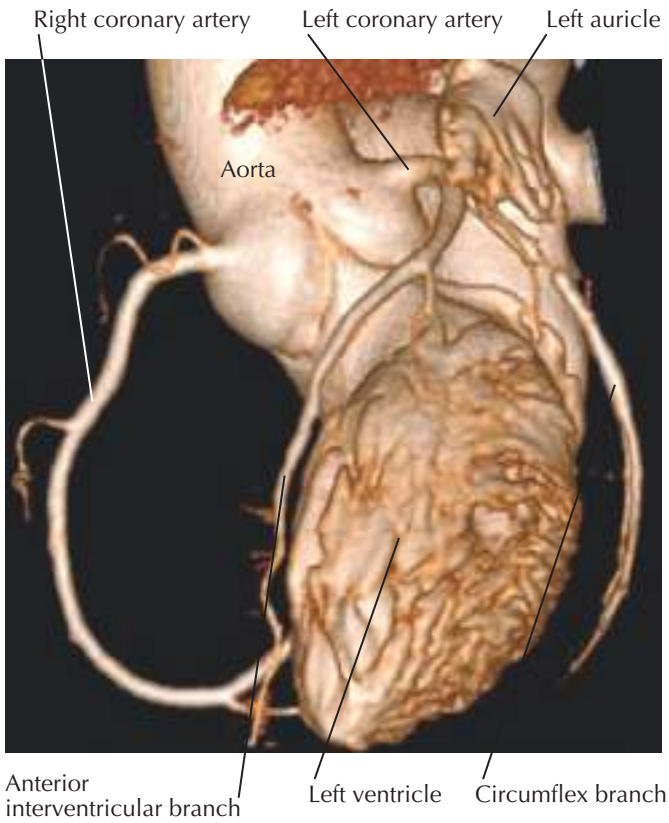


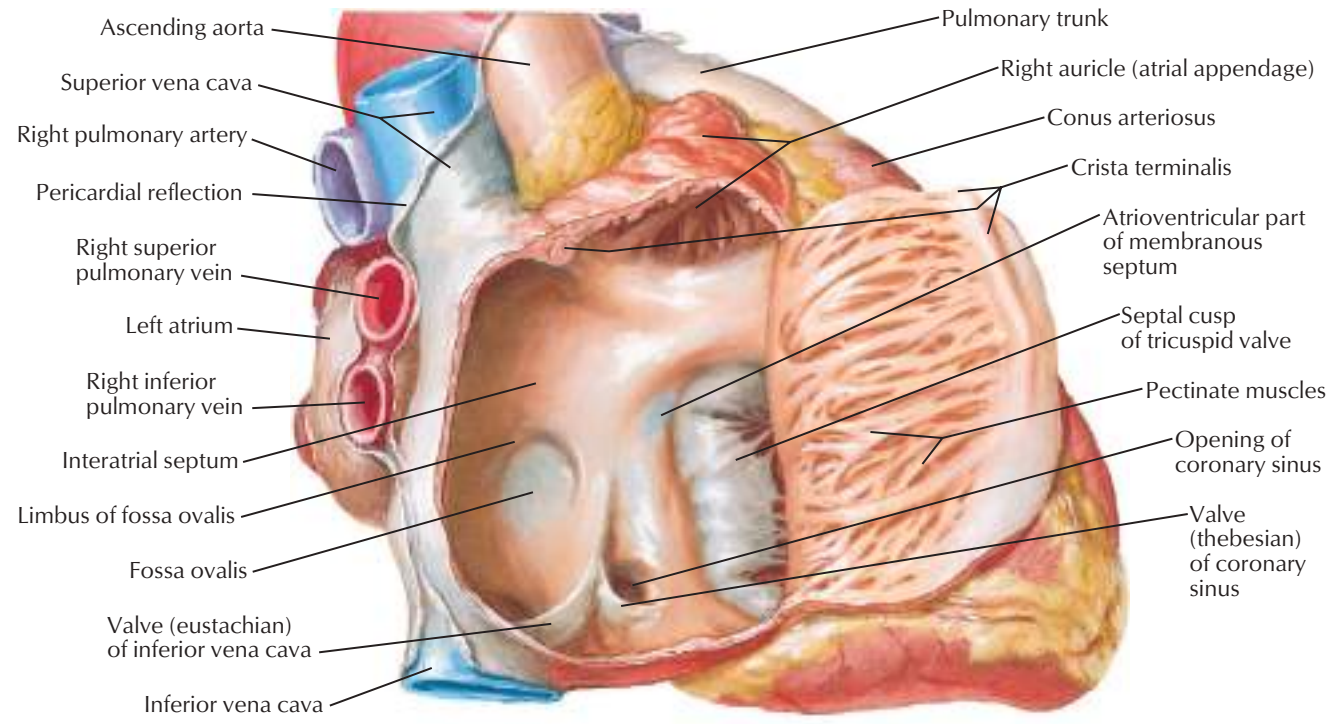
Diaphragmatic surface


Sinu-atrial (SA) nodal branch
Right coronary artery
Atrioventricular (AV) nodal branch
Branches to back of left ventricle
Right (acute) marginal branch
Posterior interventricular branch (posterior descending artery)

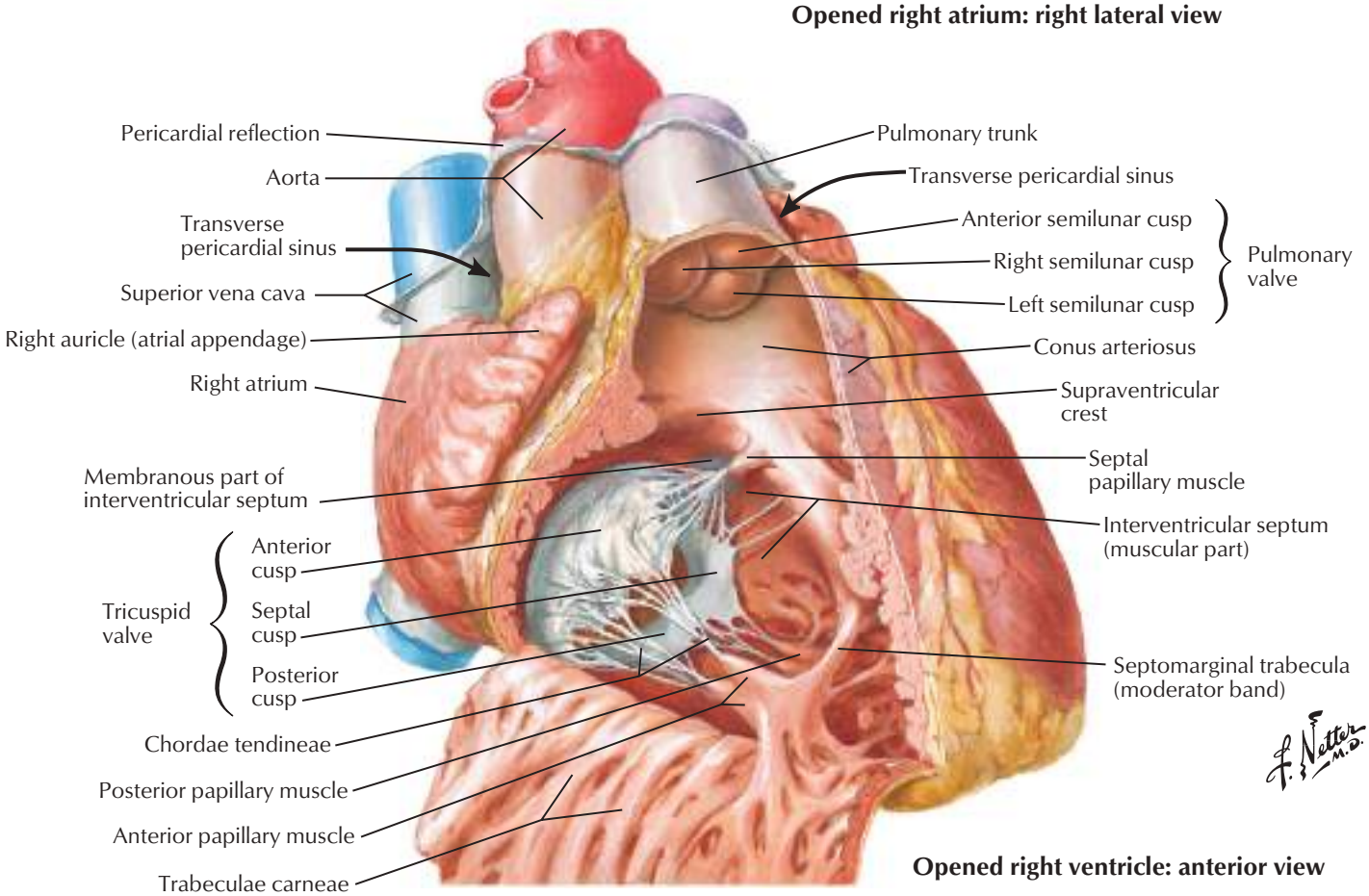

Left coronary artery
Circumflex branch
Anterior interventricular (left anterior descending) branch
Atrioventricular branch of circumflex branch
Left (obtuse) marginal branch
Posterolateral branches
(Perforating) interventricular septal branches
Diagonal branches of anterior interventricular branch


Right marginal artery
Right coronary artery
Left coronary artery
Circumflex branch
Aorta
Posterior interventricular branch
Anterior interventricular branch
Left ventricle

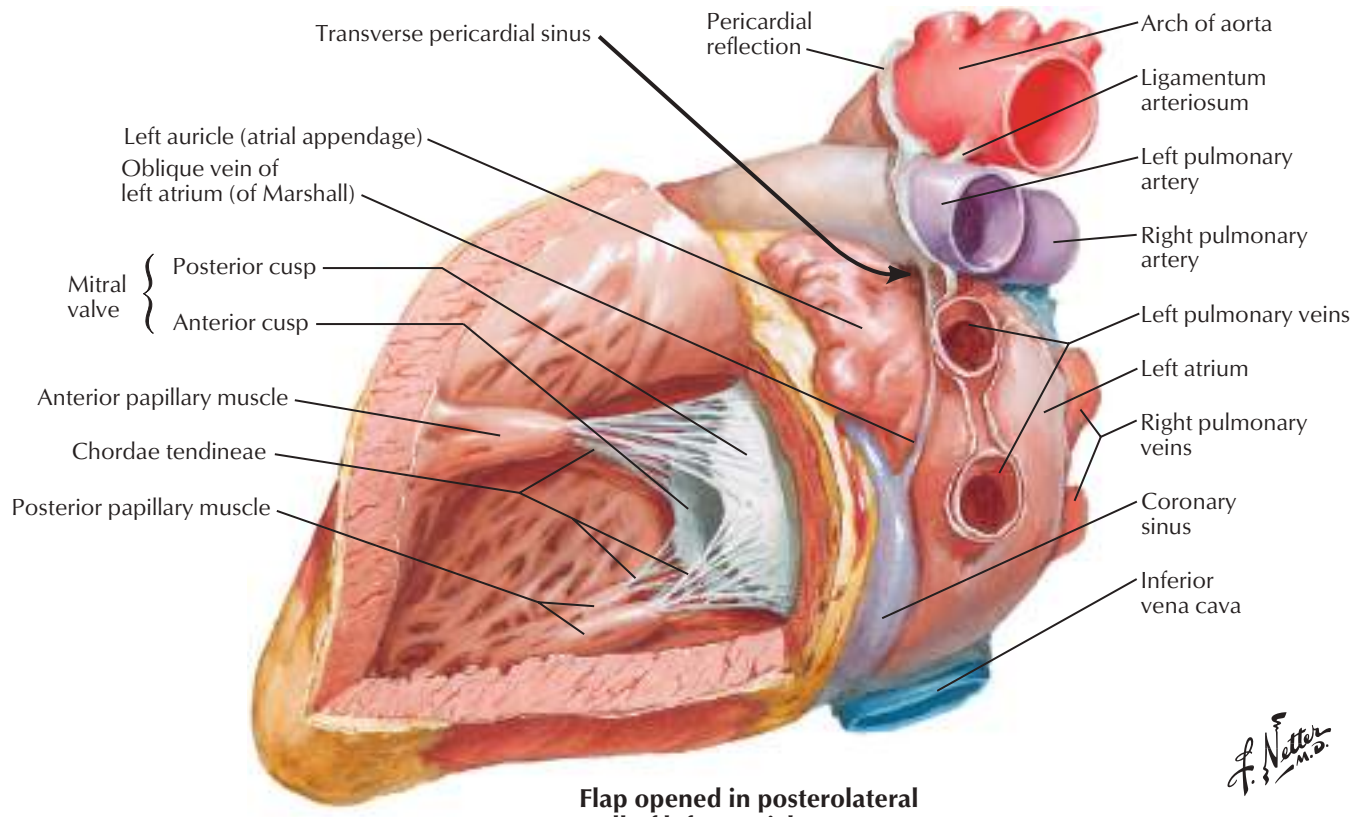

Right coronary artery
Left coronary artery
Left auricle
Aorta
Anterior interventricular branch
Left ventricle
Circumflex branch



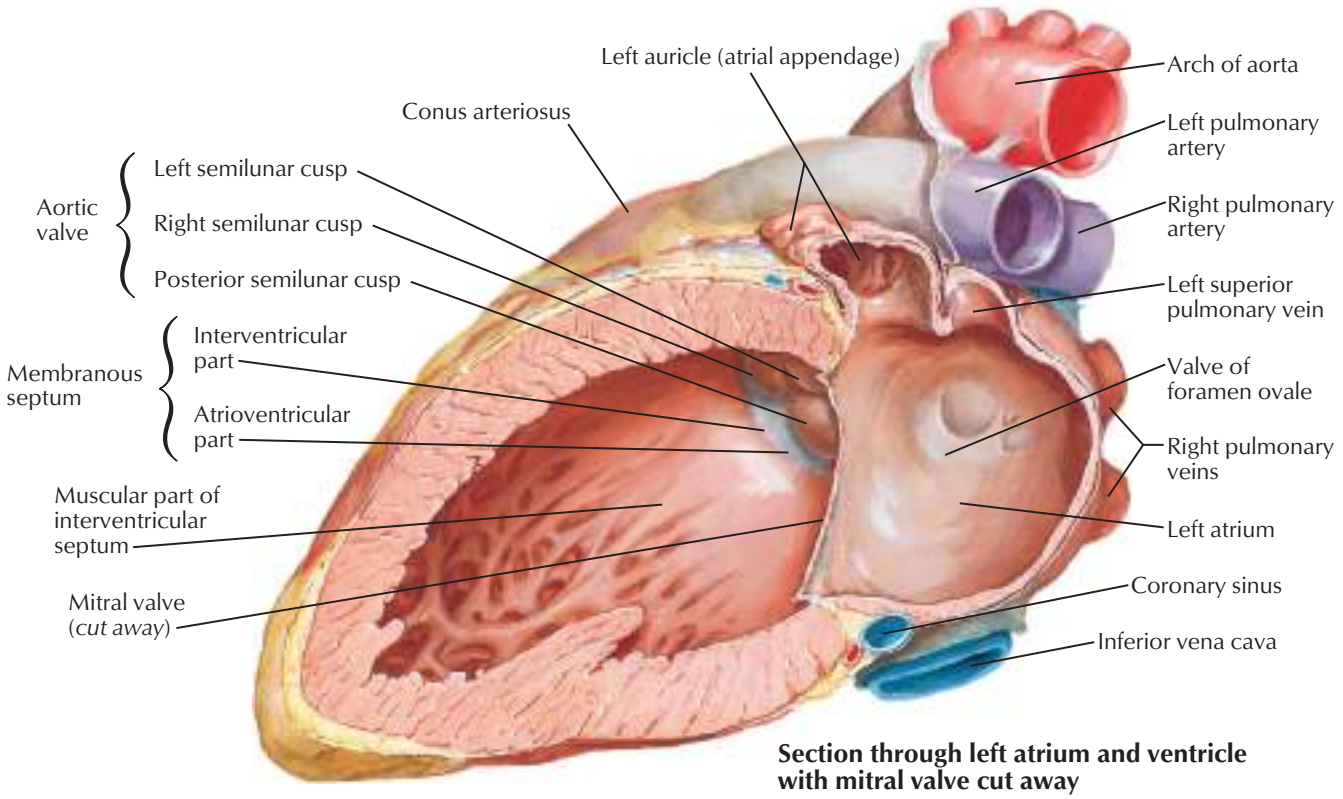
Opened right atrium: right lateral view



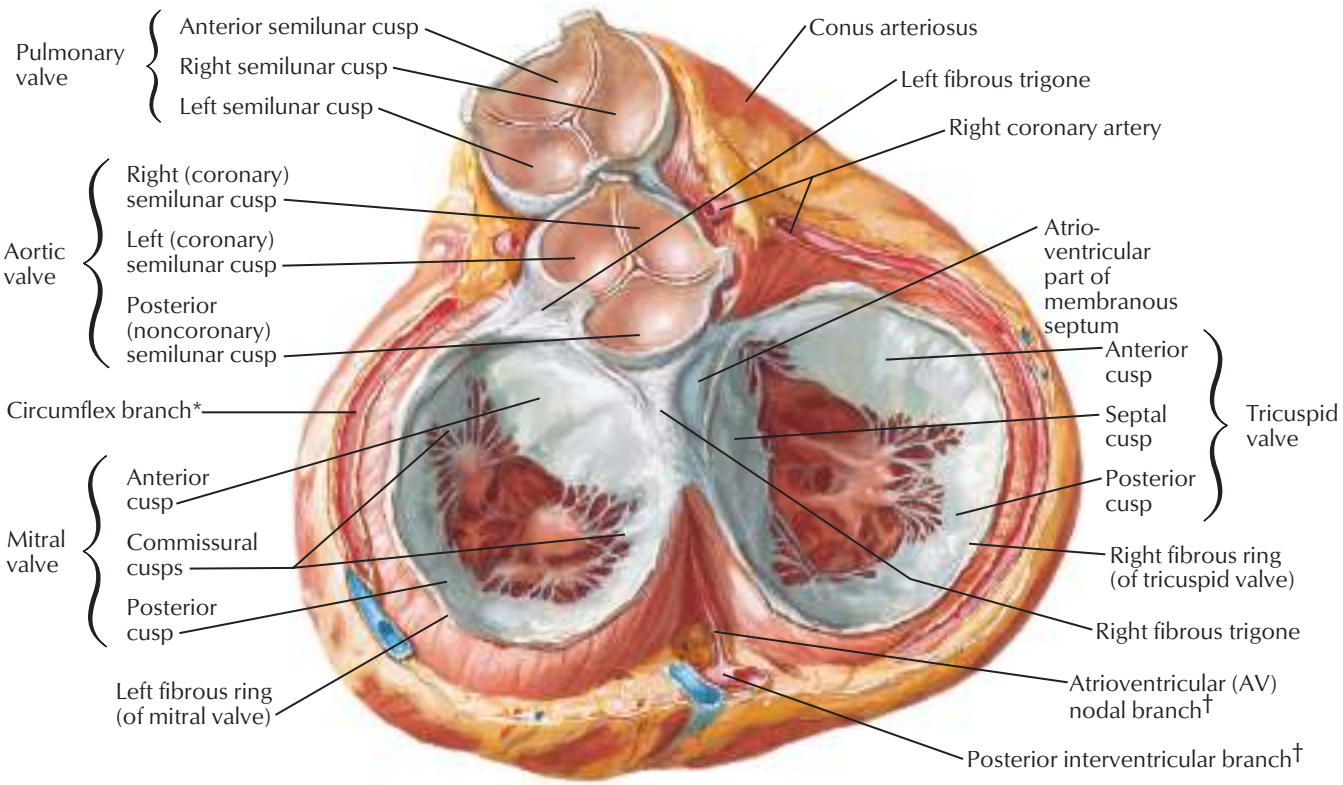
Opened right ventricle: anterior view



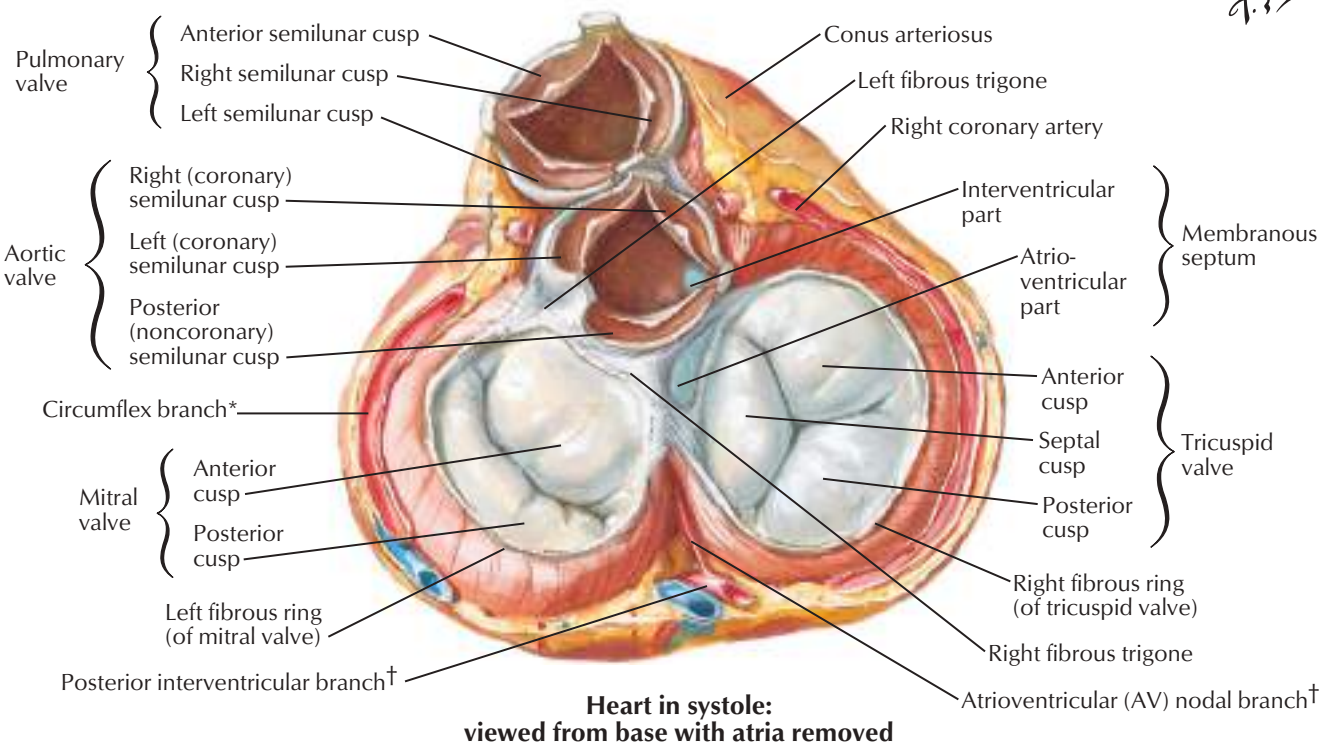
Flap opened in posterolateral wall of left ventricle



Section through left atrium and ventricle with mitral valve cut away

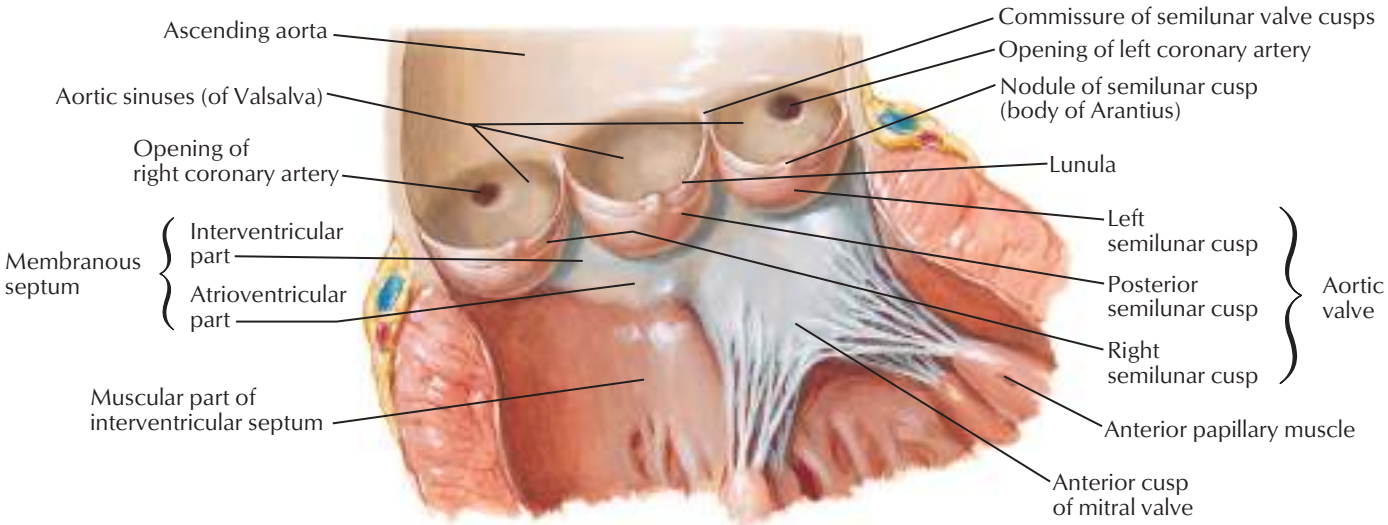


Heart in diastole:
viewed from base with atria removed

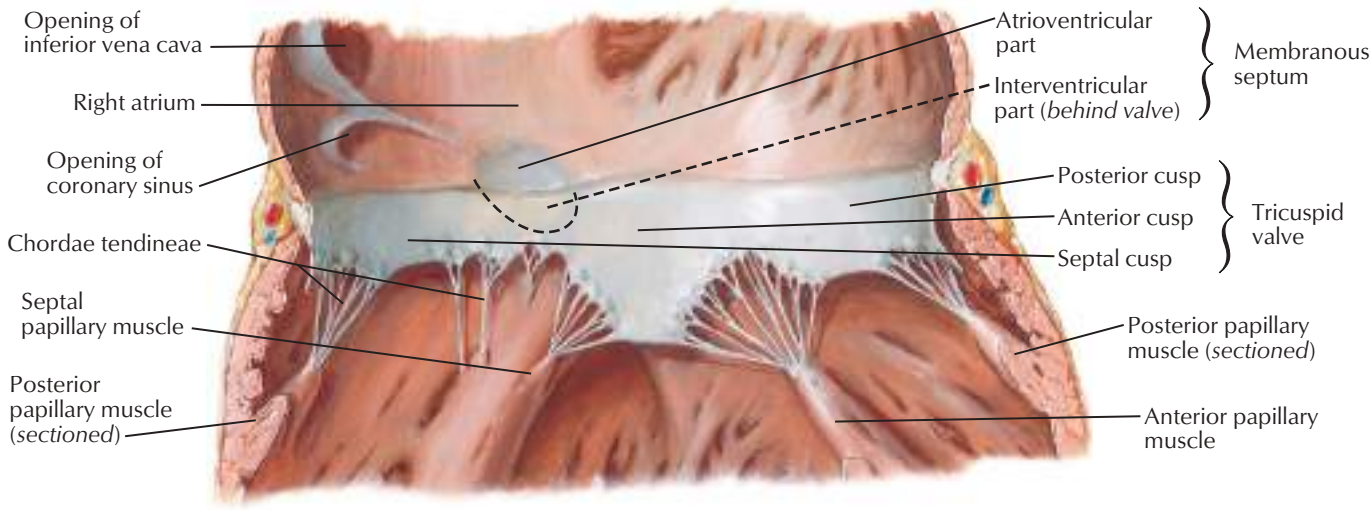


Heart in systole:
viewed from base with atria removed

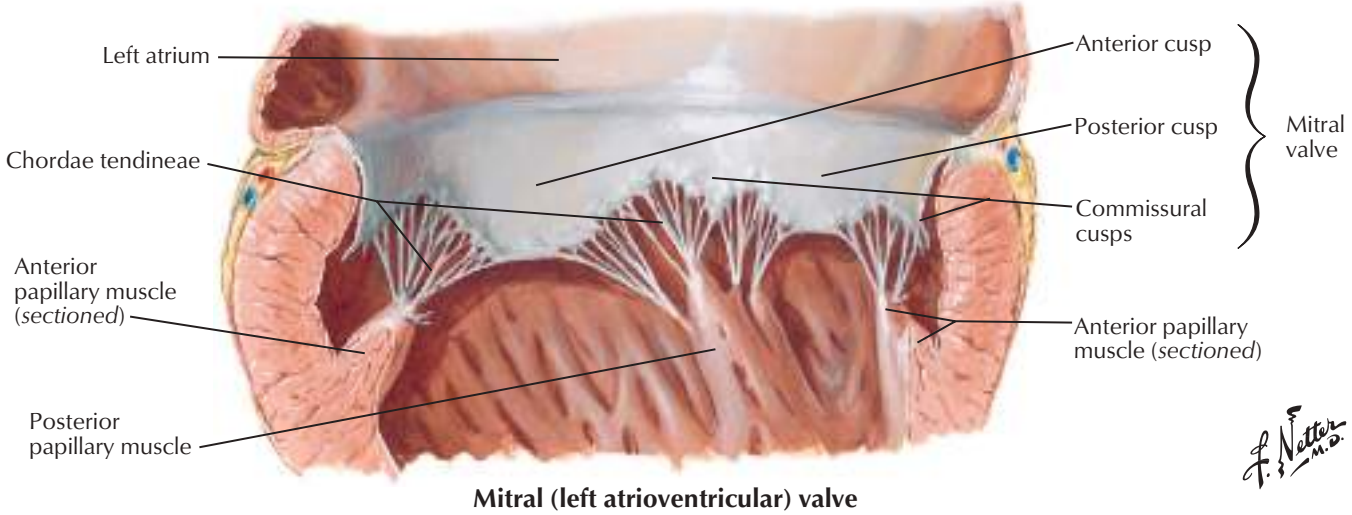
*Of left coronary artery
†Of right coronary artery



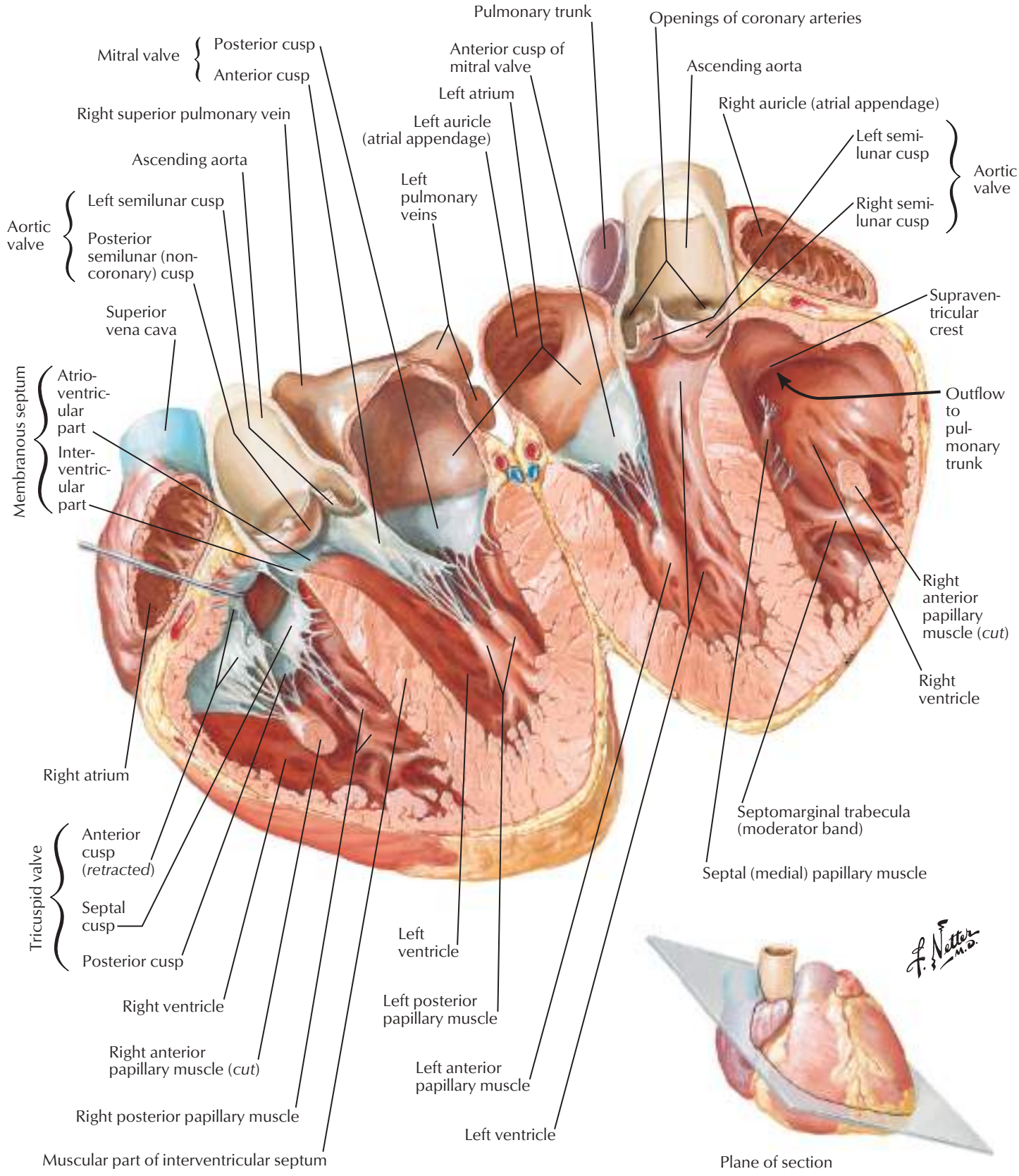
Aortic valve

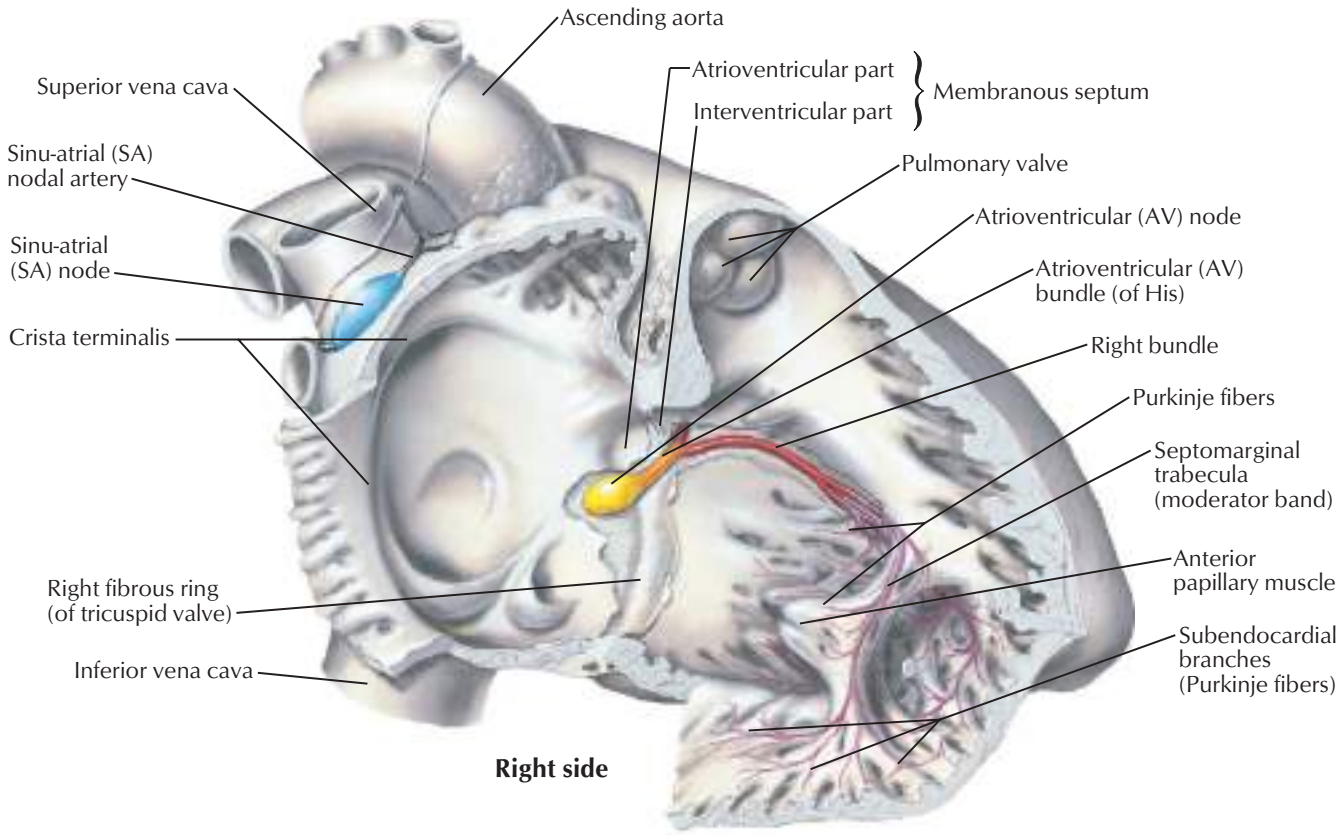


Tricuspid (right atrioventricular) valve

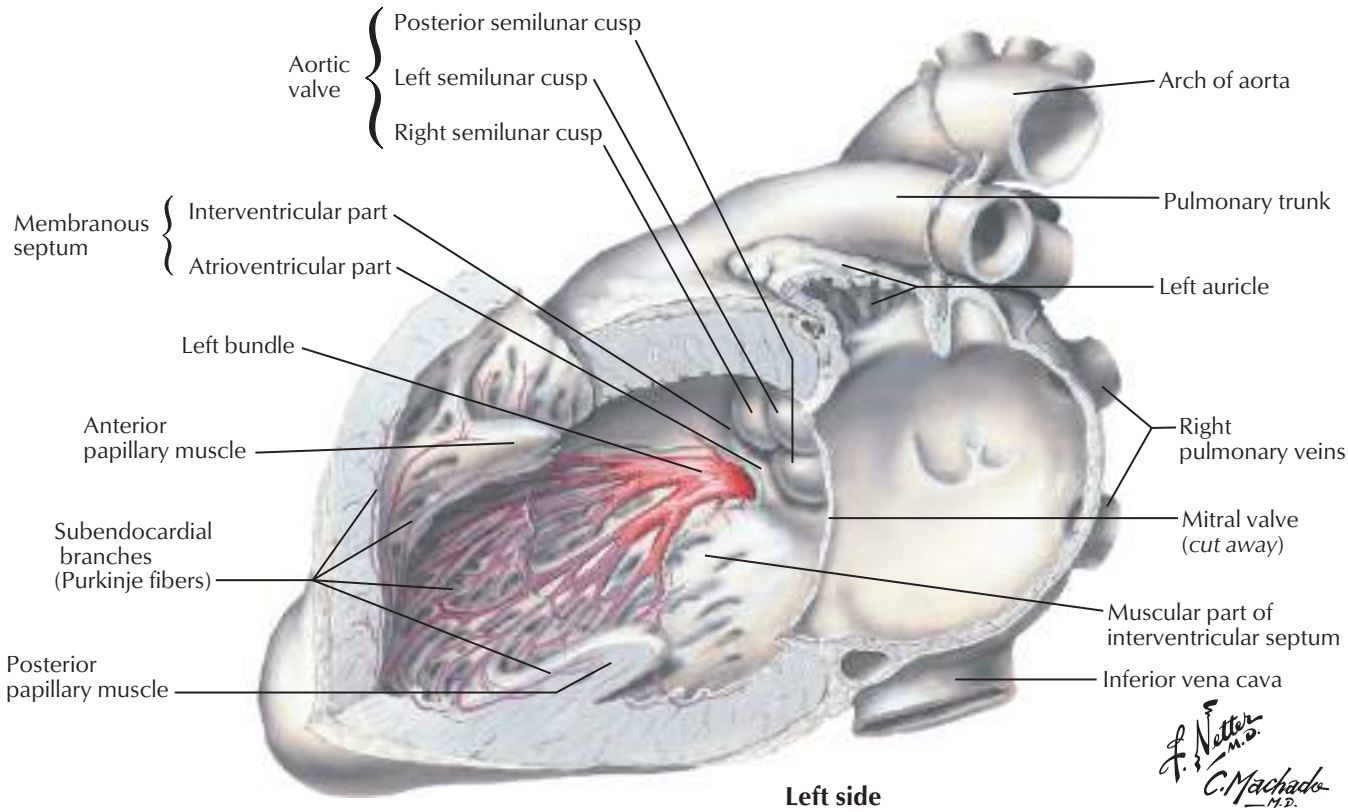


Mitral (left atrioventricular) valve

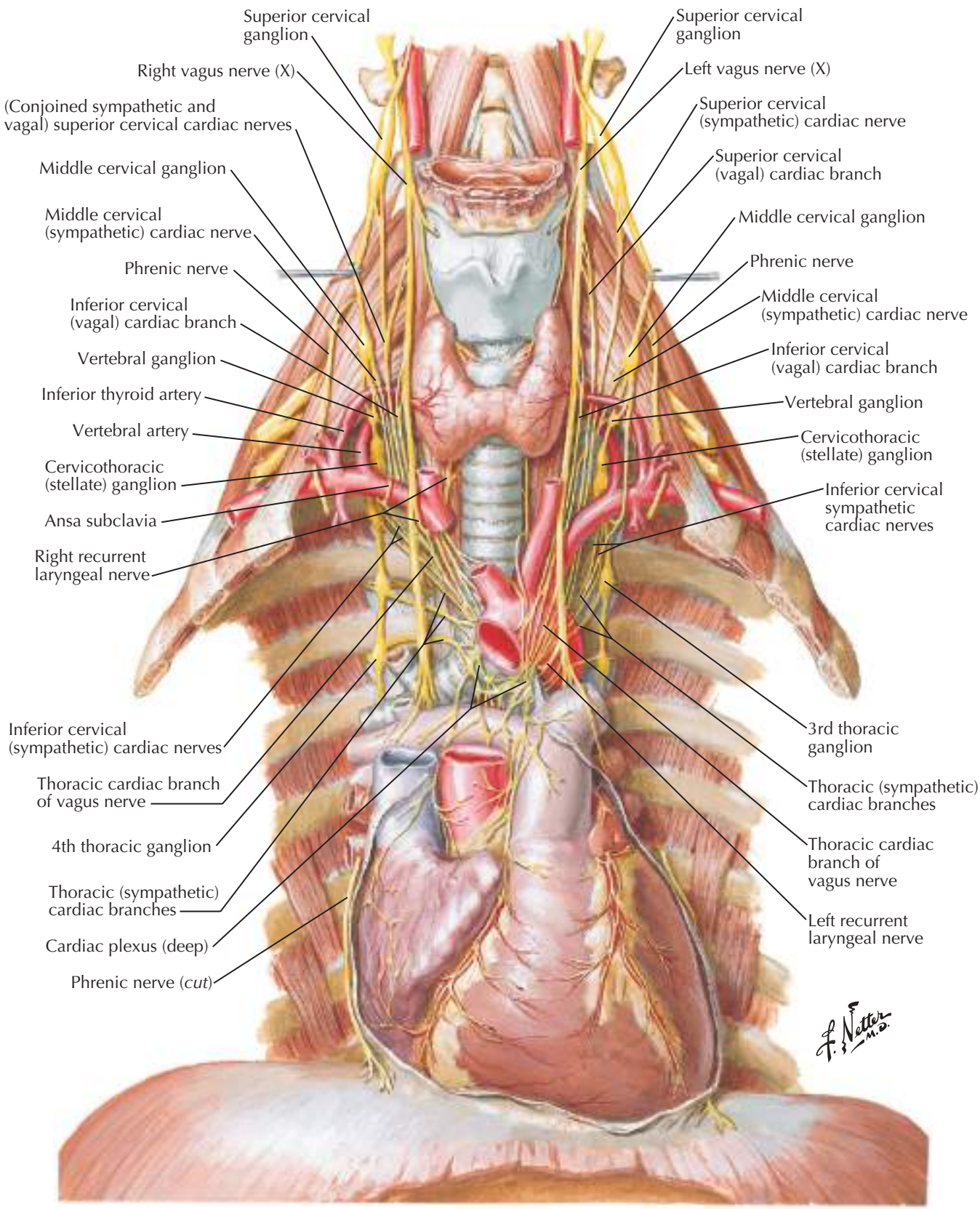

Pulmonary trunk
Openings of coronary arteries
Mitral valve
Posterior cusp
Anterior cusp
Anterior cusp of mitral valve
Ascending aorta
Left atrium
Right auricle (atrial appendage)
Right superior pulmonary vein
Left auricle (atrial appendage)
Left semi-lunar cusp
Aortic valve
Right semi-lunar cusp
Ascending aorta
Left pulmonary veins
Aortic valve
Left semilunar cusp
Posterior semilunar (non-coronary) cusp
Supraventricular crest
Superior vena cava
Membranous septum
Atrioventricular part
Interventricular part
Outflow to pulmonary trunk
Right anterior papillary muscle (cut)
Right ventricle
Right atrium
Septomarginal trabecula (moderator band)
Septal (medial) papillary muscle
Tricuspid valve
Anterior cusp (retracted)
Septal cusp
Posterior cusp
Left ventricle
Right ventricle
Left posterior papillary muscle
Right anterior papillary muscle (cut)
Left anterior papillary muscle
Right posterior papillary muscle
Left ventricle
Muscular part of interventricular septum
Plane of section

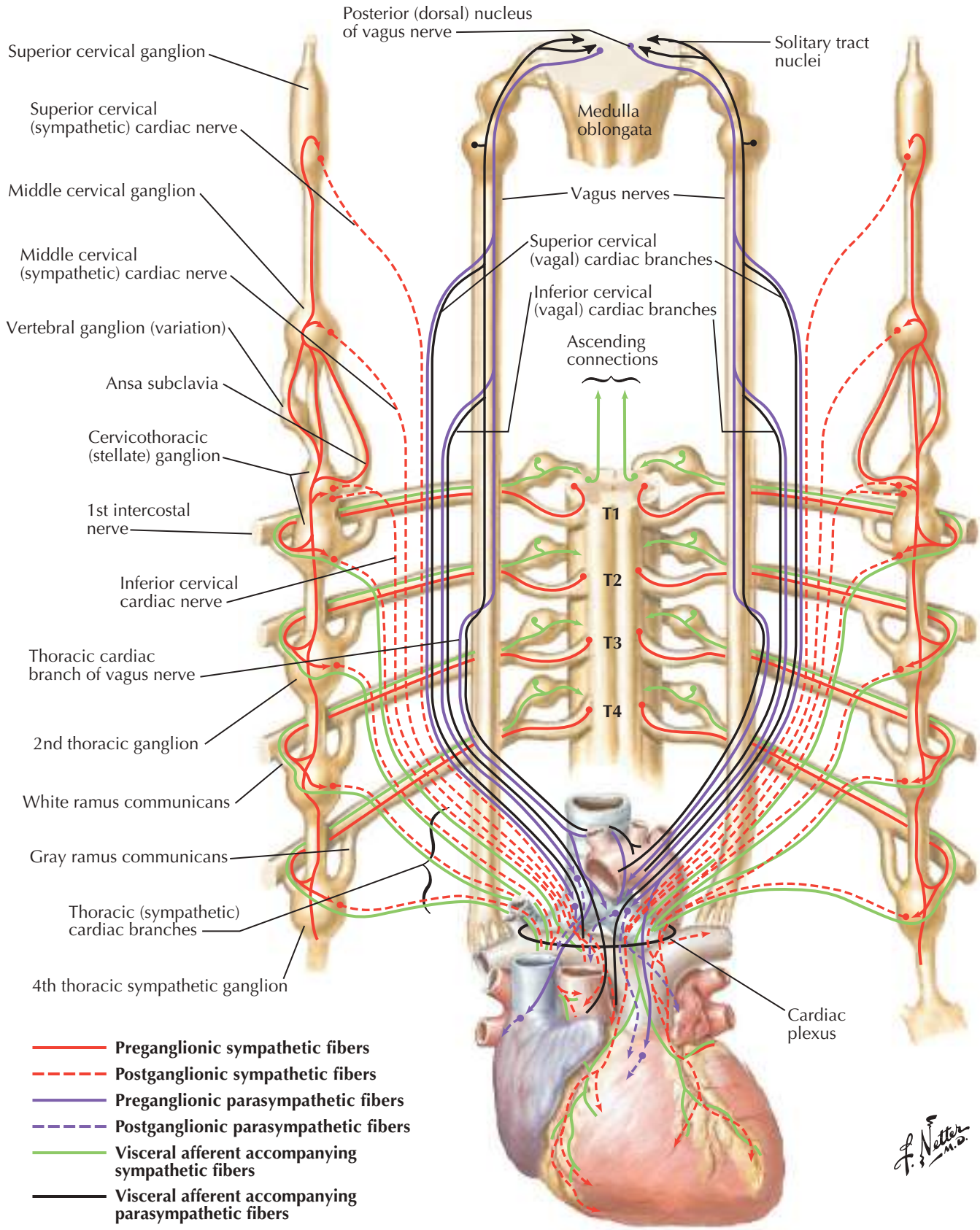


Right side

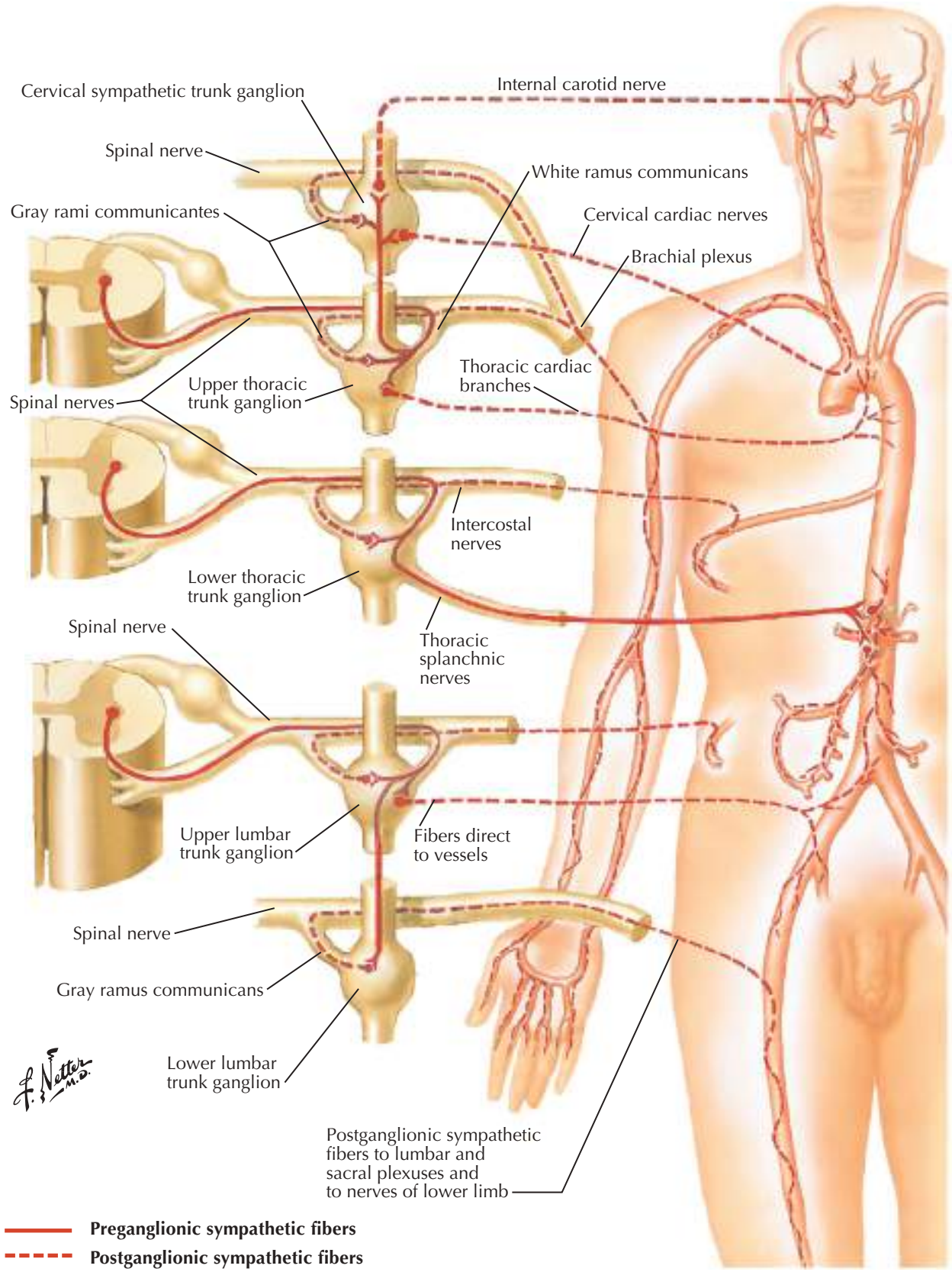


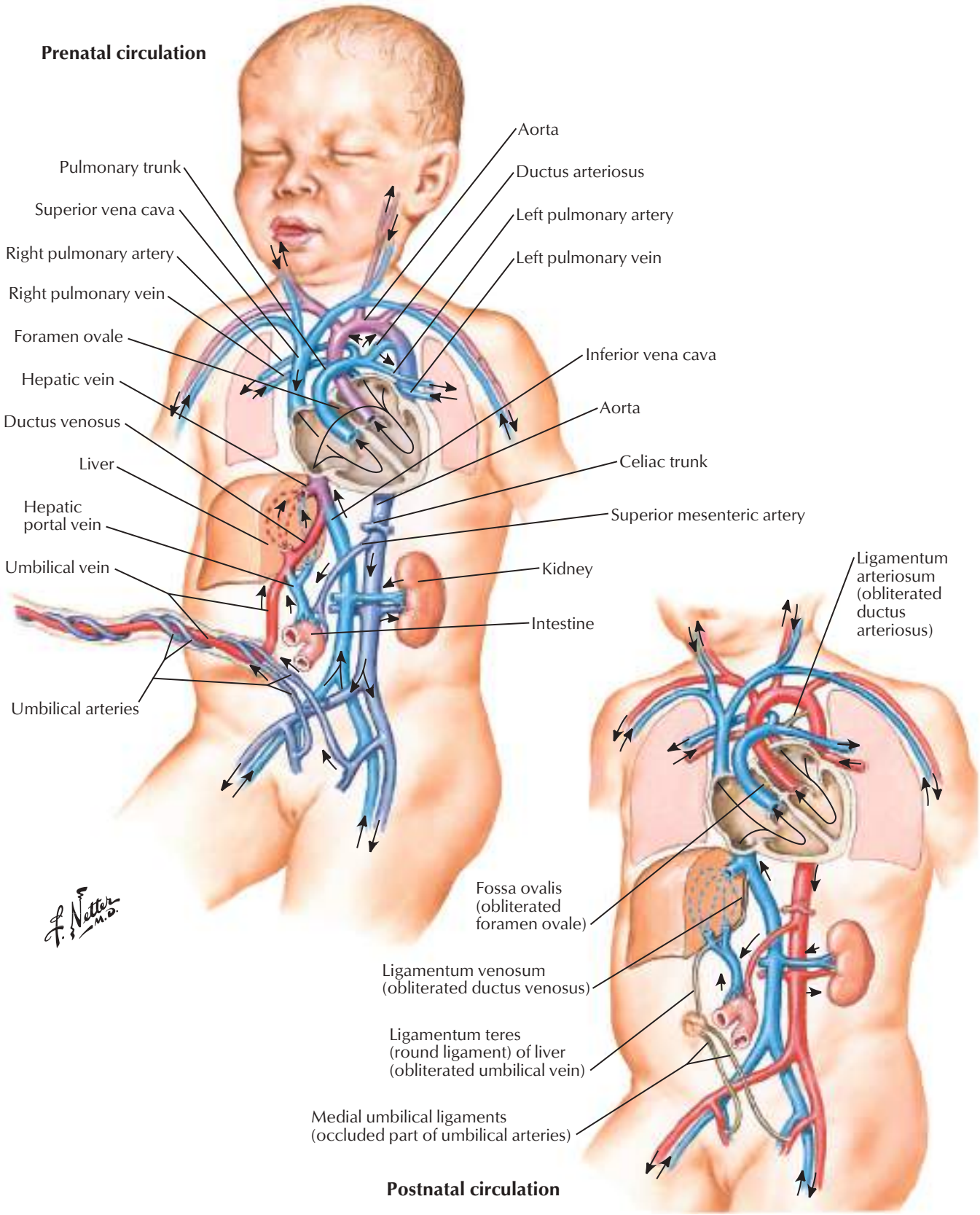
Left side

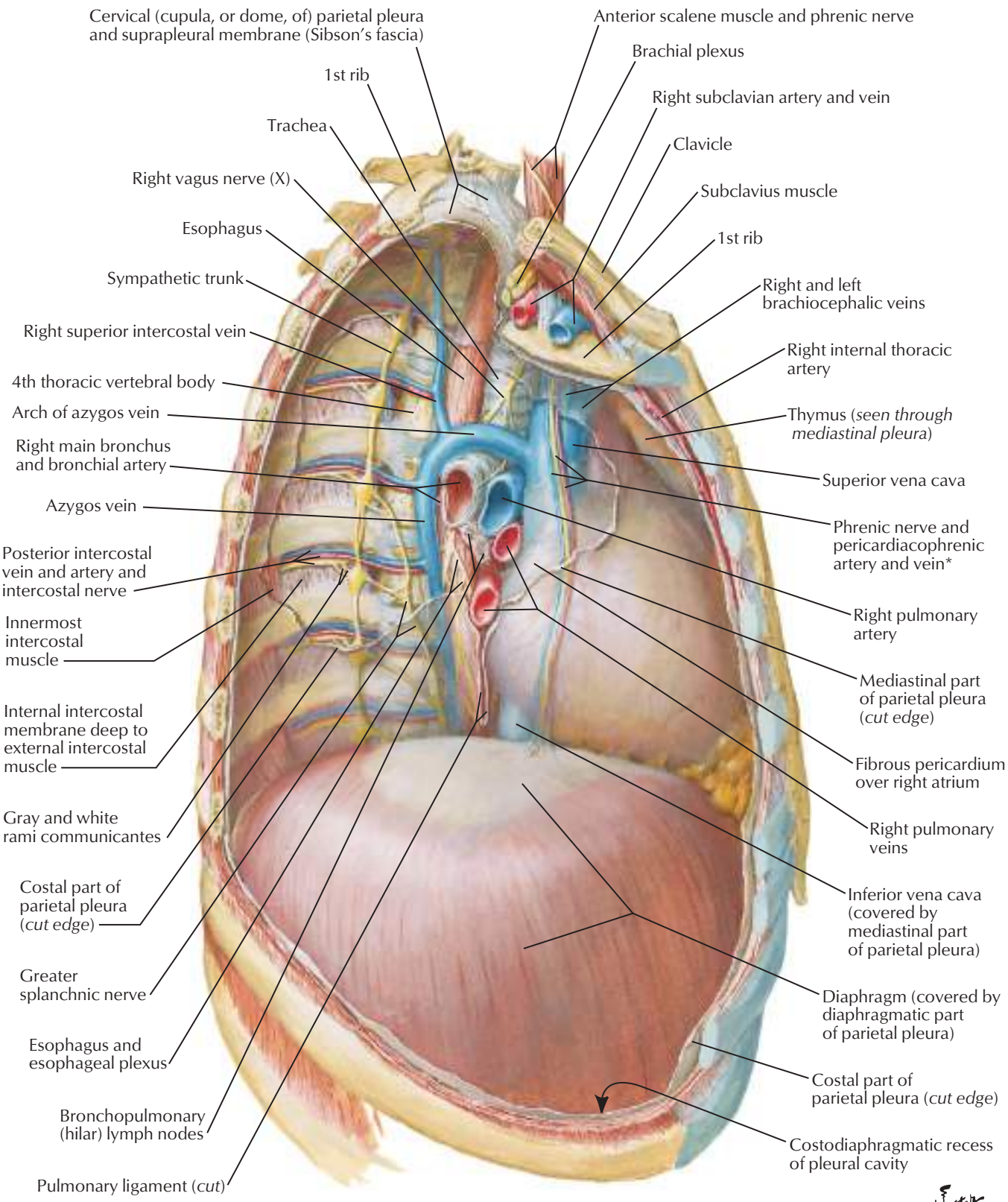

Superior cervical ganglion
Right vagus nerve (X)
(Conjoined sympathetic and vagal) superior cervical cardiac nerves
Middle cervical ganglion
Middle cervical (sympathetic) cardiac nerve
Phrenic nerve
Inferior cervical (vagal) cardiac branch
Vertebral ganglion
Inferior thyroid artery
Vertebral artery
Cervicothoracic (stellate) ganglion
Ansa subclavia
Right recurrent laryngeal nerve
Inferior cervical (sympathetic) cardiac nerves
Thoracic cardiac branch of vagus nerve
4th thoracic ganglion
Thoracic (sympathetic) cardiac branches
Cardiac plexus (deep)
Phrenic nerve (cut)
Superior cervical ganglion
Left vagus nerve (X)
Superior cervical (sympathetic) cardiac nerve
Superior cervical (vagal) cardiac branch
Middle cervical ganglion
Phrenic nerve
Middle cervical (sympathetic) cardiac nerve
Inferior cervical (vagal) cardiac branch
Vertebral ganglion
Cervicothoracic (stellate) ganglion
Inferior cervical sympathetic cardiac nerves
3rd thoracic ganglion
Thoracic (sympathetic) cardiac branches
Thoracic cardiac branch of vagus nerve
Left recurrent laryngeal nerve


Posterior (dorsal) nucleus of vagus nerve
Solitary tract nuclei
Superior cervical ganglion
Medulla oblongata
Superior cervical (sympathetic) cardiac nerve
Middle cervical ganglion
Vagus nerves
Middle cervical (sympathetic) cardiac nerve
Superior cervical (vagal) cardiac branches
Inferior cervical (vagal) cardiac branches
Vertebral ganglion (variation)
Ascending connections
Ansa subclavia
Cervicothoracic (stellate) ganglion
T1
1st intercostal nerve
T2
Inferior cervical cardiac nerve
T3
Thoracic cardiac branch of vagus nerve
T4
2nd thoracic ganglion
White ramus communicans
Gray ramus communicans
Thoracic (sympathetic) cardiac branches
4th thoracic sympathetic ganglion
Cardiac plexus
Preganglionic sympathetic fibers
Postganglionic sympathetic fibers
Preganglionic parasympathetic fibers
Postganglionic parasympathetic fibers
Visceral afferent accompanying sympathetic fibers
Visceral afferent accompanying parasympathetic fibers

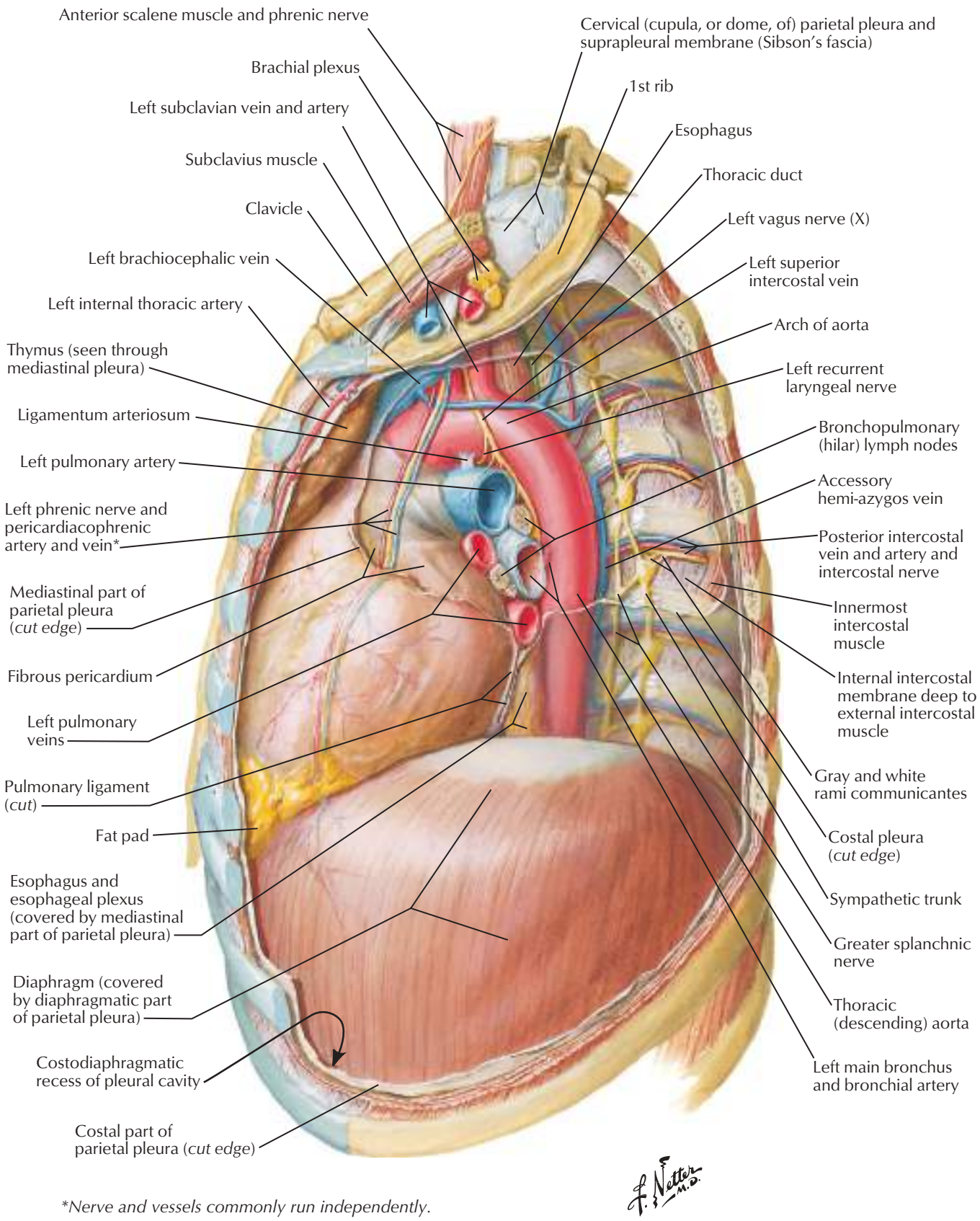
Innervation of Blood Vessels: Schema



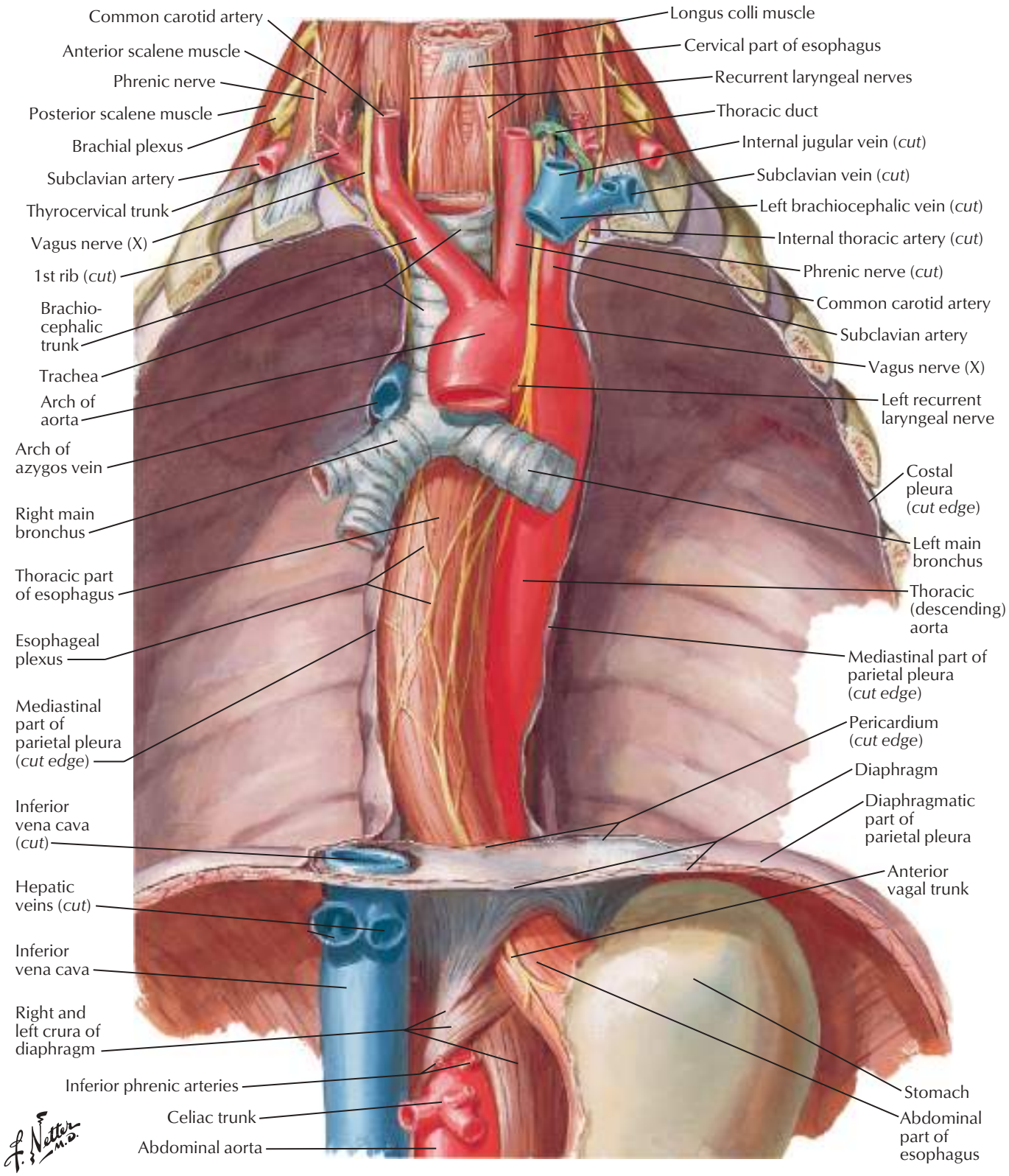

Prenatal circulation
Pulmonary trunk
Superior vena cava
Right pulmonary artery
Right pulmonary vein
Foramen ovale
Hepatic vein
Ductus venosus
Liver
Hepatic portal vein
Umbilical vein
Umbilical arteries
Aorta
Ductus arteriosus
Left pulmonary artery
Left pulmonary vein
Inferior vena cava
Aorta
Celiac trunk
Superior mesenteric artery
Kidney
Intestine
F. Netter M.D.
Ligamentum arteriosum (obliterated ductus arteriosus)
Fossa ovalis (obliterated foramen ovale)
Ligamentum venosum (obliterated ductus venosus)
Ligamentum teres (round ligament) of liver (obliterated umbilical vein)
Medial umbilical ligaments (occluded part of umbilical arteries)
Postnatal circulation

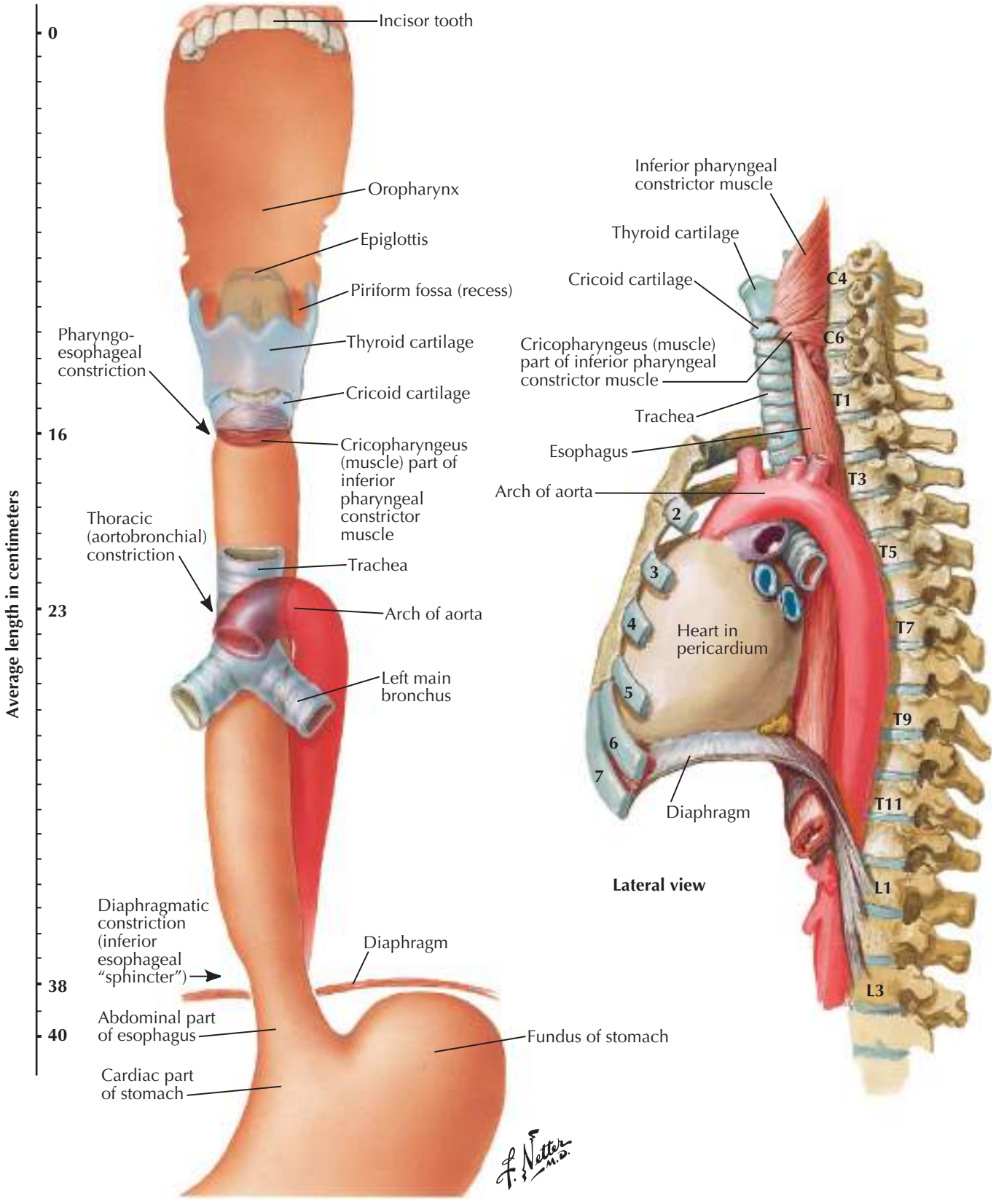


**Nerve and vessels commonly run independently.*



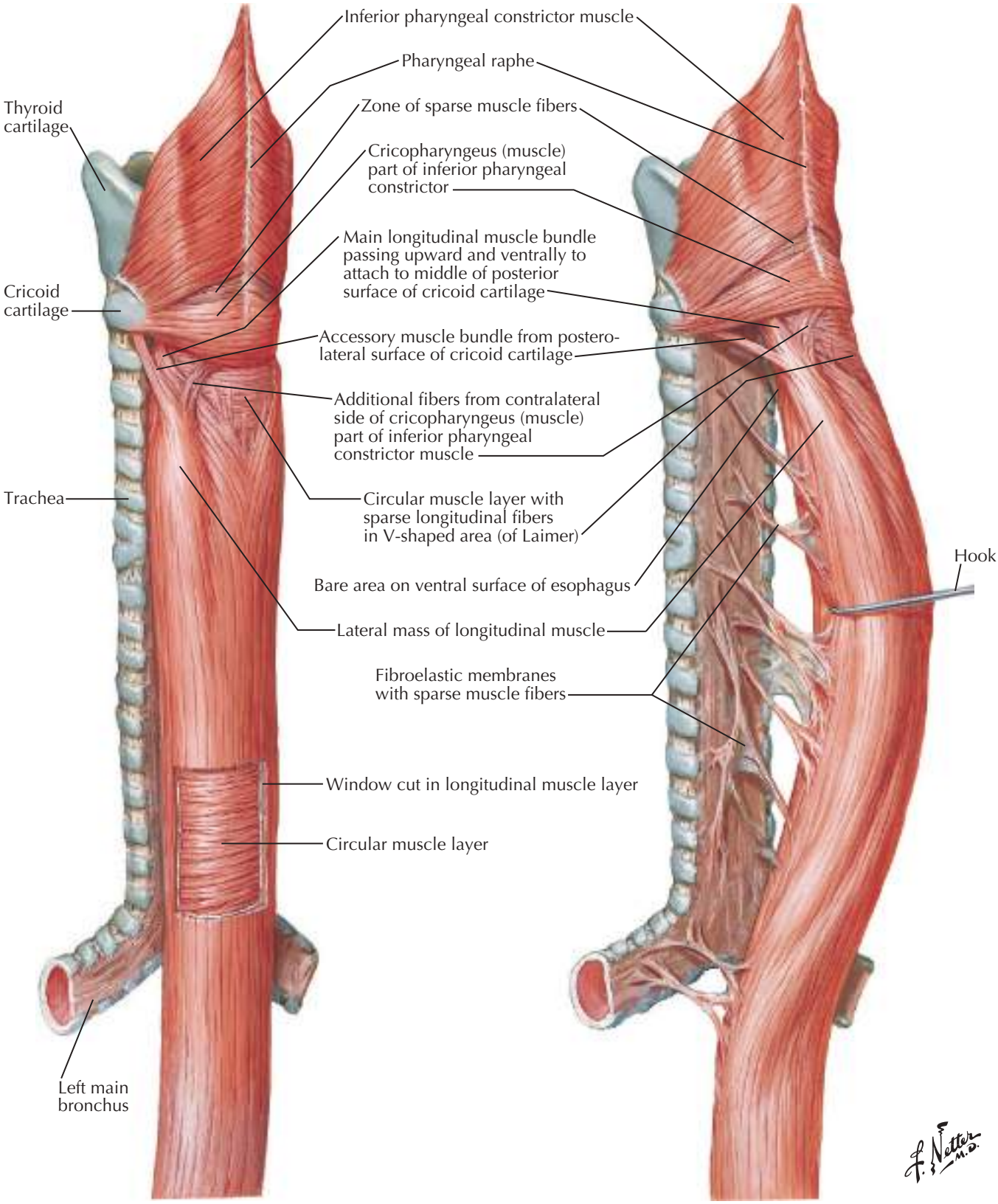
*Nerve and vessels commonly run independently.


Common carotid artery
Anterior scalene muscle
Phrenic nerve
Posterior scalene muscle
Brachial plexus
Subclavian artery
Thyrocervical trunk
Vagus nerve (X)
1st rib (*cut*)
Brachio-cephalic trunk
Trachea
Arch of aorta
Arch of azygos vein
Right main bronchus
Thoracic part of esophagus
Esophageal plexus
Mediastinal part of parietal pleura (*cut edge*)
Inferior vena cava (*cut*)
Hepatic veins (*cut*)
Inferior vena cava
Right and left crura of diaphragm
Inferior phrenic arteries
Celiac trunk
Abdominal aorta
Longus colli muscle
Cervical part of esophagus
Recurrent laryngeal nerves
Thoracic duct
Internal jugular vein (*cut*)
Subclavian vein (*cut*)
Left brachiocephalic vein (*cut*)
Internal thoracic artery (*cut*)
Phrenic nerve (*cut*)
Common carotid artery
Subclavian artery
Vagus nerve (X)
Left recurrent laryngeal nerve
Costal pleura (*cut edge*)
Left main bronchus
Thoracic (descending) aorta
Mediastinal part of parietal pleura (*cut edge*)
Pericardium (*cut edge*)
Diaphragm
Diaphragmatic part of parietal pleura
Anterior vagal trunk
Stomach
Abdominal part of esophagus

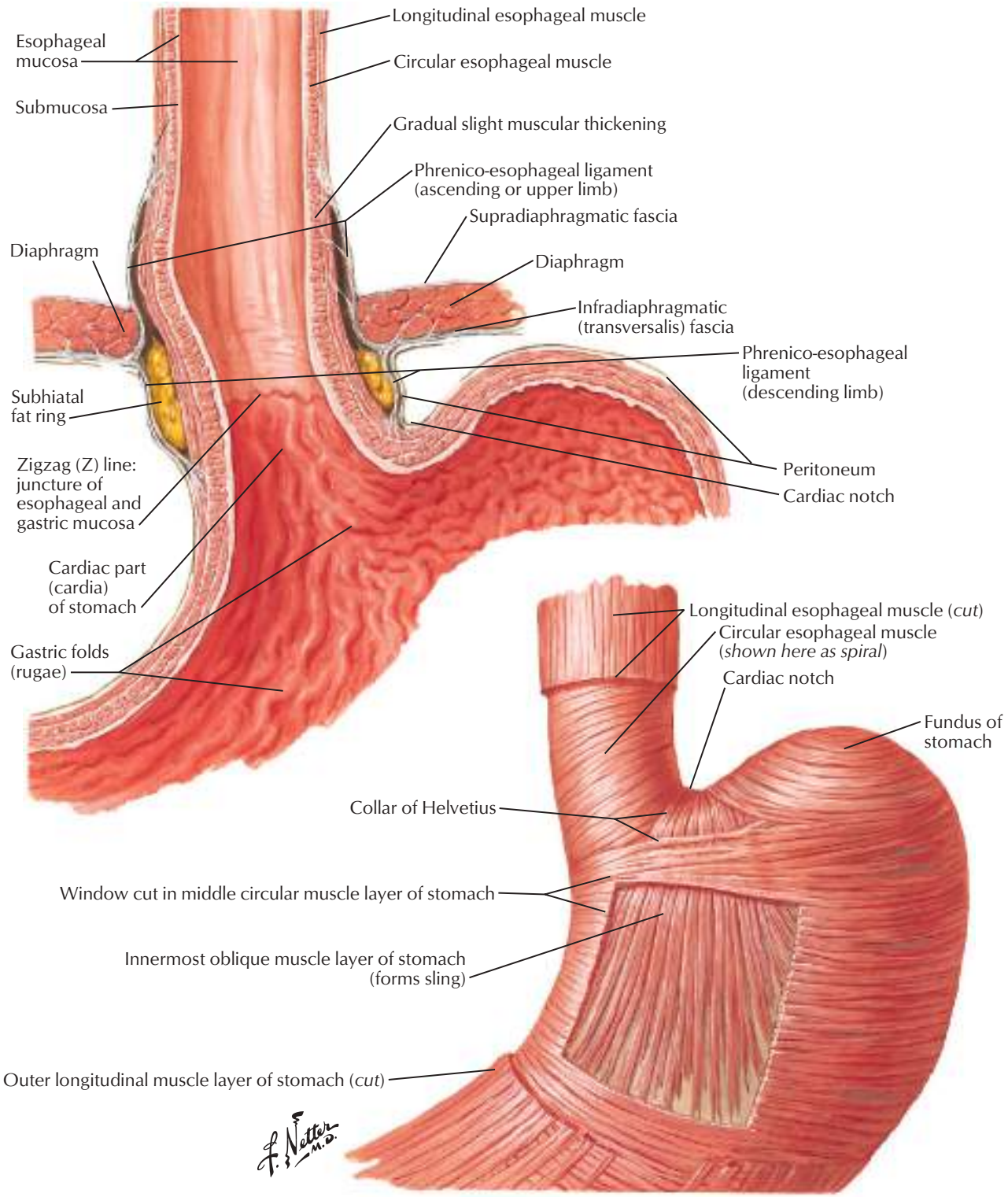

Average length in centimeters
0
16
23
38
40
Incisor tooth
Oropharynx
Epiglottis
Piriform fossa (recess)
Pharyngo-esophageal constriction
Thyroid cartilage
Cricoid cartilage
Cricopharyngeus (muscle) part of inferior pharyngeal constrictor muscle
Thoracic (aortobronchial) constriction
Trachea
Arch of aorta
Left main bronchus
Diaphragmatic constriction (inferior esophageal "sphincter")
Diaphragm
Abdominal part of esophagus
Fundus of stomach
Cardiac part of stomach
Inferior pharyngeal constrictor muscle
Thyroid cartilage
Cricoid cartilage
C4
C6
Cricopharyngeus (muscle) part of inferior pharyngeal constrictor muscle
T1
Trachea
Esophagus
T3
Arch of aorta
2
T5
3
4
Heart in pericardium
T7
5
T9
6
7
Diaphragm
T11
Lateral view
L1
L3

Musculature of Esophagus

See also Plates 67, 70

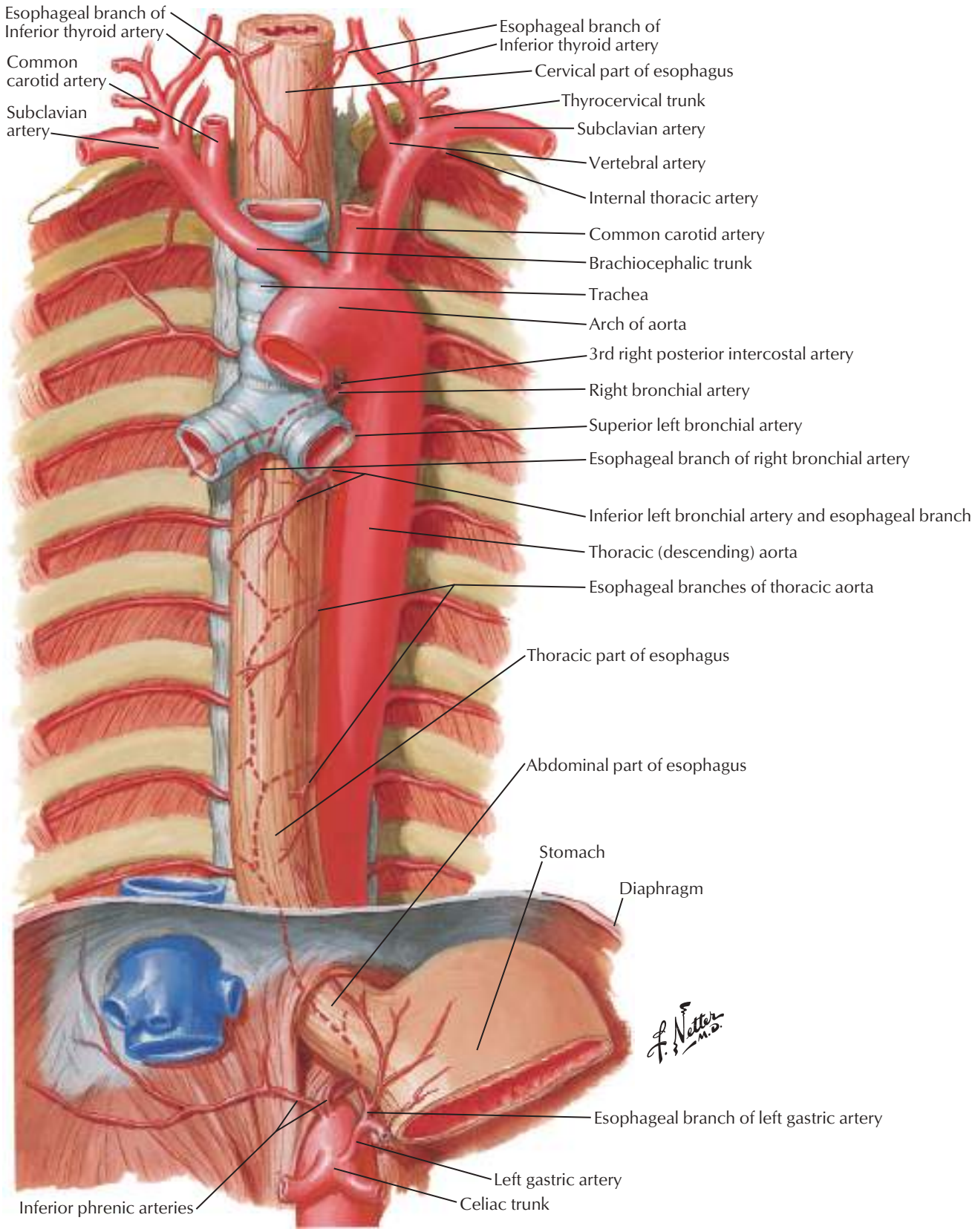


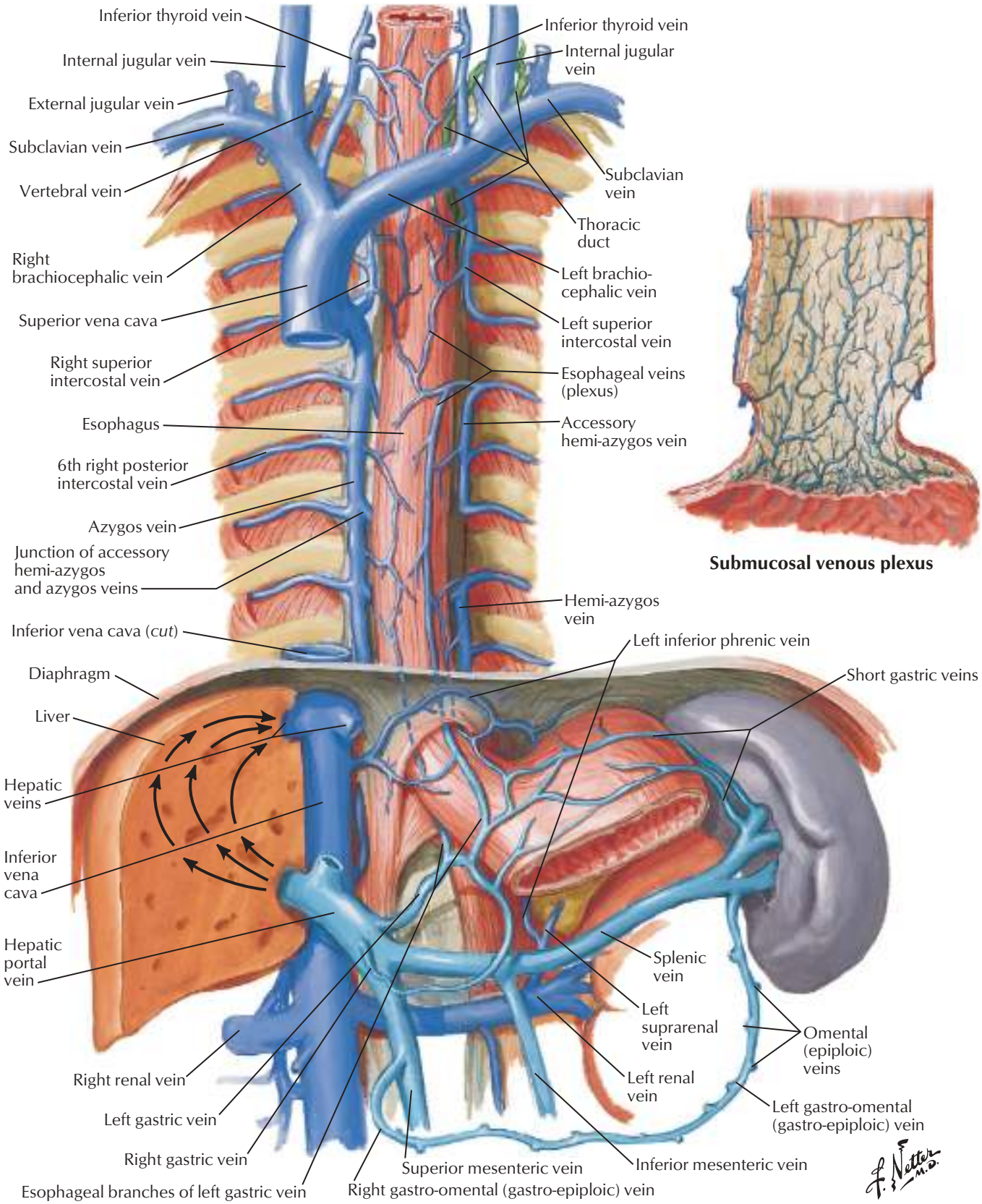
Posterolateral view


Esophageal mucosa
Submucosa
Diaphragm
Subhiatal fat ring
Zigzag (Z) line: juncture of esophageal and gastric mucosa
Cardiac part (cardia) of stomach
Gastric folds (rugae)
Longitudinal esophageal muscle
Circular esophageal muscle
Gradual slight muscular thickening
Phrenico-esophageal ligament (ascending or upper limb)
Supradiaphragmatic fascia
Diaphragm
Infradiaphragmatic (transversalis) fascia
Phrenico-esophageal ligament (descending limb)
Peritoneum
Cardiac notch
Longitudinal esophageal muscle (cut)
Circular esophageal muscle (shown here as spiral)
Cardiac notch
Fundus of stomach
Collar of Helvetius
Window cut in middle circular muscle layer of stomach
Innermost oblique muscle layer of stomach (forms sling)
Outer longitudinal muscle layer of stomach (cut)

Arteries of Esophagus

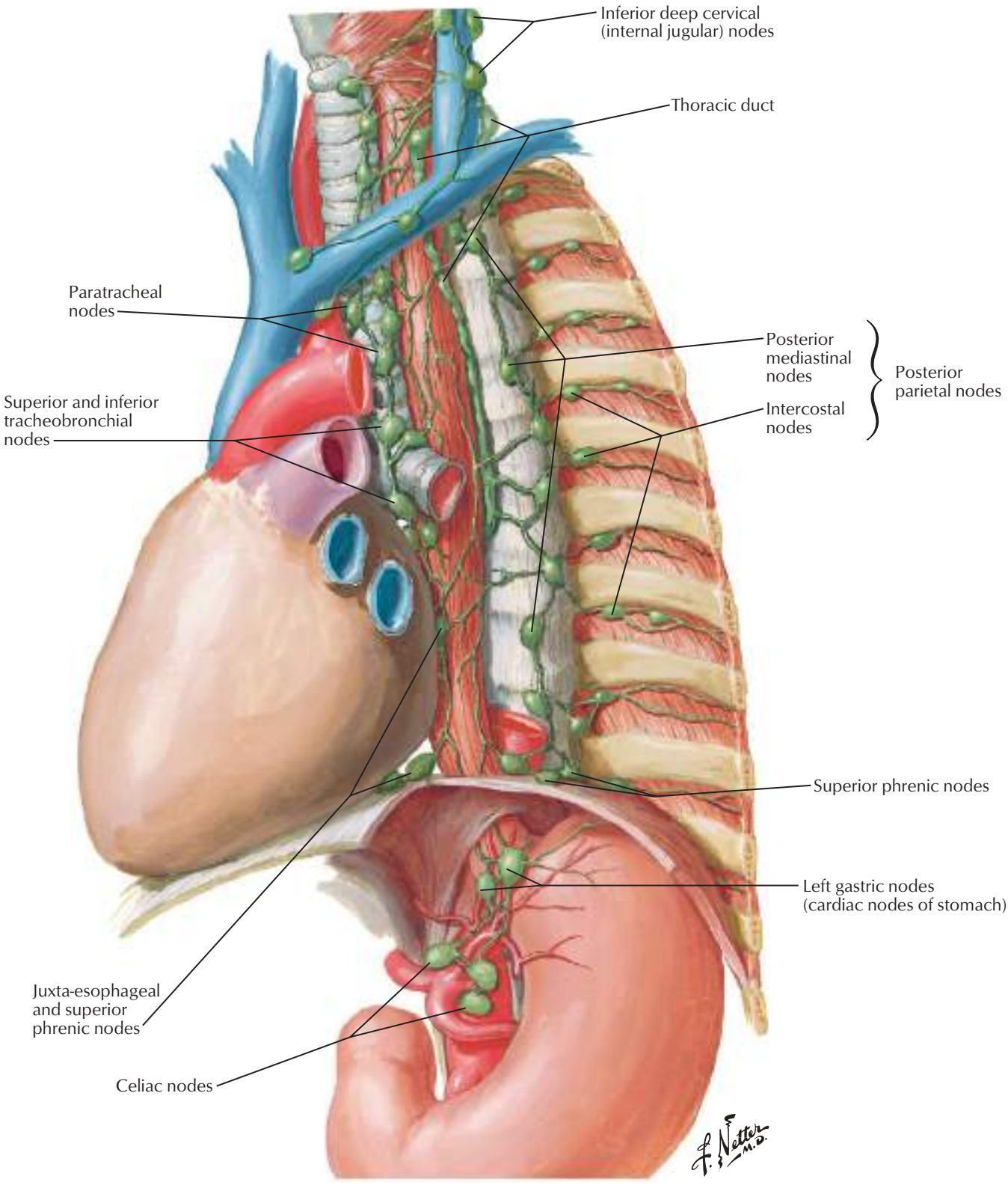
See also Plates 204, 284

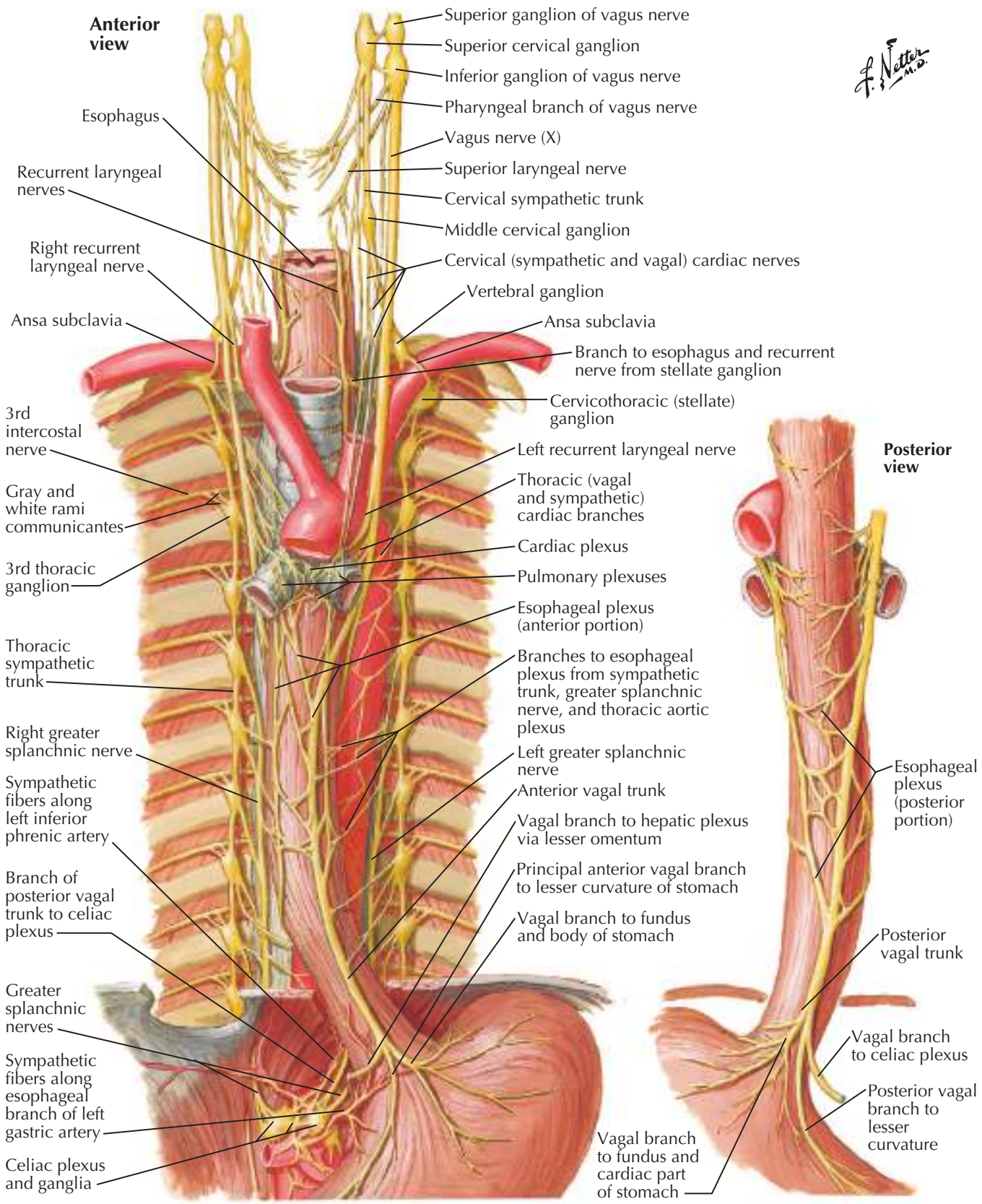



Inferior thyroid vein
Internal jugular vein
External jugular vein
Subclavian vein
Vertebral vein
Right brachiocephalic vein
Superior vena cava
Right superior intercostal vein
Esophagus
6th right posterior intercostal vein
Azygos vein
Junction of accessory hemi-azygos and azygos veins
Inferior vena cava (cut)
Diaphragm
Liver
Hepatic veins
Inferior vena cava
Hepatic portal vein
Right renal vein
Left gastric vein
Right gastric vein
Esophageal branches of left gastric vein
Inferior thyroid vein
Internal jugular vein
Subclavian vein
Thoracic duct
Left brachio-cephalic vein
Left superior intercostal vein
Esophageal veins (plexus)
Accessory hemi-azygos vein
Hemi-azygos vein
Left inferior phrenic vein
Short gastric veins
Splenic vein
Left suprarenal vein
Left renal vein
Omental (epiploic) veins
Left gastro-omental (gastro-epiploic) vein
Inferior mesenteric vein
Superior mesenteric vein
Right gastro-omental (gastro-epiploic) vein
Submucosal venous plexus

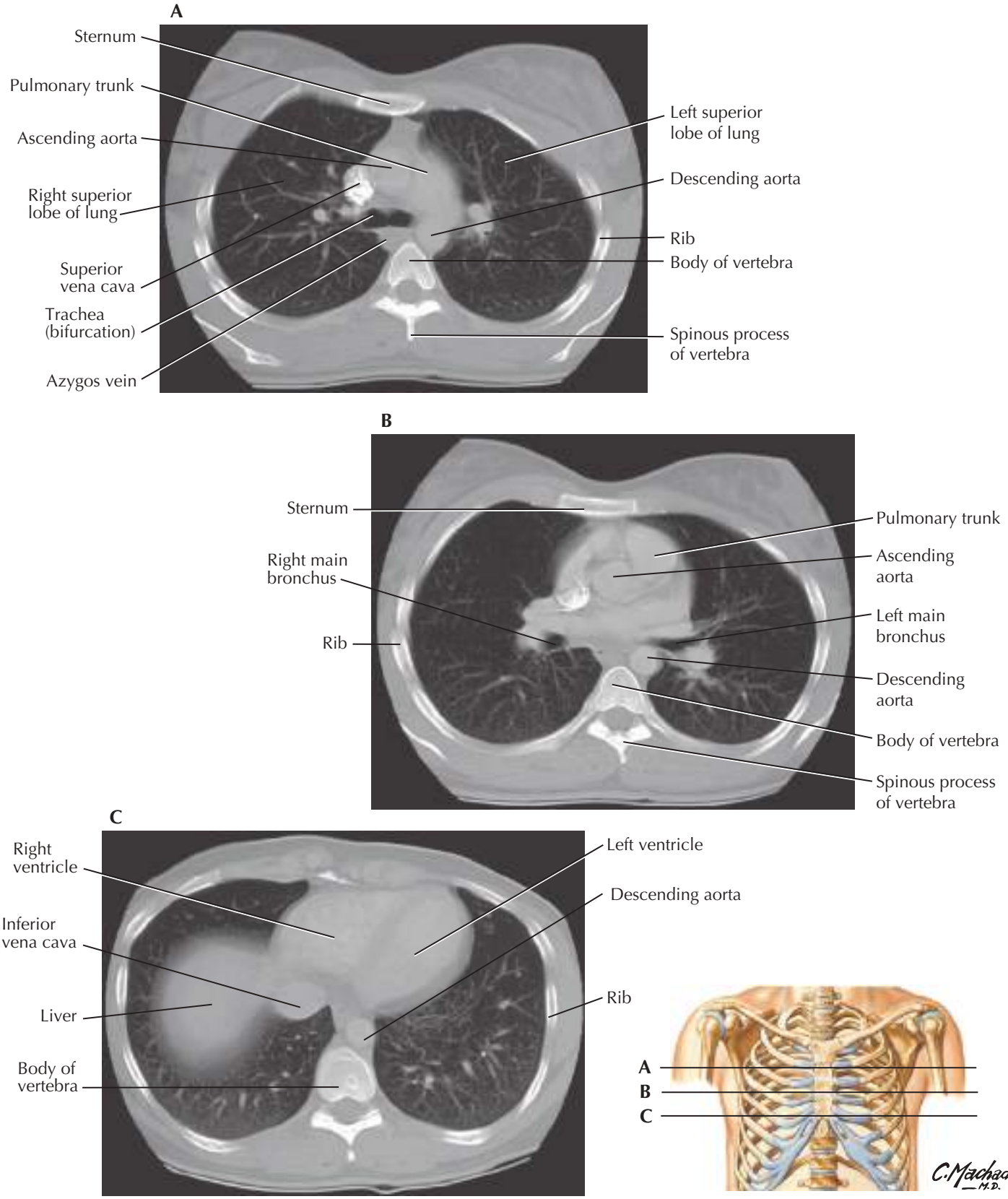
Lymph Vessels and Nodes of Esophagus

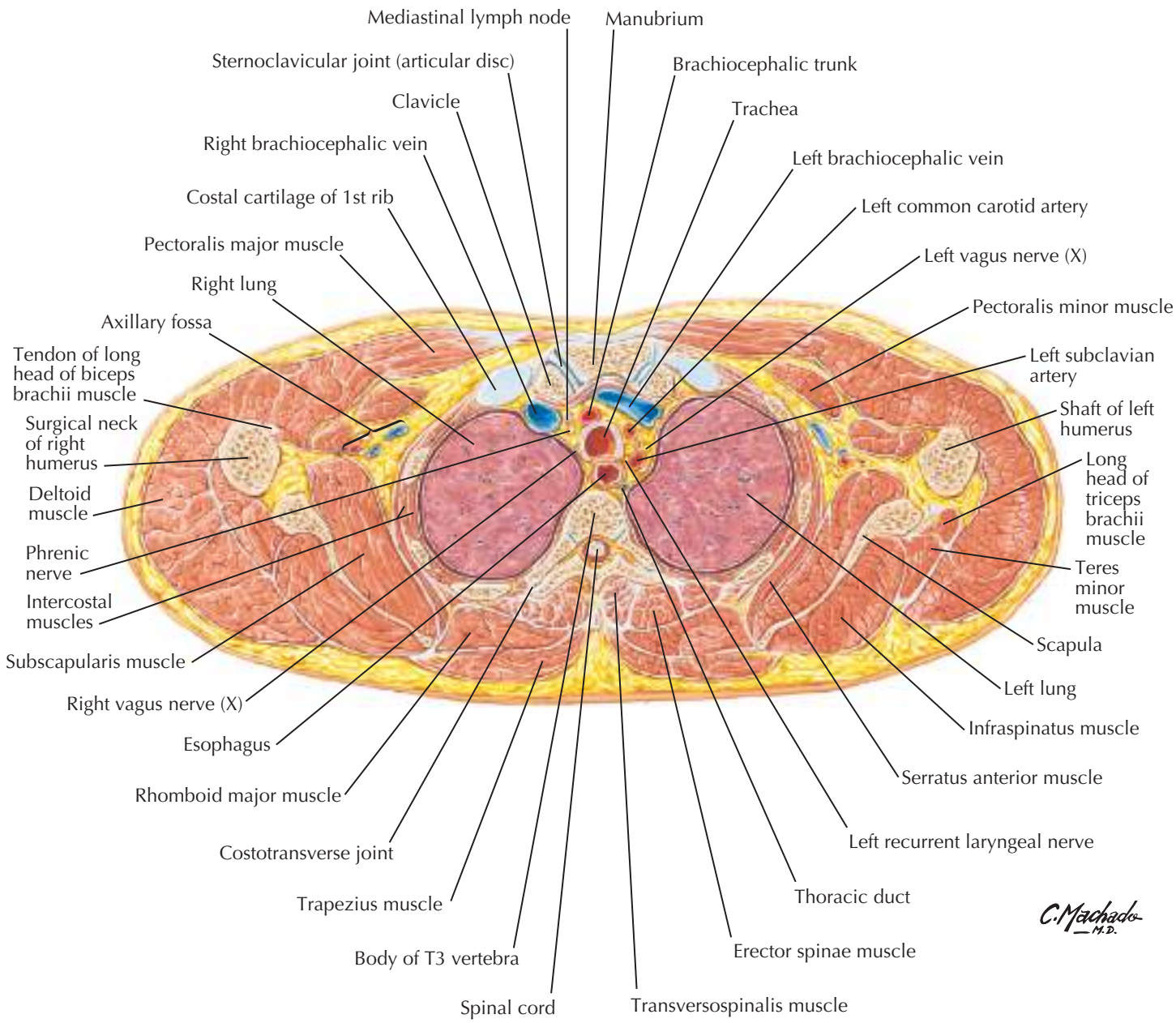
See also Plates 205, 293



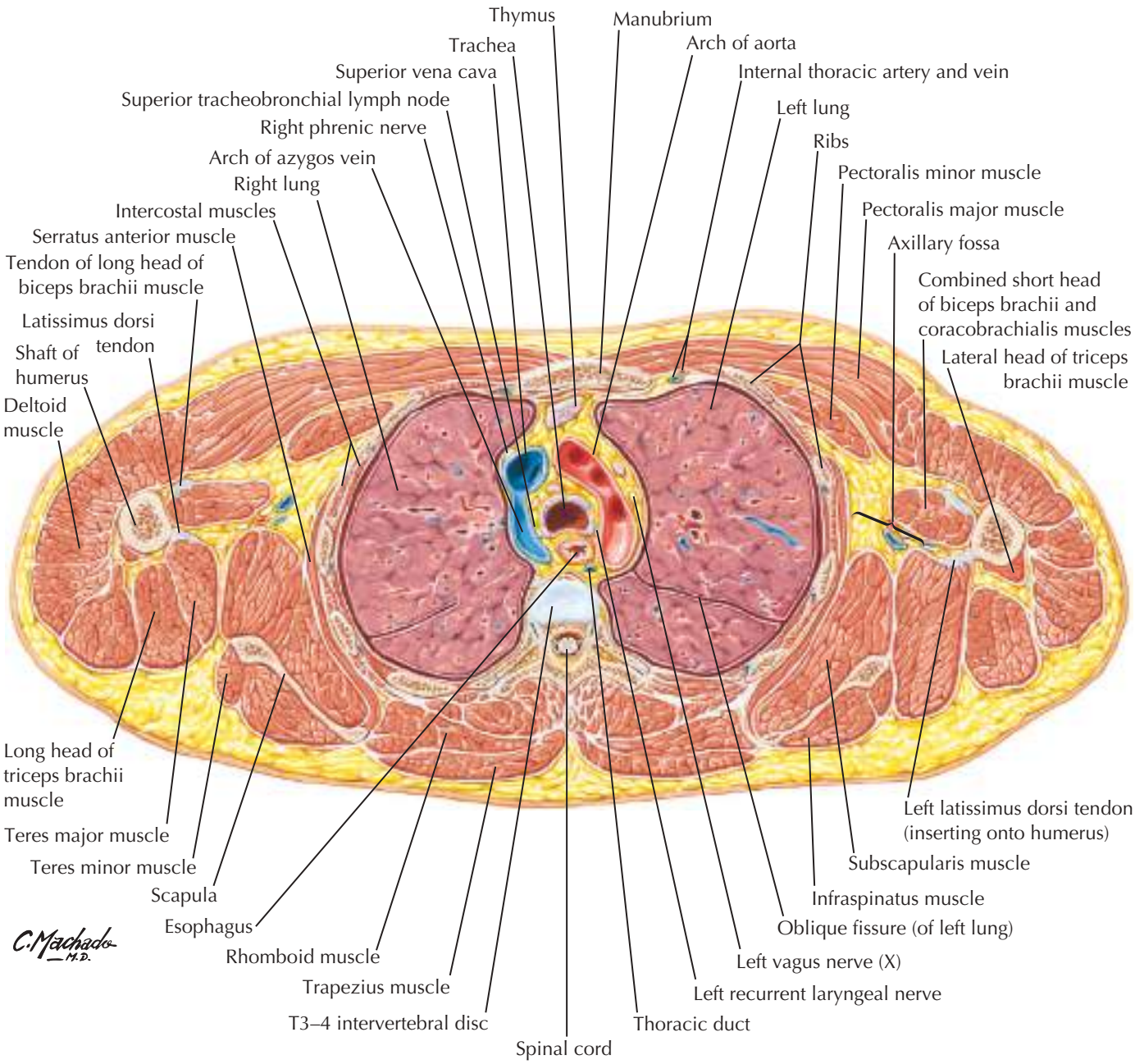

Anterior view
Superior ganglion of vagus nerve
Superior cervical ganglion
Inferior ganglion of vagus nerve
Pharyngeal branch of vagus nerve
Esophagus
Vagus nerve (X)
Recurrent laryngeal nerves
Superior laryngeal nerve
Cervical sympathetic trunk
Middle cervical ganglion
Right recurrent laryngeal nerve
Cervical (sympathetic and vagal) cardiac nerves
Vertebral ganglion
Ansa subclavia
Ansa subclavia
Branch to esophagus and recurrent nerve from stellate ganglion
Cervicothoracic (stellate) ganglion
3rd intercostal nerve
Left recurrent laryngeal nerve
Gray and white rami communicantes
Thoracic (vagal and sympathetic) cardiac branches
3rd thoracic ganglion
Cardiac plexus
Pulmonary plexuses
Esophageal plexus (anterior portion)
Thoracic sympathetic trunk
Branches to esophageal plexus from sympathetic trunk, greater splanchnic nerve, and thoracic aortic plexus
Right greater splanchnic nerve
Left greater splanchnic nerve
Sympathetic fibers along left inferior phrenic artery
Anterior vagal trunk
Vagal branch to hepatic plexus via lesser omentum
Branch of posterior vagal trunk to celiac plexus
Principal anterior vagal branch to lesser curvature of stomach
Vagal branch to fundus and body of stomach
Greater splanchnic nerves
Sympathetic fibers along esophageal branch of left gastric artery
Celiac plexus and ganglia
Vagal branch to fundus and cardiac part of stomach
Posterior view
Esophageal plexus (posterior portion)
Posterior vagal trunk
Vagal branch to celiac plexus
Posterior vagal branch to lesser curvature

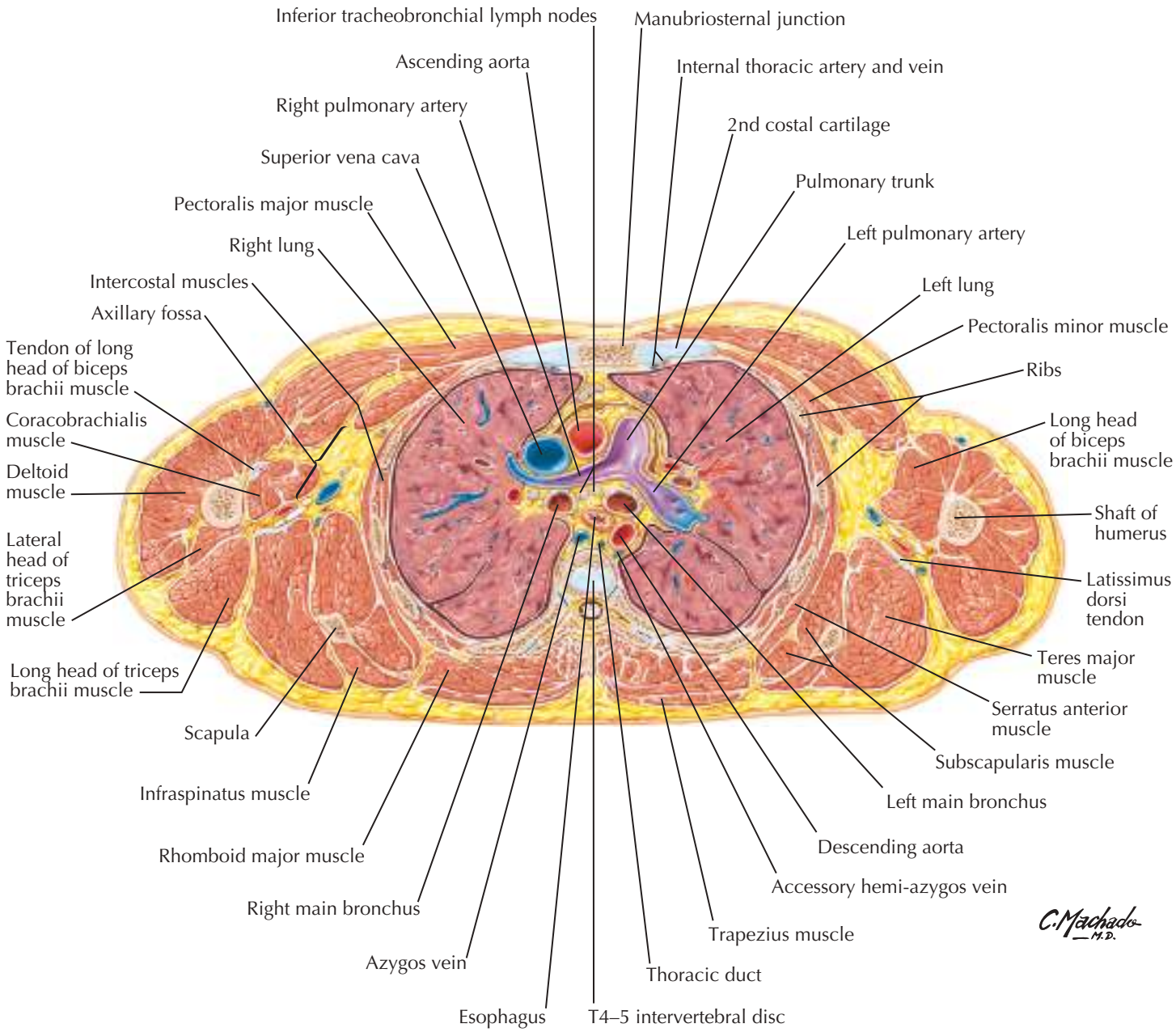
Series of chest axial CT images from superior (A) to inferior (C)



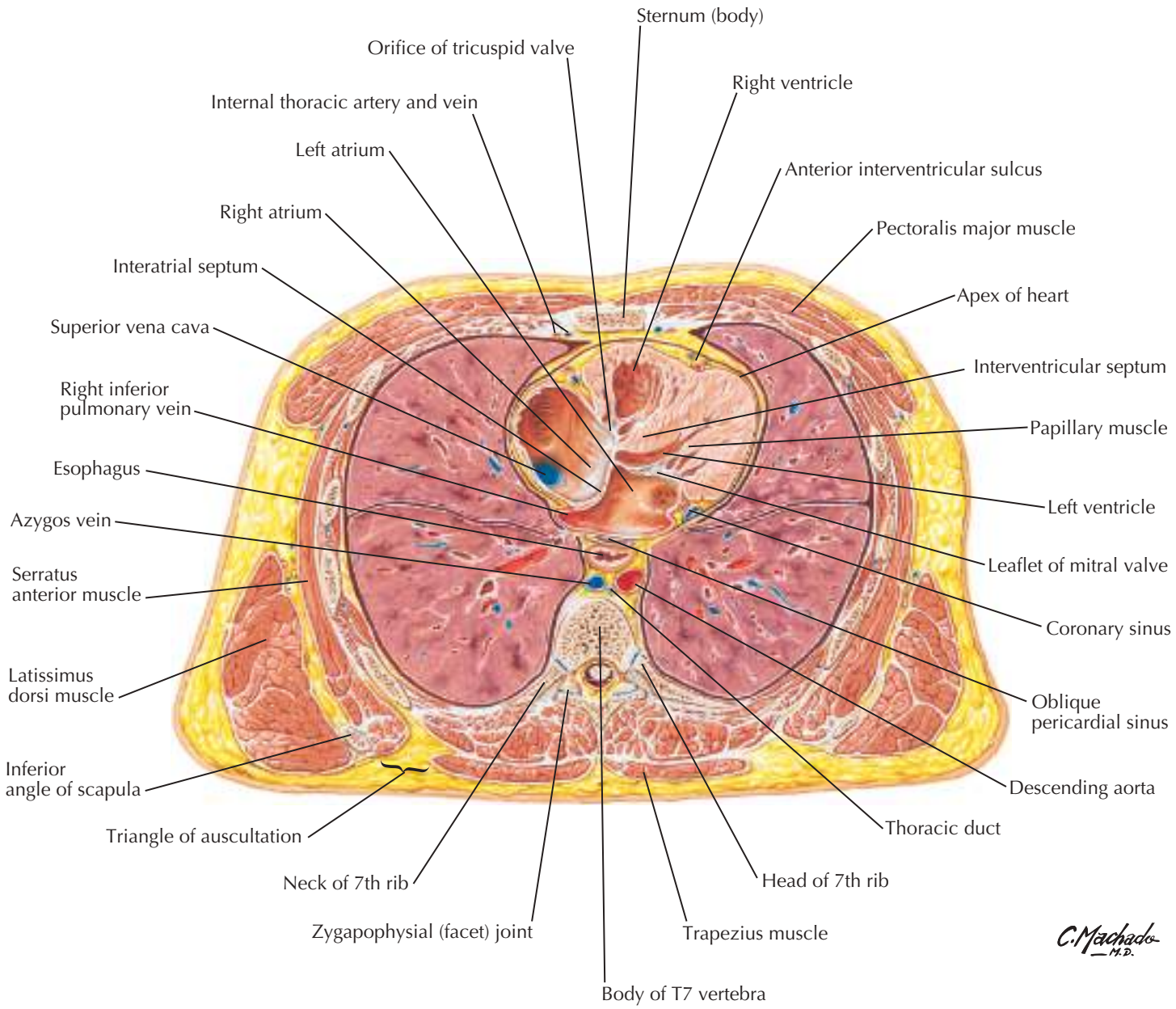

Mediastinal lymph node
Manubrium
Sternoclavicular joint (articular disc)
Brachiocephalic trunk
Clavicle
Trachea
Right brachiocephalic vein
Left brachiocephalic vein
Costal cartilage of 1st rib
Left common carotid artery
Pectoralis major muscle
Left vagus nerve (X)
Right lung
Pectoralis minor muscle
Axillary fossa
Tendon of long head of biceps brachii muscle
Left subclavian artery
Surgical neck of right humerus
Shaft of left humerus
Deltoid muscle
Long head of triceps brachii muscle
Phrenic nerve
Teres minor muscle
Intercostal muscles
Scapula
Subscapularis muscle
Left lung
Right vagus nerve (X)
Infraspinatus muscle
Esophagus
Serratus anterior muscle
Rhomboid major muscle
Left recurrent laryngeal nerve
Costotransverse joint
Thoracic duct
Trapezius muscle
Erector spinae muscle
Body of T3 vertebra
Spinal cord
Transversospinalis muscle
C. Machado M.D.

Cross Section of Thorax at T3-4 Disc Level




Inferior tracheobronchial lymph nodes
Manubriosternal junction
Ascending aorta
Internal thoracic artery and vein
Right pulmonary artery
2nd costal cartilage
Superior vena cava
Pulmonary trunk
Pectoralis major muscle
Left pulmonary artery
Right lung
Left lung
Intercostal muscles
Pectoralis minor muscle
Axillary fossa
Ribs
Tendon of long head of biceps brachii muscle
Long head of biceps brachii muscle
Coracobrachialis muscle
Deltoid muscle
Shaft of humerus
Lateral head of triceps brachii muscle
Latissimus dorsi tendon
Teres major muscle
Long head of triceps brachii muscle
Serratus anterior muscle
Scapula
Subscapularis muscle
Infraspinatus muscle
Left main bronchus
Descending aorta
Rhomboid major muscle
Accessory hemi-azygos vein
Right main bronchus
Trapezius muscle
Azygos vein
Thoracic duct
Esophagus
T4–5 intervertebral disc
C. Machado M.D.

Cross Section of Thorax at T7 Level



MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Diaphragm	Xiphoid process, lower six costal cartilages, L1–L3 vertebrae	Converge into central tendon	Phrenic nerve	Draws central tendon down and forward during inspiration	Pericardiacophrenic, musculophrenic, superior and inferior phrenic arteries	Posterior abdominal wall
External intercostal	Lower border of ribs	Upper border of rib below rib of origin	Intercostal nerves	Supports intercostal spaces in inspiration and expiration, elevates ribs in inspiration	Posterior intercostal arteries, collateral branches of posterior intercostal arteries, costocervical trunk, anterior intercostal branches of internal thoracic artery, musculophrenic artery	Thoracic wall
Innermost intercostal	Lower border of ribs	Upper border of rib below rib of origin	Intercostal nerves	Elevates ribs	Muscular branches of anterior intercostal arteries, muscular branches of posterior intercostal arteries, intercostal branches of internal thoracic and musculophrenic arteries, costocervical trunk branches	Thoracic wall
Internal intercostal	Lower border of ribs	Costal cartilage and edge of costal groove of rib above rib of origin	Intercostal nerves	Prevents pushing out or drawing in of intercostal spaces in inspiration and expiration, lowers ribs in forced expiration	Muscular branches of anterior intercostal arteries, muscular branches of posterior intercostal arteries, intercostal branches of internal thoracic and musculophrenic arteries, costocervical trunk branches	Thoracic wall
Levator costarum	Transverse processes of C7 and T1–T11	Subjacent ribs between tubercle and angle	Dorsal ramus of lower thoracic nerves	Elevates ribs	Posterior intercostal arteries	Thoracic wall
Pectoralis major	Sternal half of clavicle, sternum to 7th rib, cartilages of true ribs, aponeurosis of external oblique muscle	Lateral lip of intertubercular sulcus of humerus	Medial and lateral pectoral nerves	Flexes and adducts arm, rotates arm medially	Pectoral branch of thoraco-acromial artery, perforating branches of internal thoracic artery	Pectoral/axilla region
Pectoralis minor	Outer surface of upper margin of ribs 3–5	Coracoid process of scapula	Medial pectoral nerve	Lowers lateral angle of scapula and protracts scapula	Pectoral branch of thoraco-acromial and intercostal lateral thoracic arteries	Pectoral/axilla region
Serratus anterior	Lateral surfaces of upper 8–9 ribs	Costal surface of medial border of scapula	Long thoracic nerve	Protracts scapula and holds it against thoracic wall	Lateral thoracic artery	Pectoral/axilla region
Serratus posterior inferior	Spinous processes of T11–L2	Inferior aspect of ribs 9–12	Ventral rami of lower thoracic nerves	Depresses ribs	Posterior intercostal arteries	Superficial back
Serratus posterior superior	Ligamentum nuchae, spinous processes of C7–T3	Superior aspect of ribs 2–4	Ventral rami of upper thoracic nerves	Elevates ribs	Posterior intercostal arteries	Superficial back
Subcostal	Internal surface of lower ribs near their angles	Superior borders of 2nd or 3rd rib below	Intercostal nerves	Depresses ribs	Posterior intercostal artery, musculophrenic artery	Thoracic wall
Transversus thoracis	Internal surface of costal cartilages 2–6	Posterior surface of lower sternum	Intercostal nerves	Depresses ribs and costal cartilages	Anterior intercostal arteries, internal thoracic artery	Thoracic wall

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

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4 ABDOMEN

Section

Topographic Anatomy

Plate 242

242 Abdomen: Surface Anatomy

Body Wall

Plates 243–262

243 Bony Framework of Abdomen
244 Regions and Planes of Abdomen
245 Anterior Abdominal Wall: Superficial Dissection
246 Anterior Abdominal Wall: Intermediate Dissection
247 Anterior Abdominal Wall: Deep Dissection
248 Rectus Sheath: Cross Section
249 Anterior Abdominal Wall: Internal View
250 Posterolateral Abdominal Wall
251 Arteries of Anterior Abdominal Wall
252 Veins of Anterior Abdominal Wall
253 Nerves of Anterior Abdominal Wall
254 Thoracoabdominal Nerves
255 Inguinal Region: Dissections
256 Inguinal Canal and Spermatic Cord
257 Femoral Sheath and Inguinal Canal
258 Posterior Abdominal Wall: Internal View
259 Arteries of Posterior Abdominal Wall
260 Veins of Posterior Abdominal Wall
261 Lymph Vessels and Nodes of Posterior Abdominal Wall
262 Nerves of Posterior Abdominal Wall

Peritoneal Cavity

Plates 263–268

263 Greater Omentum and Abdominal Viscera

264 Mesenteric Relations of Intestines

265 Mesenteric Relations of Intestines (continued)

266 Omental Bursa: Stomach Reflected

267 Omental Bursa: Cross Section

268 Peritoneum of Posterior Abdominal Wall

Viscera (Gut)

Plates 269–276

269 Stomach in Situ

270 Mucosa of Stomach

271 Duodenum in Situ

272 Mucosa and Musculature of Duodenum

273 Ileocecal Region

274 Ileocecal Region (continued)

275 (Vermiform) Appendix

276 Mucosa and Musculature of Large Intestine

Viscera (Accessory Organs)

Plates 277–282

277 Surfaces and Bed of Liver

278 Liver in Situ: Vascular and Duct Systems

279 Liver Structure: Schema

280 Gallbladder, Extrahepatic Bile Ducts, and Pancreatic Duct

281 Pancreas in Situ

282 Spleen

Visceral Vasculature

Plates 283–296

283 Arteries of Stomach, Liver, and Spleen

284 Arteries of Liver, Pancreas, Duodenum, and Spleen

285 Celiac Arteriogram and CT Angiogram

286 Arteries of Duodenum and Head of Pancreas

287 Arteries of Small Intestine

288 Arteries of Large Intestine

289 Veins of Stomach, Duodenum, Pancreas, and Spleen

290 Veins of Small Intestine

291 Veins of Large Intestine

292 Hepatic Portal Vein Tributaries: Portacaval Anastomoses

293 Lymph Vessels and Nodes of Stomach

294 Lymph Vessels and Nodes of Pancreas

295 Lymph Vessels and Nodes of Small Intestine

296 Lymph Vessels and Nodes of Large Intestine

Innervation

Pates 297–307

297 Autonomic Nerves and Ganglia of Abdomen

298 Autonomic Innervation of Stomach and Duodenum

299 Autonomic Innervation of Stomach and Duodenum (continued)

300 Autonomic Innervation of Stomach and Duodenum: Schema

301 Autonomic Innervation of Small Intestine

302 Autonomic Innervation of Large Intestine

303 Autonomic Innervation of Small and Large Intestines: Schema

304 Autonomic Reflex Pathways: Schema

305 Intrinsic Autonomic Plexuses of Intestine: Schema

306 Autonomic Innervation of Liver and Biliary Tract: Schema

307 Autonomic Innervation of Pancreas: Schema

Kidneys and Suprarenal Glands

Plates 308–320

308 Kidneys in Situ: Anterior Views

309 Kidneys in Situ: Posterior Views

310 Renal Artery and Vein in Situ

311 Gross Structure of Kidney

312 Intrarenal Arteries and Renal Segments

313 Ureters in Abdomen and Pelvis

314 Arteries of Ureters and Urinary Bladder

315 Renal Fasciae

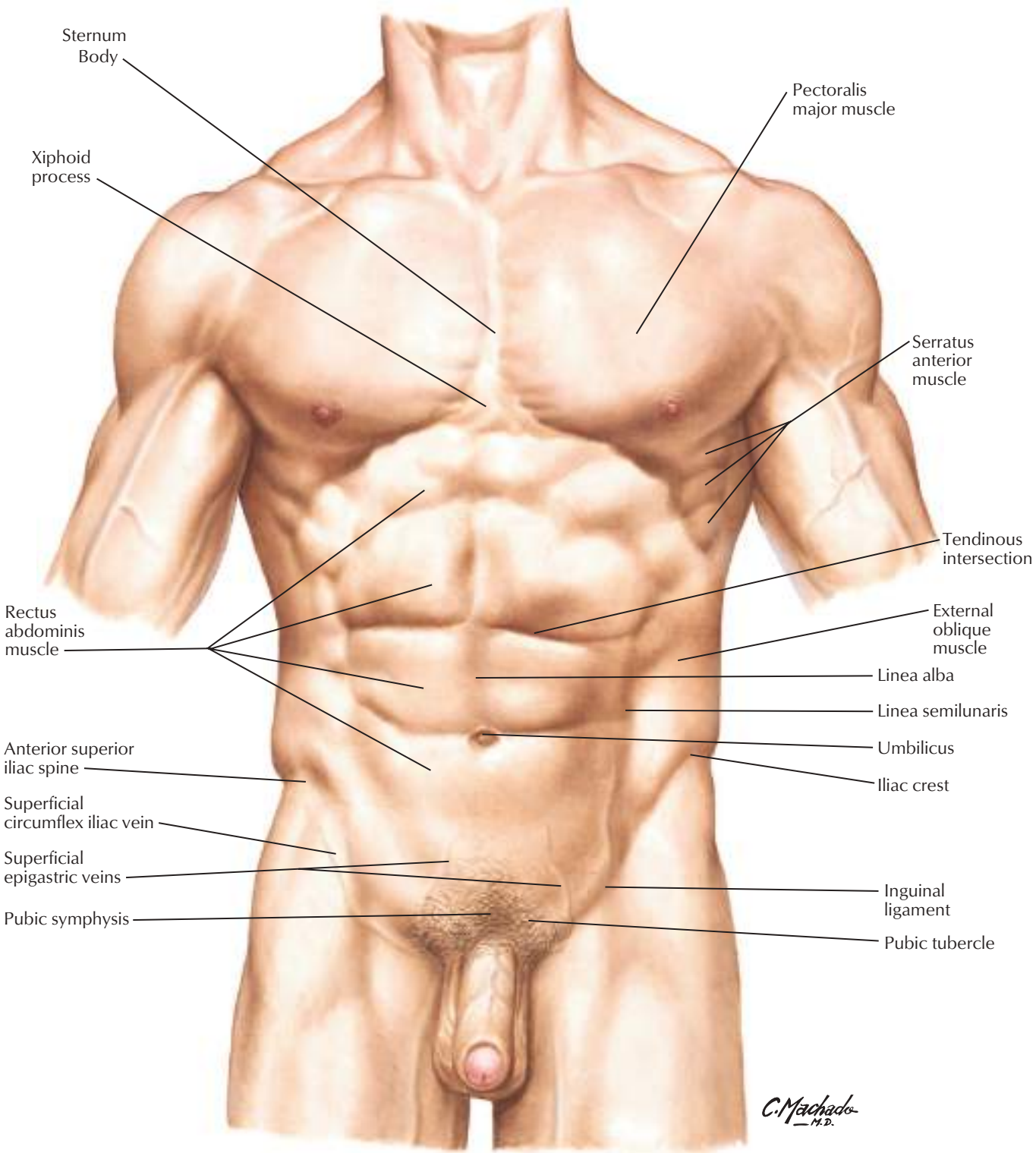
316 Lymph Vessels and Nodes of Kidneys and Urinary Bladder
317 Autonomic Nerves of Kidneys, Ureters, and Urinary Bladder
318 Autonomic Innervation of Kidneys and Upper Ureters: Schema
319 Autonomic Nerves of Suprarenal Glands: Dissection and Schema
320 Arteries and Veins of Suprarenal Glands in Situ

Sectional Anatomy

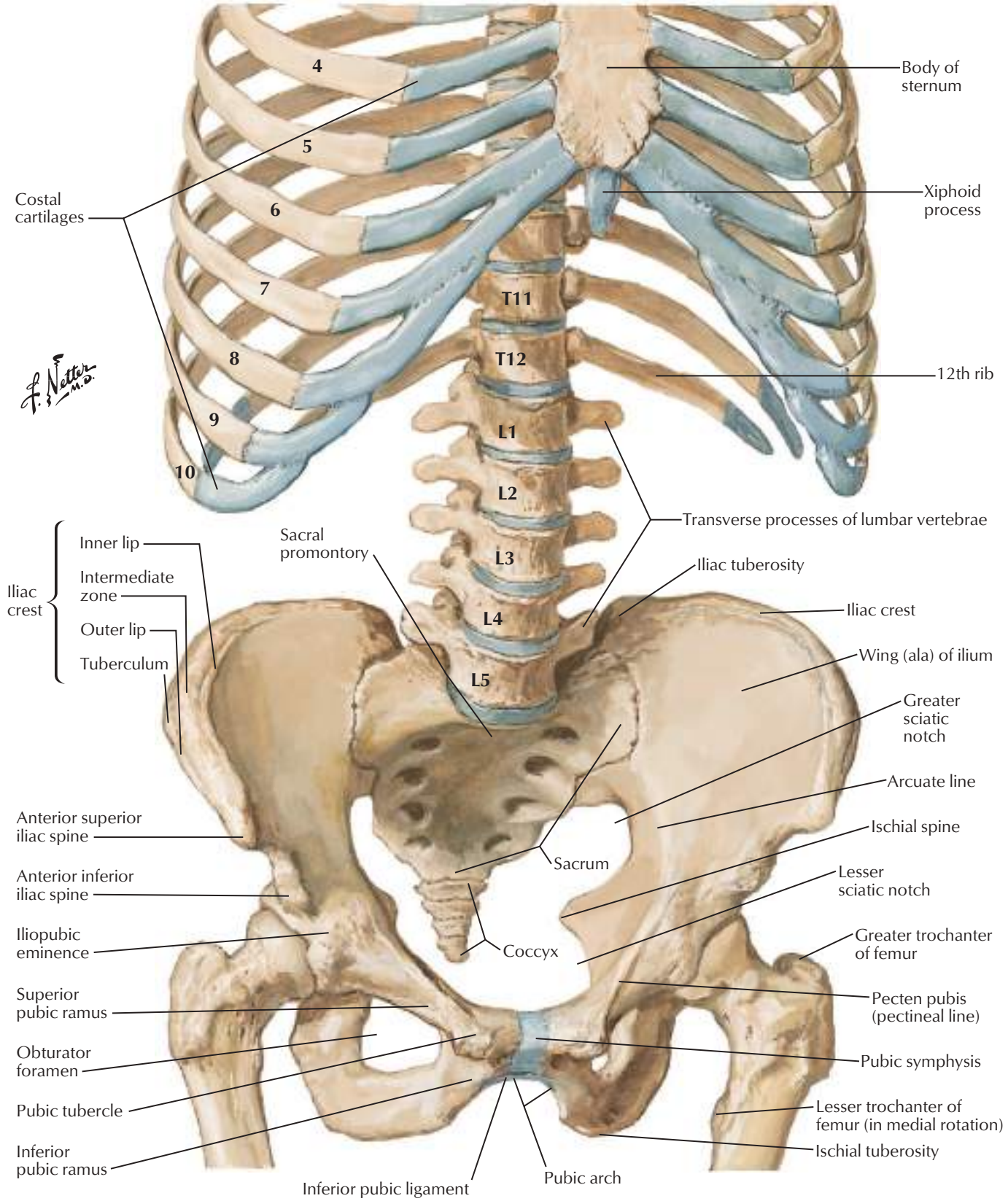
Plates 321–328

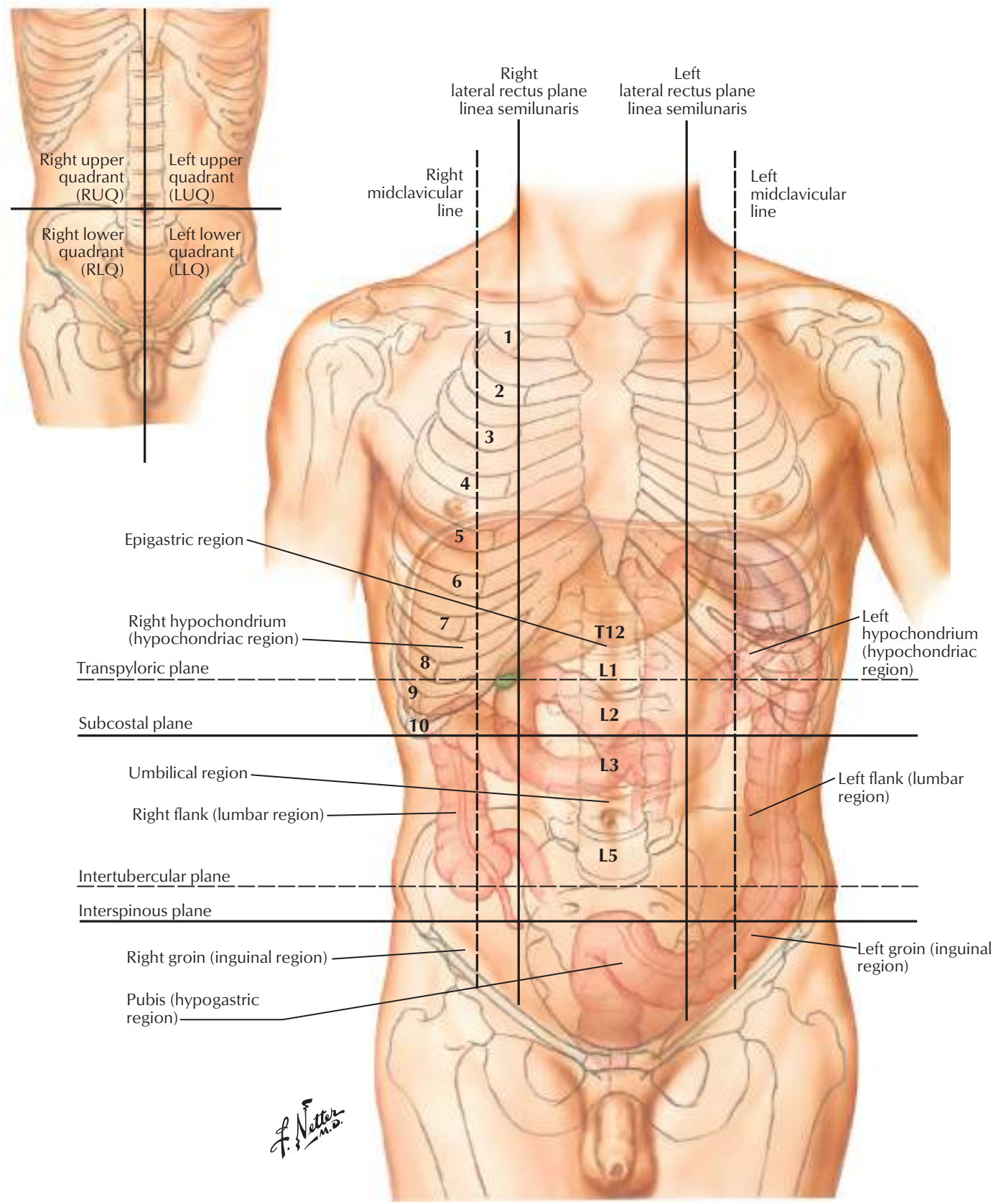
321 Abdominal Wall and Viscera: Paramedian (Parasagittal) Section
322 Abdominal Scans: Axial CT Images
323 Abdominal Scans: Axial CT Images (continued)
324 Cross Section at T10, Esophagogastric Junction
325 Cross Section at T12, Inferior to Xiphoid
326 Cross Section at T12–L1, Intervertebral Disc
327 Cross Section at L1–2, Intervertebral Disc
328 Cross Section at L3–4

Muscle Table


Sternum
Body
Xiphoid
process
Pectoralis
major muscle
Serratus
anterior
muscle
Tendinous
intersection
External
oblique
muscle
Rectus
abdominis
muscle
Linea alba
Linea semilunaris
Umbilicus
Iliac crest
Anterior superior
iliac spine
Superficial
circumflex iliac vein
Superficial
epigastric veins
Inguinal
ligament
Pubic symphysis
Pubic tubercle
C. Machado M.D.

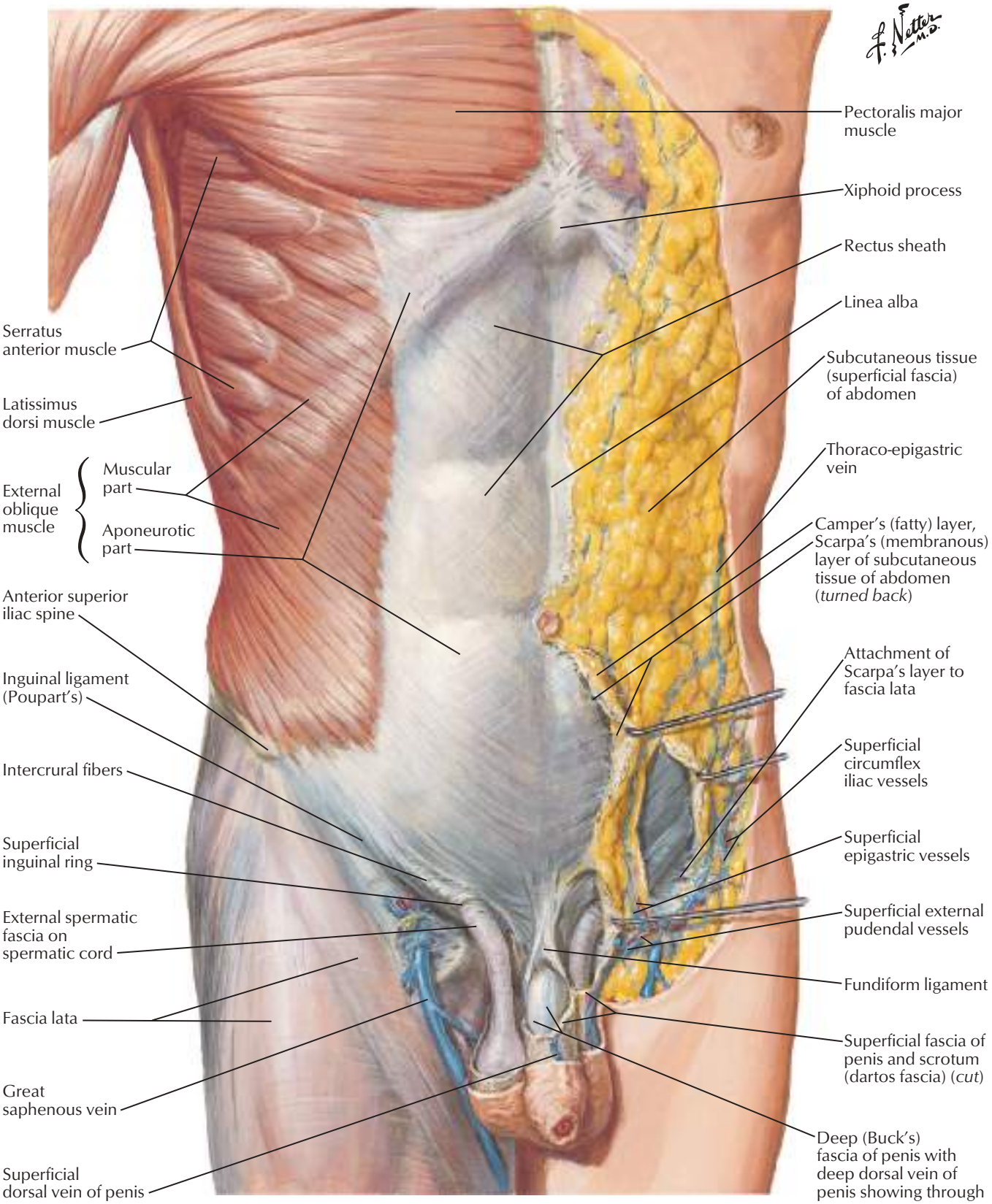
See also Plates 183, 332

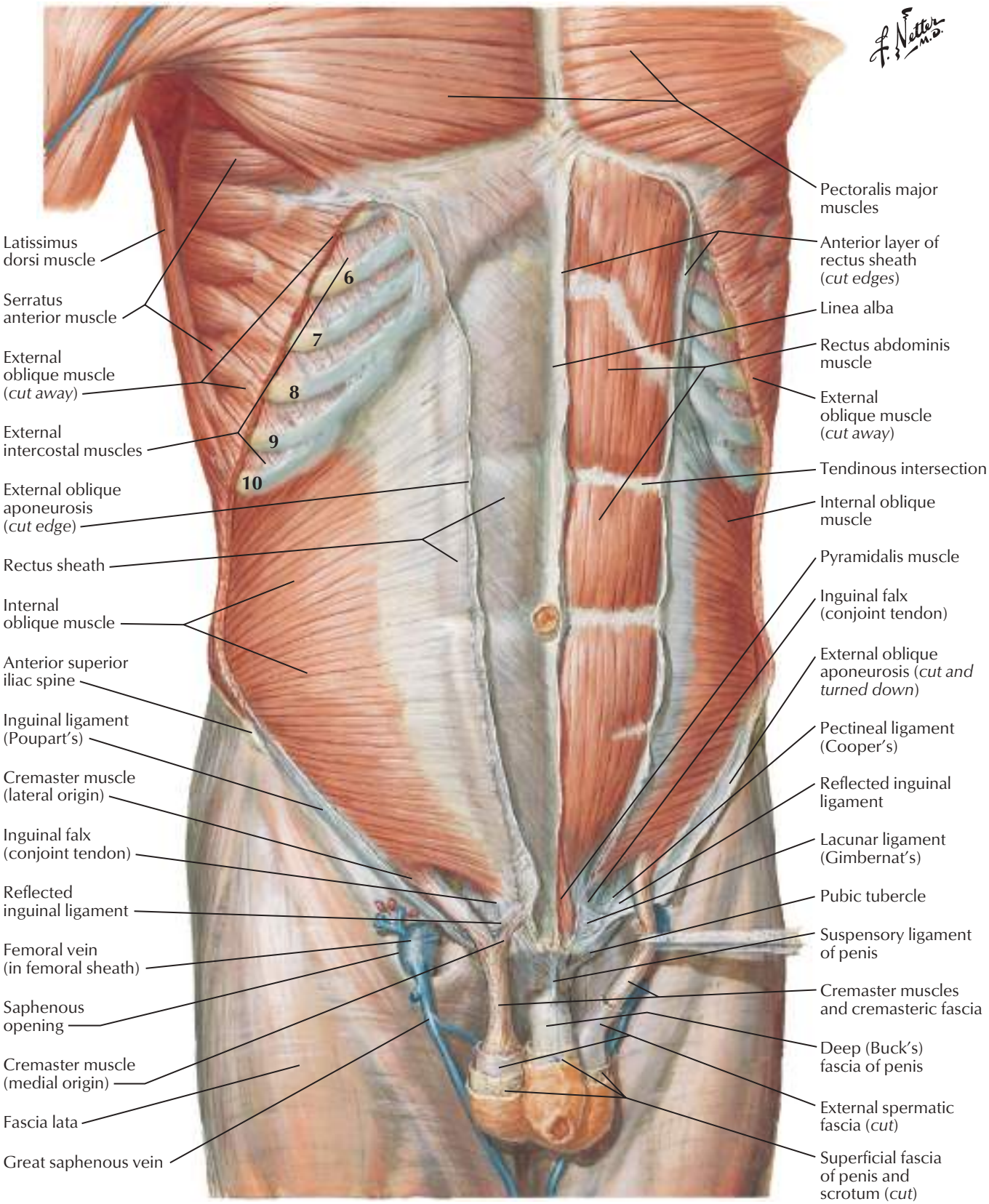



Right upper quadrant (RUQ)
Left upper quadrant (LUQ)
Right lower quadrant (RLQ)
Left lower quadrant (LLQ)
Right lateral rectus plane linea semilunaris
Left lateral rectus plane linea semilunaris
Right midclavicular line
Left midclavicular line
1
2
3
4
5
6
7
8
9
10
T12
L1
L2
L3
L5
Epigastric region
Right hypochondrium (hypochondriac region)
Left hypochondrium (hypochondriac region)
Transpyloric plane
Subcostal plane
Umbilical region
Right flank (lumbar region)
Left flank (lumbar region)
Intertubercular plane
Interspinous plane
Right groin (inguinal region)
Left groin (inguinal region)
Pubis (hypogastric region)
F. Netter M.D.

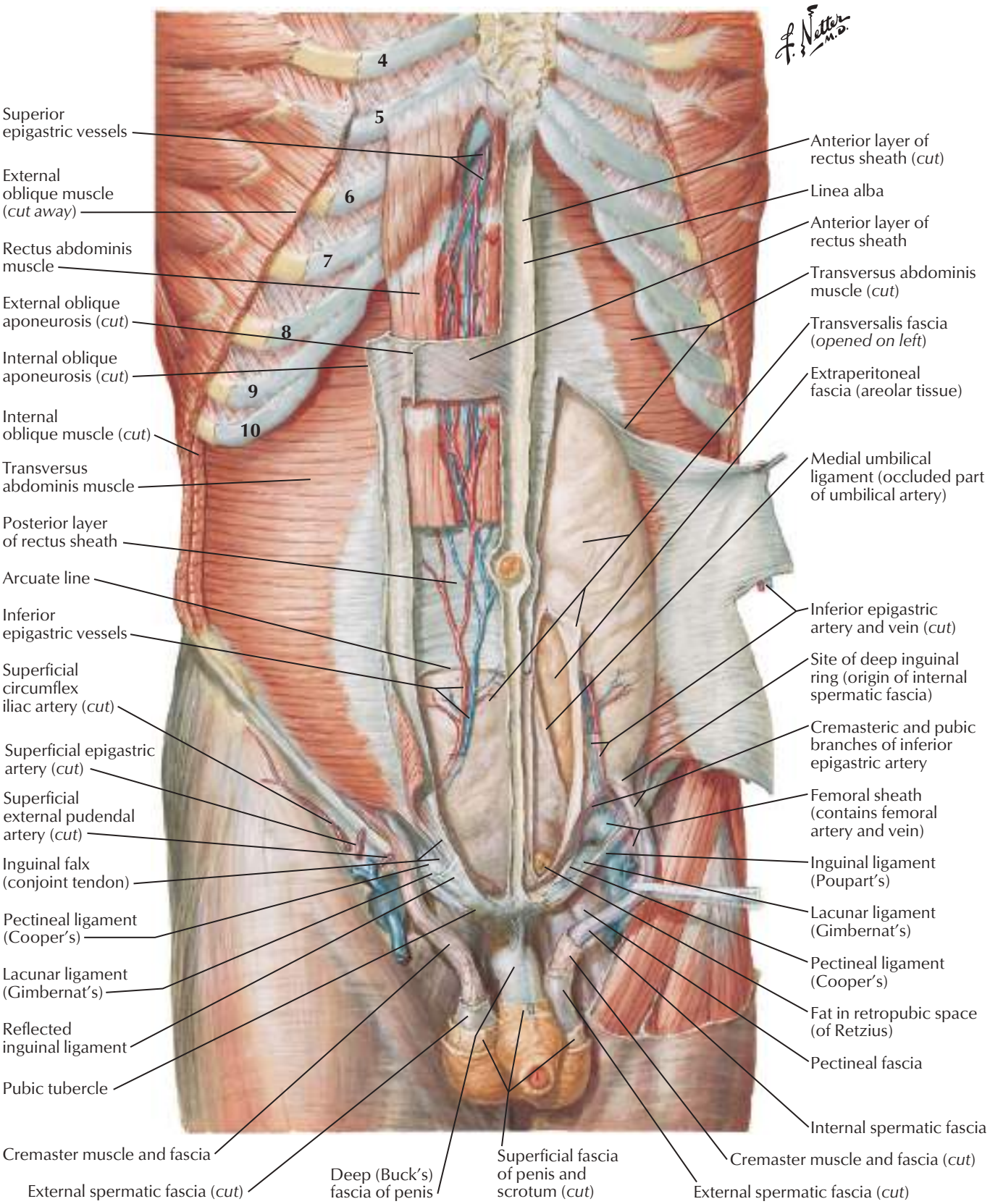
Anterior Abdominal Wall: Superficial Dissection

See also Plates 252, 329

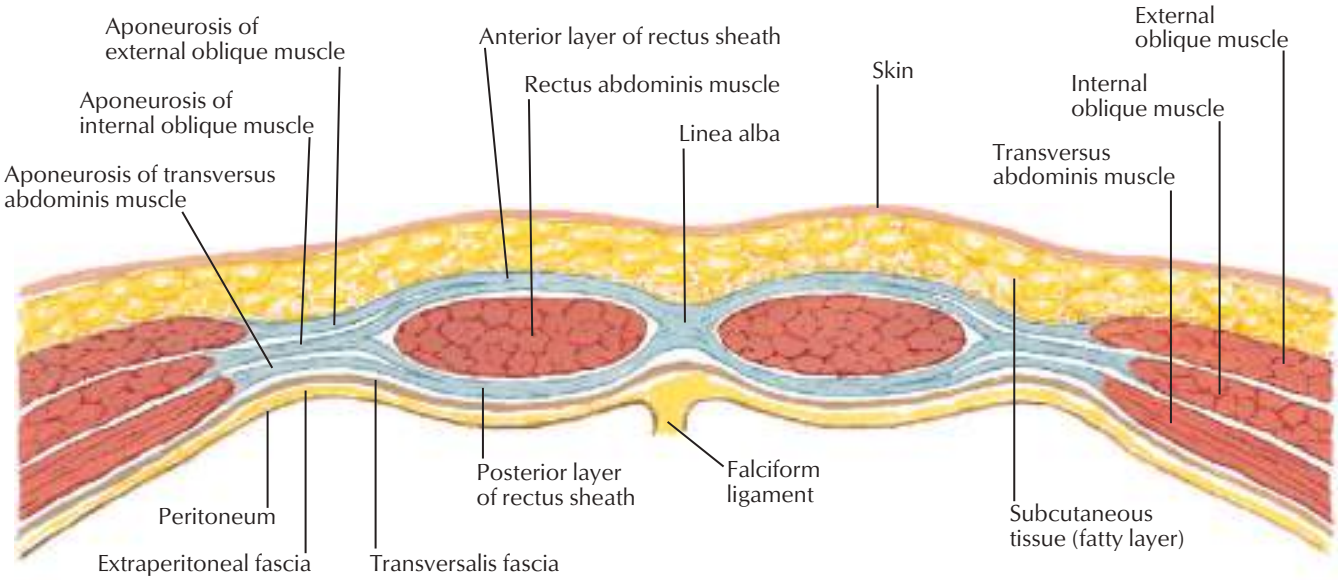



Latissimus dorsi muscle
Serratus anterior muscle
External oblique muscle (*cut away*)
External intercostal muscles
External oblique aponeurosis (*cut edge*)
Rectus sheath
Internal oblique muscle
Anterior superior iliac spine
Inguinal ligament (Poupart's)
Cremaster muscle (lateral origin)
Inguinal falx (conjoint tendon)
Reflected inguinal ligament
Femoral vein (in femoral sheath)
Saphenous opening
Cremaster muscle (medial origin)
Fascia lata
Great saphenous vein
6
7
8
9
10
Pectoralis major muscles
Anterior layer of rectus sheath (*cut edges*)
Linea alba
Rectus abdominis muscle
External oblique muscle (*cut away*)
Tendinous intersection
Internal oblique muscle
Pyramidalis muscle
Inguinal falx (conjoint tendon)
External oblique aponeurosis (*cut and turned down*)
Pectineal ligament (Cooper's)
Reflected inguinal ligament
Lacunar ligament (Gimbernat's)
Pubic tubercle
Suspensory ligament of penis
Cremaster muscles and cremasteric fascia
Deep (Buck's) fascia of penis
External spermatic fascia (*cut*)
Superficial fascia of penis and scrotum (*cut*)

See also Plates 186, 251

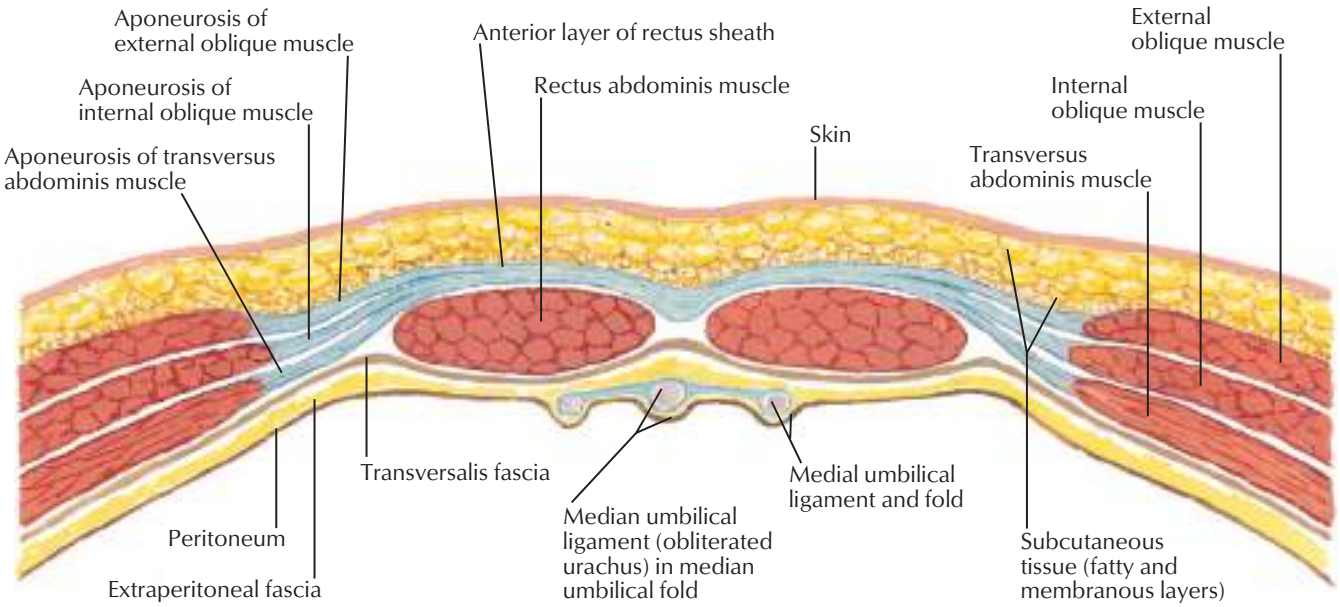


Section above arcuate line



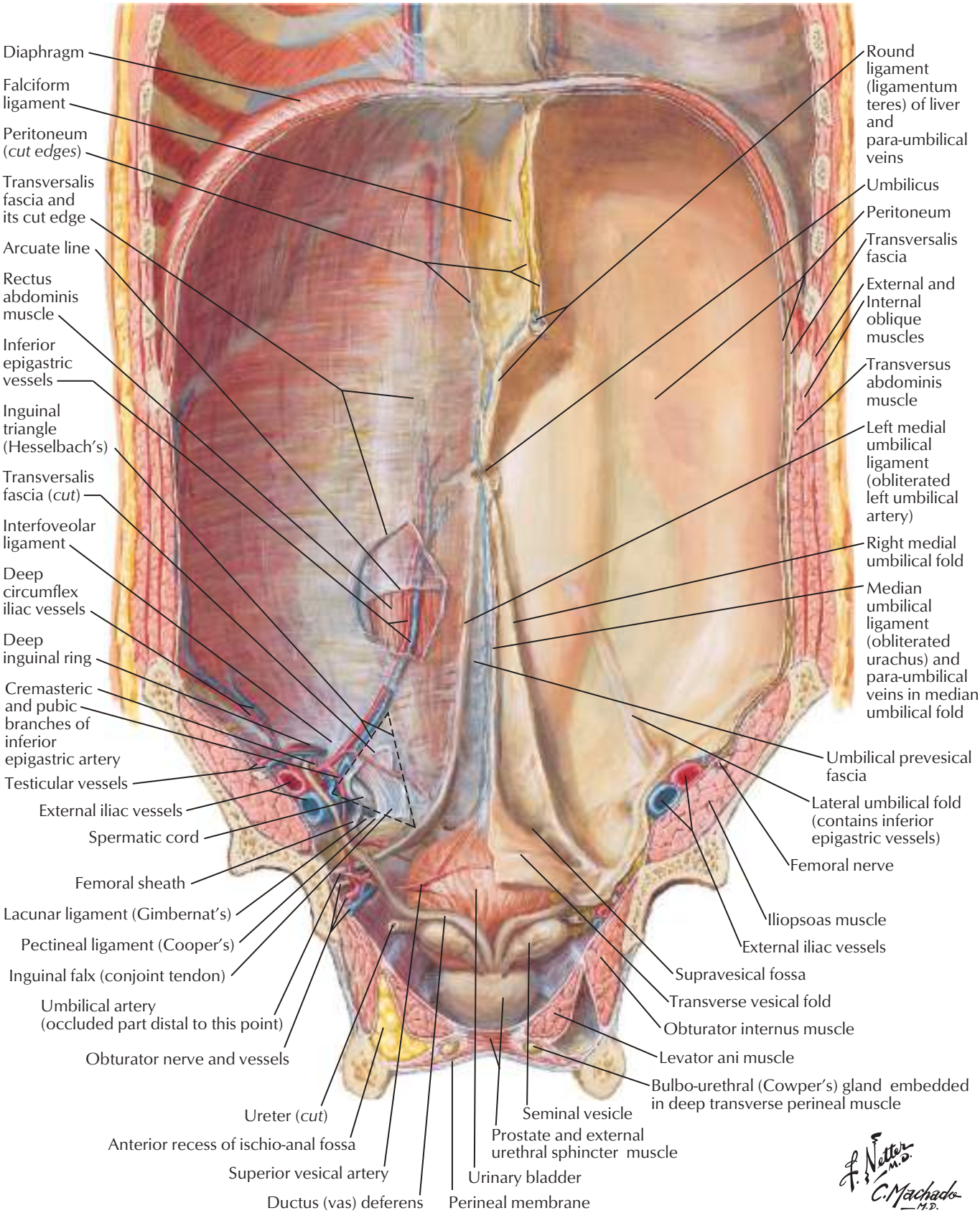
Aponeurosis of internal oblique muscle splits to form anterior and posterior layers of rectus sheath. Aponeurosis of external oblique muscle joins anterior layer of sheath; aponeurosis of transversus abdominis muscle joins posterior layer. Anterior and posterior layers of rectus sheath unite medially to form linea alba.

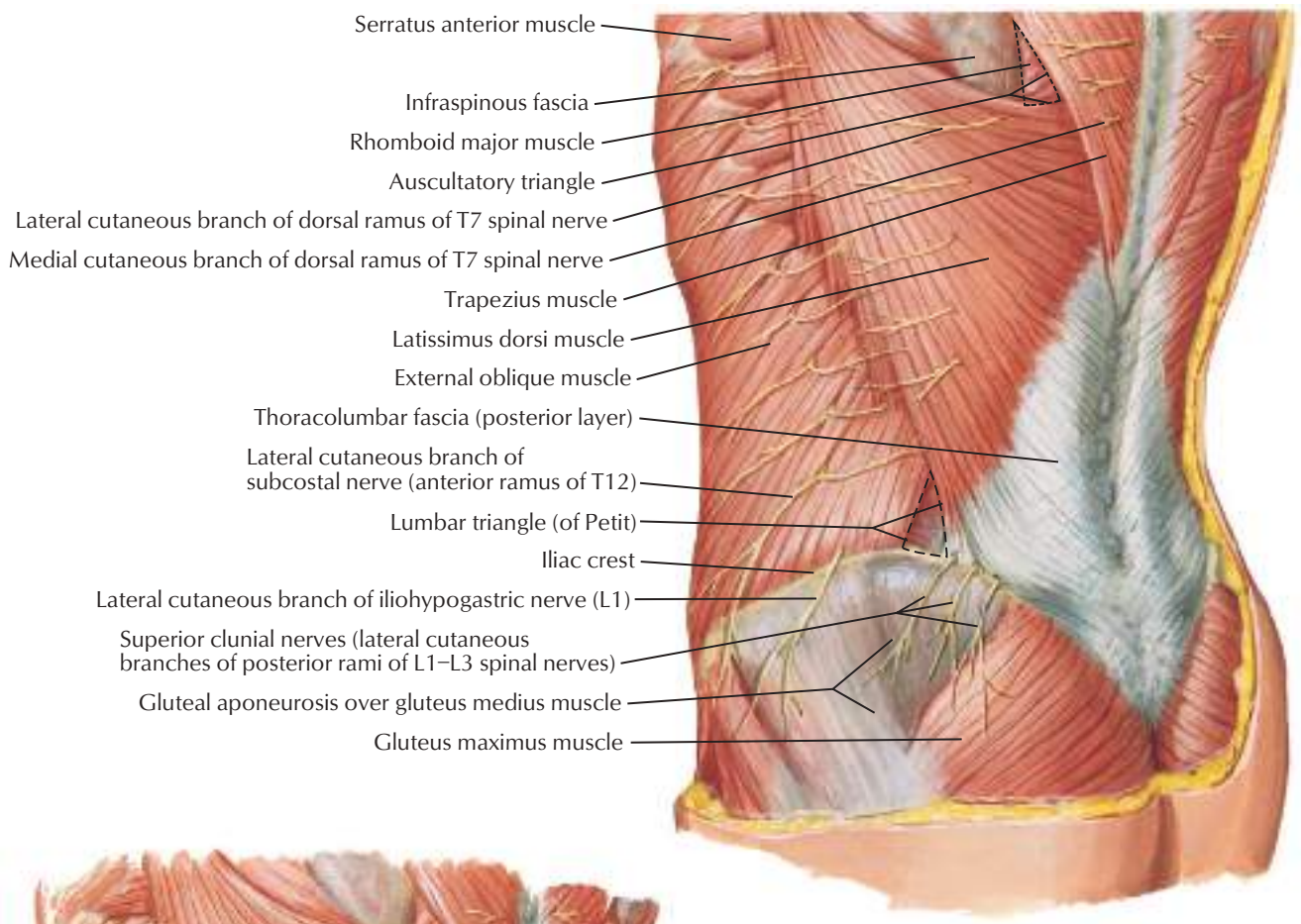
Section below arcuate line

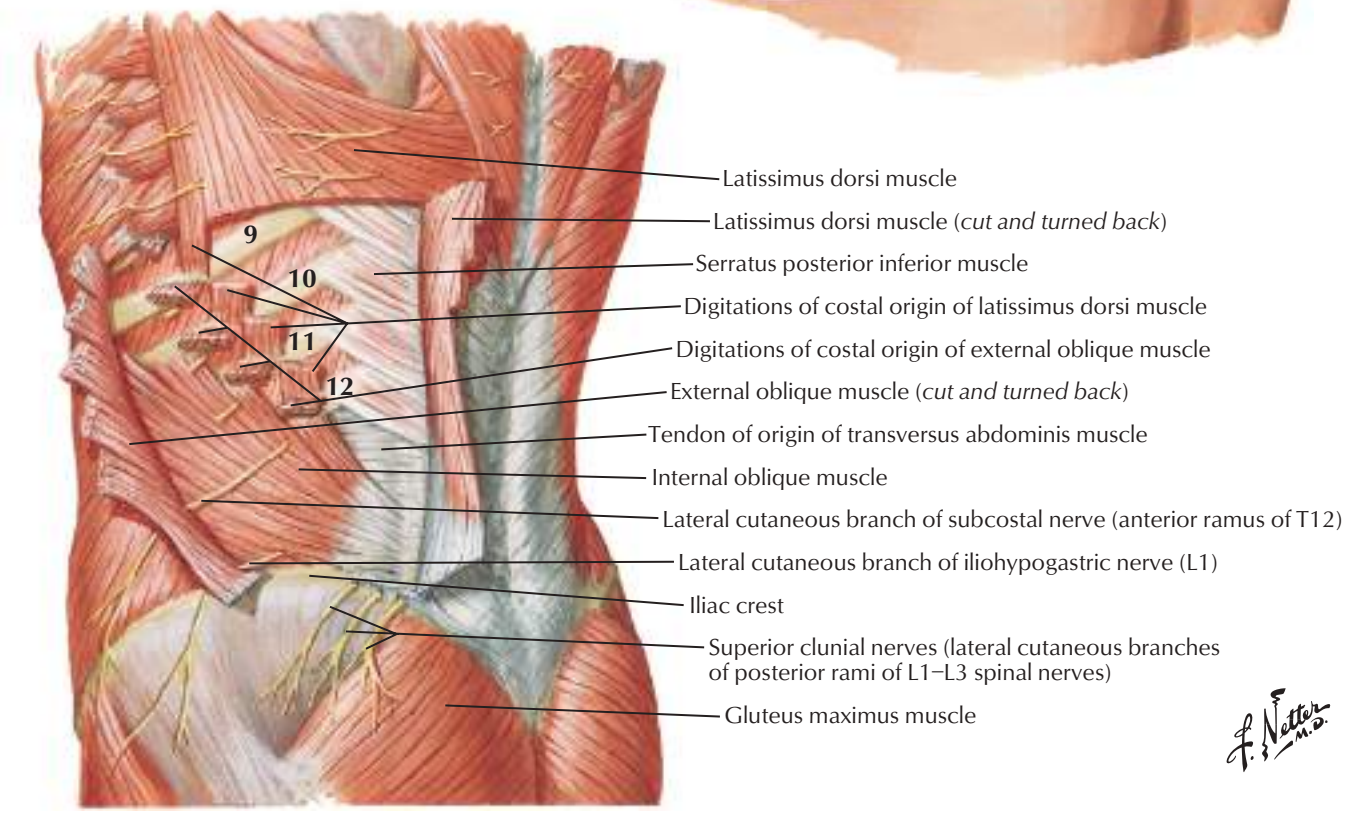


Aponeurosis of internal oblique muscle does not split at this level but passes completely anterior to rectus abdominis muscle and is fused there with both aponeurosis of external oblique muscle and that of transversus abdominis muscle. Thus, posterior wall of rectus sheath is absent below arcuate line, leaving only transversalis fascia.

See also Plates 362, 381

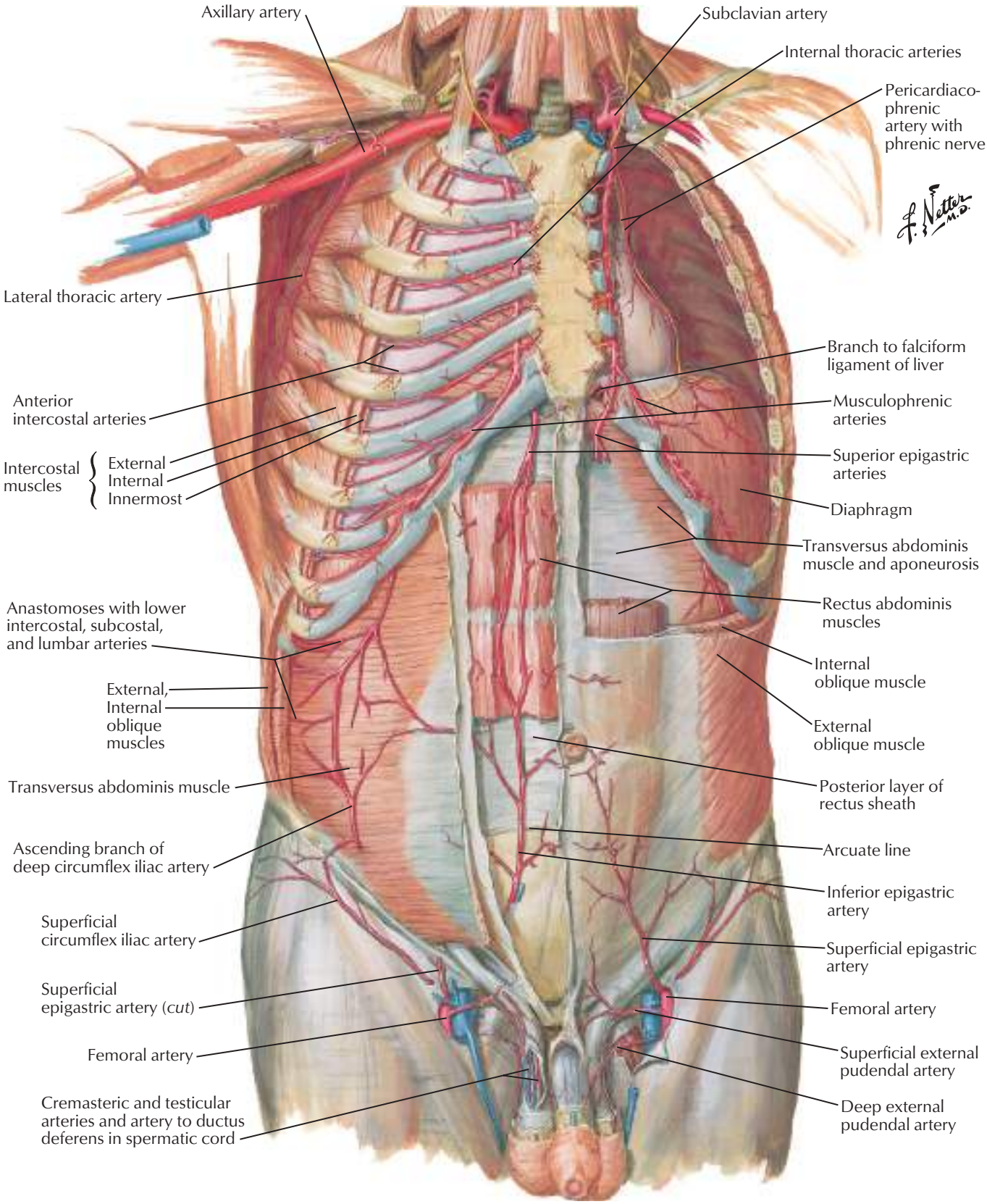


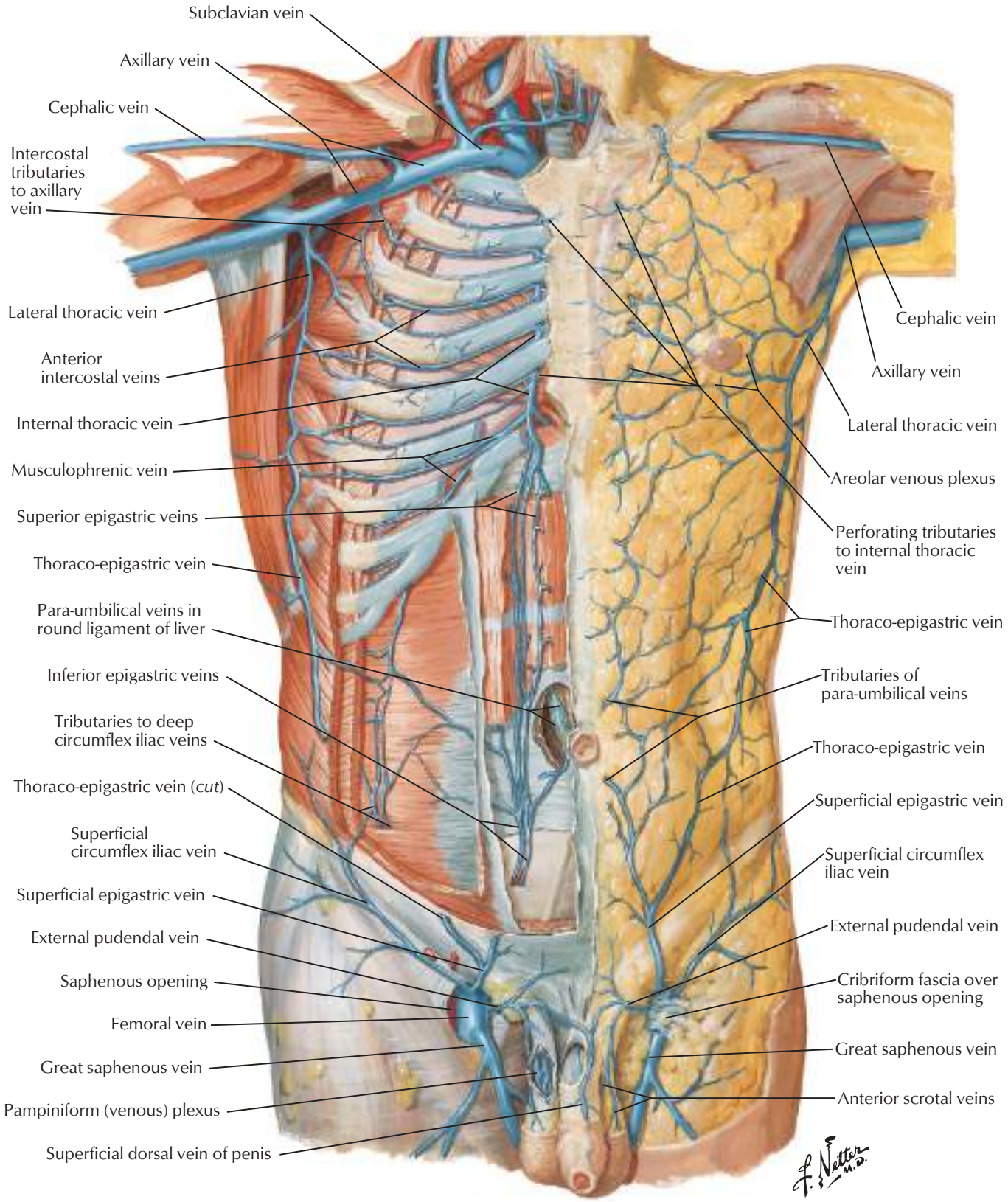

Serratus anterior muscle
Infraspinous fascia
Rhomboid major muscle
Auscultatory triangle
Lateral cutaneous branch of dorsal ramus of T7 spinal nerve
Medial cutaneous branch of dorsal ramus of T7 spinal nerve
Trapezius muscle
Latissimus dorsi muscle
External oblique muscle
Thoracolumbar fascia (posterior layer)
Lateral cutaneous branch of subcostal nerve (anterior ramus of T12)
Lumbar triangle (of Petit)
Iliac crest
Lateral cutaneous branch of iliohypogastric nerve (L1)
Superior clunial nerves (lateral cutaneous branches of posterior rami of L1–L3 spinal nerves)
Gluteal aponeurosis over gluteus medius muscle
Gluteus maximus muscle


9
10
11
12
Latissimus dorsi muscle
Latissimus dorsi muscle (cut and turned back)
Serratus posterior inferior muscle
Digitations of costal origin of latissimus dorsi muscle
Digitations of costal origin of external oblique muscle
External oblique muscle (cut and turned back)
Tendon of origin of transversus abdominis muscle
Internal oblique muscle
Lateral cutaneous branch of subcostal nerve (anterior ramus of T12)
Lateral cutaneous branch of iliohypogastric nerve (L1)
Iliac crest
Superior clunial nerves (lateral cutaneous branches of posterior rami of L1–L3 spinal nerves)
Gluteus maximus muscle

Arteries of Anterior Abdominal Wall

See also Plate 247




Subclavian vein
Axillary vein
Cephalic vein
Intercostal tributaries to axillary vein
Lateral thoracic vein
Anterior intercostal veins
Internal thoracic vein
Musculophrenic vein
Superior epigastric veins
Thoraco-epigastric vein
Para-umbilical veins in round ligament of liver
Inferior epigastric veins
Tributaries to deep circumflex iliac veins
Thoraco-epigastric vein (cut)
Superficial circumflex iliac vein
Superficial epigastric vein
External pudendal vein
Saphenous opening
Femoral vein
Great saphenous vein
Pampiniform (venous) plexus
Superficial dorsal vein of penis
Cephalic vein
Axillary vein
Lateral thoracic vein
Areolar venous plexus
Perforating tributaries to internal thoracic vein
Thoraco-epigastric vein
Tributaries of para-umbilical veins
Thoraco-epigastric vein
Superficial epigastric vein
Superficial circumflex iliac vein
External pudendal vein
Cribriform fascia over saphenous opening
Great saphenous vein
Anterior scrotal veins
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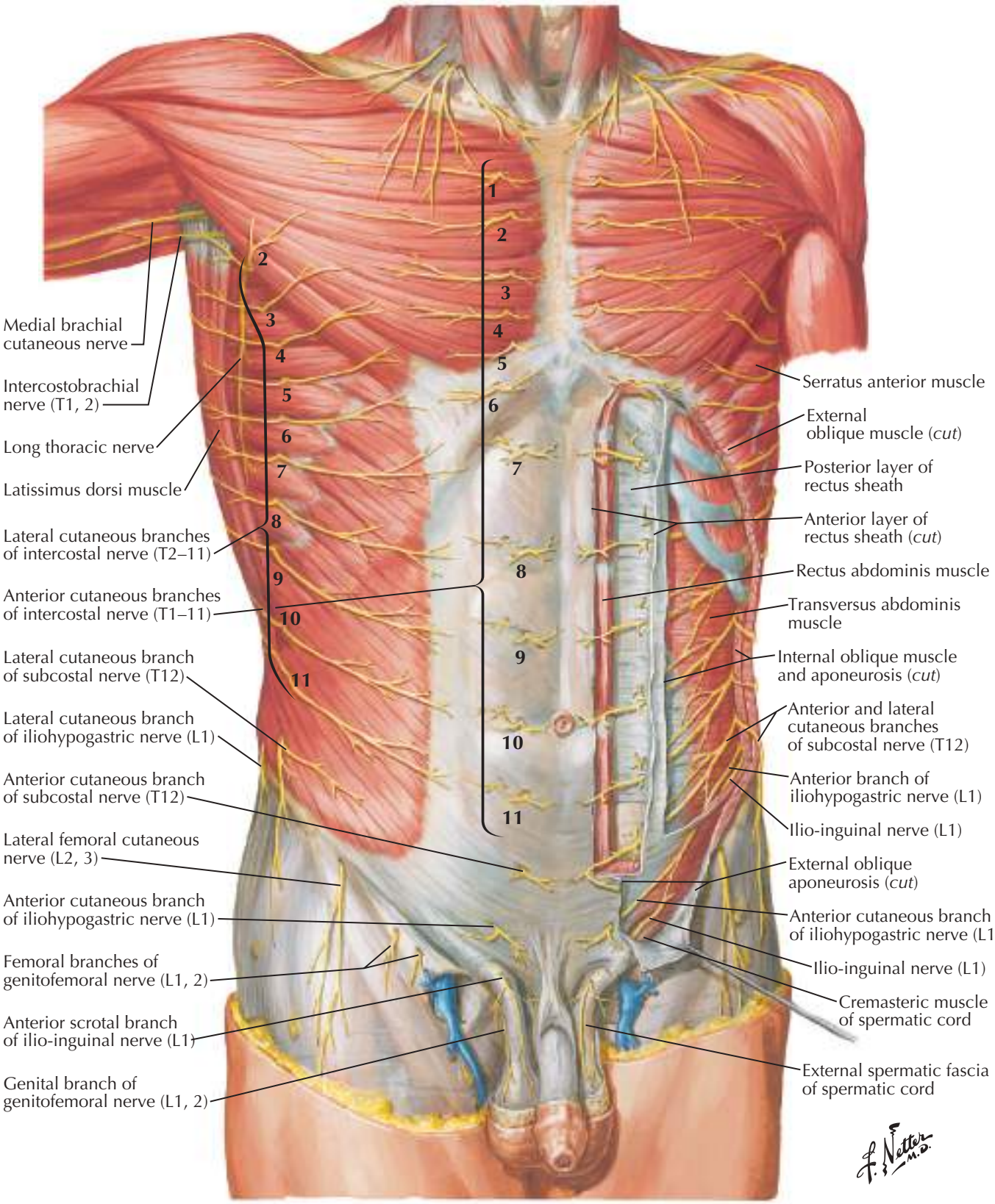
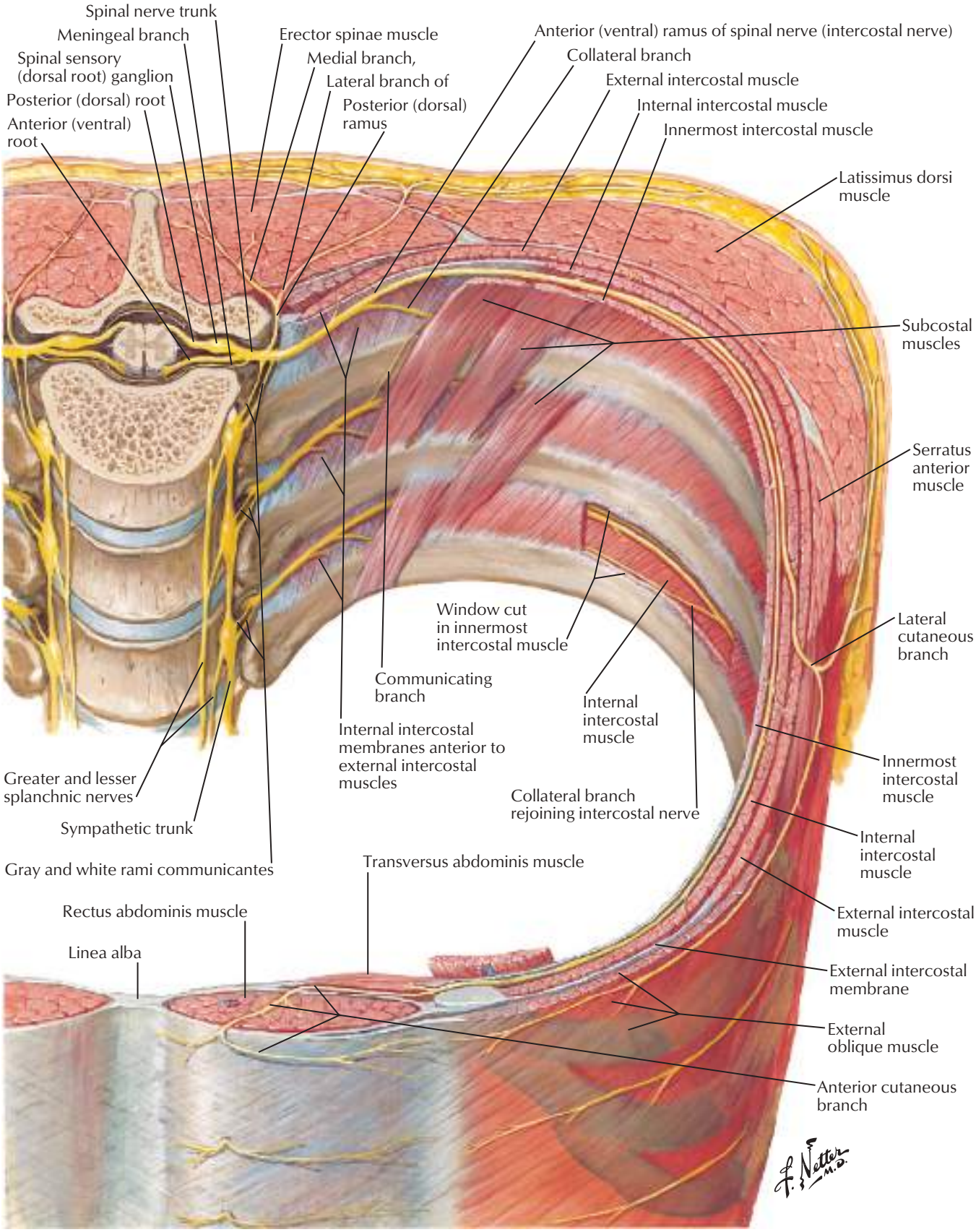
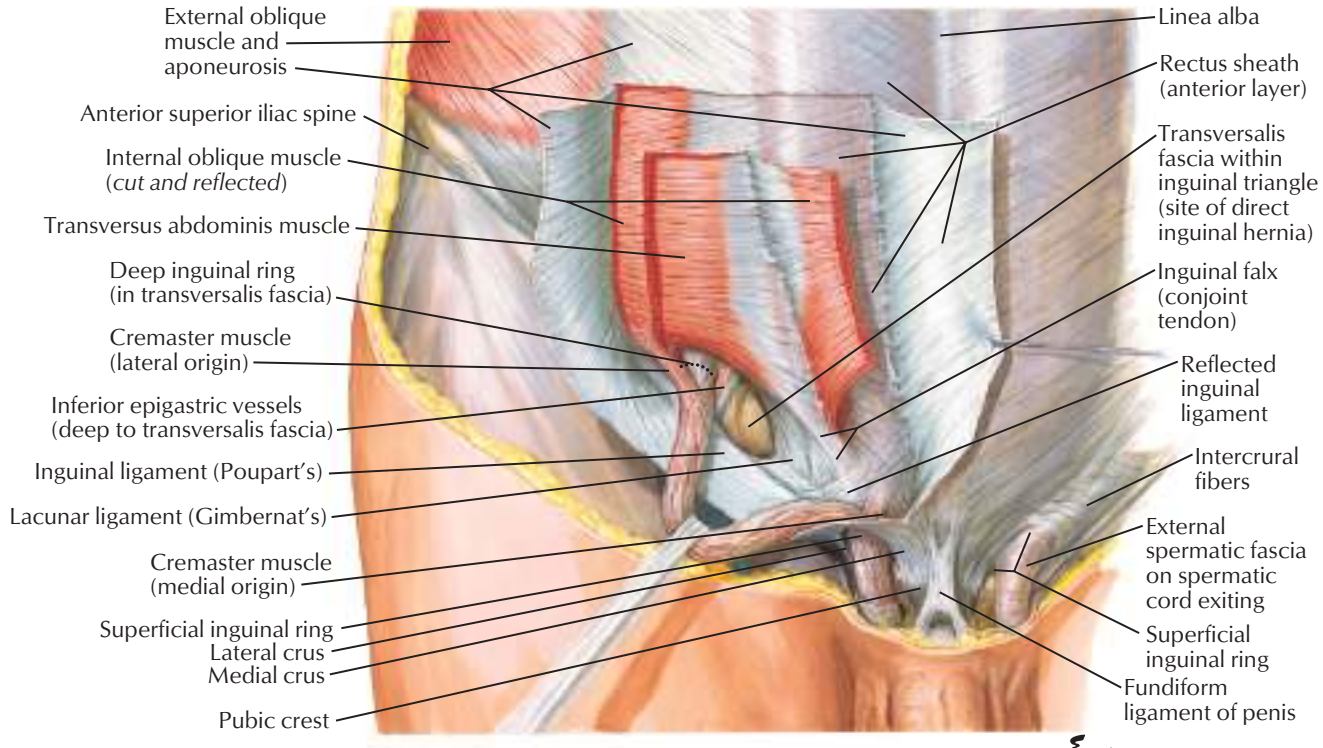
Nerves of Anterior Abdominal Wall

See also Plates 177, 185, 254



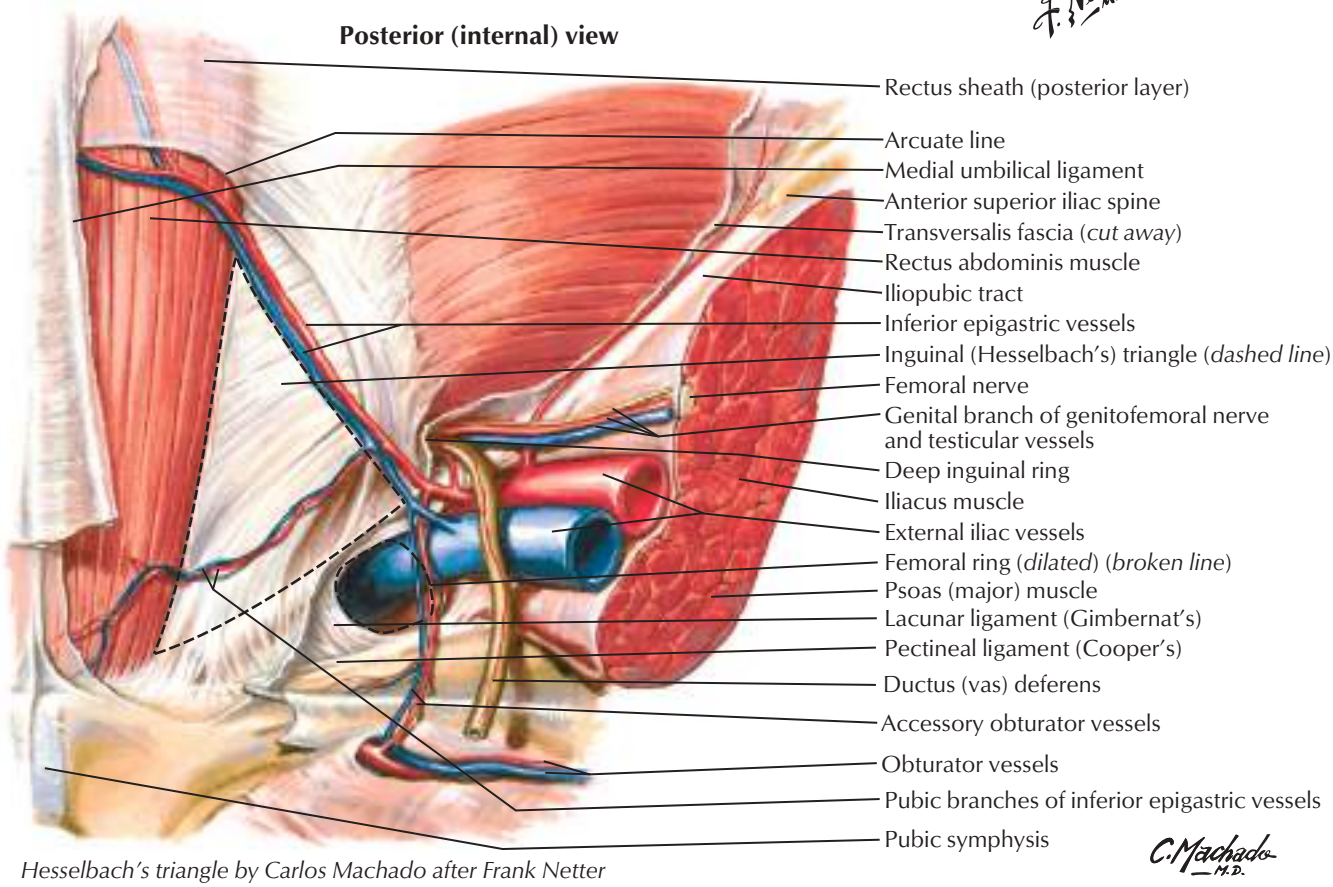

Spinal nerve trunk
Meningeal branch
Spinal sensory (dorsal root) ganglion
Posterior (dorsal) root
Anterior (ventral) root
Erector spinae muscle
Medial branch,
Lateral branch of Posterior (dorsal) ramus
Anterior (ventral) ramus of spinal nerve (intercostal nerve)
Collateral branch
External intercostal muscle
Internal intercostal muscle
Innermost intercostal muscle
Latissimus dorsi muscle
Subcostal muscles
Serratus anterior muscle
Lateral cutaneous branch
Window cut in innermost intercostal muscle
Communicating branch
Internal intercostal membranes anterior to external intercostal muscles
Internal intercostal muscle
Greater and lesser splanchnic nerves
Sympathetic trunk
Collateral branch rejoining intercostal nerve
Innermost intercostal muscle
Internal intercostal muscle
Gray and white rami communicantes
Transversus abdominis muscle
External intercostal muscle
Rectus abdominis muscle
Linea alba
External intercostal membrane
External oblique muscle
Anterior cutaneous branch
F. Netter M.D.

See also Plates 247, 249

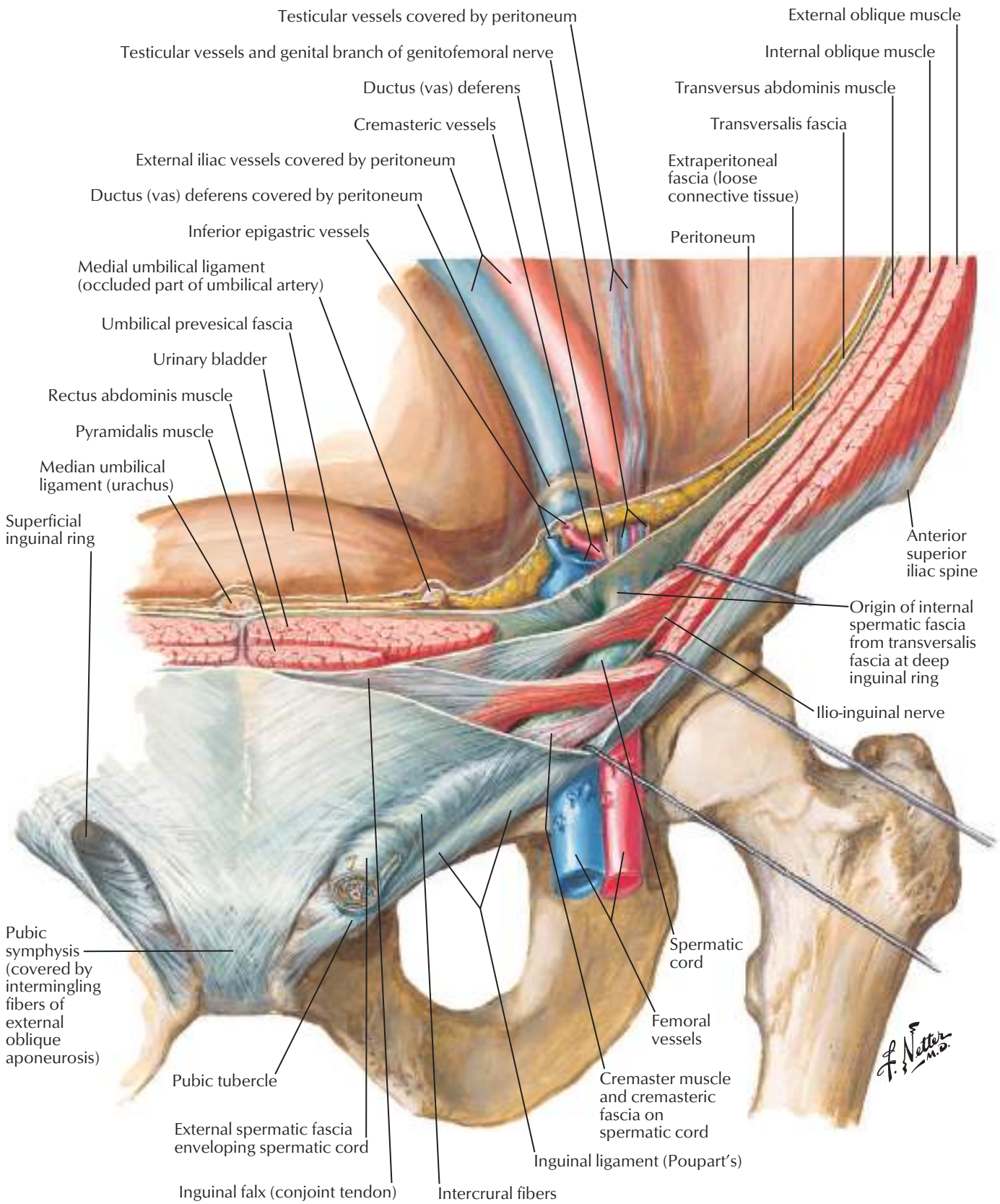


Anterior view

Posterior (internal) view

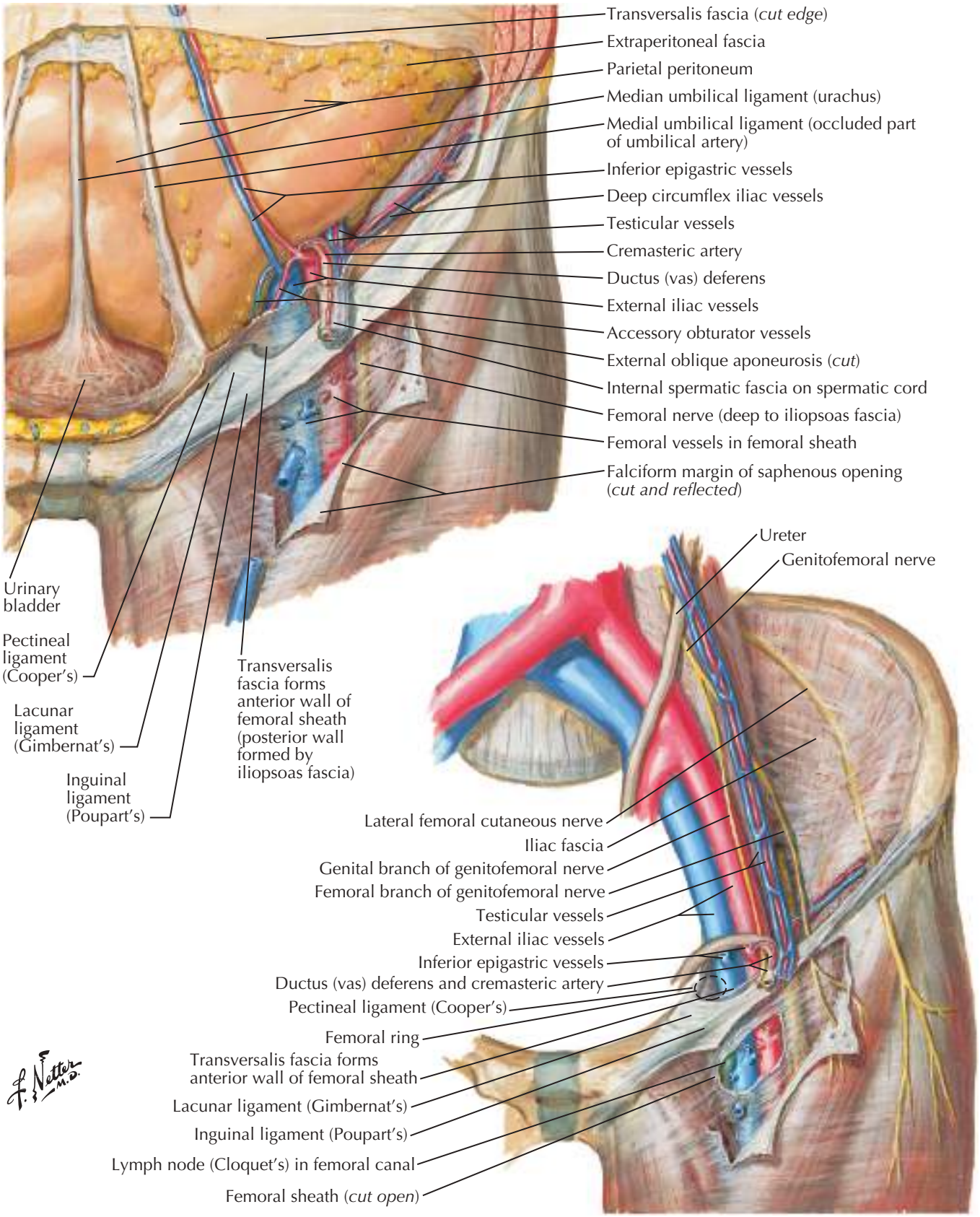


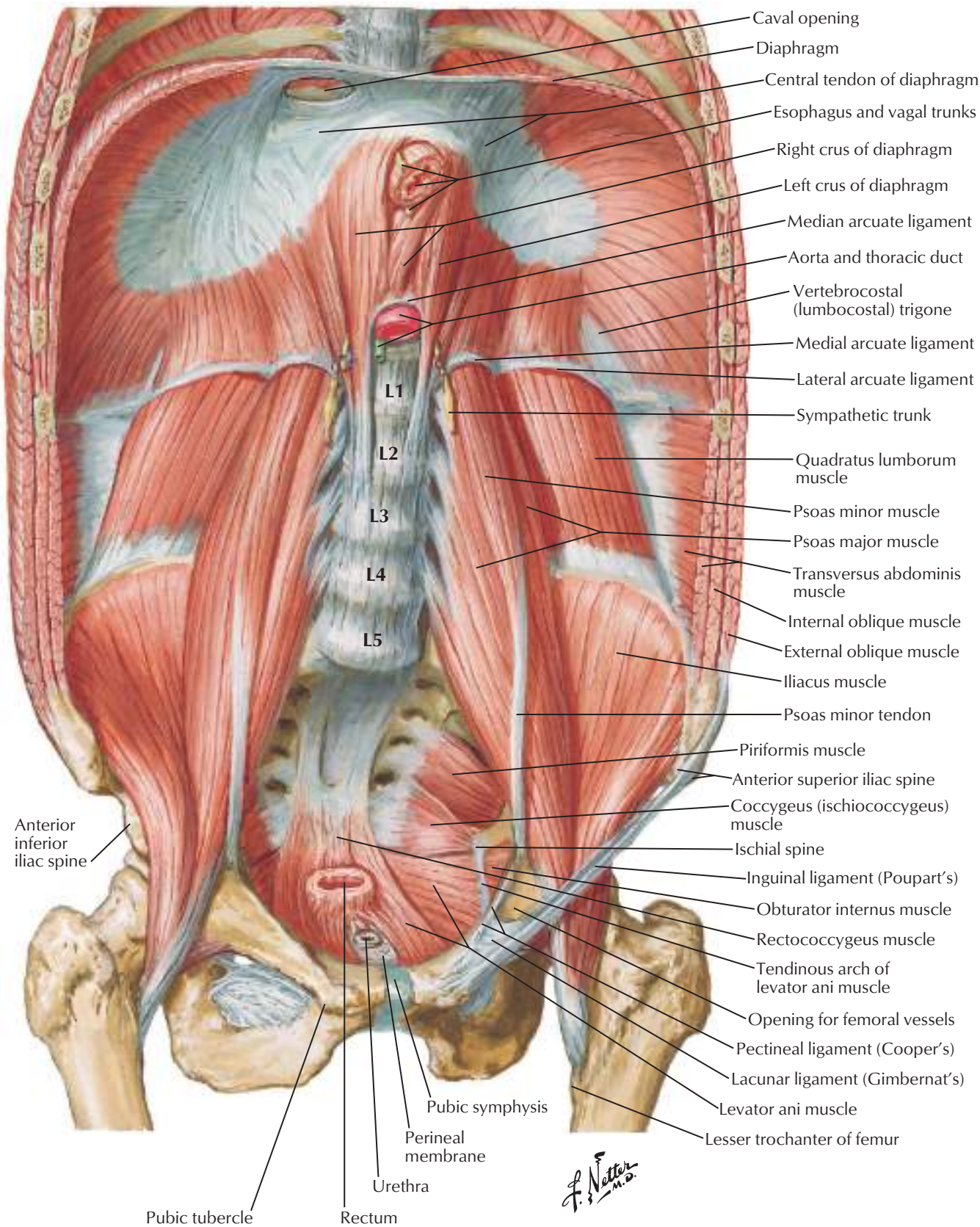
Hesselbach's triangle by Carlos Machado after Frank Netter


Testicular vessels covered by peritoneum
Testicular vessels and genital branch of genitofemoral nerve
Ductus (vas) deferens
Cremasteric vessels
External iliac vessels covered by peritoneum
Ductus (vas) deferens covered by peritoneum
Inferior epigastric vessels
Medial umbilical ligament (occluded part of umbilical artery)
Umbilical prevesical fascia
Urinary bladder
Rectus abdominis muscle
Pyramidalis muscle
Median umbilical ligament (urachus)
Superficial inguinal ring
Pubic symphysis (covered by intermingling fibers of external oblique aponeurosis)
Pubic tubercle
External spermatic fascia enveloping spermatic cord
Inguinal falx (conjoint tendon)
Intercrural fibers
Inguinal ligament (Poupart's)
Cremaster muscle and cremasteric fascia on spermatic cord
Femoral vessels
Spermatic cord
Origin of internal spermatic fascia from transversalis fascia at deep inguinal ring
Ilio-inguinal nerve
Anterior superior iliac spine
Peritoneum
Extraperitoneal fascia (loose connective tissue)
Transversalis fascia
Transversus abdominis muscle
Internal oblique muscle
External oblique muscle
F. Netter M.D.

Femoral Sheath and Inguinal Canal

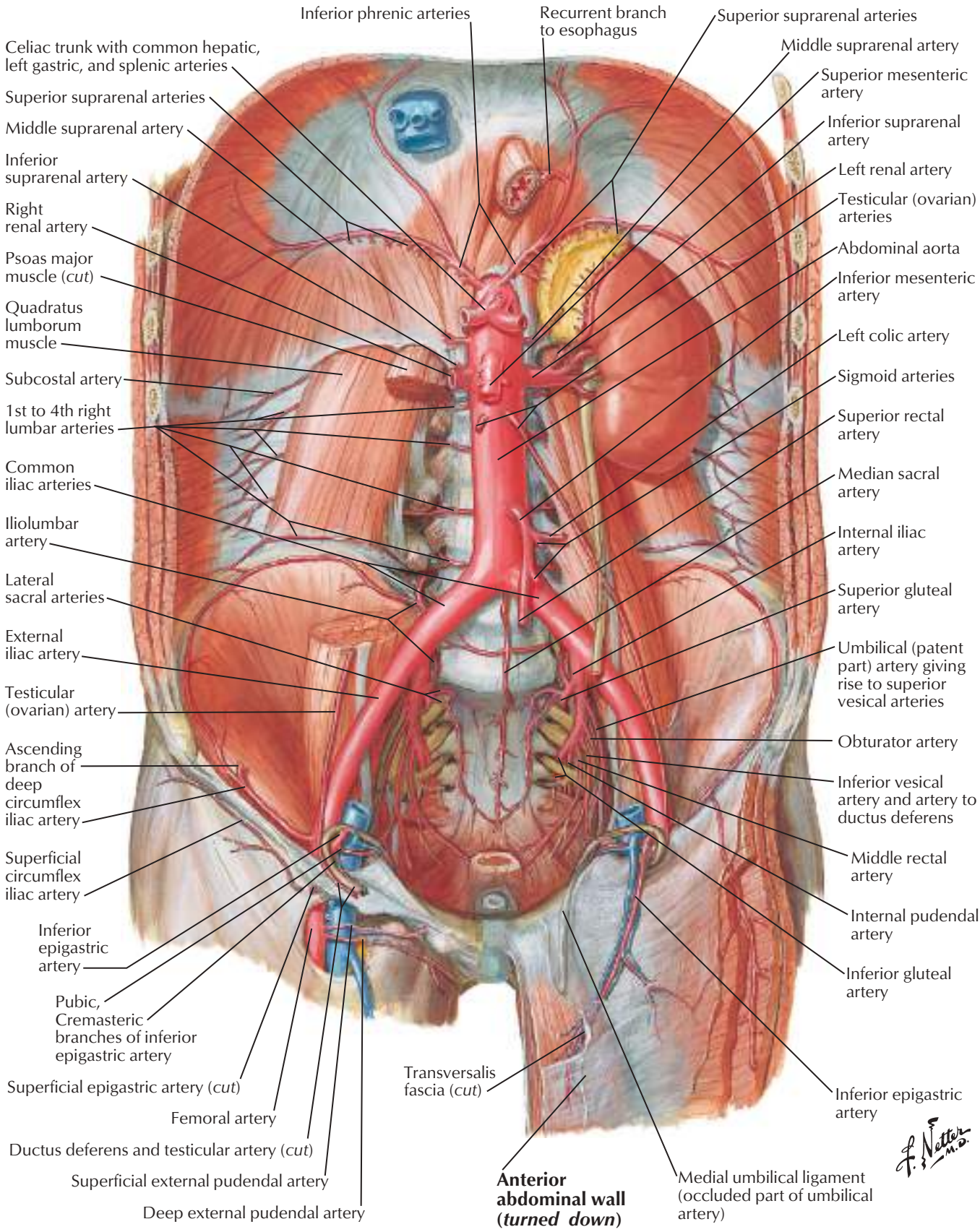
See also Plates 246, 247, 249

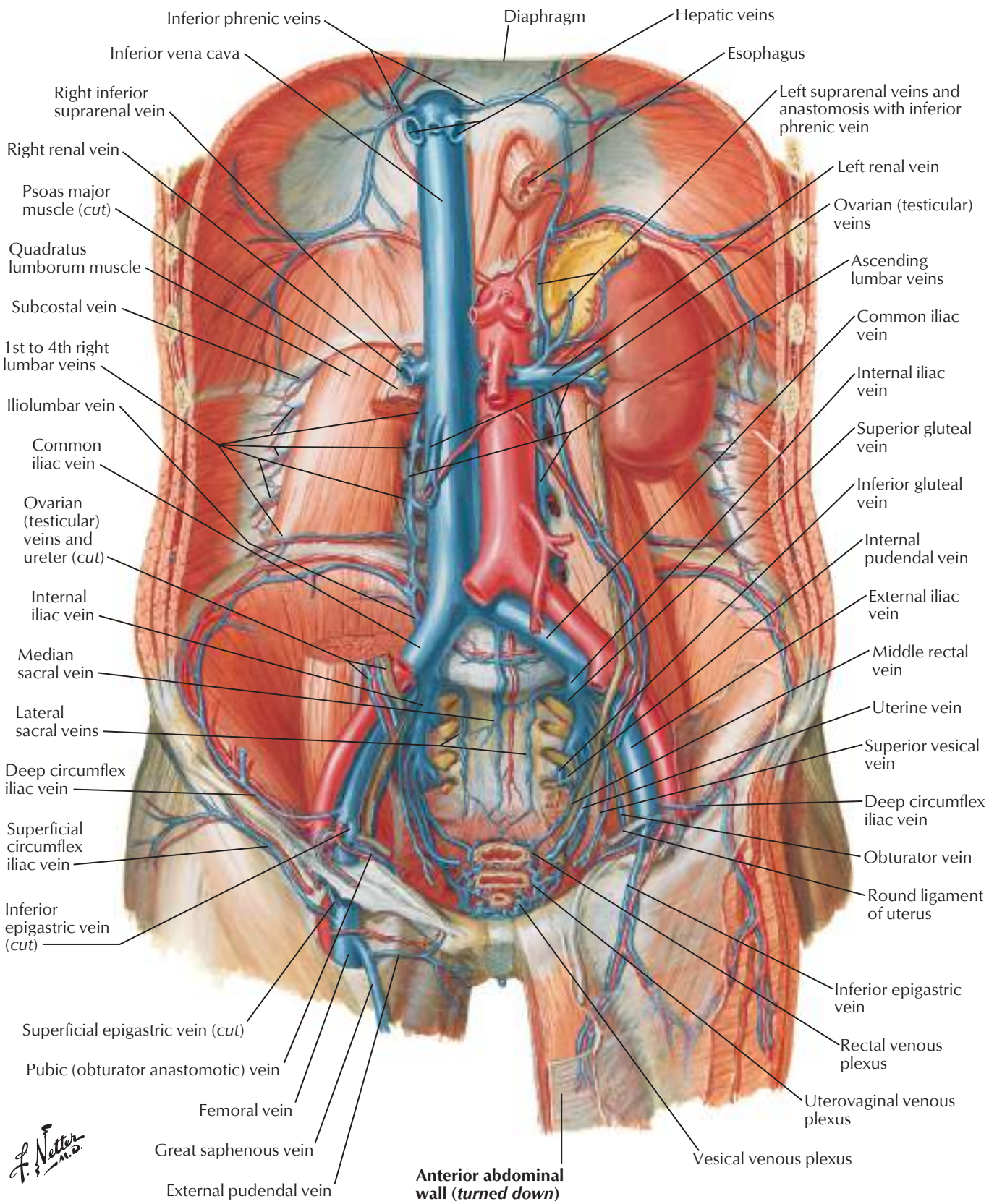



Caval opening
Diaphragm
Central tendon of diaphragm
Esophagus and vagal trunks
Right crus of diaphragm
Left crus of diaphragm
Median arcuate ligament
Aorta and thoracic duct
Vertebrocostal (lumbocostal) trigone
Medial arcuate ligament
Lateral arcuate ligament
Sympathetic trunk
Quadratus lumborum muscle
Psoas minor muscle
Psoas major muscle
Transversus abdominis muscle
Internal oblique muscle
External oblique muscle
Iliacus muscle
Psoas minor tendon
Piriformis muscle
Anterior superior iliac spine
Coccygeus (ischiococcygeus) muscle
Ischial spine
Inguinal ligament (Poupart's)
Obturator internus muscle
Rectococcygeus muscle
Tendinous arch of levator ani muscle
Opening for femoral vessels
Pectineal ligament (Cooper's)
Lacunar ligament (Gimbernat's)
Levator ani muscle
Lesser trochanter of femur
L1
L2
L3
L4
L5
Anterior inferior iliac spine
Pubic symphysis
Perineal membrane
Urethra
Pubic tubercle
Rectum
F. Netter M.D.

Arteries of Posterior Abdominal Wall

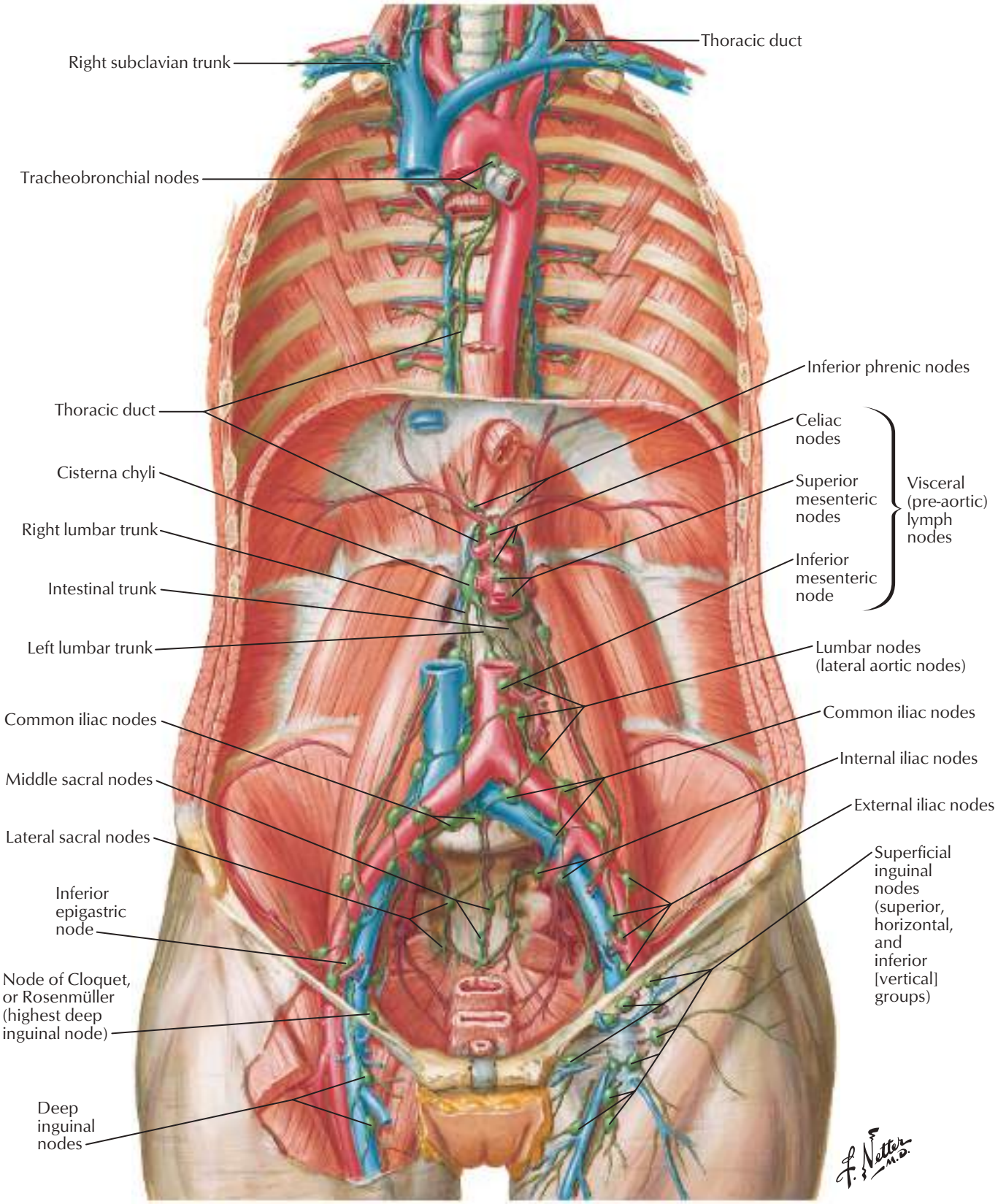
See also Plates 192, 379, 381

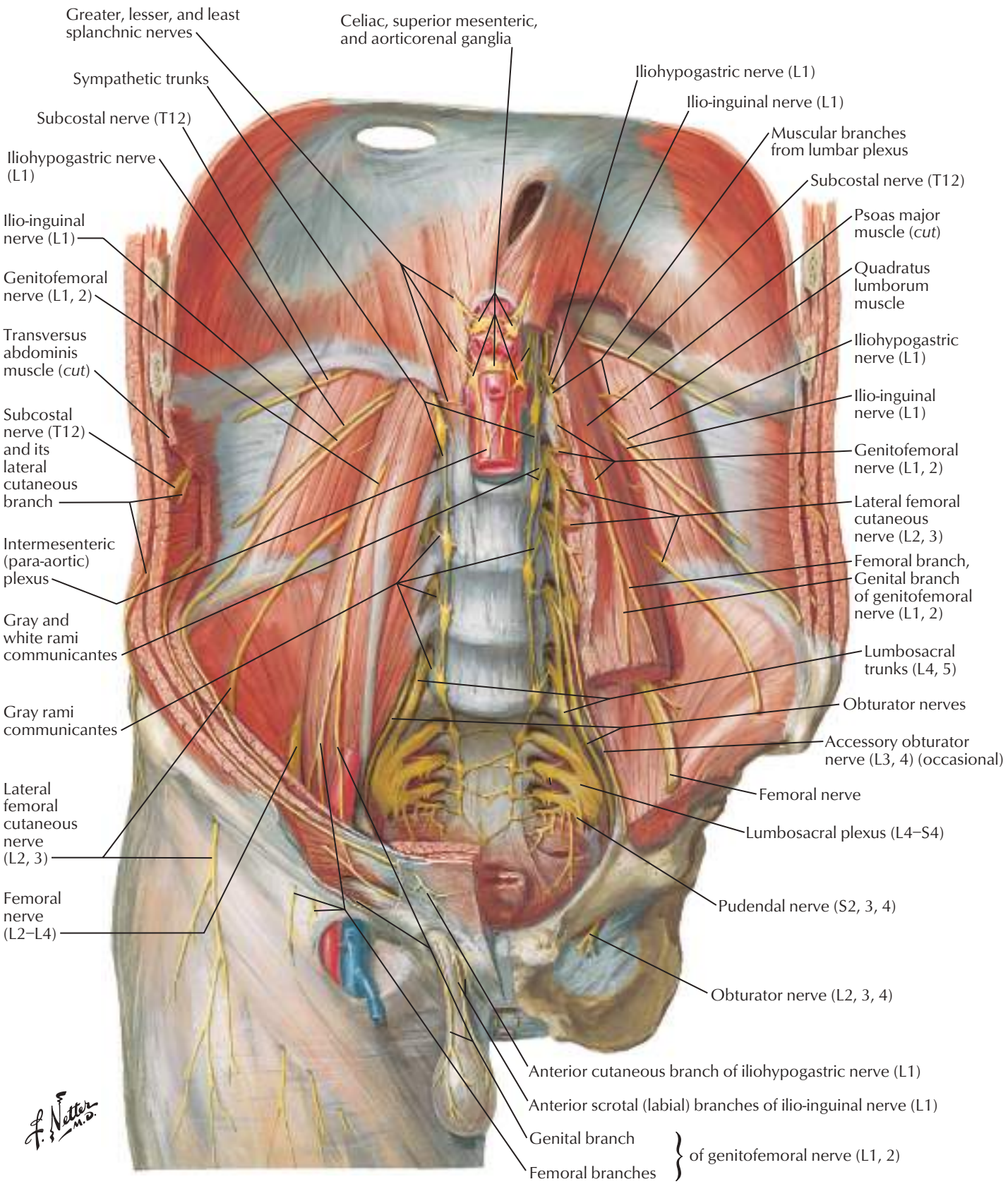


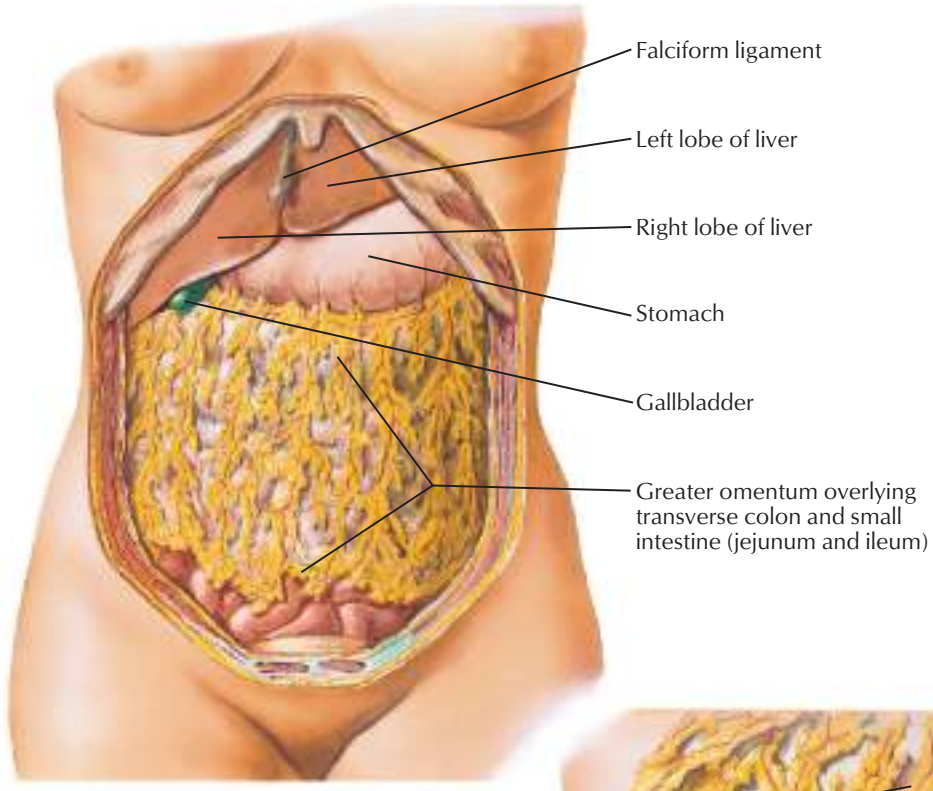

Inferior phrenic veins
Diaphragm
Hepatic veins
Inferior vena cava
Esophagus
Right inferior suprarenal vein
Left suprarenal veins and anastomosis with inferior phrenic vein
Right renal vein
Left renal vein
Psoas major muscle (*cut*)
Ovarian (testicular) veins
Quadratus lumborum muscle
Ascending lumbar veins
Subcostal vein
Common iliac vein
1st to 4th right lumbar veins
Internal iliac vein
Iliolumbar vein
Superior gluteal vein
Common iliac vein
Inferior gluteal vein
Ovarian (testicular) veins and ureter (*cut*)
Internal pudendal vein
Internal iliac vein
External iliac vein
Median sacral vein
Middle rectal vein
Lateral sacral veins
Uterine vein
Superior vesical vein
Deep circumflex iliac vein
Deep circumflex iliac vein
Superficial circumflex iliac vein
Obturator vein
Round ligament of uterus
Inferior epigastric vein (*cut*)
Inferior epigastric vein
Rectal venous plexus
Superficial epigastric vein (*cut*)
Pubic (obturator anastomotic) vein
Uterovaginal venous plexus
Femoral vein
Great saphenous vein
Vesical venous plexus
External pudendal vein
Anterior abdominal wall (*turned down*)

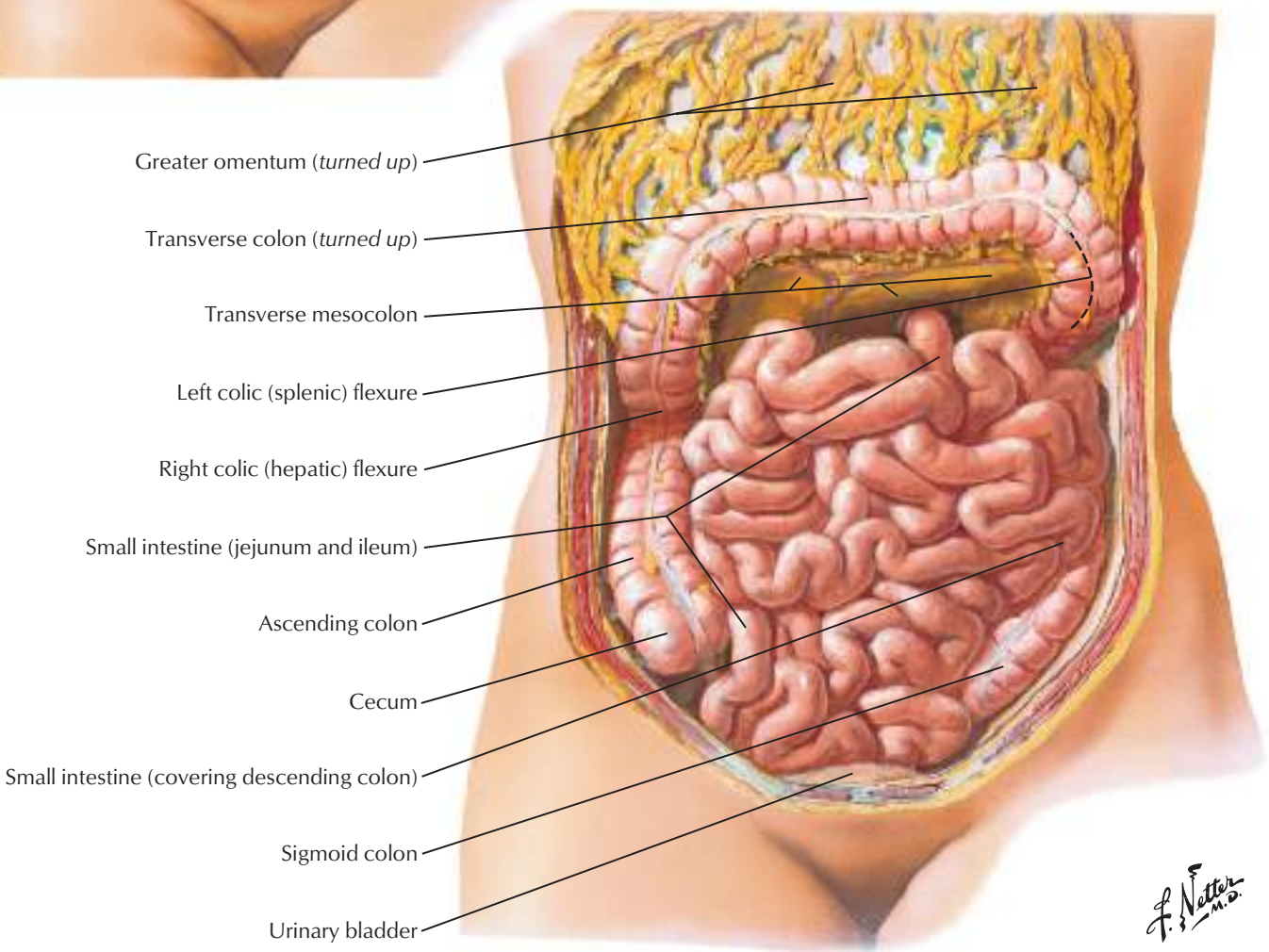
Lymph Vessels and Nodes of Posterior Abdominal Wall

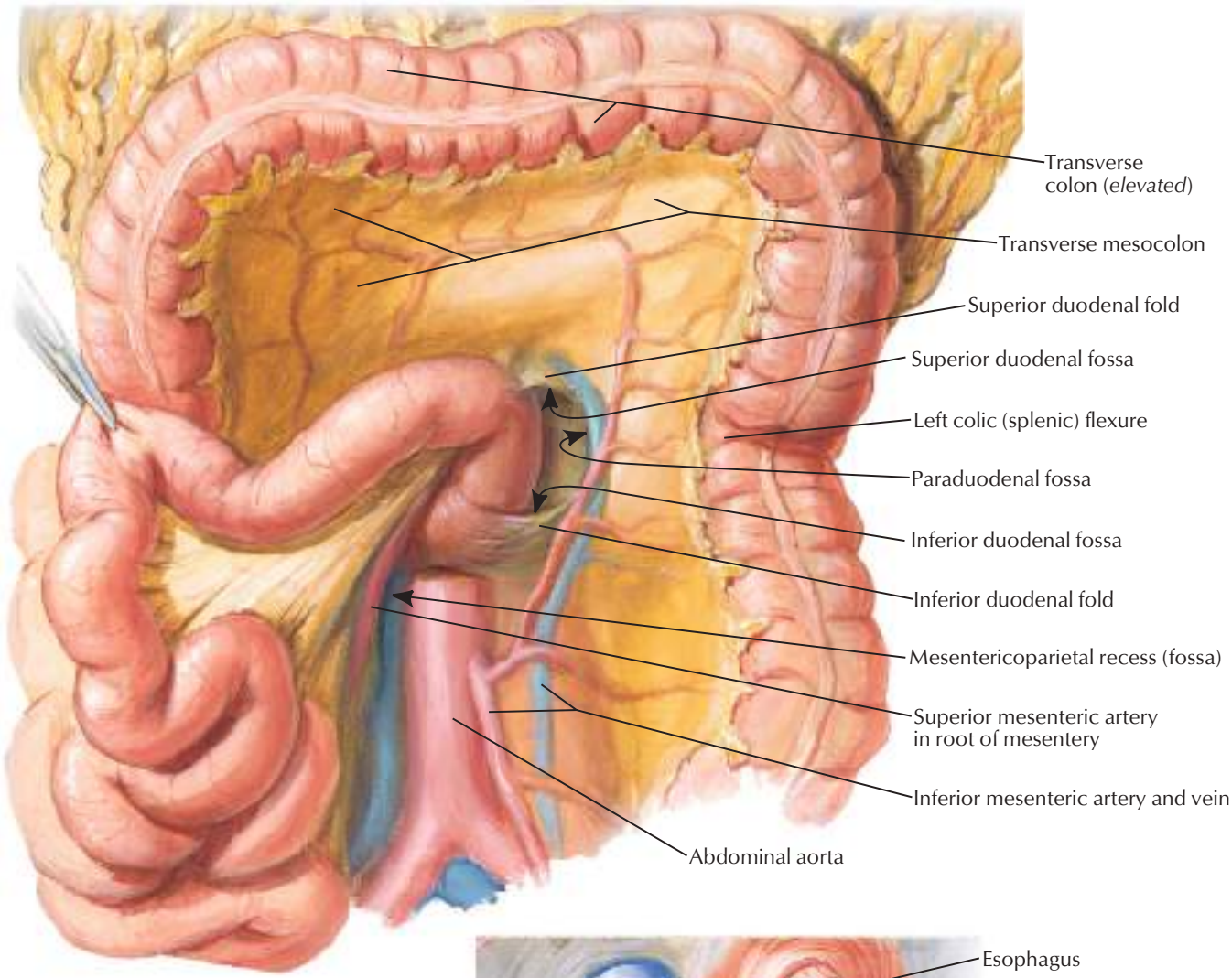
See also Plates 235, 384



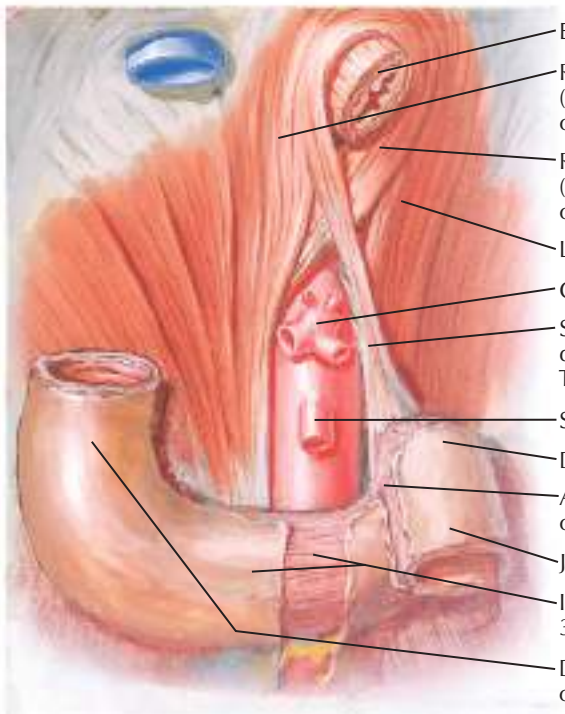

Greater, lesser, and least splanchnic nerves
Celiac, superior mesenteric, and aorticorenal ganglia
Sympathetic trunks
Iliohypogastric nerve (L1)
Ilio-inguinal nerve (L1)
Subcostal nerve (T12)
Muscular branches from lumbar plexus
Iliohypogastric nerve (L1)
Subcostal nerve (T12)
Ilio-inguinal nerve (L1)
Psoas major muscle (cut)
Genitofemoral nerve (L1, 2)
Quadratus lumborum muscle
Transversus abdominis muscle (cut)
Iliohypogastric nerve (L1)
Ilio-inguinal nerve (L1)
Subcostal nerve (T12) and its lateral cutaneous branch
Genitofemoral nerve (L1, 2)
Lateral femoral cutaneous nerve (L2, 3)
Intermesenteric (para-aortic) plexus
Femoral branch, Genital branch of genitofemoral nerve (L1, 2)
Gray and white rami communicantes
Lumbosacral trunks (L4, 5)
Gray rami communicantes
Obturator nerves
Accessory obturator nerve (L3, 4) (occasional)
Lateral femoral cutaneous nerve (L2, 3)
Femoral nerve
Lumbosacral plexus (L4–S4)
Femoral nerve (L2–L4)
Pudendal nerve (S2, 3, 4)
Obturator nerve (L2, 3, 4)
Anterior cutaneous branch of iliohypogastric nerve (L1)
Anterior scrotal (labial) branches of ilio-inguinal nerve (L1)
Genital branch
Femoral branches
of genitofemoral nerve (L1, 2)


Falciform ligament
Left lobe of liver
Right lobe of liver
Stomach
Gallbladder
Greater omentum overlying transverse colon and small intestine (jejunum and ileum)


Greater omentum (*turned up*)
Transverse colon (*turned up*)
Transverse mesocolon
Left colic (splenic) flexure
Right colic (hepatic) flexure
Small intestine (jejunum and ileum)
Ascending colon
Cecum
Small intestine (covering descending colon)
Sigmoid colon
Urinary bladder

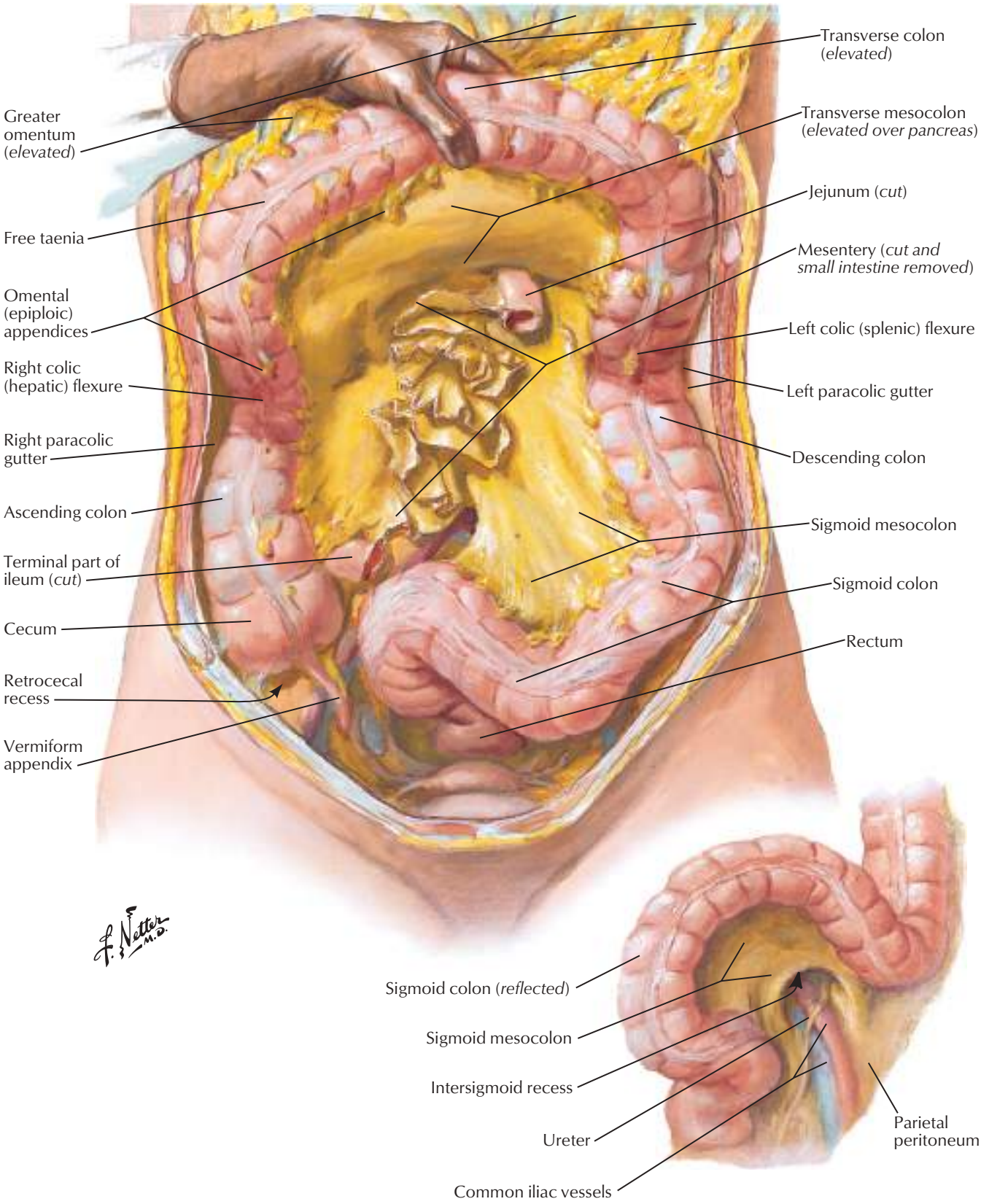


Exposure of suspensory muscle of duodenum (ligament of Treitz)



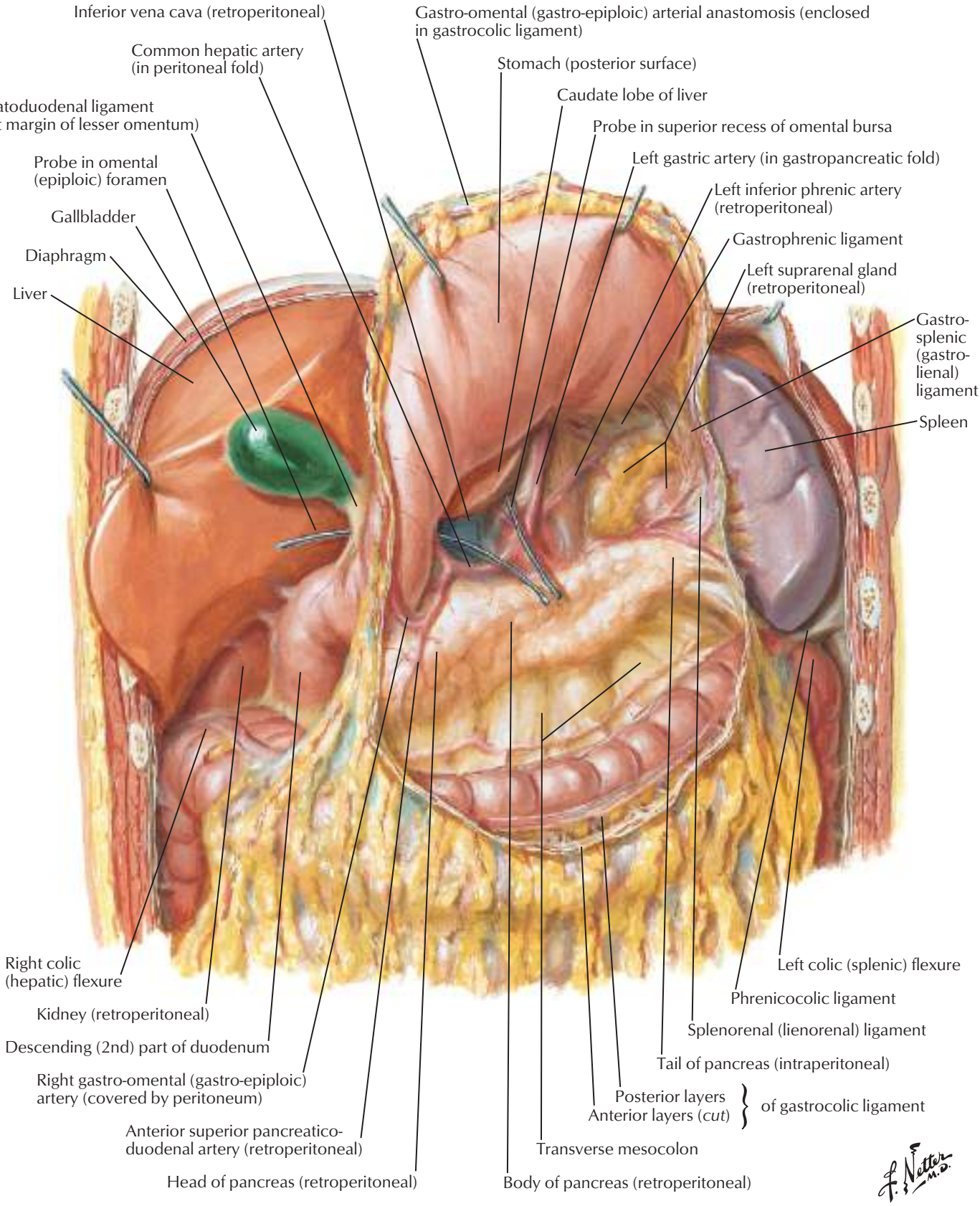
Mesenteric Relations of Intestines (continued)

See also Plate 288



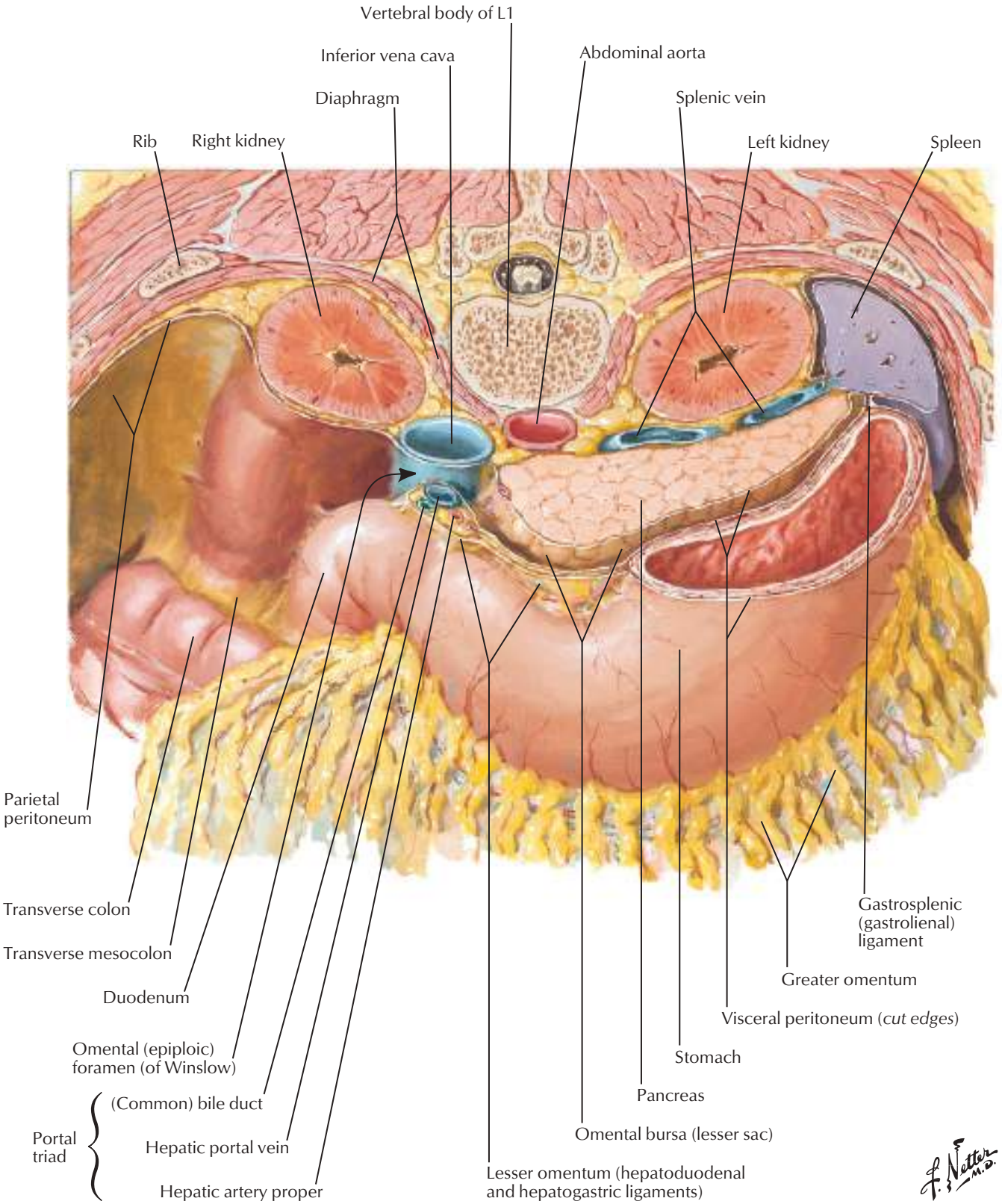
Omental Bursa: Stomach Reflected

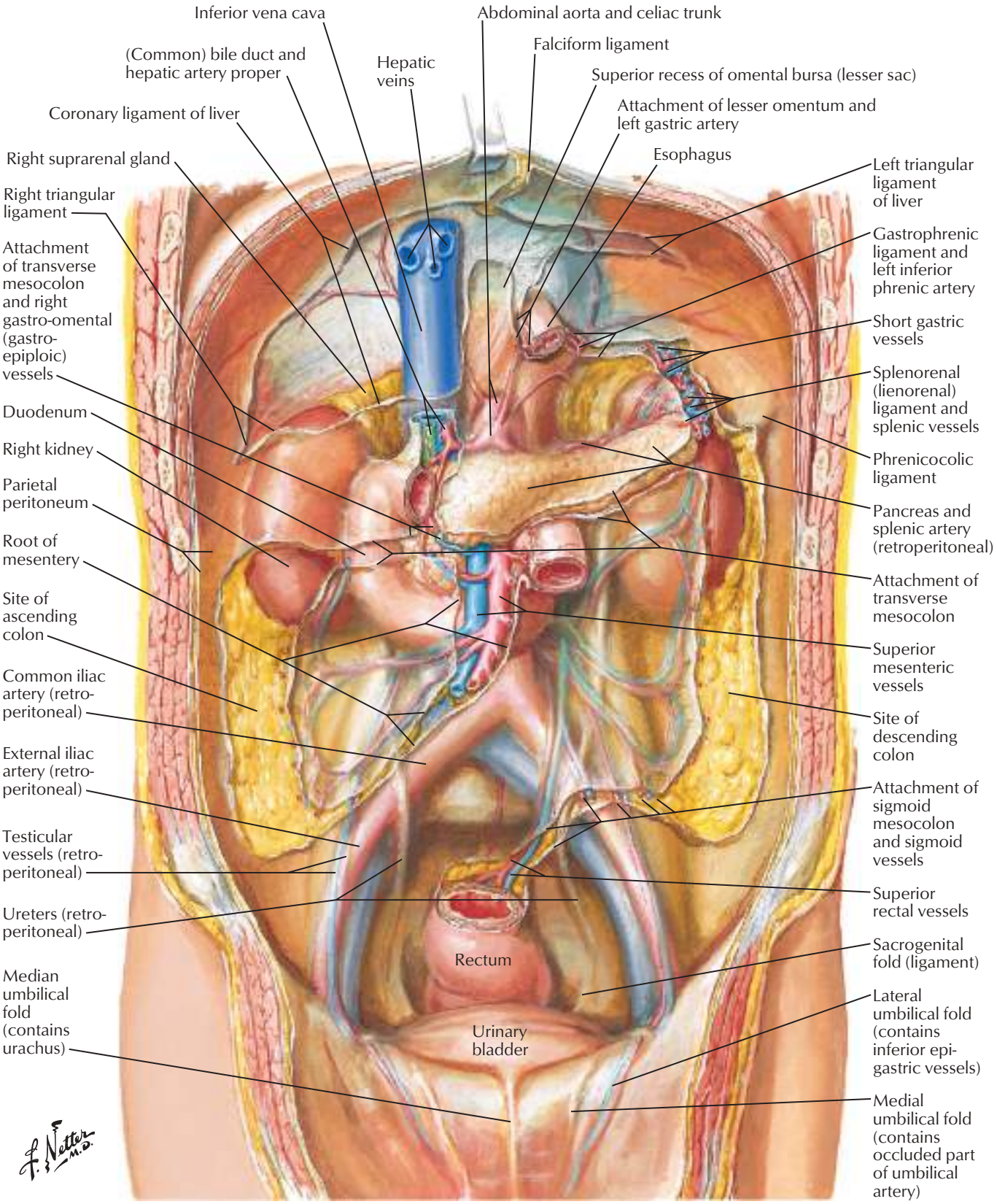
See also Plates 281, 284

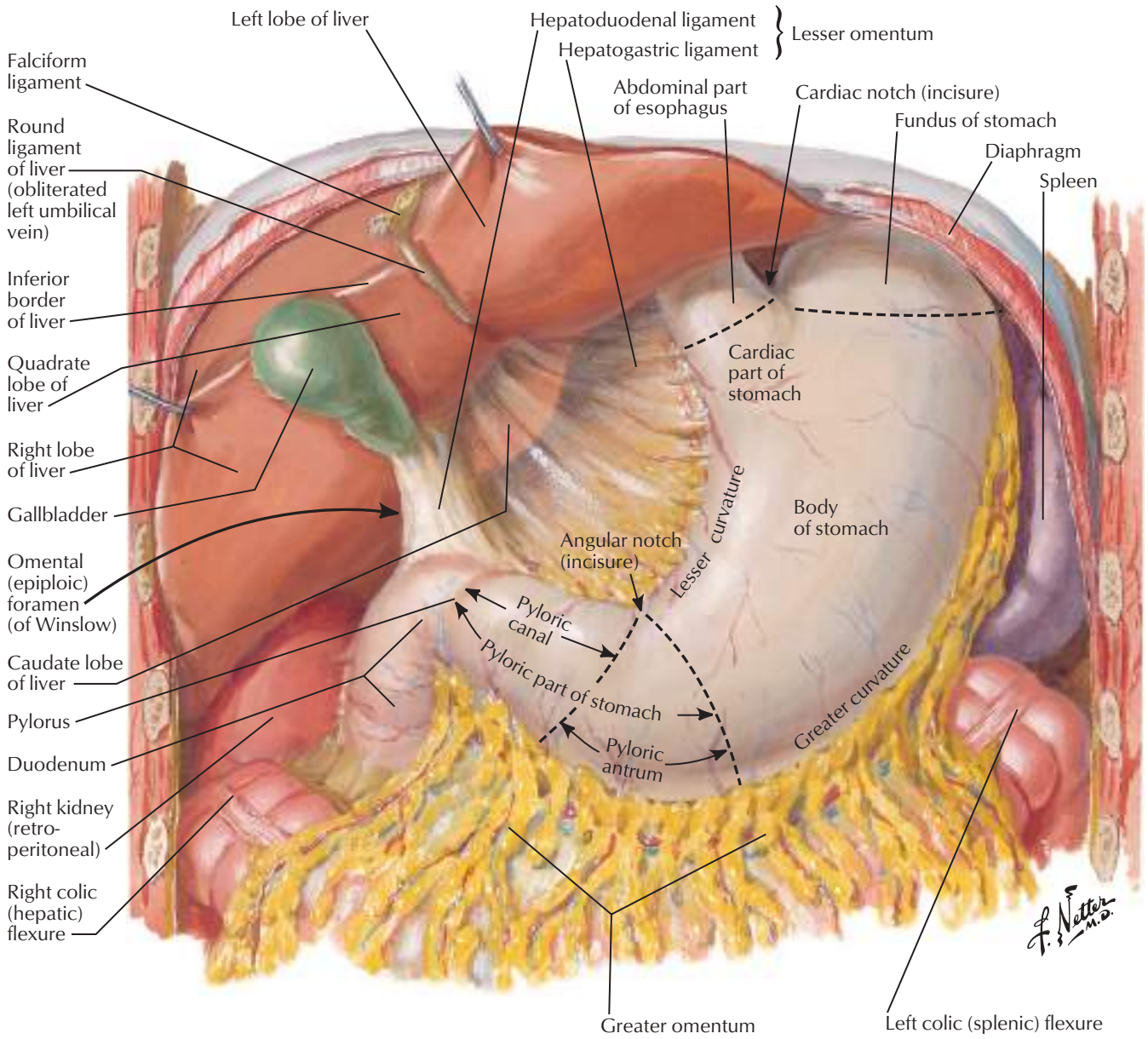


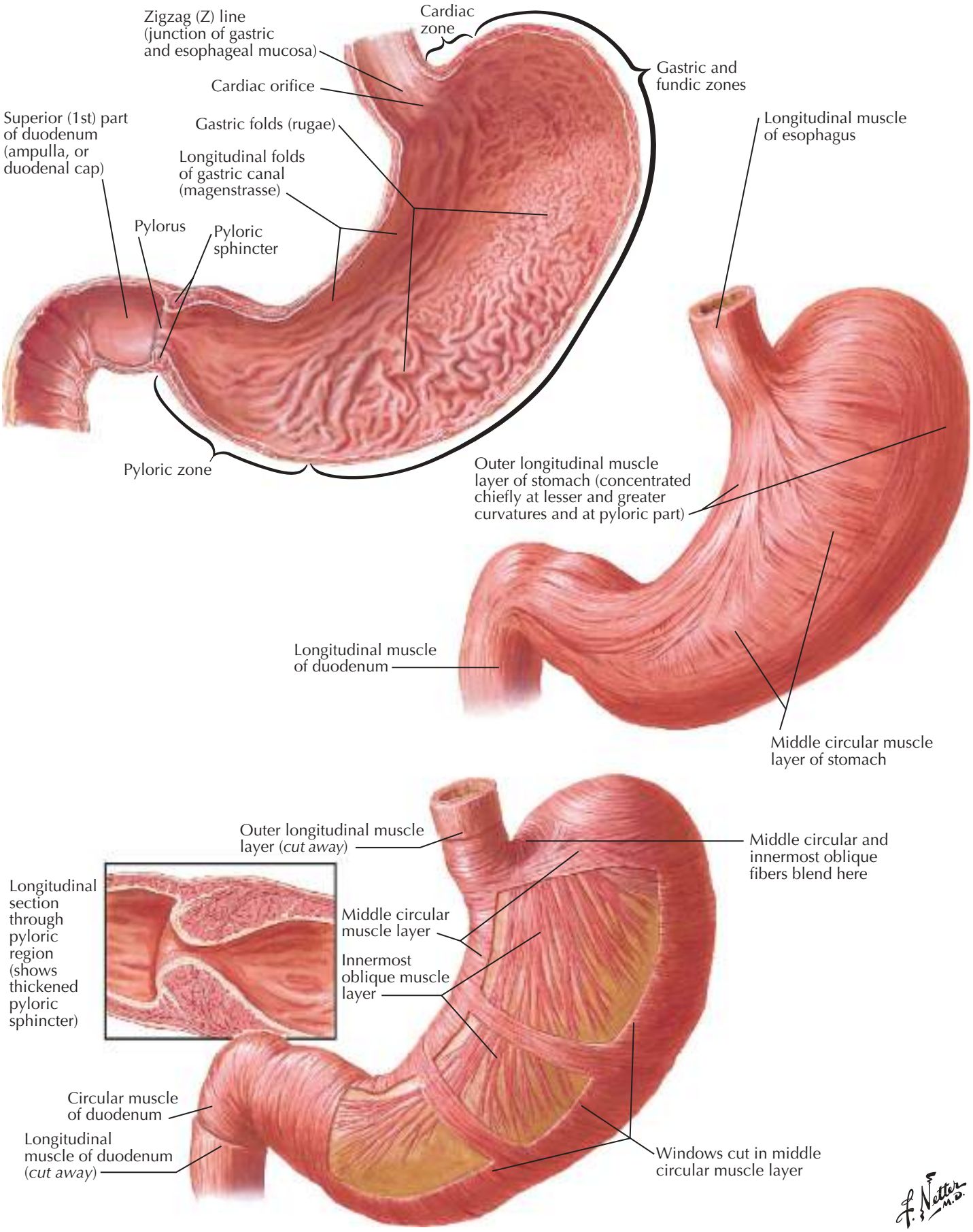
Omental Bursa: Cross Section

See also Plate 269



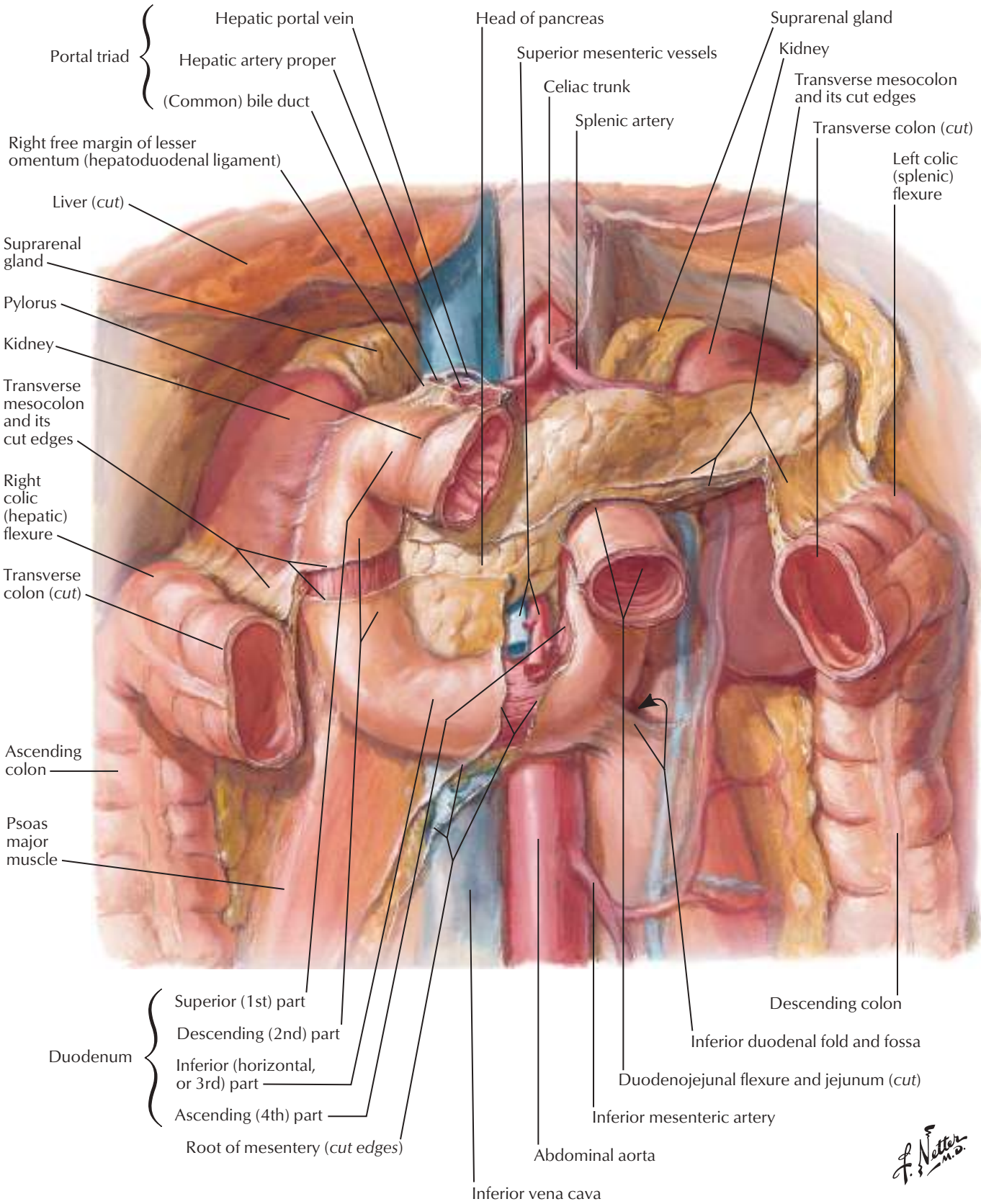

Inferior vena cava
Abdominal aorta and celiac trunk
(Common) bile duct and hepatic artery proper
Hepatic veins
Falciform ligament
Superior recess of omental bursa (lesser sac)
Coronary ligament of liver
Attachment of lesser omentum and left gastric artery
Right suprarenal gland
Esophagus
Left triangular ligament of liver
Right triangular ligament
Gastrophrenic ligament and left inferior phrenic artery
Attachment of transverse mesocolon and right gastro-omental (gastro-epiploic) vessels
Short gastric vessels
Splenorenal (lienorenal) ligament and splenic vessels
Duodenum
Phrenicocolic ligament
Right kidney
Pancreas and splenic artery (retroperitoneal)
Parietal peritoneum
Root of mesentery
Attachment of transverse mesocolon
Site of ascending colon
Superior mesenteric vessels
Common iliac artery (retro-peritoneal)
Site of descending colon
External iliac artery (retro-peritoneal)
Attachment of sigmoid mesocolon and sigmoid vessels
Testicular vessels (retro-peritoneal)
Superior rectal vessels
Ureters (retro-peritoneal)
Rectum
Sacrogenital fold (ligament)
Median umbilical fold (contains urachus)
Lateral umbilical fold (contains inferior epi-gastric vessels)
Urinary bladder
Medial umbilical fold (contains occluded part of umbilical artery)

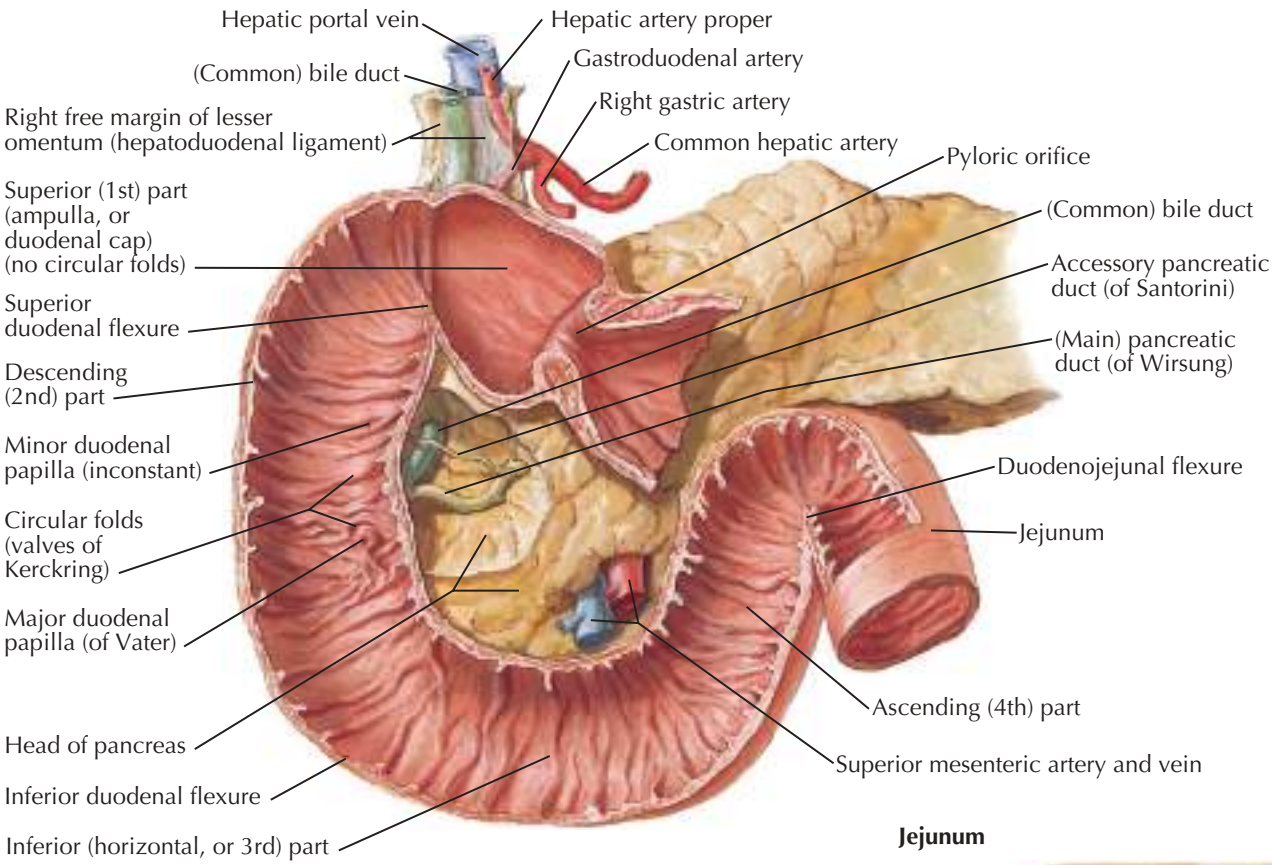

Left lobe of liver
Hepatoduodenal ligament
Hepatogastric ligament
Lesser omentum
Falciform ligament
Round ligament of liver (obliterated left umbilical vein)
Abdominal part of esophagus
Cardiac notch (incisure)
Fundus of stomach
Diaphragm
Spleen
Inferior border of liver
Quadrate lobe of liver
Cardiac part of stomach
Right lobe of liver
Gallbladder
Body of stomach
Lesser curvature
Angular notch (incisure)
Omental (epiploic) foramen (of Winslow)
Pyloric canal
Pyloric part of stomach
Caudate lobe of liver
Pylorus
Greater curvature
Pyloric antrum
Duodenum
Right kidney (retro-peritoneal)
Right colic (hepatic) flexure
Greater omentum
Left colic (splenic) flexure


Zigzag (Z) line (junction of gastric and esophageal mucosa)
Cardiac zone
Cardiac orifice
Gastric and fundic zones
Superior (1st) part of duodenum (ampulla, or duodenal cap)
Gastric folds (rugae)
Longitudinal folds of gastric canal (magenstrasse)
Longitudinal muscle of esophagus
Pylorus
Pyloric sphincter
Pyloric zone
Outer longitudinal muscle layer of stomach (concentrated chiefly at lesser and greater curvatures and at pyloric part)
Longitudinal muscle of duodenum
Middle circular muscle layer of stomach
Outer longitudinal muscle layer (cut away)
Middle circular and innermost oblique fibers blend here
Longitudinal section through pyloric region (shows thickened pyloric sphincter)
Middle circular muscle layer
Innermost oblique muscle layer
Circular muscle of duodenum
Longitudinal muscle of duodenum (cut away)
Windows cut in middle circular muscle layer
F. Netter M.D.

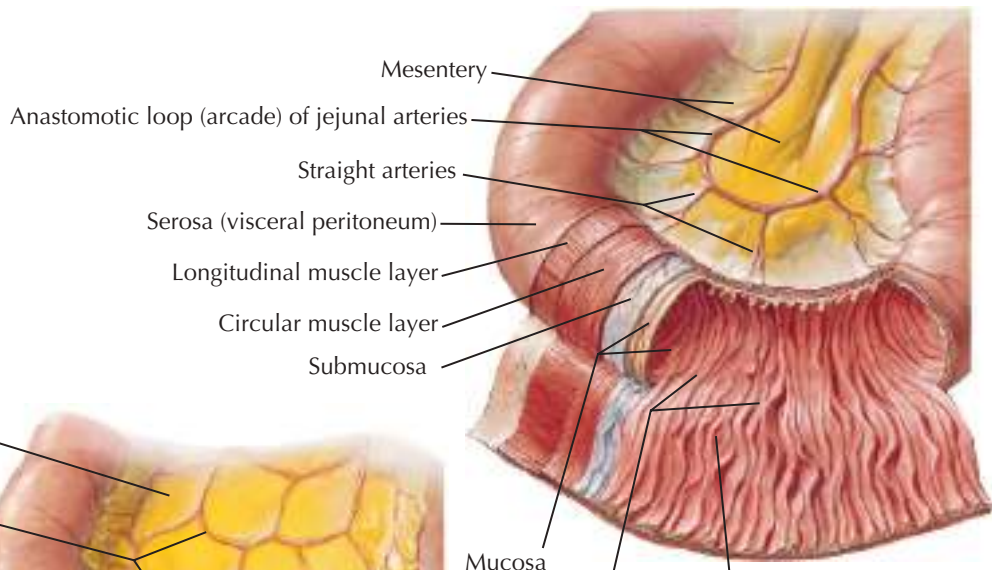
Duodenum in Situ

See also Plate 268

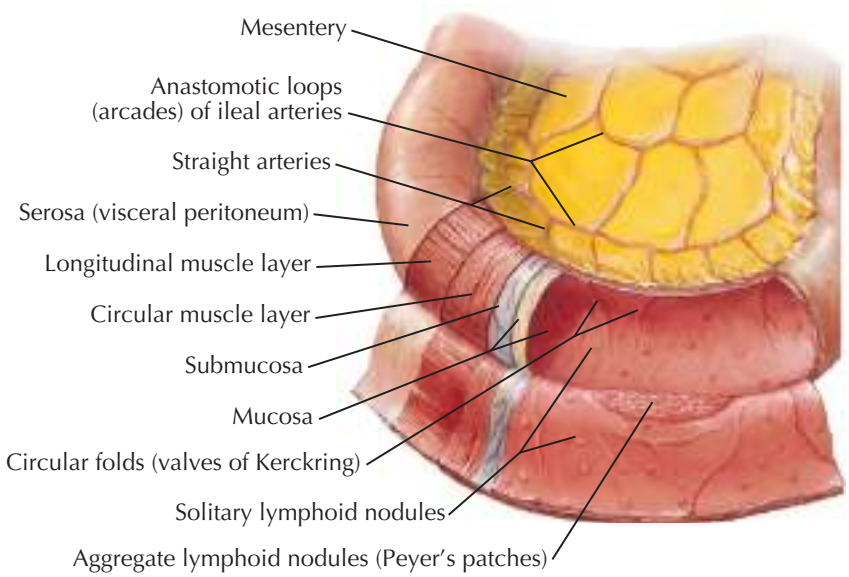


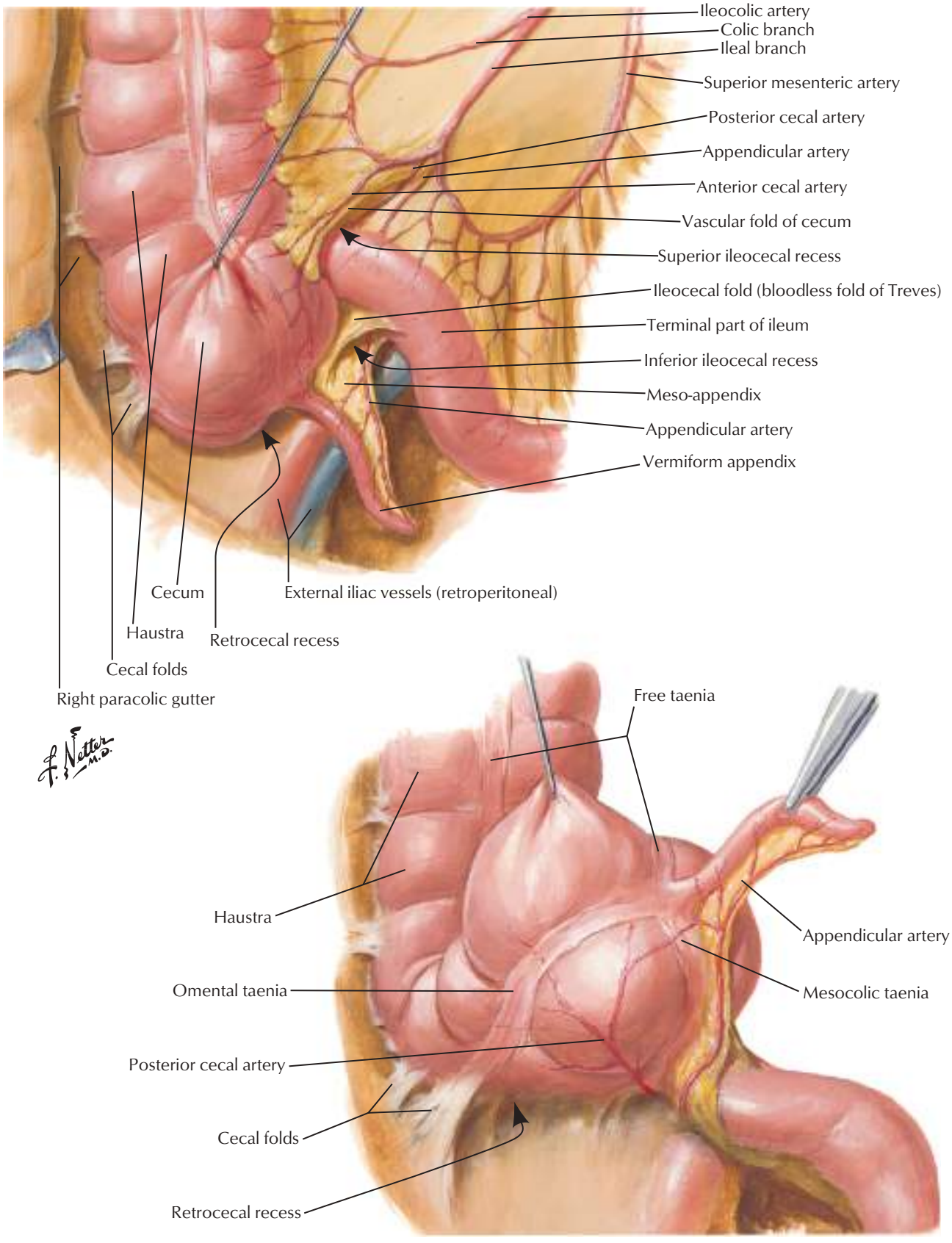


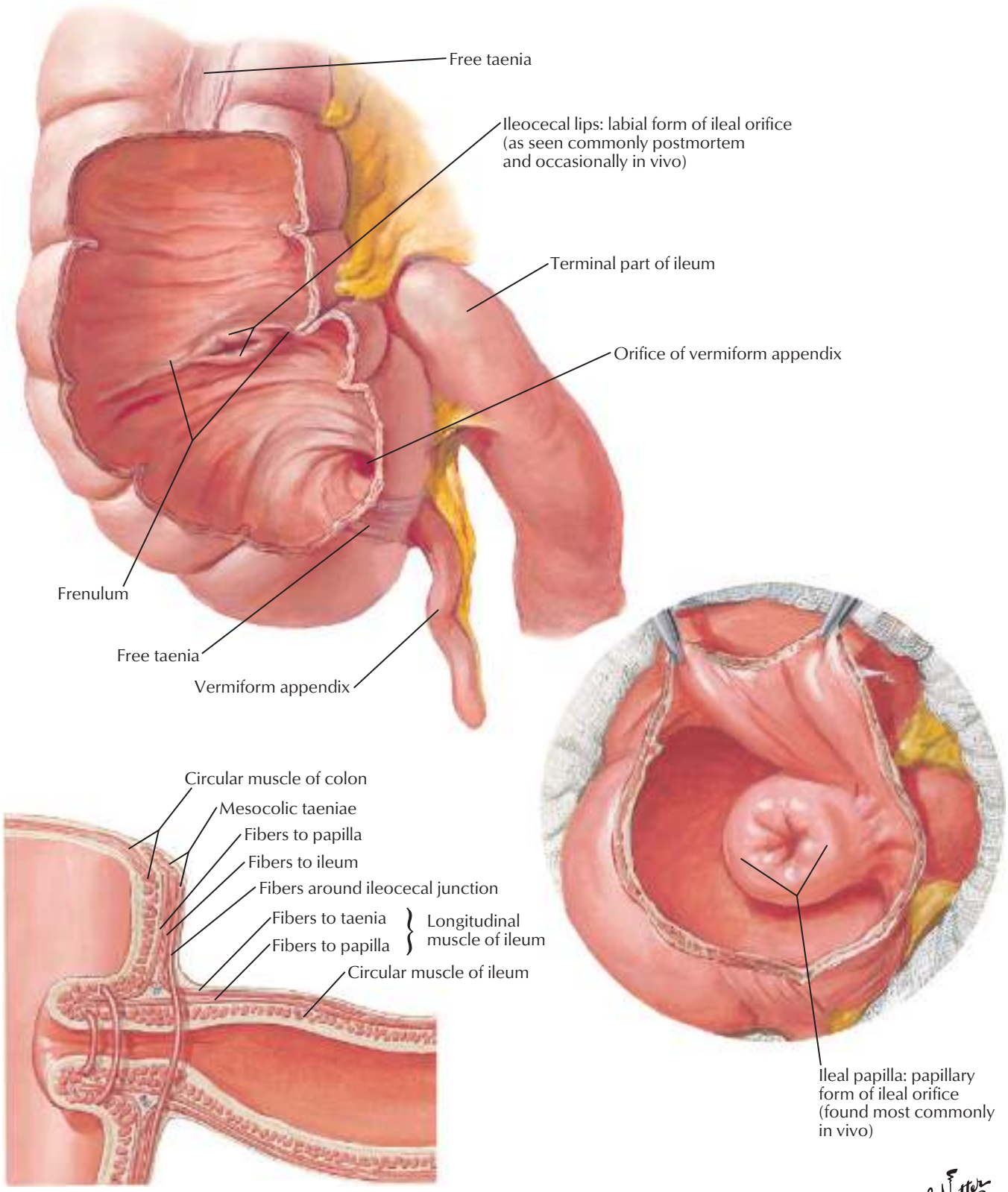
Jejunum



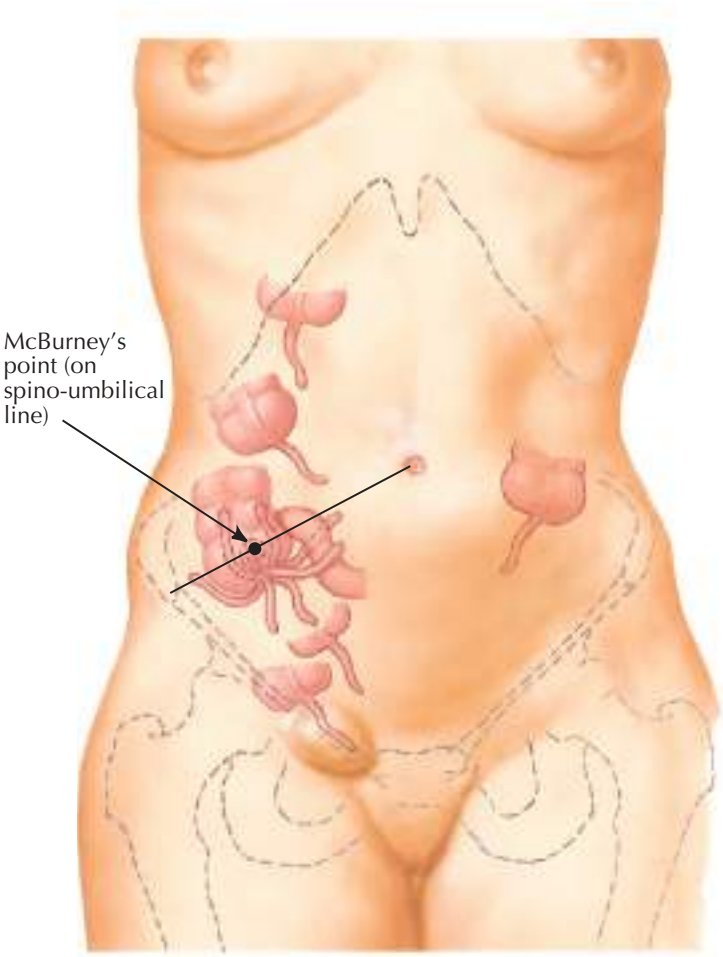
Ileum




Ileocolic artery
Colic branch
Ileal branch
Superior mesenteric artery
Posterior cecal artery
Appendicular artery
Anterior cecal artery
Vascular fold of cecum
Superior ileocecal recess
Ileocecal fold (bloodless fold of Treves)
Terminal part of ileum
Inferior ileocecal recess
Meso-appendix
Appendicular artery
Vermiform appendix
Cecum
External iliac vessels (retroperitoneal)
Haustra
Retrocecal recess
Cecal folds
Right paracolic gutter
Free taenia
Haustra
Appendicular artery
Omental taenia
Mesocolic taenia
Posterior cecal artery
Cecal folds
Retrocecal recess

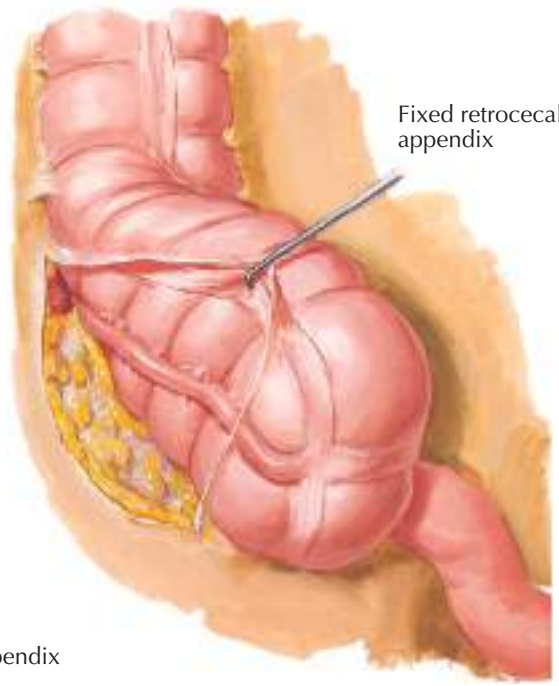


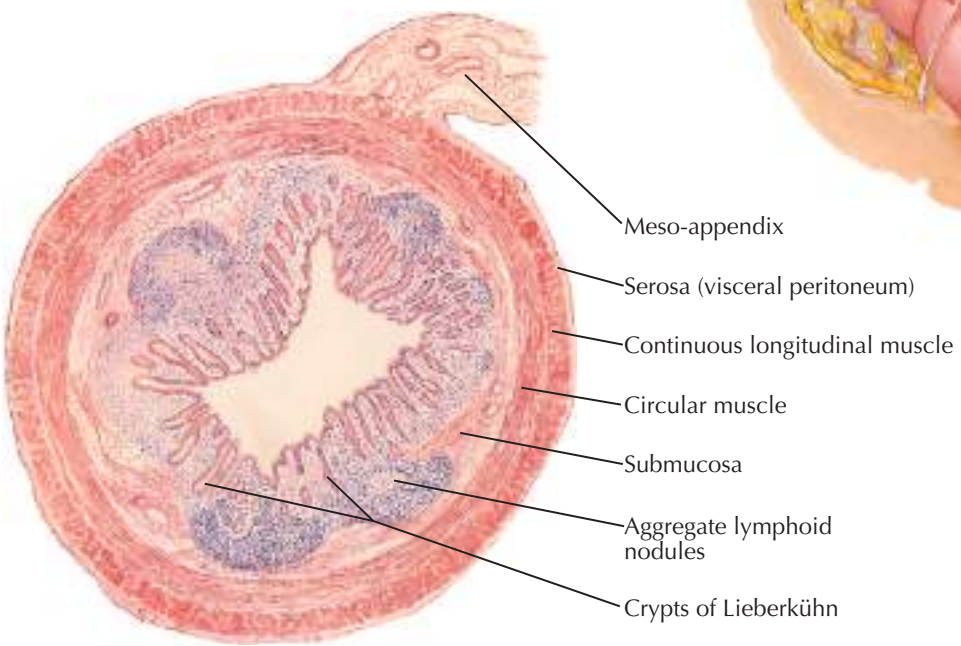
Schema of muscle fibers at ileal orifice

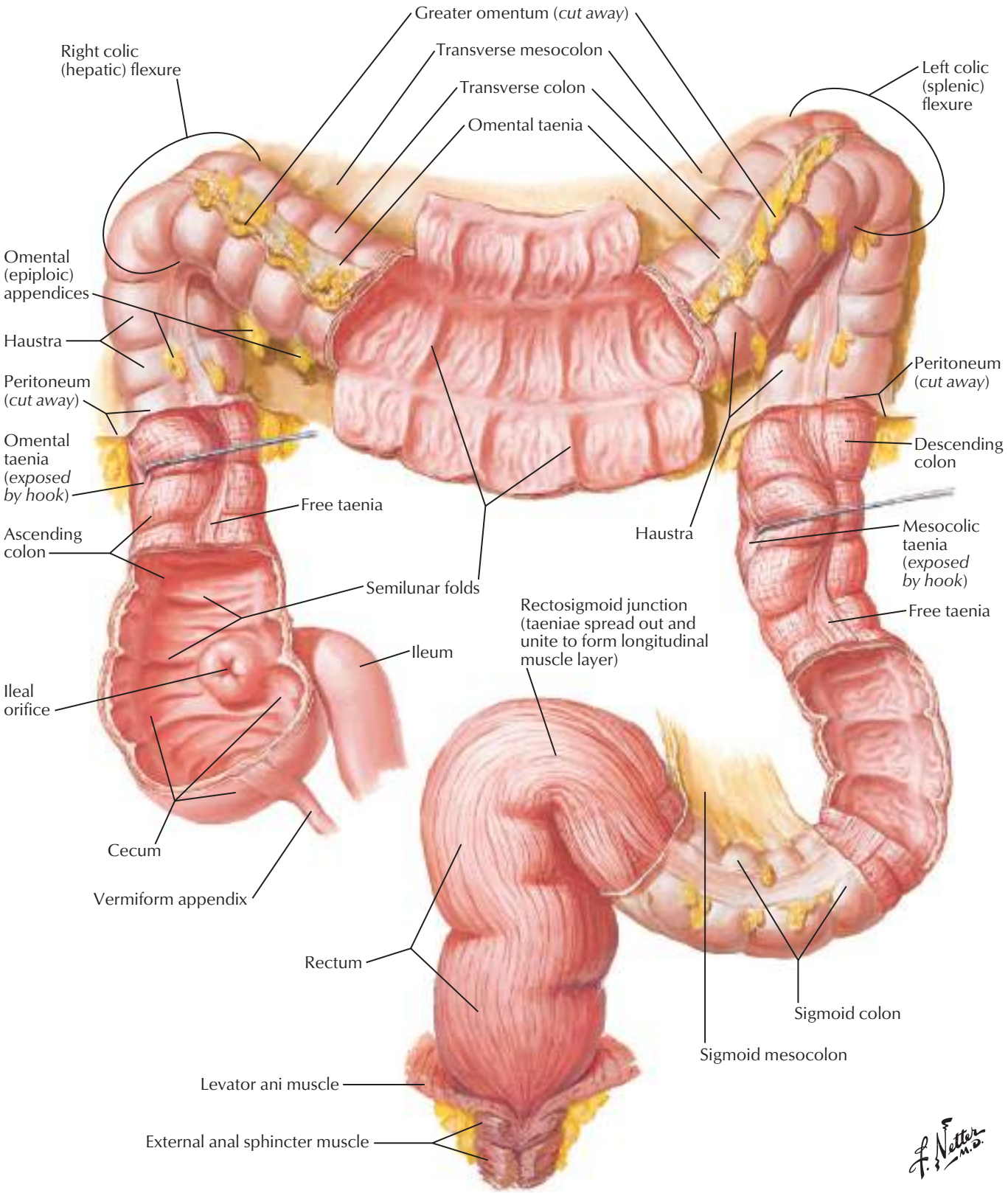


Variations in position of appendix

Coronal CT with contrast

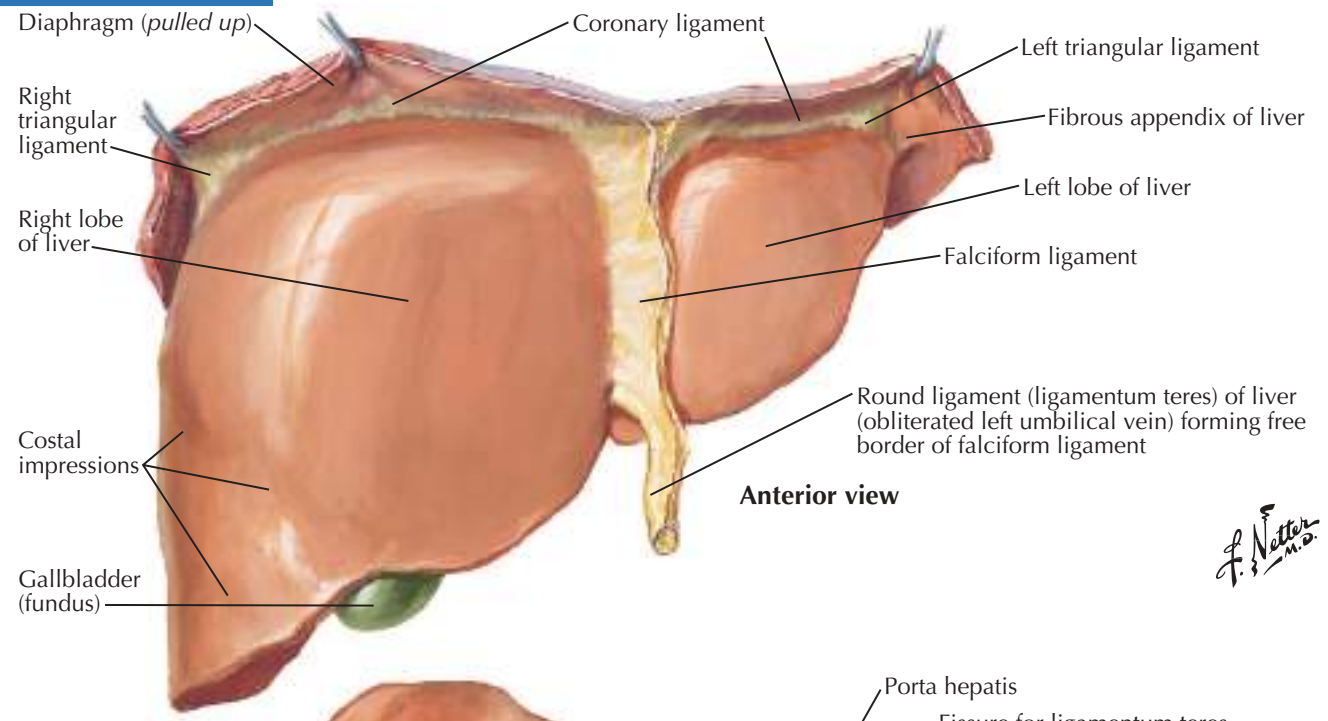




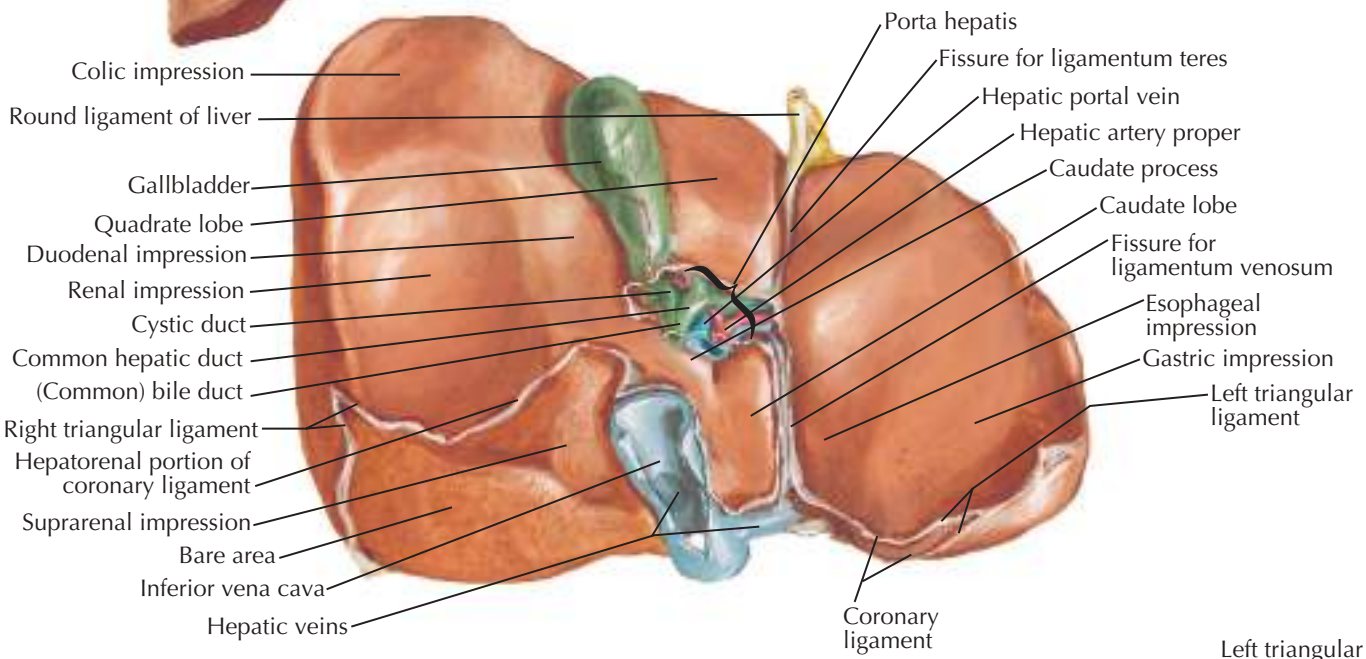

Greater omentum (*cut away*)
Right colic (hepatic) flexure
Transverse mesocolon
Transverse colon
Omental taenia
Left colic (splenic) flexure
Omental (epiploic) appendices
Haustra
Peritoneum (*cut away*)
Omental taenia (*exposed by hook*)
Free taenia
Ascending colon
Semilunar folds
Ileum
Ileal orifice
Cecum
Vermiform appendix
Haustra
Peritoneum (*cut away*)
Descending colon
Mesocolic taenia (*exposed by hook*)
Free taenia
Rectosigmoid junction (taeniae spread out and unite to form longitudinal muscle layer)
Rectum
Levator ani muscle
External anal sphincter muscle
Sigmoid colon
Sigmoid mesocolon

Surfaces and Bed of Liver

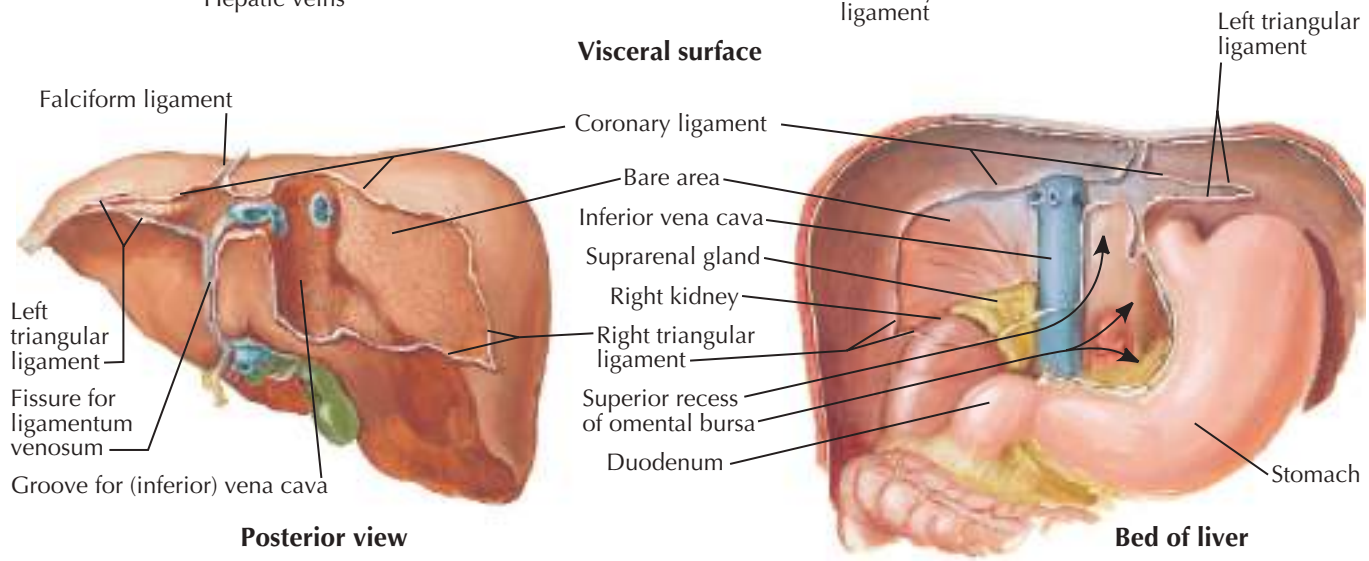
See also Plate 268



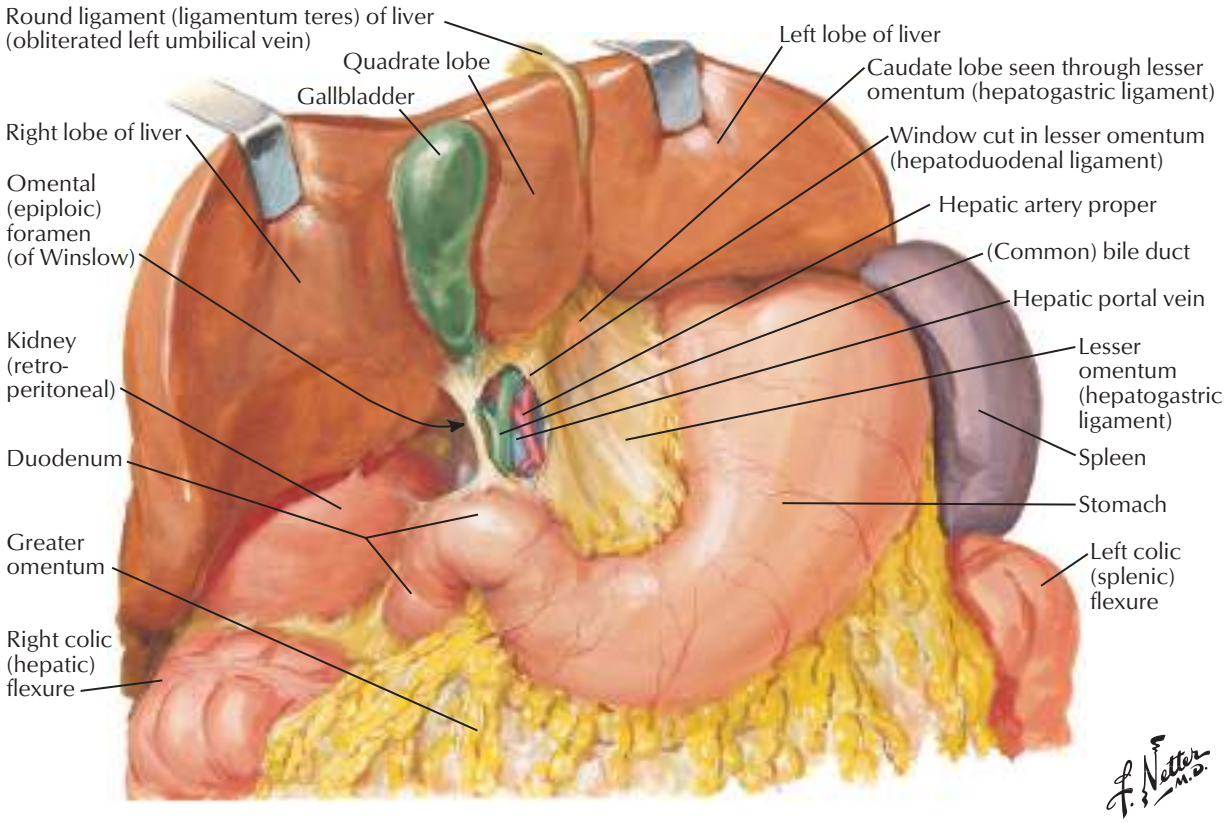
Anterior view

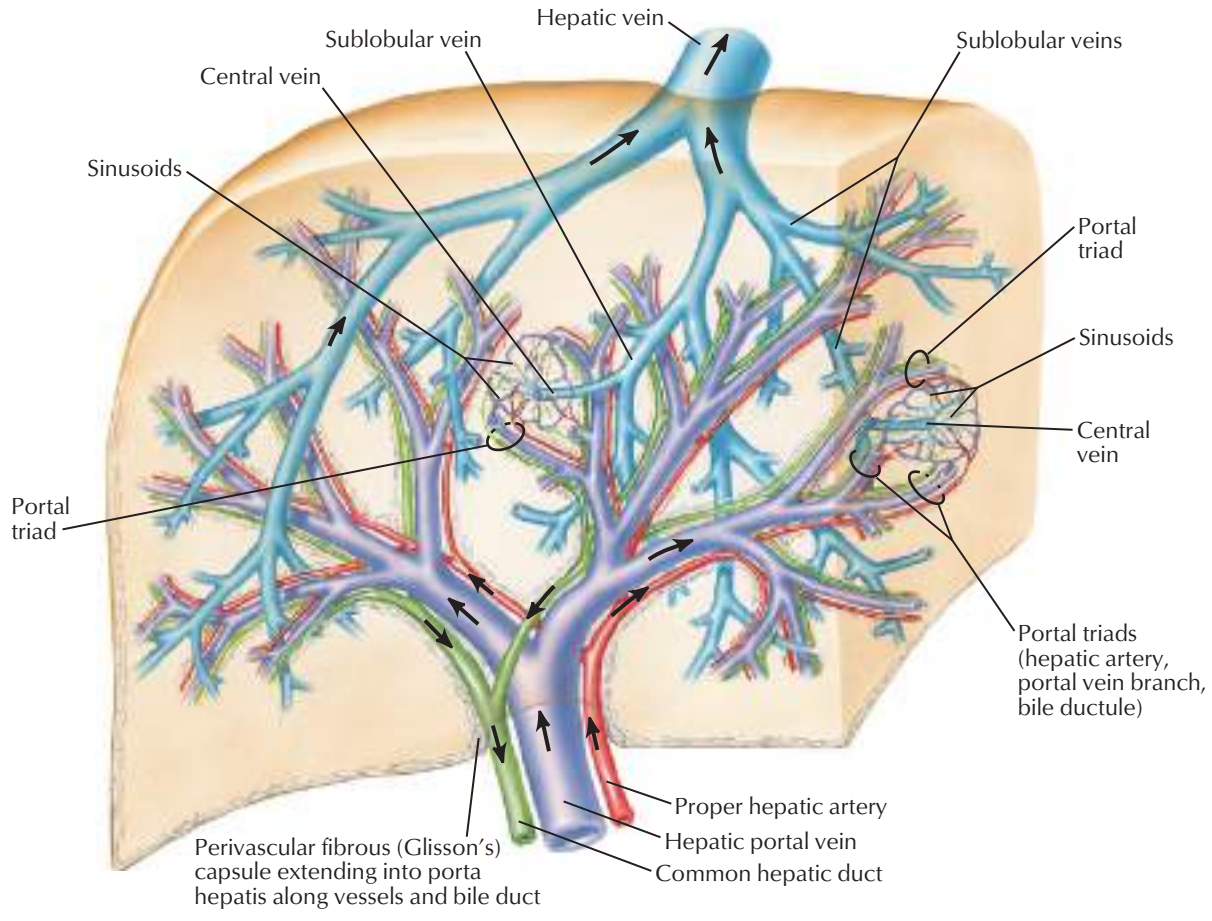


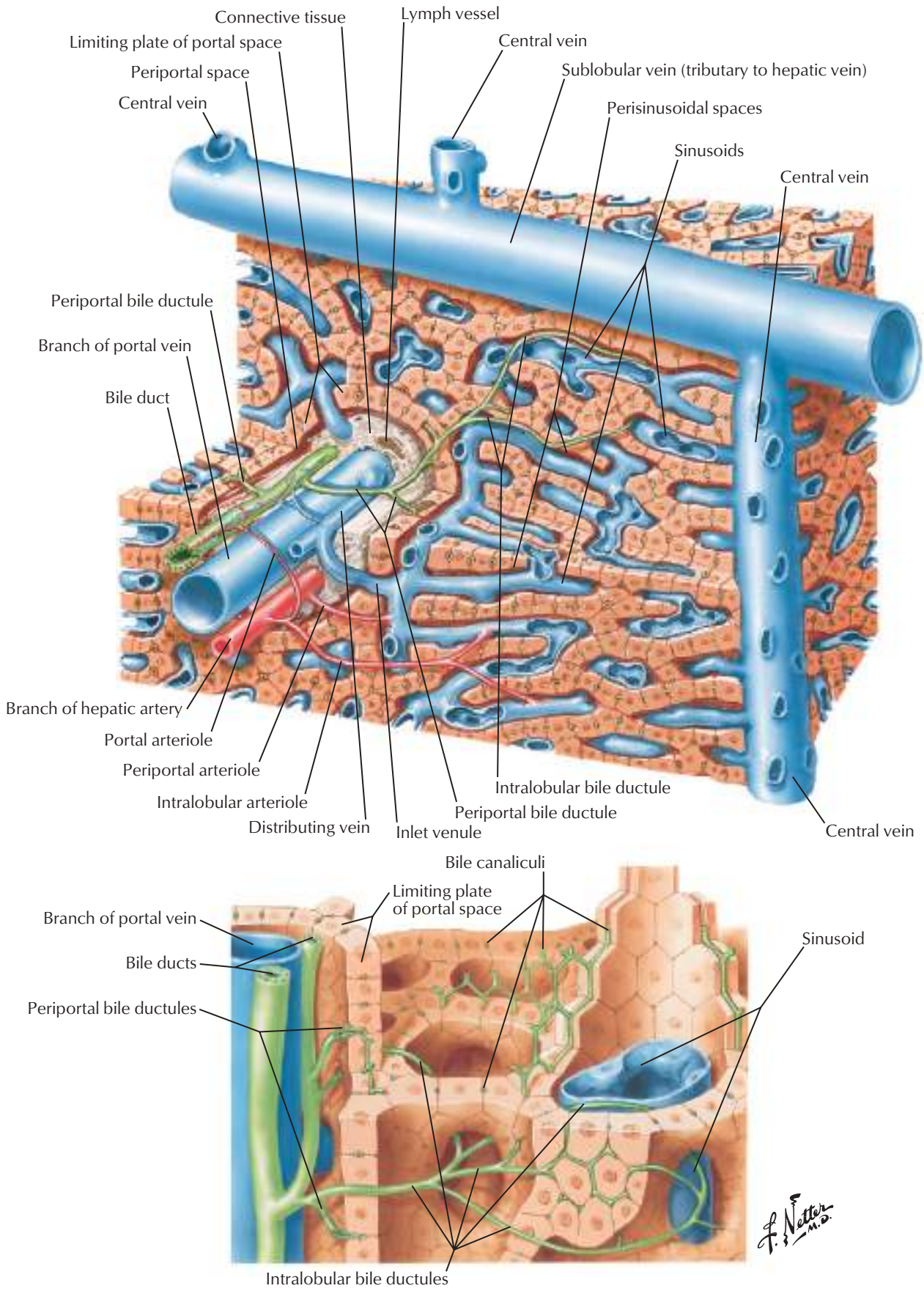
Visceral surface

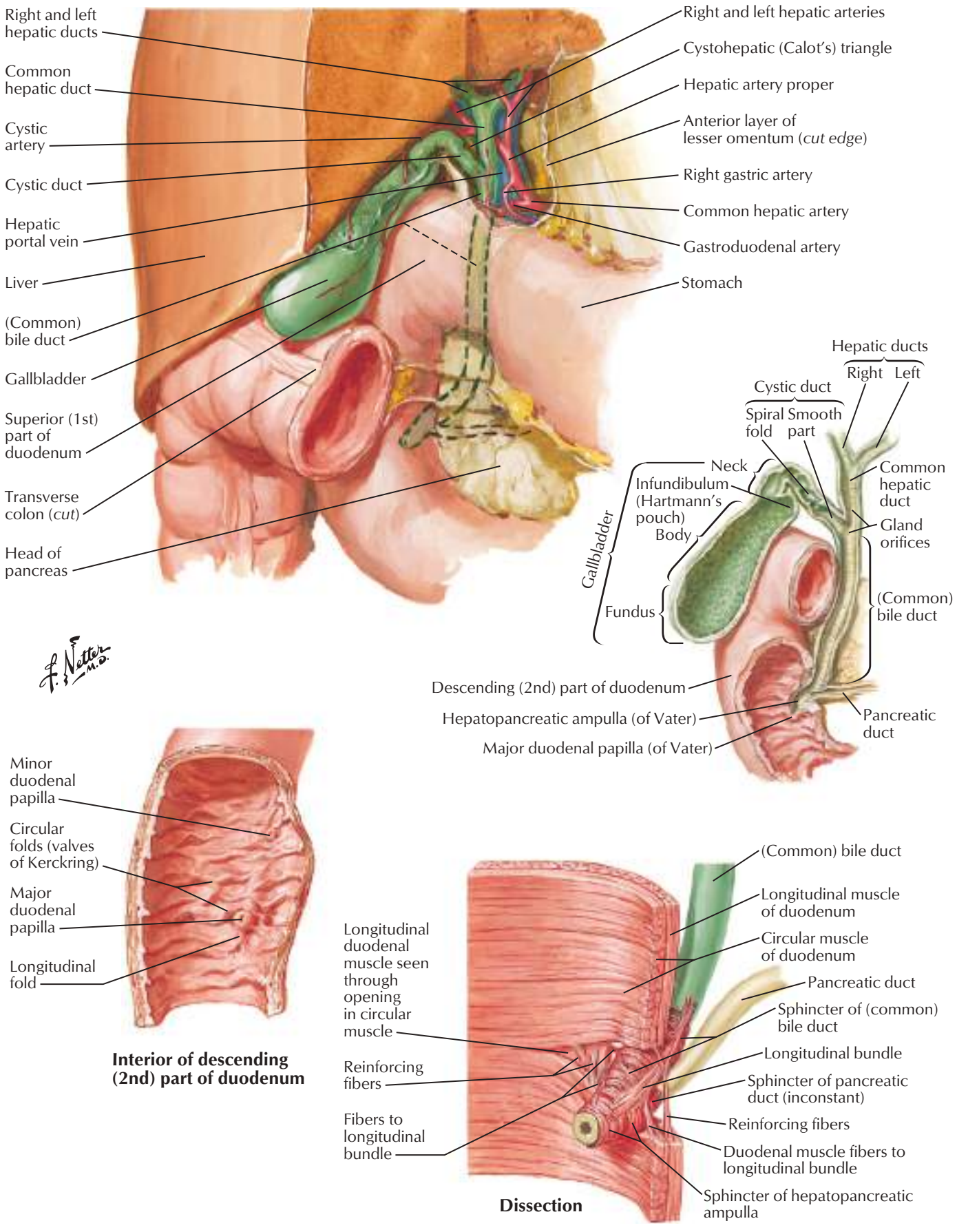


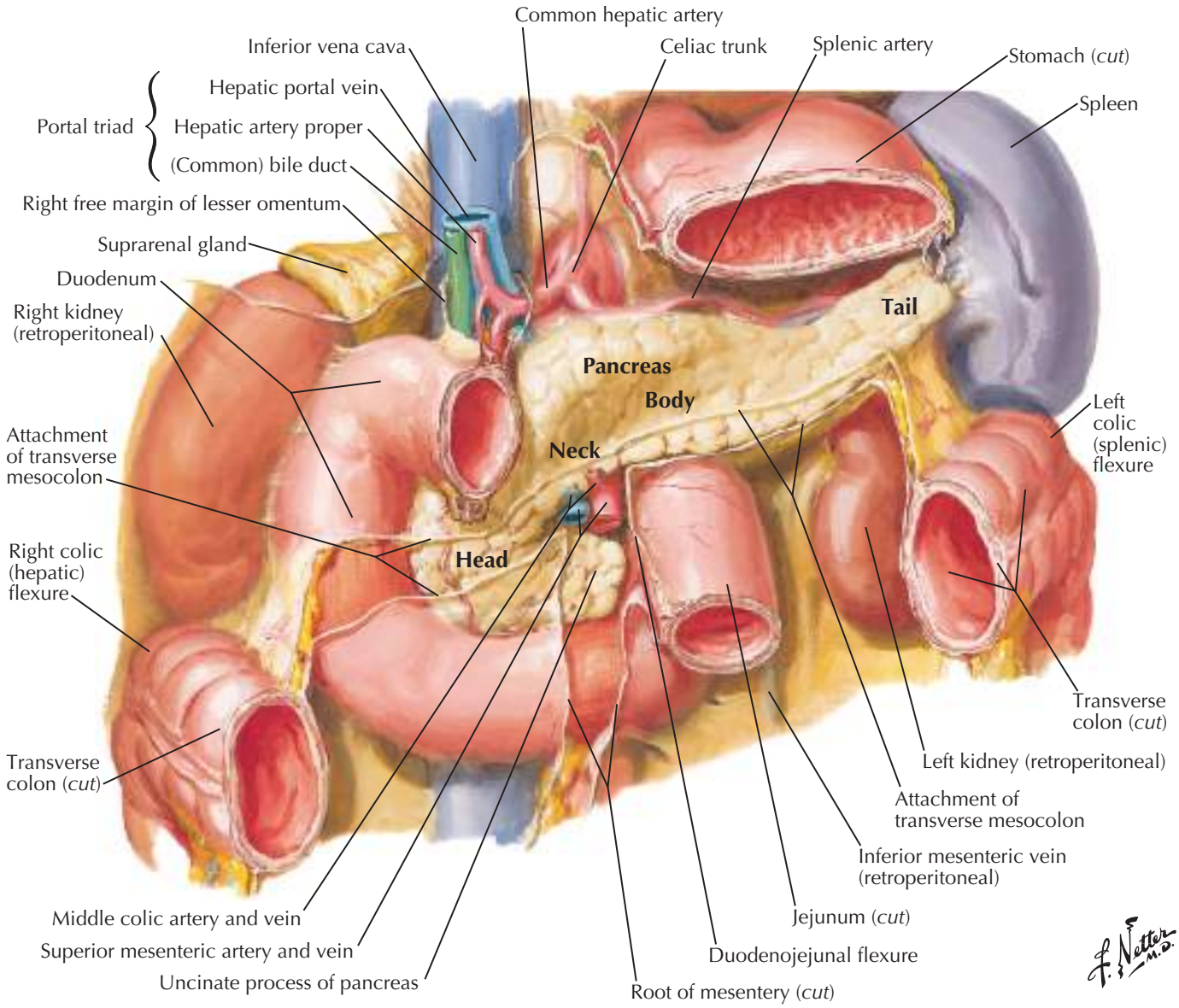
Posterior view **Bed of liver**


Round ligament (ligamentum teres) of liver (obliterated left umbilical vein)
Quadrate lobe
Gallbladder
Right lobe of liver
Omental (epiploic) foramen (of Winslow)
Kidney (retro-peritoneal)
Duodenum
Greater omentum
Right colic (hepatic) flexure
Left lobe of liver
Caudate lobe seen through lesser omentum (hepatogastric ligament)
Window cut in lesser omentum (hepatoduodenal ligament)
Hepatic artery proper
(Common) bile duct
Hepatic portal vein
Lesser omentum (hepatogastric ligament)
Spleen
Stomach
Left colic (splenic) flexure

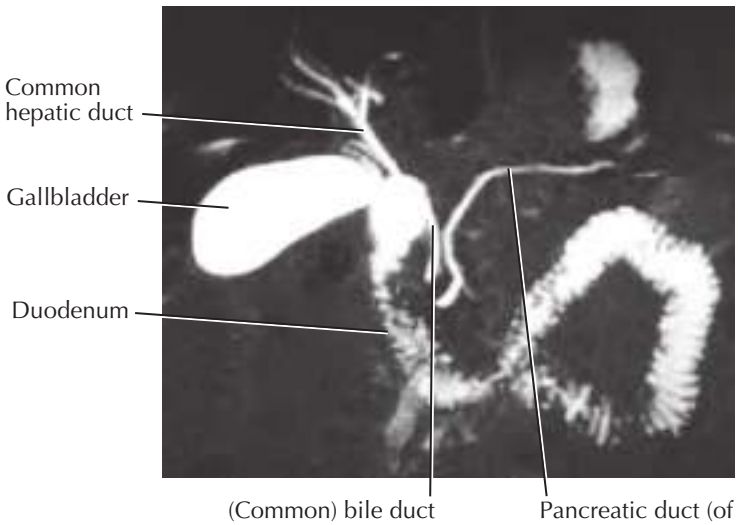

Hepatic vein
Sublobular vein
Central vein
Sinusoids
Portal triad
Sublobular veins
Portal triad
Sinusoids
Central vein
Portal triads (hepatic artery, portal vein branch, bile ductule)
Proper hepatic artery
Hepatic portal vein
Common hepatic duct
Perivascular fibrous (Glisson's) capsule extending into porta hepatis along vessels and bile duct

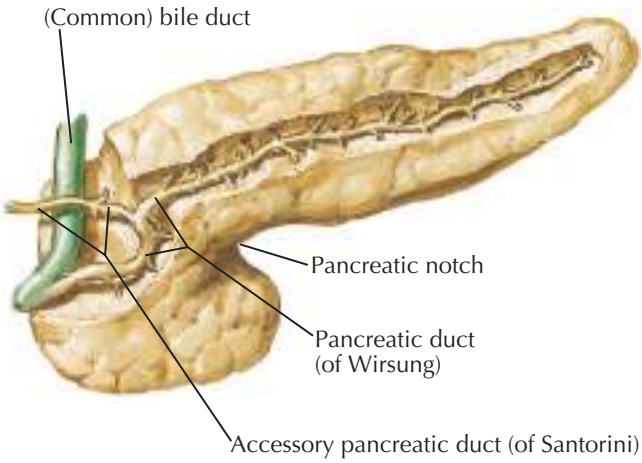

Connective tissue
Lymph vessel
Limiting plate of portal space
Central vein
Periportal space
Sublobular vein (tributary to hepatic vein)
Central vein
Perisinusoidal spaces
Sinusoids
Central vein
Periportal bile ductule
Branch of portal vein
Bile duct
Branch of hepatic artery
Portal arteriole
Periportal arteriole
Intralobular arteriole
Distributing vein
Inlet venule
Intralobular bile ductule
Periportal bile ductule
Central vein
Bile canaliculi
Limiting plate of portal space
Branch of portal vein
Sinusoid
Bile ducts
Periportal bile ductules
Intralobular bile ductules

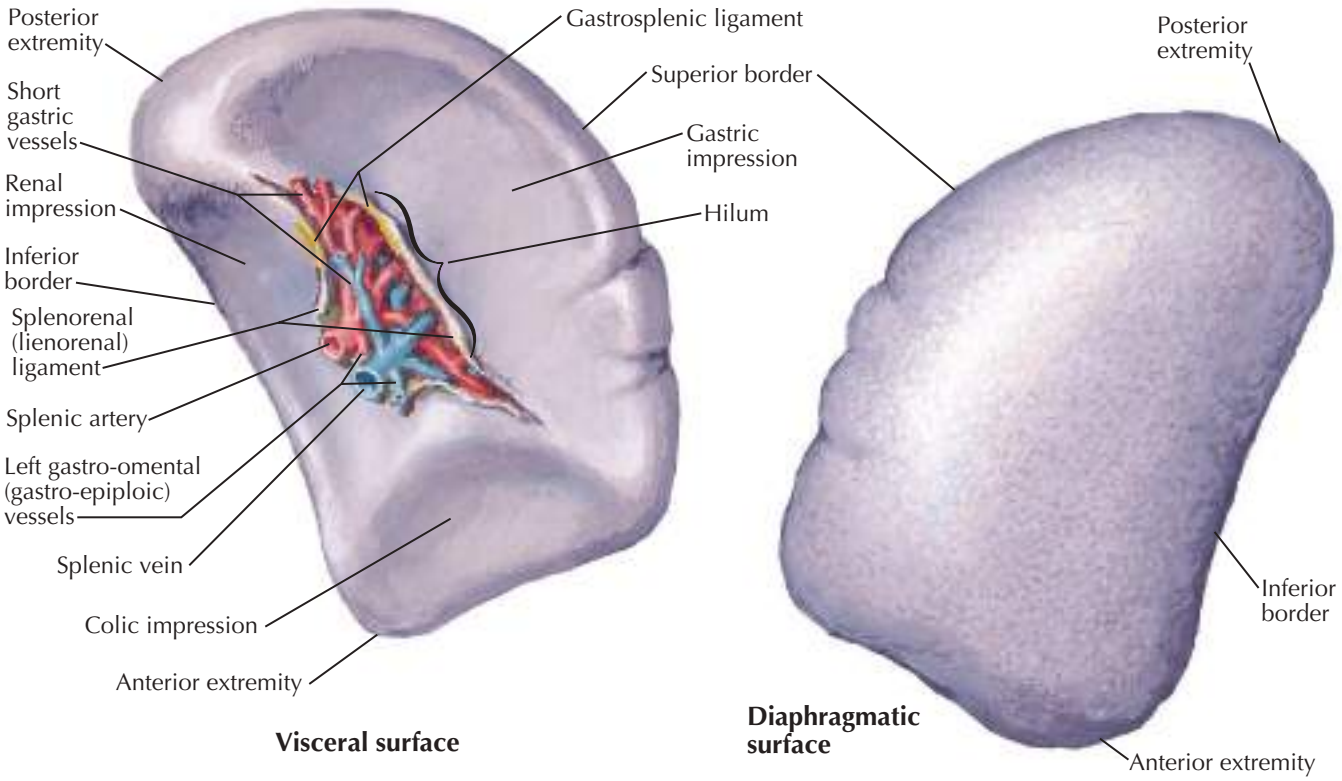

Right and left hepatic ducts
Common hepatic duct
Cystic artery
Cystic duct
Hepatic portal vein
Liver
(Common) bile duct
Gallbladder
Superior (1st) part of duodenum
Transverse colon (cut)
Head of pancreas
Right and left hepatic arteries
Cystohepatic (Calot's) triangle
Hepatic artery proper
Anterior layer of lesser omentum (cut edge)
Right gastric artery
Common hepatic artery
Gastroduodenal artery
Stomach
Hepatic ducts
Right
Left
Cystic duct
Spiral fold
Smooth part
Neck
Infundibulum (Hartmann's pouch)
Body
Fundus
Gallbladder
Common hepatic duct
Gland orifices
(Common) bile duct
Descending (2nd) part of duodenum
Hepatopancreatic ampulla (of Vater)
Major duodenal papilla (of Vater)
Pancreatic duct
Minor duodenal papilla
Circular folds (valves of Kerckring)
Major duodenal papilla
Longitudinal fold
Interior of descending (2nd) part of duodenum
Longitudinal duodenal muscle seen through opening in circular muscle
Reinforcing fibers
Fibers to longitudinal bundle
(Common) bile duct
Longitudinal muscle of duodenum
Circular muscle of duodenum
Pancreatic duct
Sphincter of (common) bile duct
Longitudinal bundle
Sphincter of pancreatic duct (inconstant)
Reinforcing fibers
Duodenal muscle fibers to longitudinal bundle
Sphincter of hepatopancreatic ampulla
Dissection

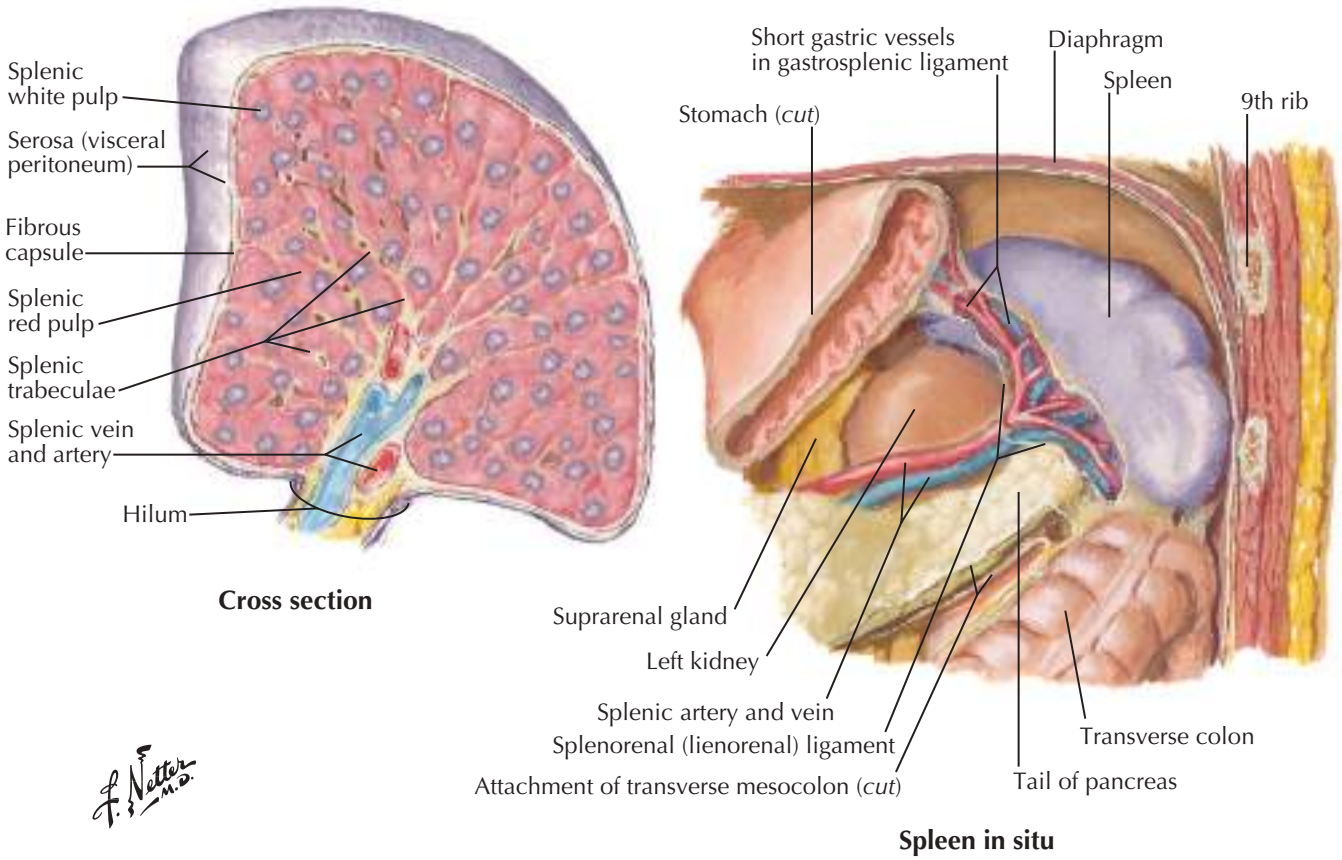


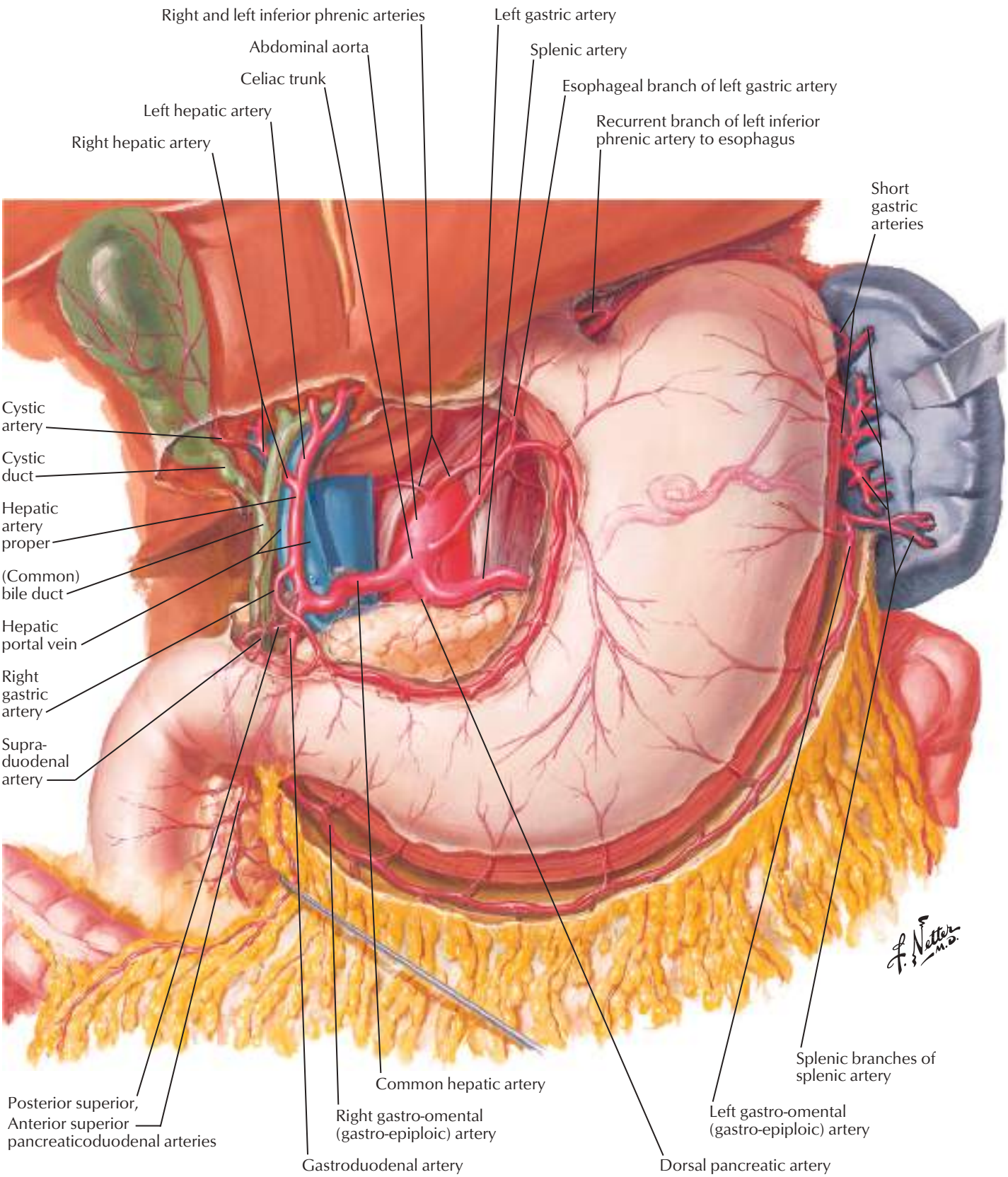
Magnetic resonance cholangiopancreatography (MRCP)

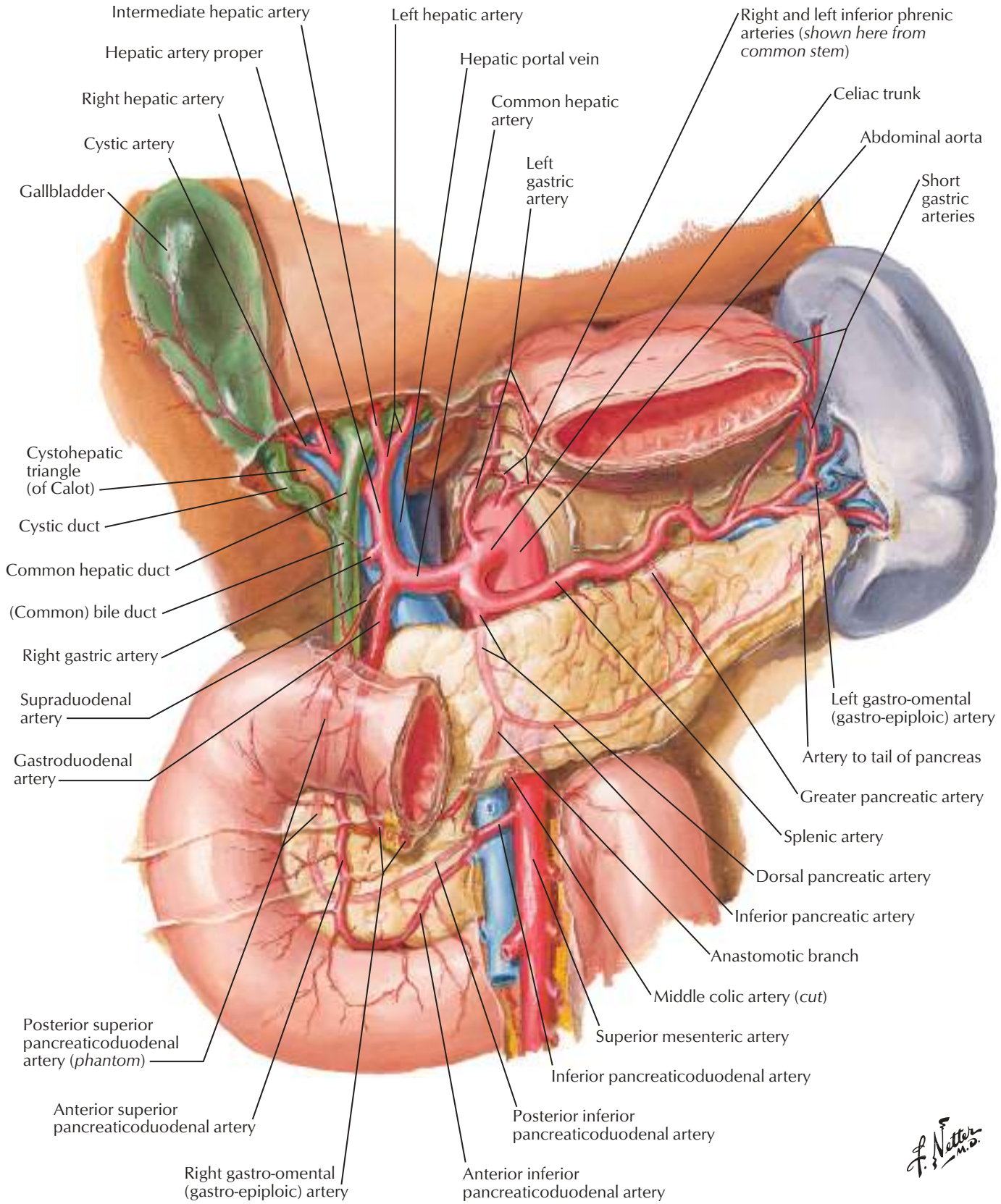





Posterior extremity
Short gastric vessels
Renal impression
Inferior border
Splenorenal (lienorenal) ligament
Splenic artery
Left gastro-omental (gastro-epiploic) vessels
Splenic vein
Colic impression
Anterior extremity
Gastrosplenic ligament
Superior border
Gastric impression
Hilum
Visceral surface
Posterior extremity
Inferior border
Anterior extremity
Diaphragmatic surface

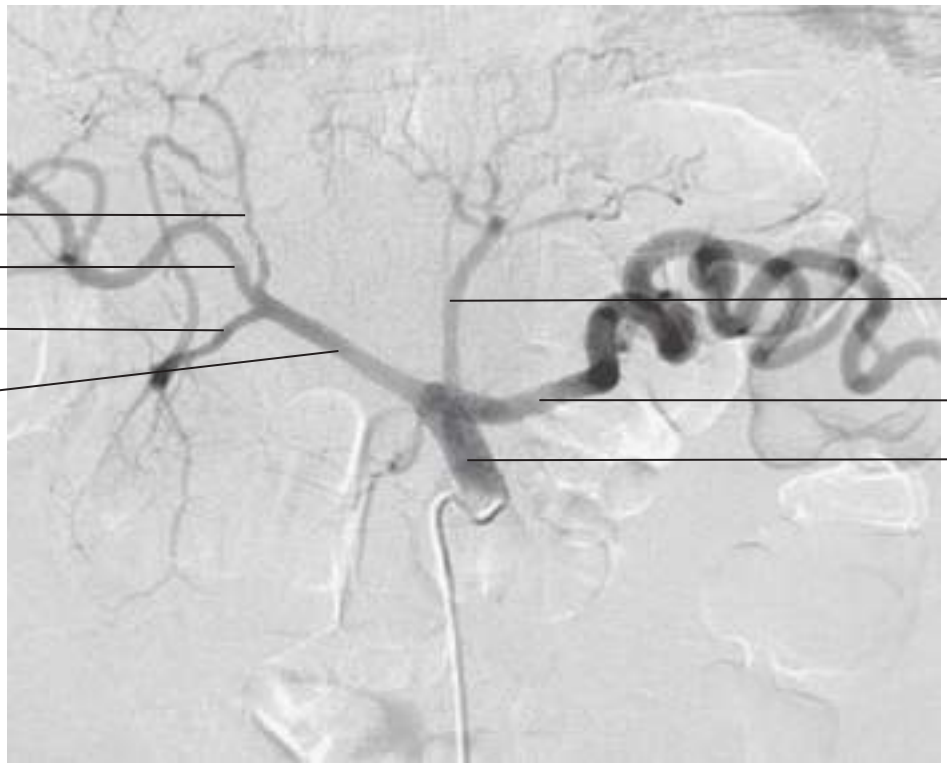

Splenic white pulp
Serosa (visceral peritoneum)
Fibrous capsule
Splenic red pulp
Splenic trabeculae
Splenic vein and artery
Hilum
Cross section
Short gastric vessels in gastrosplenic ligament
Diaphragm
Spleen
9th rib
Stomach (cut)
Suprarenal gland
Left kidney
Splenic artery and vein
Splenorenal (lienorenal) ligament
Attachment of transverse mesocolon (cut)
Transverse colon
Tail of pancreas
Spleen in situ


Right and left inferior phrenic arteries
Left gastric artery
Abdominal aorta
Splenic artery
Celiac trunk
Esophageal branch of left gastric artery
Left hepatic artery
Recurrent branch of left inferior phrenic artery to esophagus
Right hepatic artery
Short gastric arteries
Cystic artery
Cystic duct
Hepatic artery proper
(Common) bile duct
Hepatic portal vein
Right gastric artery
Supra-duodenal artery
Splenic branches of splenic artery
Common hepatic artery
Posterior superior, Anterior superior pancreaticoduodenal arteries
Right gastro-omental (gastro-epiploic) artery
Left gastro-omental (gastro-epiploic) artery
Gastroduodenal artery
Dorsal pancreatic artery

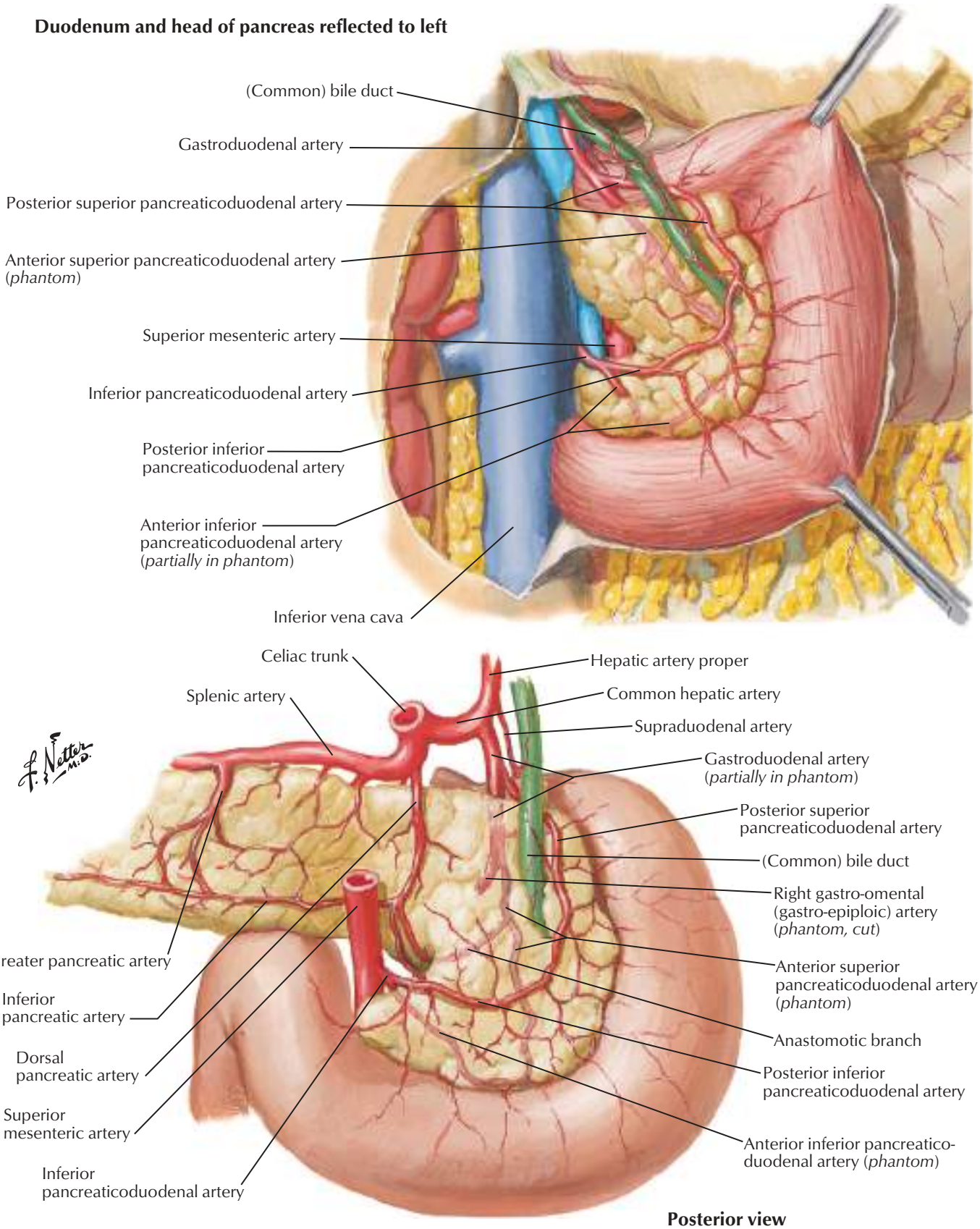

Intermediate hepatic artery
Left hepatic artery
Right and left inferior phrenic arteries (*shown here from common stem*)
Hepatic artery proper
Hepatic portal vein
Right hepatic artery
Common hepatic artery
Celiac trunk
Cystic artery
Abdominal aorta
Left gastric artery
Gallbladder
Short gastric arteries
Cystohepatic triangle (of Calot)
Cystic duct
Common hepatic duct
(Common) bile duct
Right gastric artery
Supraduodenal artery
Gastroduodenal artery
Left gastro-omental (gastro-epiploic) artery
Artery to tail of pancreas
Greater pancreatic artery
Splenic artery
Dorsal pancreatic artery
Inferior pancreatic artery
Anastomotic branch
Middle colic artery (*cut*)
Superior mesenteric artery
Inferior pancreaticoduodenal artery
Posterior superior pancreaticoduodenal artery (*phantom*)
Anterior superior pancreaticoduodenal artery
Posterior inferior pancreaticoduodenal artery
Right gastro-omental (gastro-epiploic) artery
Anterior inferior pancreaticoduodenal artery

Celiac Arteriogram and CT Angiogram

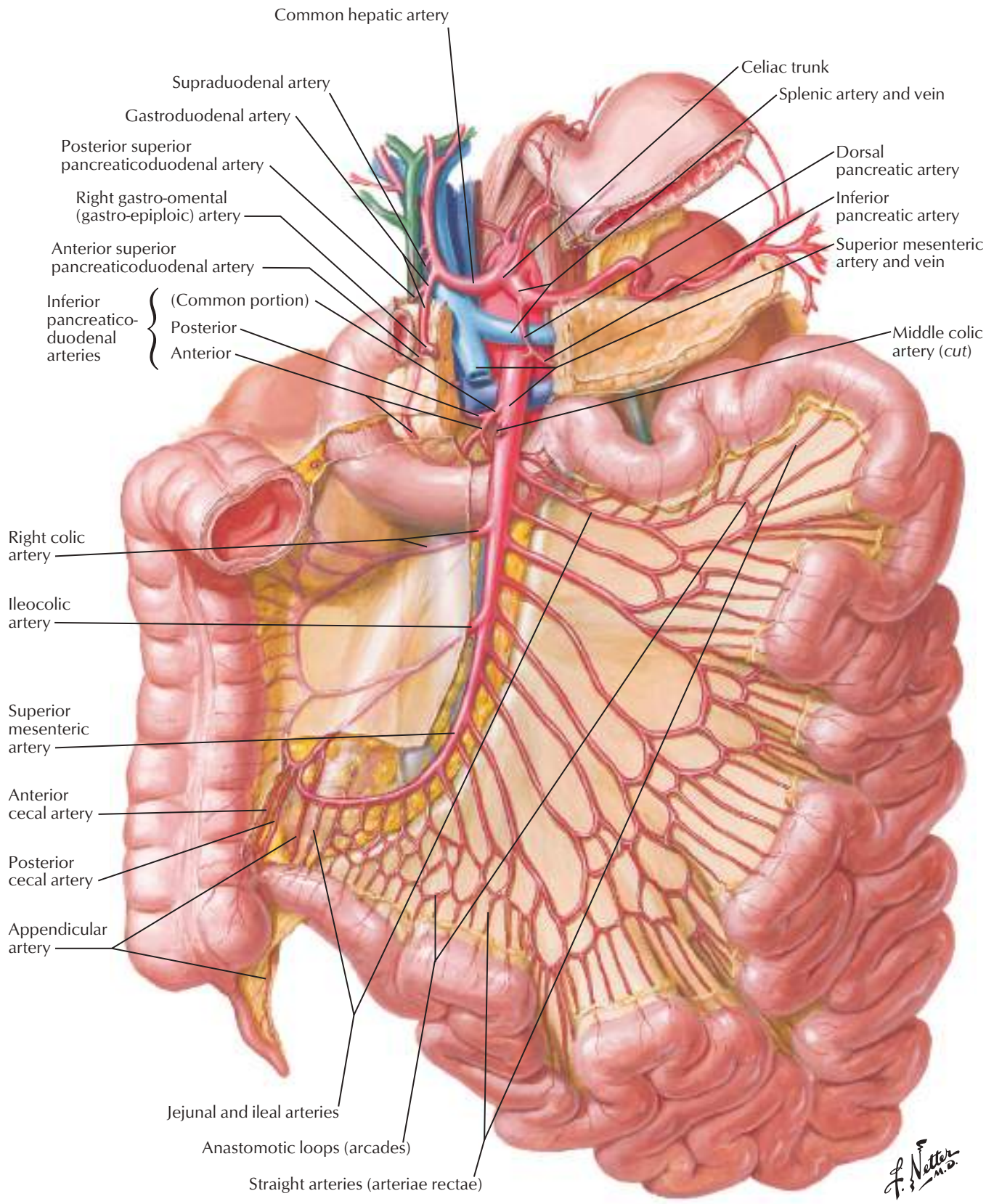
See also Plates 283, 284



Duodenum and head of pancreas reflected to left

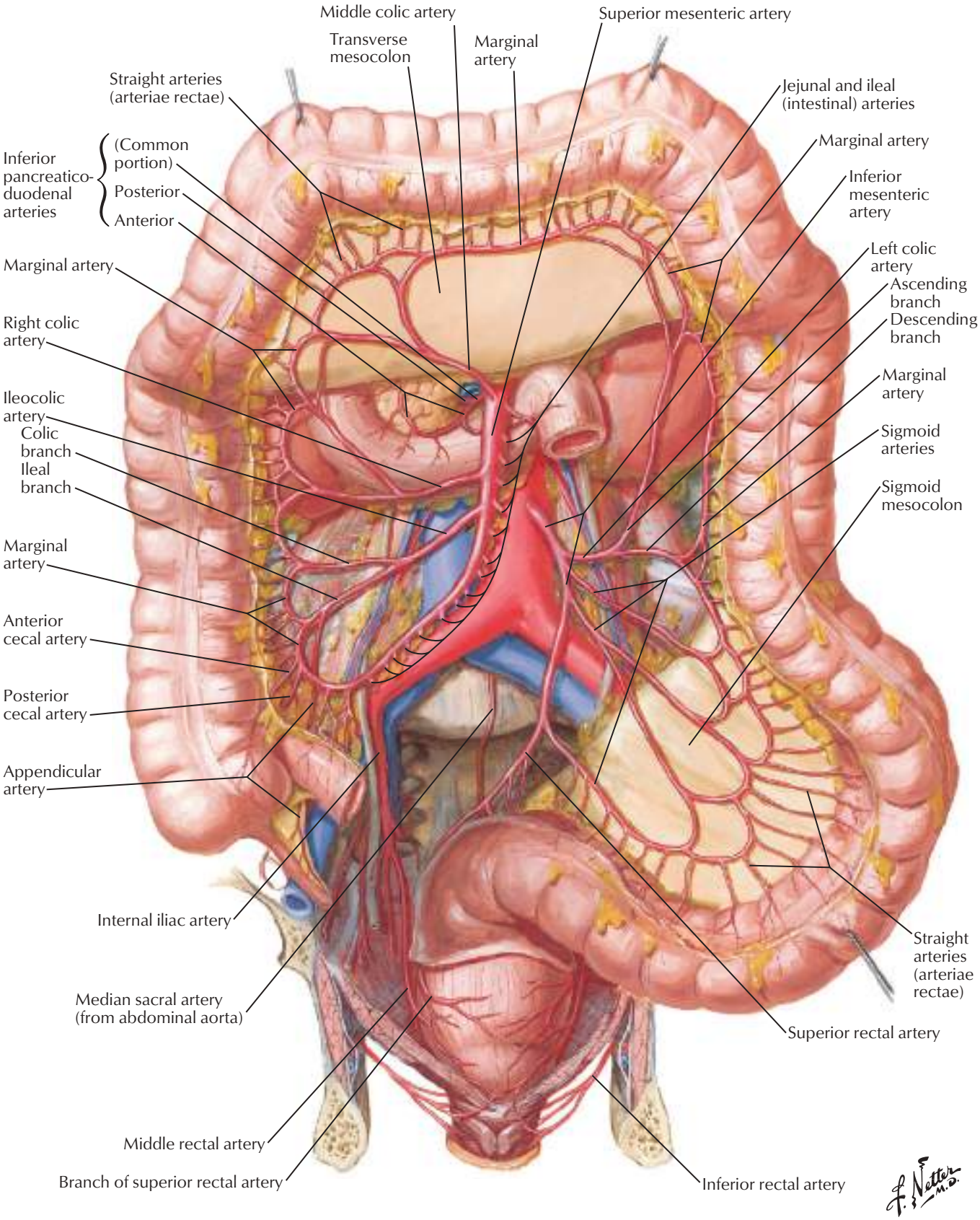


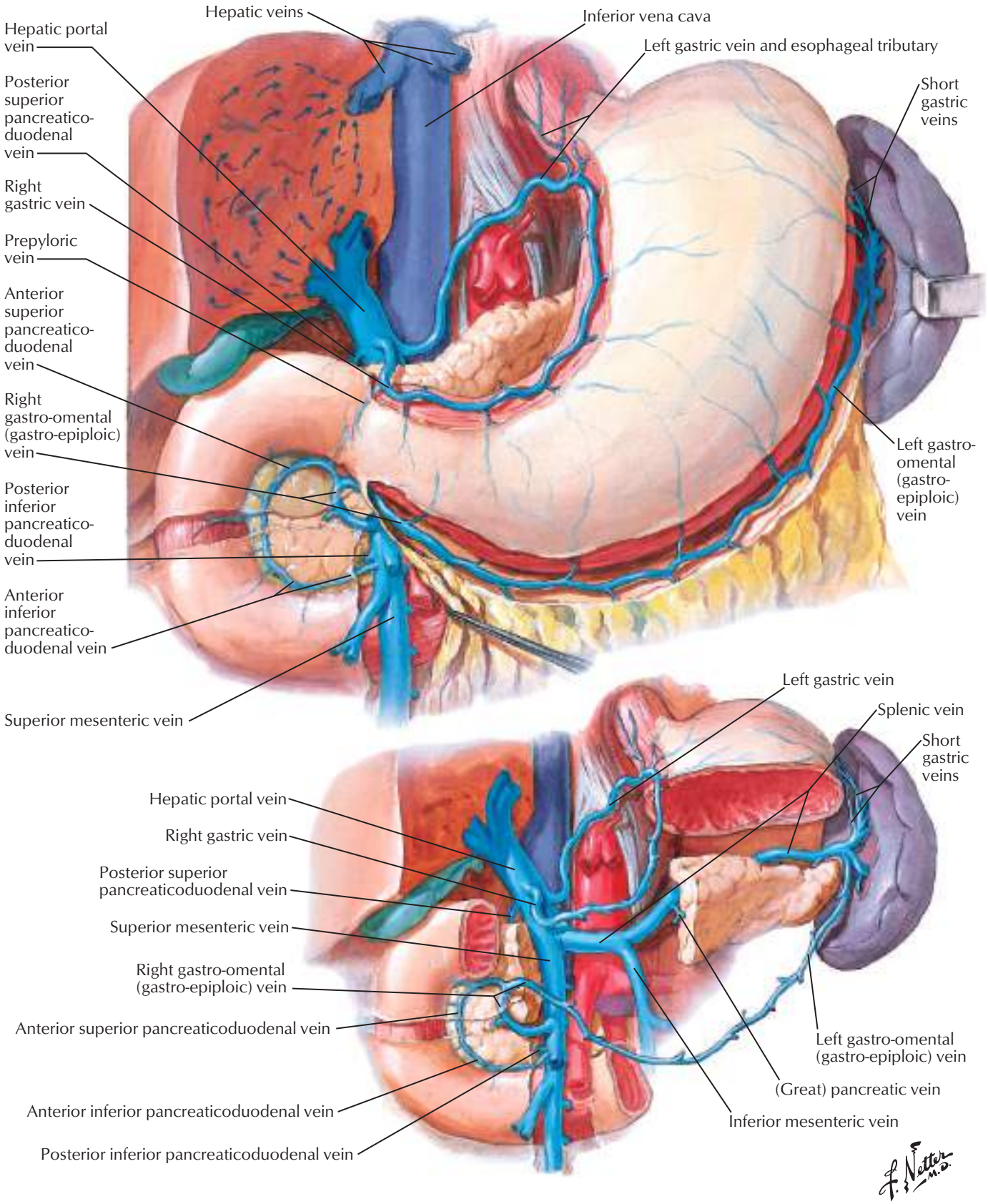
Posterior view

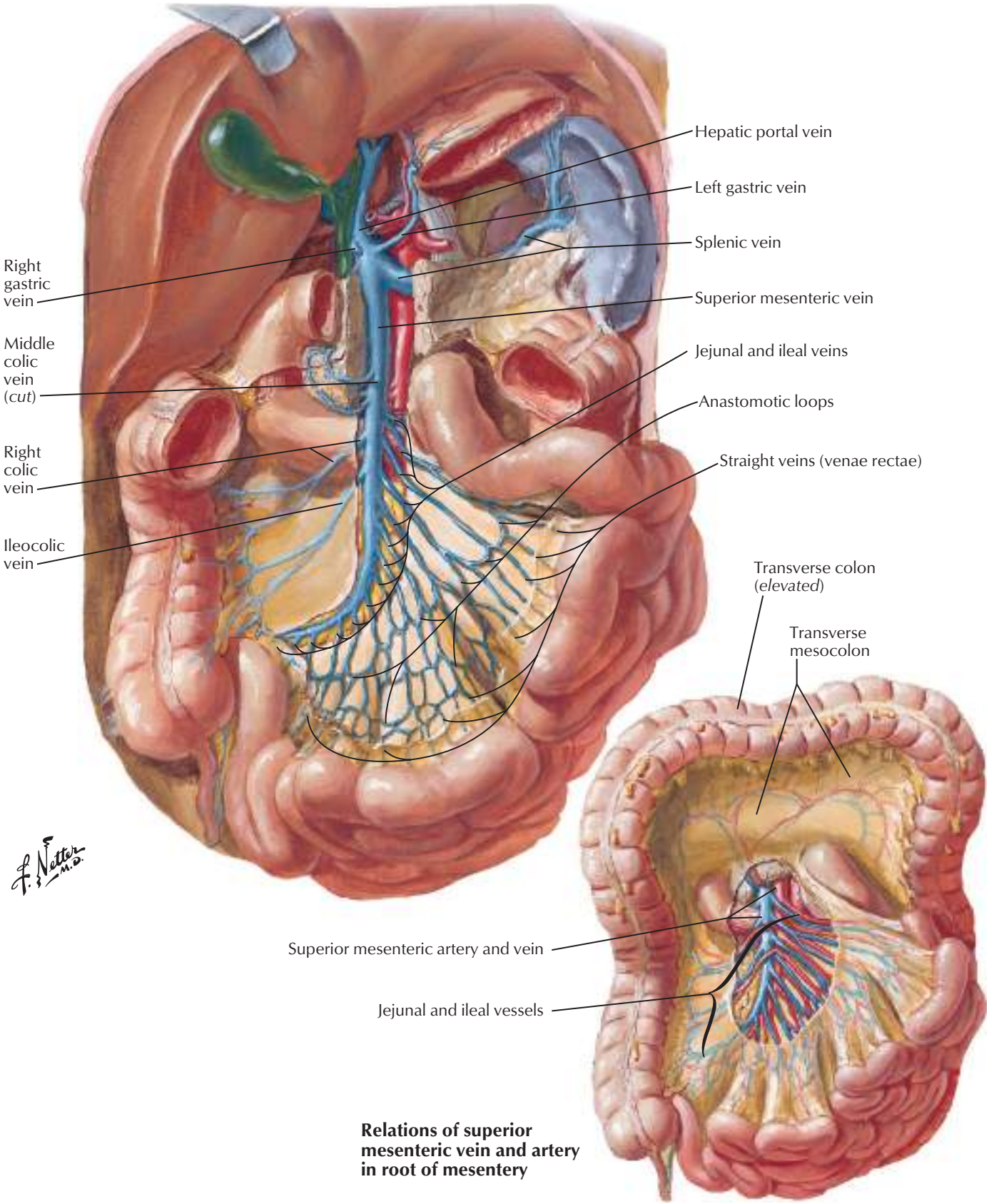

Common hepatic artery
Supraduodenal artery
Gastroduodenal artery
Posterior superior pancreaticoduodenal artery
Right gastro-omental (gastro-epiploic) artery
Anterior superior pancreaticoduodenal artery
Inferior pancreatico-duodenal arteries
(Common portion)
Posterior
Anterior
Celiac trunk
Splenic artery and vein
Dorsal pancreatic artery
Inferior pancreatic artery
Superior mesenteric artery and vein
Middle colic artery (cut)
Right colic artery
Ileocolic artery
Superior mesenteric artery
Anterior cecal artery
Posterior cecal artery
Appendicular artery
Jejunal and ileal arteries
Anastomotic loops (arcades)
Straight arteries (arteriae rectae)

Arteries of Large Intestine

For arteries of rectum see also Plate 376



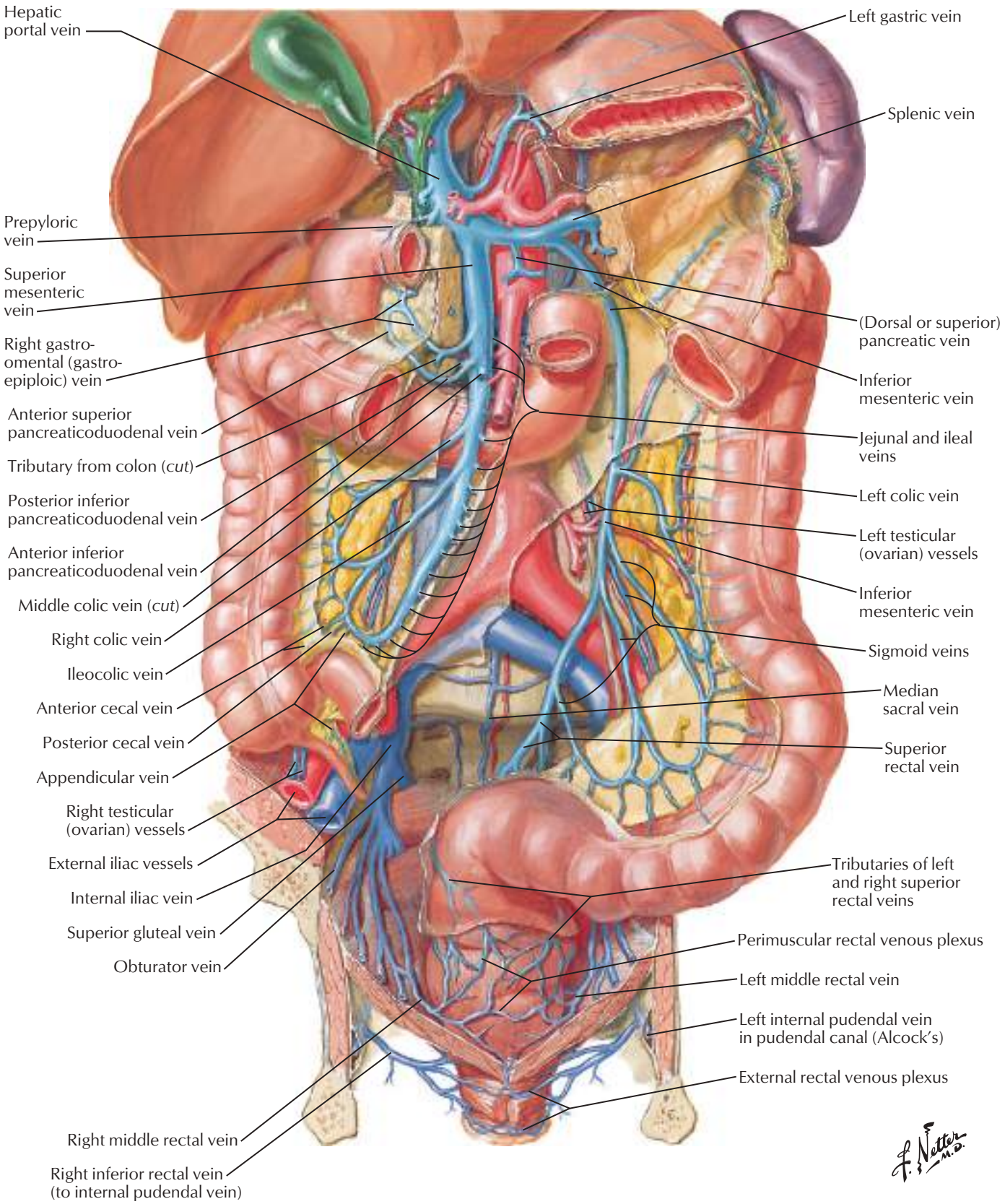

Hepatic veins
Inferior vena cava
Hepatic portal vein
Left gastric vein and esophageal tributary
Posterior superior pancreatico-duodenal vein
Short gastric veins
Right gastric vein
Prepyloric vein
Anterior superior pancreatico-duodenal vein
Right gastro-omental (gastro-epiploic) vein
Left gastro-omental (gastro-epiploic) vein
Posterior inferior pancreatico-duodenal vein
Anterior inferior pancreatico-duodenal vein
Superior mesenteric vein
Left gastric vein
Splenic vein
Short gastric veins
Hepatic portal vein
Right gastric vein
Posterior superior pancreaticoduodenal vein
Superior mesenteric vein
Right gastro-omental (gastro-epiploic) vein
Anterior superior pancreaticoduodenal vein
Left gastro-omental (gastro-epiploic) vein
(Great) pancreatic vein
Anterior inferior pancreaticoduodenal vein
Inferior mesenteric vein
Posterior inferior pancreaticoduodenal vein

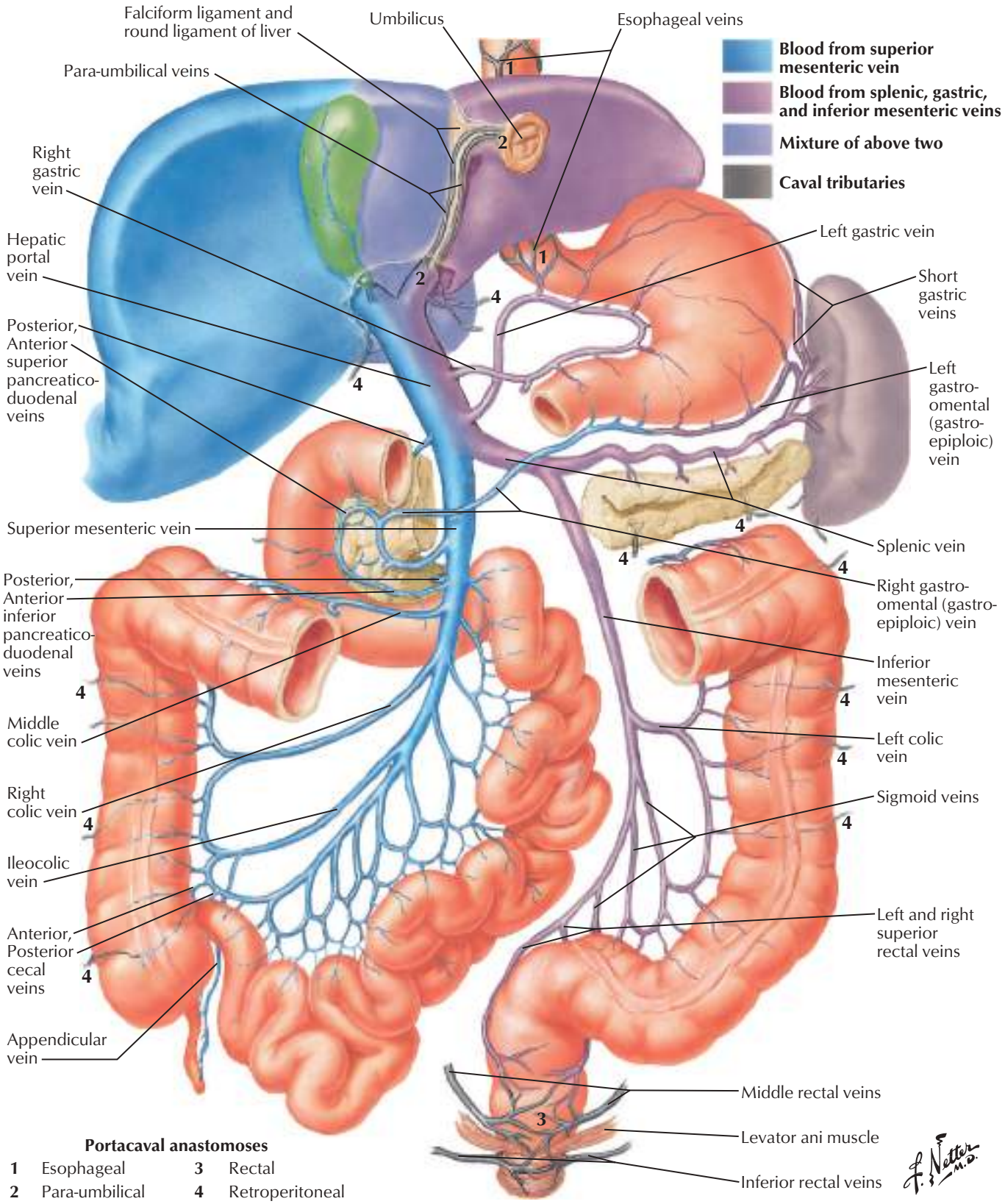


Relations of superior mesenteric vein and artery in root of mesentery

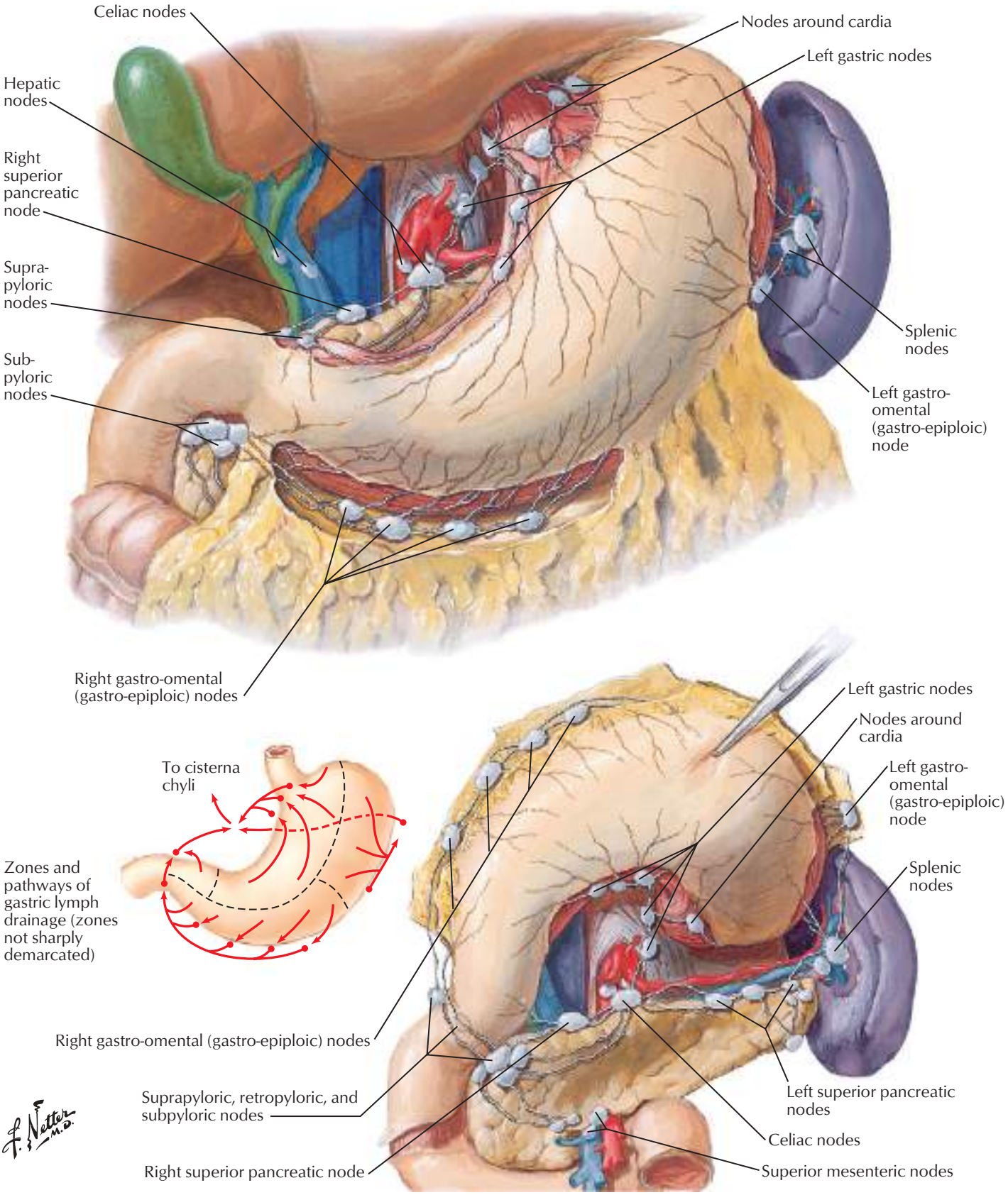
Veins of Large Intestine

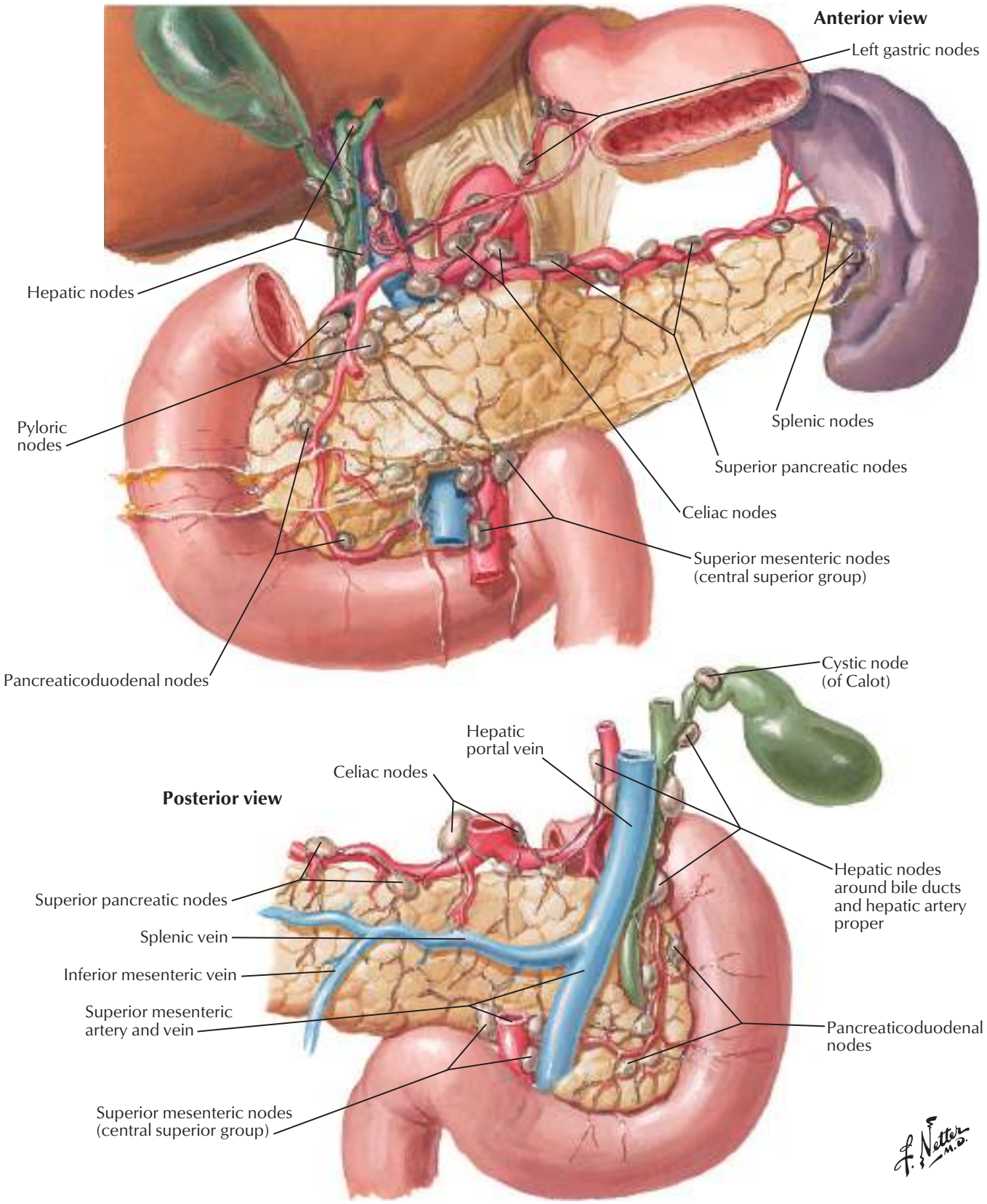
For veins of rectum see also Plate 377

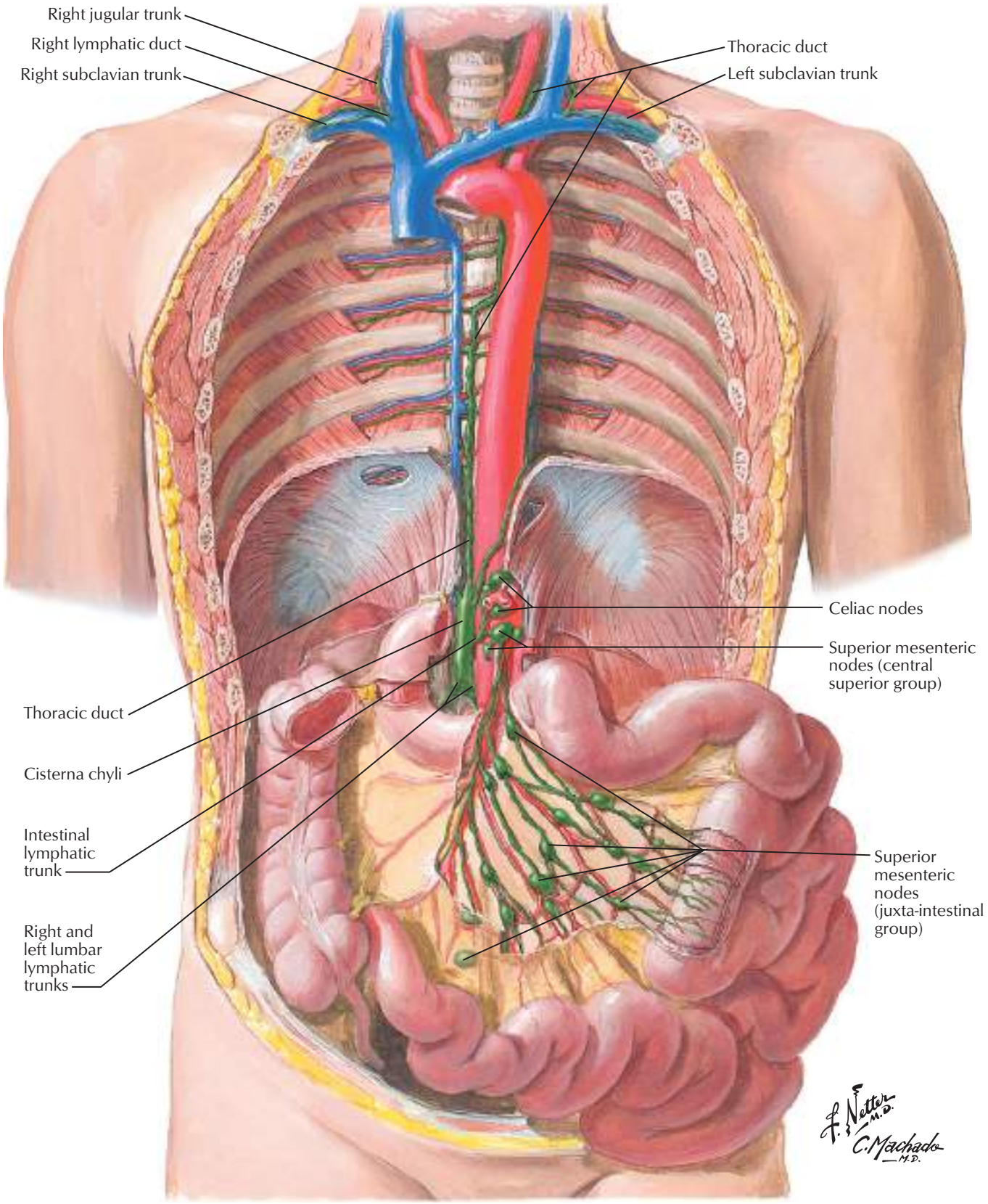


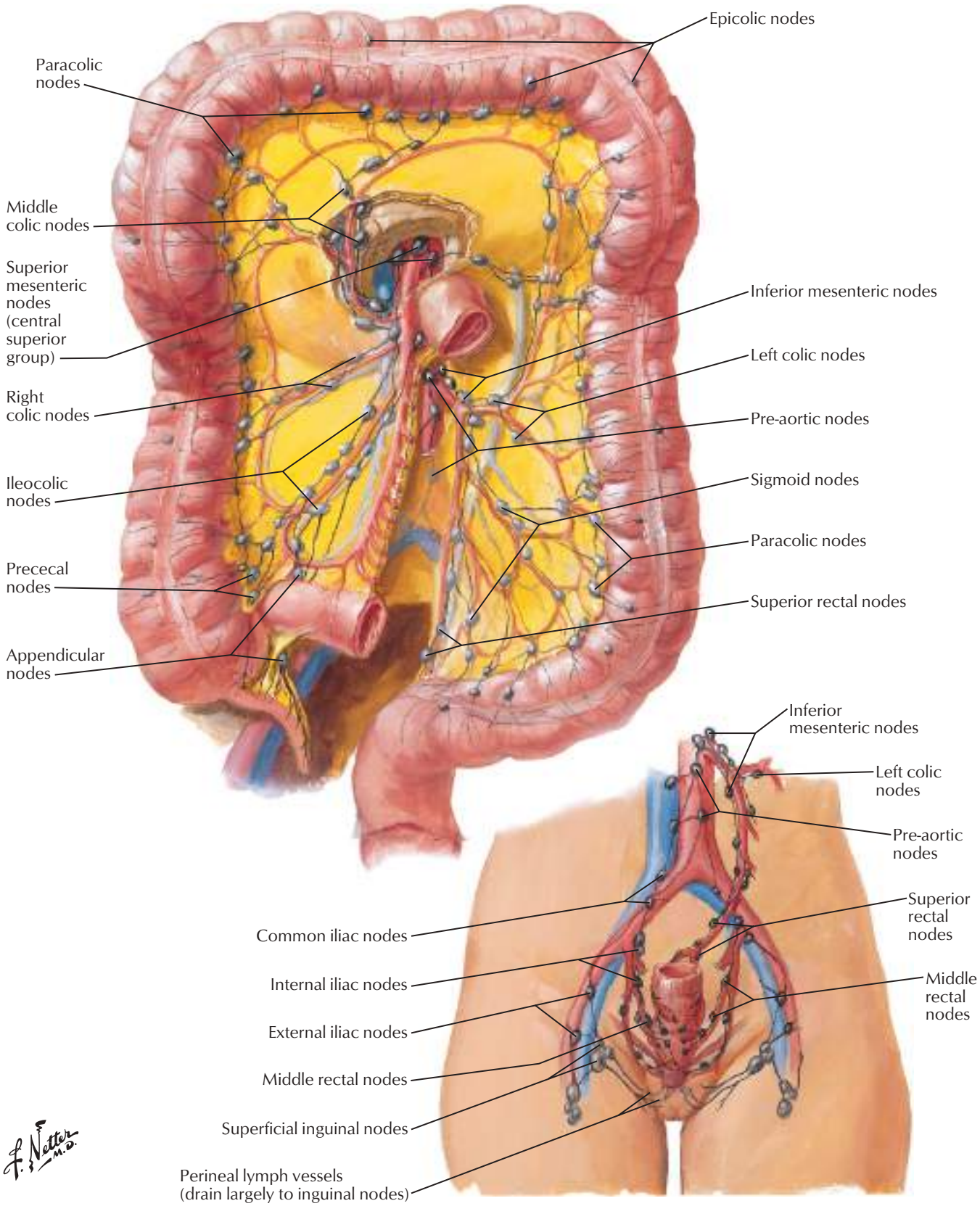

Falciform ligament and round ligament of liver
Umbilicus
Esophageal veins
Para-umbilical veins
Blood from superior mesenteric vein
Blood from splenic, gastric, and inferior mesenteric veins
Mixture of above two
Caval tributaries
Right gastric vein
Hepatic portal vein
Left gastric vein
Short gastric veins
Posterior, Anterior superior pancreatico-duodenal veins
Left gastro-omental (gastro-epiploic) vein
Superior mesenteric vein
Splenic vein
Posterior, Anterior inferior pancreatico-duodenal veins
Right gastro-omental (gastro-epiploic) vein
Inferior mesenteric vein
Middle colic vein
Left colic vein
Right colic vein
Sigmoid veins
Ileocolic vein
Left and right superior rectal veins
Anterior, Posterior cecal veins
Appendicular vein
Middle rectal veins
Levator ani muscle
Inferior rectal veins
Portacaval anastomoses
1 Esophageal
2 Para-umbilical
3 Rectal
4 Retroperitoneal

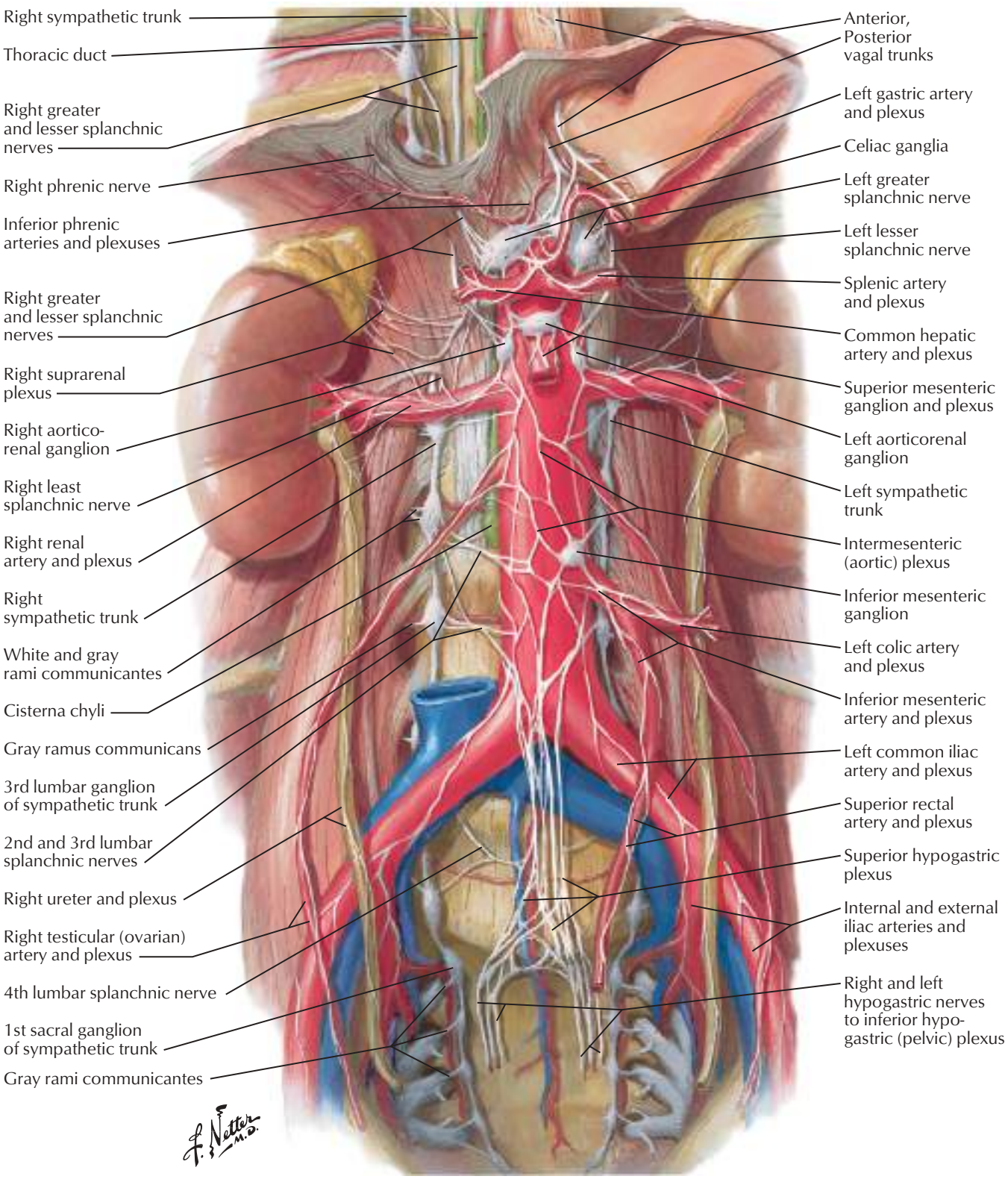
Lymph Vessels and Nodes of Stomach

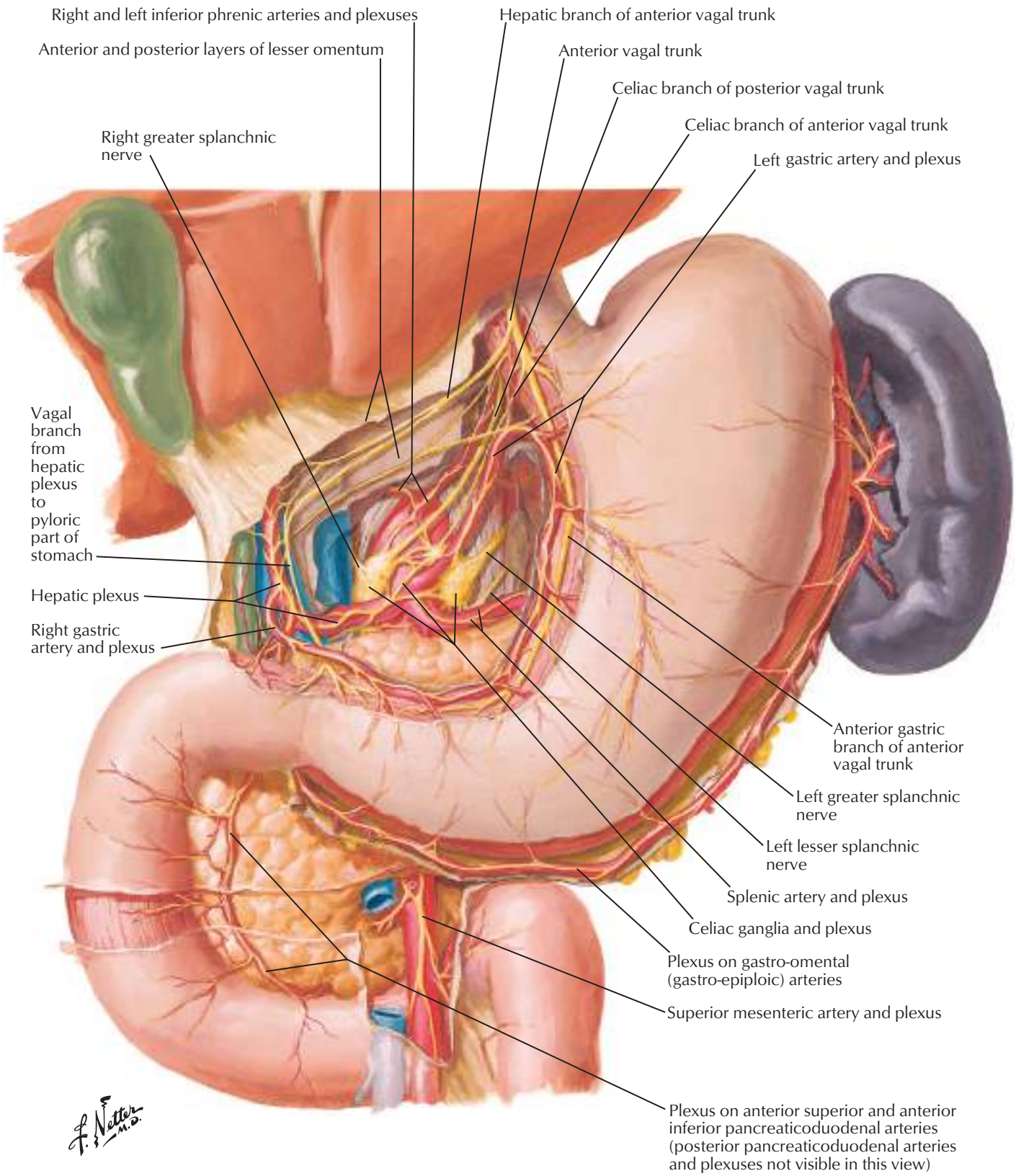


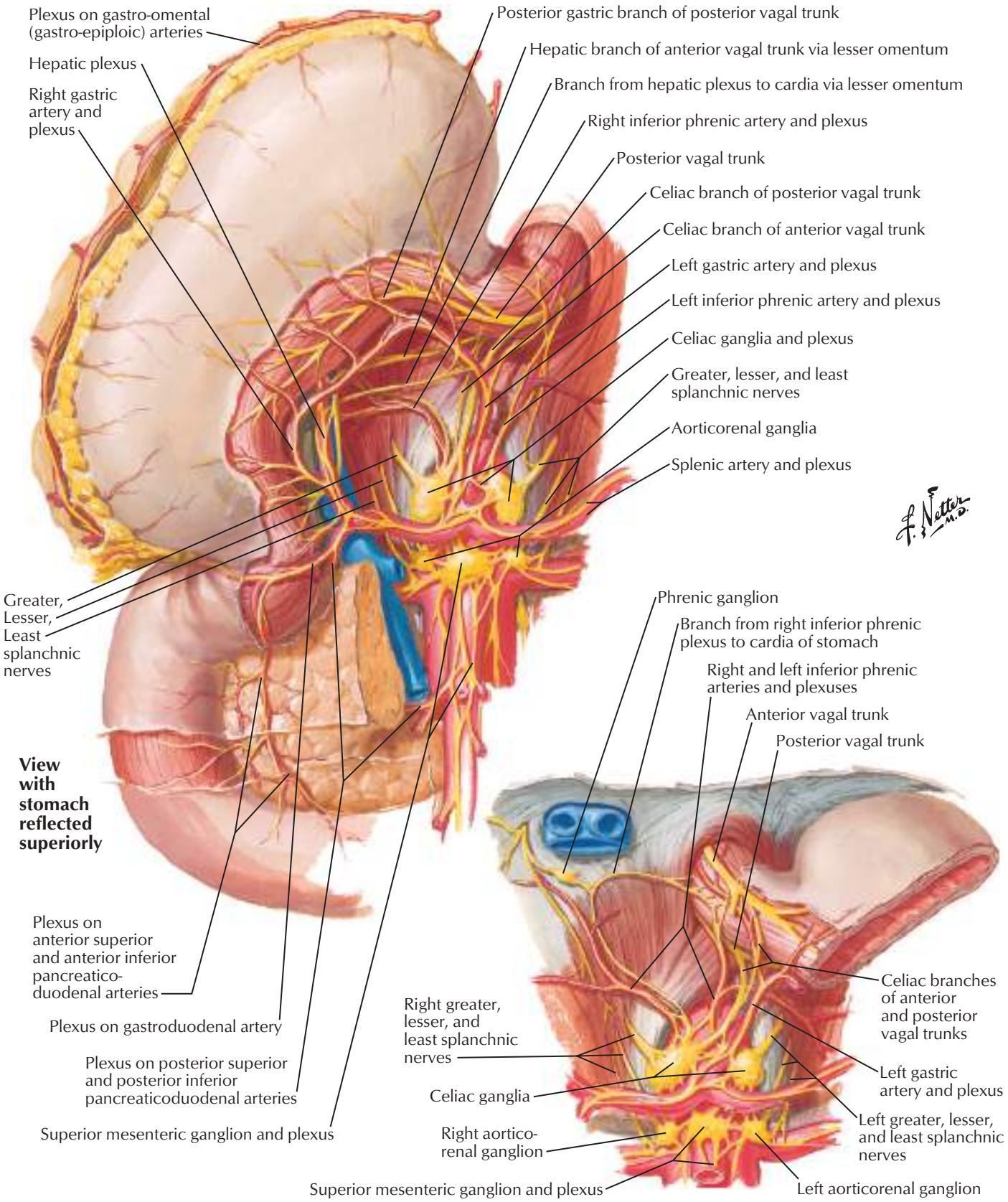

Anterior view
Left gastric nodes
Hepatic nodes
Pyloric nodes
Splenic nodes
Superior pancreatic nodes
Celiac nodes
Superior mesenteric nodes (central superior group)
Pancreaticoduodenal nodes
Cystic node (of Calot)
Hepatic portal vein
Celiac nodes
Posterior view
Hepatic nodes around bile ducts and hepatic artery proper
Superior pancreatic nodes
Splenic vein
Inferior mesenteric vein
Superior mesenteric artery and vein
Pancreaticoduodenal nodes
Superior mesenteric nodes (central superior group)


Right jugular trunk
Right lymphatic duct
Right subclavian trunk
Thoracic duct
Left subclavian trunk
Celiac nodes
Superior mesenteric nodes (central superior group)
Thoracic duct
Cisterna chyli
Intestinal lymphatic trunk
Right and left lumbar lymphatic trunks
Superior mesenteric nodes (juxta-intestinal group)
F. Netter M.D.
C. Machado M.D.


Epicolic nodes
Paracolic nodes
Middle colic nodes
Superior mesenteric nodes (central superior group)
Right colic nodes
Ileocolic nodes
Prececal nodes
Appendicular nodes
Inferior mesenteric nodes
Left colic nodes
Pre-aortic nodes
Sigmoid nodes
Paracolic nodes
Superior rectal nodes
Inferior mesenteric nodes
Left colic nodes
Pre-aortic nodes
Superior rectal nodes
Middle rectal nodes
Common iliac nodes
Internal iliac nodes
External iliac nodes
Middle rectal nodes
Superficial inguinal nodes
Perineal lymph vessels (drain largely to inguinal nodes)
F. Netter M.D.

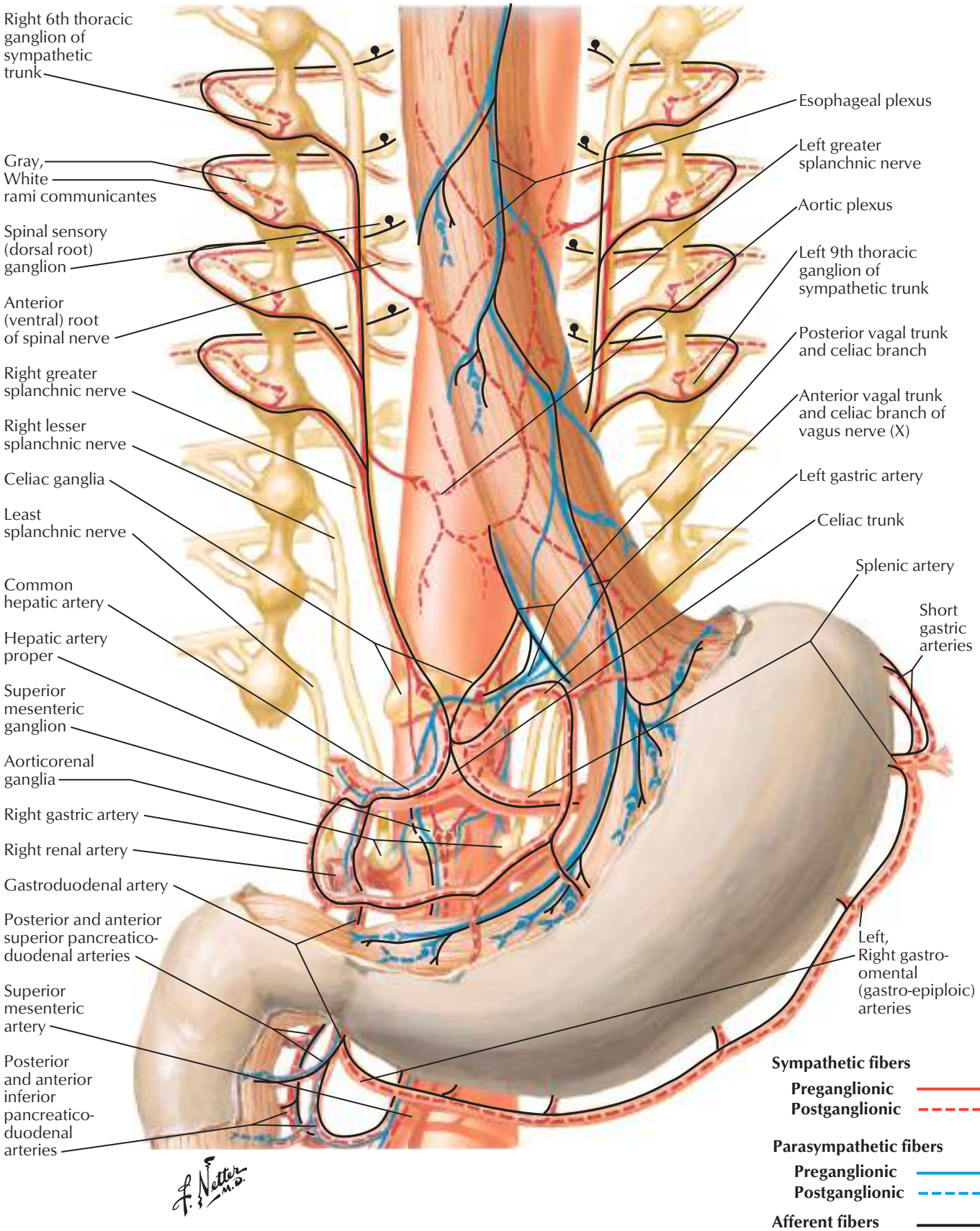

Right sympathetic trunk
Thoracic duct
Right greater and lesser splanchnic nerves
Right phrenic nerve
Inferior phrenic arteries and plexuses
Right greater and lesser splanchnic nerves
Right suprarenal plexus
Right aortico-renal ganglion
Right least splanchnic nerve
Right renal artery and plexus
Right sympathetic trunk
White and gray rami communicantes
Cisterna chyli
Gray ramus communicans
3rd lumbar ganglion of sympathetic trunk
2nd and 3rd lumbar splanchnic nerves
Right ureter and plexus
Right testicular (ovarian) artery and plexus
4th lumbar splanchnic nerve
1st sacral ganglion of sympathetic trunk
Gray rami communicantes
Anterior, Posterior vagal trunks
Left gastric artery and plexus
Celiac ganglia
Left greater splanchnic nerve
Left lesser splanchnic nerve
Splenic artery and plexus
Common hepatic artery and plexus
Superior mesenteric ganglion and plexus
Left aorticorenal ganglion
Left sympathetic trunk
Intermesenteric (aortic) plexus
Inferior mesenteric ganglion
Left colic artery and plexus
Inferior mesenteric artery and plexus
Left common iliac artery and plexus
Superior rectal artery and plexus
Superior hypogastric plexus
Internal and external iliac arteries and plexuses
Right and left hypogastric nerves to inferior hypo-gastric (pelvic) plexus


Right and left inferior phrenic arteries and plexuses
Anterior and posterior layers of lesser omentum
Hepatic branch of anterior vagal trunk
Anterior vagal trunk
Celiac branch of posterior vagal trunk
Celiac branch of anterior vagal trunk
Left gastric artery and plexus
Right greater splanchnic nerve
Vagal branch from hepatic plexus to pyloric part of stomach
Hepatic plexus
Right gastric artery and plexus
Anterior gastric branch of anterior vagal trunk
Left greater splanchnic nerve
Left lesser splanchnic nerve
Splenic artery and plexus
Celiac ganglia and plexus
Plexus on gastro-omental (gastro-epiploic) arteries
Superior mesenteric artery and plexus
Plexus on anterior superior and anterior inferior pancreaticoduodenal arteries (posterior pancreaticoduodenal arteries and plexuses not visible in this view)

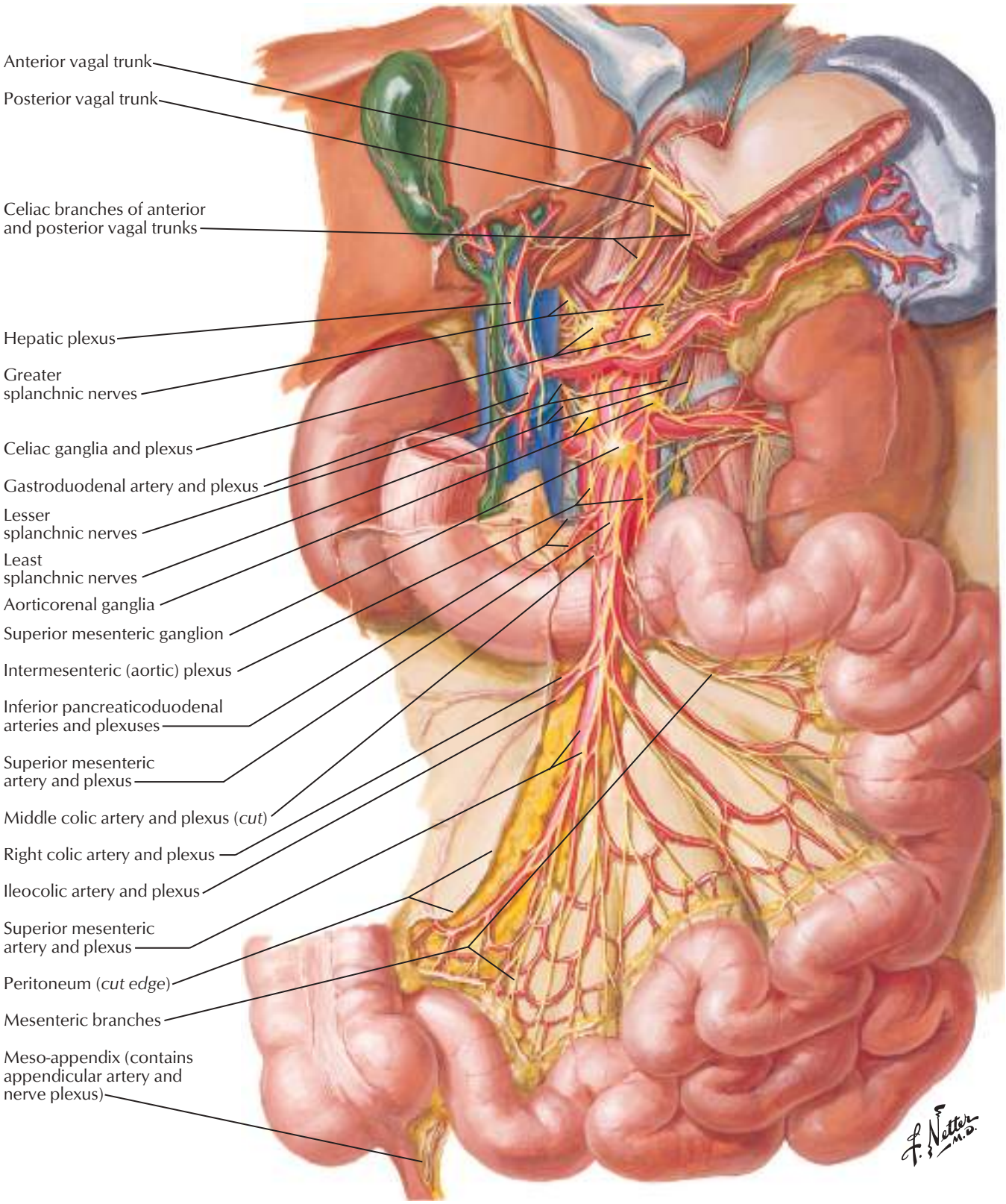

Plexus on gastro-omental (gastro-epiploic) arteries
Hepatic plexus
Right gastric artery and plexus
Posterior gastric branch of posterior vagal trunk
Hepatic branch of anterior vagal trunk via lesser omentum
Branch from hepatic plexus to cardia via lesser omentum
Right inferior phrenic artery and plexus
Posterior vagal trunk
Celiac branch of posterior vagal trunk
Celiac branch of anterior vagal trunk
Left gastric artery and plexus
Left inferior phrenic artery and plexus
Celiac ganglia and plexus
Greater, lesser, and least splanchnic nerves
Aorticorenal ganglia
Splenic artery and plexus
Greater, Lesser, Least splanchnic nerves
View with stomach reflected superiorly
Plexus on anterior superior and anterior inferior pancreatico-duodenal arteries
Plexus on gastroduodenal artery
Plexus on posterior superior and posterior inferior pancreaticoduodenal arteries
Superior mesenteric ganglion and plexus
Phrenic ganglion
Branch from right inferior phrenic plexus to cardia of stomach
Right and left inferior phrenic arteries and plexuses
Anterior vagal trunk
Posterior vagal trunk
Celiac branches of anterior and posterior vagal trunks
Right greater, lesser, and least splanchnic nerves
Left gastric artery and plexus
Celiac ganglia
Left greater, lesser, and least splanchnic nerves
Right aortico-renal ganglion
Superior mesenteric ganglion and plexus
Left aorticorenal ganglion

Autonomic Innervation of Stomach and Duodenum: Schema

See also Plates 163, 164

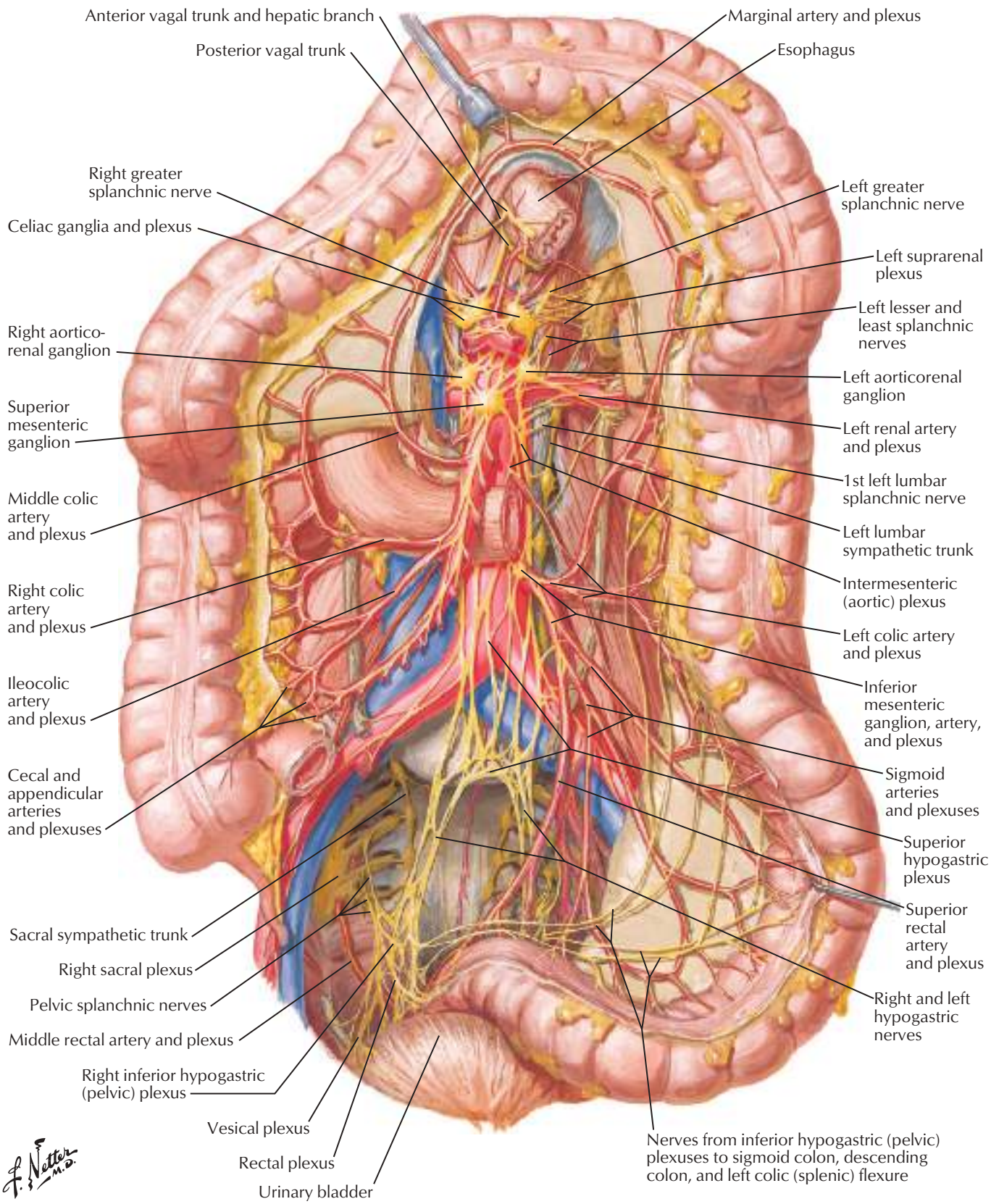


Autonomic Innervation of Small Intestine



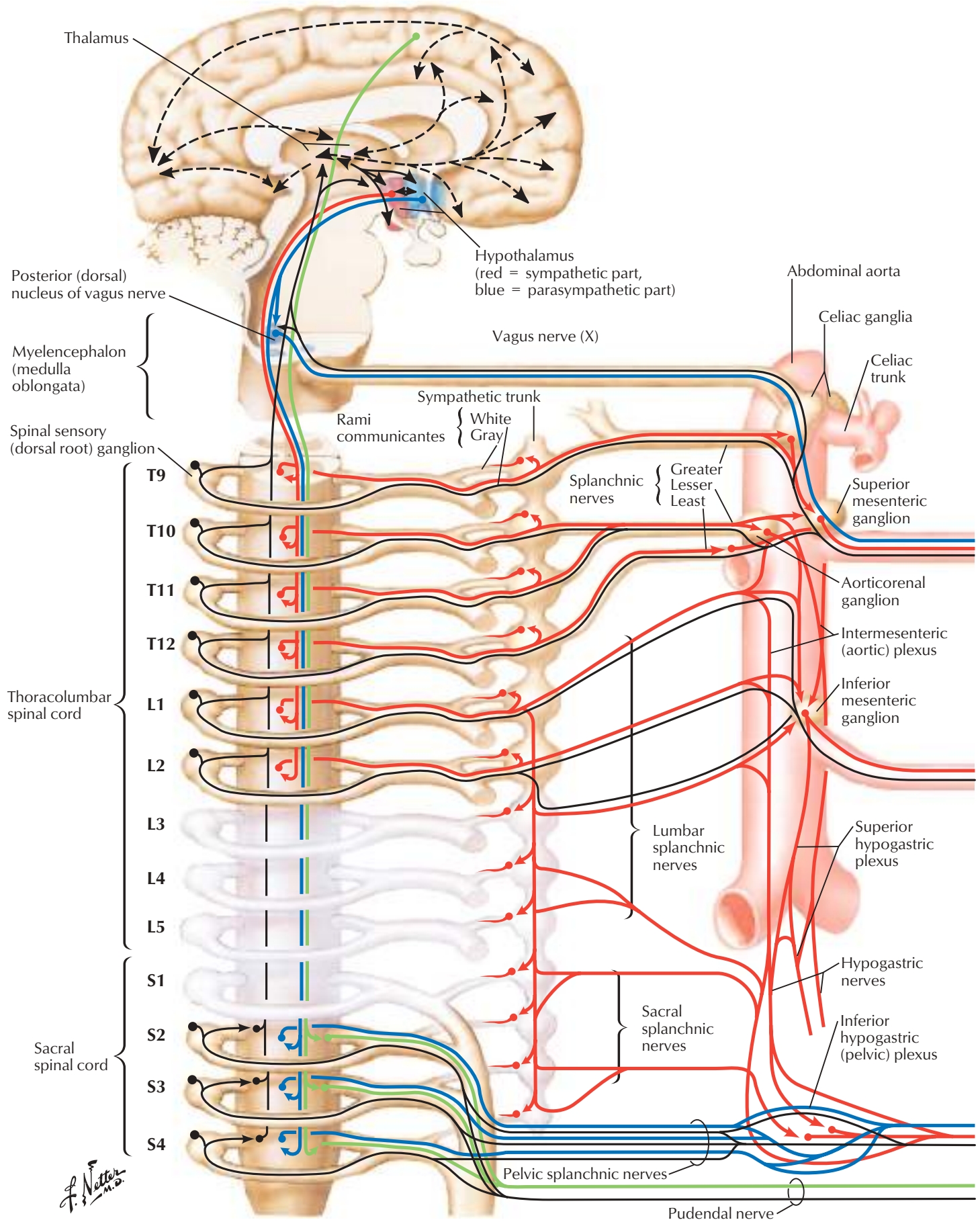
Autonomic Innervation of Large Intestine

For nerves of rectum see Plates 388–391



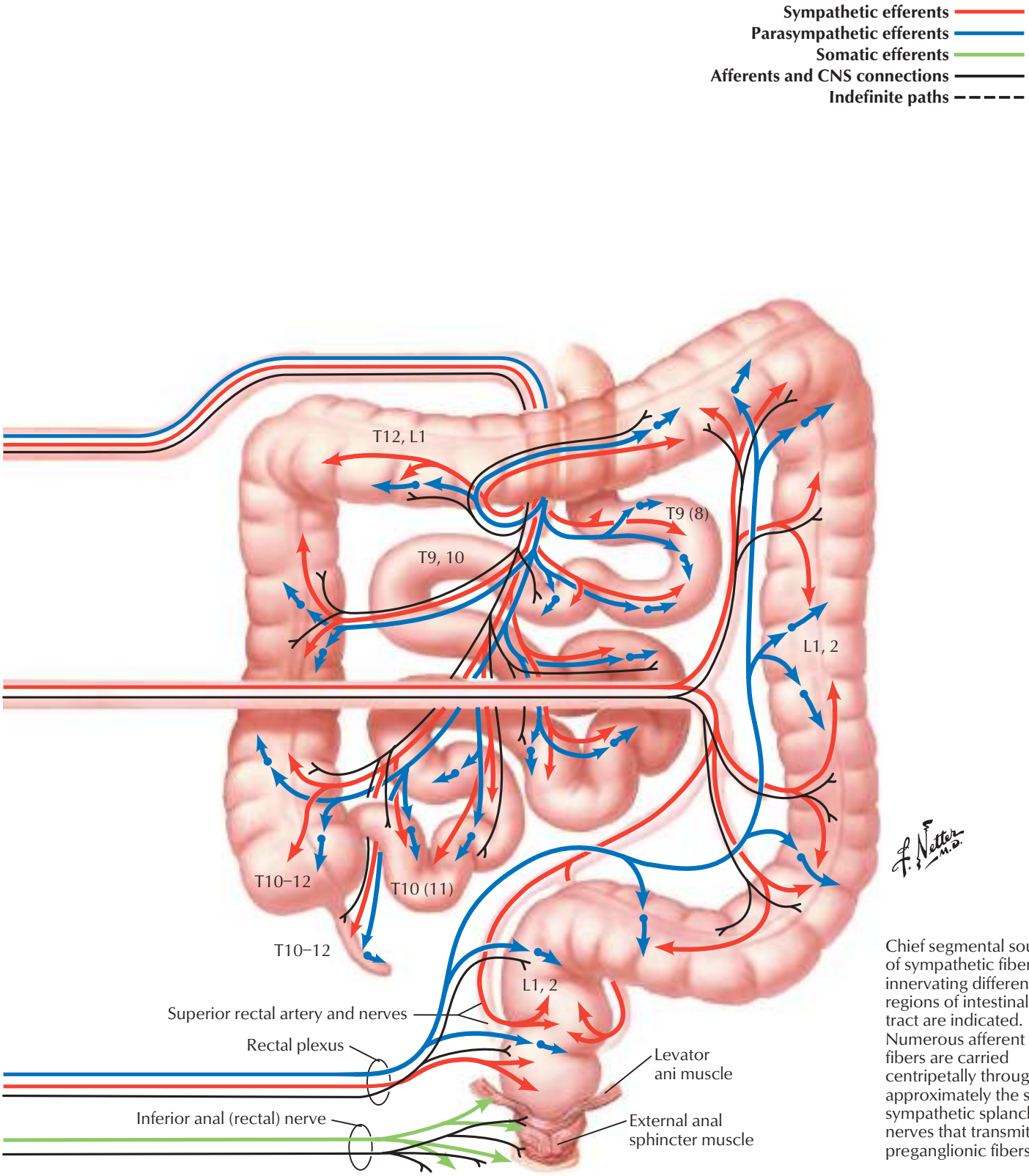
Autonomic Innervation of Small and Large Intestines: Schema

See also Plates 163, 164



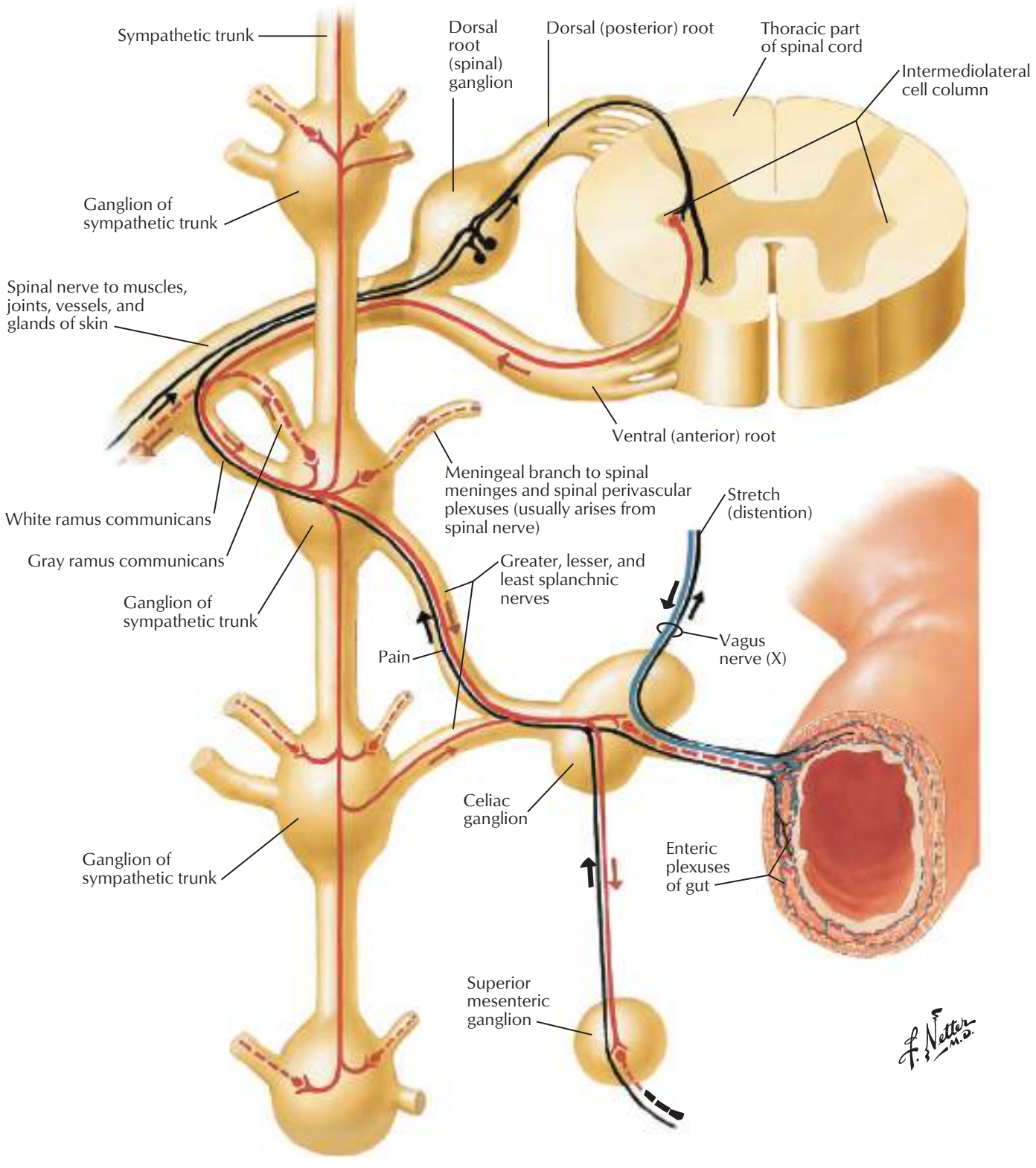
Autonomic Innervation of Small and Large Intestines: Schema

See also **Plates 163, 164**

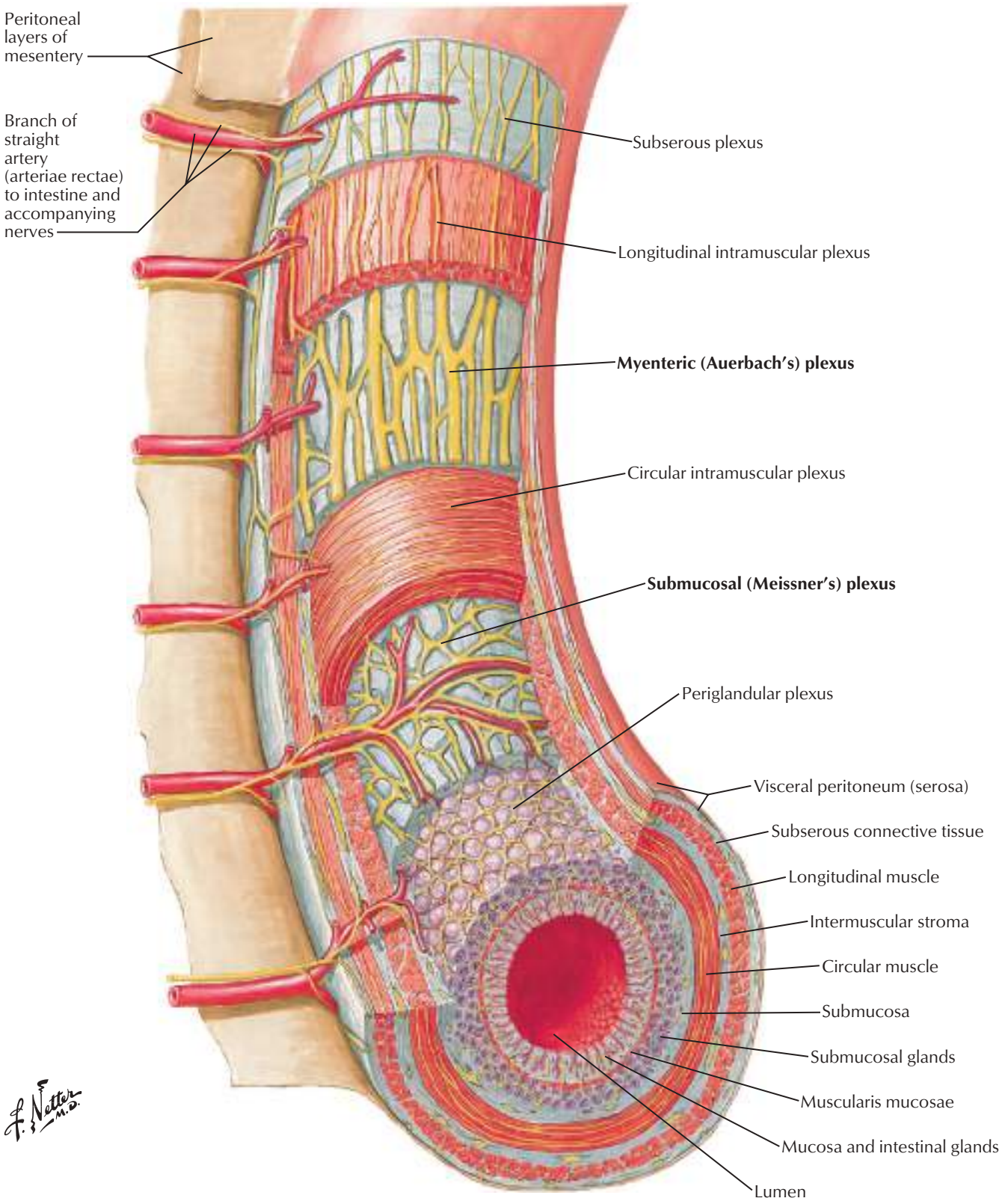


Chief segmental sources of sympathetic fibers innervating different regions of intestinal tract are indicated. Numerous afferent fibers are carried centripetally through approximately the same sympathetic splanchnic nerves that transmit preganglionic fibers.

Autonomic Reflex Pathways: Schema



Intrinsic Autonomic Plexuses of Intestine: Schema



Note: Intestinal wall is shown much thicker than in actuality.

Autonomic Innervation of Liver and Biliary Tract: Schema

See also Plates 163, 164

Common areas of referred pain in biliary disease

Sympathetic trunk
Dorsal root (spinal) ganglion
Thoracic part of spinal cord
Left greater splanchnic nerve
Anterior vagal trunk
Right greater splanchnic nerve
Posterior vagal trunk
Right phrenic nerve to diaphragmatic part of parietal peritoneum
T7
T8
T9
T10

Hepatic branch of anterior vagal trunk
Diaphragm
Phrenic ganglion
Celiac ganglia
Common hepatic artery
Splenic artery
Anterior hepatic plexus
Posterior hepatic plexus
Aorta
Gastroduodenal artery and plexus
Sphincter of hepatopancreatic ampulla

Sympathetic fibers
- **Preganglionic**
- **Postganglionic**

Parasympathetic fibers
- **Preganglionic**
- **Postganglionic**

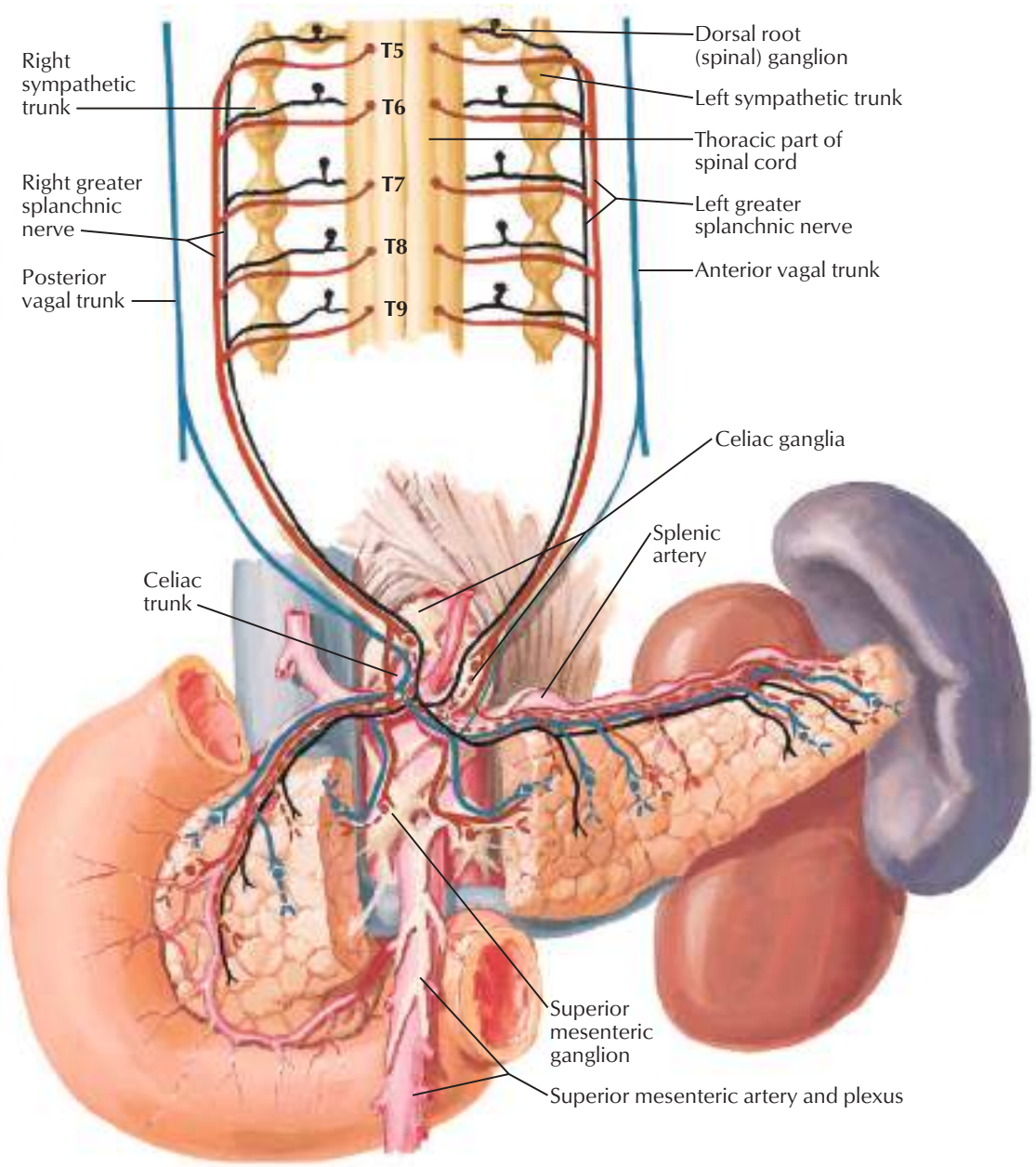
Afferent fibers

Ramification of nerve fibers around fine branch of hepatic artery

Autonomic Innervation of Pancreas: Schema

See also Plates 163, 164

Common areas of pancreatic pain



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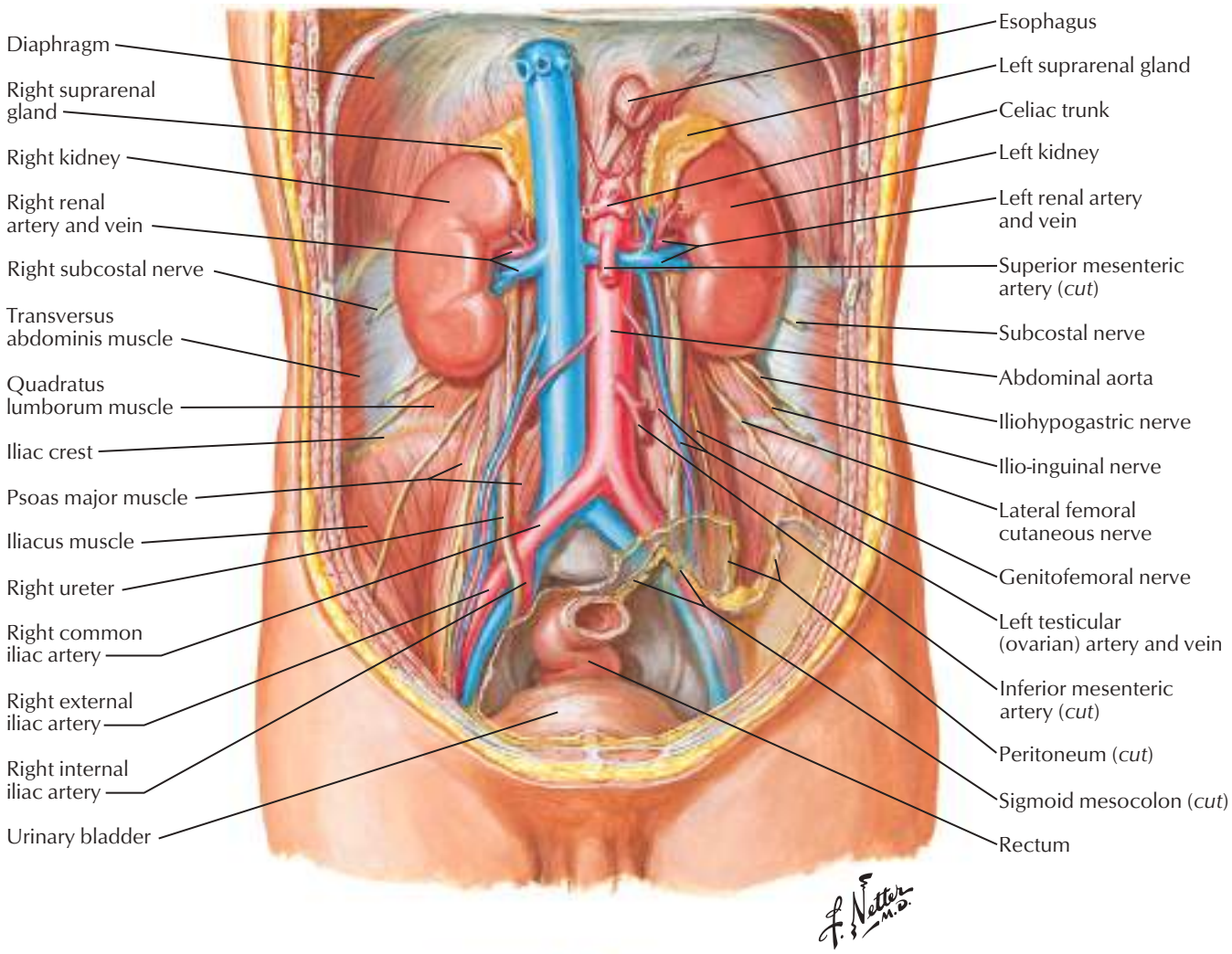
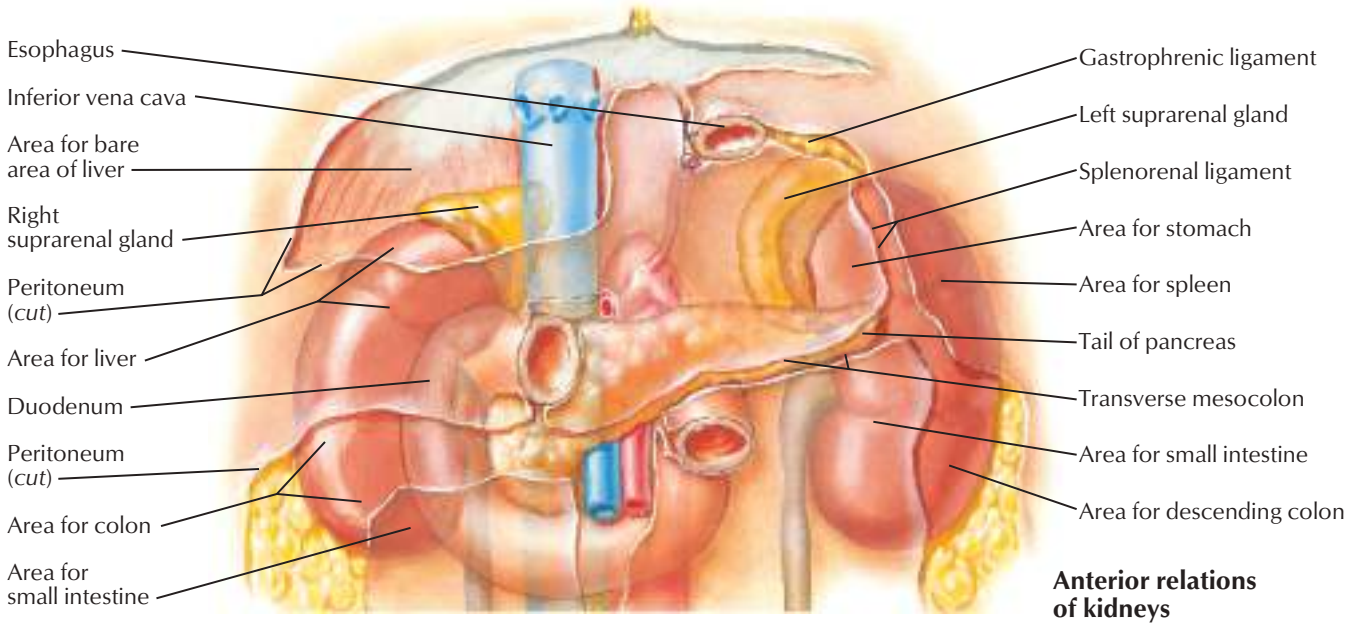
Sympathetic fibers
- **Preganglionic**
- **Postganglionic**

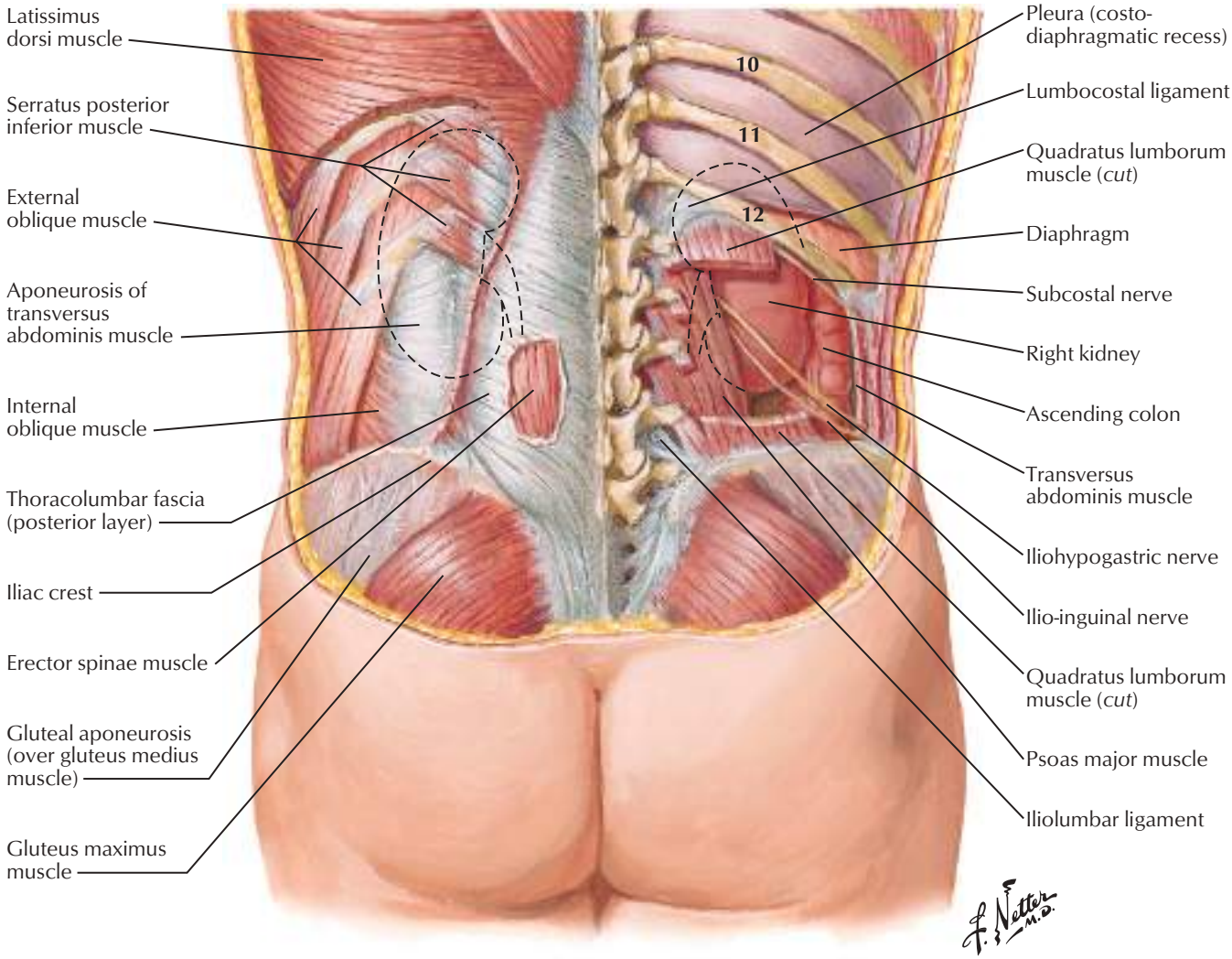
Parasympathetic fibers
- **Preganglionic**
- **Postganglionic**

Afferent fibers





Anterior relations of kidneys


Latissimus dorsi muscle
Serratus posterior inferior muscle
External oblique muscle
Aponeurosis of transversus abdominis muscle
Internal oblique muscle
Thoracolumbar fascia (posterior layer)
Iliac crest
Erector spinae muscle
Gluteal aponeurosis (over gluteus medius muscle)
Gluteus maximus muscle
10
11
12
Pleura (costo-diaphragmatic recess)
Lumbocostal ligament
Quadratus lumborum muscle (cut)
Diaphragm
Subcostal nerve
Right kidney
Ascending colon
Transversus abdominis muscle
Iliohypogastric nerve
Ilio-inguinal nerve
Quadratus lumborum muscle (cut)
Psoas major muscle
Iliolumbar ligament
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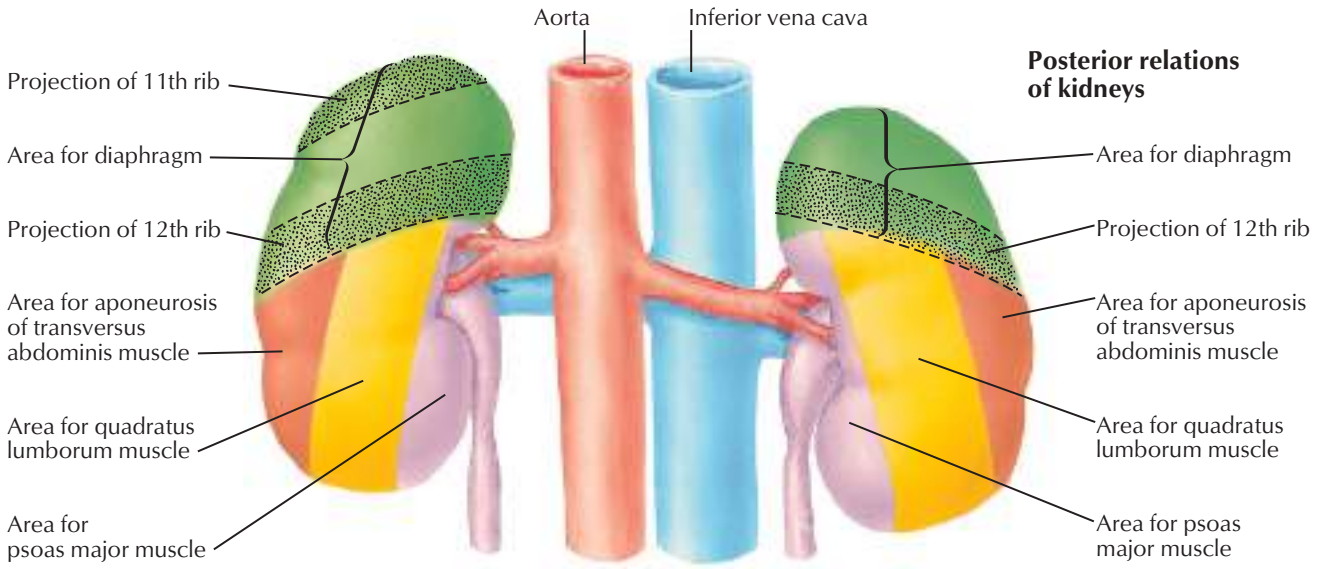
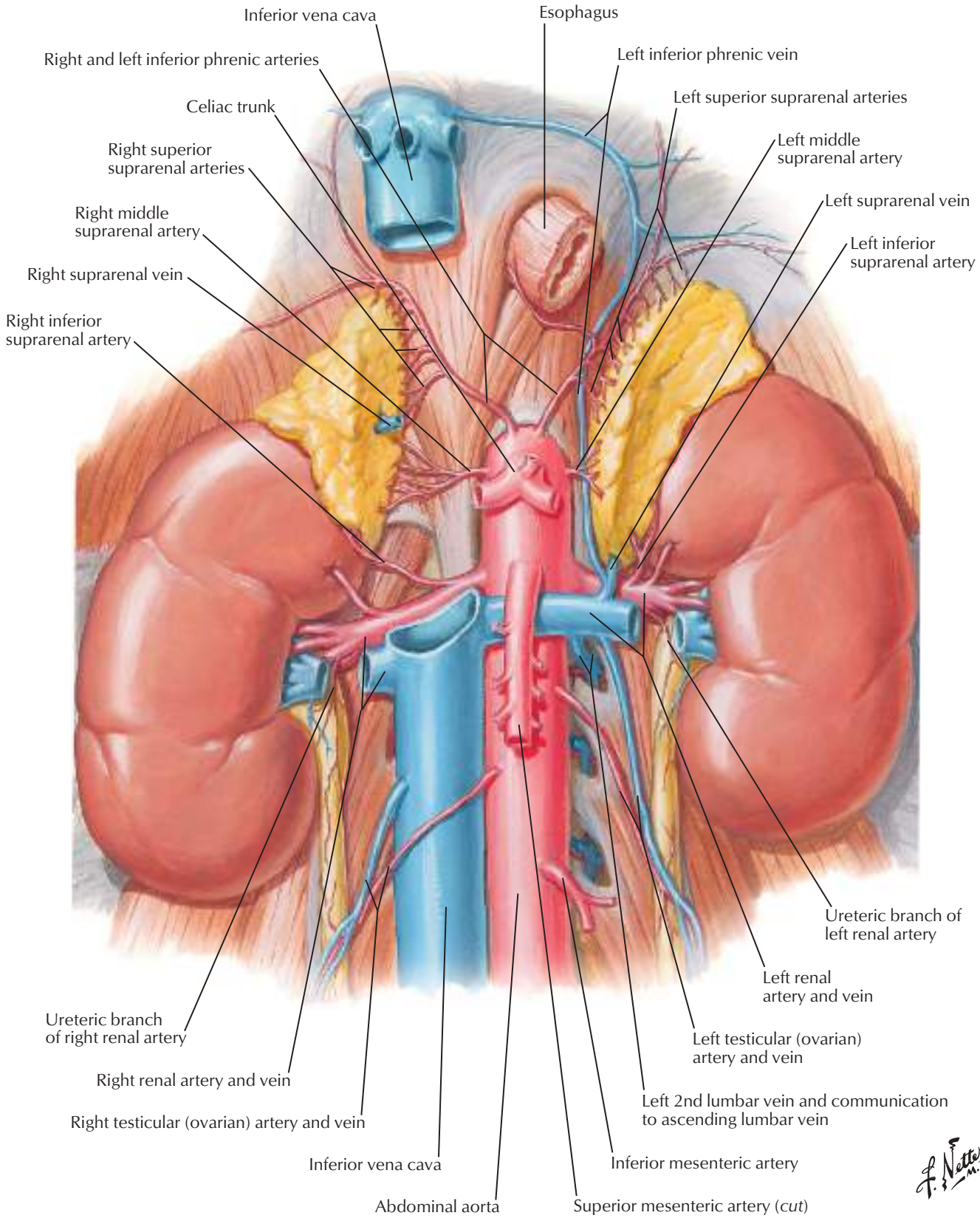
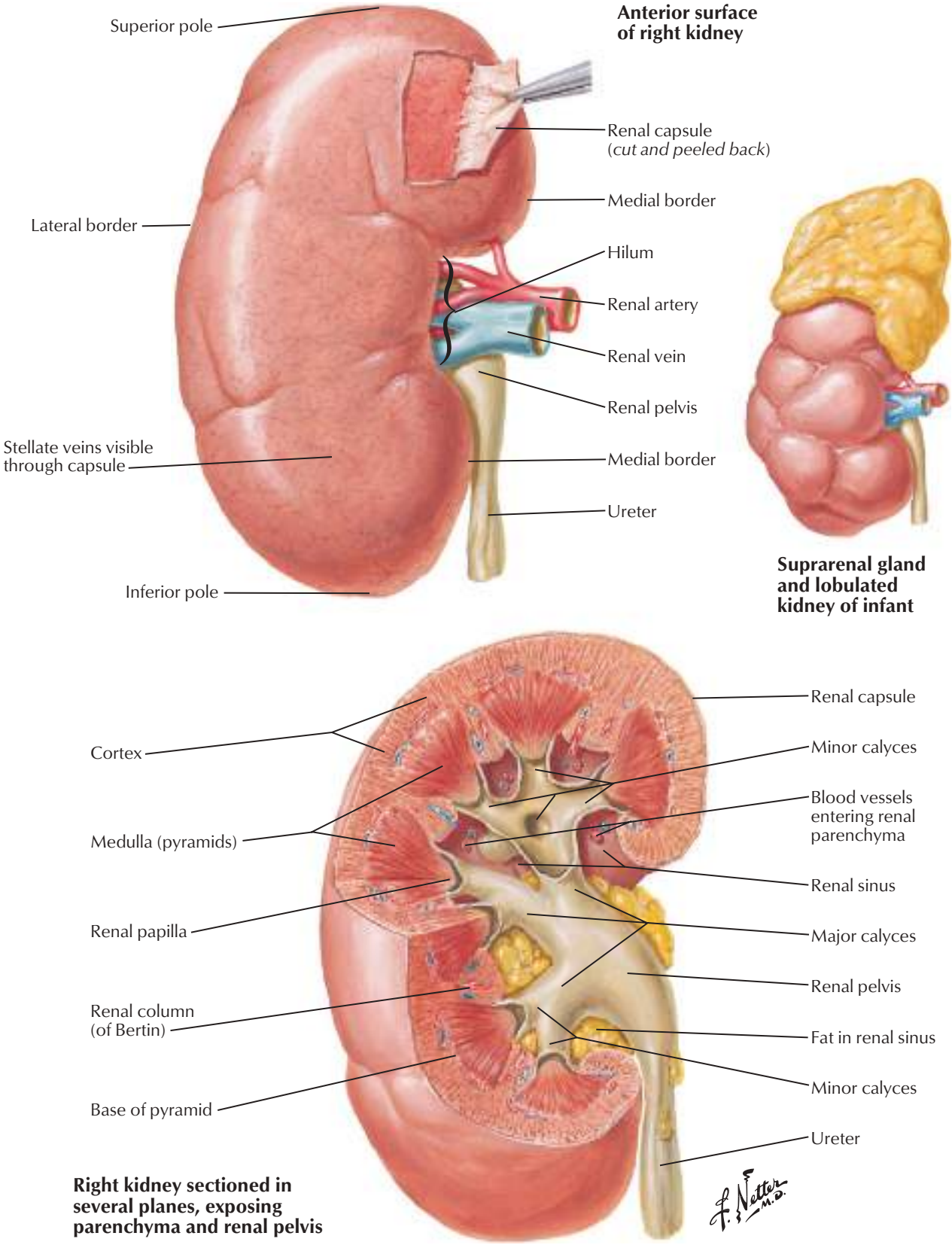
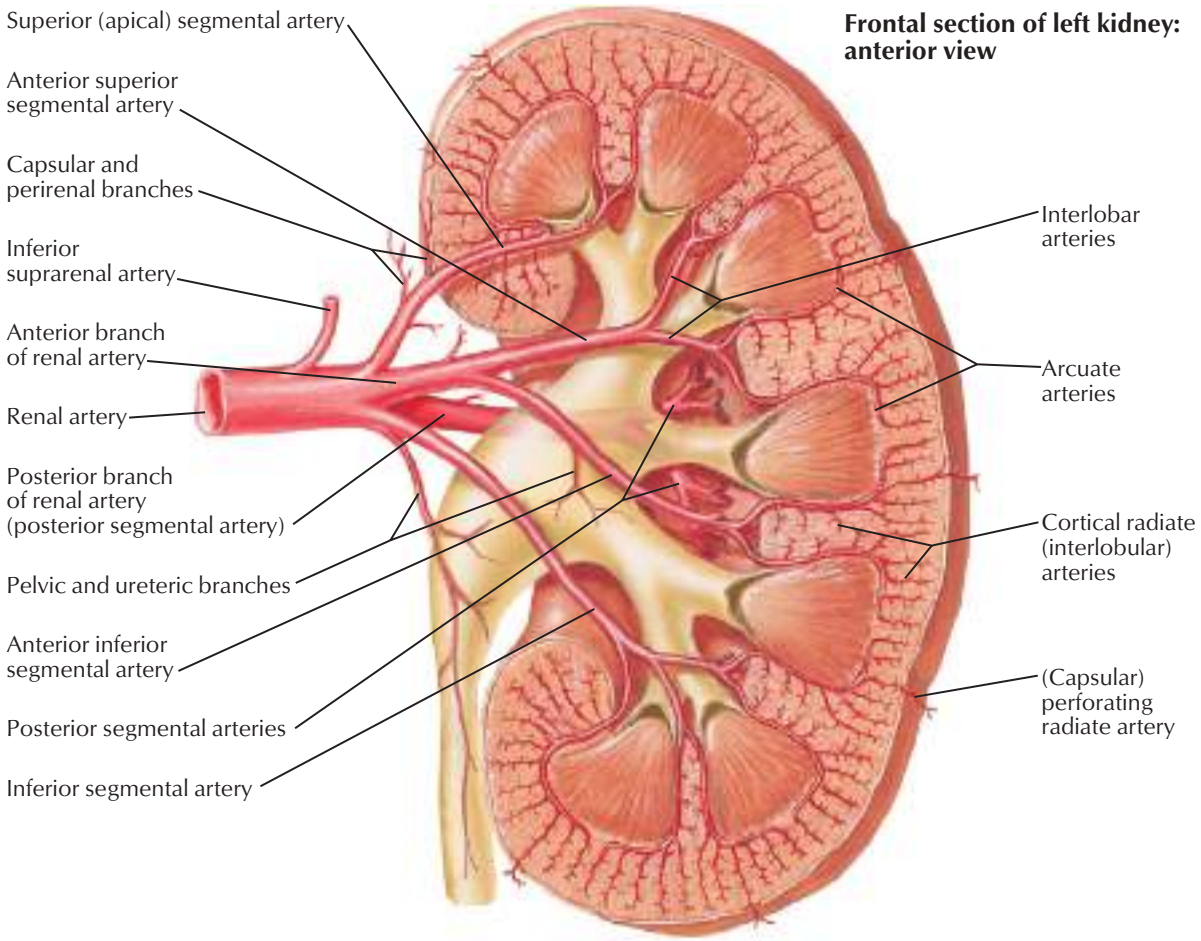
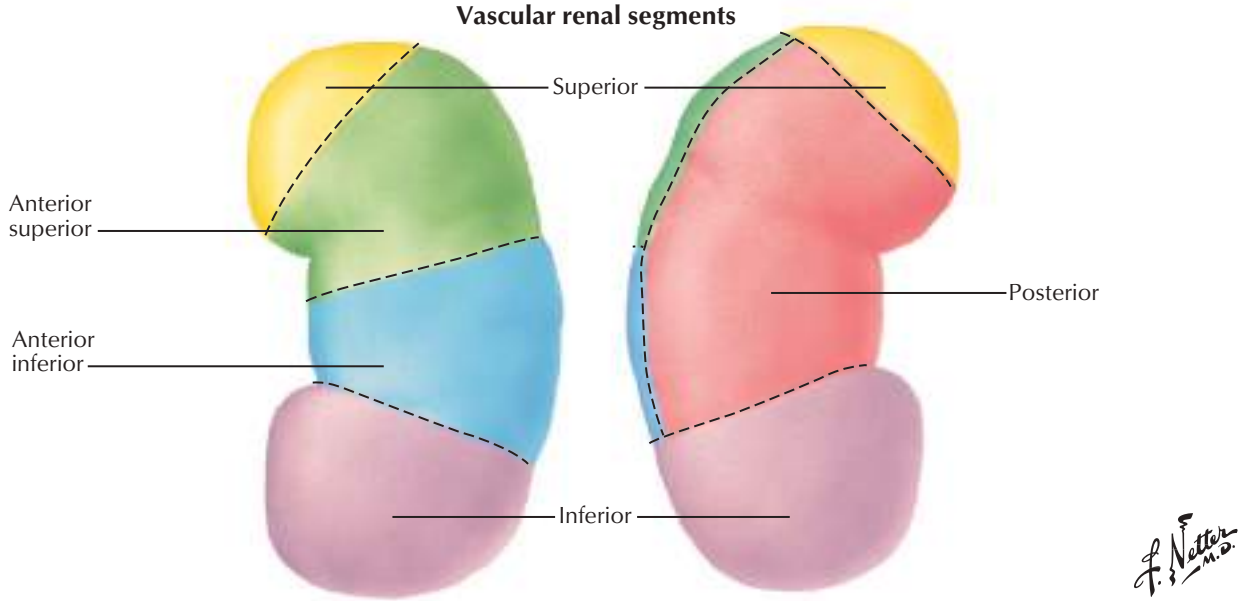

Aorta
Inferior vena cava
Projection of 11th rib
Area for diaphragm
Projection of 12th rib
Area for aponeurosis of transversus abdominis muscle
Area for quadratus lumborum muscle
Area for psoas major muscle
Posterior relations of kidneys
Area for diaphragm
Projection of 12th rib
Area for aponeurosis of transversus abdominis muscle
Area for quadratus lumborum muscle
Area for psoas major muscle

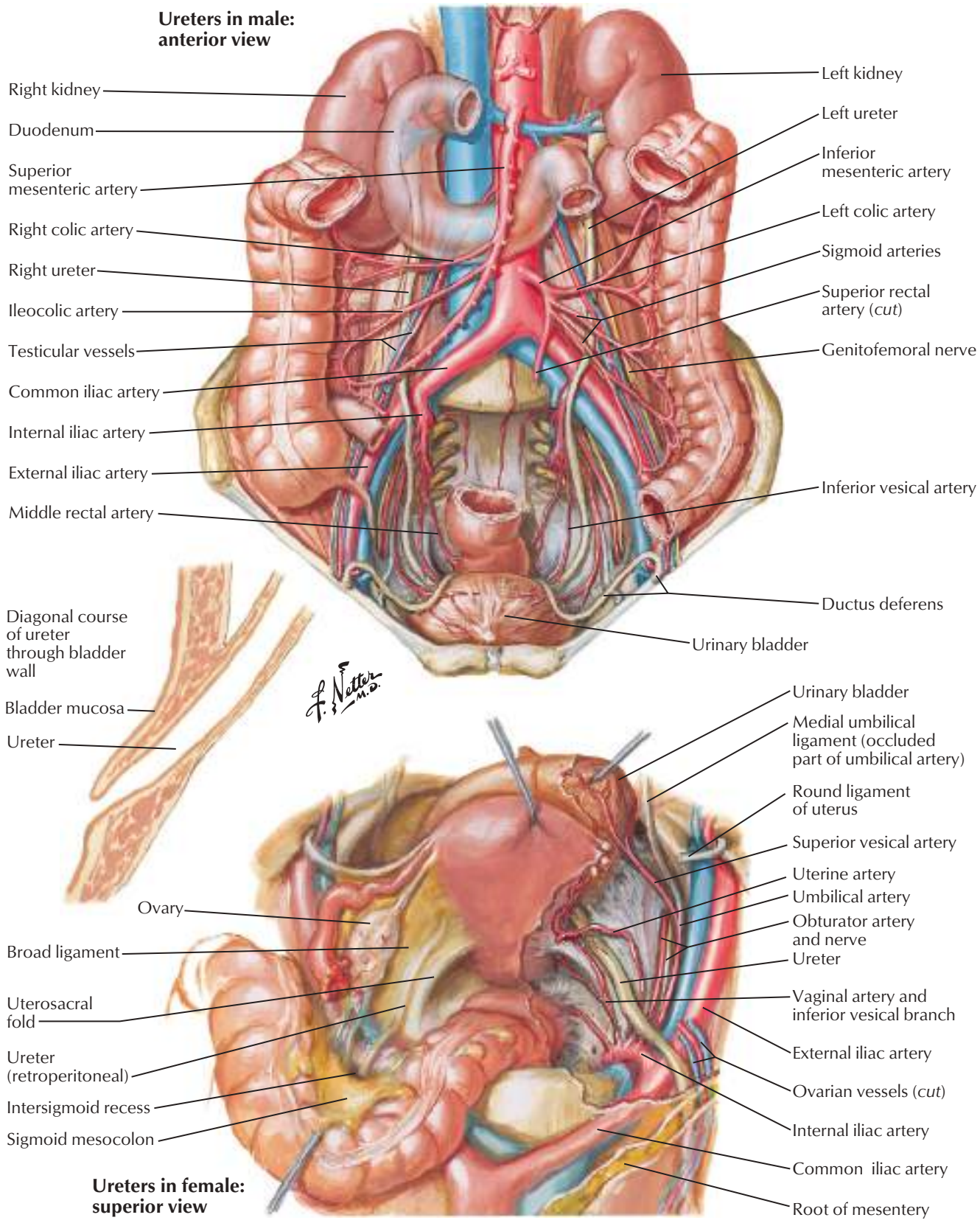

Inferior vena cava
Esophagus
Right and left inferior phrenic arteries
Left inferior phrenic vein
Celiac trunk
Left superior suprarenal arteries
Right superior suprarenal arteries
Left middle suprarenal artery
Left suprarenal vein
Right middle suprarenal artery
Left inferior suprarenal artery
Right suprarenal vein
Right inferior suprarenal artery
Ureteric branch of left renal artery
Left renal artery and vein
Left testicular (ovarian) artery and vein
Ureteric branch of right renal artery
Right renal artery and vein
Left 2nd lumbar vein and communication to ascending lumbar vein
Right testicular (ovarian) artery and vein
Inferior vena cava
Inferior mesenteric artery
Abdominal aorta
Superior mesenteric artery (cut)

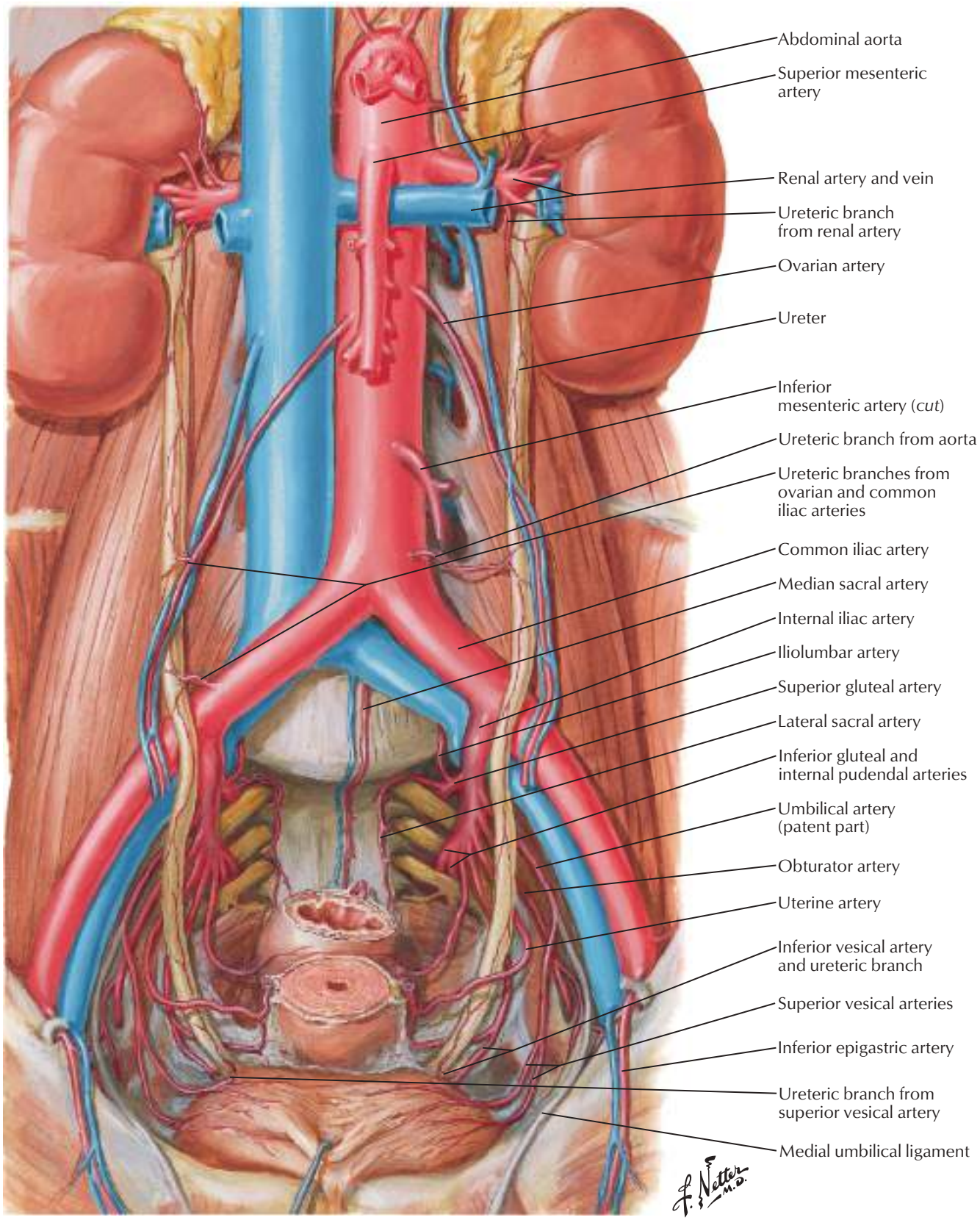


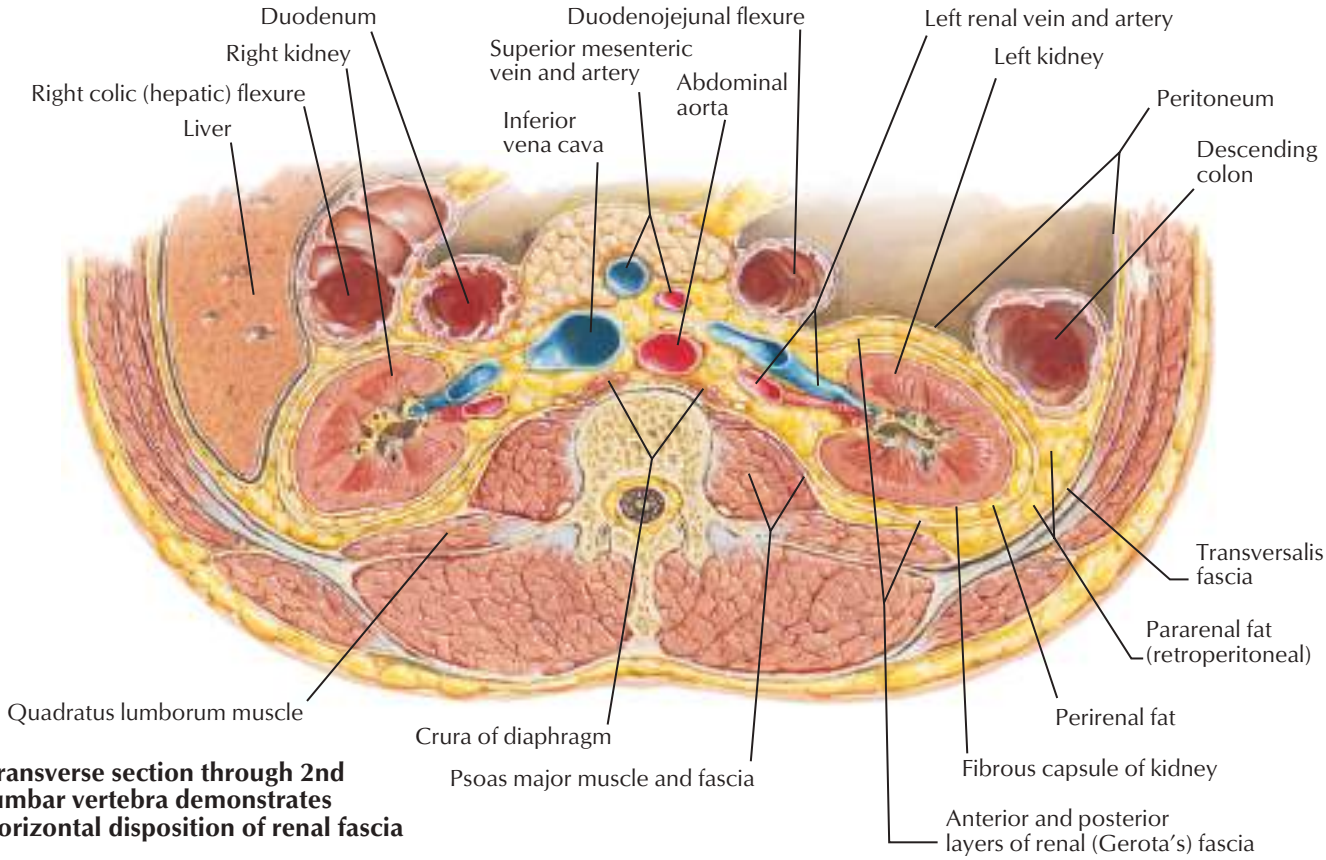
Right kidney sectioned in several planes, exposing parenchyma and renal pelvis


Frontal section of left kidney: anterior view
Superior (apical) segmental artery
Anterior superior segmental artery
Capsular and perirenal branches
Inferior suprarenal artery
Anterior branch of renal artery
Renal artery
Posterior branch of renal artery (posterior segmental artery)
Pelvic and ureteric branches
Anterior inferior segmental artery
Posterior segmental arteries
Inferior segmental artery
Interlobar arteries
Arcuate arteries
Cortical radiate (interlobular) arteries
(Capsular) perforating radiate artery

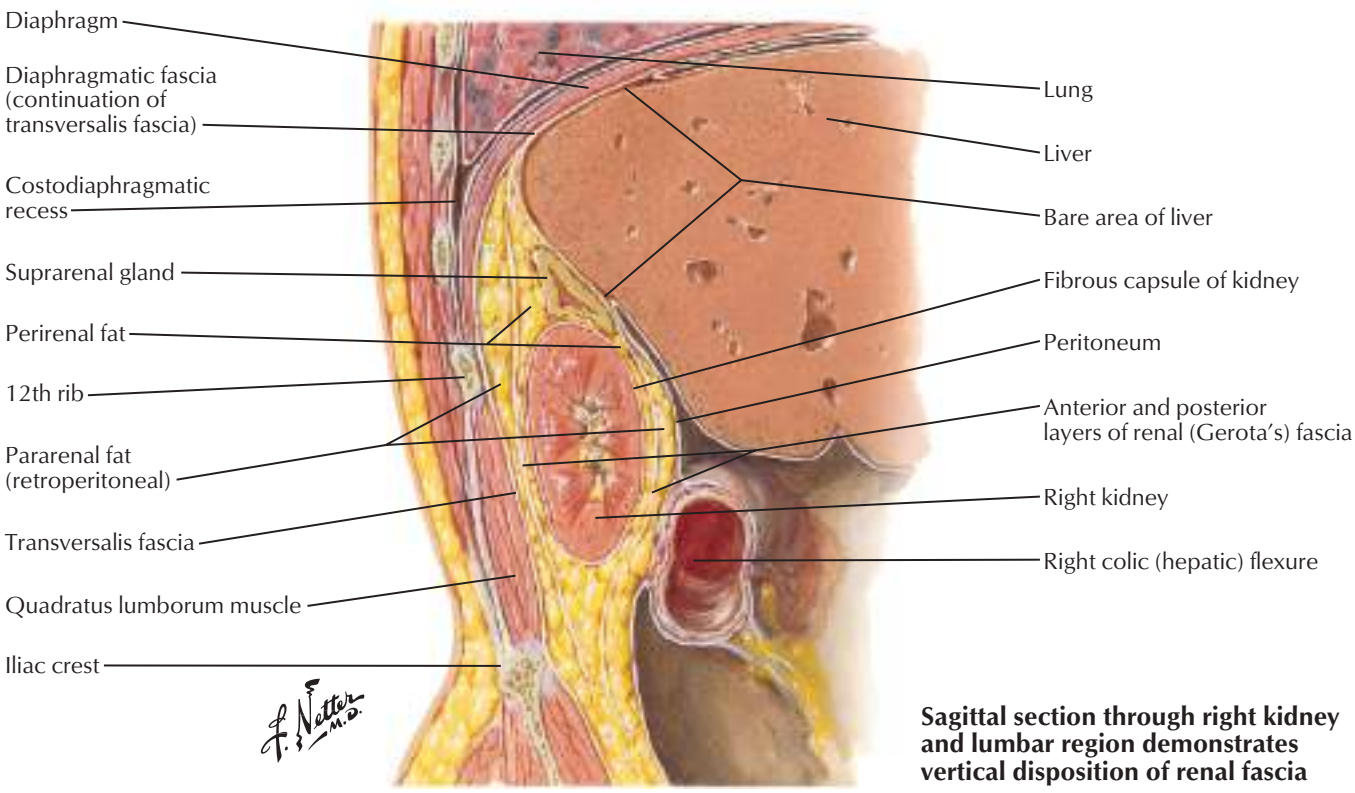

Vascular renal segments
Superior
Anterior superior
Anterior inferior
Inferior
Posterior
Anterior surface of left kidney
Posterior surface of left kidney


Ureters in male: anterior view
Right kidney
Duodenum
Superior mesenteric artery
Right colic artery
Right ureter
Ileocolic artery
Testicular vessels
Common iliac artery
Internal iliac artery
External iliac artery
Middle rectal artery
Left kidney
Left ureter
Inferior mesenteric artery
Left colic artery
Sigmoid arteries
Superior rectal artery (cut)
Genitofemoral nerve
Inferior vesical artery
Ductus deferens
Urinary bladder
Diagonal course of ureter through bladder wall
Bladder mucosa
Ureter
F. Netter M.D.
Urinary bladder
Medial umbilical ligament (occluded part of umbilical artery)
Round ligament of uterus
Superior vesical artery
Uterine artery
Umbilical artery
Obturator artery and nerve
Ureter
Vaginal artery and inferior vesical branch
External iliac artery
Ovarian vessels (cut)
Internal iliac artery
Common iliac artery
Root of mesentery
Ovary
Broad ligament
Uterosacral fold
Ureter (retroperitoneal)
Intersigmoid recess
Sigmoid mesocolon
Ureters in female: superior view


Abdominal aorta
Superior mesenteric artery
Renal artery and vein
Ureteric branch from renal artery
Ovarian artery
Ureter
Inferior mesenteric artery (*cut*)
Ureteric branch from aorta
Ureteric branches from ovarian and common iliac arteries
Common iliac artery
Median sacral artery
Internal iliac artery
Iliolumbar artery
Superior gluteal artery
Lateral sacral artery
Inferior gluteal and internal pudendal arteries
Umbilical artery (patent part)
Obturator artery
Uterine artery
Inferior vesical artery and ureteric branch
Superior vesical arteries
Inferior epigastric artery
Ureteric branch from superior vesical artery
Medial umbilical ligament



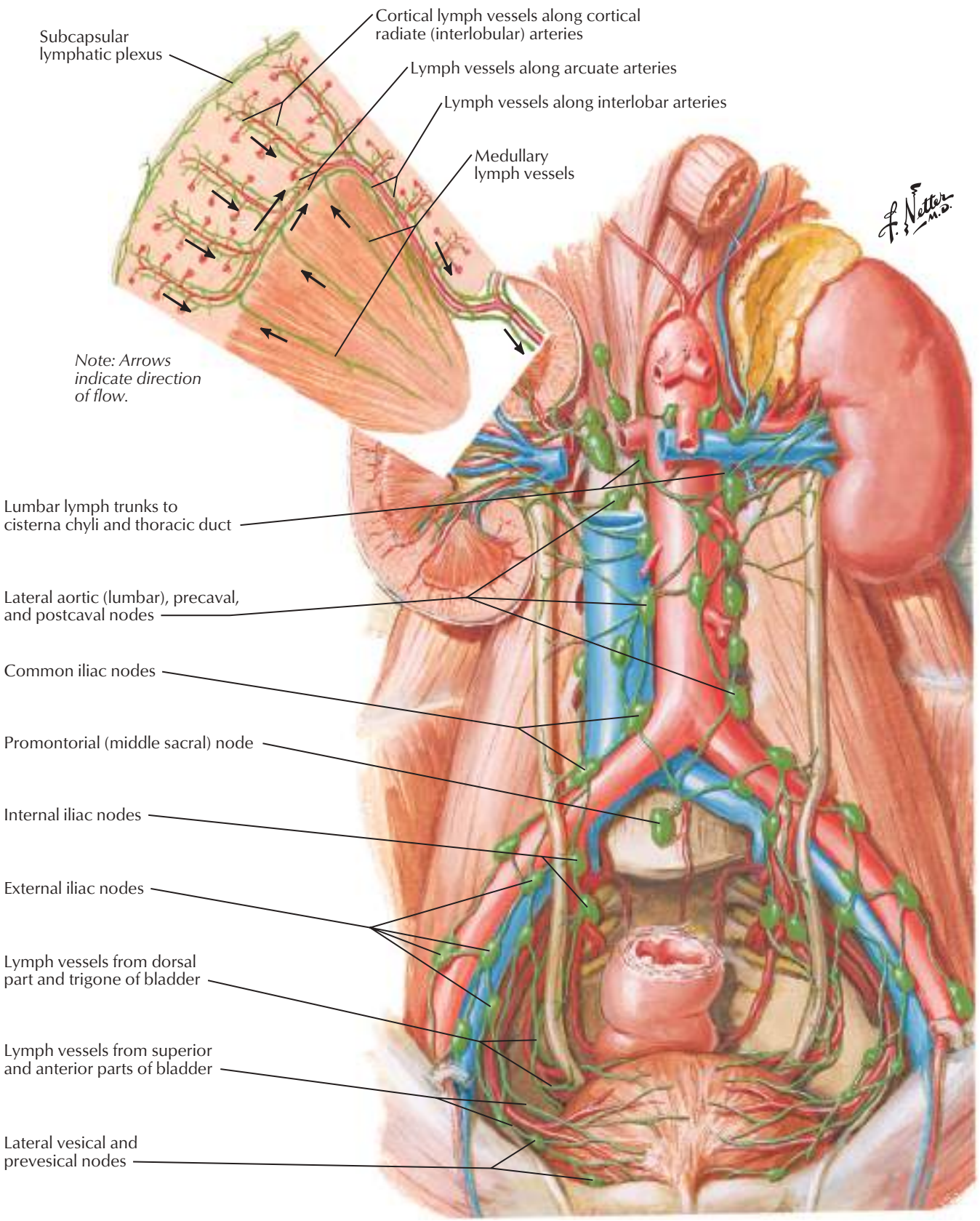
Transverse section through 2nd lumbar vertebra demonstrates horizontal disposition of renal fascia

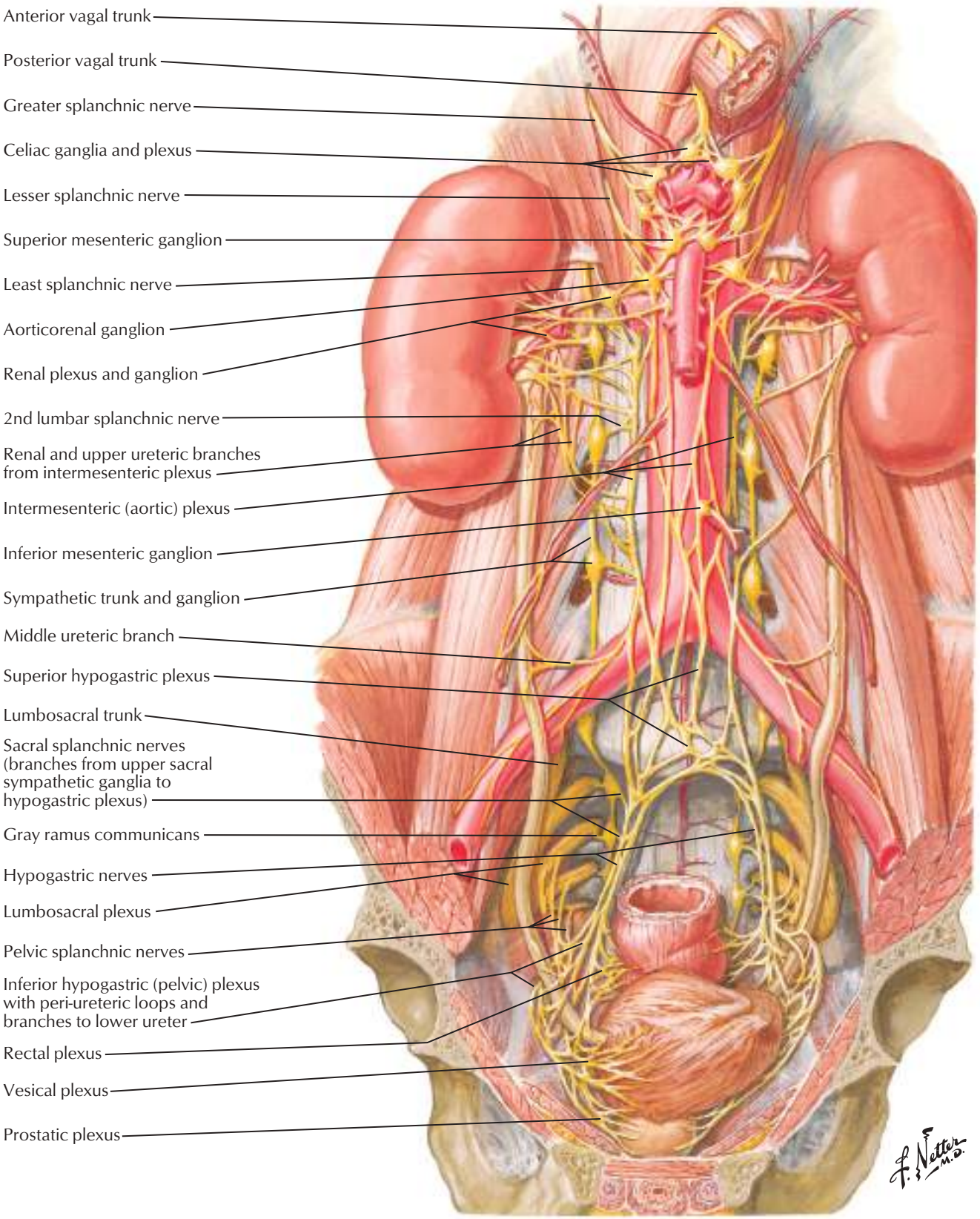


Sagittal section through right kidney and lumbar region demonstrates vertical disposition of renal fascia

Lymph Vessels and Nodes of Kidneys and Urinary Bladder

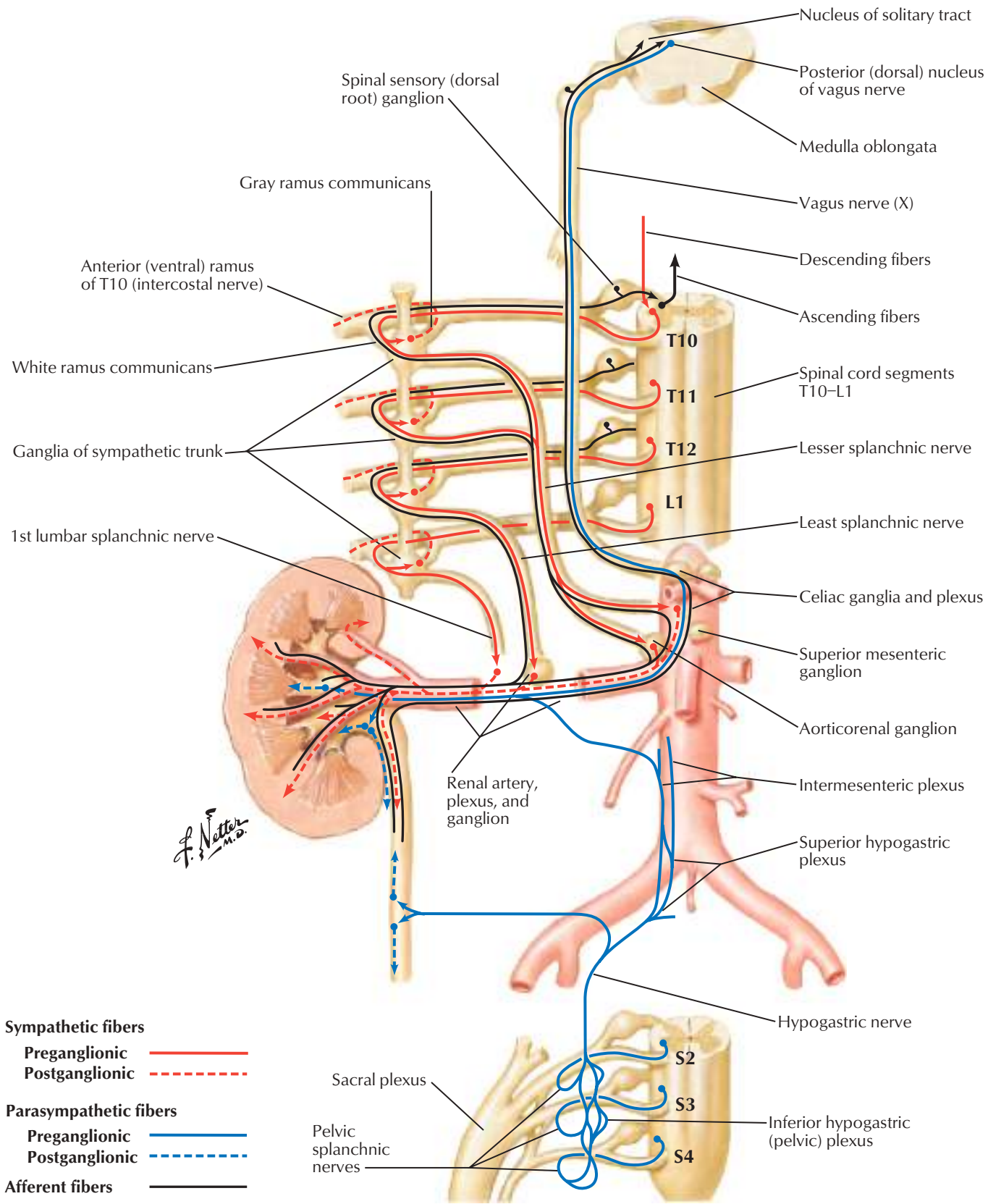
See also Plates 384, 386




Anterior vagal trunk
Posterior vagal trunk
Greater splanchnic nerve
Celiac ganglia and plexus
Lesser splanchnic nerve
Superior mesenteric ganglion
Least splanchnic nerve
Aorticorenal ganglion
Renal plexus and ganglion
2nd lumbar splanchnic nerve
Renal and upper ureteric branches from intermesenteric plexus
Intermesenteric (aortic) plexus
Inferior mesenteric ganglion
Sympathetic trunk and ganglion
Middle ureteric branch
Superior hypogastric plexus
Lumbosacral trunk
Sacral splanchnic nerves (branches from upper sacral sympathetic ganglia to hypogastric plexus)
Gray ramus communicans
Hypogastric nerves
Lumbosacral plexus
Pelvic splanchnic nerves
Inferior hypogastric (pelvic) plexus with peri-ureteric loops and branches to lower ureter
Rectal plexus
Vesical plexus
Prostatic plexus

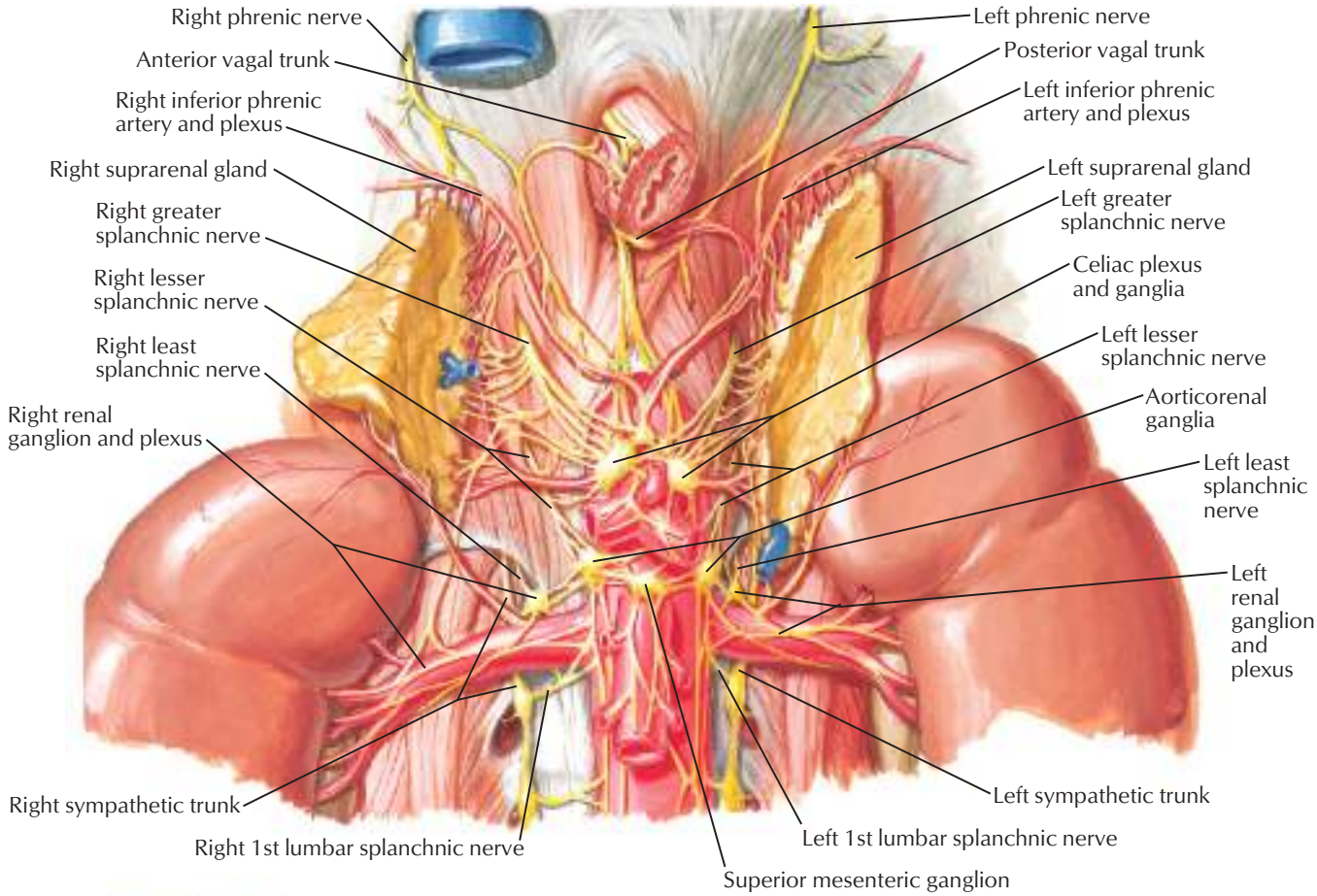
Autonomic Innervation of Kidneys and Upper Ureters: Schema

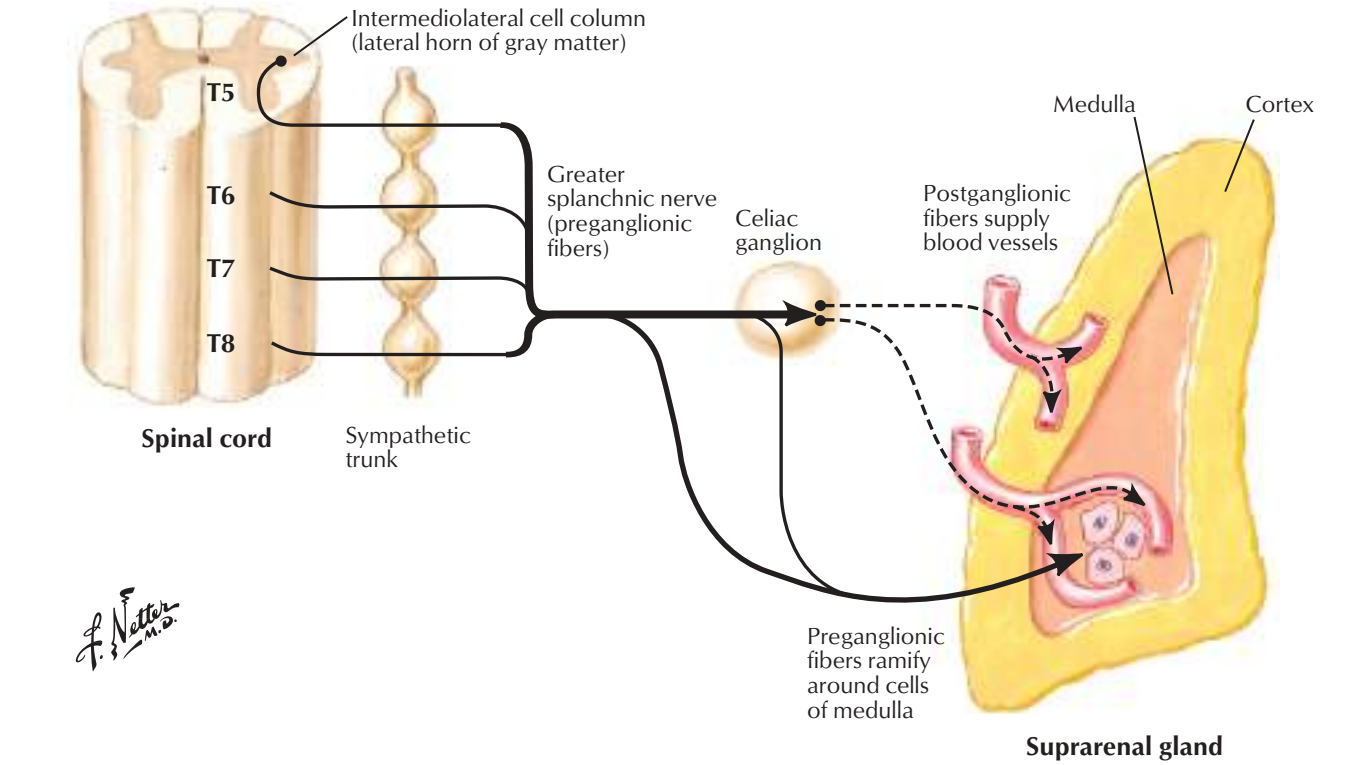
See also Plates 163, 164, 395

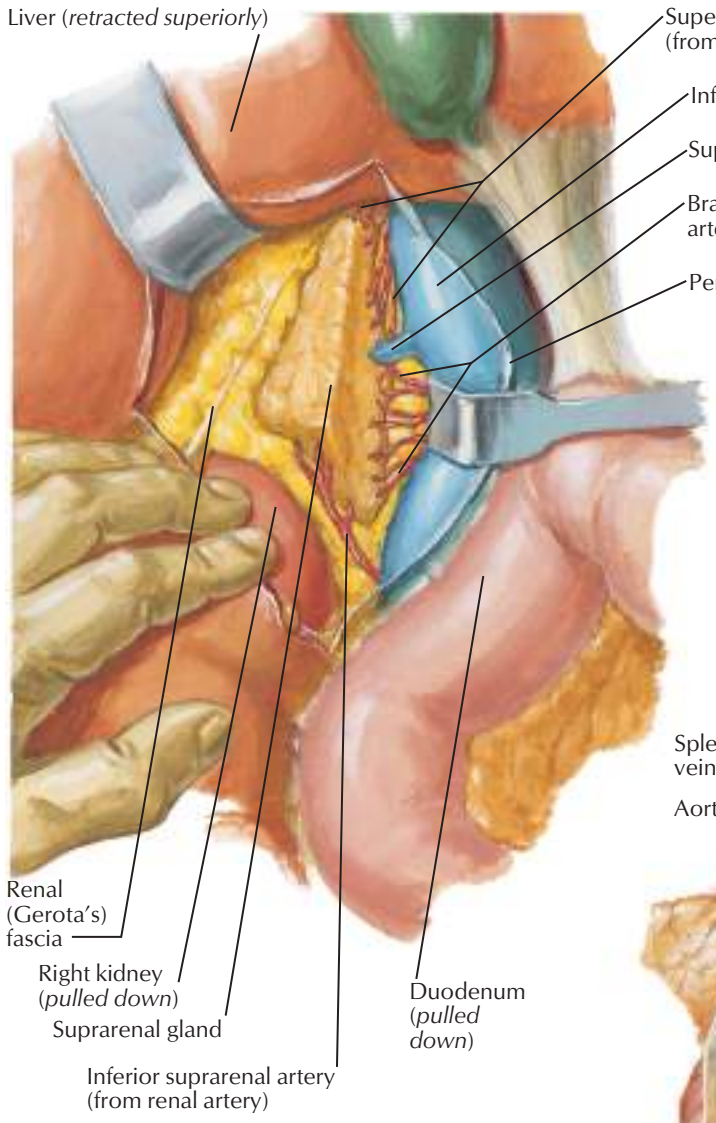


Autonomic Nerves of Suprarenal Glands: Dissection and Schema

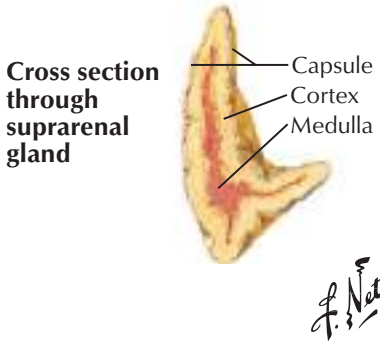
See also Plates 163, 164



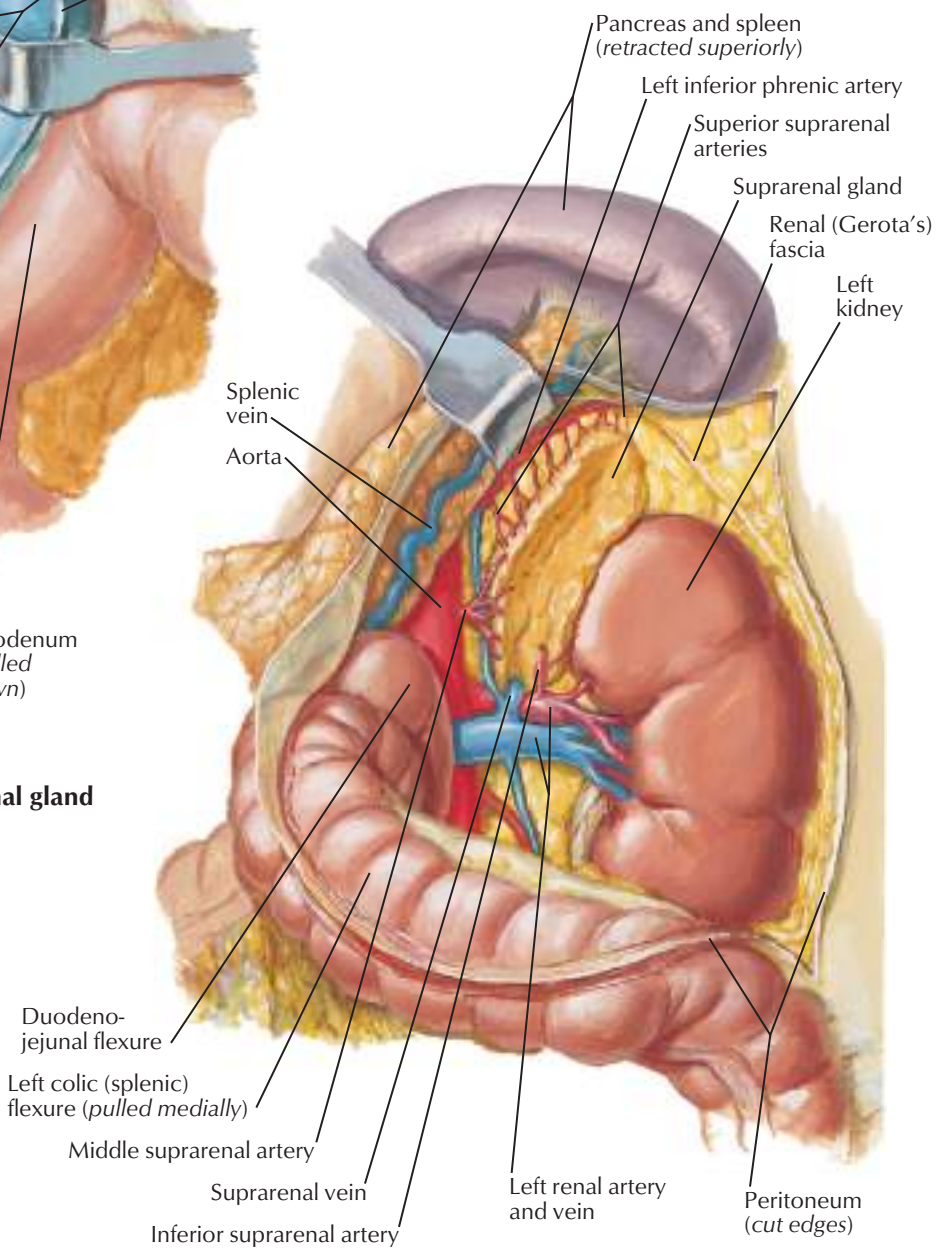




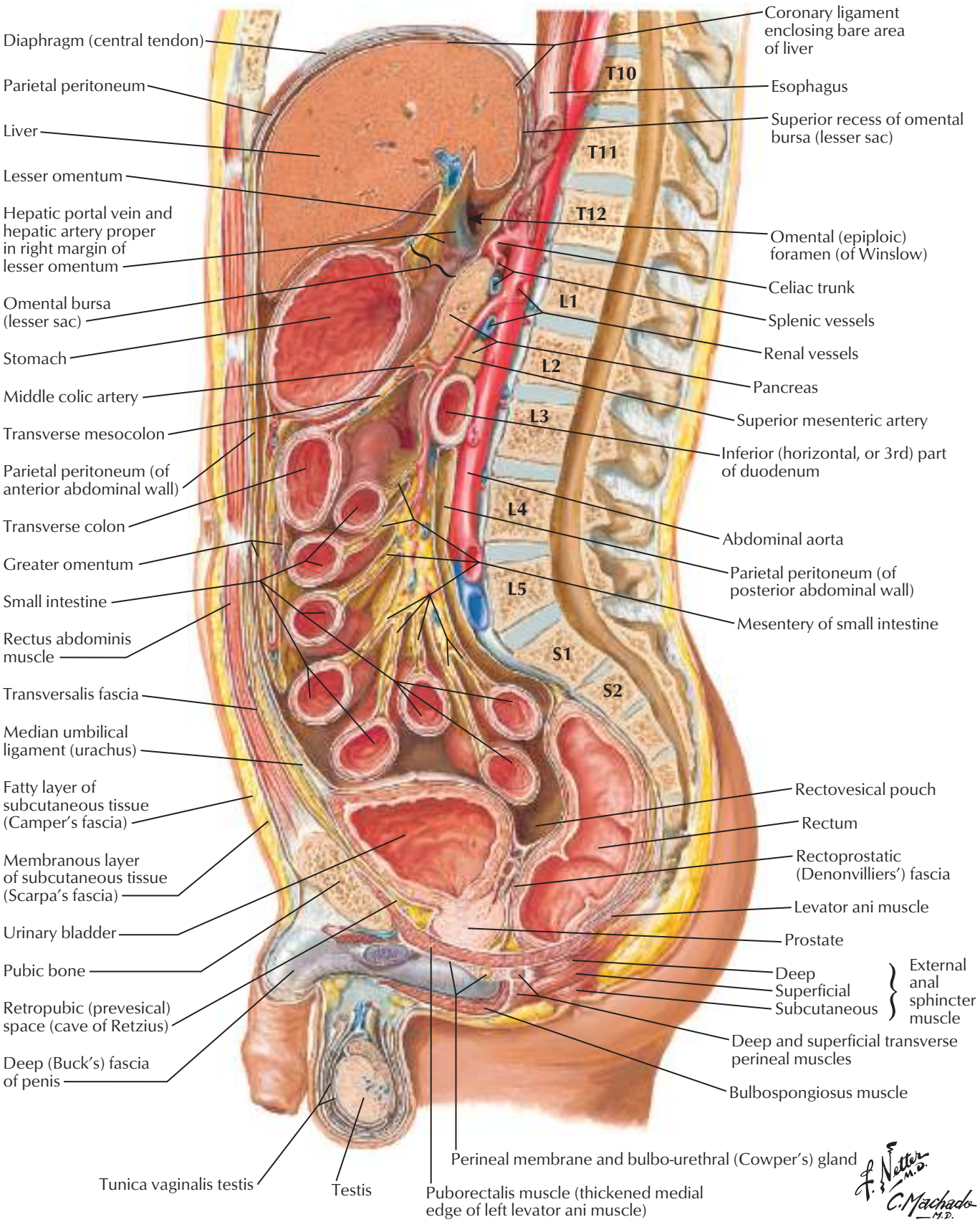
Abdominal exposure of right suprarenal gland



Cross section through suprarenal gland



Abdominal exposure of left suprarenal gland


Diaphragm (central tendon)
Parietal peritoneum
Liver
Lesser omentum
Hepatic portal vein and hepatic artery proper in right margin of lesser omentum
Omental bursa (lesser sac)
Stomach
Middle colic artery
Transverse mesocolon
Parietal peritoneum (of anterior abdominal wall)
Transverse colon
Greater omentum
Small intestine
Rectus abdominis muscle
Transversalis fascia
Median umbilical ligament (urachus)
Fatty layer of subcutaneous tissue (Camper's fascia)
Membranous layer of subcutaneous tissue (Scarpa's fascia)
Urinary bladder
Pubic bone
Retropubic (prevesical) space (cave of Retzius)
Deep (Buck's) fascia of penis
Tunica vaginalis testis
Testis
Perineal membrane and bulbo-urethral (Cowper's) gland
Puborectalis muscle (thickened medial edge of left levator ani muscle)
Coronary ligament enclosing bare area of liver
T10
Esophagus
Superior recess of omental bursa (lesser sac)
T11
T12
Omental (epiploic) foramen (of Winslow)
Celiac trunk
L1
Splenic vessels
Renal vessels
L2
Pancreas
Superior mesenteric artery
L3
Inferior (horizontal, or 3rd) part of duodenum
L4
Abdominal aorta
Parietal peritoneum (of posterior abdominal wall)
L5
Mesentery of small intestine
S1
S2
Rectovesical pouch
Rectum
Rectoprostatic (Denonvilliers') fascia
Levator ani muscle
Prostate
Deep
Superficial
Subcutaneous
External anal sphincter muscle
Deep and superficial transverse perineal muscles
Bulbospongiosus muscle
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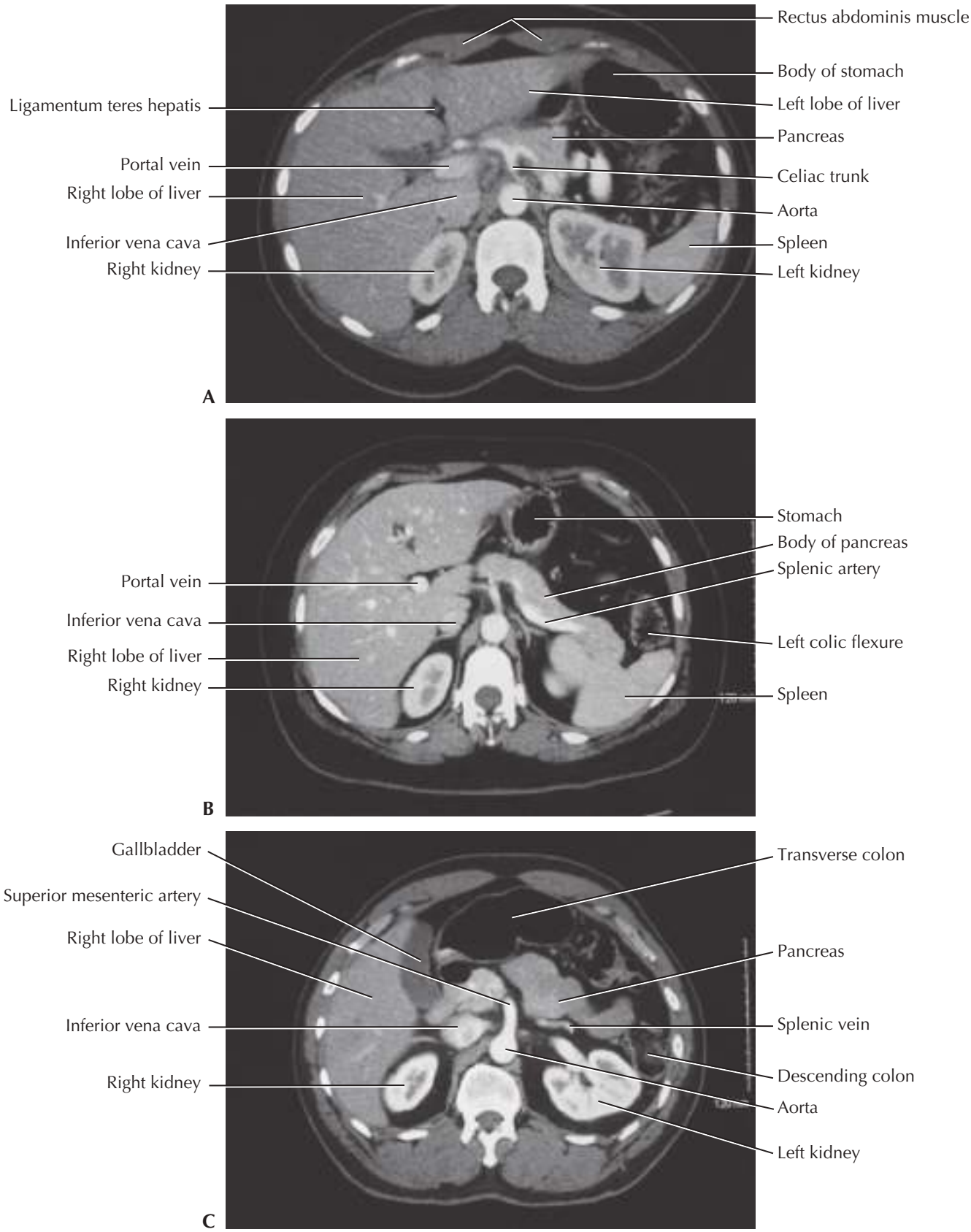
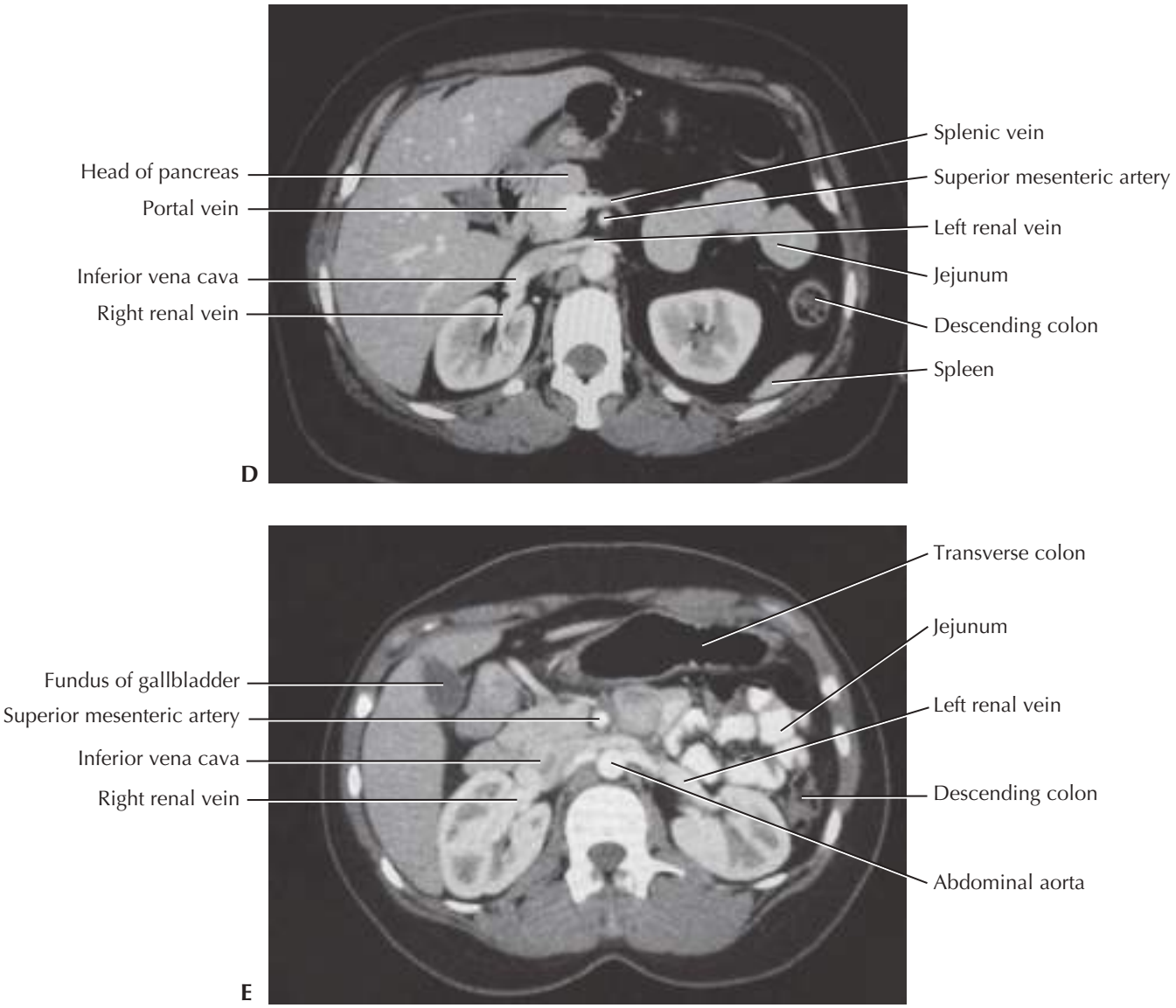
C. Machado M.D.

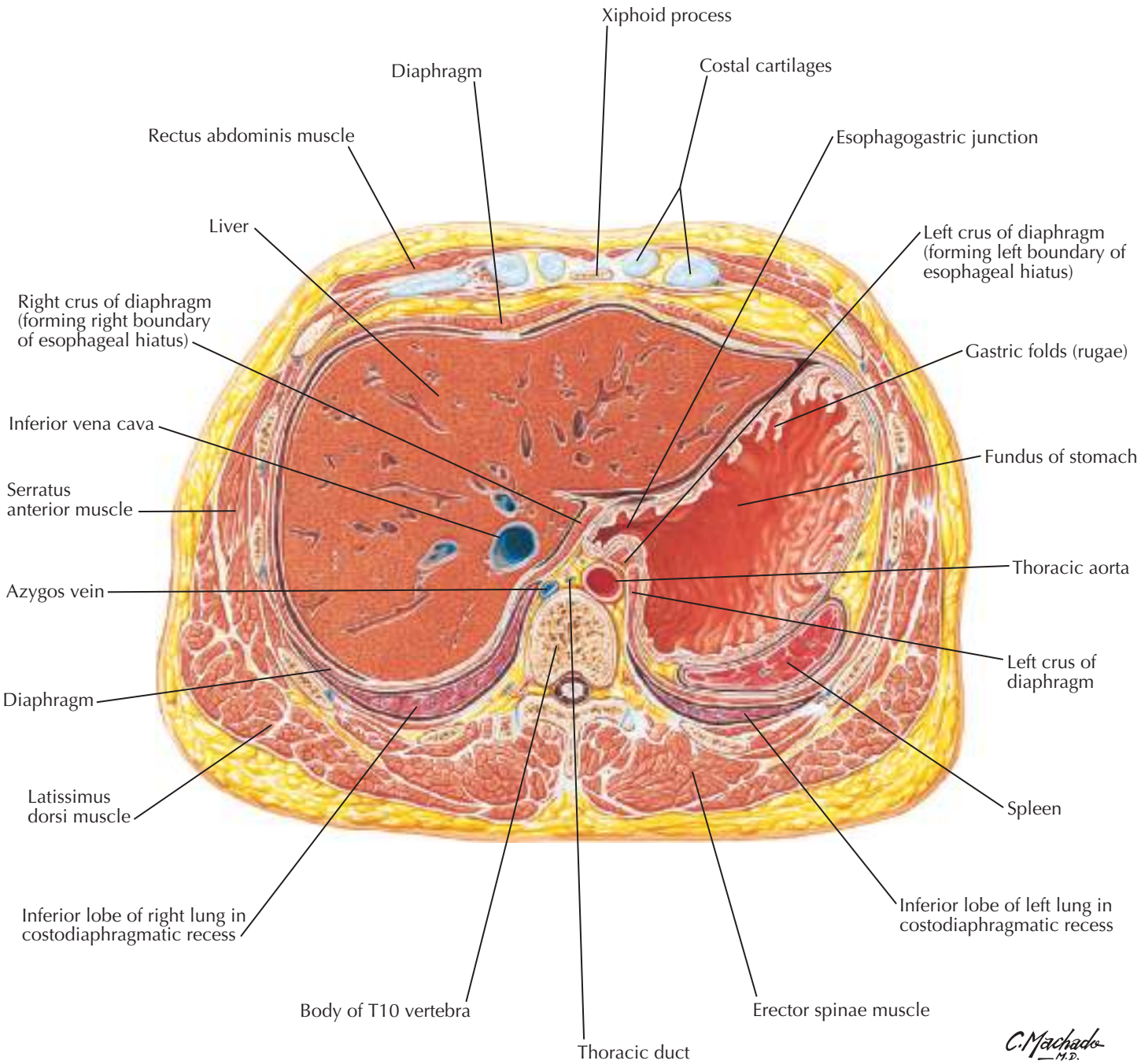
Series of abdominal axial CT images from superior (A) to inferior (C)

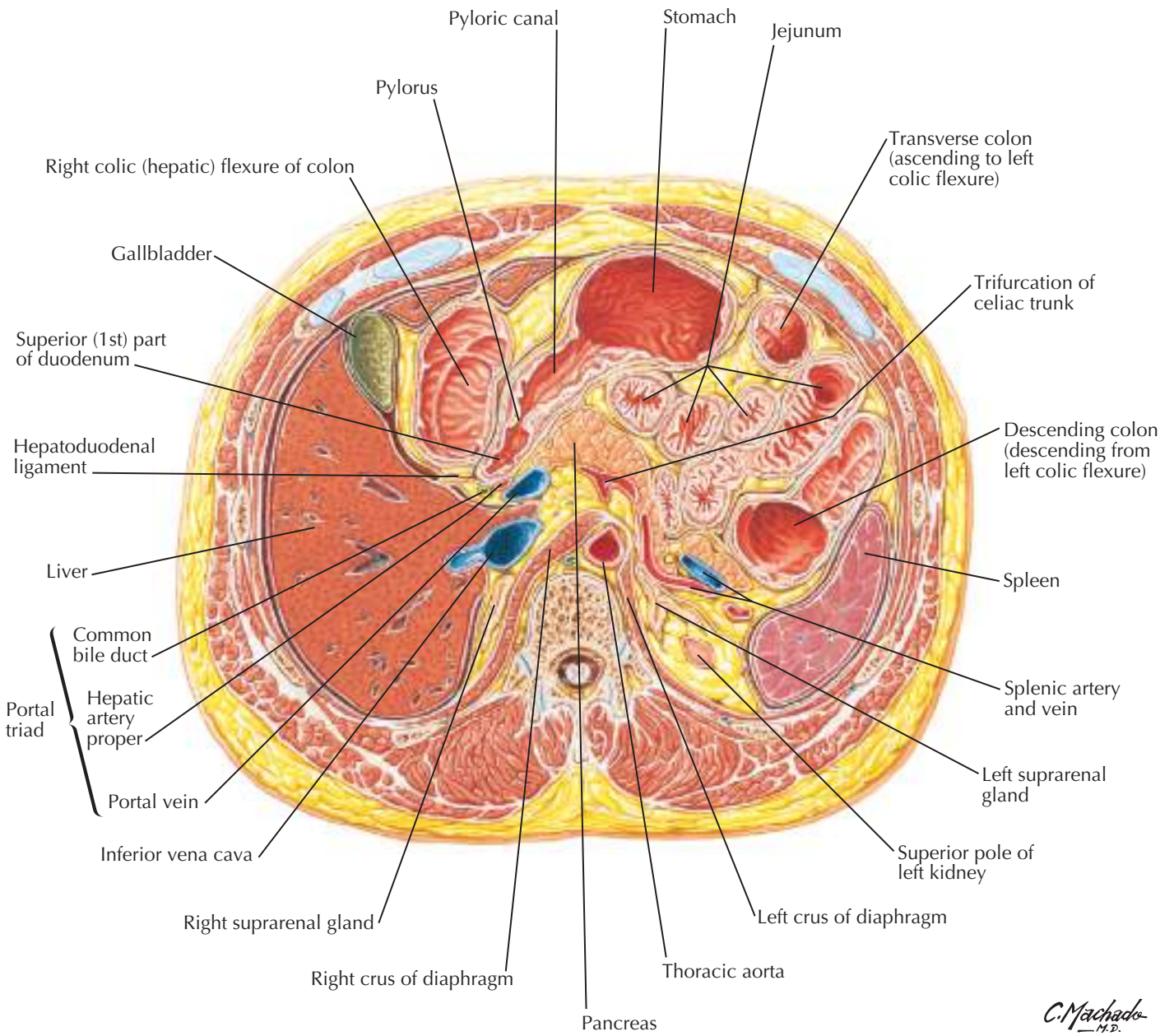


Series of abdominal axial CT images from superior (D) to inferior (E)

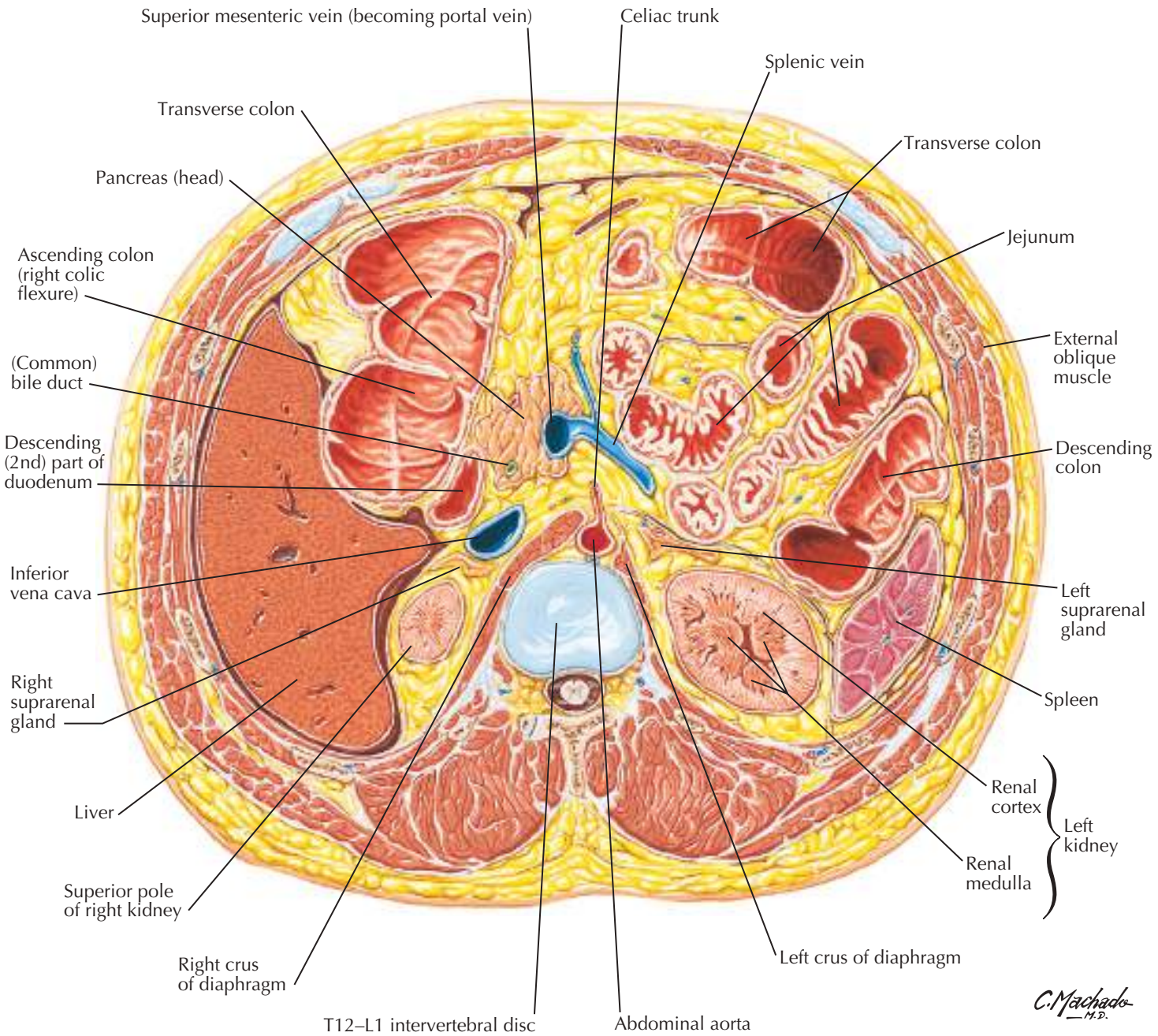


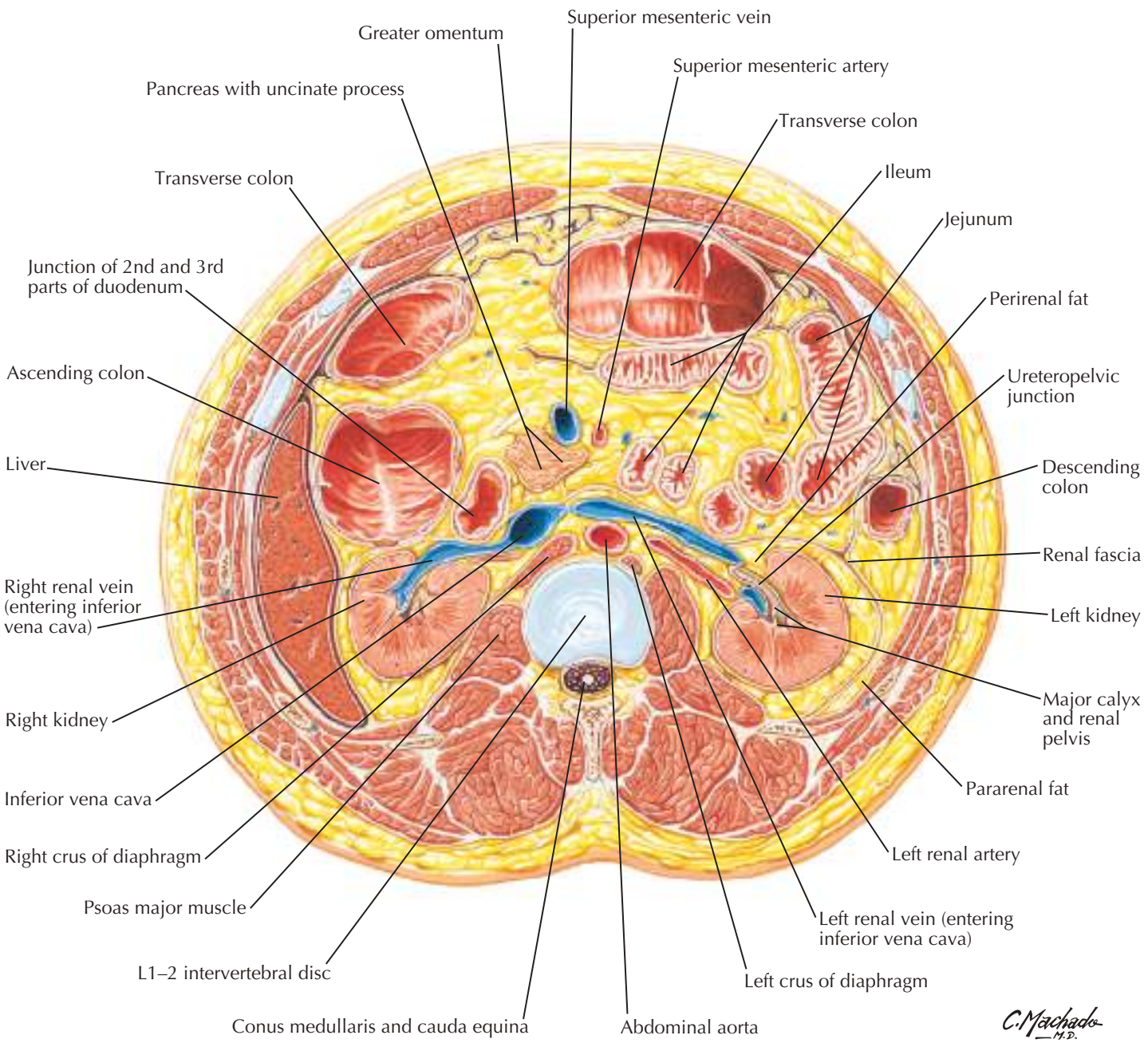
Cross Section at T10, Esophagogastric Junction

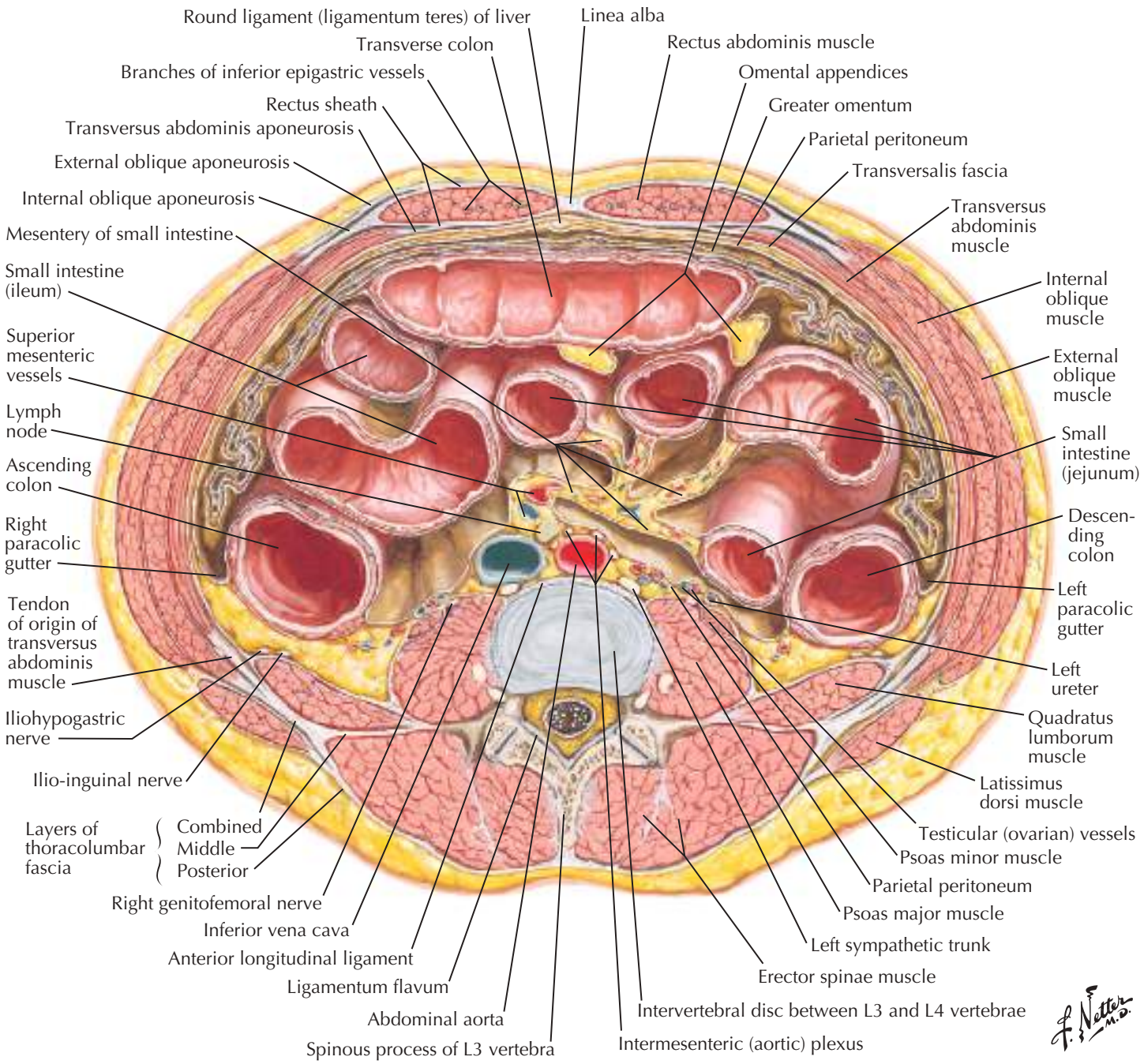



Pyloric canal
Stomach
Jejunum
Pylorus
Transverse colon (ascending to left colic flexure)
Right colic (hepatic) flexure of colon
Gallbladder
Trifurcation of celiac trunk
Superior (1st) part of duodenum
Descending colon (descending from left colic flexure)
Hepatoduodenal ligament
Liver
Spleen
Common bile duct
Portal triad
Hepatic artery proper
Splenic artery and vein
Portal vein
Left suprarenal gland
Inferior vena cava
Superior pole of left kidney
Right suprarenal gland
Left crus of diaphragm
Right crus of diaphragm
Thoracic aorta
Pancreas
C. Machado M.D.

Cross Section at T12–L1, Intervertebral Disc




Greater omentum
Superior mesenteric vein
Superior mesenteric artery
Pancreas with uncinate process
Transverse colon
Transverse colon
Ileum
Jejunum
Junction of 2nd and 3rd parts of duodenum
Perirenal fat
Ascending colon
Ureteropelvic junction
Liver
Descending colon
Renal fascia
Right renal vein (entering inferior vena cava)
Left kidney
Major calyx and renal pelvis
Right kidney
Pararenal fat
Inferior vena cava
Left renal artery
Right crus of diaphragm
Left renal vein (entering inferior vena cava)
Psoas major muscle
Left crus of diaphragm
L1–2 intervertebral disc
Conus medullaris and cauda equina
Abdominal aorta
C. Machado M.D.


Round ligament (ligamentum teres) of liver
Linea alba
Transverse colon
Rectus abdominis muscle
Branches of inferior epigastric vessels
Omental appendices
Rectus sheath
Greater omentum
Transversus abdominis aponeurosis
Parietal peritoneum
External oblique aponeurosis
Transversalis fascia
Internal oblique aponeurosis
Transversus abdominis muscle
Mesentery of small intestine
Small intestine (ileum)
Internal oblique muscle
Superior mesenteric vessels
External oblique muscle
Lymph node
Small intestine (jejunum)
Ascending colon
Descending colon
Right paracolic gutter
Left paracolic gutter
Tendon of origin of transversus abdominis muscle
Left ureter
Iliohypogastric nerve
Quadratus lumborum muscle
Ilio-inguinal nerve
Latissimus dorsi muscle
Layers of thoracolumbar fascia
Combined
Middle
Posterior
Testicular (ovarian) vessels
Psoas minor muscle
Parietal peritoneum
Right genitofemoral nerve
Psoas major muscle
Inferior vena cava
Left sympathetic trunk
Anterior longitudinal ligament
Erector spinae muscle
Ligamentum flavum
Intervertebral disc between L3 and L4 vertebrae
Abdominal aorta
Intermesenteric (aortic) plexus
Spinous process of L3 vertebra

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Diaphragm	Xiphoid process, lower six costal cartilages, L1–L3 vertebrae	Converges into central tendon	Phrenic nerve	Draws central tendon down and forward during inspiration	Pericardiacophrenic, musculophrenic, superior and inferior phrenic arteries	Posterior abdominal wall
External oblique	External surfaces of ribs 5–12	Linea alba, pubic tubercle, anterior half of iliac crest	Ventral rami of six inferior thoracic nerves	Compresses and supports abdominal viscera, flexes and rotates trunk	Superior and inferior epigastric arteries	Abdominal wall
Iliacus	Superior 2/3 iliac fossa, ala of sacrum, anterior sacro-iliac ligaments	Lesser trochanter of femur and shaft inferior to it, and to psoas major tendon	Femoral nerve	Flexes hip and stabilizes hip joint; acts with psoas major	Iliac branches of iliolumbar artery	Posterior abdominal wall
Internal oblique	Thoracolumbar fascia, anterior 2/3 of iliac crest, lateral half of inguinal ligament	Inferior borders of ribs 10–12, linea alba, pubis via conjoint tendon	Ventral rami of six inferior thoracic and first lumbar nerves	Compresses and supports abdominal viscera, flexes and rotates trunk	Superior and inferior epigastric and deep circumflex iliac arteries	Abdominal wall
Psoas major	Transverse processes of lumbar vertebrae, sides of bodies of T12–L5 vertebrae, intervening intervertebral discs	Lesser trochanter of femur	Ventral rami of first four lumbar nerves	Acting superiorly with iliacus, flexes hip; acting inferiorly, flexes vertebral column laterally; used to balance trunk in sitting position; acting inferiorly with iliacus, flexes trunk	Lumbar branches of iliolumbar artery	Posterior abdominal wall
Psoas minor	Vertebral margins of T12–L1 vertebrae, corresponding intervertebral disc	Pectineal line, iliopectineal eminence	Ventral rami of first lumbar nerve	Flexes pelvis on vertebral column	Lumbar branch of iliolumbar artery	Posterior abdominal wall
Pyramidalis	Body of pubis, anterior to rectus abdominis	Linea alba	Iliohypogastric nerve	Tenses linea alba	Inferior epigastric artery	Abdominal wall
Quadratus lumborum	Medial half of inferior border of 12th rib, tips of lumbar transverse processes	Iliolumbar ligament, internal lip of iliac crest	Ventral rami of T12 and first four lumbar nerves	Extends and laterally flexes vertebral column, fixes 12th rib during inspiration	Iliolumbar artery	Posterior abdominal wall
Rectus abdominis	Pubic symphysis, pubic crest	Xiphoid process, costal cartilages 5–7	Ventral rami of six inferior thoracic nerves	Flexes trunk, compresses abdominal viscera	Superior and interior epigastric arteries	Abdominal wall
Transversus abdominis	Internal surfaces of costal cartilages 7–12, thoracolumbar fascia, iliac crest, lateral third of inguinal ligament	Linea alba with aponeurosis of internal oblique, pubic crest, and pecten pubis via conjoint tendon	Ventral rami of six inferior thoracic and first lumbar nerves	Compresses and supports abdominal viscera	Deep circumflex iliac and inferior epigastric arteries	Abdominal wall

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

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Section 5

5 PELVIS AND PERINEUM

Topographic Anatomy

Plate 329

329 Pelvis and Perineum: Surface Anatomy

Bones and Ligaments

Plates 330–334

330 Bony Framework of Pelvis
331 Radiographs of Male and Female Pelvis
332 Sex Differences of Pelvis: Measurements
333 Bones and Ligaments of Pelvis
334 Bones and Ligaments of Pelvis (continued)

Pelvic Floor and Contents

Plates 335–345

335 Pelvic Diaphragm: Female
336 Pelvic Diaphragm: Female (continued)
337 Pelvic Diaphragm: Female (continued)
338 Pelvic Diaphragm: Male
339 Pelvic Diaphragm: Male (continued)
340 Pelvic Viscera and Perineum: Female
341 Pelvic Contents: Female
342 Pelvic Viscera: Female
343 Endopelvic Fascia and Potential Spaces
344 Pelvic Viscera and Perineum: Male
345 Pelvic Contents: Male

Urinary Bladder

Plates 346–348

346 Urinary Bladder: Orientation and Supports

347 Female Sphincters

348 Urinary Bladder: Female and Male

Uterus, Vagina, and Supporting Structures

Plates 349–353

349 Uterine Growth

350 Uterus, Vagina, and Supporting Structures

351 Uterus: Fascial Ligaments

352 Uterus and Adnexa

353 Pelvic Ligaments

Perineum and External Genitalia: Female

Plates 354–357

354 Female Perineum and External Genitalia (Pudendum or Vulva)

355 Female Perineum (Superficial Dissection)

356 Female Perineum and Deep Perineum

357 Female Perineal Spaces

Perineum and External Genitalia: Male

Plates 358–365

358 Male Perineum and External Genitalia (Superficial Dissection)

359 Male Perineum and External Genitalia (Deeper Dissection)

360 Penis

361 Male Perineal Spaces

362 Prostate and Seminal Vesicles

363 Urethra

364 Descent of Testis

365 Scrotum and Contents

Homologues of Genitalia

Plates 366–367

366 Homologues of External Genitalia

367 Homologues of Internal Genitalia

Testis, Epididymis, and Ductus Deferens

Plate 368

368 Testis, Epididymis, and Ductus Deferens

Rectum

Plates 369–374

369 Rectum in Situ: Female and Male

370 Ischio-anal Fossae

371 Rectum and Anal Canal

372 Anorectal Musculature

373 External Anal Sphincter Muscle: Perineal Views

374 Actual and Potential Perineopelvic Spaces

Regional Scans

Plate 375

375 Pelvic Scans: Sagittal CT Images

Vasculature

Plates 376–386

376 Arteries of Rectum and Anal Canal: Male

377 Veins of Rectum and Anal Canal: Female

378 Arteries and Veins of Pelvic Organs: Female

379 Arteries and Veins of Testis

380 Arteries of Pelvis: Female

381 Arteries and Veins of Pelvis: Male

382 Arteries and Veins of Perineum and Uterus

383 Arteries and Veins of Perineum: Male

384 Lymph Vessels and Nodes of Pelvis and Genitalia: Female

385 Lymph Vessels and Nodes of Perineum: Female

386 Lymph Vessels and Nodes of Pelvis and Genitalia: Male

Innervation

Plates 387–395

387 Nerves of External Genitalia: Male

388 Nerves of Pelvic Viscera: Male

389 Nerves of Perineum: Male

390 Nerves of Pelvic Viscera: Female

391 Nerves of Perineum and External Genitalia: Female

392 Neuropathways in Parturition

393 Innervation of Female Reproductive Organs: Schema

394 Innervation of Male Reproductive Organs: Schema

395 Innervation of Urinary Bladder and Lower Ureter: Schema

Cross-Sectional Anatomy

Plates 396–397

396 Male Pelvis: Cross Section of Bladder-Prostate Junction

397 Female Pelvis: Cross Section of Vagina-Urethra

Muscle Tables

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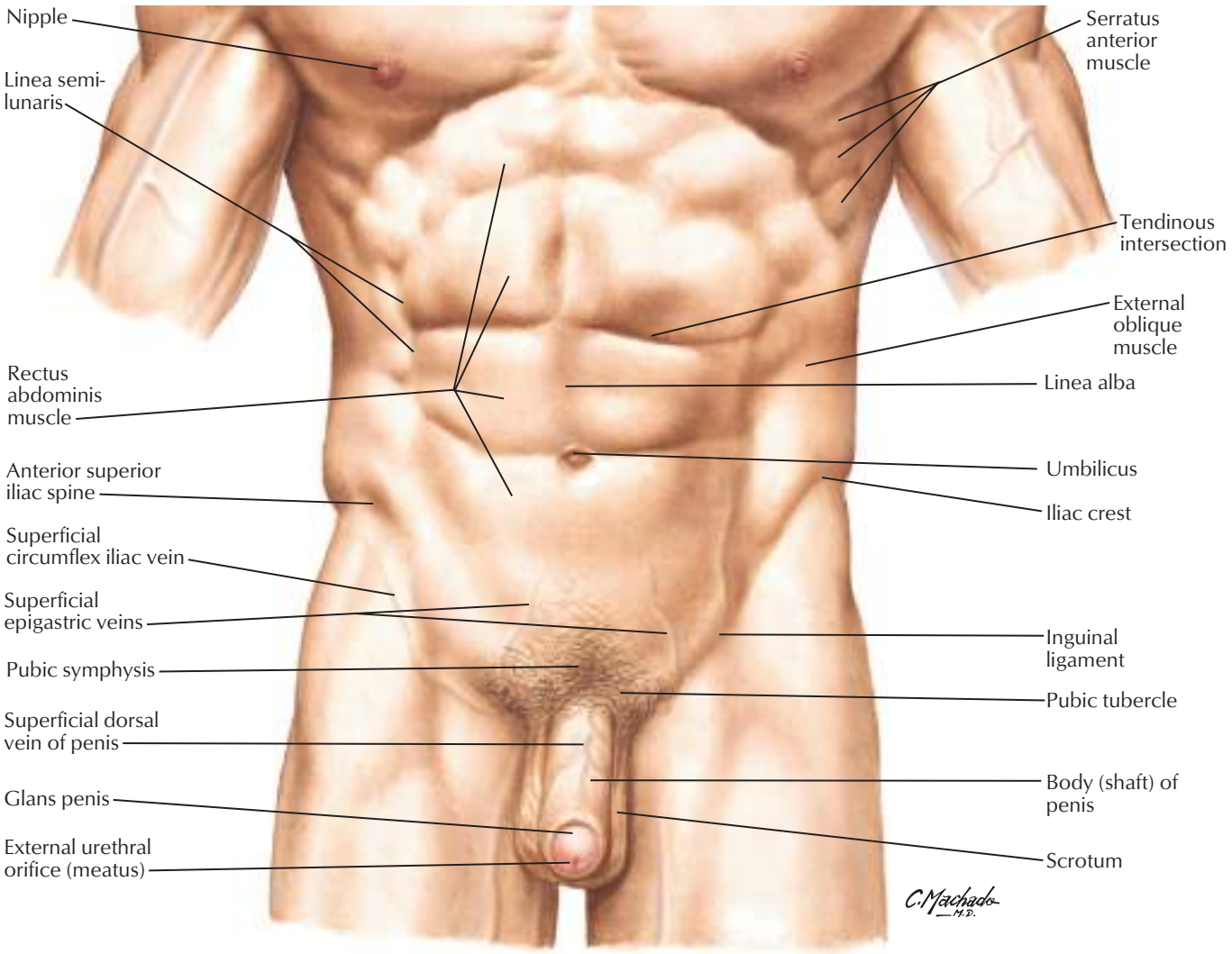
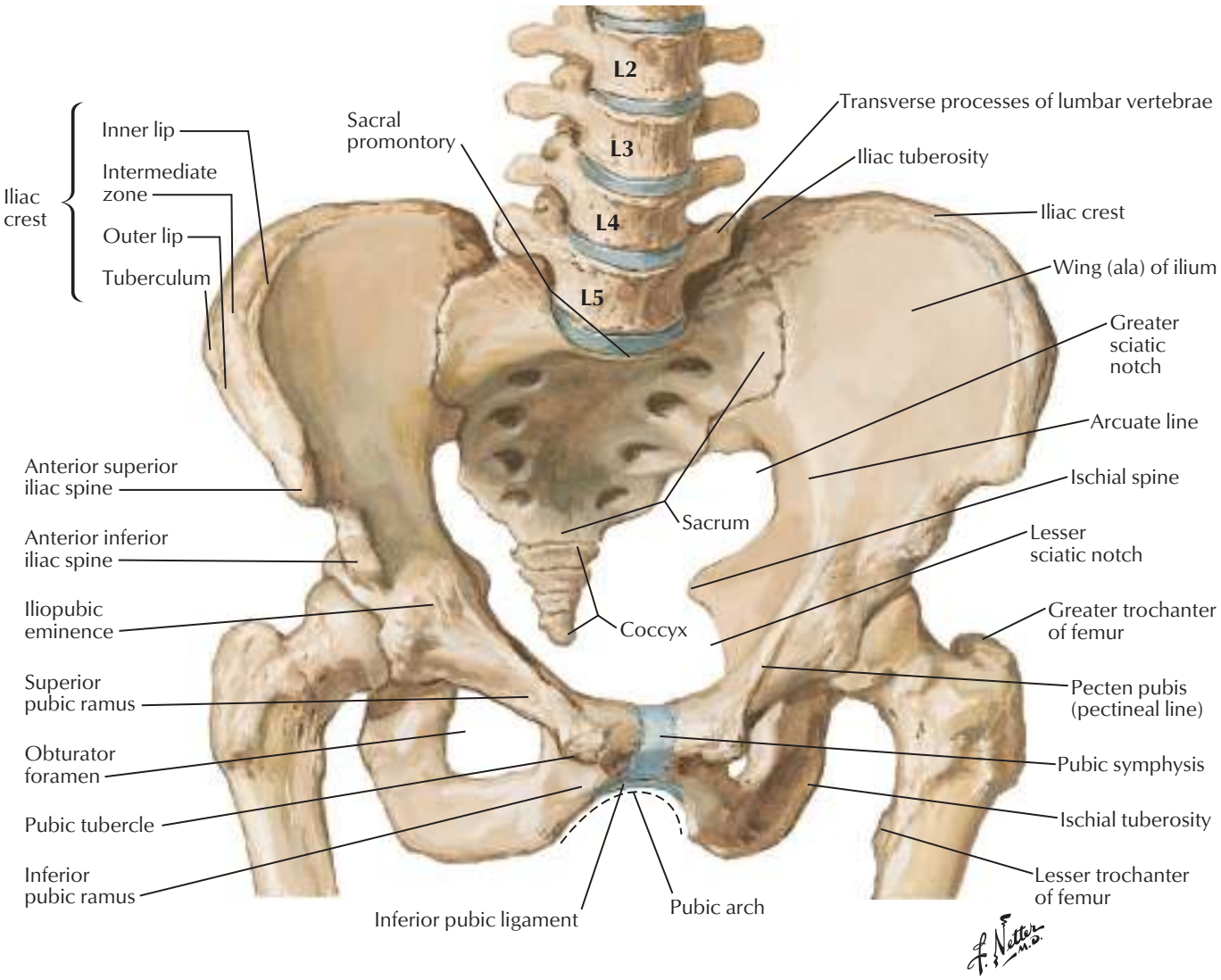
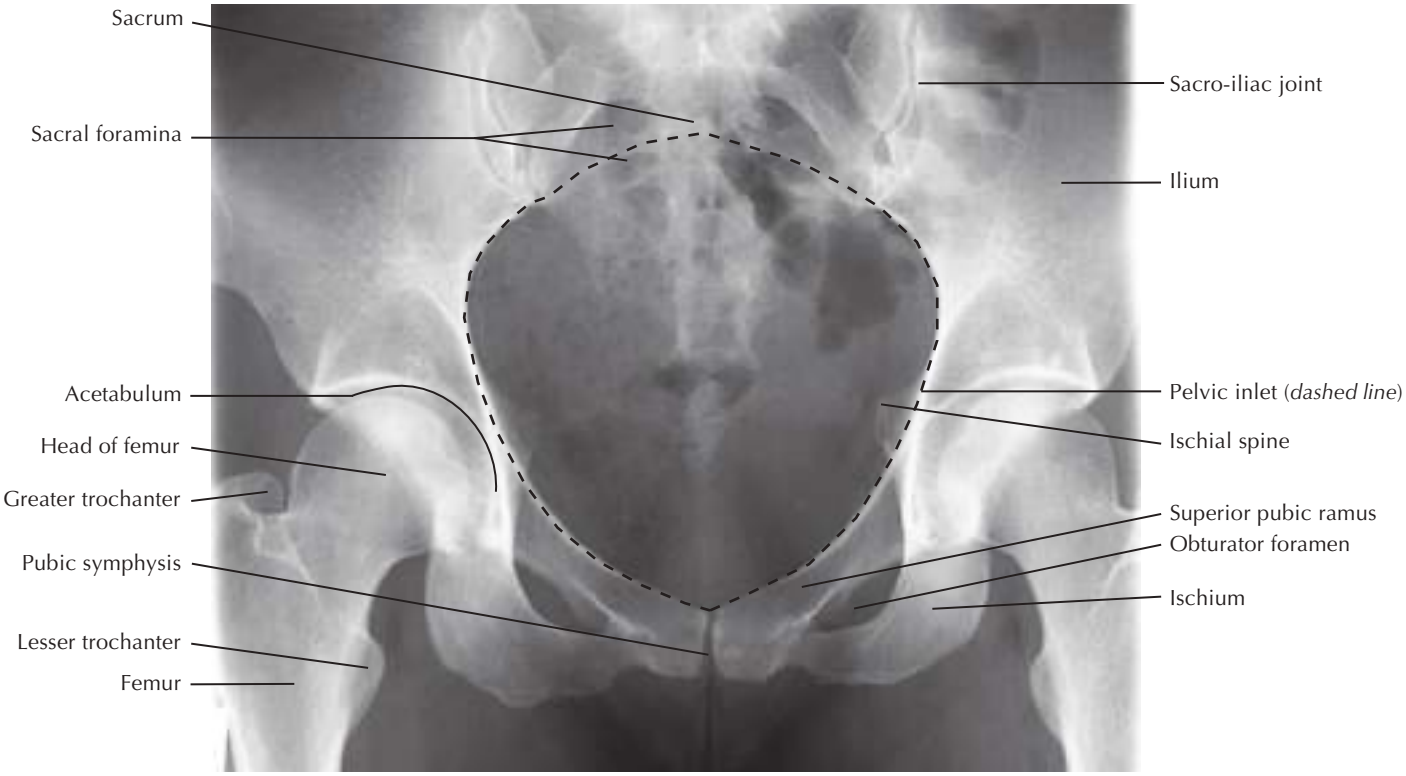
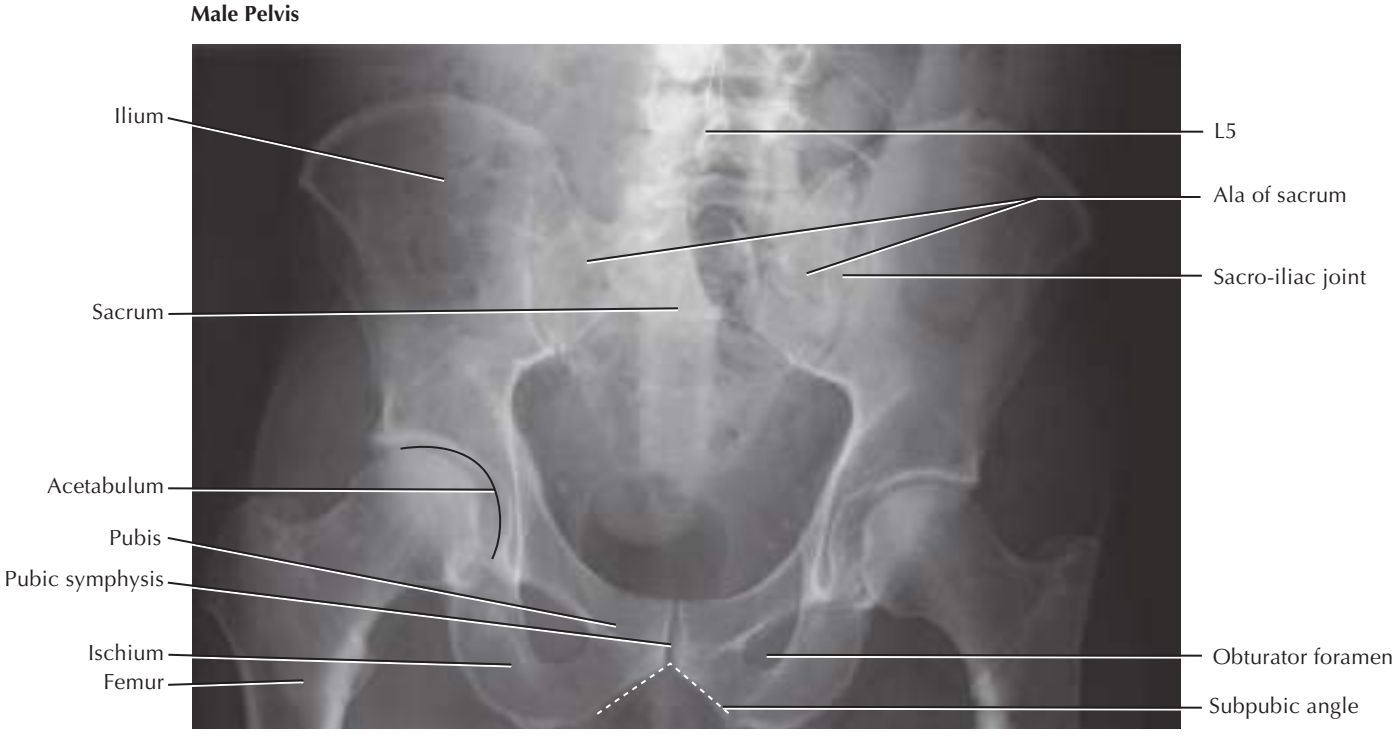

Nipple
Linea semi-lunaris
Rectus abdominis muscle
Anterior superior iliac spine
Superficial circumflex iliac vein
Superficial epigastric veins
Pubic symphysis
Superficial dorsal vein of penis
Glans penis
External urethral orifice (meatus)
Serratus anterior muscle
Tendinous intersection
External oblique muscle
Linea alba
Umbilicus
Iliac crest
Inguinal ligament
Pubic tubercle
Body (shaft) of penis
Scrotum
C. Machado M.D.


L2
L3
L4
L5
Sacral promontory
Transverse processes of lumbar vertebrae
Iliac tuberosity
Iliac crest
Wing (ala) of ilium
Greater sciatic notch
Arcuate line
Ischial spine
Lesser sciatic notch
Greater trochanter of femur
Pecten pubis (pectineal line)
Pubic symphysis
Ischial tuberosity
Lesser trochanter of femur
Iliac crest
Inner lip
Intermediate zone
Outer lip
Tuberculum
Anterior superior iliac spine
Anterior inferior iliac spine
Iliopubic eminence
Superior pubic ramus
Obturator foramen
Pubic tubercle
Inferior pubic ramus
Sacrum
Coccyx
Inferior pubic ligament
Pubic arch

Female Pelvis



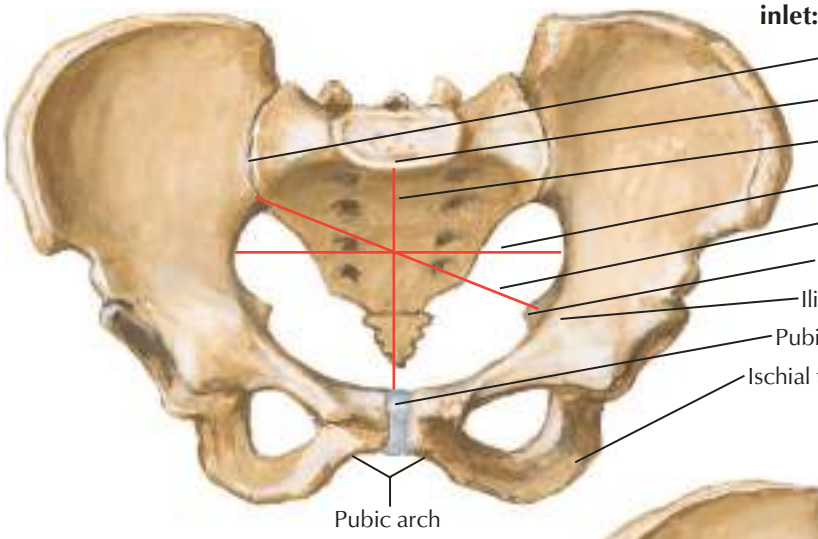
Male Pelvis



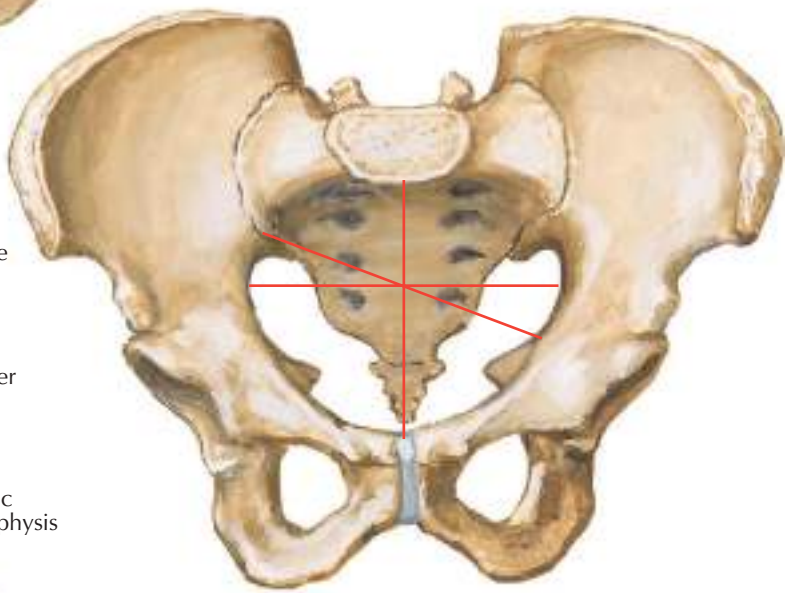
Sex Differences of Pelvis: Measurements

See also **Plate 243**

Female pelvis/female pelvic inlet: anterior view

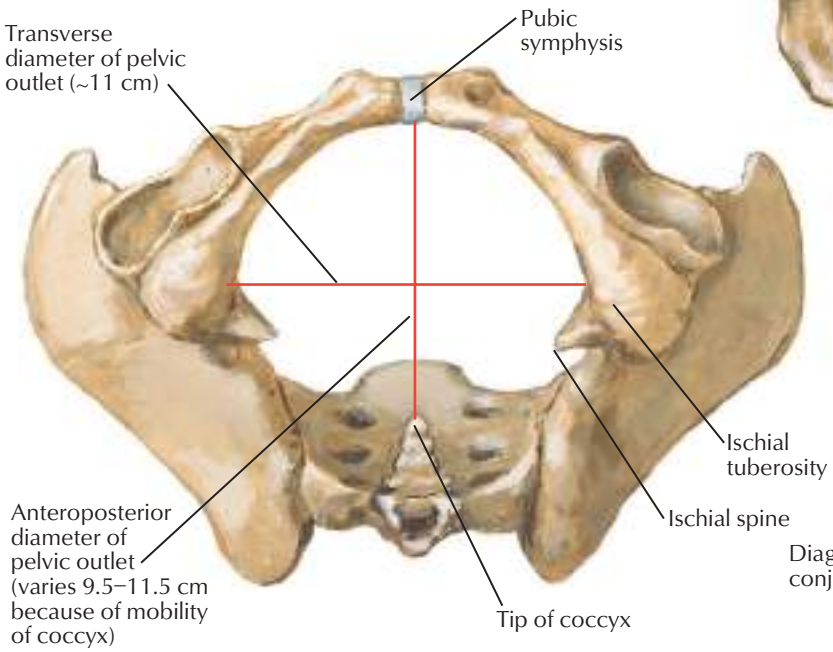


Male pelvis/male pelvic inlet: anterior view

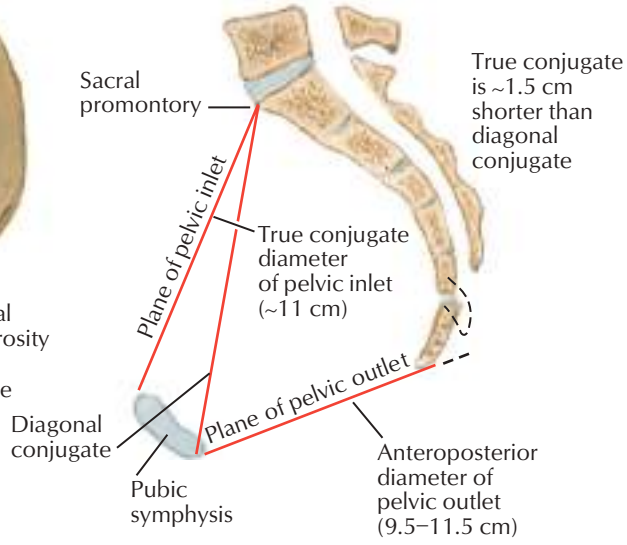


Diagonal conjugate is only diameter of pelvic inlet that can be measured clinically

- All measurements slightly shorter in relation to body size than in female
- Pelvic inlet oriented more antero-posteriorly than in female, where it tends to be transversely oval
- Pubic symphysis deeper (taller)
- Pubic arch (subpubic angle) narrower
- Ischial tuberosities less far apart
- Iliac wings less flared

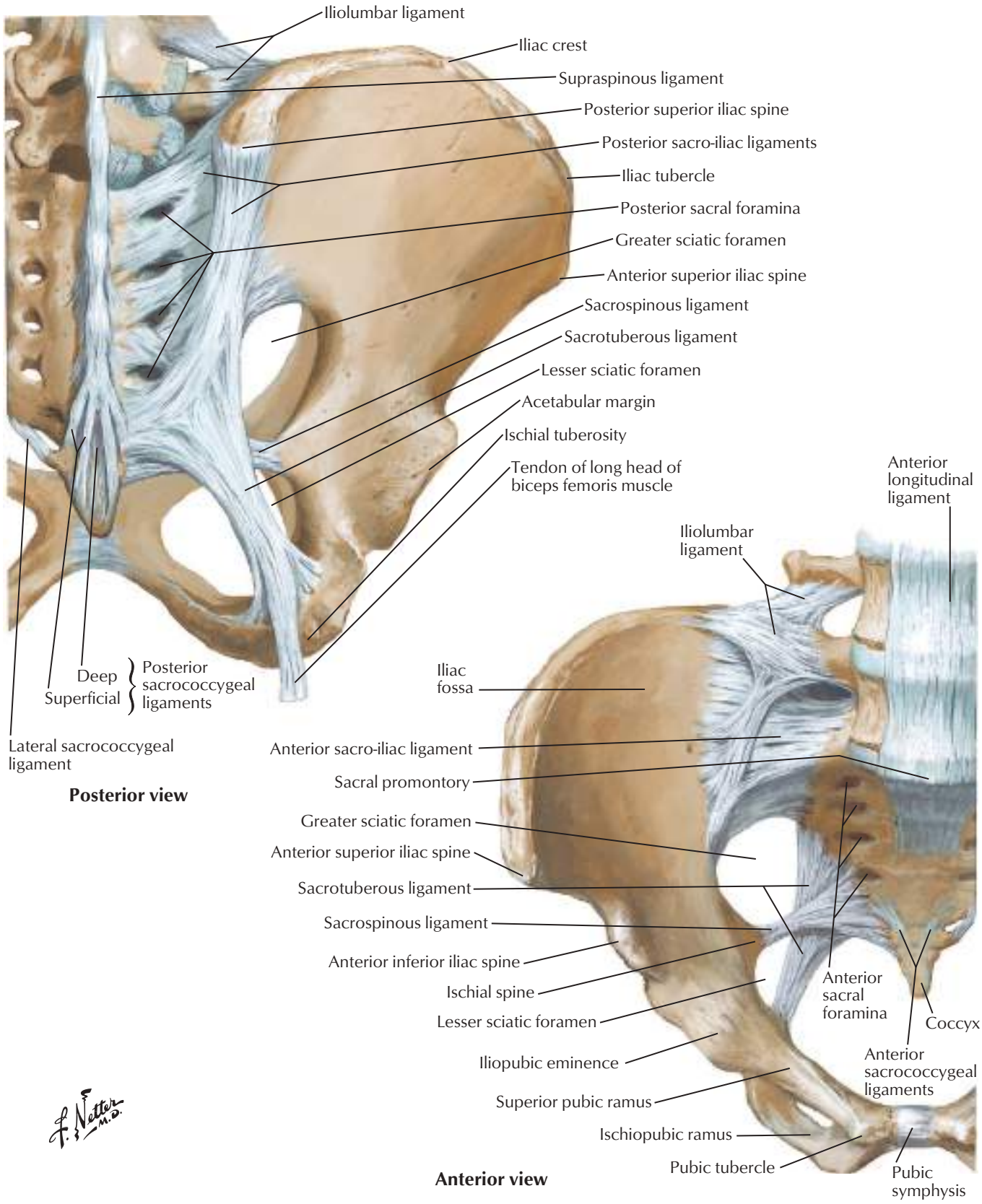


Female pelvis/female pelvic outlet: inferior view

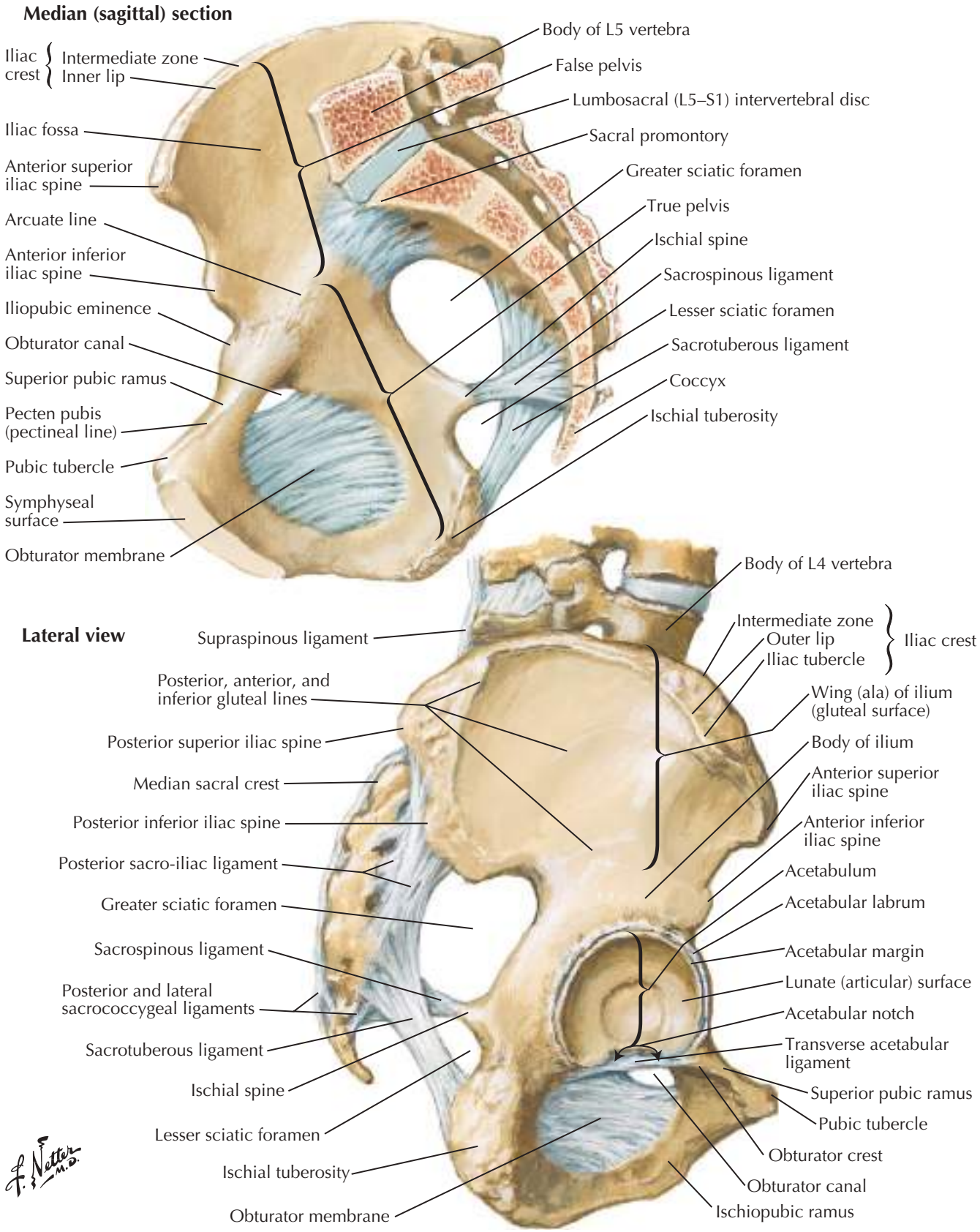


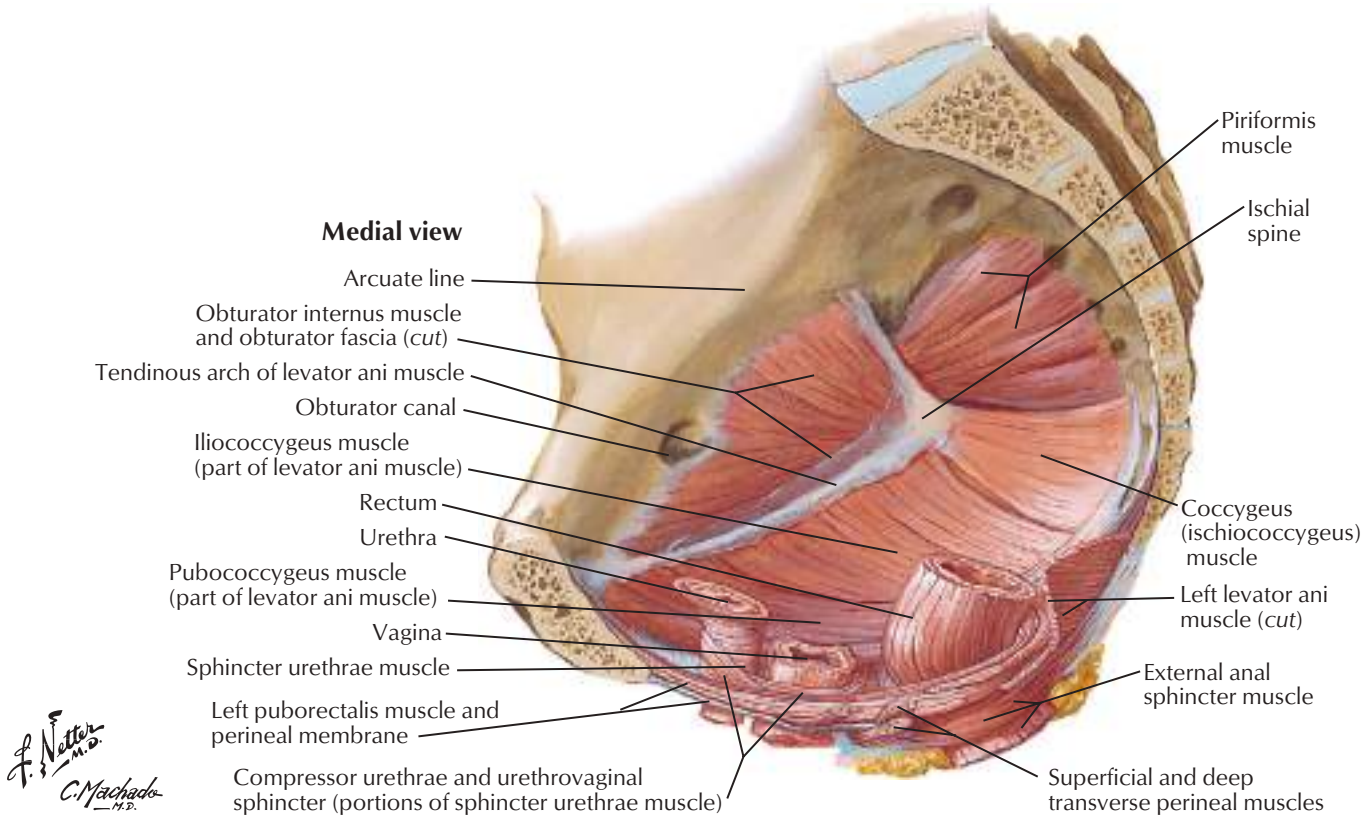
Transverse diameter is the widest distance of pelvic inlet

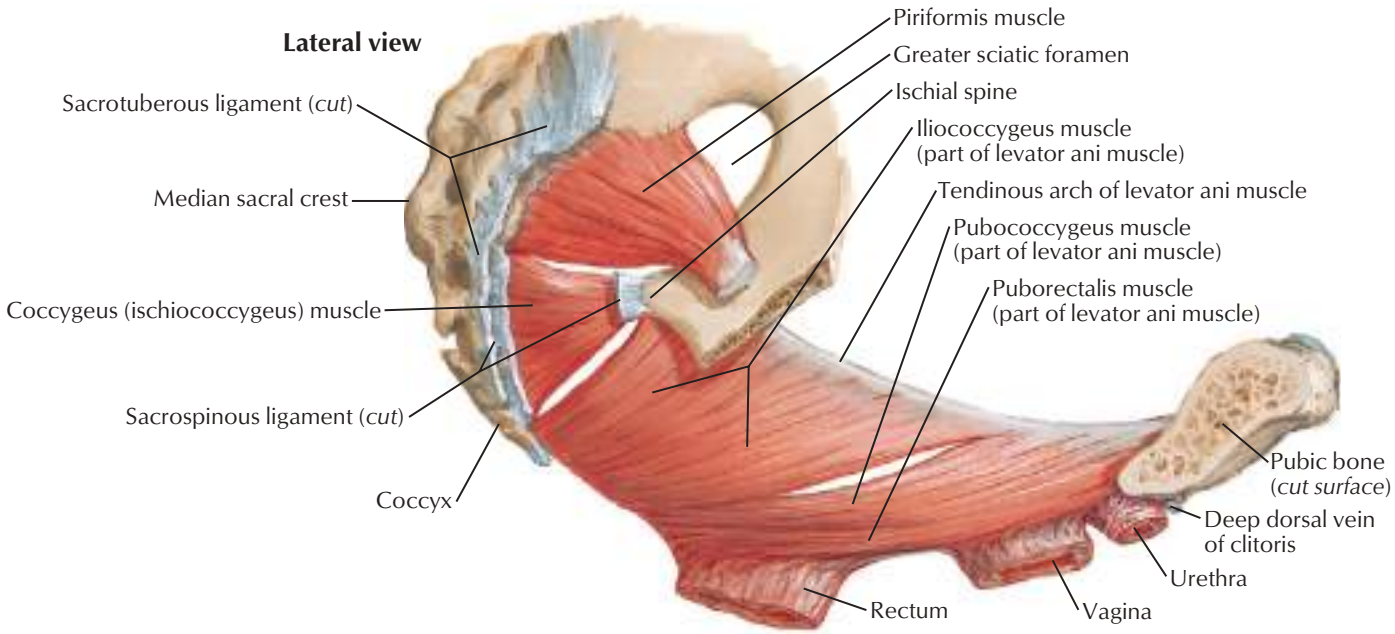
Female: sagittal section


Iliolumbar ligament
Iliac crest
Supraspinous ligament
Posterior superior iliac spine
Posterior sacro-iliac ligaments
Iliac tubercle
Posterior sacral foramina
Greater sciatic foramen
Anterior superior iliac spine
Sacrospinous ligament
Sacrotuberous ligament
Lesser sciatic foramen
Acetabular margin
Ischial tuberosity
Tendon of long head of biceps femoris muscle
Deep
Superficial
Posterior sacrococcygeal ligaments
Lateral sacrococcygeal ligament
Posterior view
Anterior longitudinal ligament
Iliolumbar ligament
Iliac fossa
Anterior sacro-iliac ligament
Sacral promontory
Greater sciatic foramen
Anterior superior iliac spine
Sacrotuberous ligament
Sacrospinous ligament
Anterior inferior iliac spine
Ischial spine
Lesser sciatic foramen
Iliopubic eminence
Superior pubic ramus
Ischiopubic ramus
Pubic tubercle
Anterior sacral foramina
Coccyx
Anterior sacrococcygeal ligaments
Pubic symphysis
Anterior view

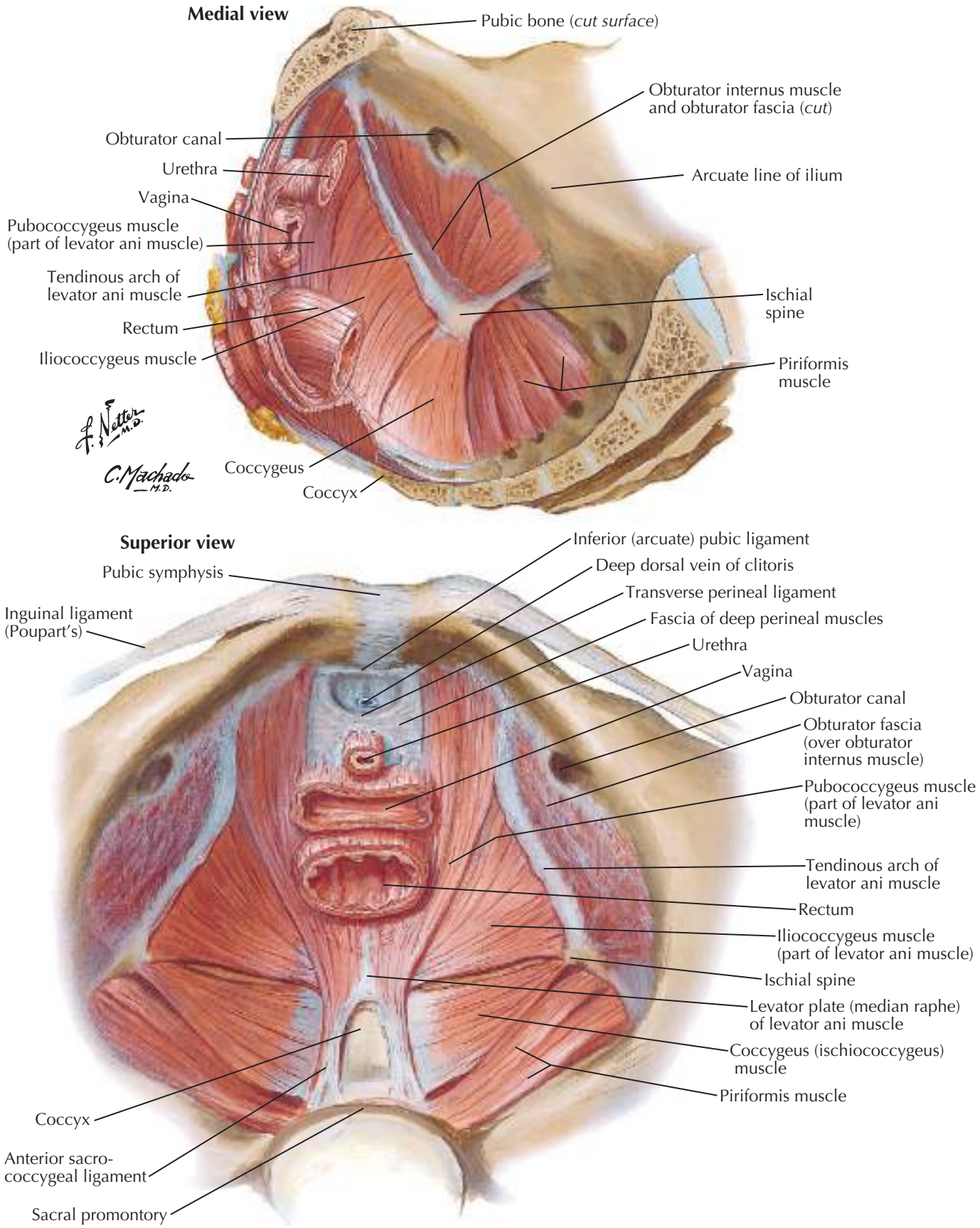
See also Plate 158

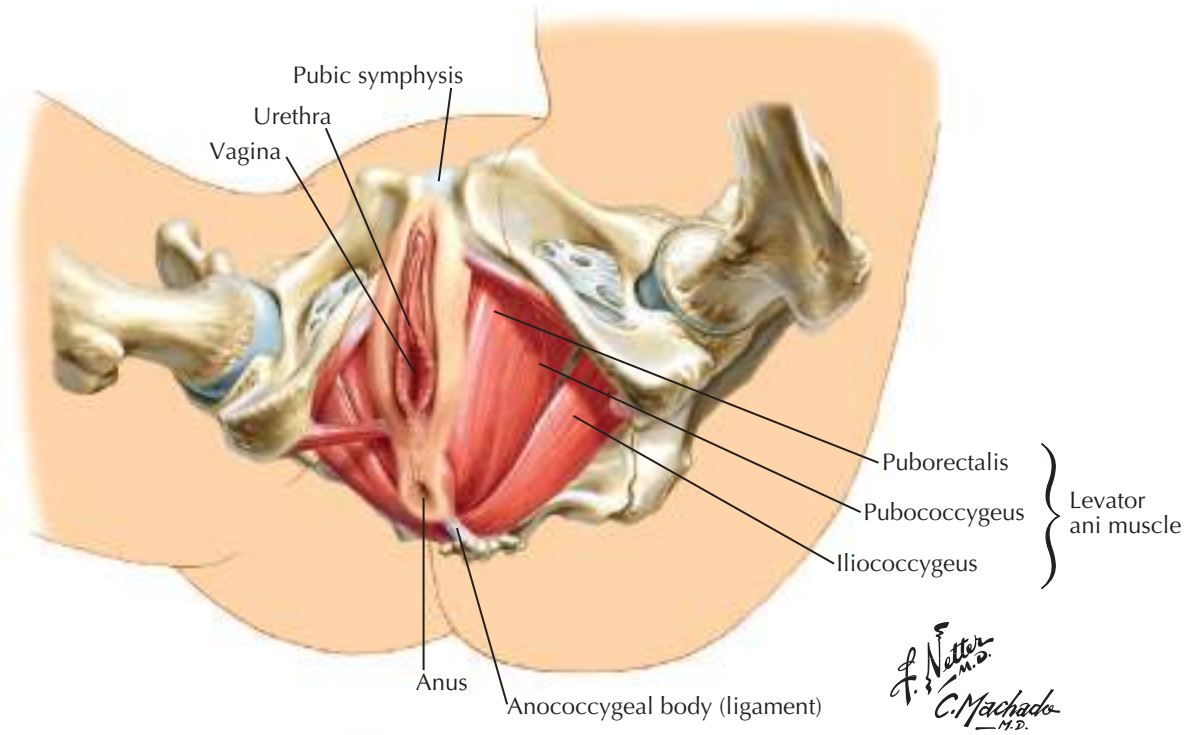



Medial view
Piriformis muscle
Ischial spine
Arcuate line
Obturator internus muscle and obturator fascia (cut)
Tendinous arch of levator ani muscle
Obturator canal
Iliococcygeus muscle (part of levator ani muscle)
Rectum
Urethra
Pubococcygeus muscle (part of levator ani muscle)
Vagina
Sphincter urethrae muscle
Left puborectalis muscle and perineal membrane
Compressor urethrae and urethrovaginal sphincter (portions of sphincter urethrae muscle)
Coccygeus (ischiococcygeus) muscle
Left levator ani muscle (cut)
External anal sphincter muscle
Superficial and deep transverse perineal muscles
F. Netter M.D.
C. Machado M.D.

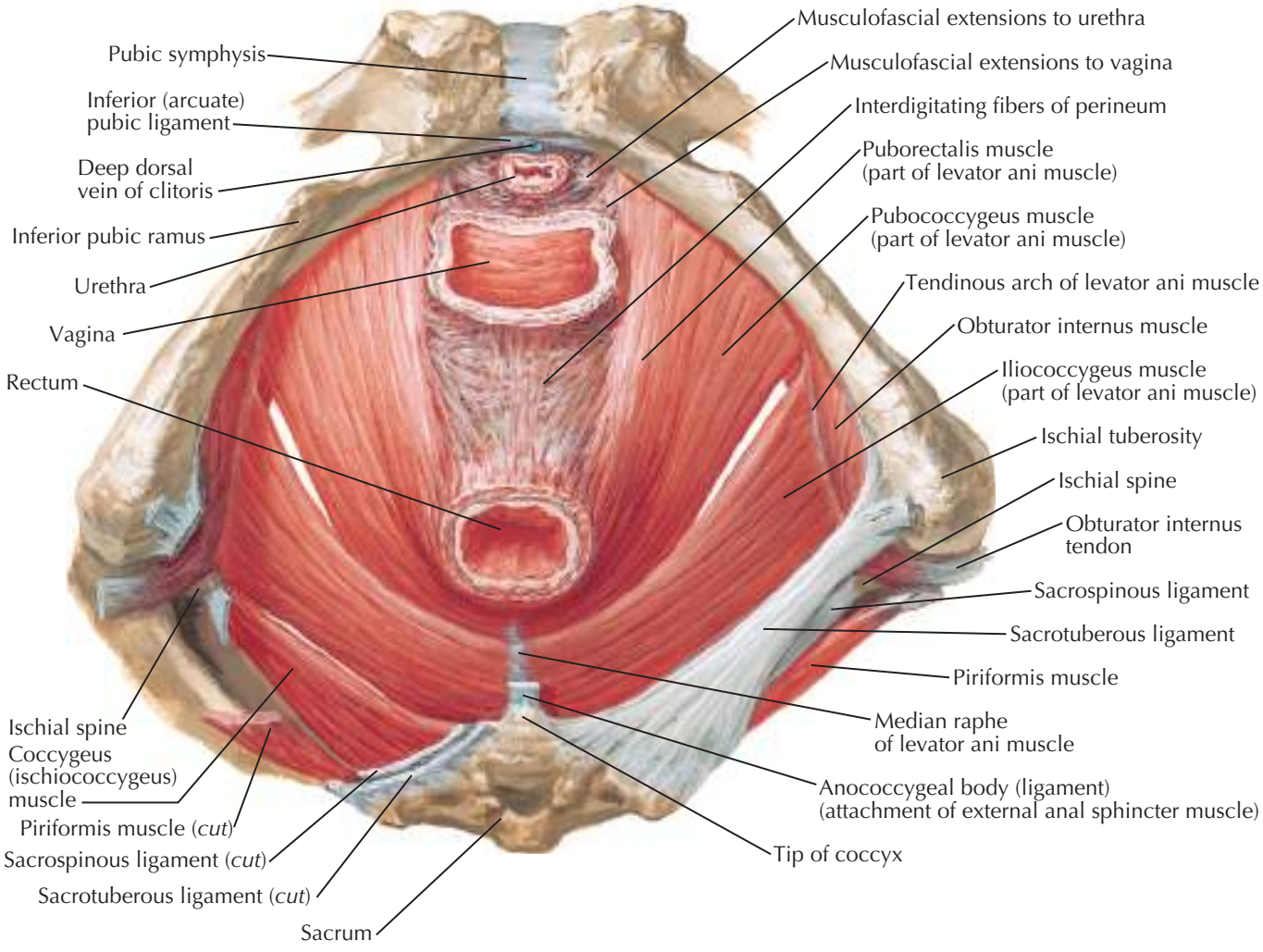

Lateral view
Piriformis muscle
Greater sciatic foramen
Ischial spine
Sacrotuberous ligament (cut)
Iliococcygeus muscle (part of levator ani muscle)
Median sacral crest
Tendinous arch of levator ani muscle
Pubococcygeus muscle (part of levator ani muscle)
Puborectalis muscle (part of levator ani muscle)
Coccygeus (ischiococcygeus) muscle
Sacrospinous ligament (cut)
Coccyx
Pubic bone (cut surface)
Deep dorsal vein of clitoris
Urethra
Rectum
Vagina

For urogenital diaphragm see **Plate 356**



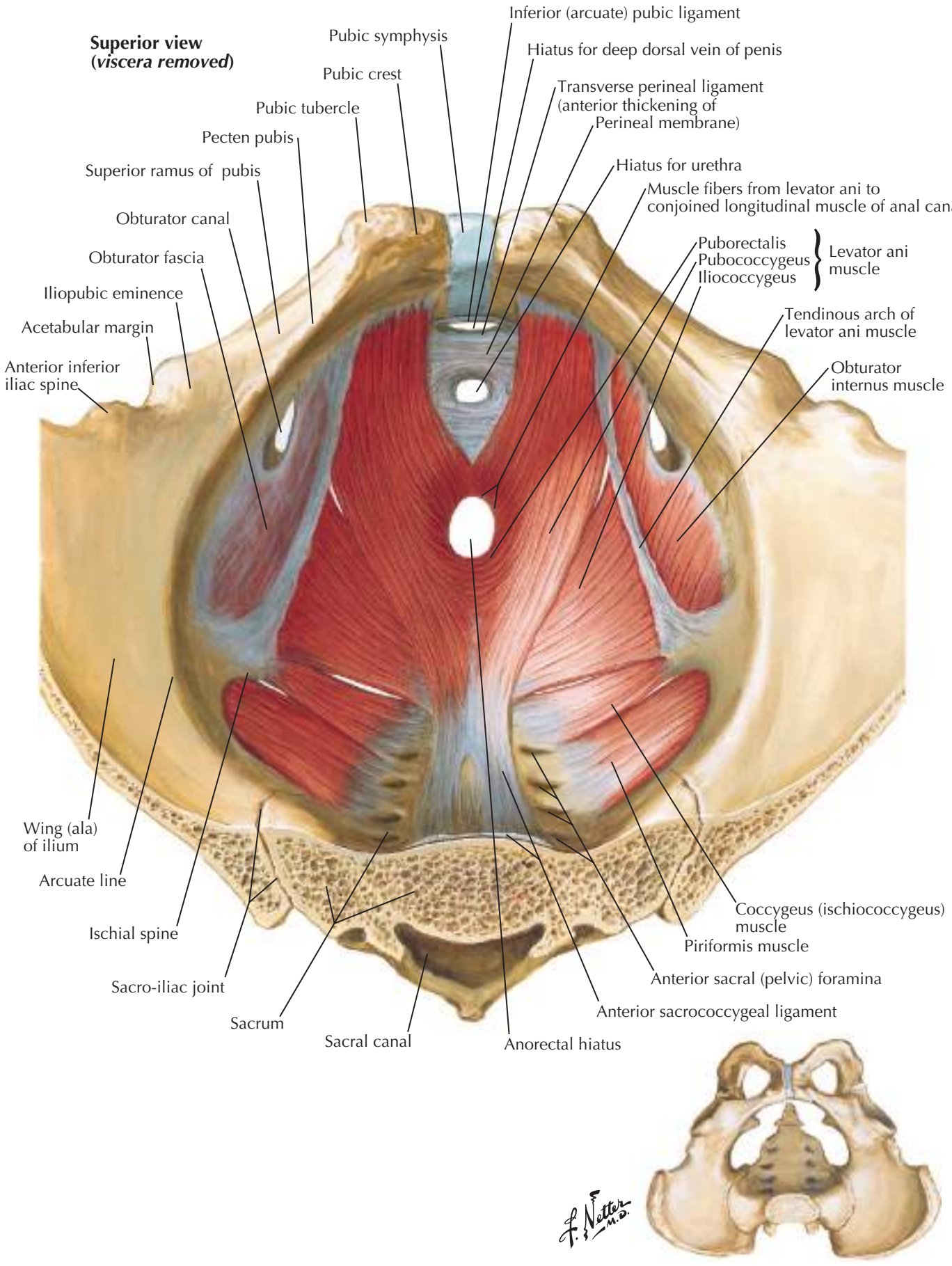


Inferior view



Pelvic Diaphragm: Male

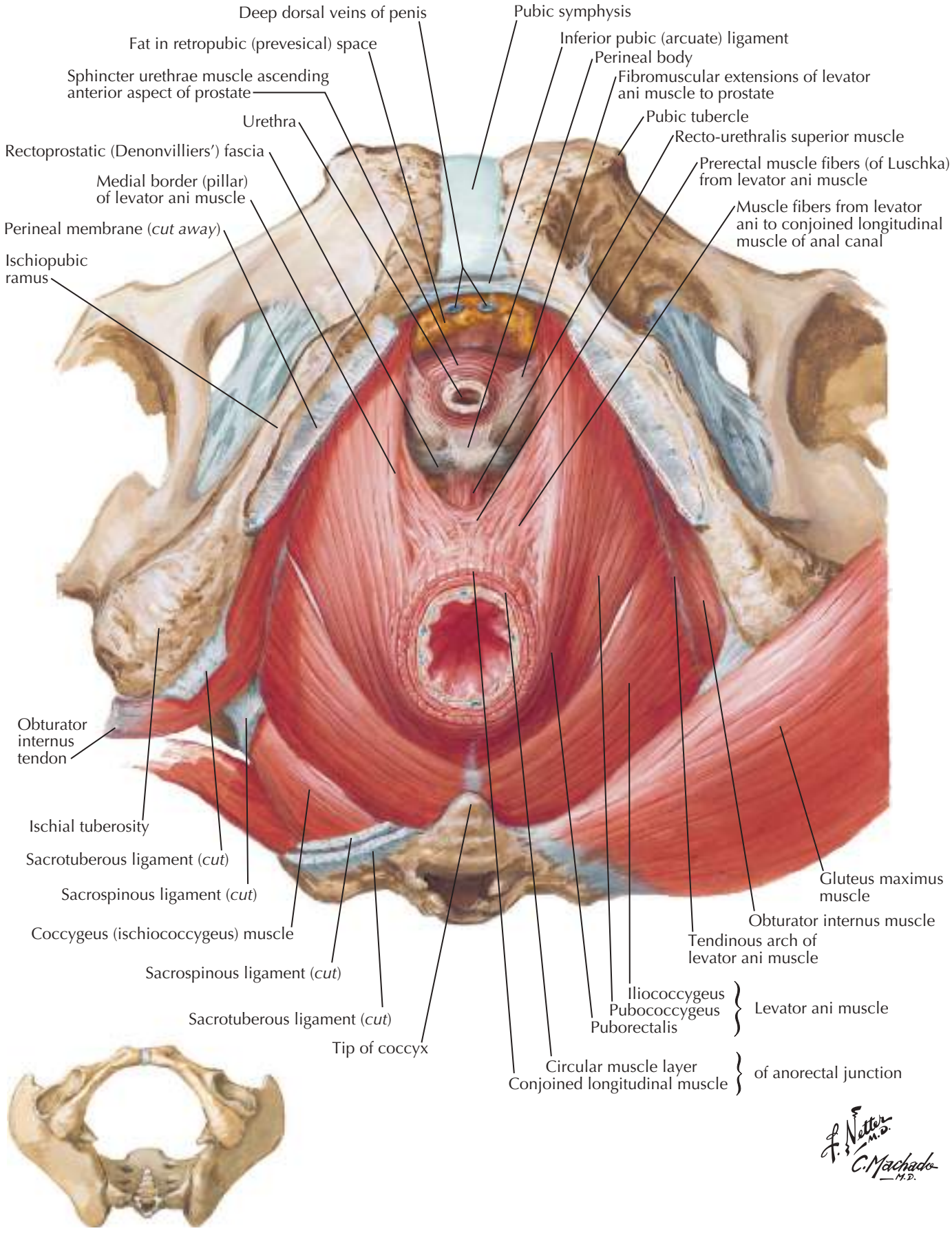
See also Plates 258, 261



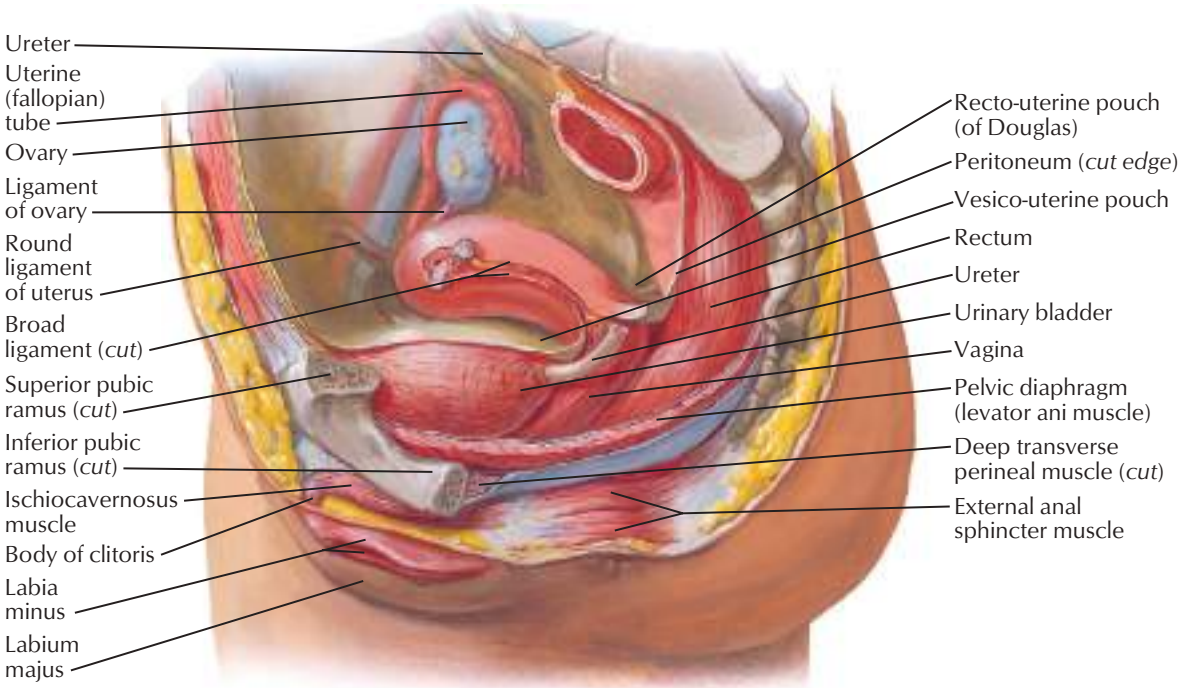
Pelvic Diaphragm: Male (continued)

For urogenital diaphragm see **Plate 361**

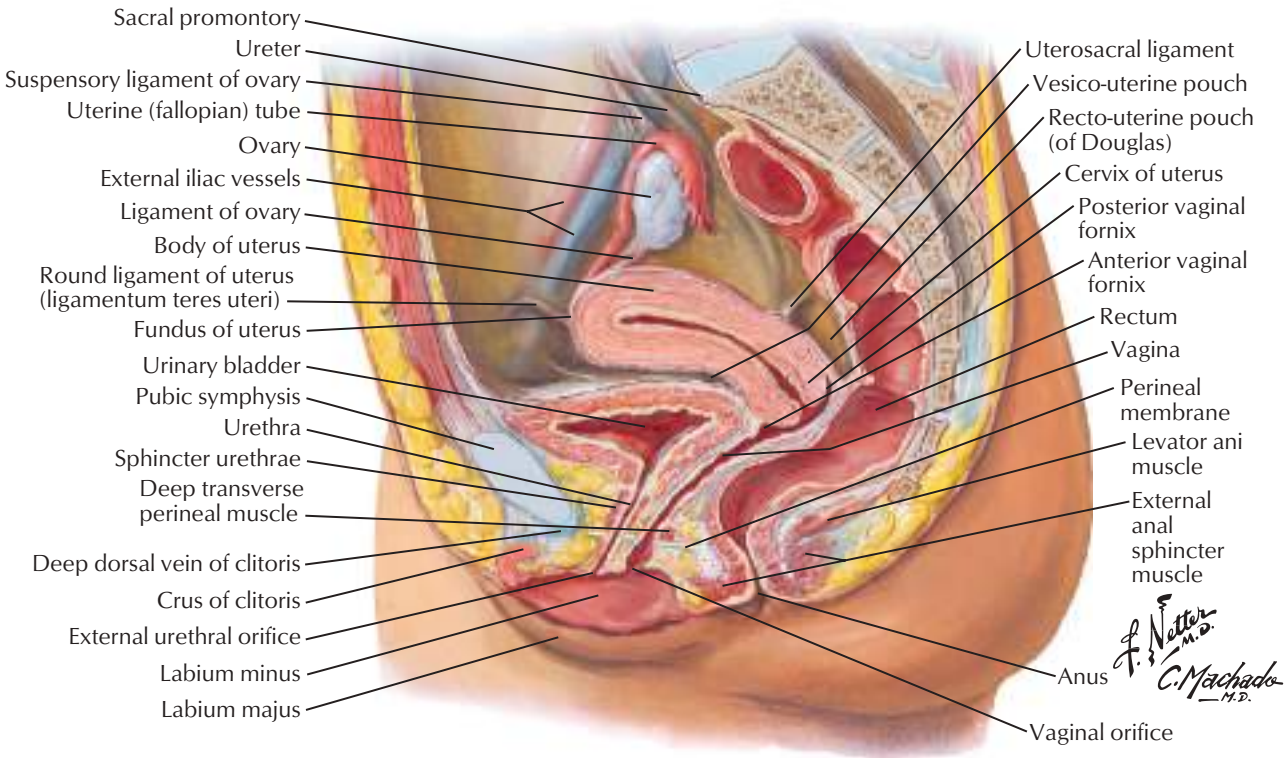
Inferior view

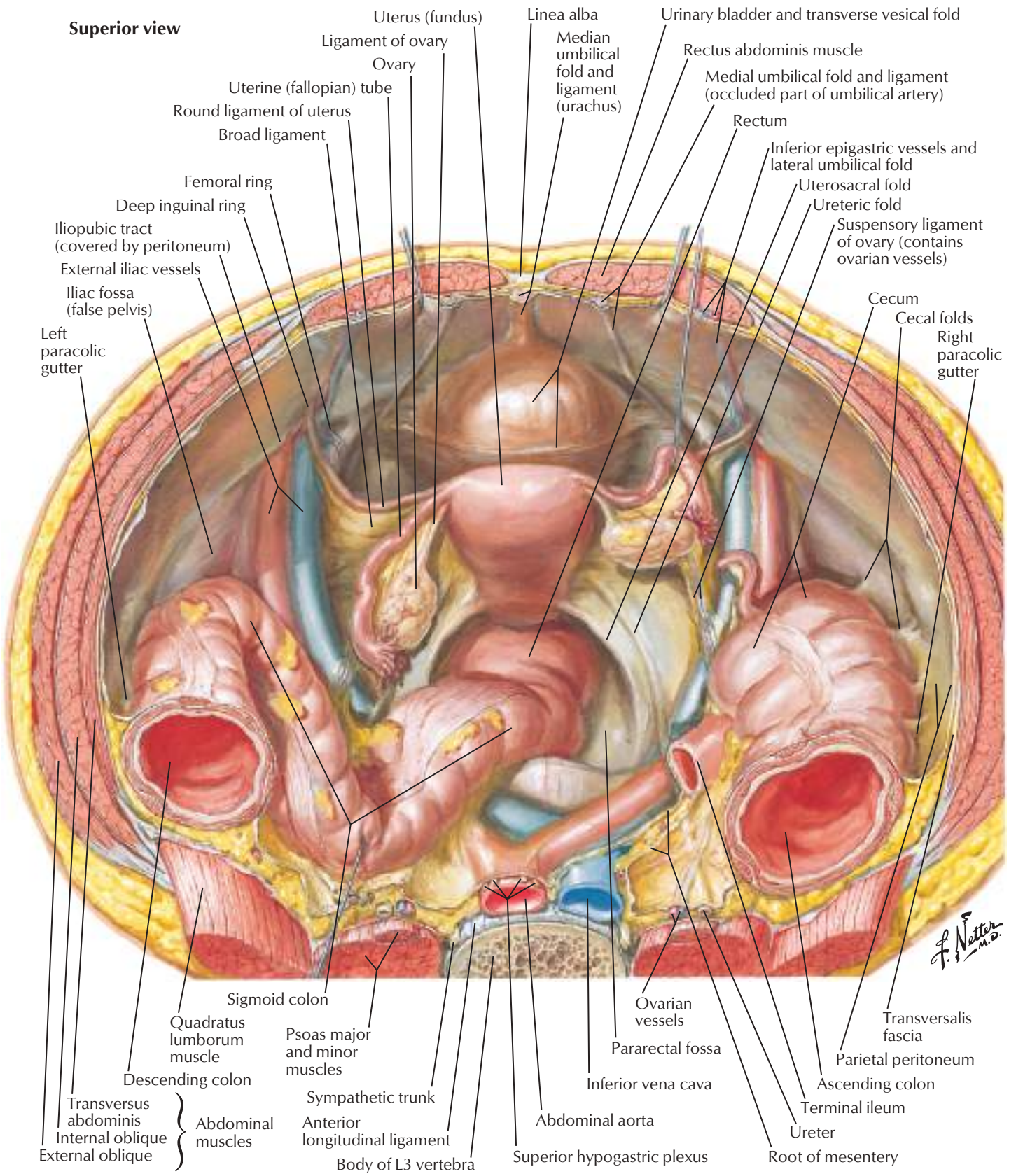


Paramedian (sagittal) dissection

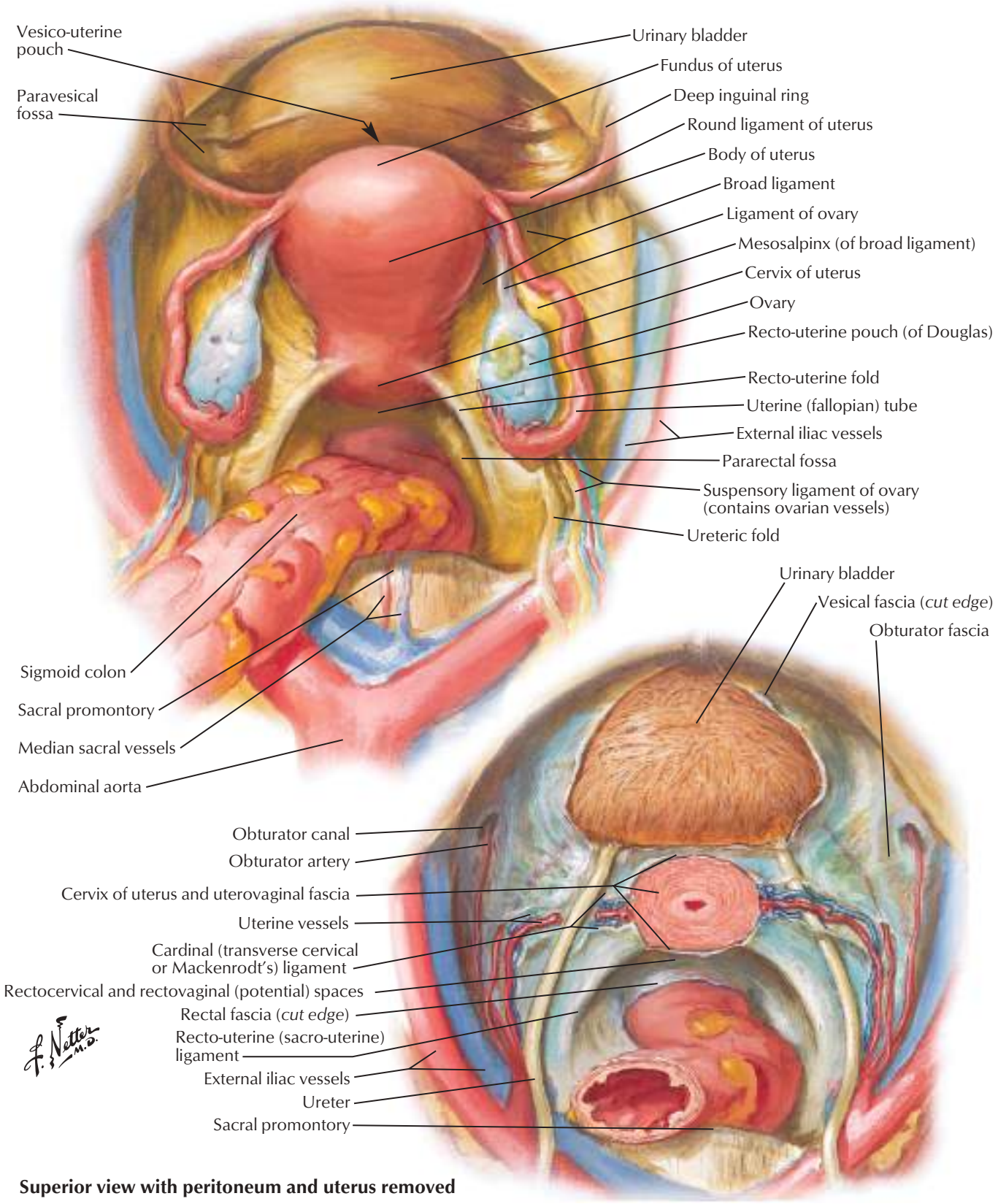


Median (sagittal) section



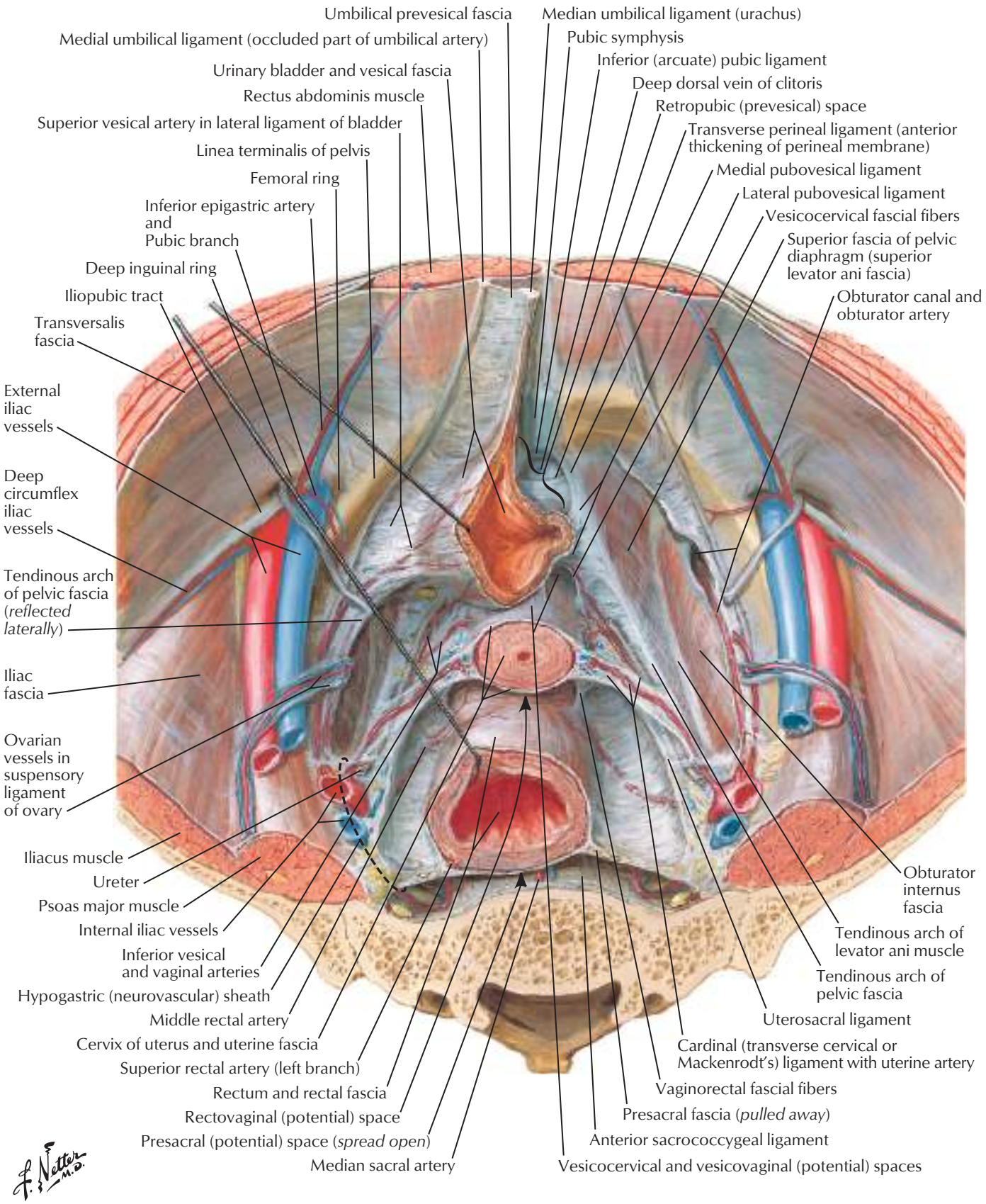

Superior view
Uterus (fundus)
Ligament of ovary
Ovary
Uterine (fallopian) tube
Round ligament of uterus
Broad ligament
Femoral ring
Deep inguinal ring
Iliopubic tract (covered by peritoneum)
External iliac vessels
Iliac fossa (false pelvis)
Left paracolic gutter
Linea alba
Median umbilical fold and ligament (urachus)
Urinary bladder and transverse vesical fold
Rectus abdominis muscle
Medial umbilical fold and ligament (occluded part of umbilical artery)
Rectum
Inferior epigastric vessels and lateral umbilical fold
Uterosacral fold
Ureteric fold
Suspensory ligament of ovary (contains ovarian vessels)
Cecum
Cecal folds
Right paracolic gutter
Sigmoid colon
Quadratus lumborum muscle
Descending colon
Transversus abdominis
Internal oblique
External oblique
Abdominal muscles
Psoas major and minor muscles
Sympathetic trunk
Anterior longitudinal ligament
Body of L3 vertebra
Abdominal aorta
Superior hypogastric plexus
Ovarian vessels
Pararectal fossa
Inferior vena cava
Ureter
Root of mesentery
Terminal ileum
Ascending colon
Parietal peritoneum
Transversalis fascia

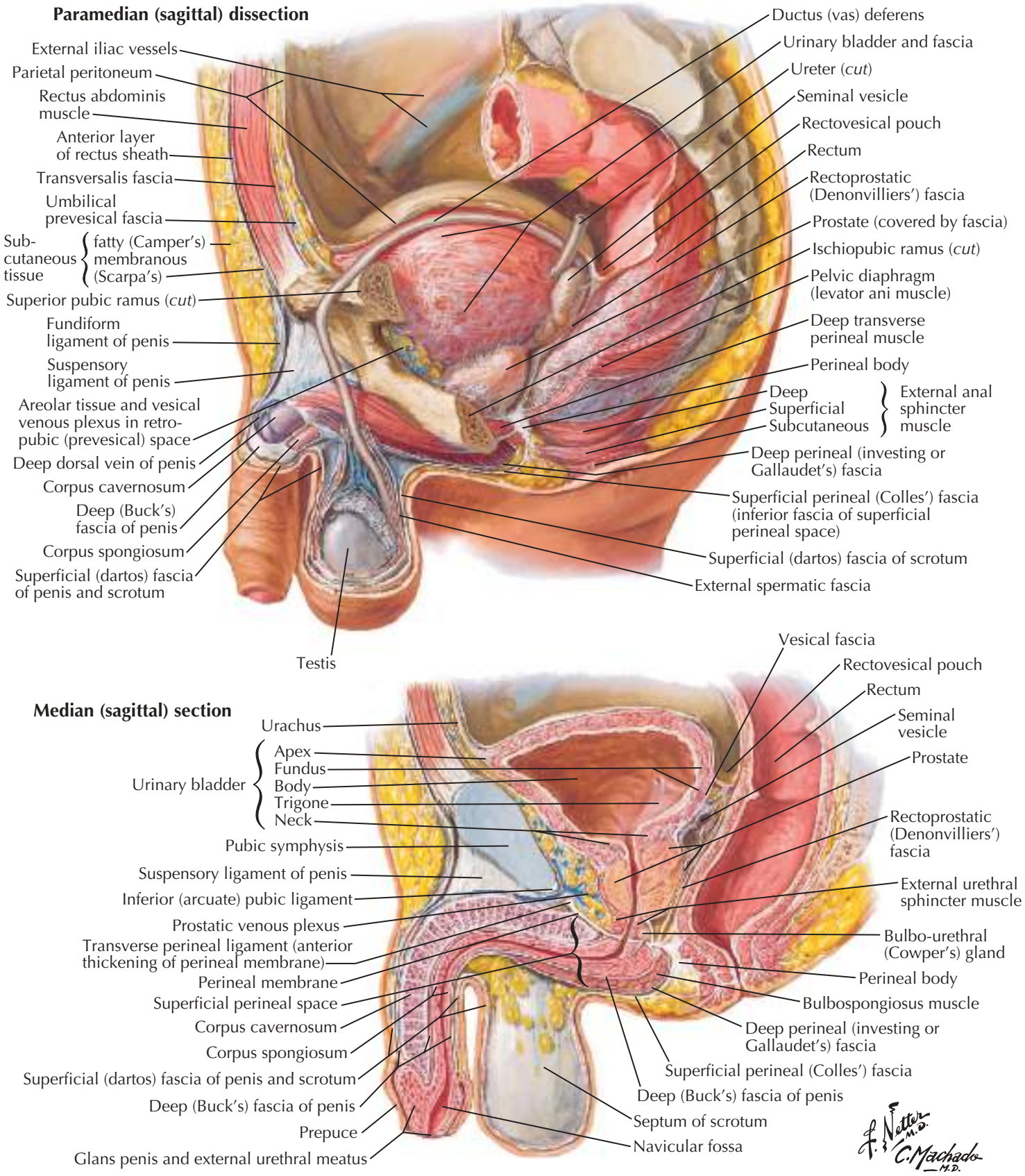
Superior view with peritoneum intact



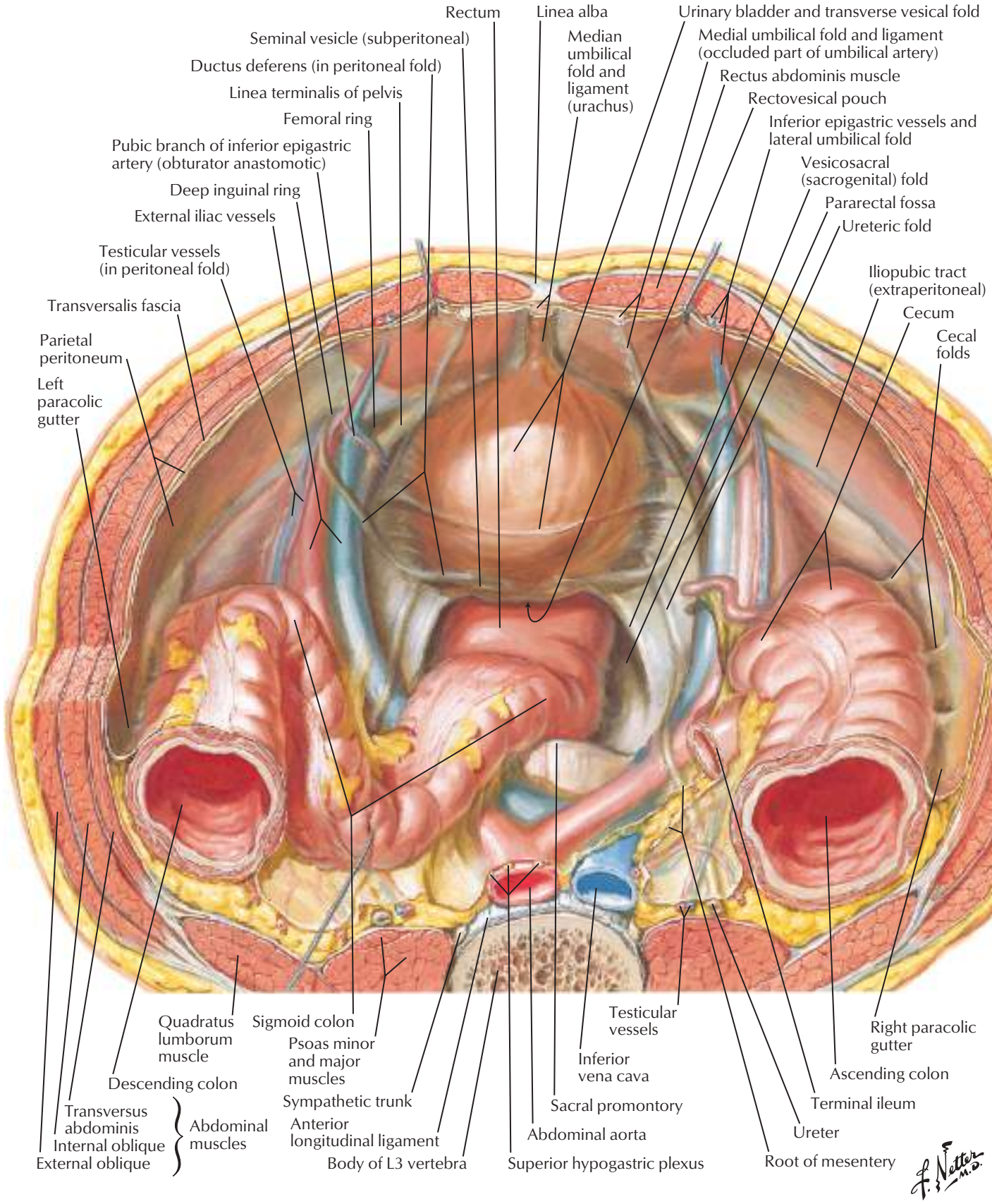
Superior view with peritoneum and uterus removed

Female: superior view (peritoneum and loose areolar tissue removed)

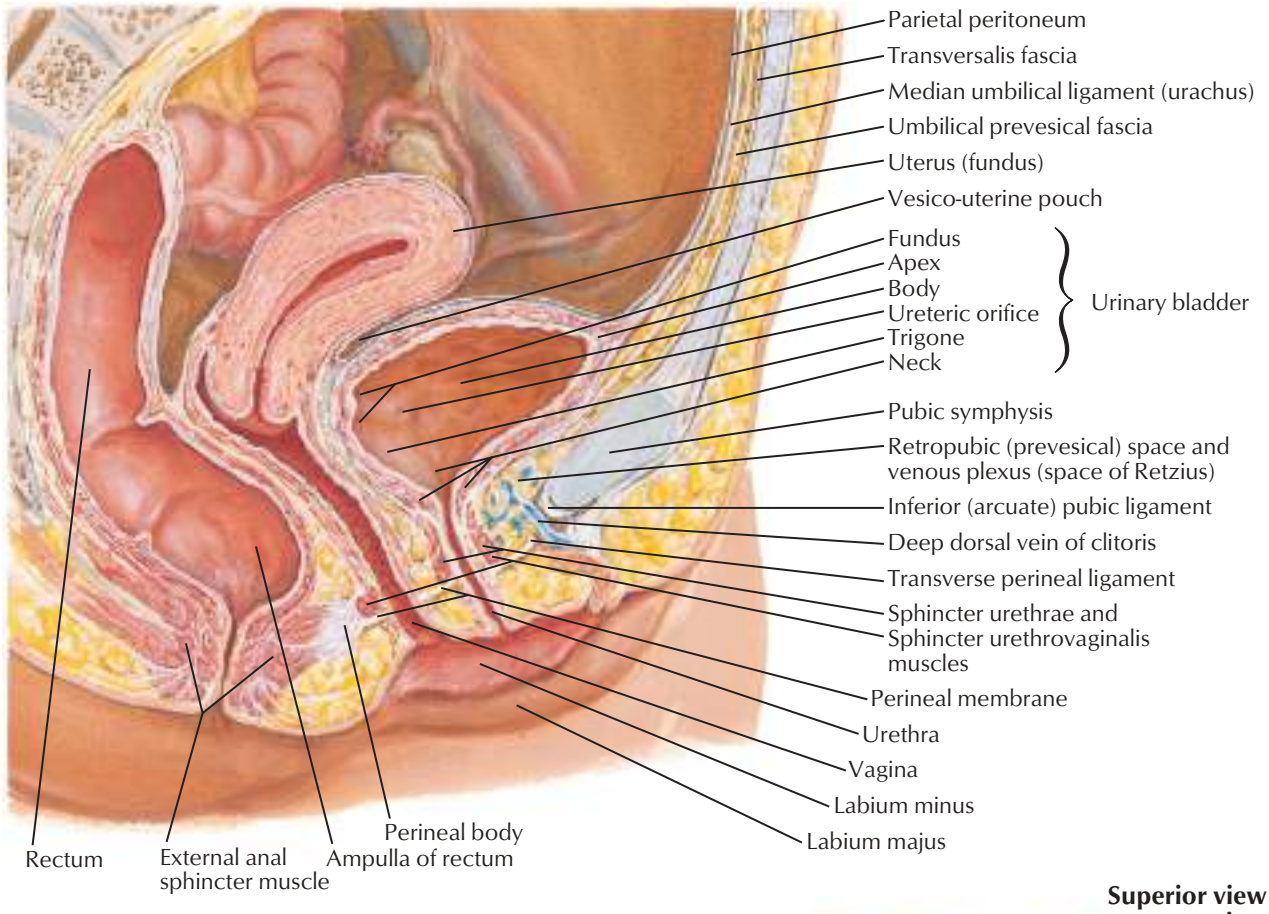



Paramedian (sagittal) dissection
External iliac vessels
Parietal peritoneum
Rectus abdominis muscle
Anterior layer of rectus sheath
Transversalis fascia
Umbilical prevesical fascia
Sub-cutaneous tissue
fatty (Camper's)
membranous (Scarpa's)
Superior pubic ramus (cut)
Fundiform ligament of penis
Suspensory ligament of penis
Areolar tissue and vesical venous plexus in retro-pubic (prevesical) space
Deep dorsal vein of penis
Corpus cavernosum
Deep (Buck's) fascia of penis
Corpus spongiosum
Superficial (dartos) fascia of penis and scrotum
Testis
Ductus (vas) deferens
Urinary bladder and fascia
Ureter (cut)
Seminal vesicle
Rectovesical pouch
Rectum
Rectoprostatic (Denonvilliers') fascia
Prostate (covered by fascia)
Ischiopubic ramus (cut)
Pelvic diaphragm (levator ani muscle)
Deep transverse perineal muscle
Perineal body
Deep
Superficial
Subcutaneous
External anal sphincter muscle
Deep perineal (investing or Gallaudet's) fascia
Superficial perineal (Colles') fascia (inferior fascia of superficial perineal space)
Superficial (dartos) fascia of scrotum
External spermatic fascia
Median (sagittal) section
Urachus
Urinary bladder
Apex
Fundus
Body
Trigone
Neck
Pubic symphysis
Suspensory ligament of penis
Inferior (arcuate) pubic ligament
Prostatic venous plexus
Transverse perineal ligament (anterior thickening of perineal membrane)
Perineal membrane
Superficial perineal space
Corpus cavernosum
Corpus spongiosum
Superficial (dartos) fascia of penis and scrotum
Deep (Buck's) fascia of penis
Prepuce
Glans penis and external urethral meatus
Vesical fascia
Rectovesical pouch
Rectum
Seminal vesicle
Prostate
Rectoprostatic (Denonvilliers') fascia
External urethral sphincter muscle
Bulbo-urethral (Cowper's) gland
Perineal body
Bulbospongiosus muscle
Deep perineal (investing or Gallaudet's) fascia
Superficial perineal (Colles') fascia
Deep (Buck's) fascia of penis
Septum of scrotum
Navicular fossa
F. Netter M.D.
C. Machado M.D.

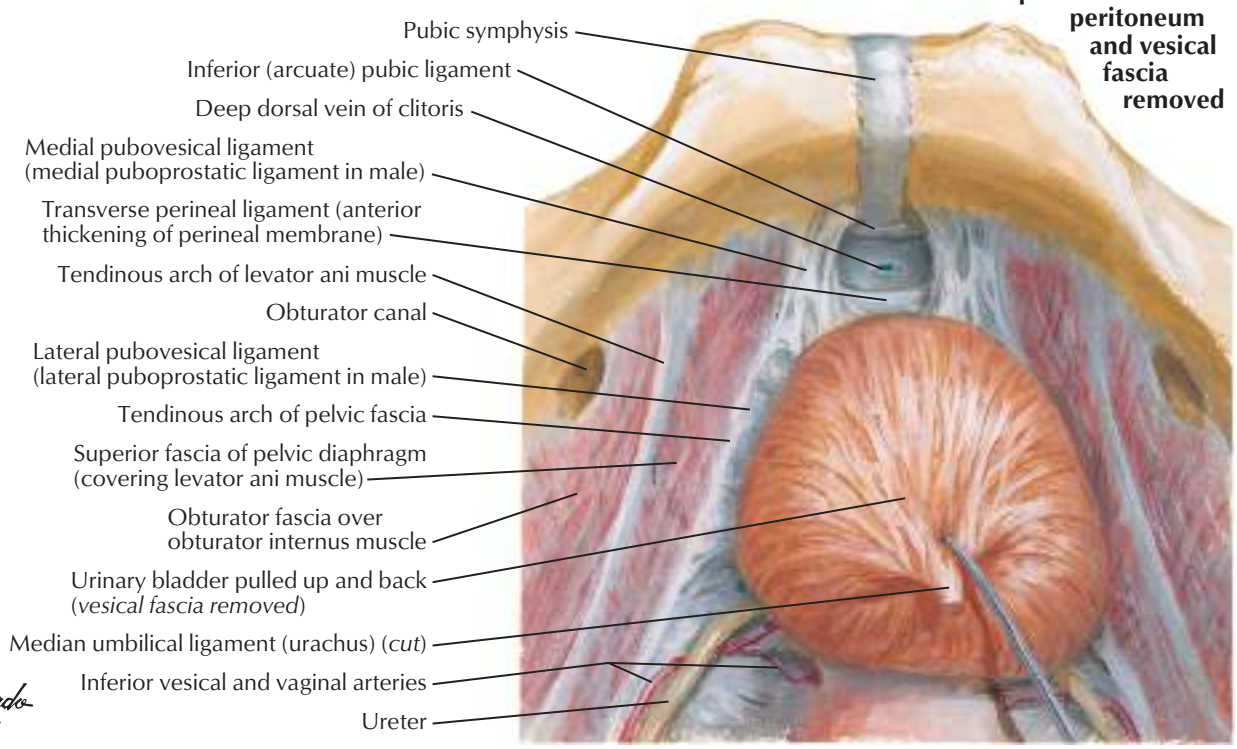
Superior view

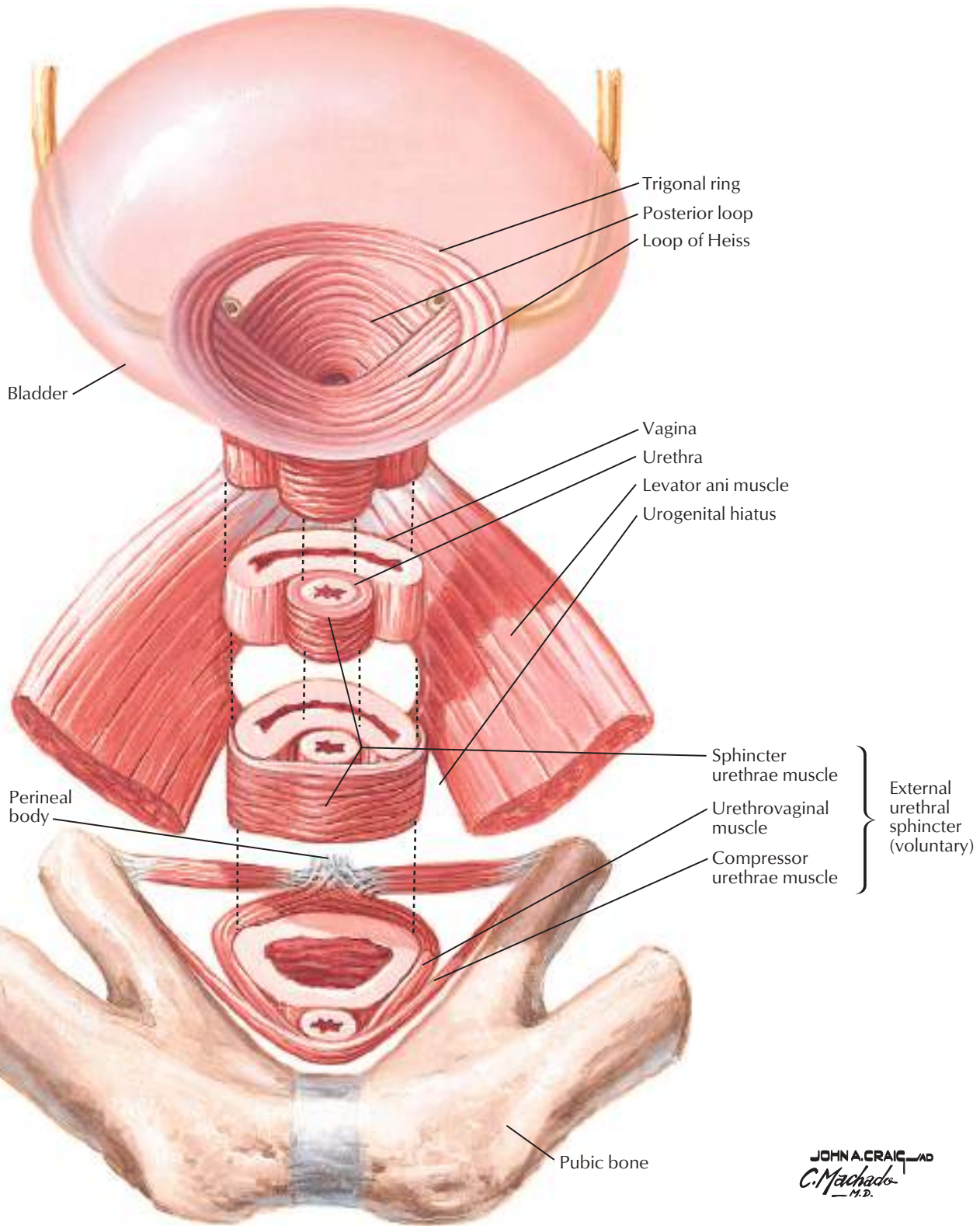


Female: midsagittal section



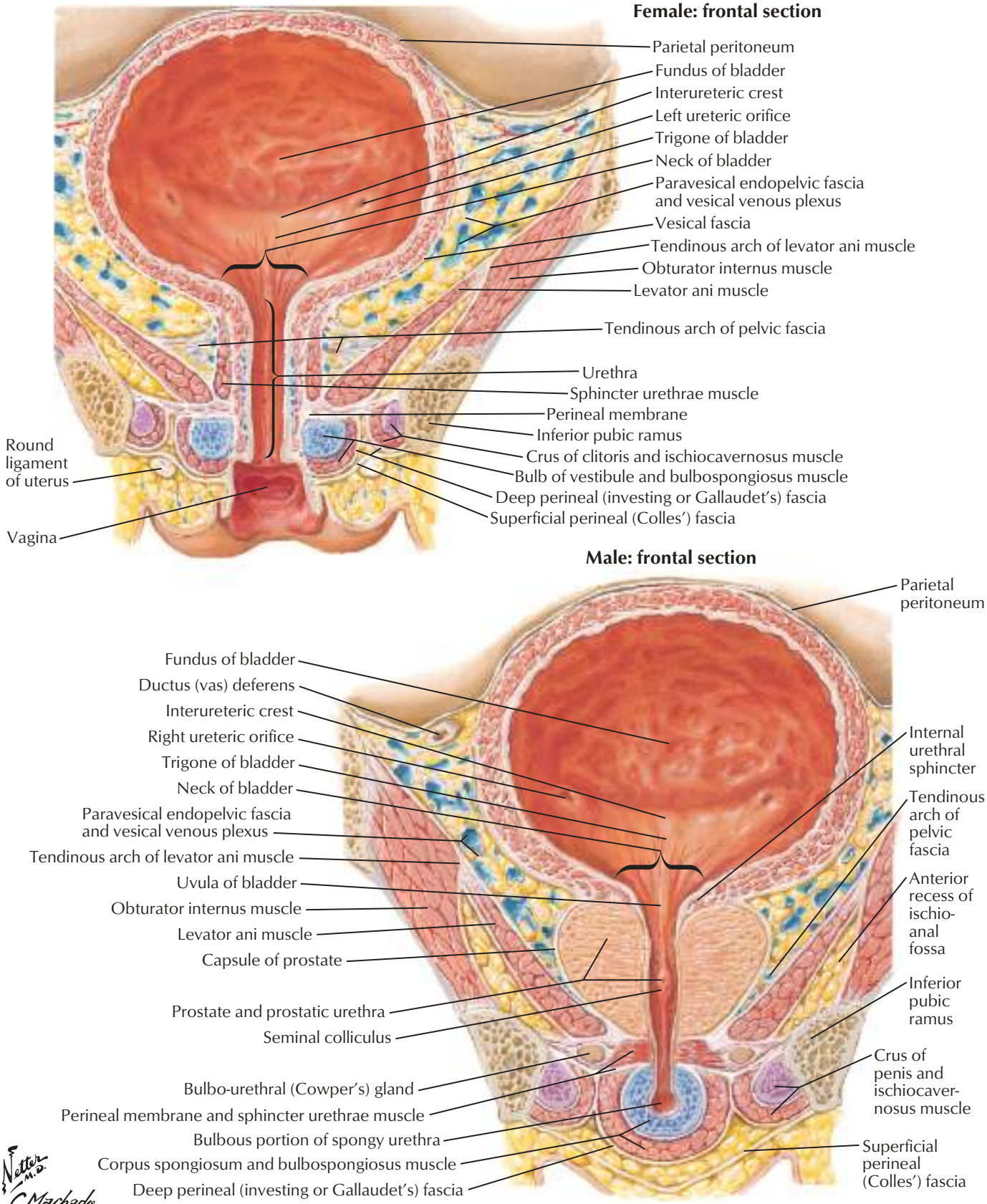
Superior view with peritoneum and vesical fascia removed

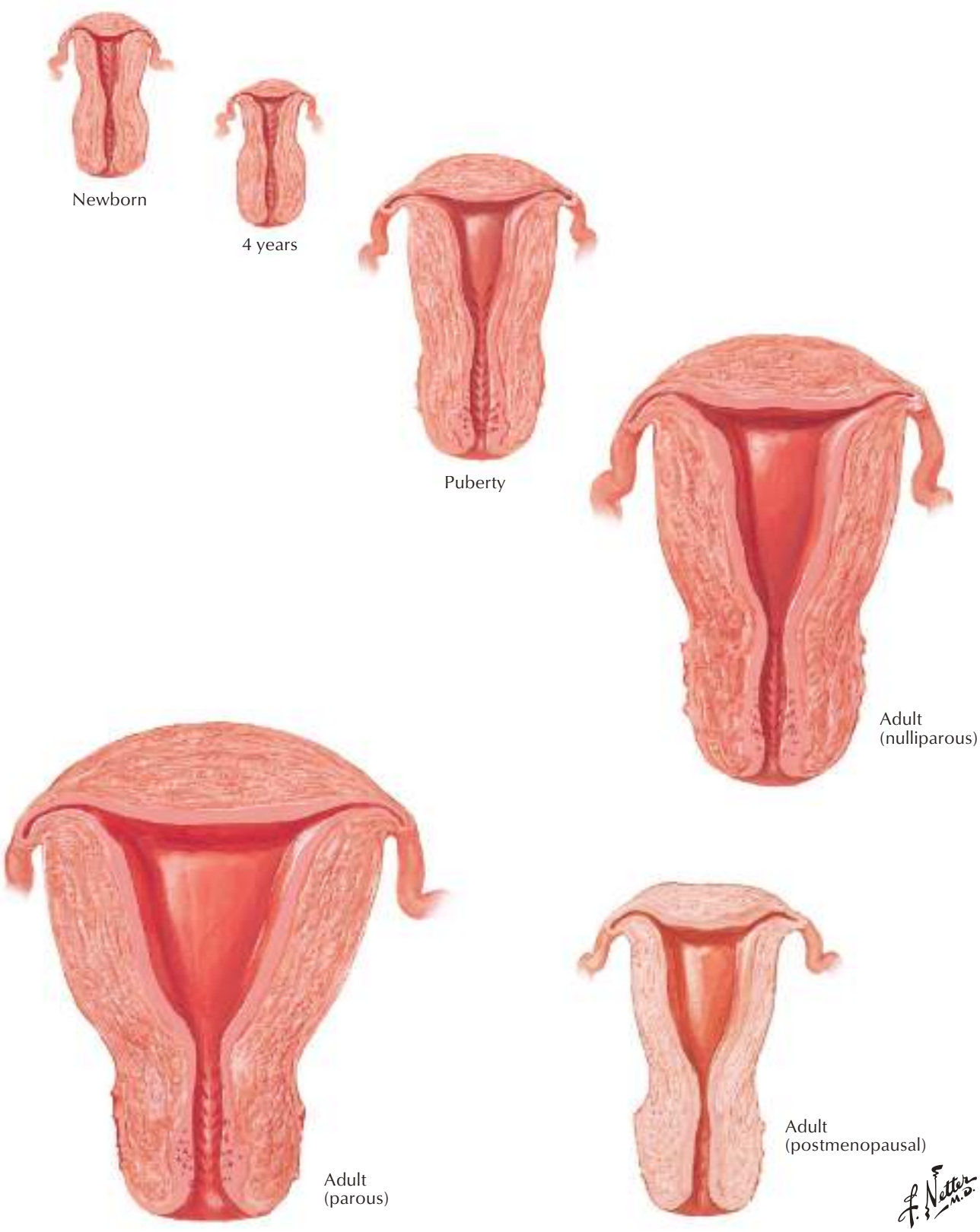



Trigonal ring
Posterior loop
Loop of Heiss
Bladder
Vagina
Urethra
Levator ani muscle
Urogenital hiatus
Sphincter urethrae muscle
Perineal body
Urethrovaginal muscle
Compressor urethrae muscle
External urethral sphincter (voluntary)
Pubic bone
JOHN A. CRAIG, M.D.
C. Machado, M.D.

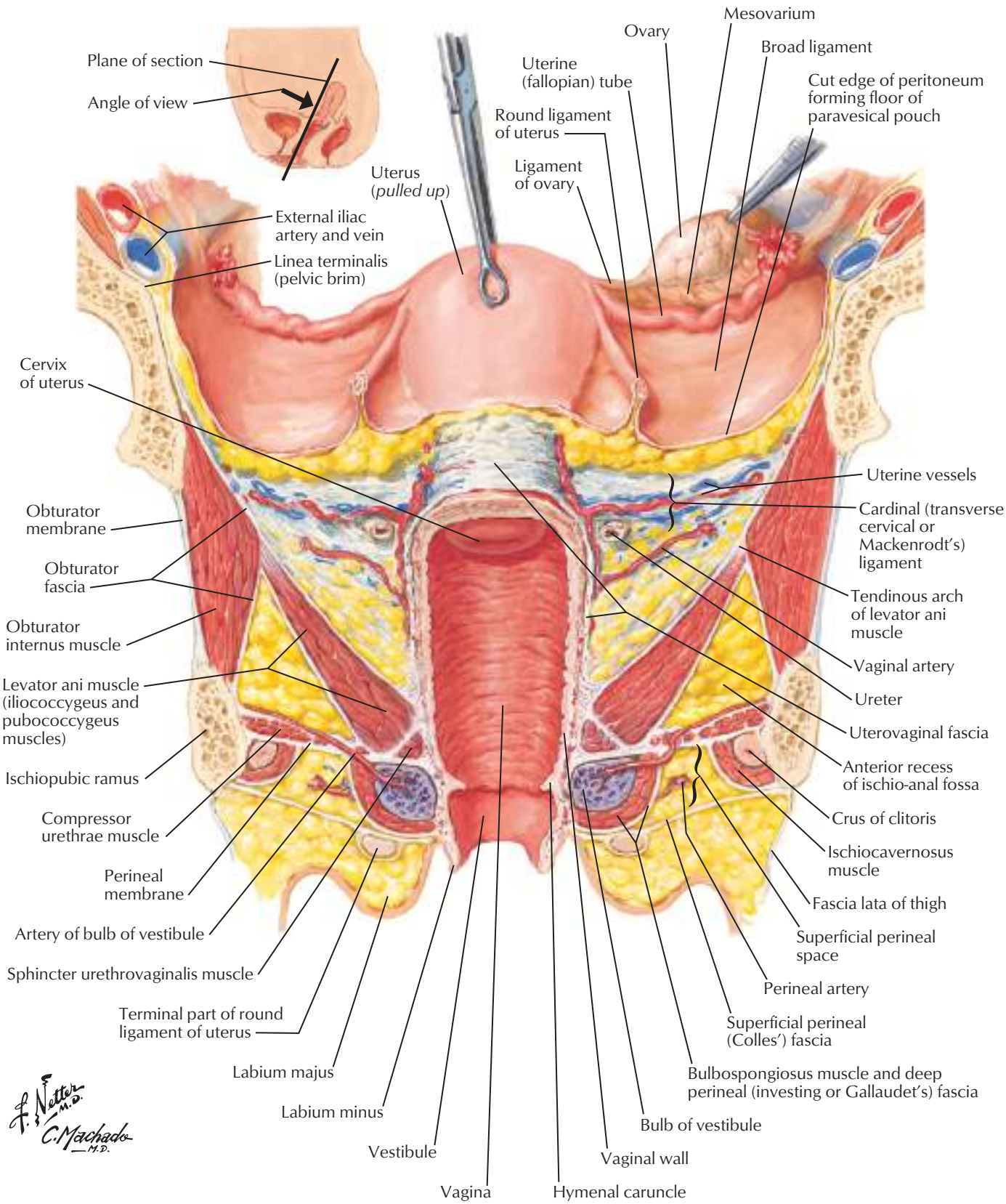
Urinary Bladder: Female and Male

See also **Plates 340, 344, 381**

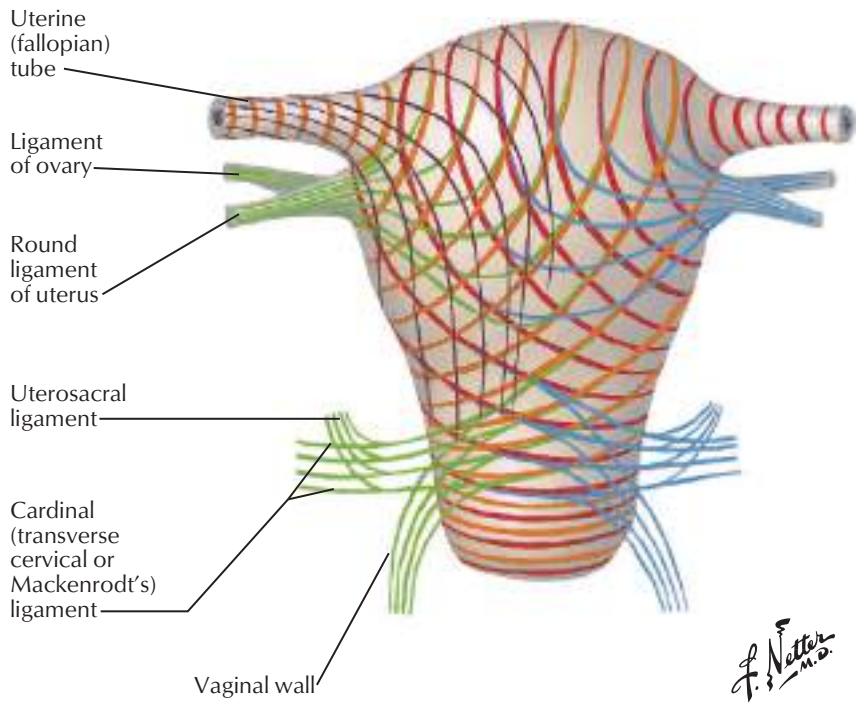



Newborn
4 years
Puberty
Adult
(nulliparous)
Adult
(parous)
Adult
(postmenopausal)
F. Netter M.D.

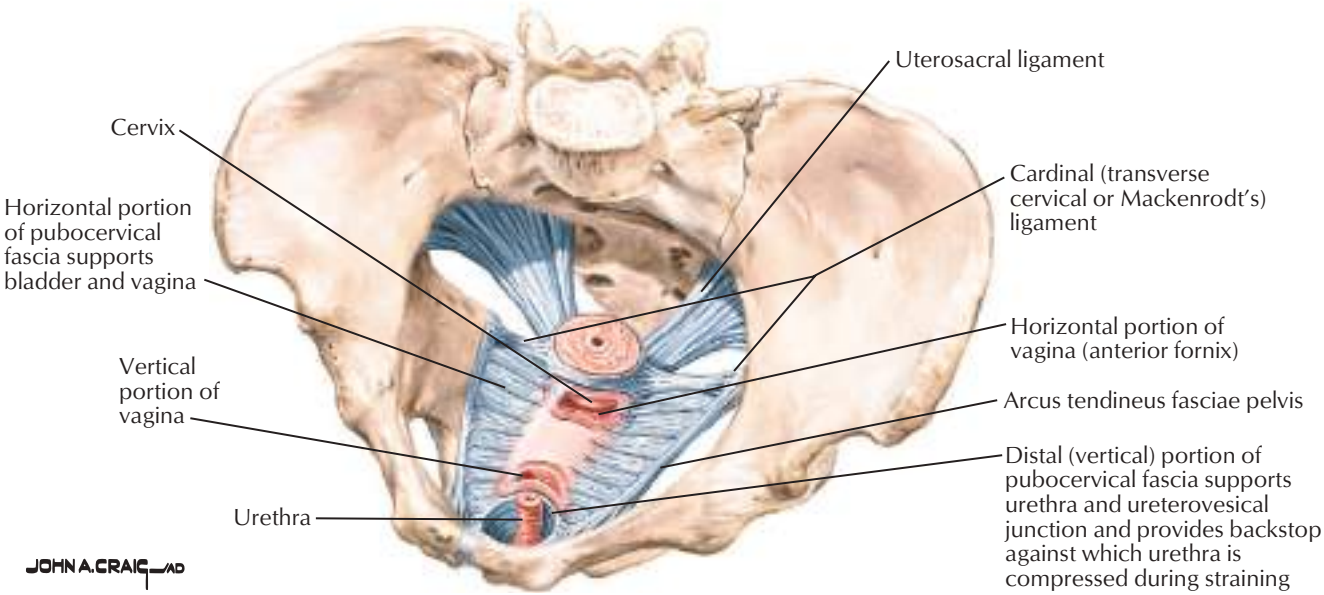
See also **Plates 382, 384, 390**

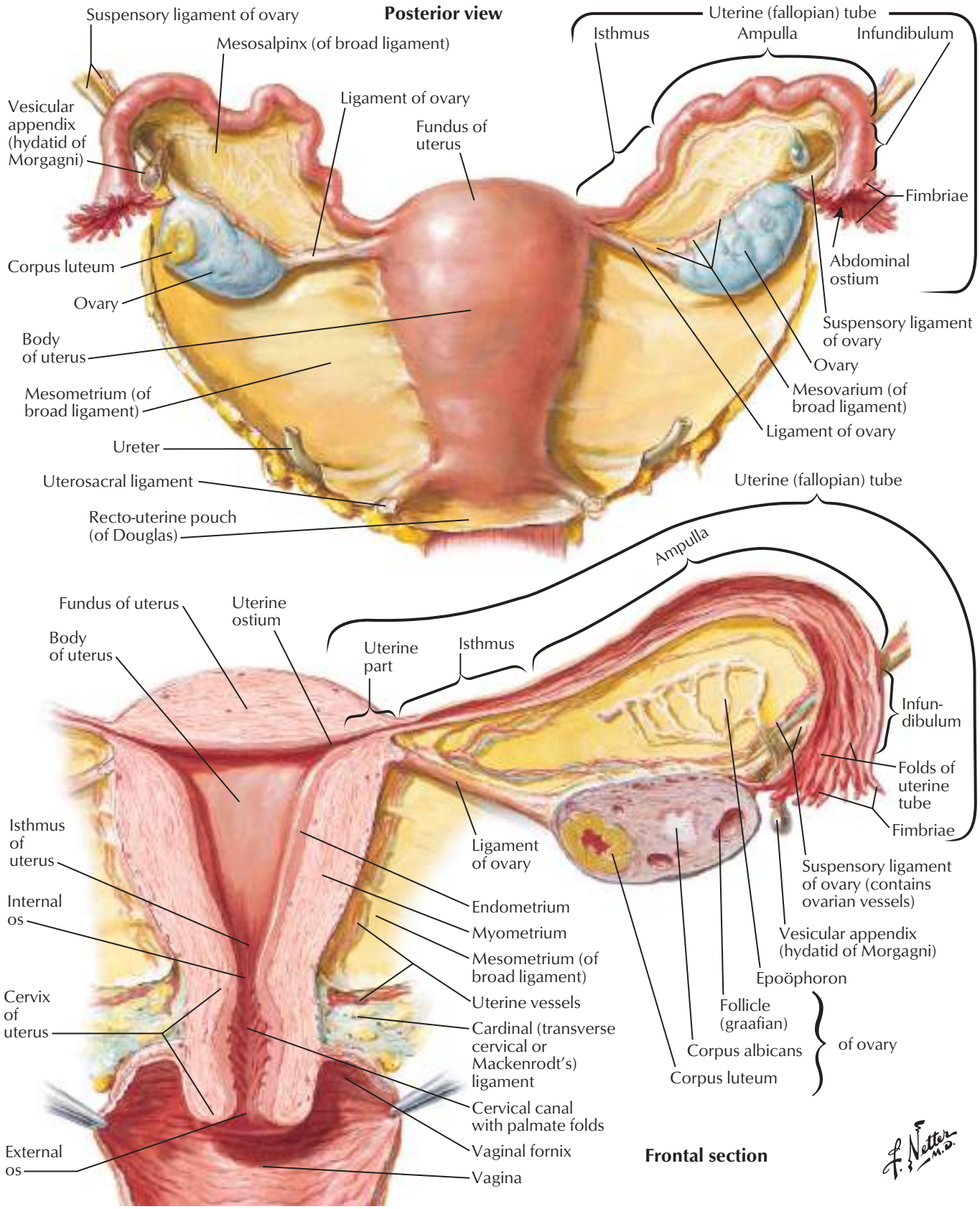


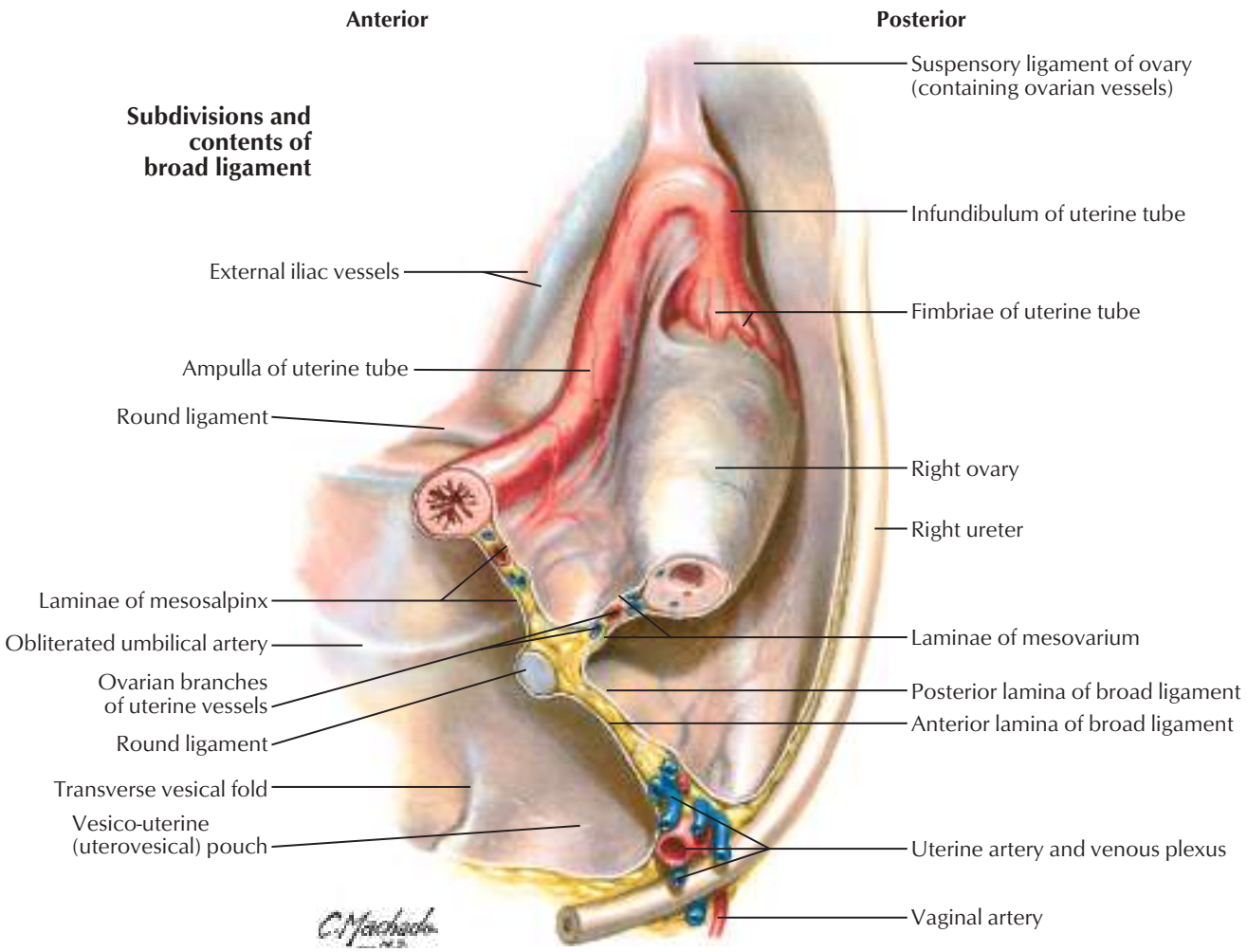
Fascial ligaments of uterus

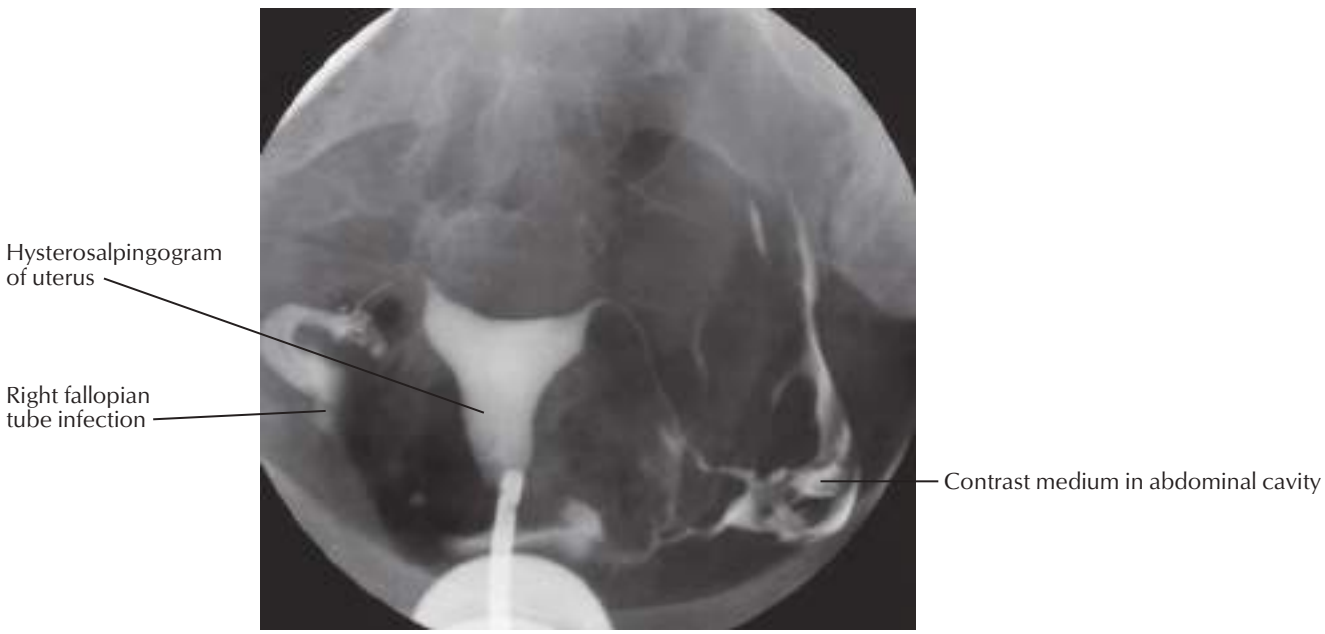


Pelvic fascia and ligaments



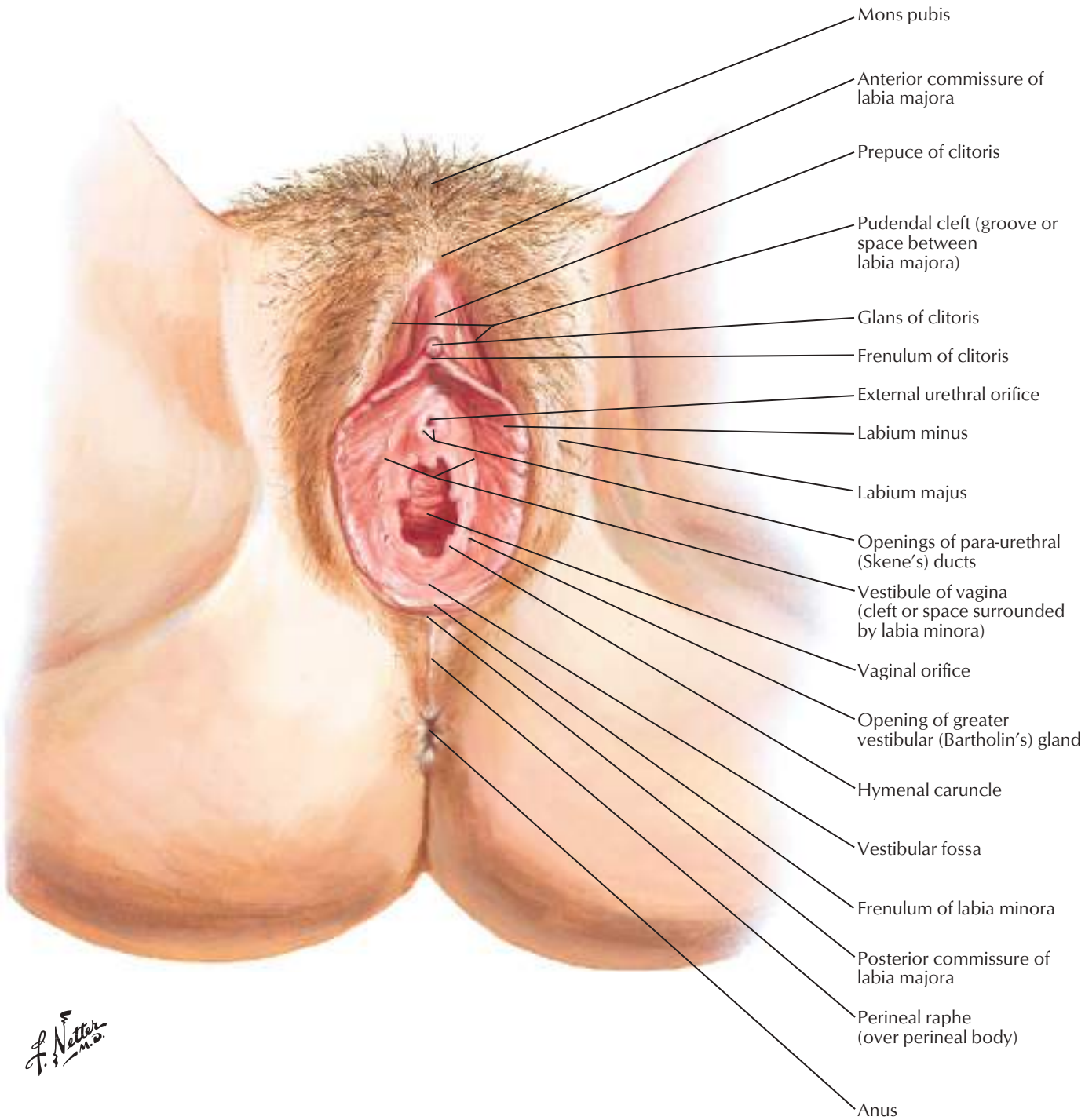

Posterior view
Suspensory ligament of ovary
Mesosalpinx (of broad ligament)
Vesicular appendix (hydatid of Morgagni)
Ligament of ovary
Fundus of uterus
Corpus luteum
Ovary
Body of uterus
Mesometrium (of broad ligament)
Ureter
Uterosacral ligament
Recto-uterine pouch (of Douglas)
Uterine (fallopian) tube
Isthmus
Ampulla
Infundibulum
Fimbriae
Abdominal ostium
Suspensory ligament of ovary
Ovary
Mesovarium (of broad ligament)
Ligament of ovary
Uterine (fallopian) tube
Ampulla
Fundus of uterus
Uterine ostium
Body of uterus
Uterine part
Isthmus
Infun-dibulum
Folds of uterine tube
Fimbriae
Isthmus of uterus
Internal os
Cervix of uterus
External os
Ligament of ovary
Endometrium
Myometrium
Mesometrium (of broad ligament)
Uterine vessels
Cardinal (transverse cervical or Mackenrodt's) ligament
Cervical canal with palmate folds
Vaginal fornix
Vagina
Suspensory ligament of ovary (contains ovarian vessels)
Vesicular appendix (hydatid of Morgagni)
Epoöphoron
Follicle (graafian)
Corpus albicans
Corpus luteum
of ovary
Frontal section

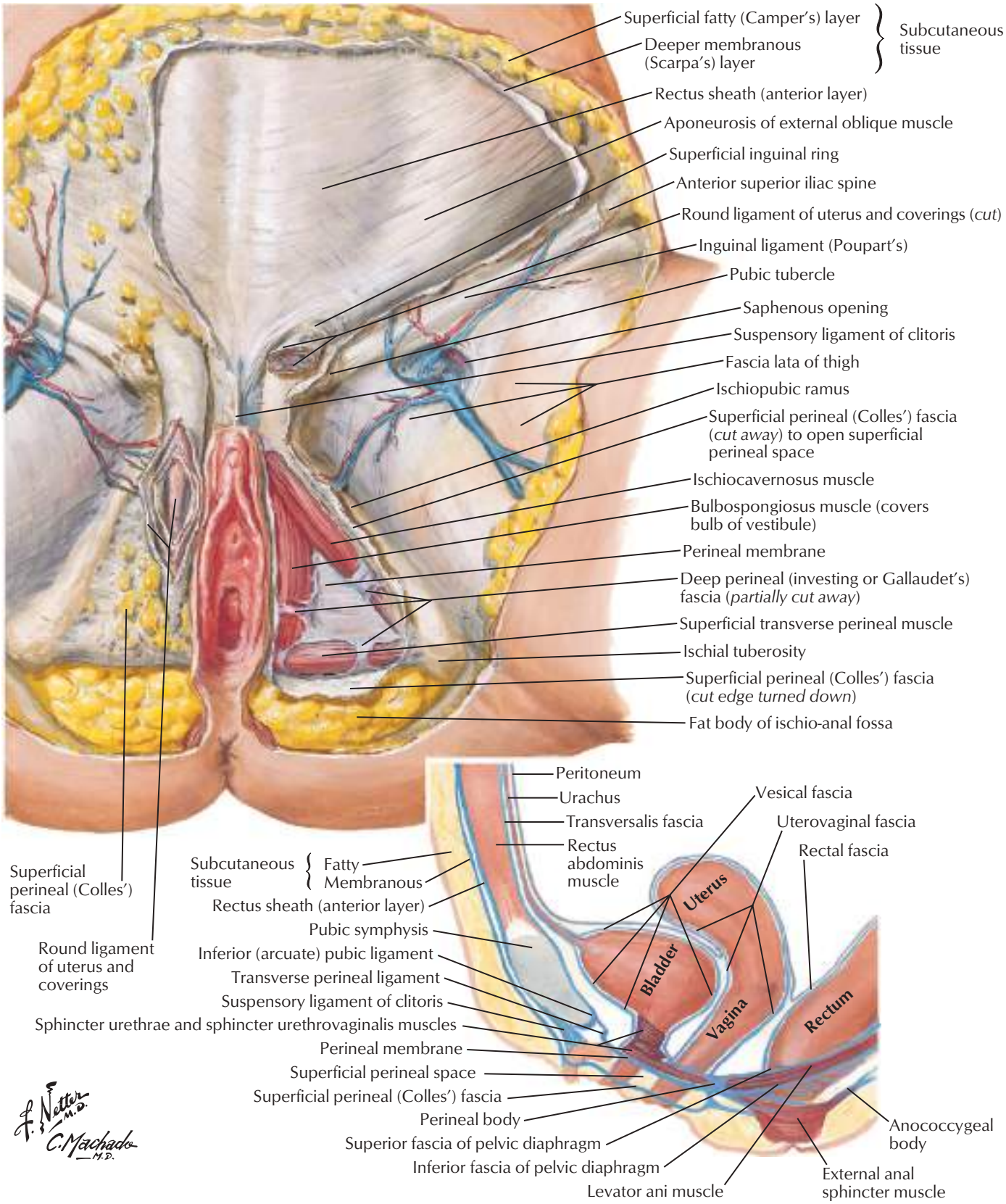

Anterior
Posterior
Subdivisions and contents of broad ligament
Suspensory ligament of ovary (containing ovarian vessels)
Infundibulum of uterine tube
External iliac vessels
Fimbriae of uterine tube
Ampulla of uterine tube
Round ligament
Right ovary
Right ureter
Laminae of mesosalpinx
Obliterated umbilical artery
Laminae of mesovarium
Ovarian branches of uterine vessels
Posterior lamina of broad ligament
Round ligament
Anterior lamina of broad ligament
Transverse vesical fold
Vesico-uterine (uterovesical) pouch
Uterine artery and venous plexus
Vaginal artery

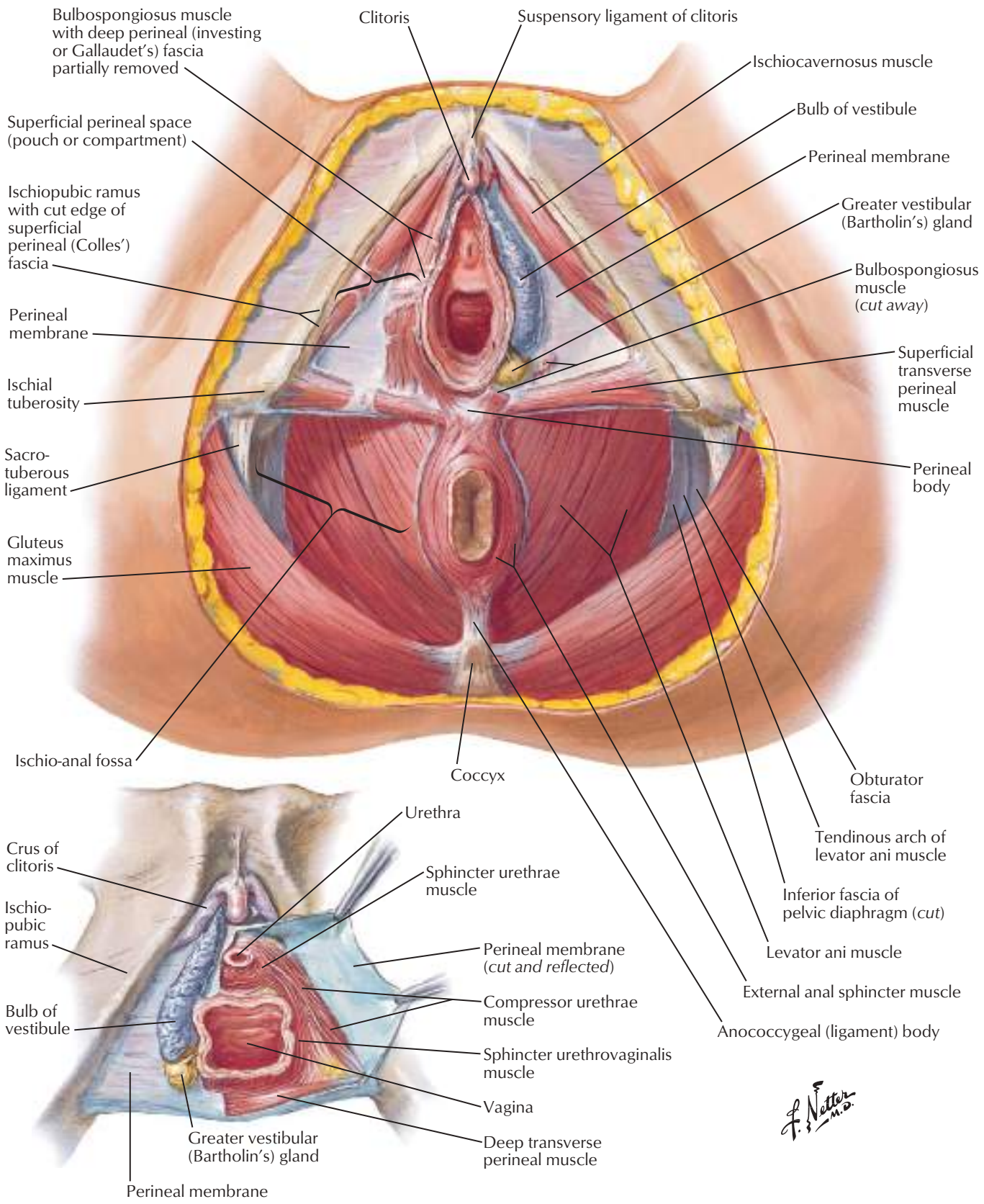

Hysterosalpingogram of uterus
Right fallopian tube infection
Contrast medium in abdominal cavity

Female Perineum and External Genitalia (Pudendum or Vulva)

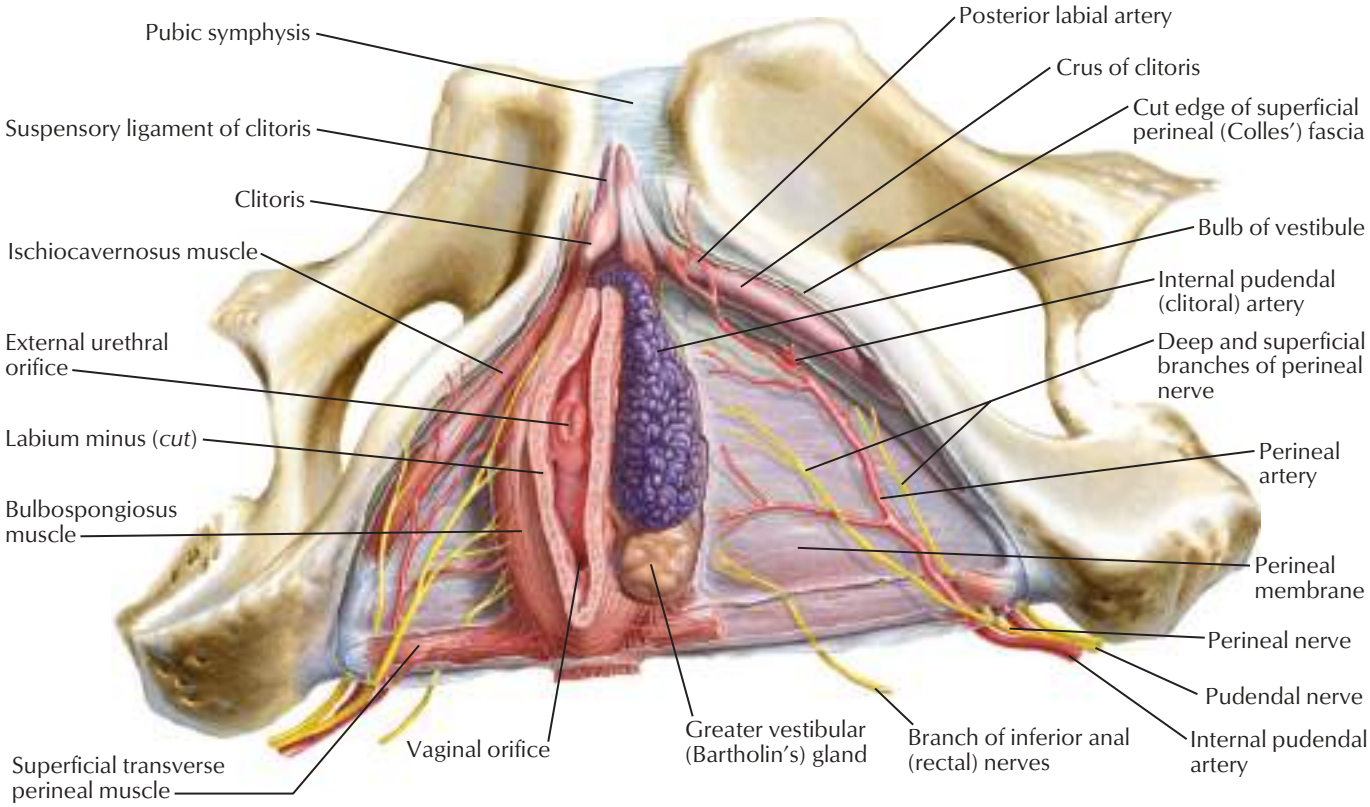
See also **Plates 382, 385, 391**



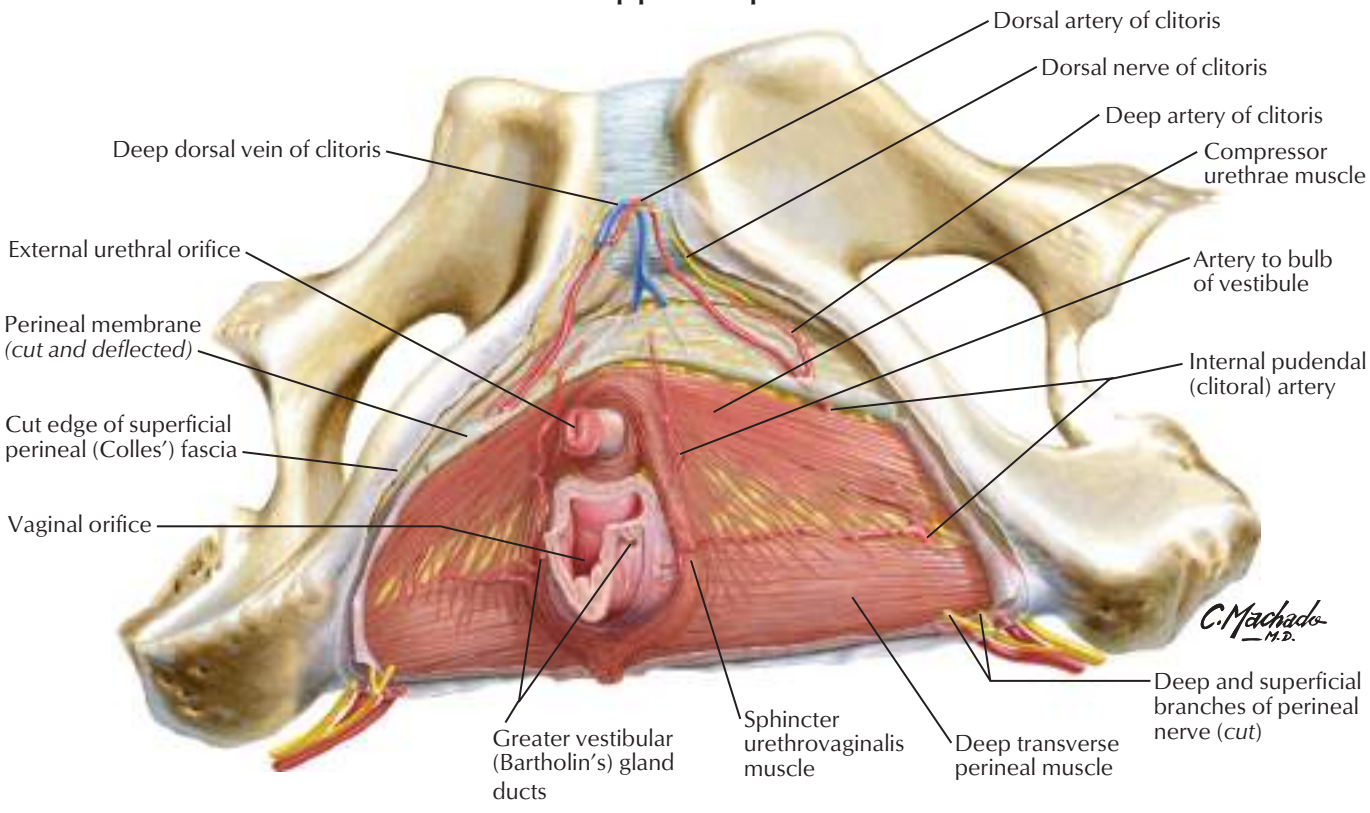

Superficial fatty (Camper's) layer
Deeper membranous (Scarpa's) layer
Subcutaneous tissue
Rectus sheath (anterior layer)
Aponeurosis of external oblique muscle
Superficial inguinal ring
Anterior superior iliac spine
Round ligament of uterus and coverings (cut)
Inguinal ligament (Poupart's)
Pubic tubercle
Saphenous opening
Suspensory ligament of clitoris
Fascia lata of thigh
Ischiopubic ramus
Superficial perineal (Colles') fascia (cut away) to open superficial perineal space
Ischiocavernosus muscle
Bulbospongiosus muscle (covers bulb of vestibule)
Perineal membrane
Deep perineal (investing or Gallaudet's) fascia (partially cut away)
Superficial transverse perineal muscle
Ischial tuberosity
Superficial perineal (Colles') fascia (cut edge turned down)
Fat body of ischio-anal fossa
Peritoneum
Urachus
Transversalis fascia
Rectus abdominis muscle
Vesical fascia
Uterovaginal fascia
Rectal fascia
Uterus
Bladder
Vagina
Rectum
Superficial perineal (Colles') fascia
Subcutaneous tissue
Fatty
Membranous
Rectus sheath (anterior layer)
Round ligament of uterus and coverings
Pubic symphysis
Inferior (arcuate) pubic ligament
Transverse perineal ligament
Suspensory ligament of clitoris
Sphincter urethrae and sphincter urethrovaginalis muscles
Perineal membrane
Superficial perineal space
Superficial perineal (Colles') fascia
Perineal body
Superior fascia of pelvic diaphragm
Inferior fascia of pelvic diaphragm
Levator ani muscle
Anococcygeal body
External anal sphincter muscle
F. Netter M.D.
C. Machado M.D.

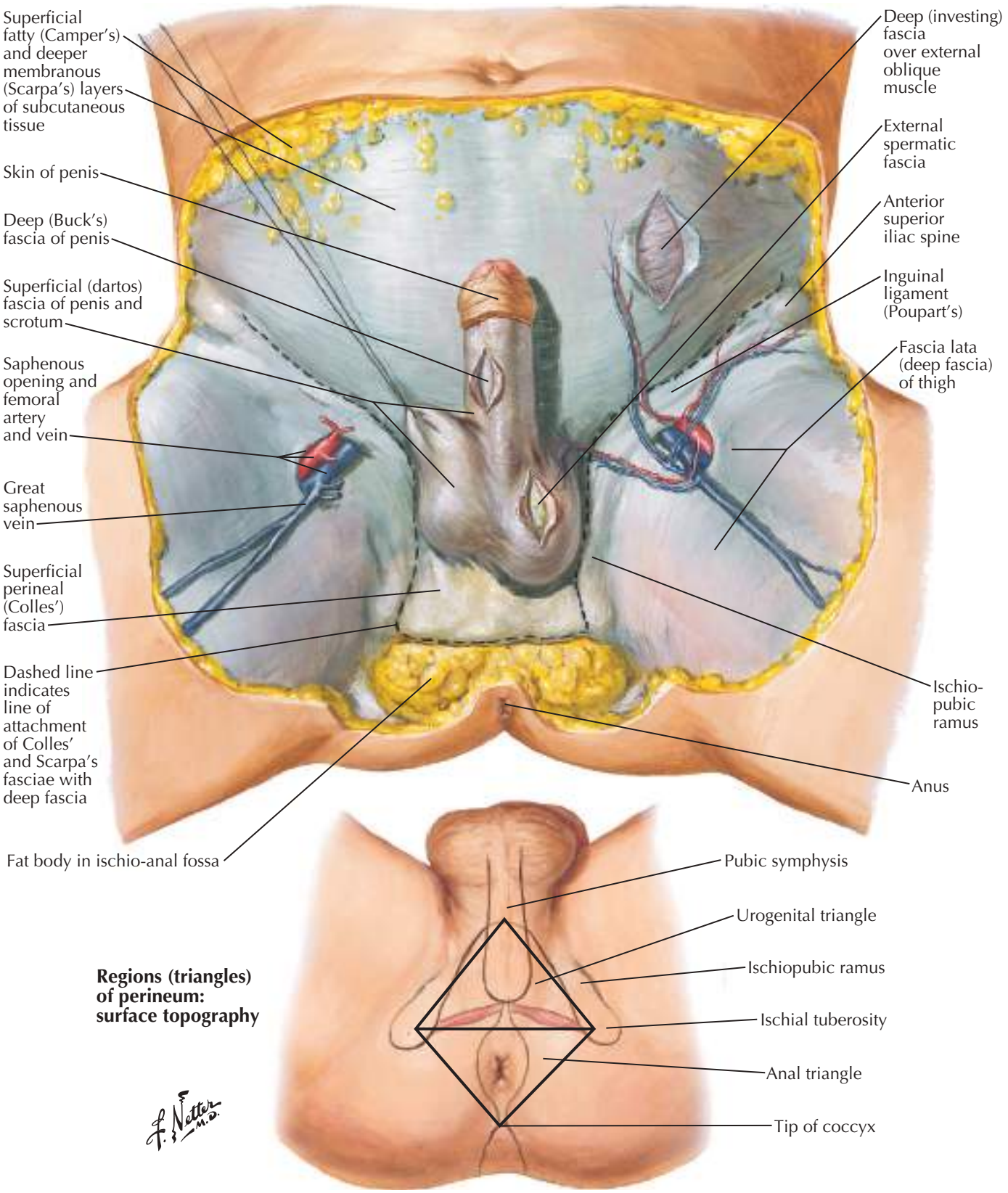

Bulbospongiosus muscle with deep perineal (investing or Gallaudet's) fascia partially removed
Clitoris
Suspensory ligament of clitoris
Ischiocavernosus muscle
Bulb of vestibule
Perineal membrane
Greater vestibular (Bartholin's) gland
Bulbospongiosus muscle (cut away)
Superficial transverse perineal muscle
Perineal body
Obturator fascia
Tendinous arch of levator ani muscle
Inferior fascia of pelvic diaphragm (cut)
Levator ani muscle
External anal sphincter muscle
Anococcygeal (ligament) body
Coccyx
Ischio-anal fossa
Sacro-tuberous ligament
Gluteus maximus muscle
Ischial tuberosity
Perineal membrane
Ischiopubic ramus with cut edge of superficial perineal (Colles') fascia
Superficial perineal space (pouch or compartment)
Urethra
Sphincter urethrae muscle
Perineal membrane (cut and reflected)
Compressor urethrae muscle
Sphincter urethrovaginalis muscle
Vagina
Deep transverse perineal muscle
Crus of clitoris
Ischio-pubic ramus
Bulb of vestibule
Greater vestibular (Bartholin's) gland
Perineal membrane

Superficial perineal space

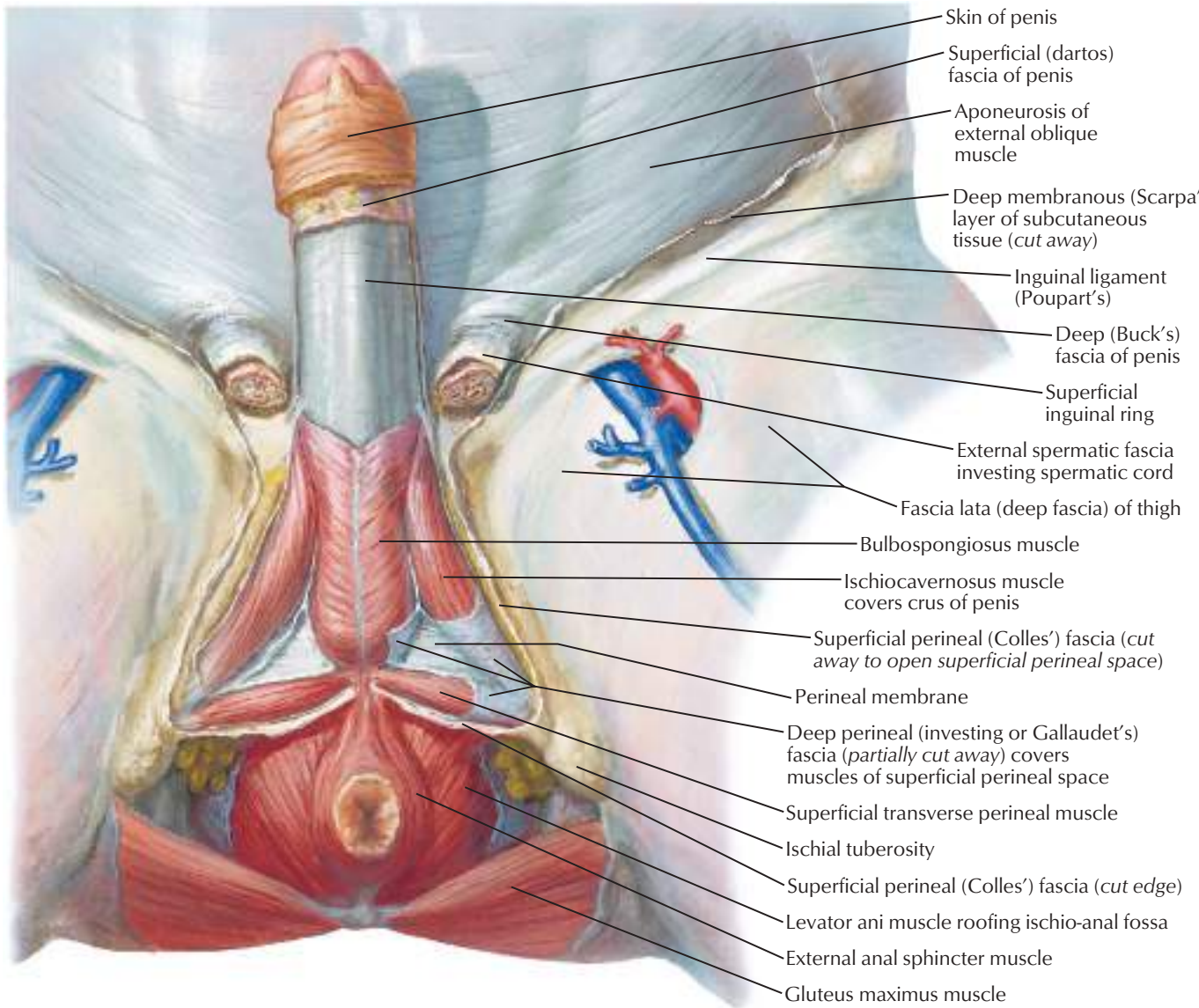


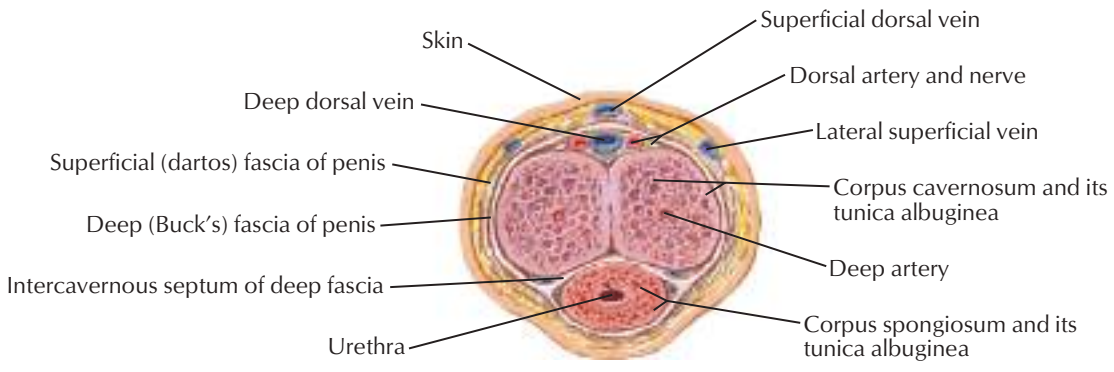
Deep perineal space



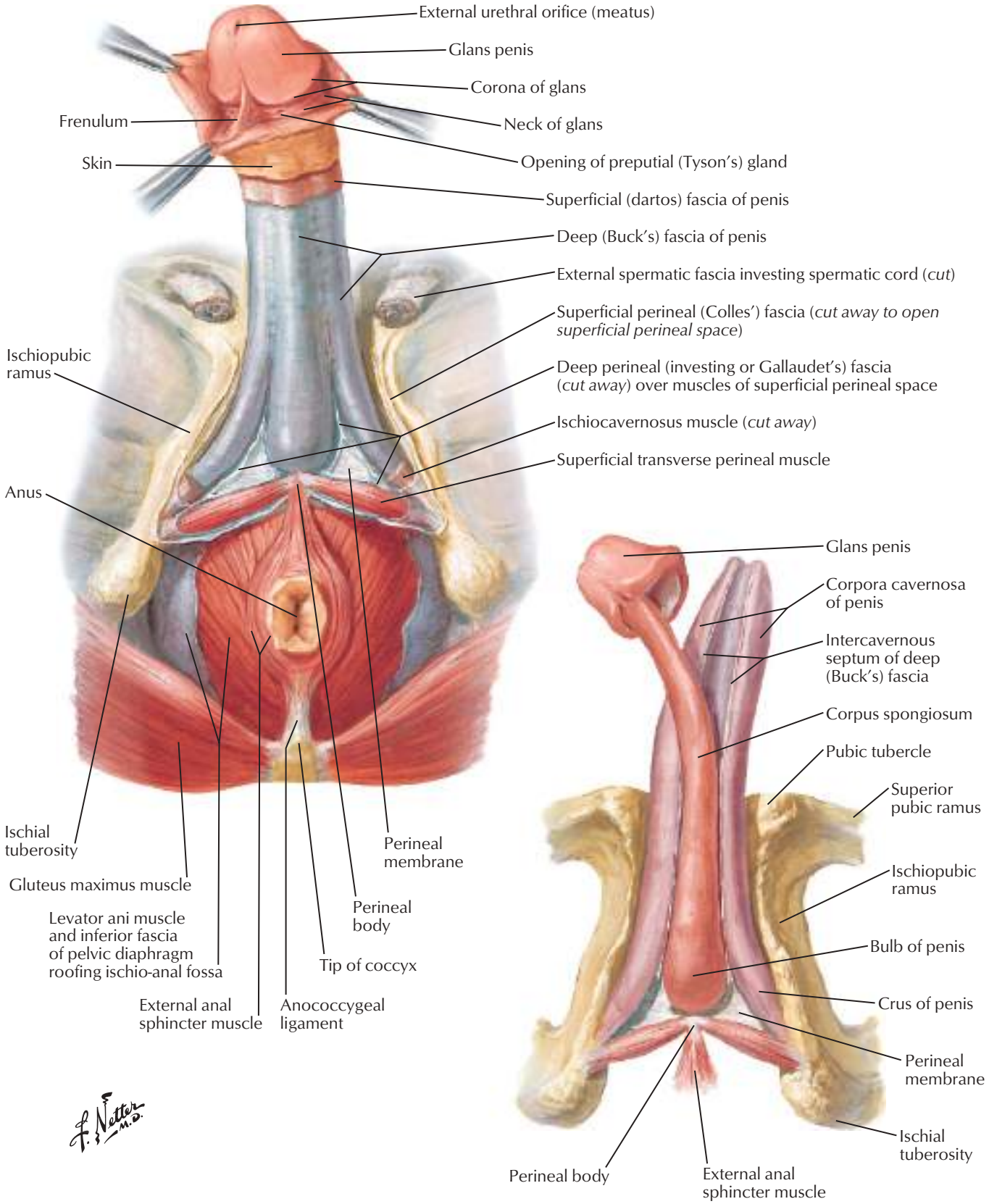


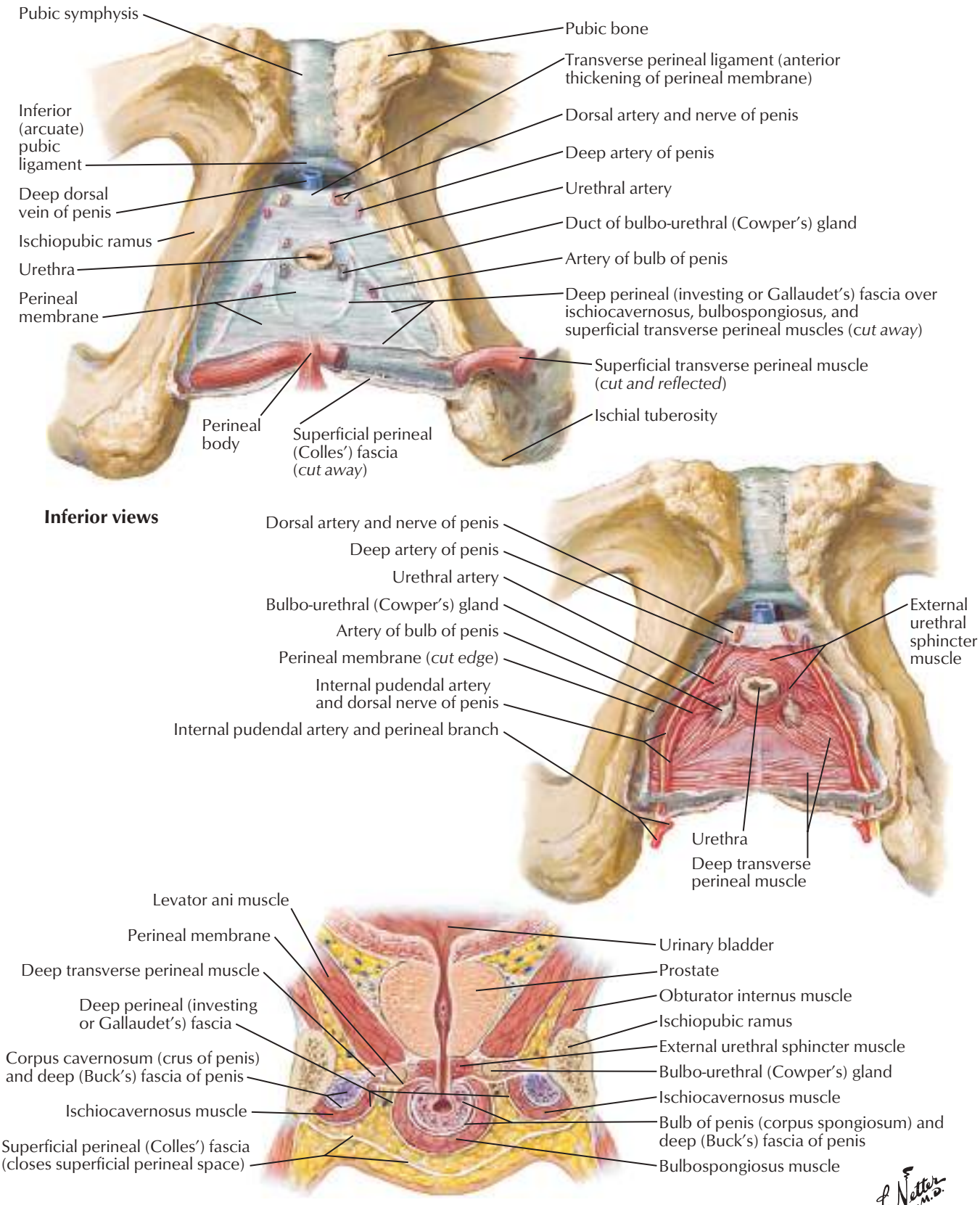
Regions (triangles) of perineum: surface topography





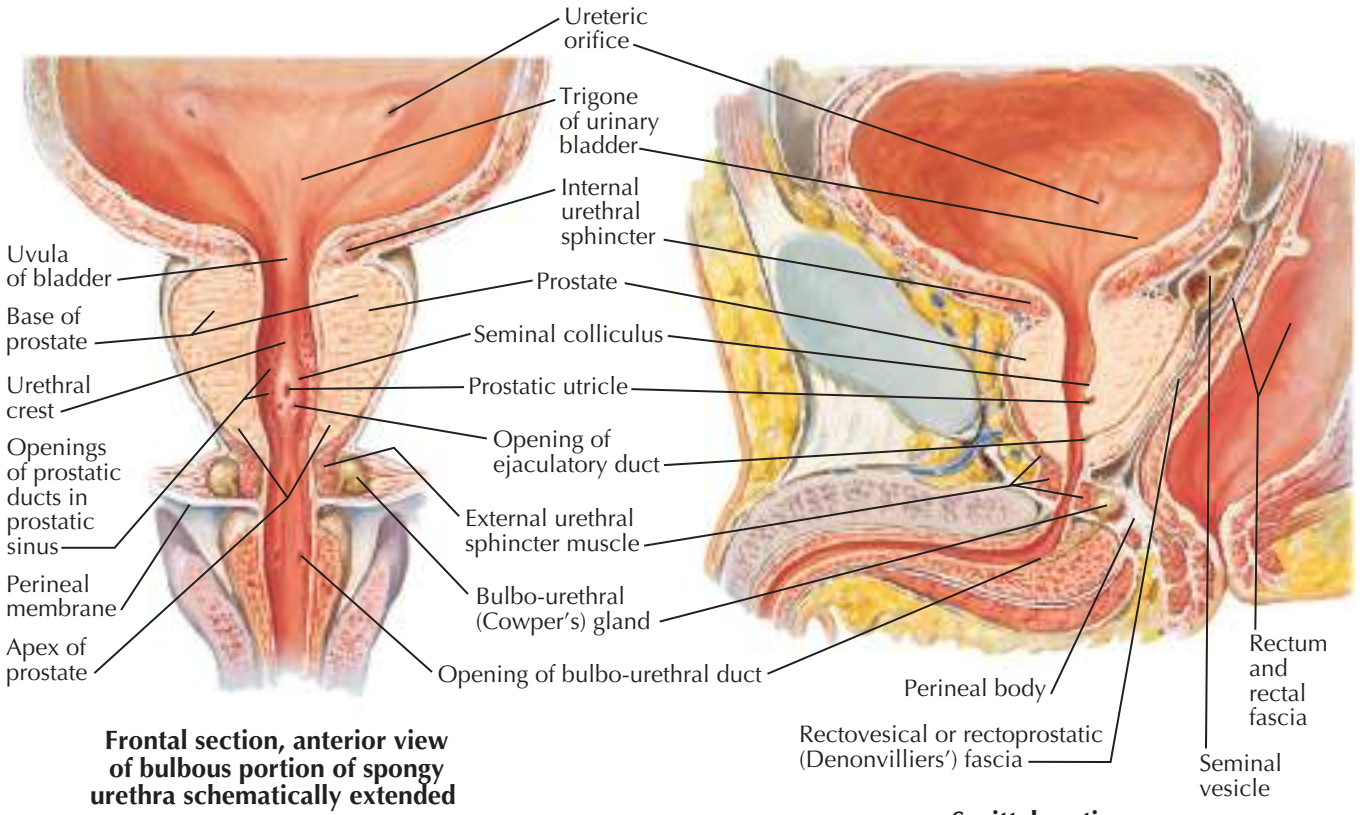
Transverse section through body of penis


External urethral orifice (meatus)
Glans penis
Corona of glans
Frenulum
Neck of glans
Skin
Opening of preputial (Tyson's) gland
Superficial (dartos) fascia of penis
Deep (Buck's) fascia of penis
External spermatic fascia investing spermatic cord (cut)
Superficial perineal (Colles') fascia (cut away to open superficial perineal space)
Ischiopubic ramus
Deep perineal (investing or Gallaudet's) fascia (cut away) over muscles of superficial perineal space
Ischiocavernosus muscle (cut away)
Superficial transverse perineal muscle
Anus
Ischial tuberosity
Perineal membrane
Gluteus maximus muscle
Perineal body
Levator ani muscle and inferior fascia of pelvic diaphragm roofing ischio-anal fossa
Tip of coccyx
External anal sphincter muscle
Anococcygeal ligament
Glans penis
Corpora cavernosa of penis
Intercavernous septum of deep (Buck's) fascia
Corpus spongiosum
Pubic tubercle
Superior pubic ramus
Ischiopubic ramus
Bulb of penis
Crus of penis
Perineal membrane
Ischial tuberosity
Perineal body
External anal sphincter muscle



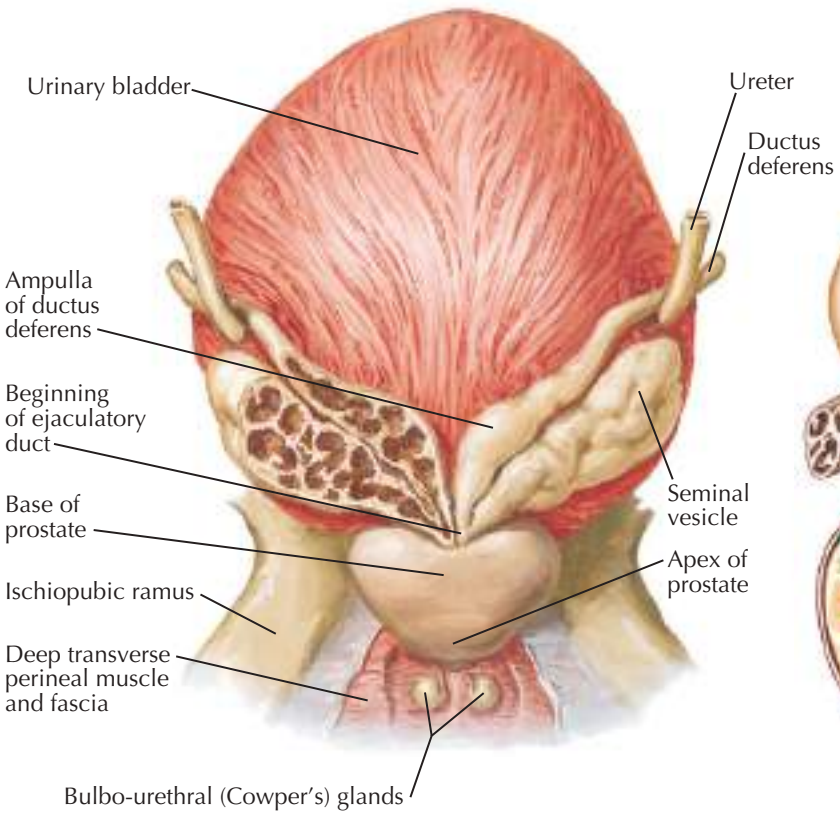
Frontal section, anterior view of perineum: schema

See also Plates 344, 348, 381

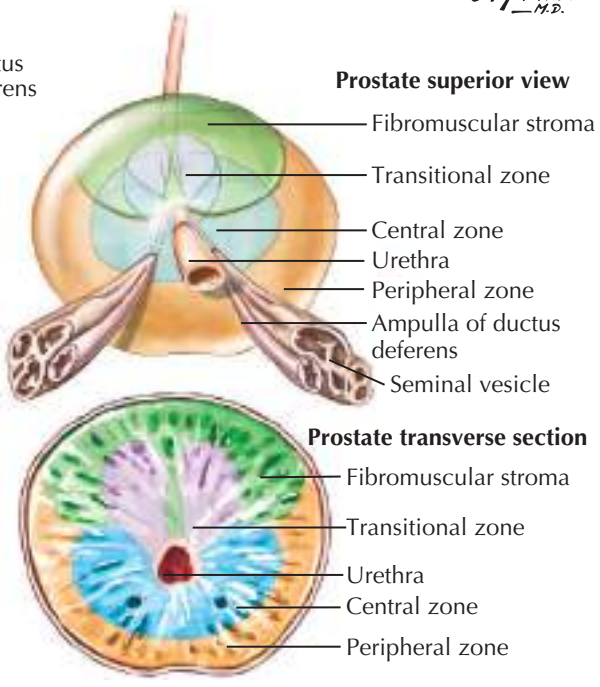


Frontal section, anterior view of bulbous portion of spongy urethra schematically extended

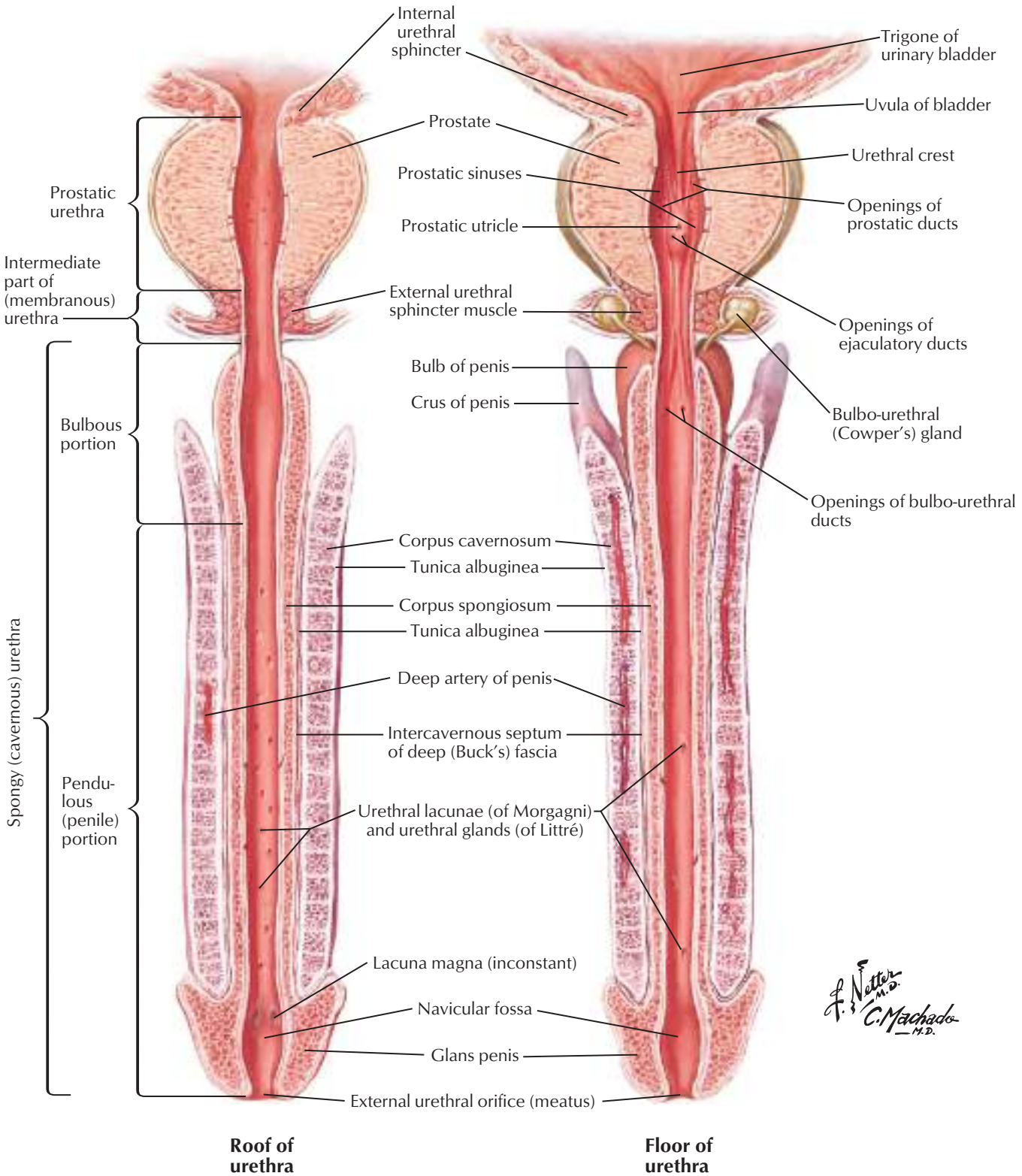
Sagittal section



Posterior view



Posterior view


Internal urethral sphincter
Prostate
Prostatic sinuses
Prostatic utricle
External urethral sphincter muscle
Bulb of penis
Crus of penis
Corpus cavernosum
Tunica albuginea
Corpus spongiosum
Tunica albuginea
Deep artery of penis
Intercavernous septum of deep (Buck's) fascia
Urethral lacunae (of Morgagni) and urethral glands (of Littré)
Lacuna magna (inconstant)
Navicular fossa
Glans penis
External urethral orifice (meatus)
Trigone of urinary bladder
Uvula of bladder
Urethral crest
Openings of prostatic ducts
Openings of ejaculatory ducts
Bulbo-urethral (Cowper's) gland
Openings of bulbo-urethral ducts
Prostatic urethra
Intermediate part of (membranous) urethra
Bulbous portion
Pendulous (penile) portion
Spongy (cavernous) urethra
Roof of urethra
Floor of urethra
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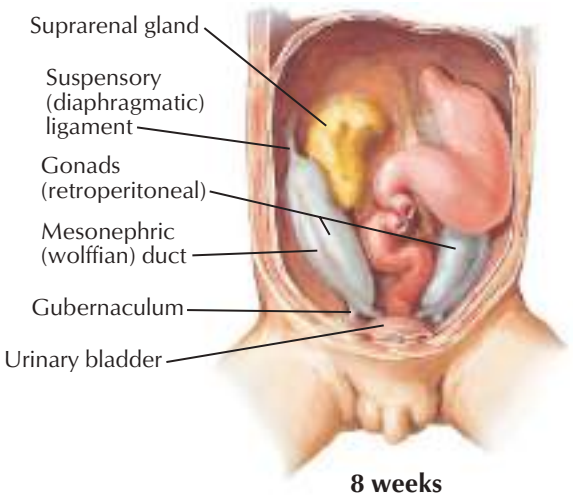
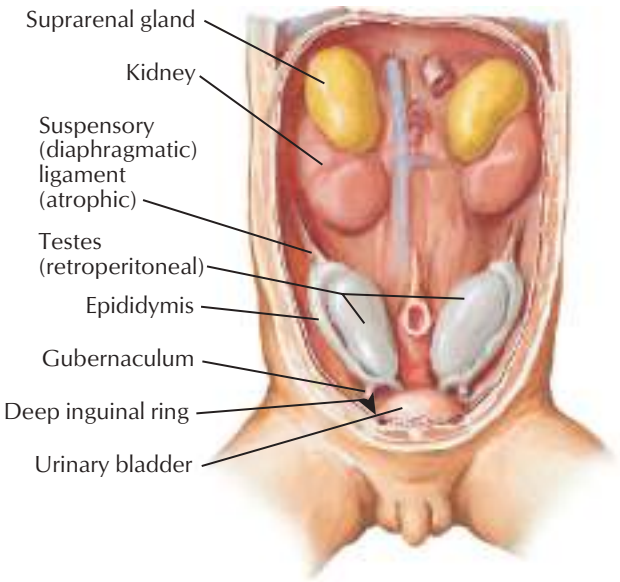
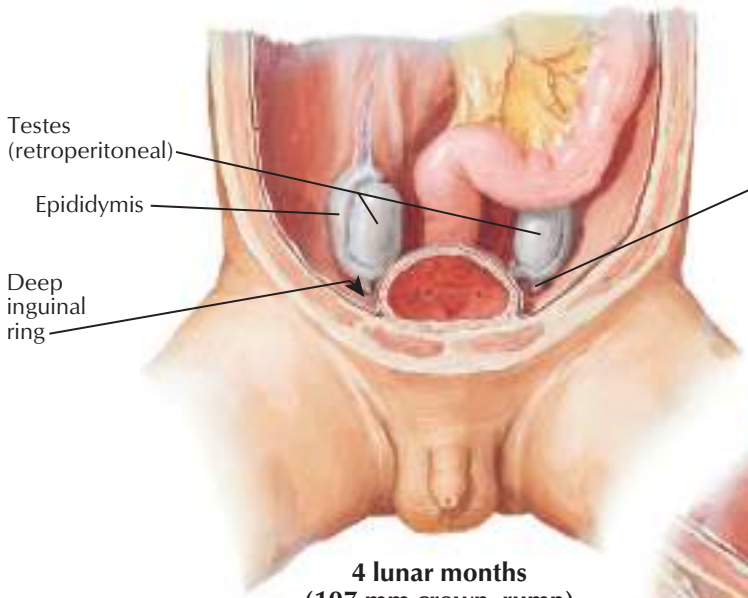
C. Machado M.D.



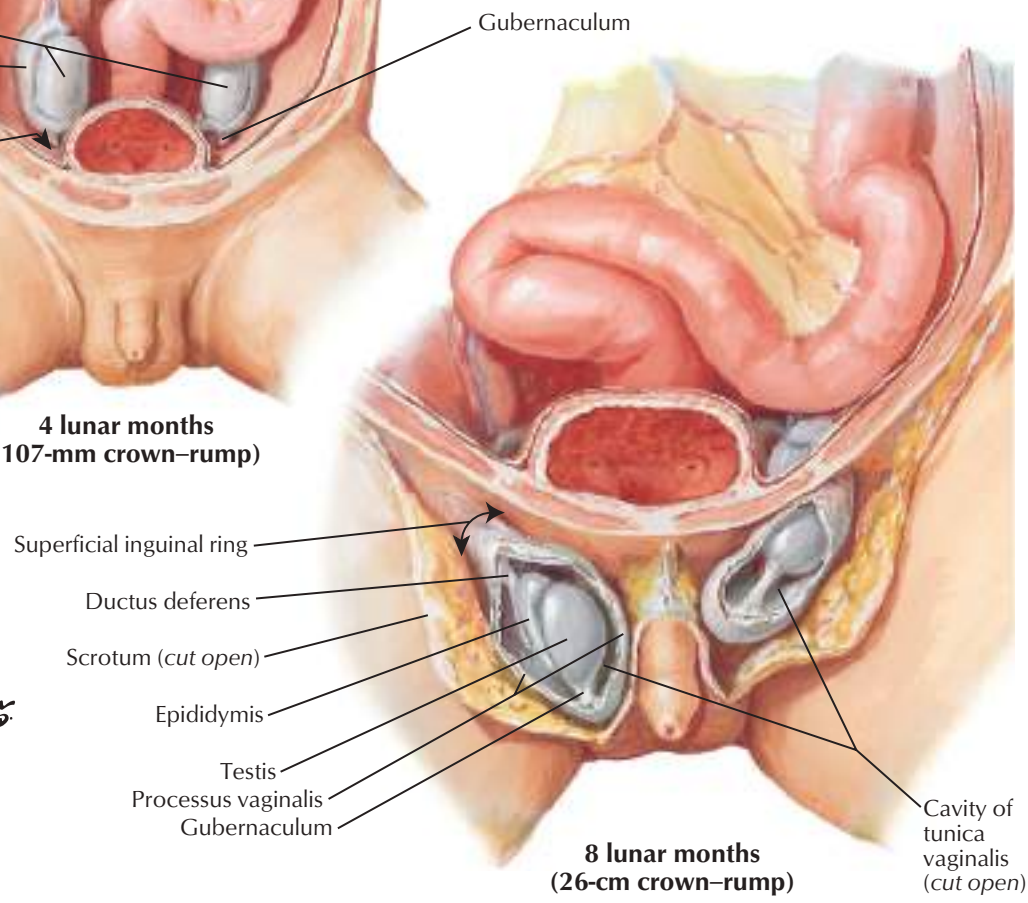
8 weeks
(22.5-mm crown–rump)



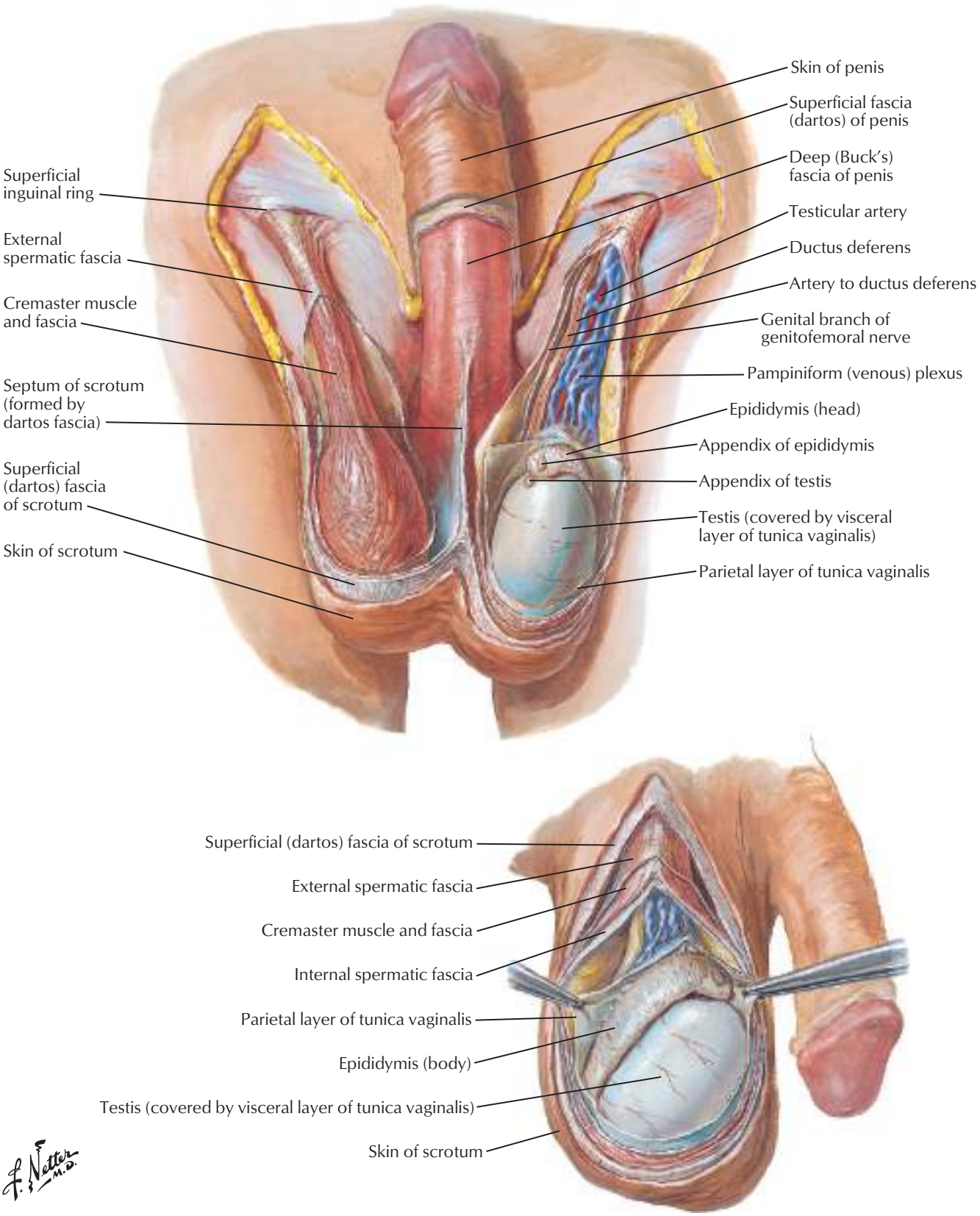
11 weeks
(43-mm crown–rump)



4 lunar months
(107-mm crown–rump)

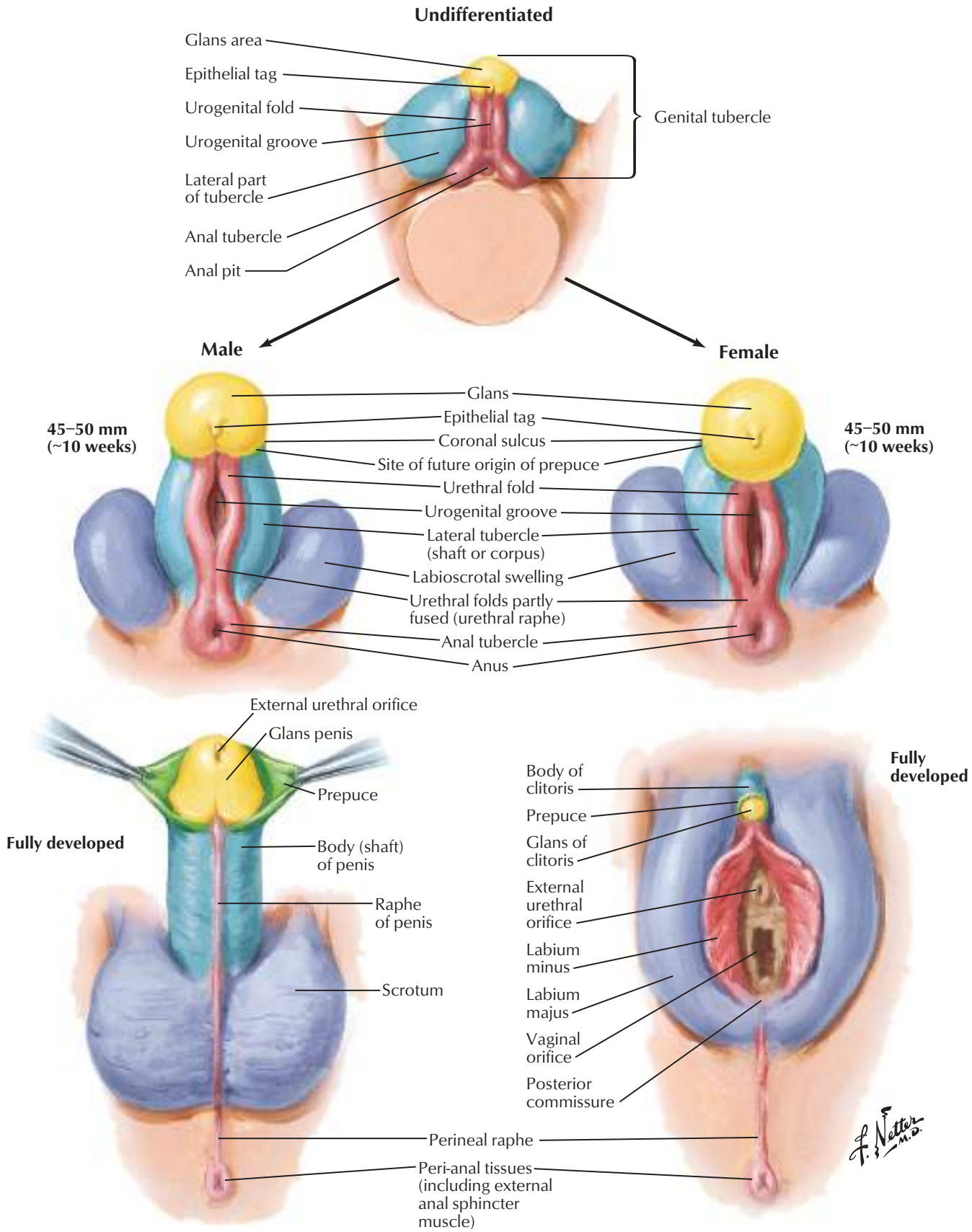


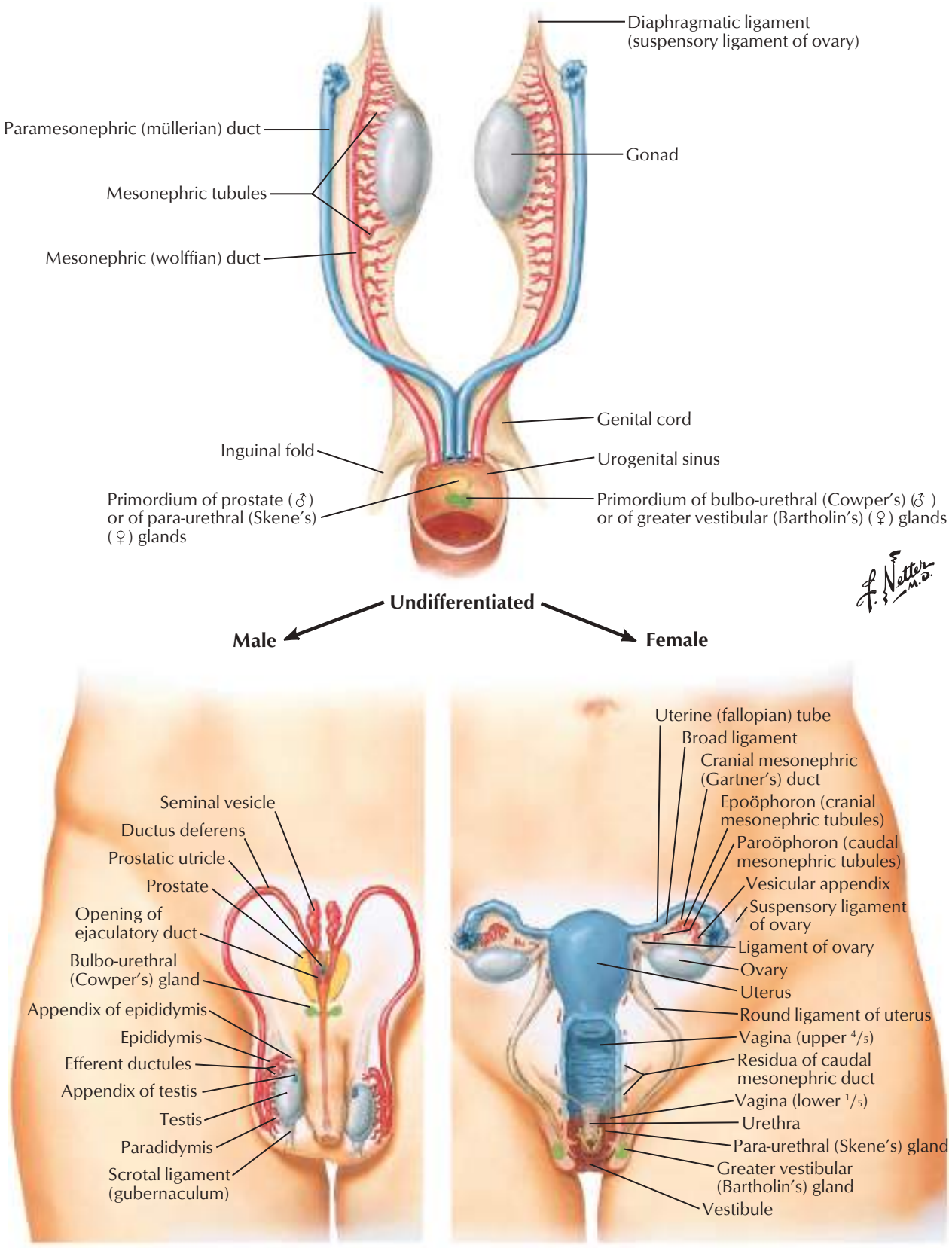
8 lunar months
(26-cm crown–rump)

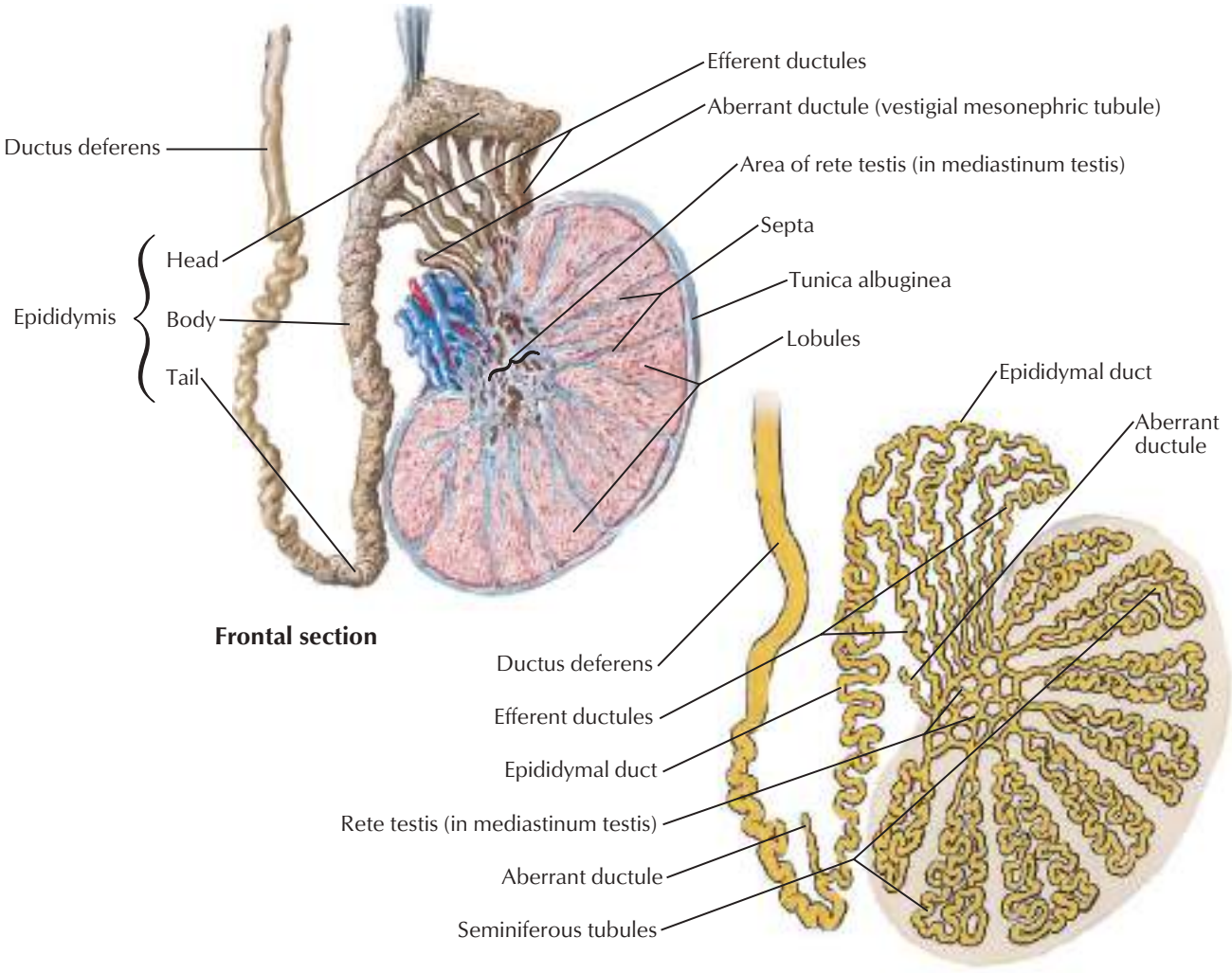

Skin of penis
Superficial fascia (dartos) of penis
Deep (Buck's) fascia of penis
Testicular artery
Ductus deferens
Artery to ductus deferens
Genital branch of genitofemoral nerve
Pampiniform (venous) plexus
Epididymis (head)
Appendix of epididymis
Appendix of testis
Testis (covered by visceral layer of tunica vaginalis)
Parietal layer of tunica vaginalis
Superficial inguinal ring
External spermatic fascia
Cremaster muscle and fascia
Septum of scrotum (formed by dartos fascia)
Superficial (dartos) fascia of scrotum
Skin of scrotum
Superficial (dartos) fascia of scrotum
External spermatic fascia
Cremaster muscle and fascia
Internal spermatic fascia
Parietal layer of tunica vaginalis
Epididymis (body)
Testis (covered by visceral layer of tunica vaginalis)
Skin of scrotum

Homologues of External Genitalia

See also **Plate 354**

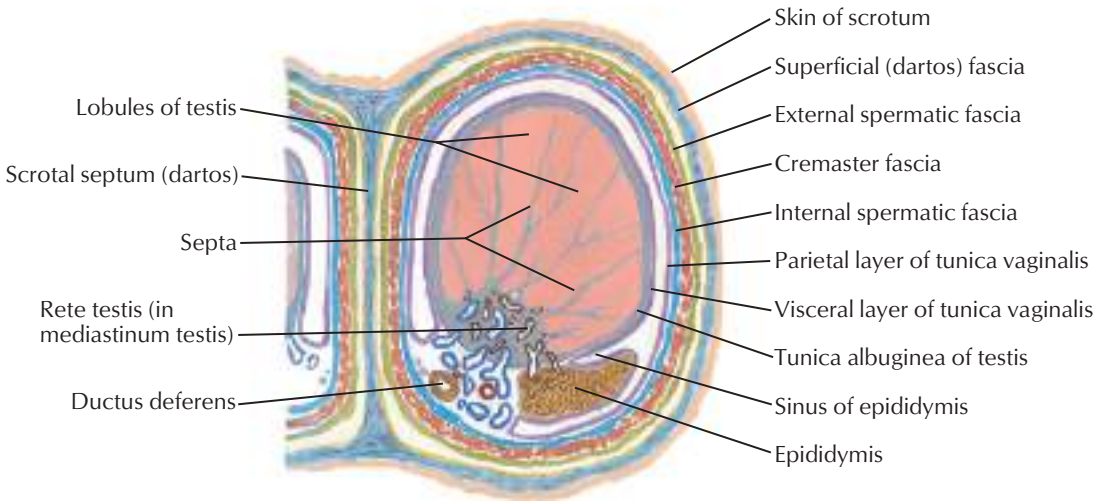



Diaphragmatic ligament
(suspensory ligament of ovary)
Paramesonephric (müllerian) duct
Gonad
Mesonephric tubules
Mesonephric (wolffian) duct
Genital cord
Inguinal fold
Urogenital sinus
Primordium of prostate (♂)
or of para-urethral (Skene's)
(♀) glands
Primordium of bulbo-urethral (Cowper's) (♂)
or of greater vestibular (Bartholin's) (♀) glands
Undifferentiated
Male
Female
Seminal vesicle
Ductus deferens
Prostatic utricle
Prostate
Opening of
ejaculatory duct
Bulbo-urethral
(Cowper's) gland
Appendix of epididymis
Epididymis
Efferent ductules
Appendix of testis
Testis
Paradidymis
Scrotal ligament
(gubernaculum)
Uterine (fallopian) tube
Broad ligament
Cranial mesonephric
(Gartner's) duct
Epoöphoron (cranial
mesonephric tubules)
Paroöphoron (caudal
mesonephric tubules)
Vesicular appendix
Suspensory ligament
of ovary
Ligament of ovary
Ovary
Uterus
Round ligament of uterus
Vagina (upper 4/5)
Residua of caudal
mesonephric duct
Vagina (lower 1/5)
Urethra
Para-urethral (Skene's) gland
Greater vestibular
(Bartholin's) gland
Vestibule

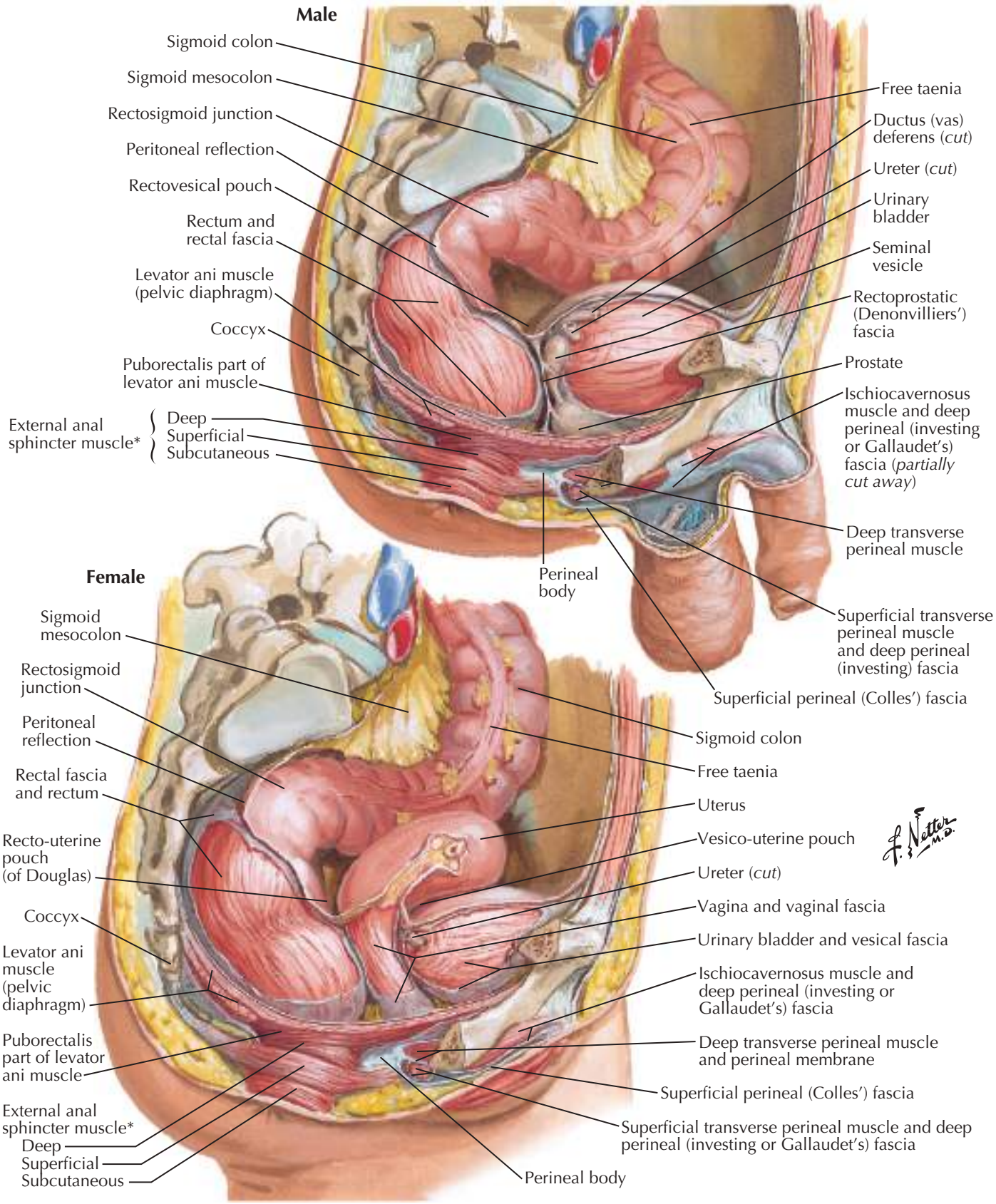


Frontal section

Schema



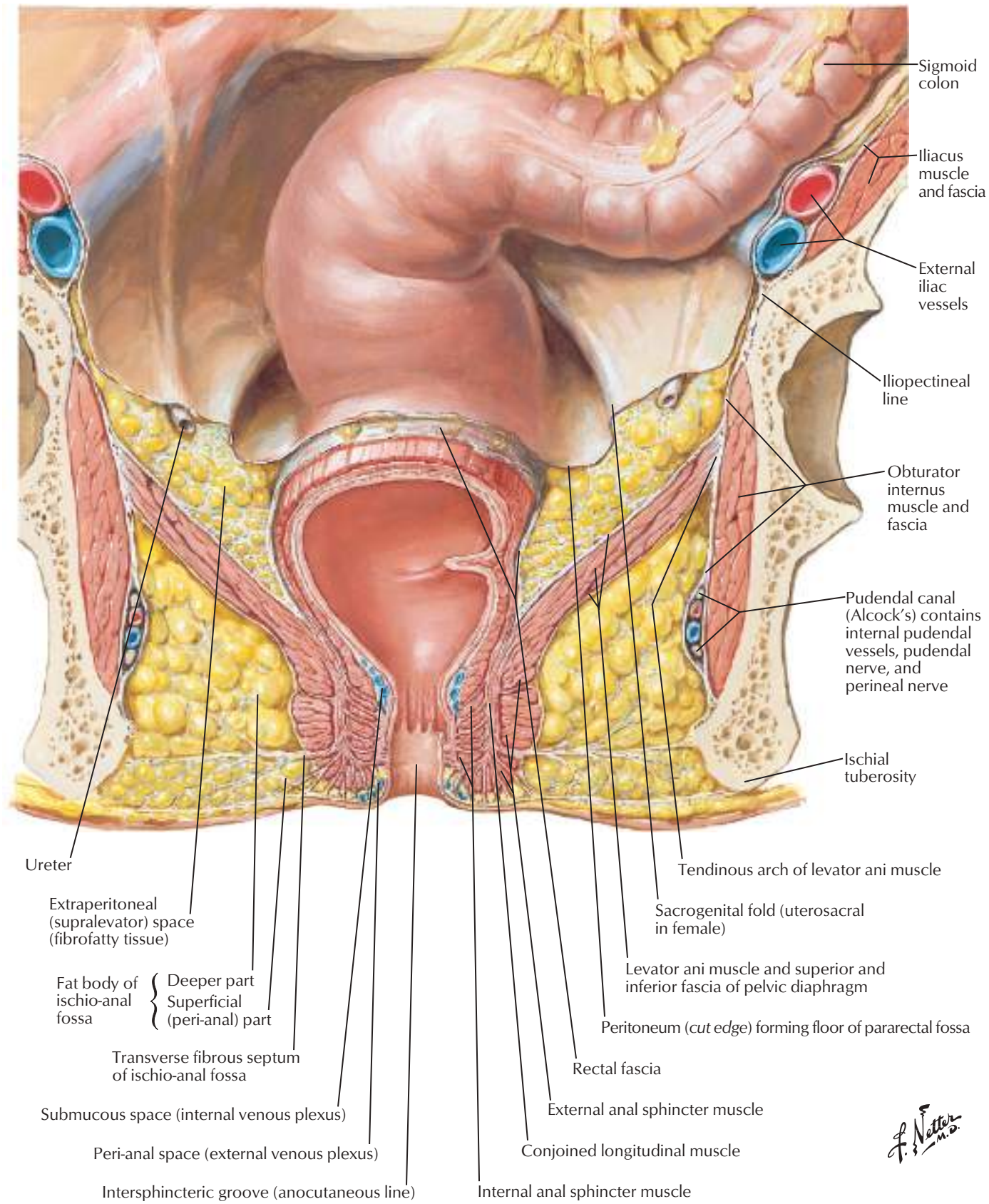
Cross section through scrotum and testis

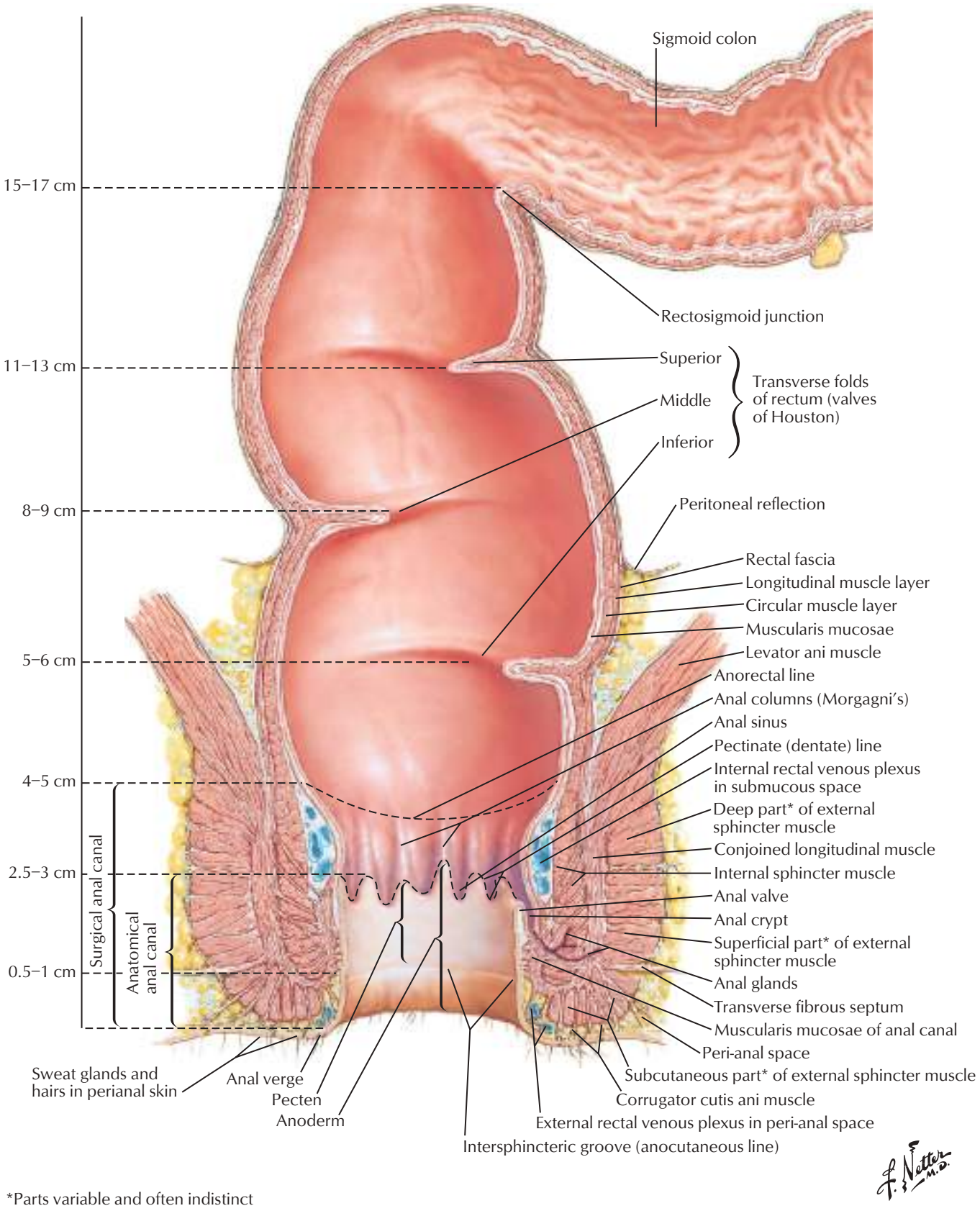


*Parts variable and often indistinct

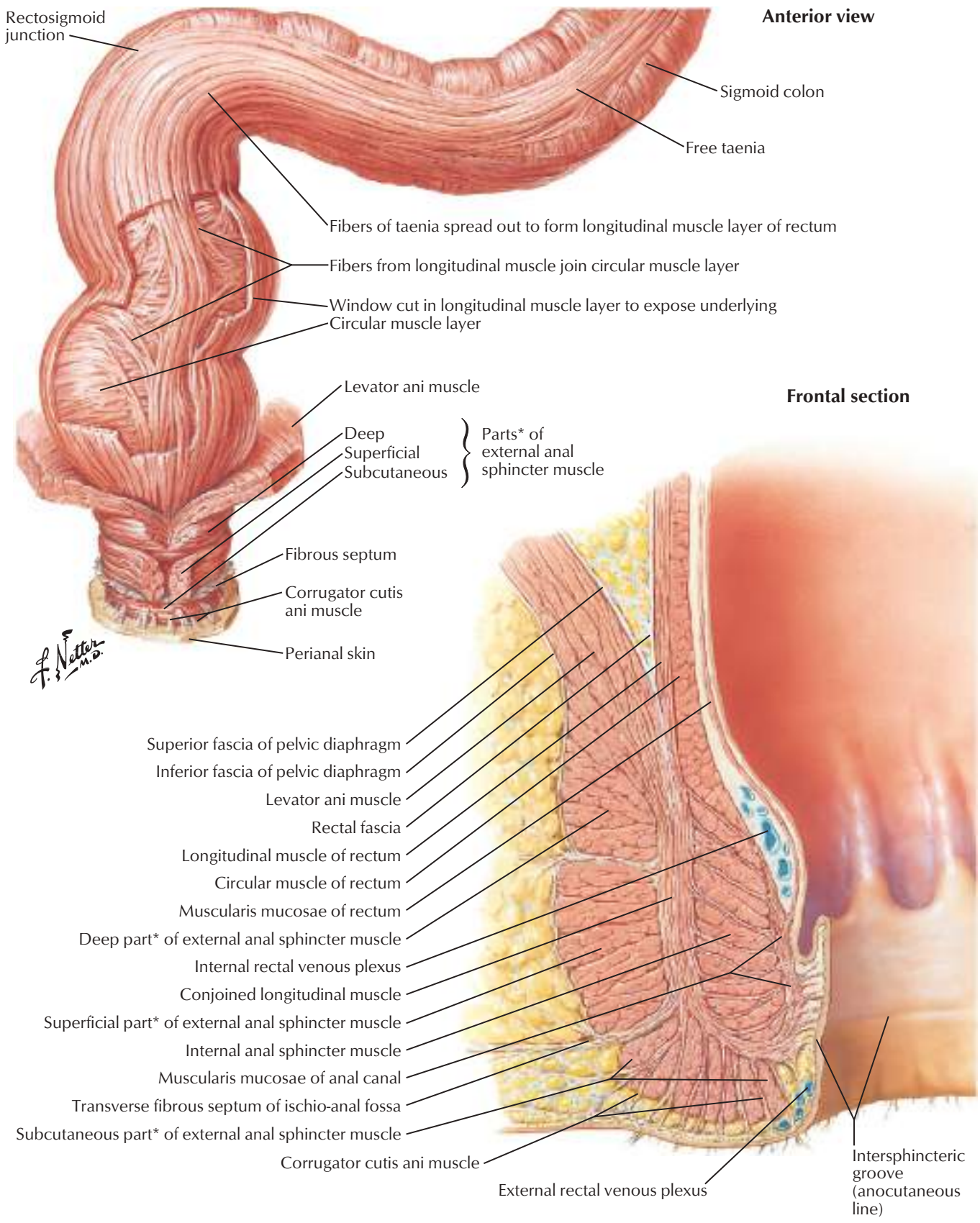
Ischio-anal Fossae

See also **Plates 296, 388**





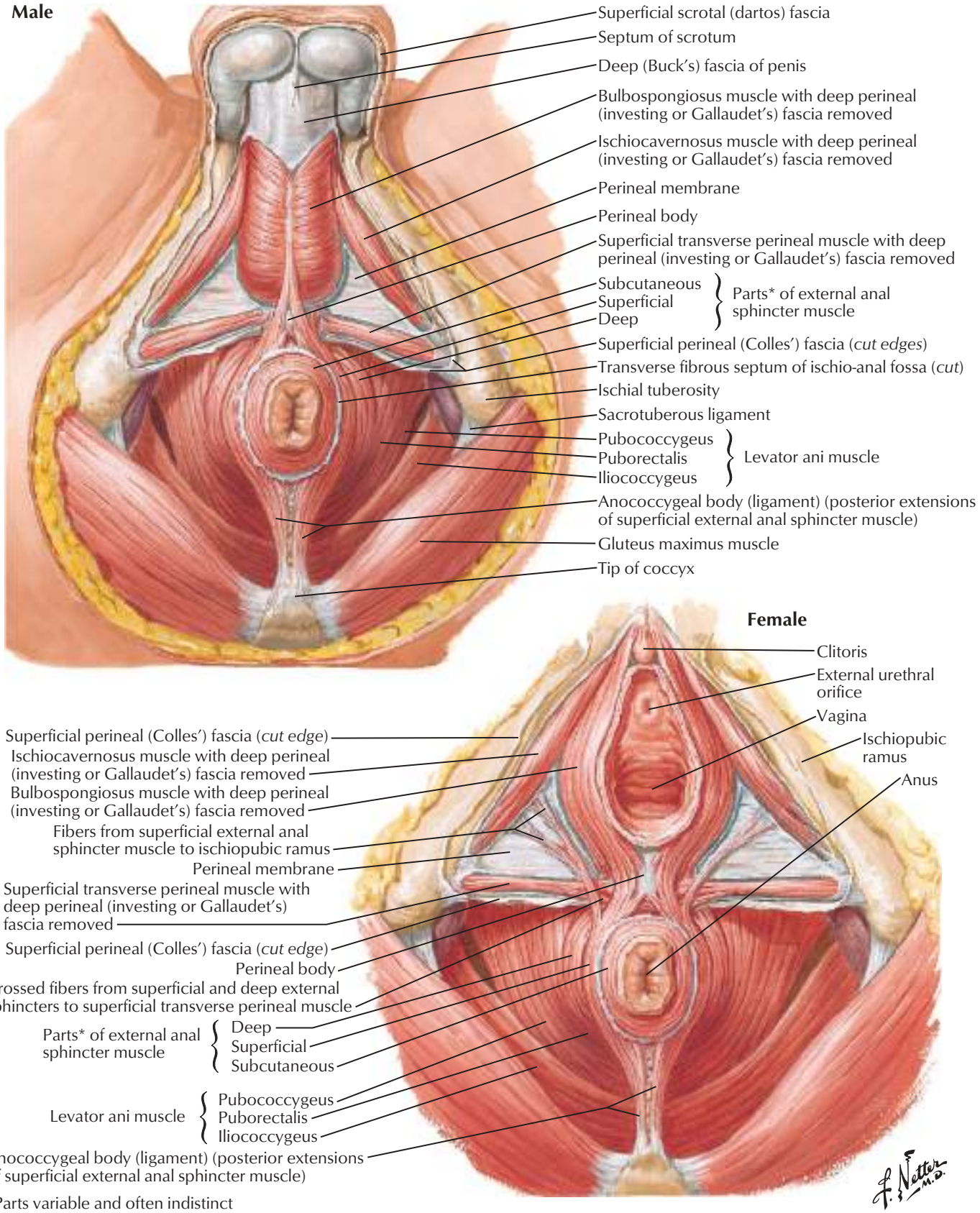
*Parts variable and often indistinct

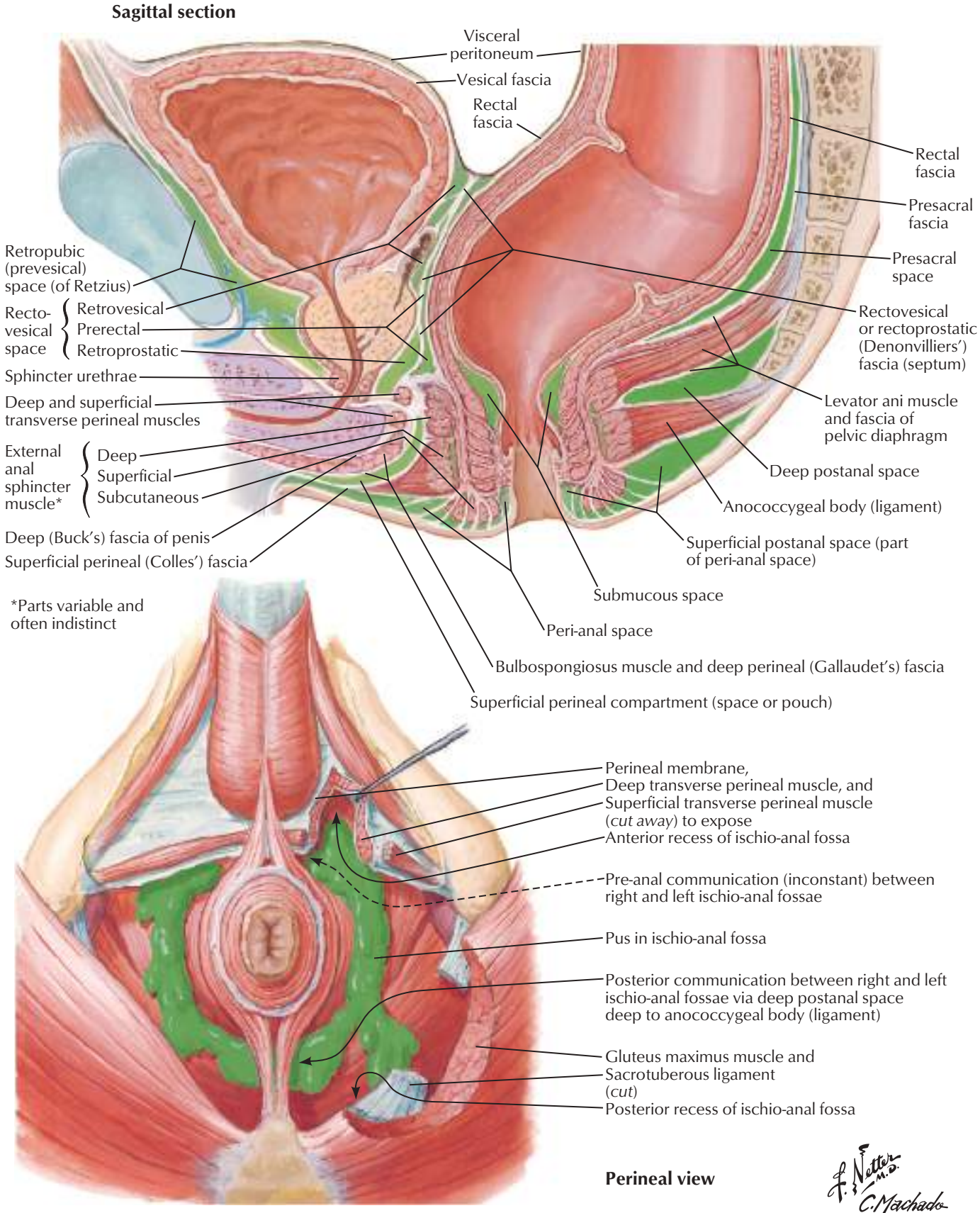


*Parts variable and often indistinct

External Anal Sphincter Muscle: Perineal Views

See also Plates 356, 359





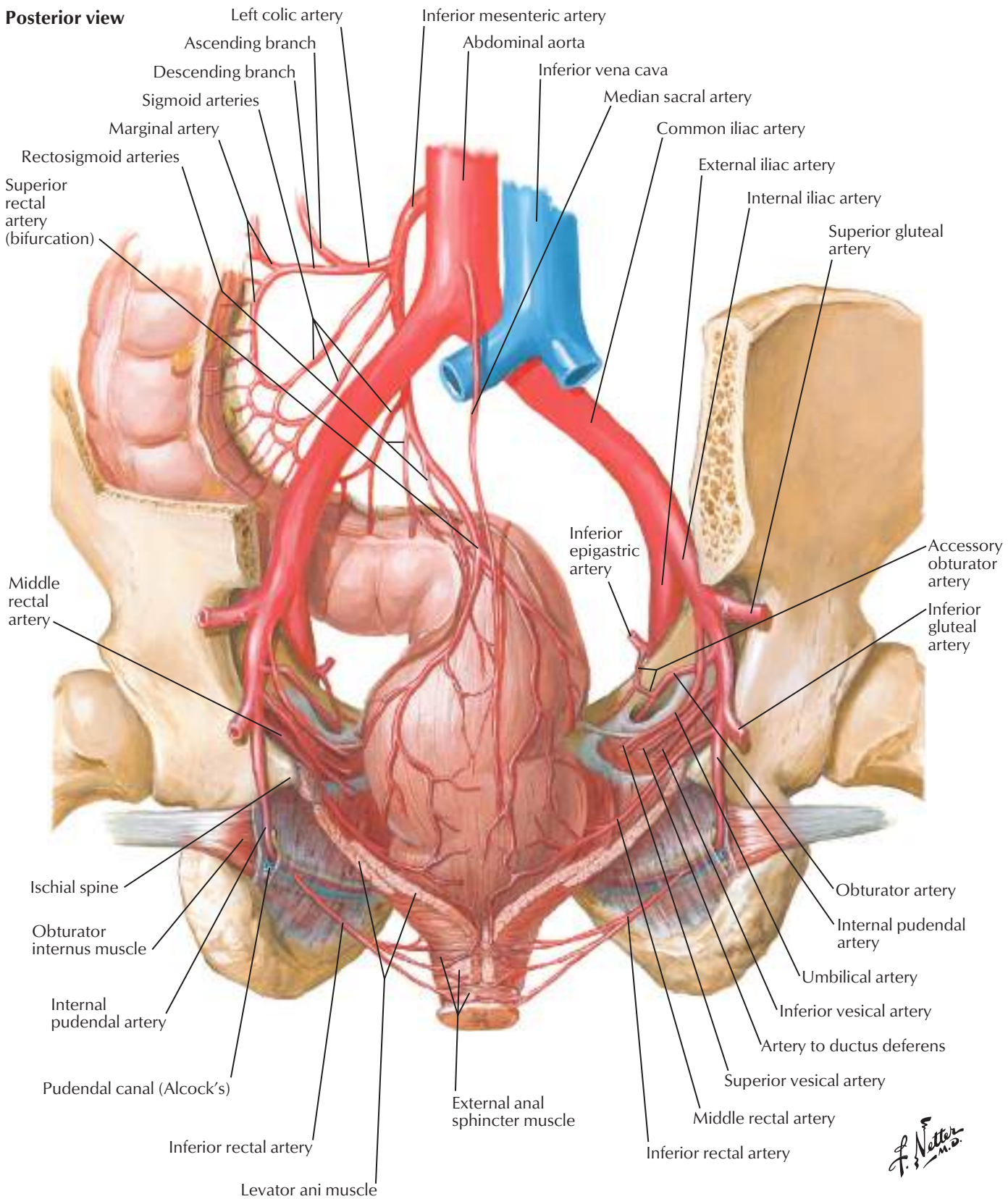
Spread of perineal abscess in perineal spaces

Female

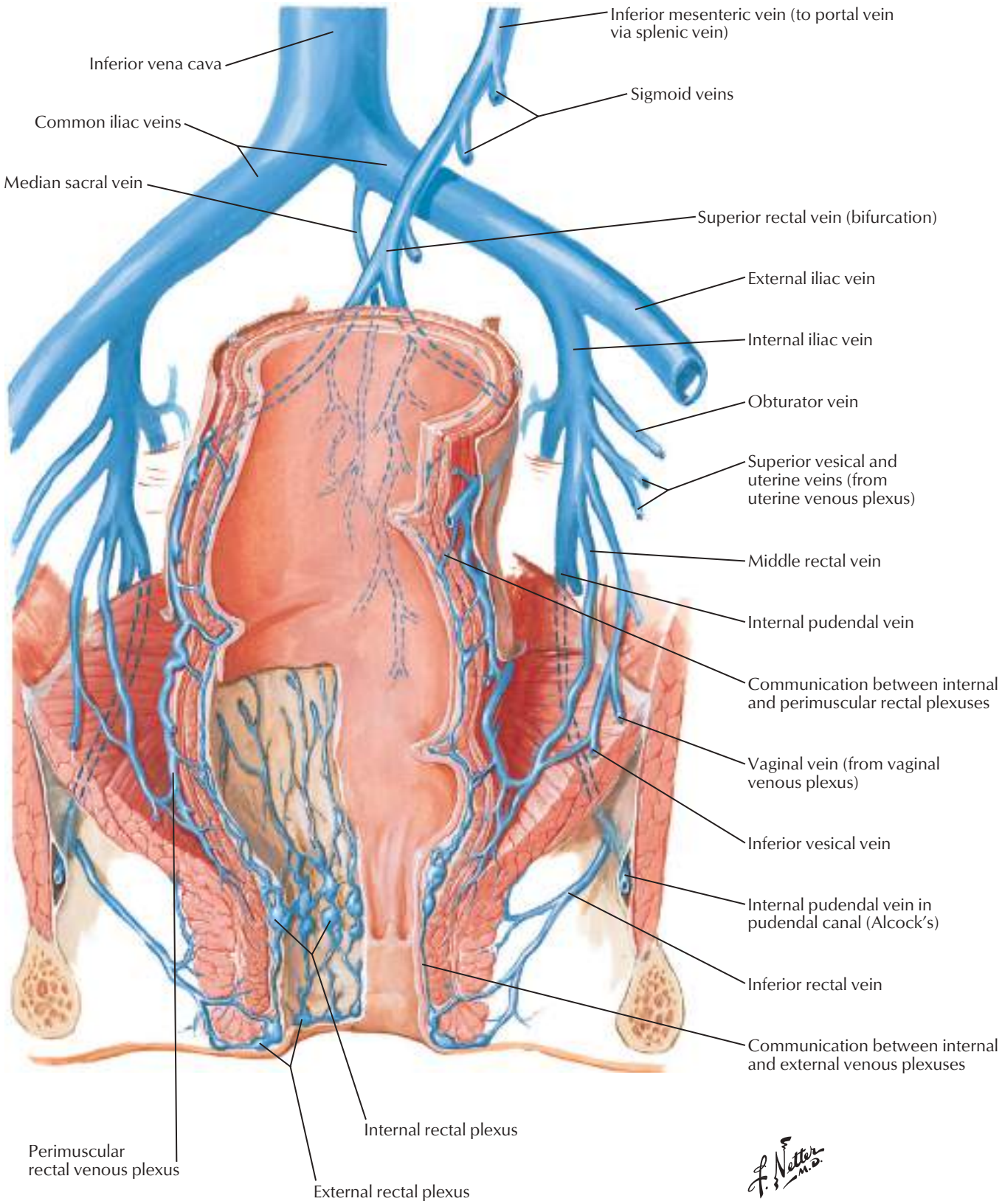
Umbilicus
Rectus abdominis muscle
Fundus of uterus
Urinary bladder
Pubic bone
L5 vertebra
Sacrum
Rectum
Vagina

Male

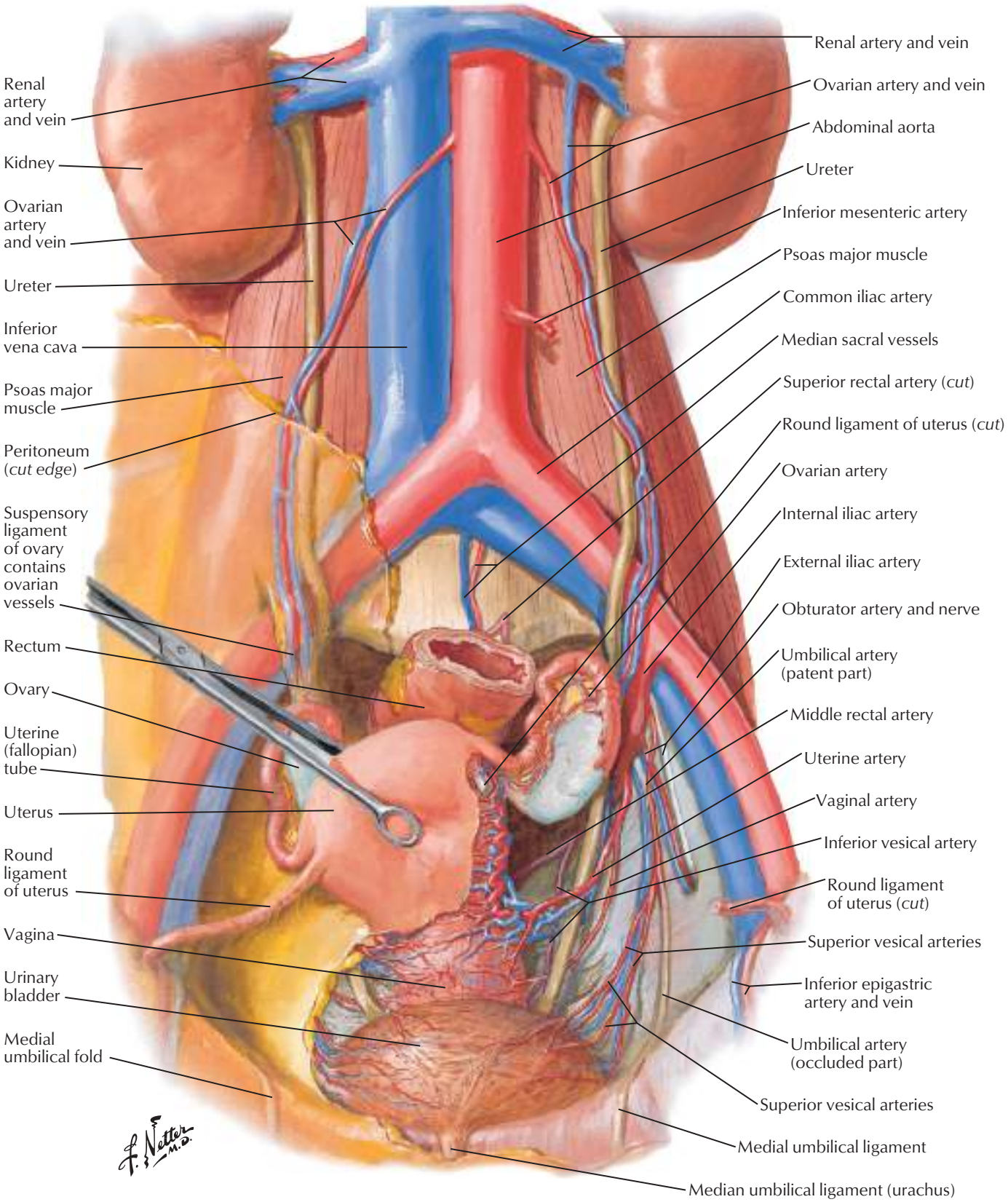
Liver
Rectus abdominis muscle
Pubic bone
Penis
Scrotum
Urinary bladder
Rectum

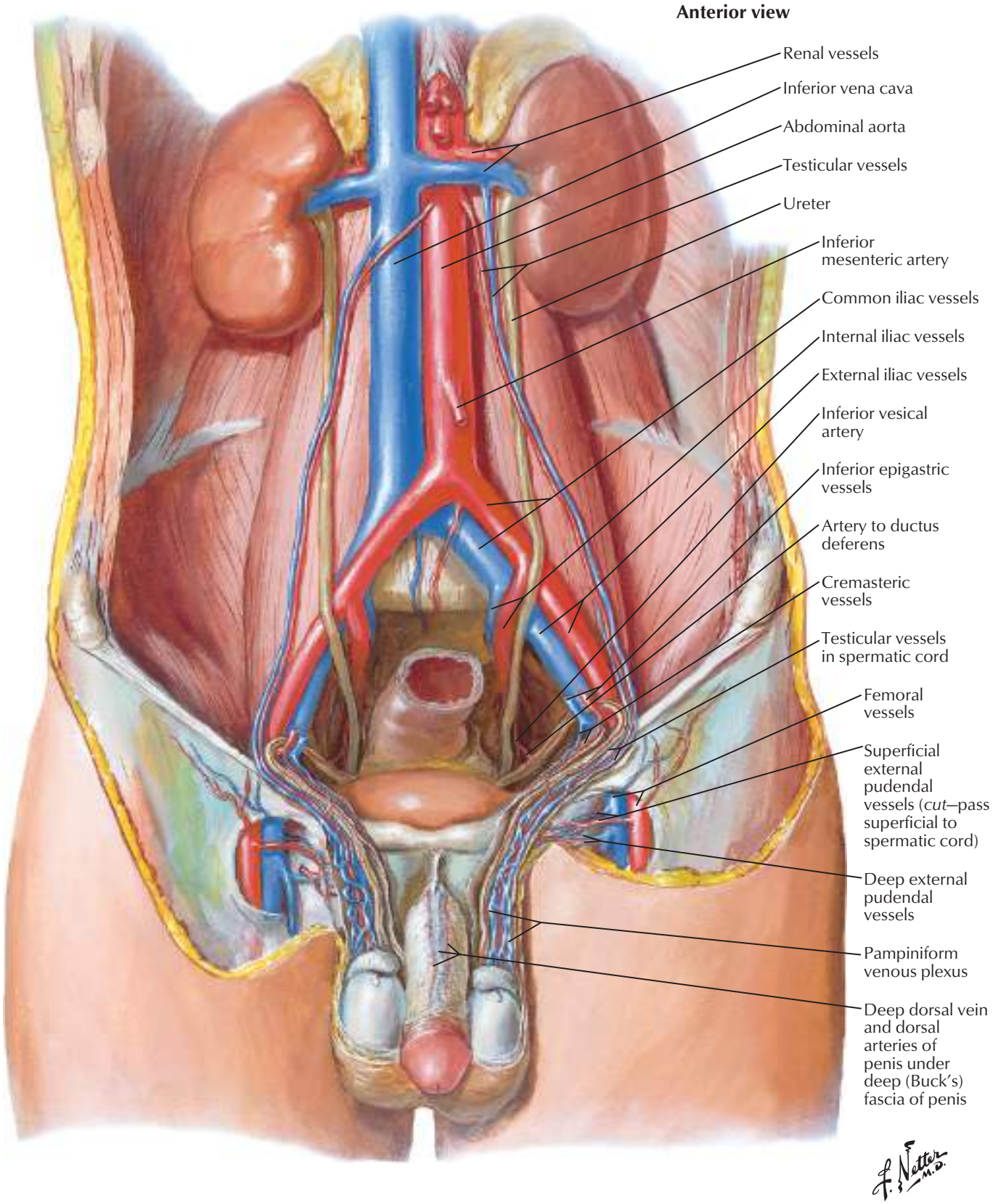

Posterior view
Left colic artery
Inferior mesenteric artery
Ascending branch
Abdominal aorta
Descending branch
Inferior vena cava
Sigmoid arteries
Median sacral artery
Marginal artery
Common iliac artery
Rectosigmoid arteries
External iliac artery
Superior rectal artery (bifurcation)
Internal iliac artery
Superior gluteal artery
Inferior epigastric artery
Accessory obturator artery
Middle rectal artery
Inferior gluteal artery
Ischial spine
Obturator artery
Obturator internus muscle
Internal pudendal artery
Umbilical artery
Internal pudendal artery
Inferior vesical artery
Artery to ductus deferens
Pudendal canal (Alcock's)
Superior vesical artery
External anal sphincter muscle
Middle rectal artery
Inferior rectal artery
Inferior rectal artery
Levator ani muscle

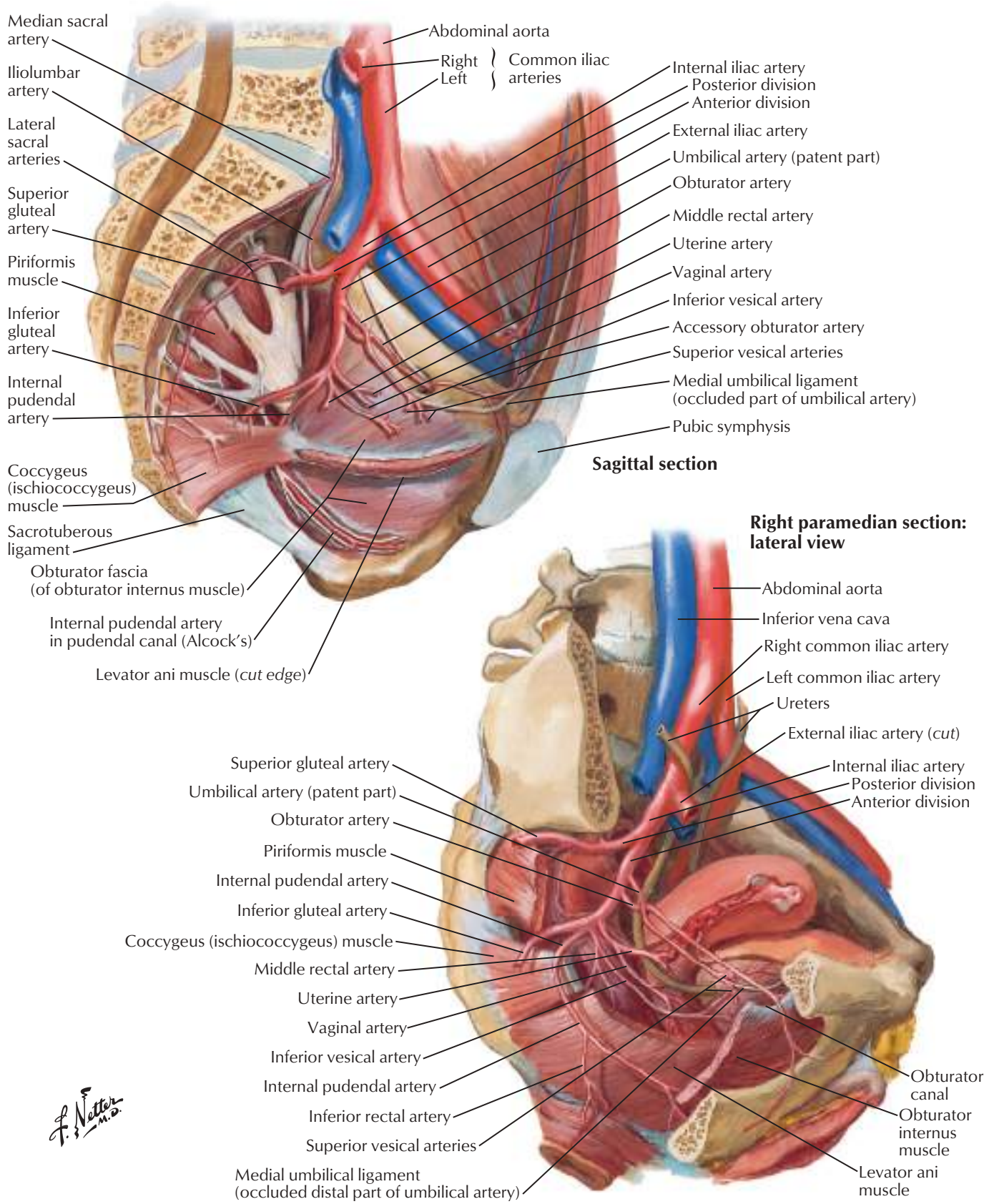
Anterior view



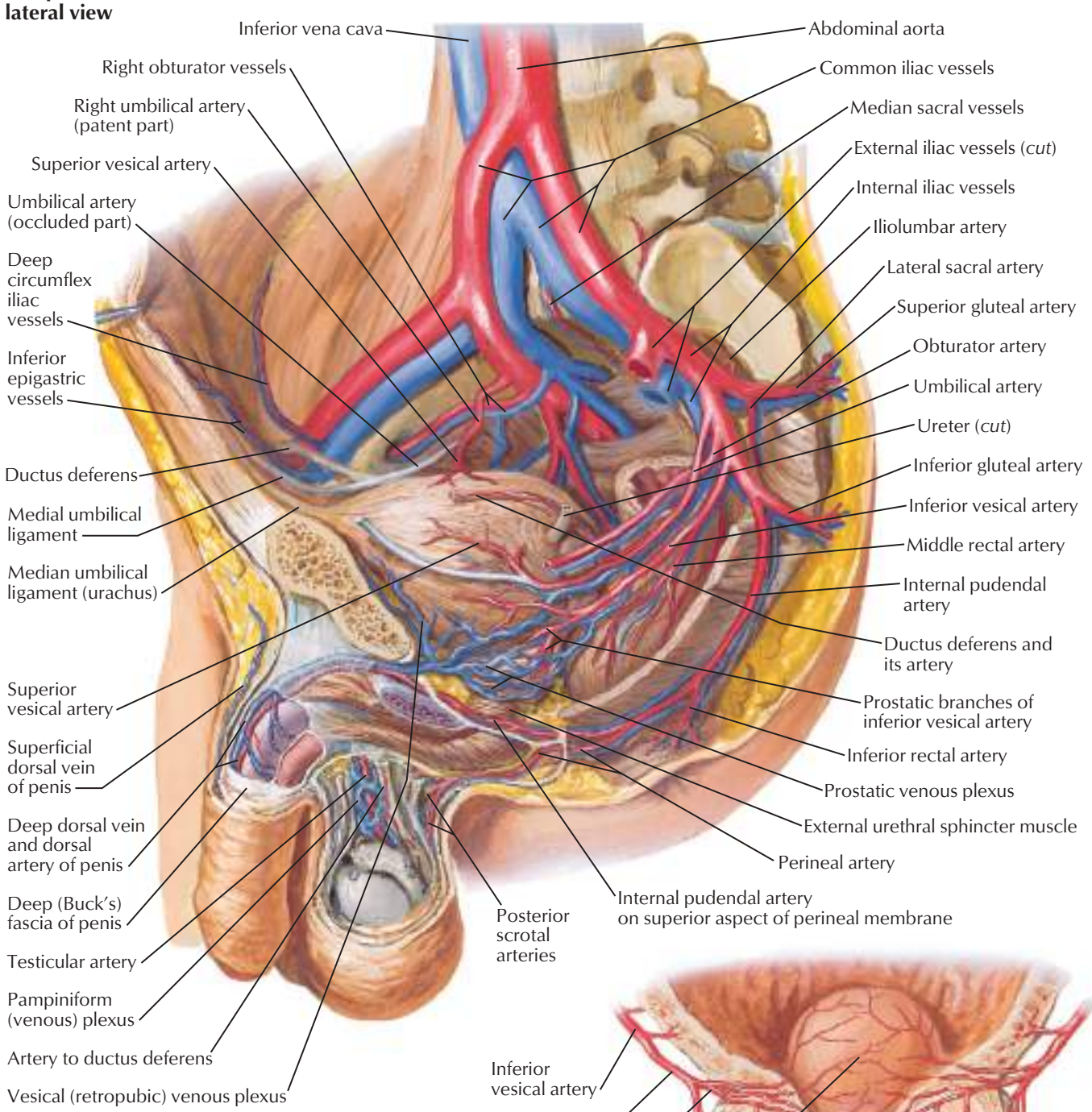
Anterior view

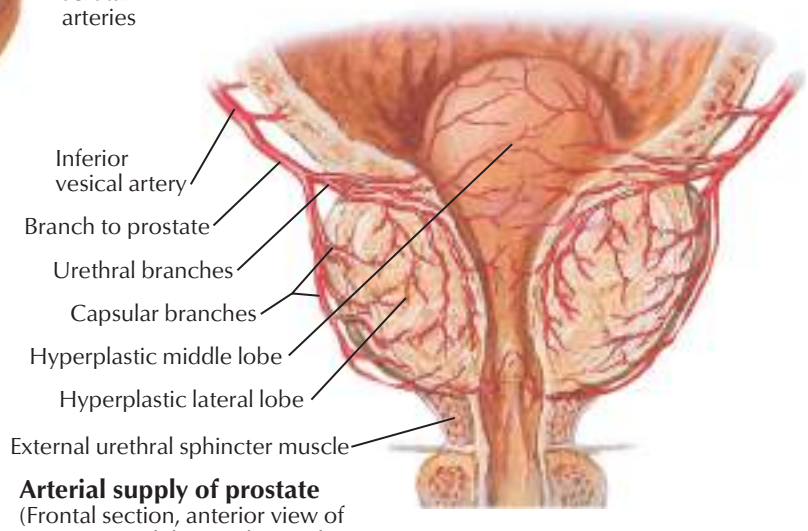



Anterior view
Renal vessels
Inferior vena cava
Abdominal aorta
Testicular vessels
Ureter
Inferior mesenteric artery
Common iliac vessels
Internal iliac vessels
External iliac vessels
Inferior vesical artery
Inferior epigastric vessels
Artery to ductus deferens
Cremasteric vessels
Testicular vessels in spermatic cord
Femoral vessels
Superficial external pudendal vessels (*cut*—pass superficial to spermatic cord)
Deep external pudendal vessels
Pampiniform venous plexus
Deep dorsal vein and dorsal arteries of penis under deep (Buck's) fascia of penis
F. Netter M.D.

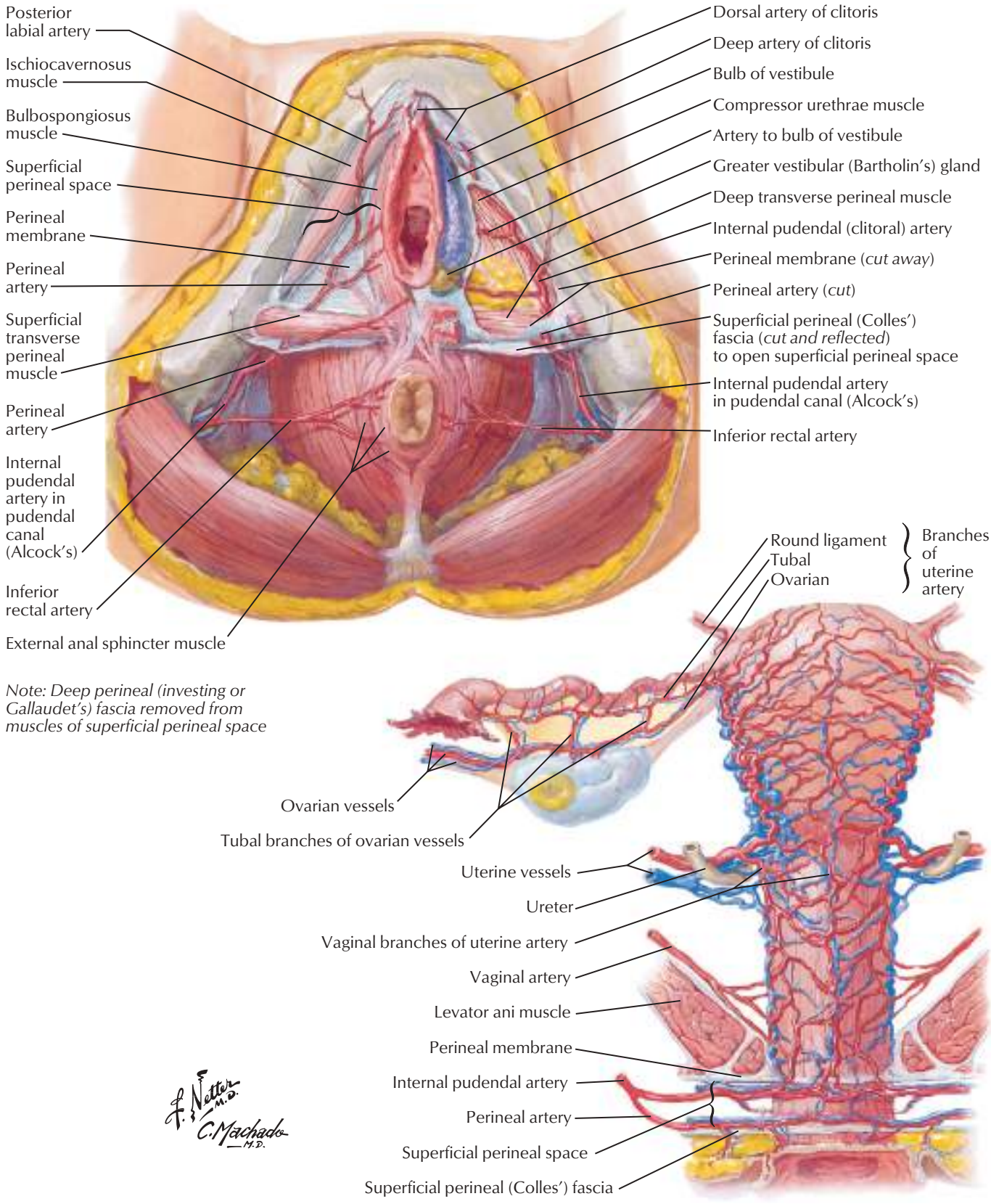

Median sacral artery
Iliolumbar artery
Lateral sacral arteries
Superior gluteal artery
Piriformis muscle
Inferior gluteal artery
Internal pudendal artery
Coccygeus (ischiococcygeus) muscle
Sacrotuberous ligament
Obturator fascia (of obturator internus muscle)
Internal pudendal artery in pudendal canal (Alcock's)
Levator ani muscle (cut edge)
Abdominal aorta
Right
Left
Common iliac arteries
Internal iliac artery
Posterior division
Anterior division
External iliac artery
Umbilical artery (patent part)
Obturator artery
Middle rectal artery
Uterine artery
Vaginal artery
Inferior vesical artery
Accessory obturator artery
Superior vesical arteries
Medial umbilical ligament (occluded part of umbilical artery)
Pubic symphysis
Sagittal section
Right paramedian section: lateral view
Abdominal aorta
Inferior vena cava
Right common iliac artery
Left common iliac artery
Ureters
External iliac artery (cut)
Internal iliac artery
Posterior division
Anterior division
Superior gluteal artery
Umbilical artery (patent part)
Obturator artery
Piriformis muscle
Internal pudendal artery
Inferior gluteal artery
Coccygeus (ischiococcygeus) muscle
Middle rectal artery
Uterine artery
Vaginal artery
Inferior vesical artery
Internal pudendal artery
Inferior rectal artery
Superior vesical arteries
Medial umbilical ligament (occluded distal part of umbilical artery)
Obturator canal
Obturator internus muscle
Levator ani muscle

Left paramedian section: lateral view

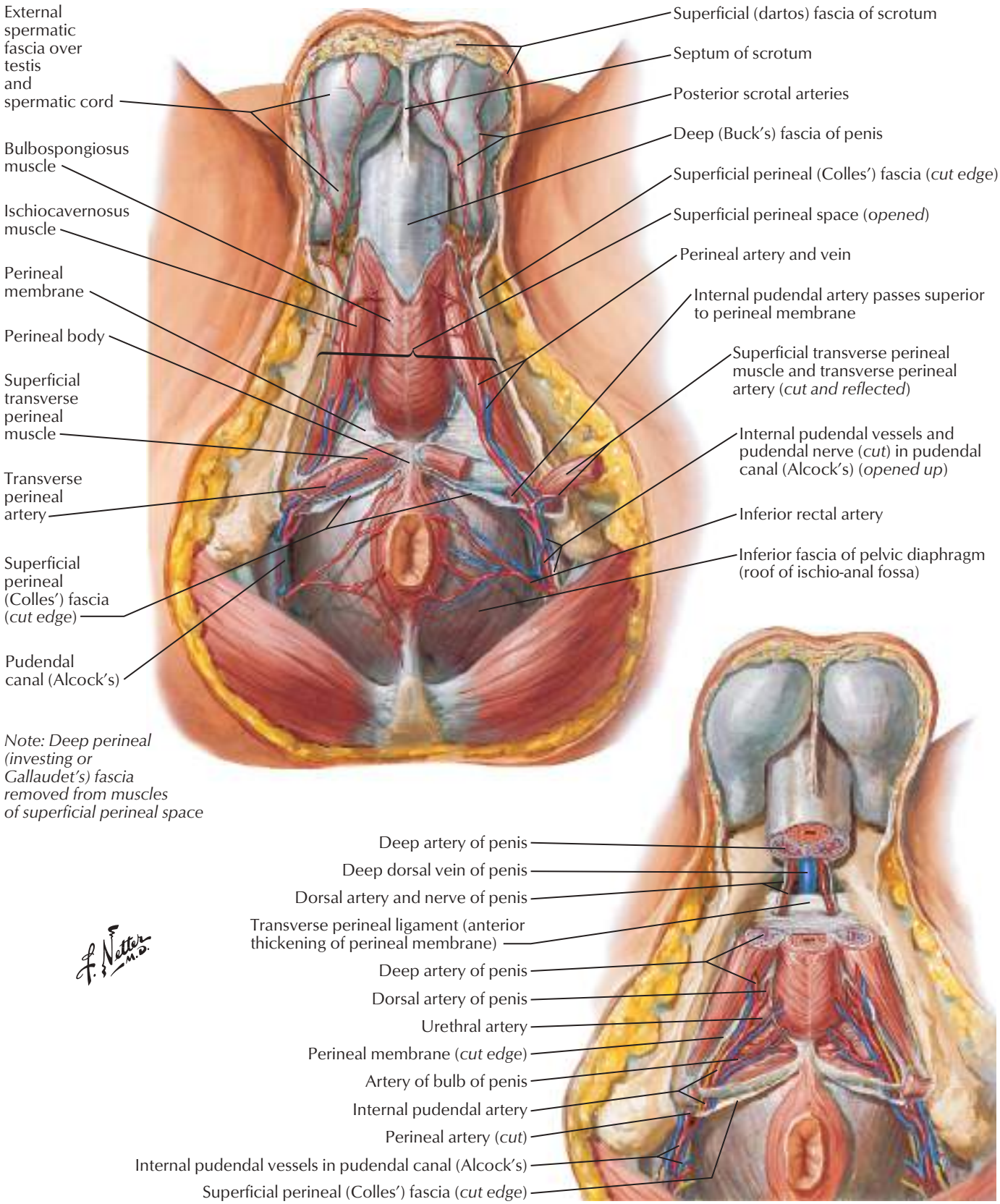




Arterial supply of prostate
(Frontal section, anterior view of specimen with benign hyperplasia)

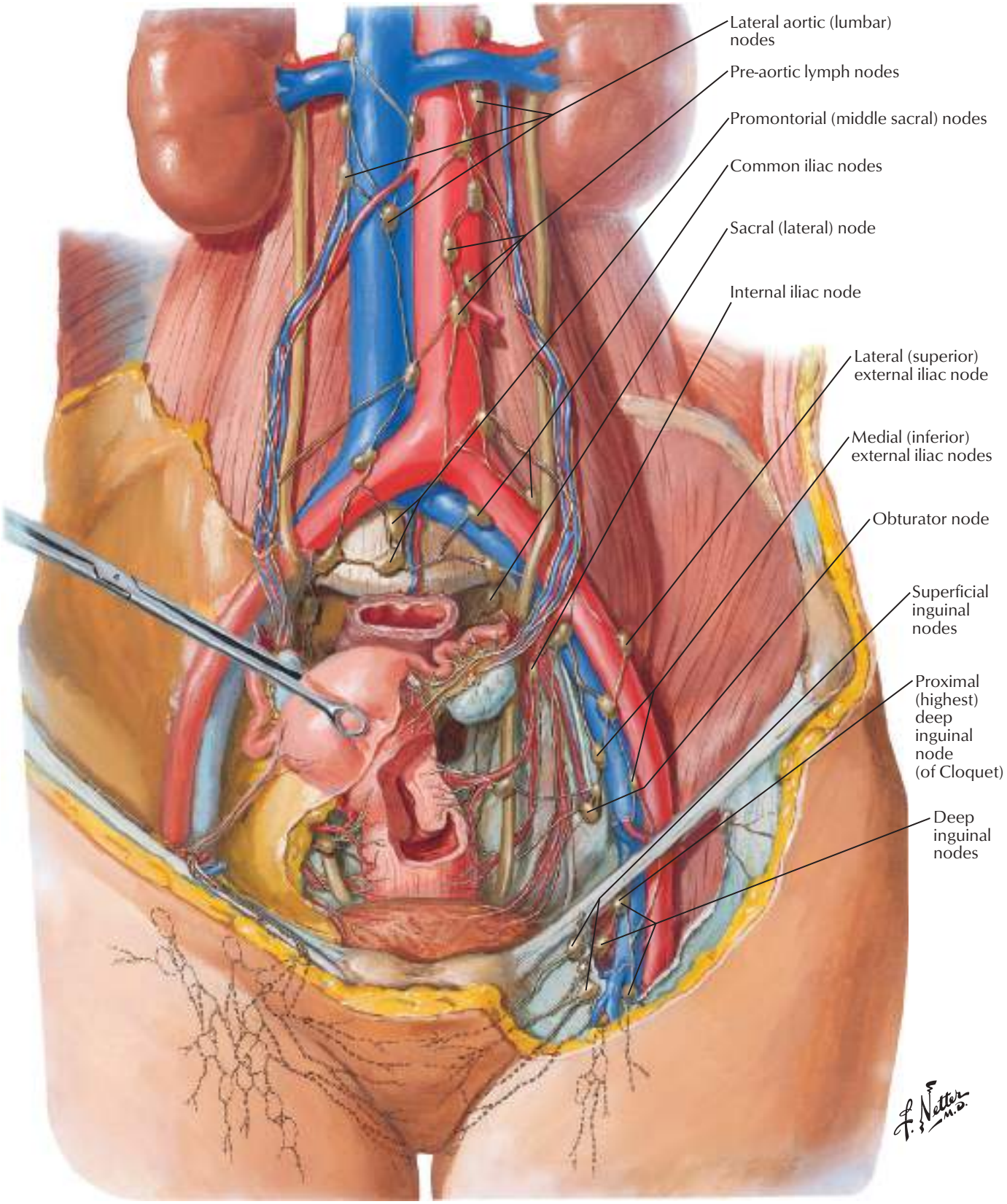


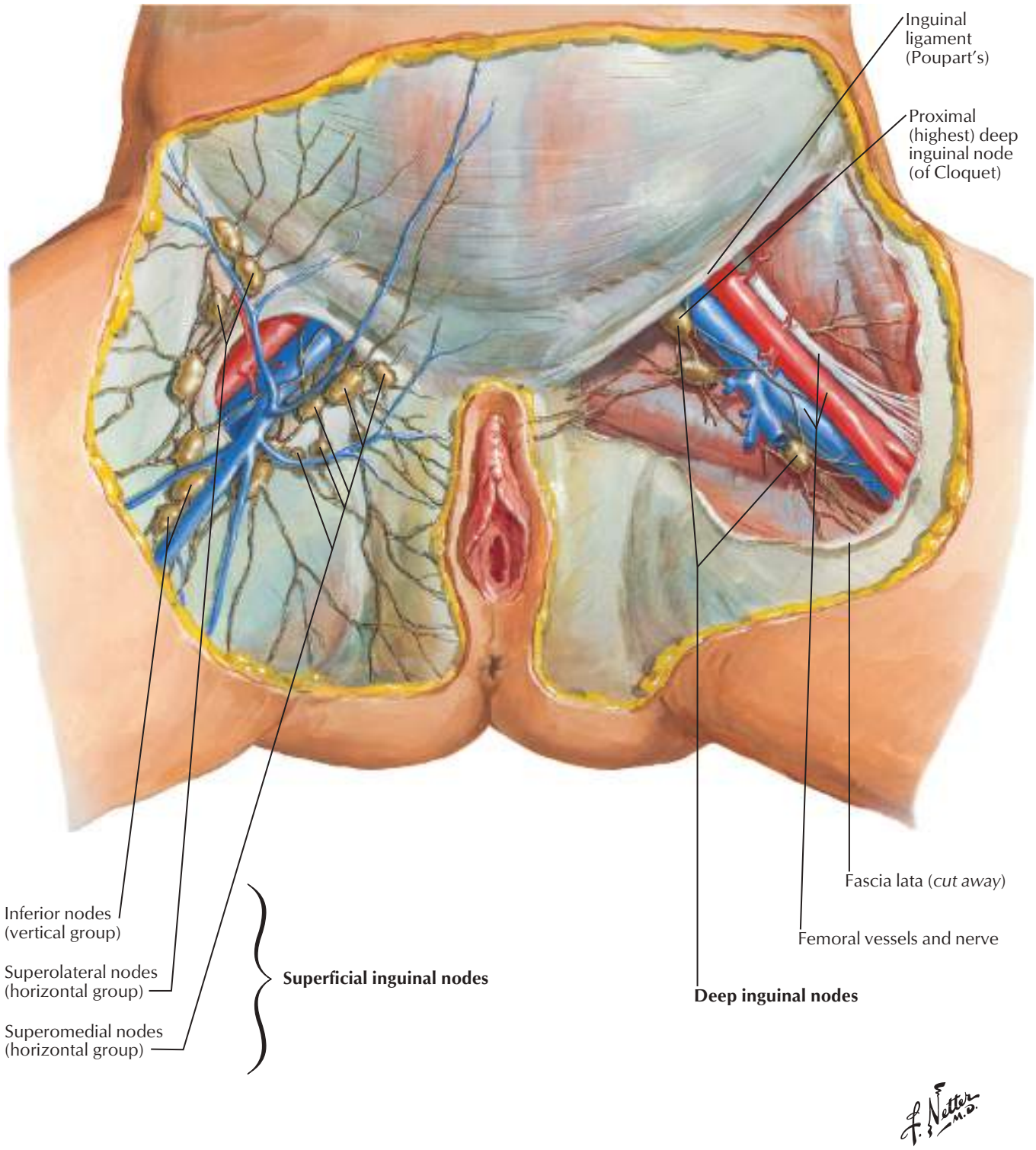
Note: Deep perineal (investing or Gallaudet's) fascia removed from muscles of superficial perineal space

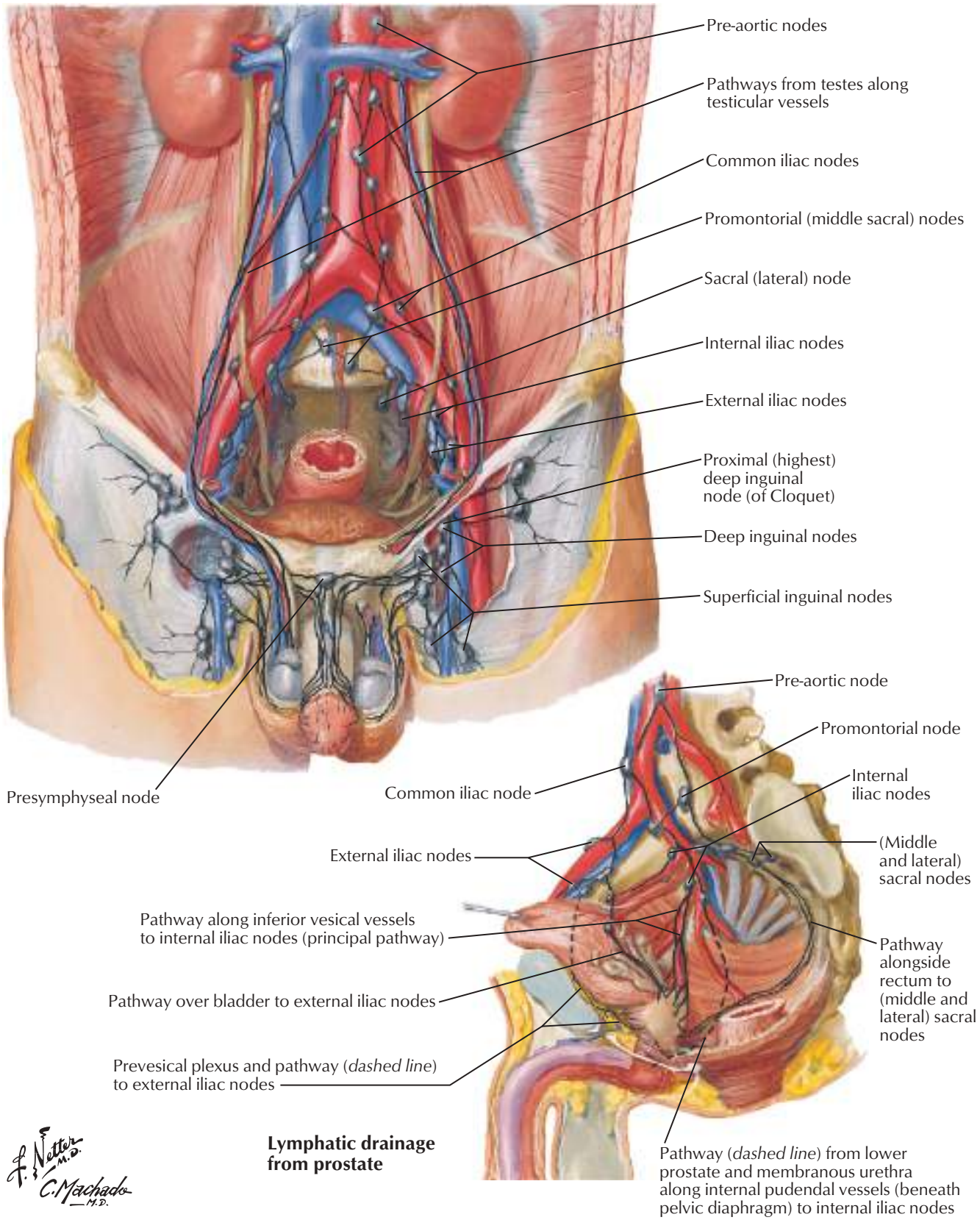


Note: Deep perineal (investing or Gallaudet's) fascia removed from muscles of superficial perineal space

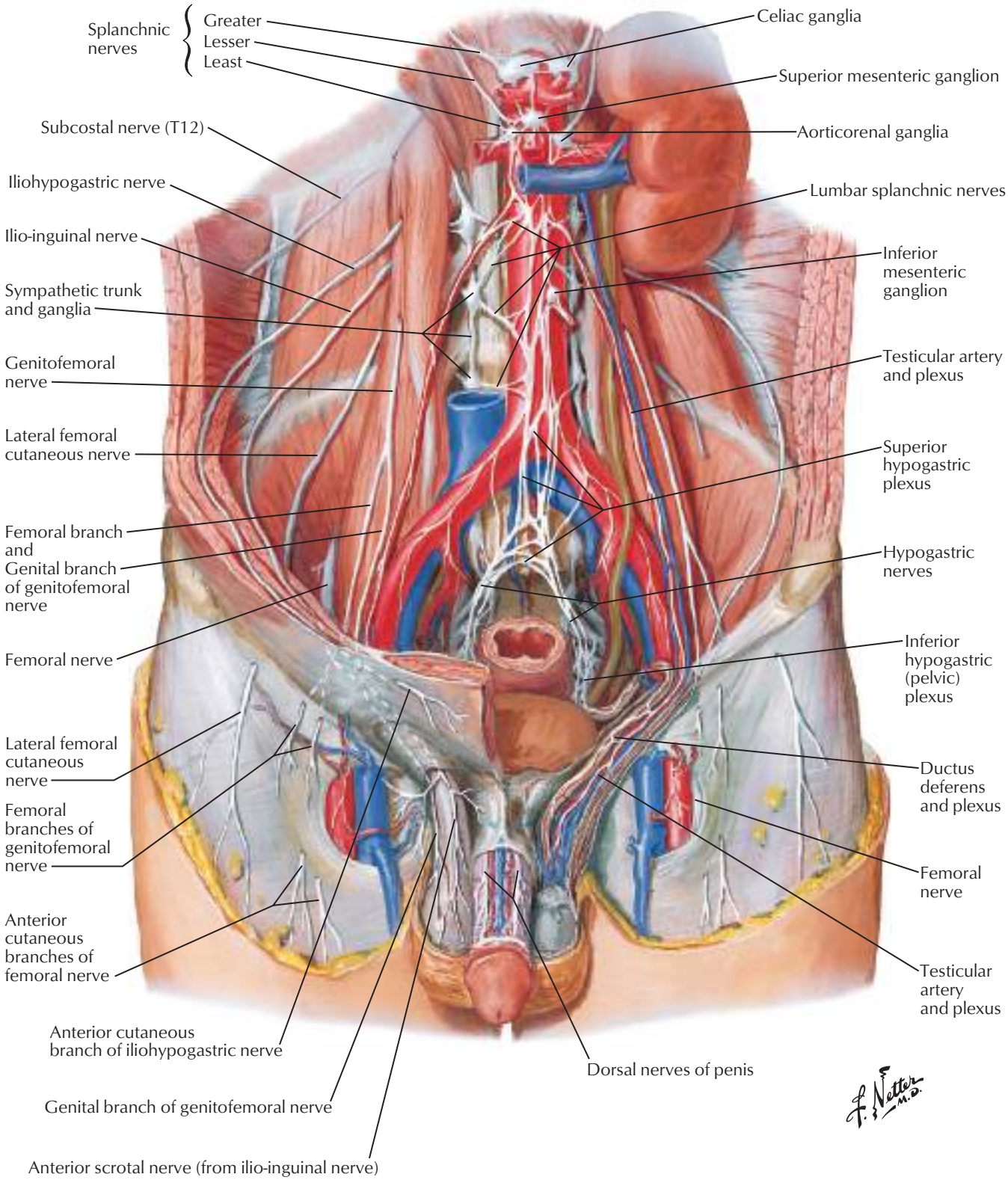
Lymph Vessels and Nodes of Pelvis and Genitalia: Female




Inguinal ligament (Poupart's)
Proximal (highest) deep inguinal node (of Cloquet)
Fascia lata (*cut away*)
Femoral vessels and nerve
Inferior nodes (vertical group)
Superolateral nodes (horizontal group)
Superomedial nodes (horizontal group)
Superficial inguinal nodes
Deep inguinal nodes

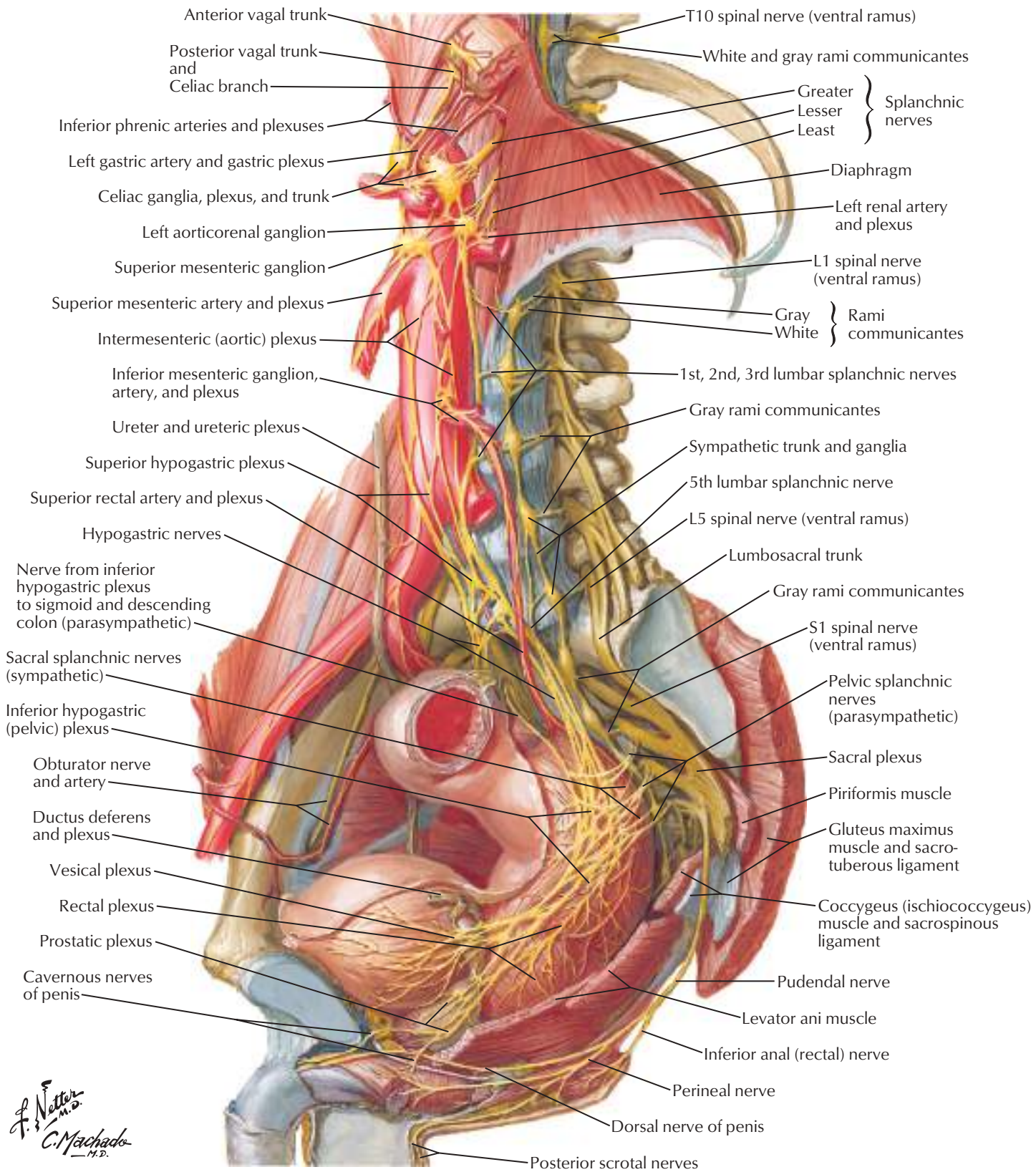


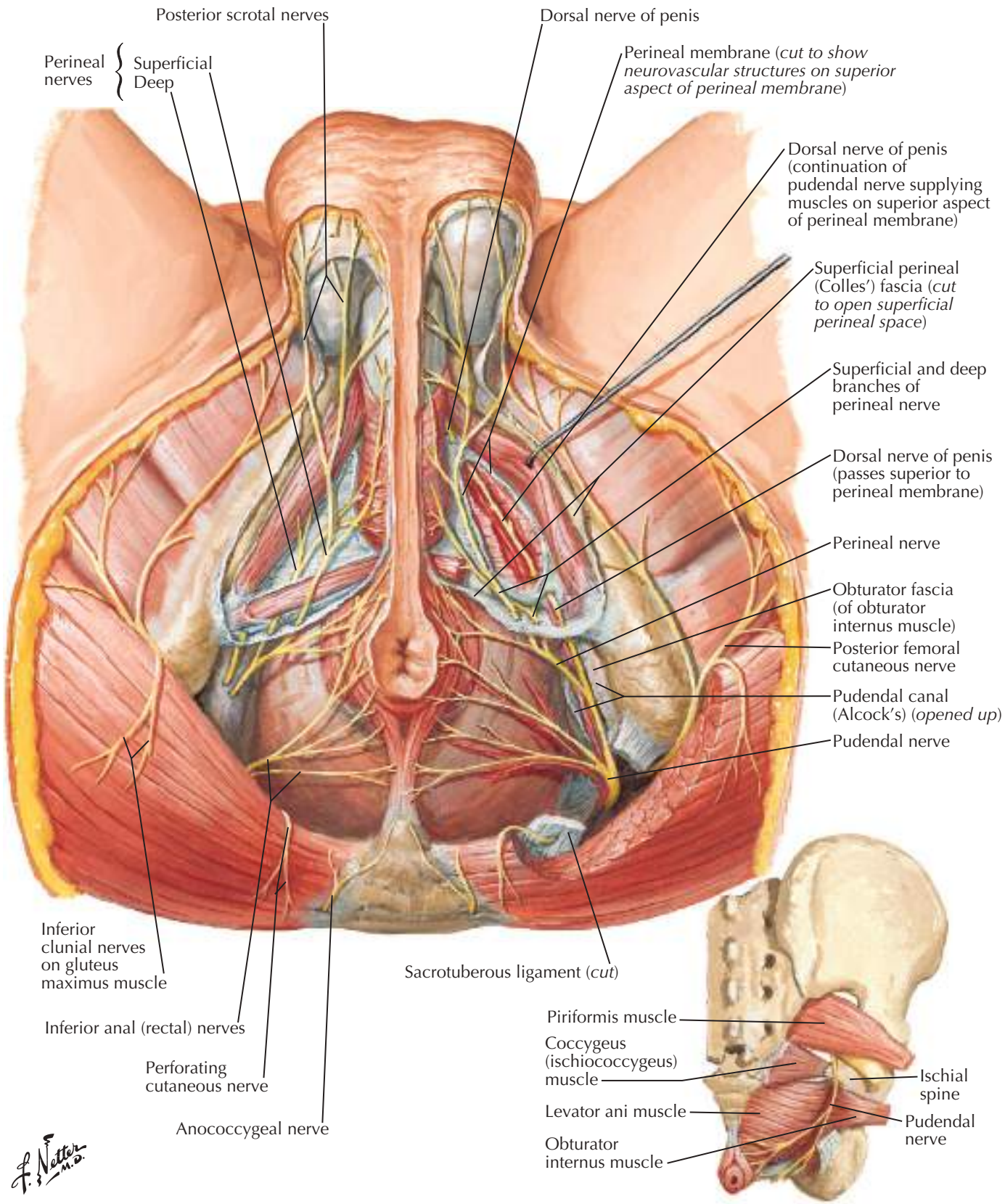
Lymphatic drainage from prostate


Splanchnic nerves
Greater
Lesser
Least
Celiac ganglia
Superior mesenteric ganglion
Subcostal nerve (T12)
Aorticorenal ganglia
Iliohypogastric nerve
Lumbar splanchnic nerves
Ilio-inguinal nerve
Inferior mesenteric ganglion
Sympathetic trunk and ganglia
Genitofemoral nerve
Testicular artery and plexus
Lateral femoral cutaneous nerve
Superior hypogastric plexus
Femoral branch and Genital branch of genitofemoral nerve
Hypogastric nerves
Femoral nerve
Inferior hypogastric (pelvic) plexus
Lateral femoral cutaneous nerve
Ductus deferens and plexus
Femoral branches of genitofemoral nerve
Femoral nerve
Anterior cutaneous branches of femoral nerve
Testicular artery and plexus
Anterior cutaneous branch of iliohypogastric nerve
Dorsal nerves of penis
Genital branch of genitofemoral nerve
Anterior scrotal nerve (from ilio-inguinal nerve)

Nerves of Pelvic Viscera: Male

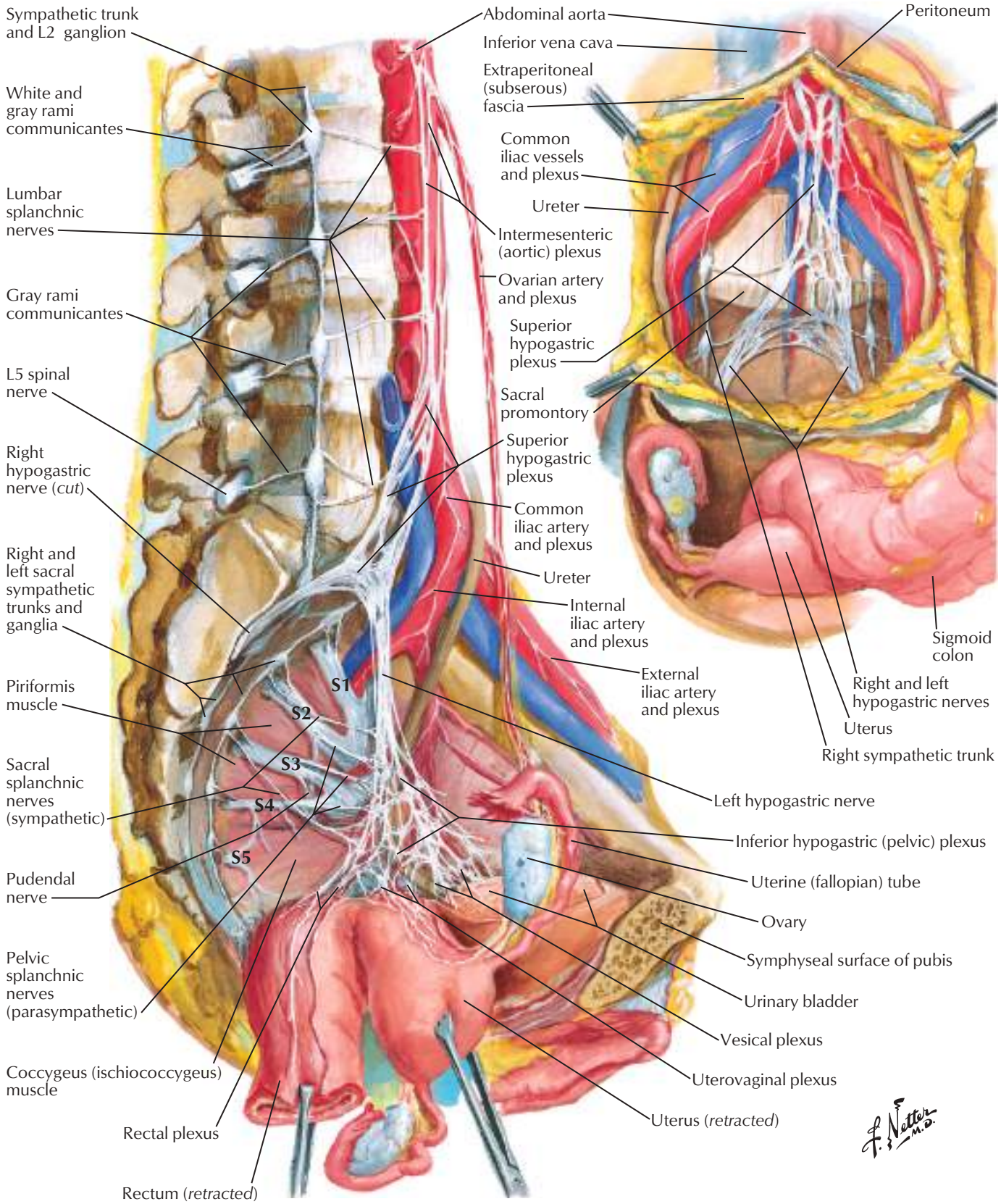
See also **Plate 297**

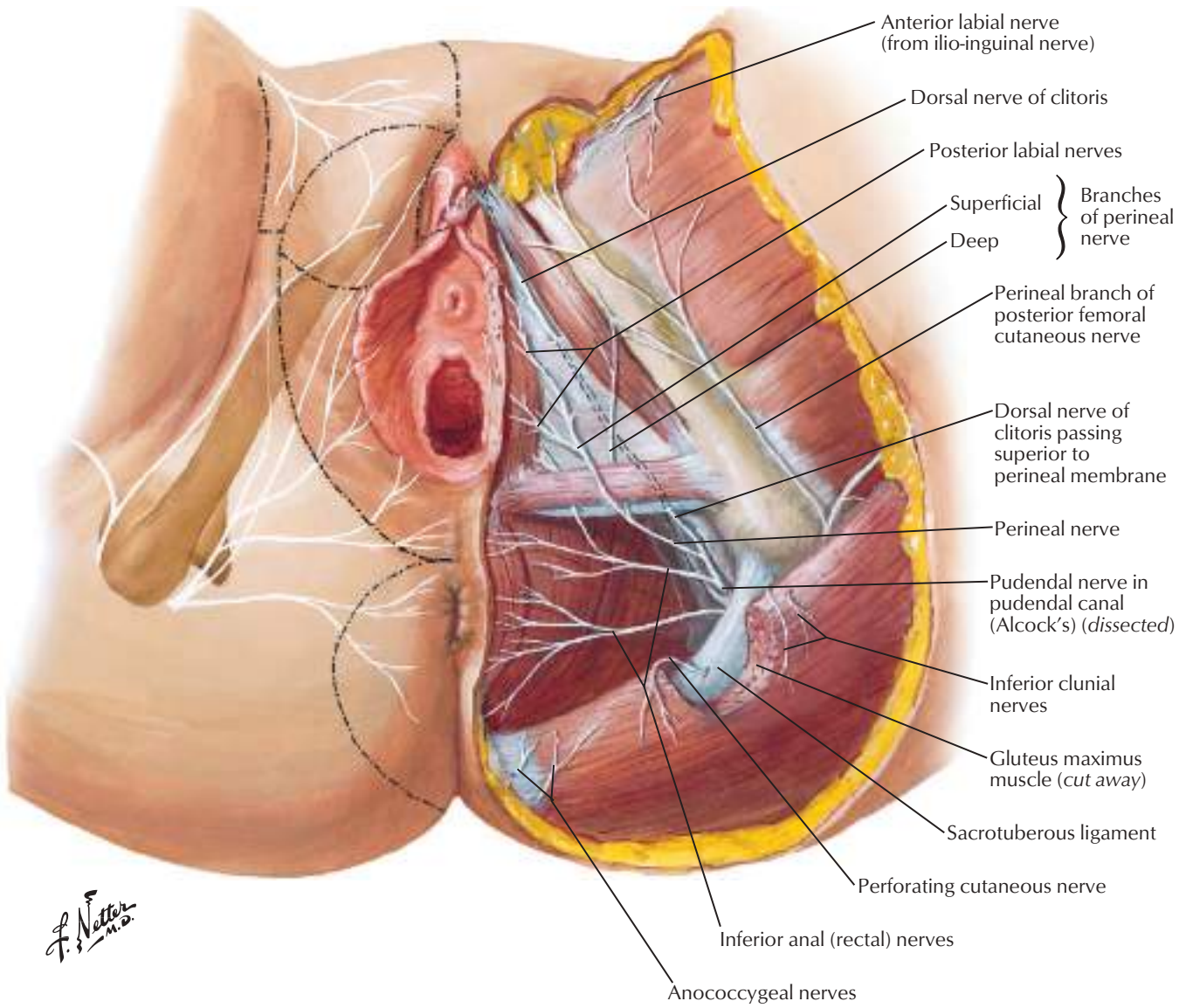


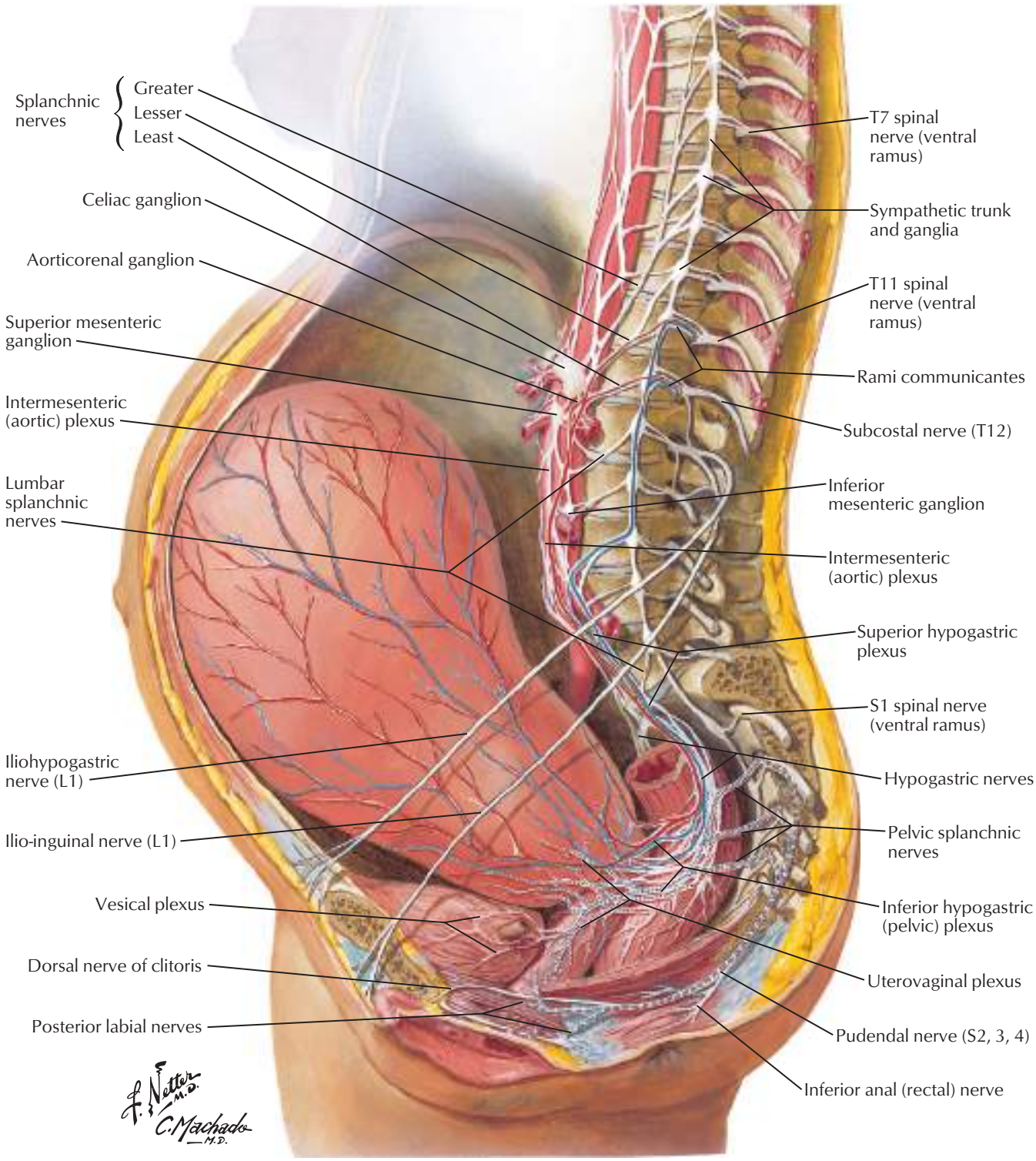

Posterior scrotal nerves
Perineal nerves
Superficial
Deep
Dorsal nerve of penis
Perineal membrane (*cut to show neurovascular structures on superior aspect of perineal membrane*)
Dorsal nerve of penis (continuation of pudendal nerve supplying muscles on superior aspect of perineal membrane)
Superficial perineal (Colles') fascia (*cut to open superficial perineal space*)
Superficial and deep branches of perineal nerve
Dorsal nerve of penis (passes superior to perineal membrane)
Perineal nerve
Obturator fascia (of obturator internus muscle)
Posterior femoral cutaneous nerve
Pudendal canal (Alcock's) (*opened up*)
Pudendal nerve
Inferior clunial nerves on gluteus maximus muscle
Inferior anal (rectal) nerves
Perforating cutaneous nerve
Anococcygeal nerve
Sacrotuberous ligament (*cut*)
Piriformis muscle
Coccygeus (ischiococcygeus) muscle
Levator ani muscle
Obturator internus muscle
Ischial spine
Pudendal nerve

Nerves of Pelvic Viscera: Female

See also **Plate 297**




Anterior labial nerve (from ilio-inguinal nerve)
Dorsal nerve of clitoris
Posterior labial nerves
Superficial
Deep
Branches of perineal nerve
Perineal branch of posterior femoral cutaneous nerve
Dorsal nerve of clitoris passing superior to perineal membrane
Perineal nerve
Pudendal nerve in pudendal canal (Alcock's) (*dissected*)
Inferior clunial nerves
Gluteus maximus muscle (*cut away*)
Sacrotuberous ligament
Perforating cutaneous nerve
Inferior anal (rectal) nerves
Anococcygeal nerves
F. Netter M.D.



Sensory fibers from uterine body and fundus accompany sympathetic fibers via hypogastric plexuses to T11, 12 (L1?)

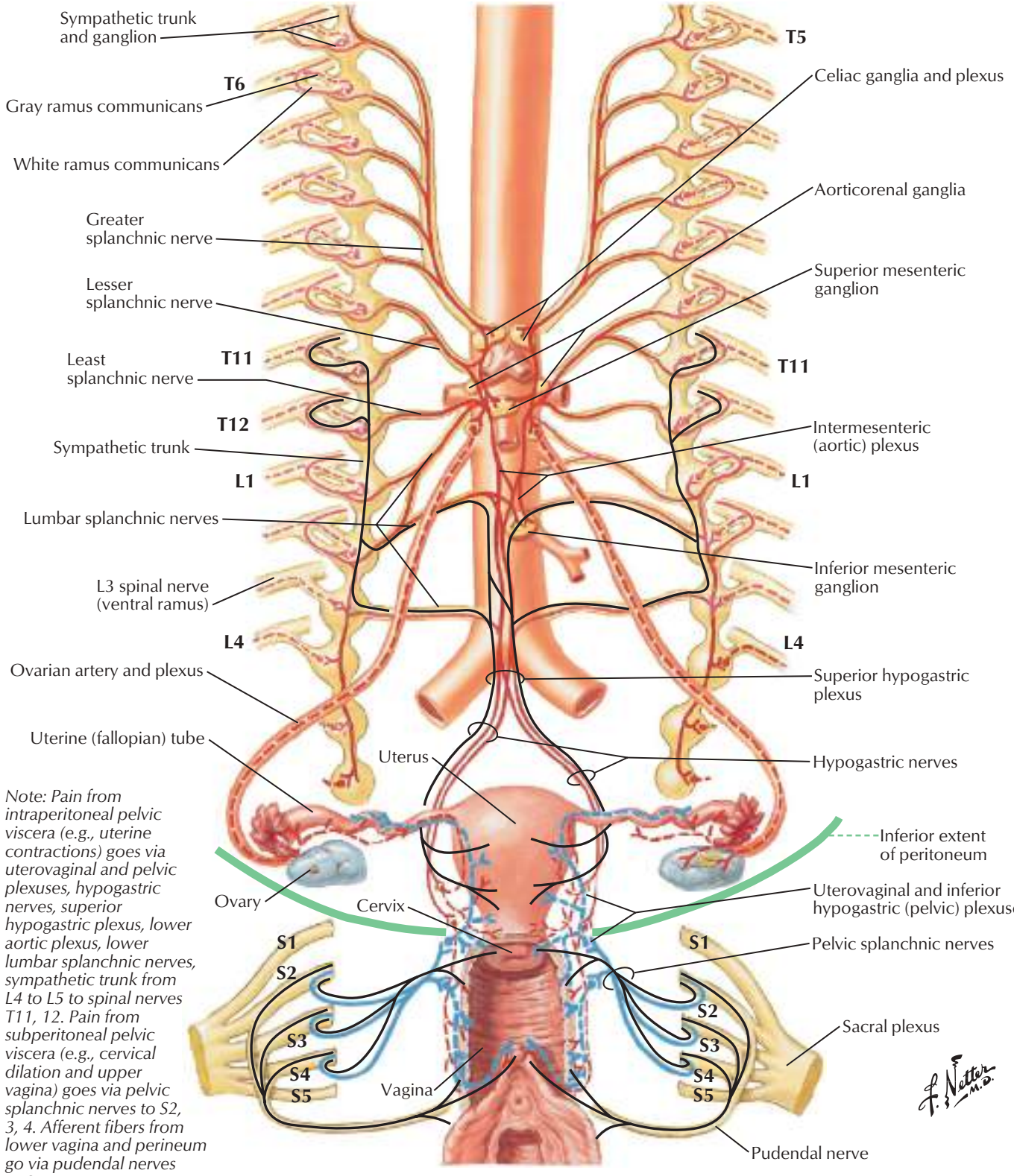
Motor fibers to uterine body and fundus (sympathetic)

Sensory fibers from cervix and upper vagina accompany pelvic splanchnic nerves (parasympathetic) to S2, 3, 4

Motor fibers to lower uterine segment, cervix, and upper vagina (parasympathetic)

Sensory fibers from lower vagina and perineum accompany somatic fibers via pudendal nerve to S2, 3, 4

Motor fibers to lower vagina and perineum via pudendal nerve (somatic)



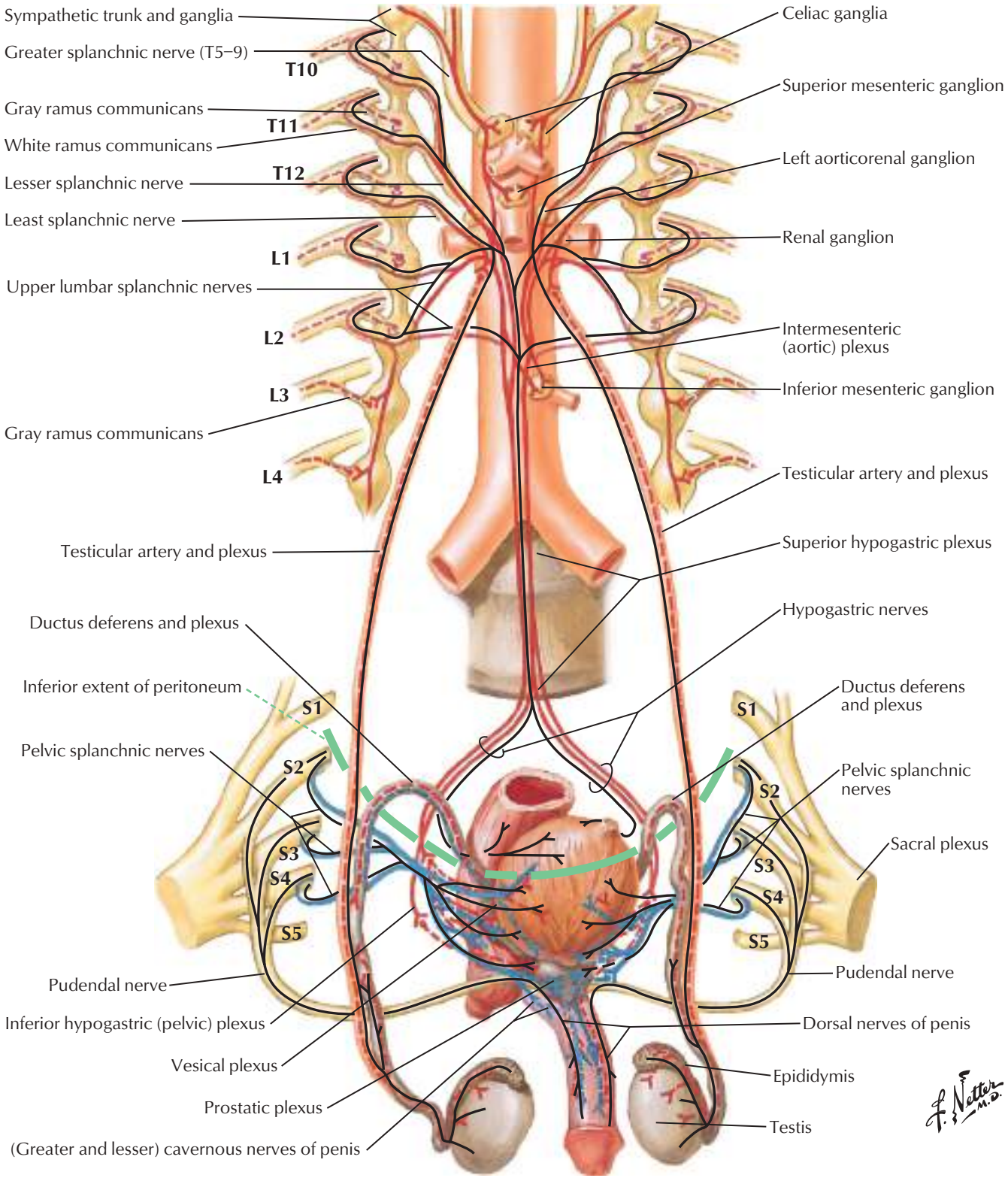
Note: Pain from intraperitoneal pelvic viscera (e.g., uterine contractions) goes via uterovaginal and pelvic plexuses, hypogastric nerves, superior hypogastric plexus, lower aortic plexus, lower lumbar splanchnic nerves, sympathetic trunk from L4 to L5 to spinal nerves T11, 12. Pain from subperitoneal pelvic viscera (e.g., cervical dilation and upper vagina) goes via pelvic splanchnic nerves to S2, 3, 4. Afferent fibers from lower vagina and perineum go via pudendal nerves to S2, 3, 4.

Sympathetic fibers { **Preganglionic** — **Postganglionic** - - -

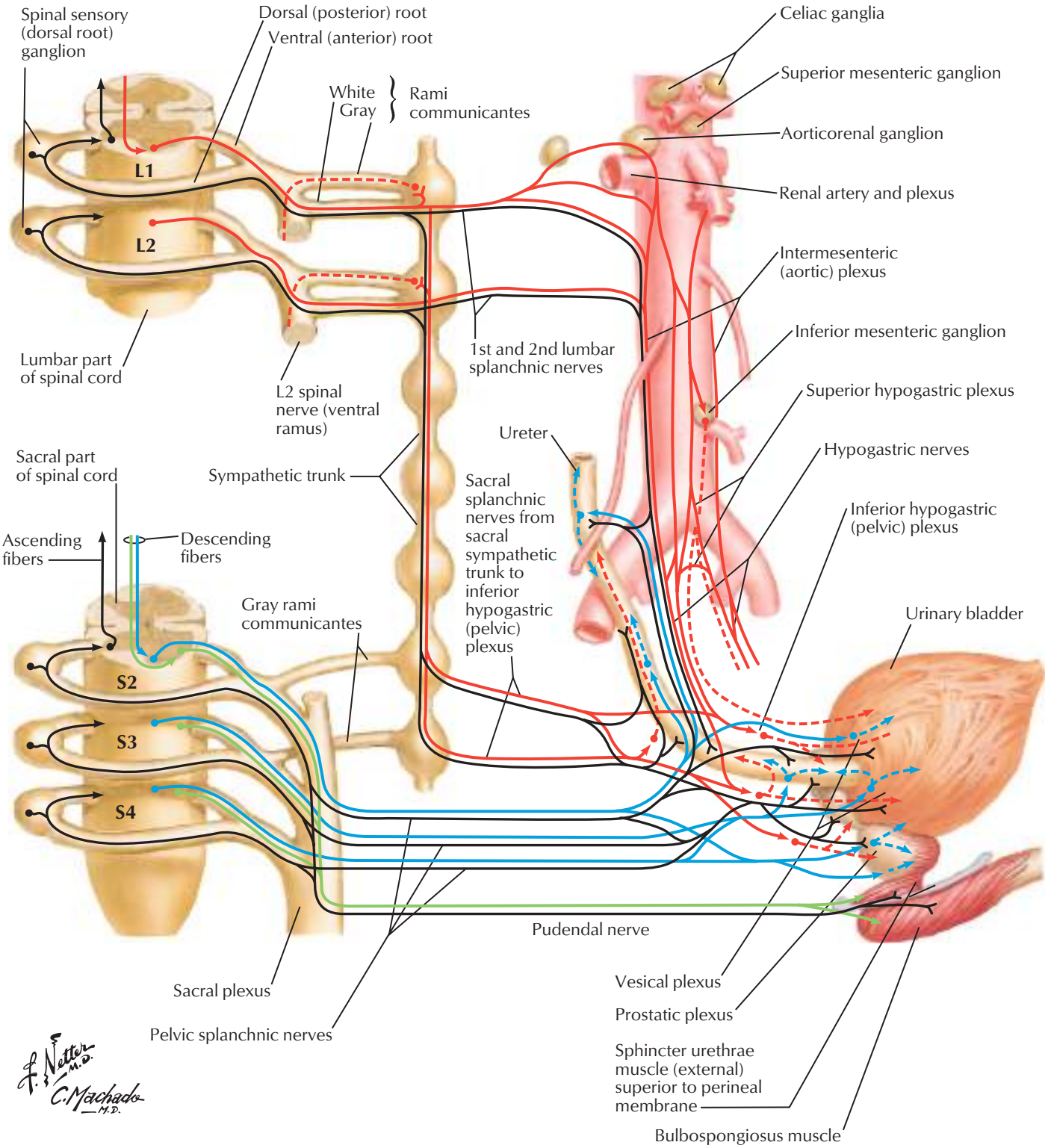
Parasympathetic fibers { **Preganglionic** — **Postganglionic** - - -

Afferent fibers —

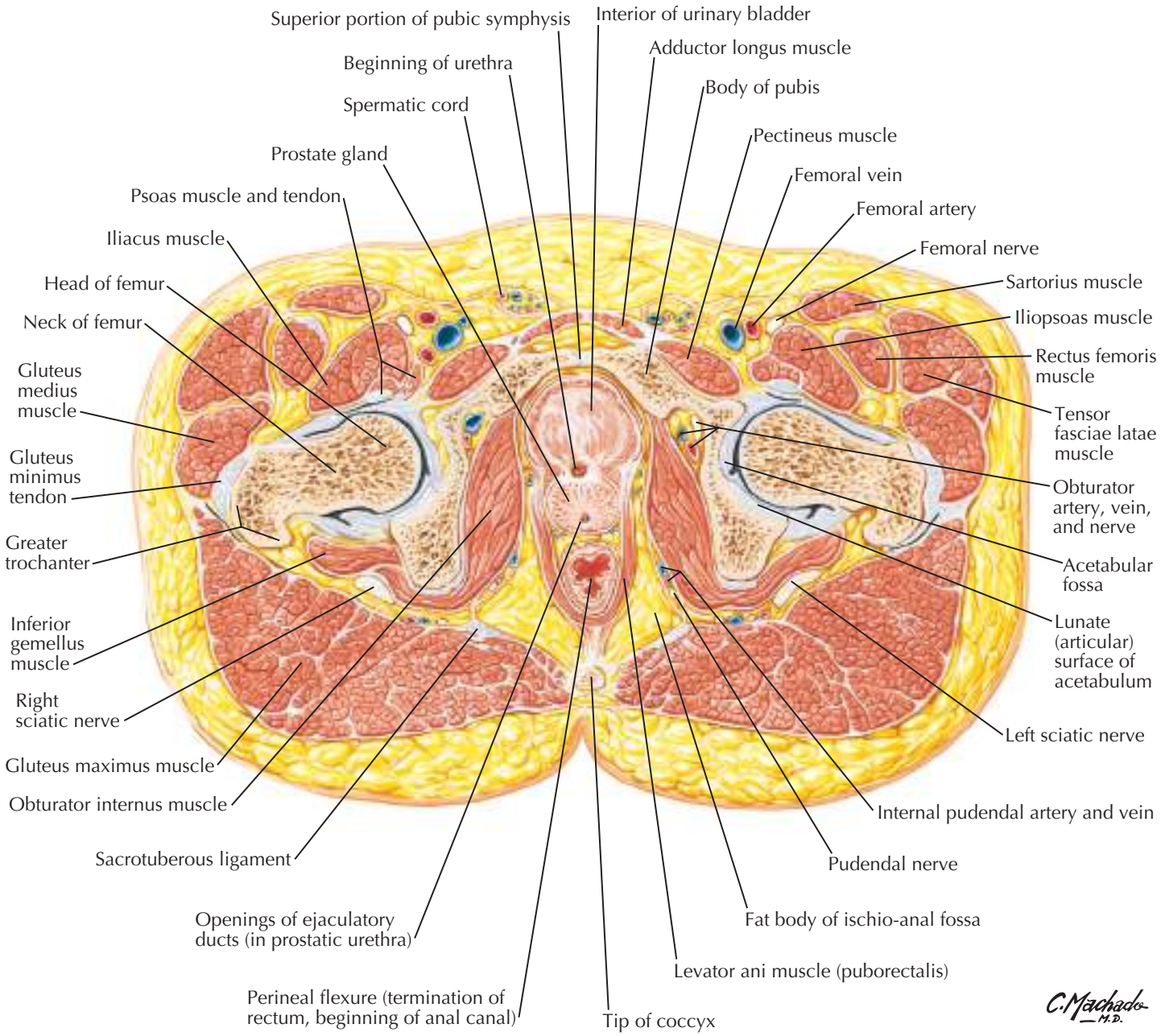
Innervation of Male Reproductive Organs: Schema

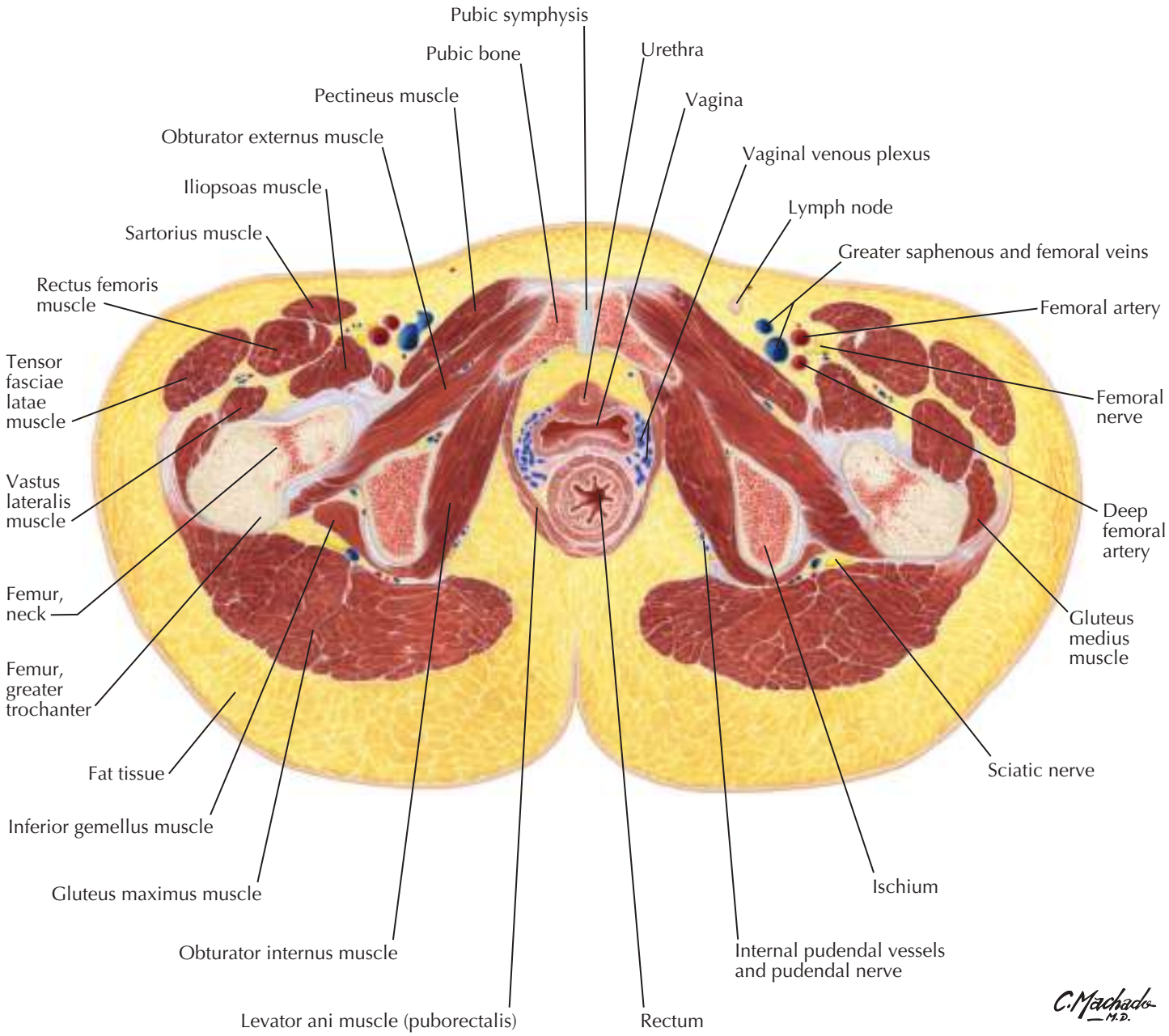


Innervation of Urinary Bladder and Lower Ureter: Schema



Male Pelvis: Cross Section of Bladder-Prostate Junction




Pubic symphysis
Pubic bone
Urethra
Pectineus muscle
Vagina
Obturator externus muscle
Vaginal venous plexus
Iliopsoas muscle
Lymph node
Sartorius muscle
Greater saphenous and femoral veins
Rectus femoris muscle
Femoral artery
Tensor fasciae latae muscle
Femoral nerve
Vastus lateralis muscle
Deep femoral artery
Femur, neck
Gluteus medius muscle
Femur, greater trochanter
Fat tissue
Sciatic nerve
Inferior gemellus muscle
Ischium
Gluteus maximus muscle
Obturator internus muscle
Internal pudendal vessels and pudendal nerve
Levator ani muscle (puborectalis)
Rectum
C. Machado M.D.

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Bulbospongiosus	*Male:* median raphe, bulb of penis, perineal body *Female:* perineal body	*Male:* perineal membrane, corpus cavernosum, bulb of penis *Female:* dorsum of clitoris, inferior fascia of urogenital diaphragm, bulb of vestibule, pubic arch	Deep branch of perineal nerve from pudendal nerve	*Male:* compresses bulb of penis, forces blood into body of penis during erection, removes urine from urethra and semen during ejaculation *Female:* constricts vaginal orifice, assists in expressing secretions of greater vestibular gland, forces blood into body of clitoris	Internal pudendal artery and its branch (perineal artery)	Perineal
Coccygeus (ischiococcygeus)	Ischial spine, sacrospinous ligament	Inferior sacrum, coccyx	Ventral rami of lower sacral nerves	Supports pelvic viscera, draws coccyx forward	Inferior gluteal artery	Pelvic floor
Compressor urethrae (female only)	Ischiopubic ramus	Anterior aspect of urethra	Perineal branches of pudendal nerve	Sphincter of urethra	Perineal branch of internal pudendal artery	Perineal
Cremaster	Lower edge of internal oblique and middle of inguinal ligament	Pubic tubercle, crest of pubis	Genital branch of genitofemoral nerve	Retracts testicle	Cremasteric branch of inferior epigastric artery	Spermatic cord
Deep transverse perineal	Inner surface of inferior ischial rami	*Male:* medial tendinous raphe and perineal body *Female:* sides of vagina	Perineal branches of pudendal nerve	Stabilizes perineal body, supports prostate/vagina	Perineal branch of internal pudendal artery	Perineal
External anal sphincter	Tip of coccyx, anococcygeal ligament	Deeper fibers surround anal canal, attach posteriorly to coccyx and anteriorly to central point of perineum	Perineal and inferior rectal branches of pudendal nerve	Closes anal orifice	Inferior rectal and transverse perineal artery	Perineal
Iliacus	Superior 2/3 of iliac fossa, ala of sacrum, anterior sacro-iliac ligaments	Lesser trochanter of femur and shaft inferior to it, to psoas major tendon	Femoral nerve	Flexes thigh at hips and stabilizes hip joint, acts with psoas major	Iliac branches of iliolumbar artery	Anterior thigh
Ischiocavernosus	Inferior internal surface of ischiopubic ramus, ischial tuberosity	Crus of penis or clitoris	Deep branch of perineal nerve from pudendal nerve	Forces blood into body of penis and clitoris during erection	Internal pudendal artery and its branch (perineal artery)	Perineal
Levator ani	Body of pubis, tendinous arch of obturator fascia, ischial spine	Perineal body, coccyx, anococcygeal raphe, walls of prostate or vagina, rectum, anal canal	Ventral rami of lower sacral nerves, perineal nerve	Supports pelvic viscera, raises pelvic floor	Inferior gluteal artery, internal pudendal artery and its branches (inferior rectal and perineal arteries)	Pelvic floor
Obturator internus	Pelvic surface of obturator membrane and surrounding bone	Medial surface of greater trochanter of femur	Nerve to obturator internus	Laterally rotates extended thigh, abducts flexed thigh at hip	Internal pudendal and obturator arteries	Gluteal region

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Piriformis	Anterior surface of sacral segments 2–4, sacrotuberous ligament	Superior border of greater trochanter of femur	Ventral rami of L5, S1, S2	Laterally rotates extended thigh, abducts flexed thigh at hip	Superior and inferior gluteal arteries, internal pudendal artery	Gluteal region
Puborectalis	Lower part of pubic symphysis, superior fascia of urogenital diaphragm	Loops around rectum; no distal attachment	Nerve to levator ani muscle			Pelvic floor
Sphincter urethrae	External fibers from junction of inferior pubic and ischial rami and adjacent fascia; internal fibers pass medially to surround membranous urethra	*Male:* median raphe in front and behind urethra *Female:* encloses urethra, attaches to sides of vagina	Perineal branches of pudendal nerve	Compresses urethra at end of micturition; in female also compresses the distal vagina	Perineal branch of internal pudendal artery	Perineal
Sphincter urethrovaginalis (female only)	Perineal body	Passes forward and anterior around urethra	Perineal branches of pudendal nerve	Sphincter of urethra and vagina	Perineal branch of pudendal artery	Perineal
Superficial transverse perineal	Ischial rami and tuberosities	Central tendon (perineal body)	Perineal branches of pudendal nerve	Stabilizes central tendon	Perineal branch of internal pudendal artery	Perineal

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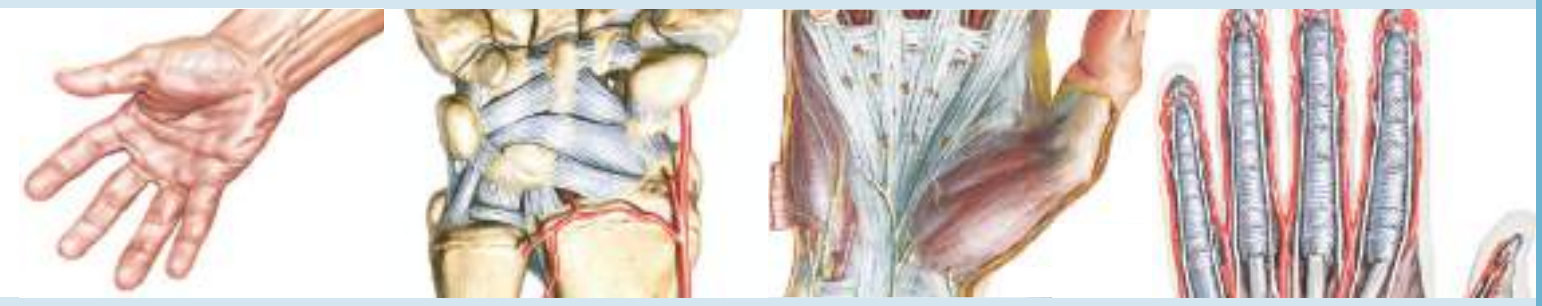


6 UPPER LIMB

Section

Topographic Anatomy

Plate 398

398 Upper Limb: Surface Anatomy

Cutaneous Anatomy

Plates 399–403

399 Dermatomes of Upper Limb

400 Cutaneous Innervation of Upper Limb

401 Cutaneous Nerves and Superficial Veins of Shoulder and Arm

402 Cutaneous Nerves and Superficial Veins of Forearm

403 Lymph Vessels and Nodes of Upper Limb

Shoulder and Axilla

Plates 404–416

404 Clavicle and Sternoclavicular Joint

405 Humerus and Scapula: Anterior Views

406 Humerus and Scapula: Posterior View

407 Shoulder: Anteroposterior Radiograph

408 Shoulder (Glenohumeral Joint)

409 Muscles of Shoulder

410 Axilla: Posterior Wall

411 Muscles of Rotator Cuff

412 Pectoral, Clavipectoral, and Axillary Fasciae

413 Scapulothoracic and Scapulohumeral Dissection

414 Axillary Artery and Anastomoses around Scapula

415 Axilla (Dissection): Anterior View
416 Brachial Plexus: Schema

Arm

Plates 417–421

417 Muscles of Arm: Anterior Views
418 Muscles of Arm: Posterior Views
419 Brachial Artery in Situ
420 Arteries of Arm and Proximal Forearm
421 Arm: Serial Cross Sections

Elbow and Forearm

Plates 422–438

422 Bones of Elbow
423 Elbow: Radiographs
424 Ligaments of Elbow
425 Bones of Forearm
426 Individual Muscles of Forearm: Rotators of Radius
427 Individual Muscles of Forearm: Extensors of Wrist and Digits
428 Individual Muscles of Forearm: Flexors of Wrist
429 Individual Muscles of Forearm: Flexors of Digits
430 Muscles of Forearm (Superficial Layer): Posterior View
431 Muscles of Forearm (Deep Layer): Posterior View
432 Muscles of Forearm (Superficial Layer): Anterior View
433 Muscles of Forearm (Intermediate Layer): Anterior View
434 Muscles of Forearm (Deep Layer): Anterior View
435 Arteries of Forearm
436 Forearm: Serial Cross Sections, Anterior View
437 Attachments of Muscles of Forearm: Anterior View
438 Attachments of Muscles of Forearm: Posterior View

Wrist and Hand

Plates 439–458

439 Carpal Bones
440 Movements of Wrist
441 Ligaments of Wrist
442 Ligaments of Wrist (continued)
443 Bones of Wrist and Hand
444 Wrist and Hand: Radiographs
445 Metacarpophalangeal and Interphalangeal Ligaments
446 Wrist and Hand: Superficial Palmar Dissections
447 Wrist and Hand: Deeper Palmar Dissections
448 Lumbrical Muscles and Bursae, Spaces, and Sheaths: Schema
449 Flexor Tendons, Arteries, and Nerves at Wrist
450 Bursae, Spaces, and Tendon Sheaths of Hand
451 Flexor and Extensor Tendons in Fingers
452 Intrinsic Muscles of Hand
453 Arteries and Nerves of Hand: Palmar Views
454 Wrist and Hand: Superficial Radial Dissection
455 Wrist and Hand: Superficial Dorsal Dissection
456 Wrist and Hand: Deep Dorsal Dissection
457 Extensor Tendons at Wrist
458 Fingers

Neurovasculature

Plates 459–466

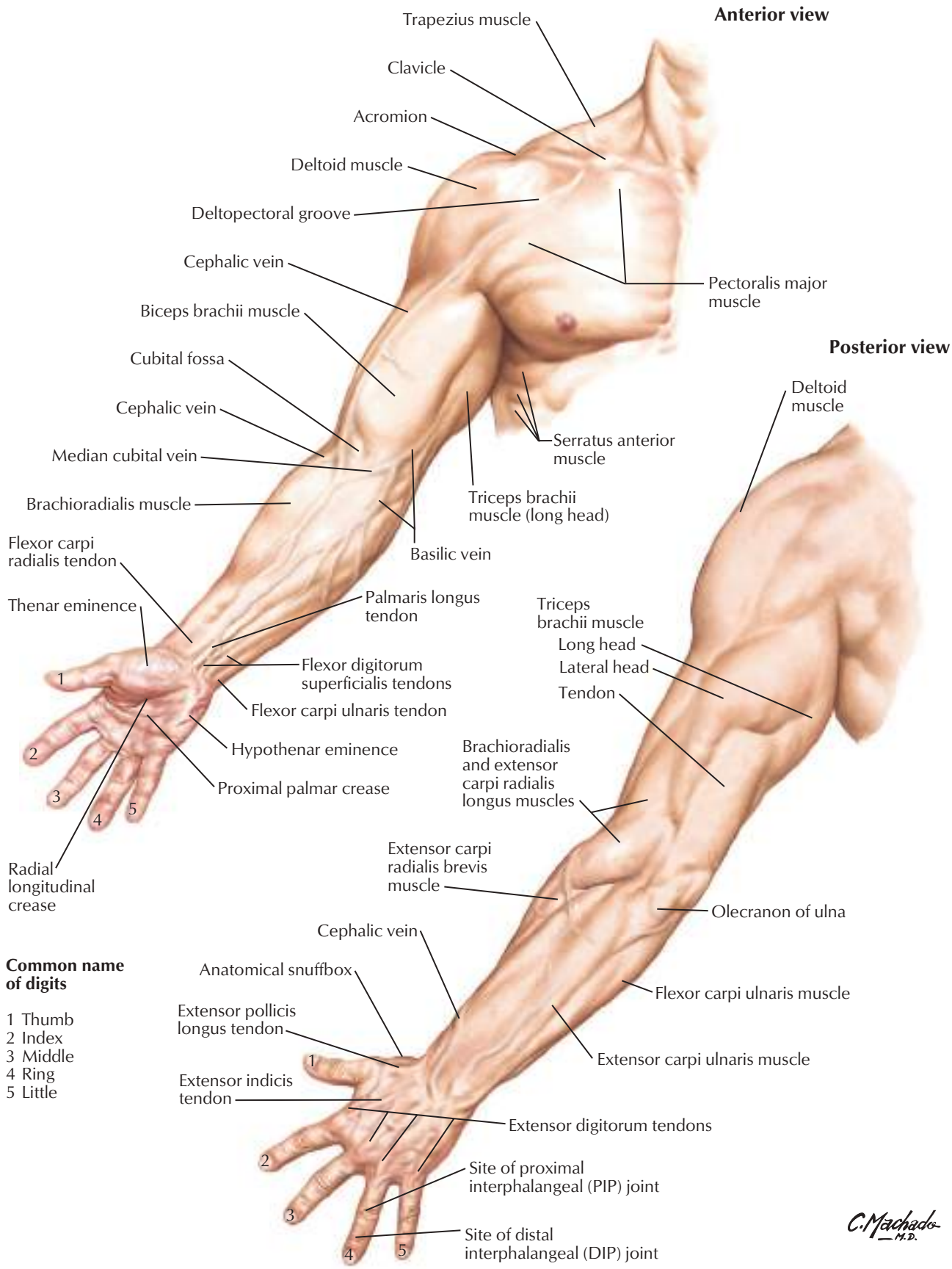
459 Cutaneous Innervation of Wrist and Hand
460 Arteries and Nerves of Upper Limb
461 Nerves of Upper Limb
462 Musculocutaneous Nerve
463 Median Nerve
464 Ulnar Nerve
465 Radial Nerve in Arm and Nerves of Posterior Shoulder
466 Radial Nerve in Forearm

Regional Scans

Plate 467

467 Shoulder MRI, CT Scan, and Arthrogram

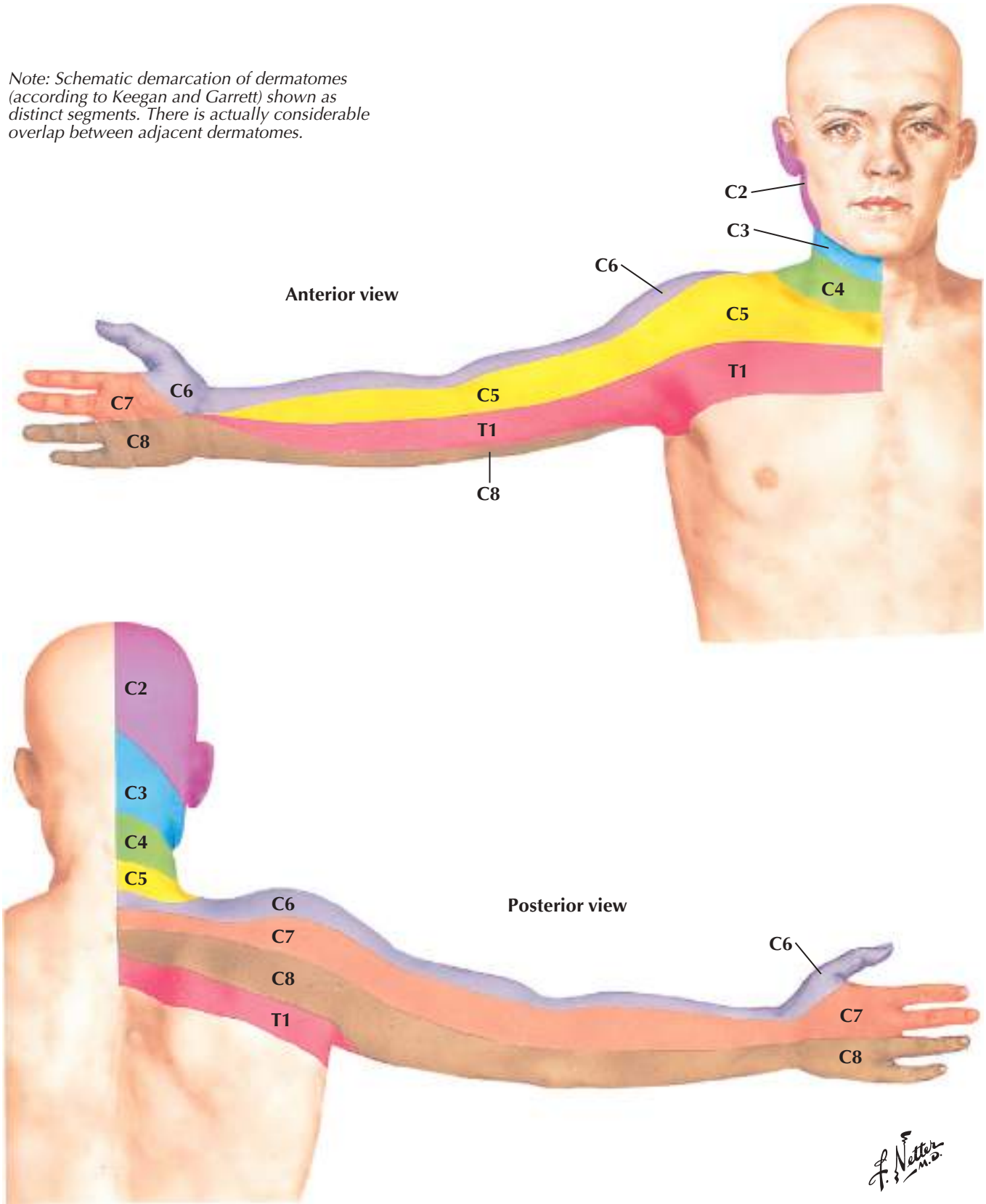
Muscle Tables


Anterior view
Trapezius muscle
Clavicle
Acromion
Deltoid muscle
Deltopectoral groove
Cephalic vein
Pectoralis major muscle
Biceps brachii muscle
Cubital fossa
Cephalic vein
Median cubital vein
Brachioradialis muscle
Serratus anterior muscle
Triceps brachii muscle (long head)
Basilic vein
Flexor carpi radialis tendon
Thenar eminence
Palmaris longus tendon
Flexor digitorum superficialis tendons
Flexor carpi ulnaris tendon
Hypothenar eminence
Proximal palmar crease
Radial longitudinal crease
Posterior view
Deltoid muscle
Triceps brachii muscle
Long head
Lateral head
Tendon
Brachioradialis and extensor carpi radialis longus muscles
Extensor carpi radialis brevis muscle
Olecranon of ulna
Cephalic vein
Anatomical snuffbox
Flexor carpi ulnaris muscle
Extensor pollicis longus tendon
Extensor carpi ulnaris muscle
Extensor indicis tendon
Extensor digitorum tendons
Site of proximal interphalangeal (PIP) joint
Site of distal interphalangeal (DIP) joint
Common name of digits
1 Thumb
2 Index
3 Middle
4 Ring
5 Little
C. Machado M.D.

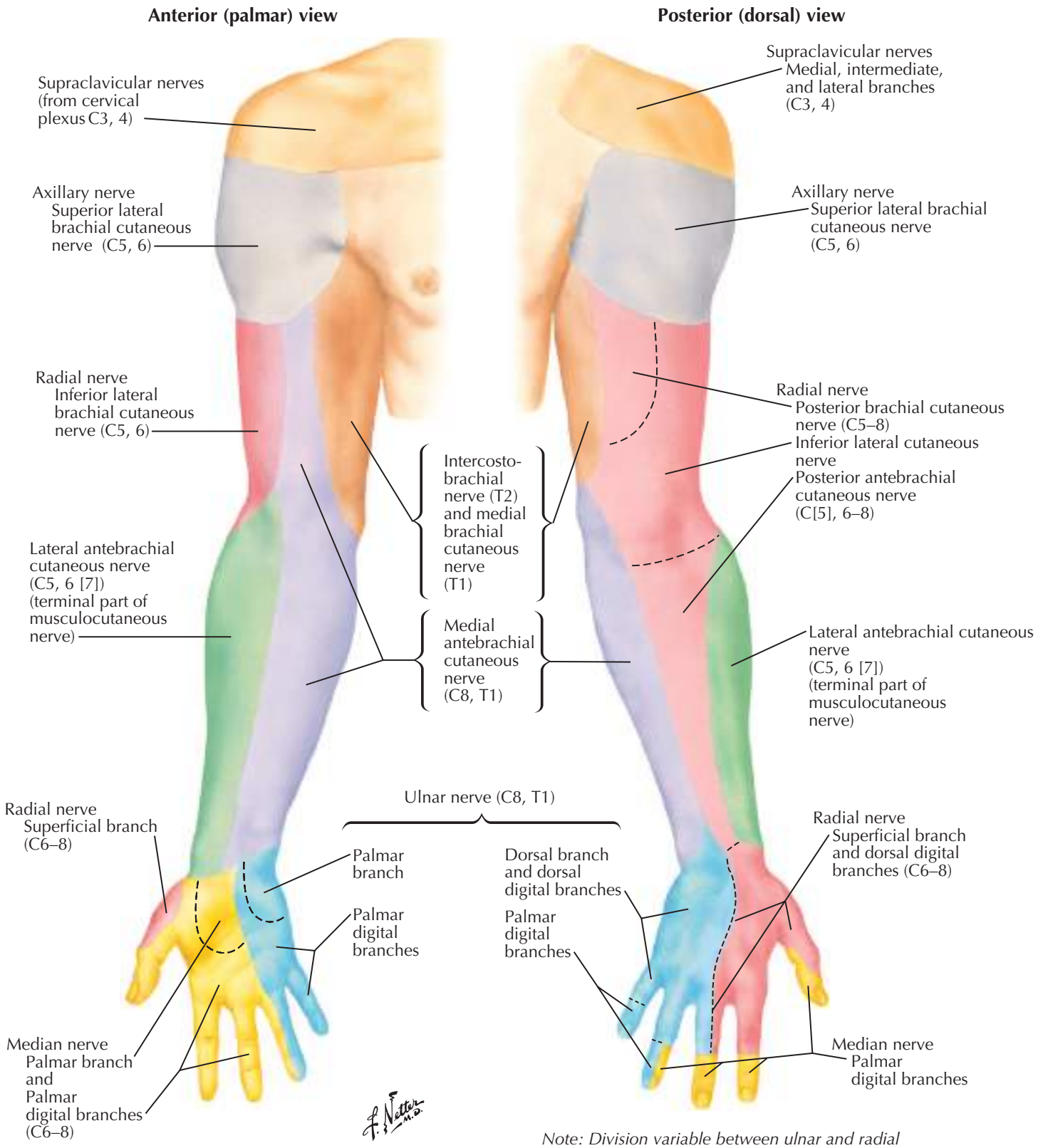
Dermatomes of Upper Limb

See also Plate 162

Note: Schematic demarcation of dermatomes (according to Keegan and Garrett) shown as distinct segments. There is actually considerable overlap between adjacent dermatomes.



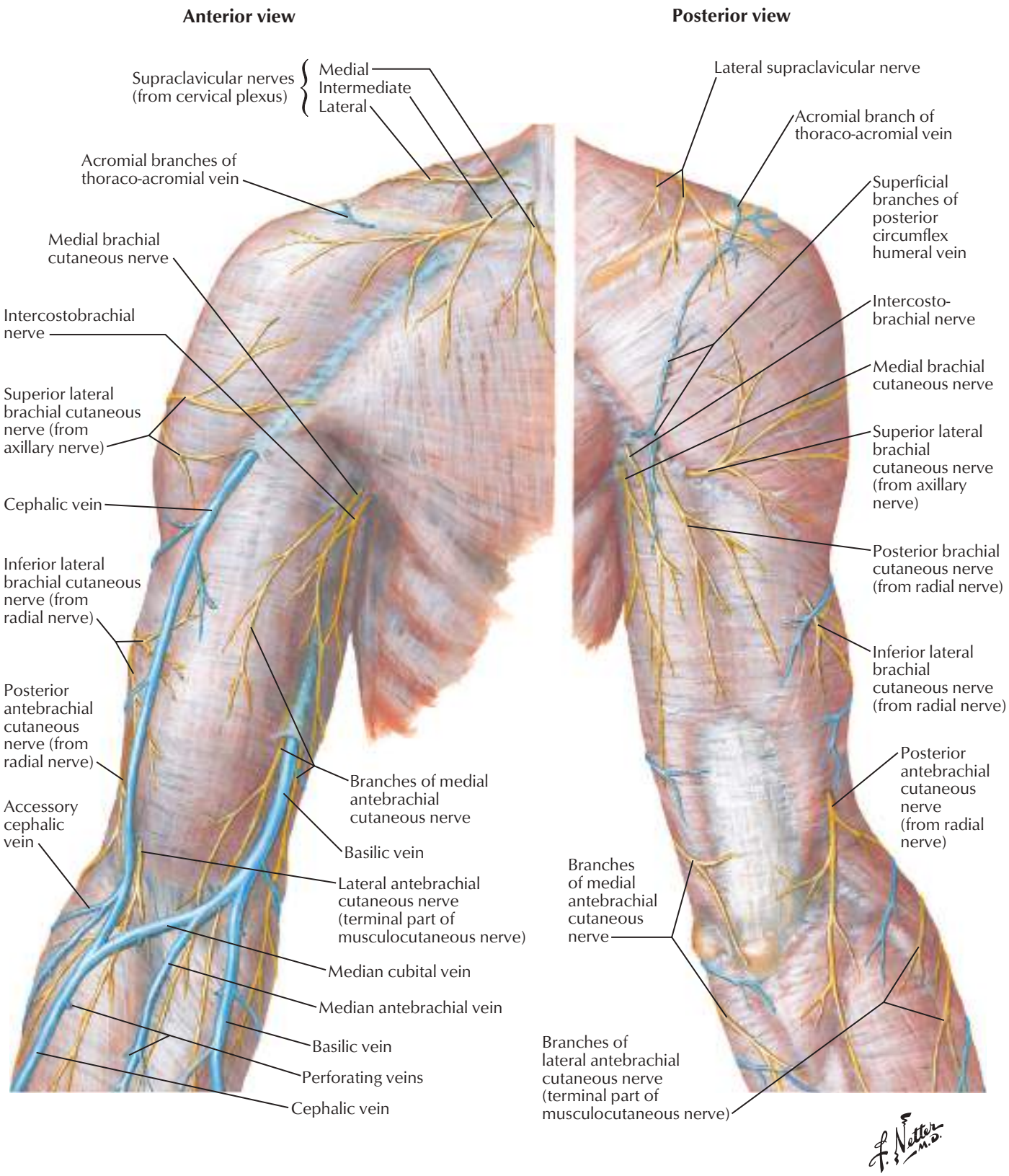
See also Plates 459, 461, 463

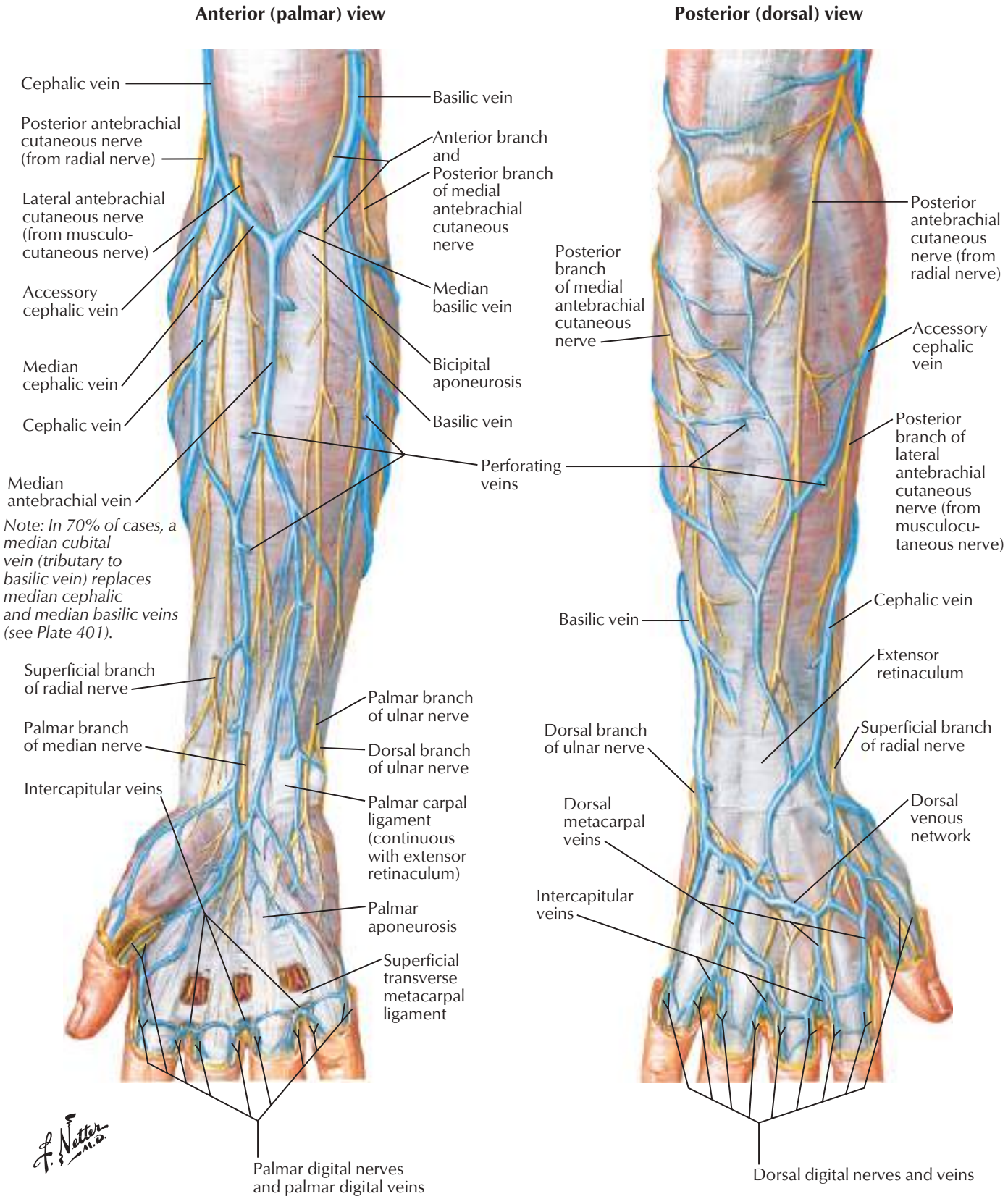


Note: Division variable between ulnar and radial innervation on dorsum of hand and often aligns with middle of 4th digit instead of 3rd digit as shown.

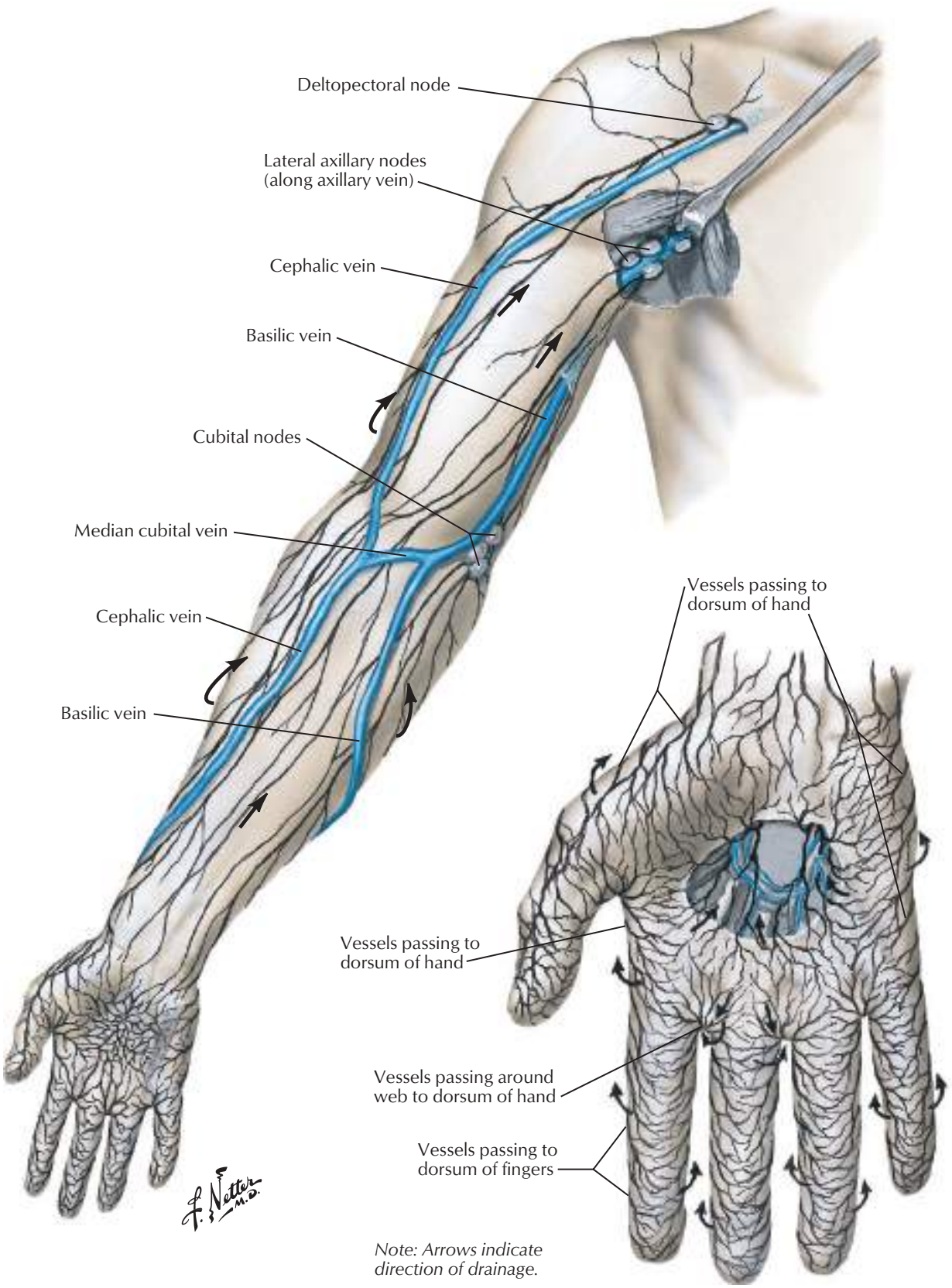
Cutaneous Nerves and Superficial Veins of Shoulder and Arm

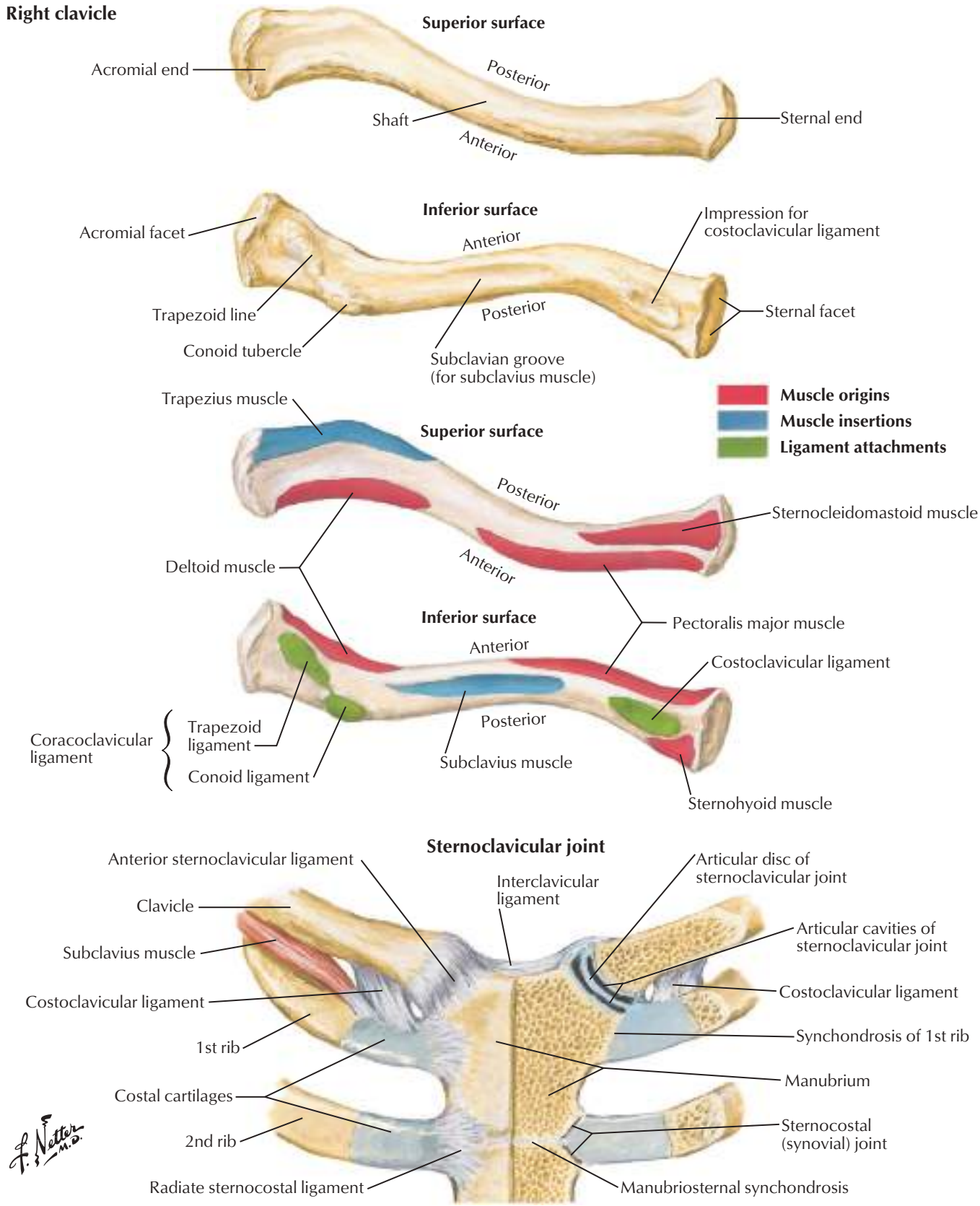
See also Plates 252, 419




Anterior (palmar) view
Posterior (dorsal) view
Cephalic vein
Basilic vein
Posterior antebrachial cutaneous nerve (from radial nerve)
Anterior branch and Posterior branch of medial antebrachial cutaneous nerve
Lateral antebrachial cutaneous nerve (from musculo-cutaneous nerve)
Accessory cephalic vein
Median basilic vein
Median cephalic vein
Bicipital aponeurosis
Cephalic vein
Basilic vein
Median antebrachial vein
Perforating veins
Note: In 70% of cases, a median cubital vein (tributary to basilic vein) replaces median cephalic and median basilic veins (see Plate 401).
Superficial branch of radial nerve
Palmar branch of ulnar nerve
Palmar branch of median nerve
Dorsal branch of ulnar nerve
Intercapitular veins
Palmar carpal ligament (continuous with extensor retinaculum)
Palmar aponeurosis
Superficial transverse metacarpal ligament
Palmar digital nerves and palmar digital veins
Posterior antebrachial cutaneous nerve (from radial nerve)
Posterior branch of medial antebrachial cutaneous nerve
Accessory cephalic vein
Posterior branch of lateral antebrachial cutaneous nerve (from musculocu-taneous nerve)
Basilic vein
Cephalic vein
Extensor retinaculum
Dorsal branch of ulnar nerve
Superficial branch of radial nerve
Dorsal metacarpal veins
Dorsal venous network
Intercapitular veins
Dorsal digital nerves and veins

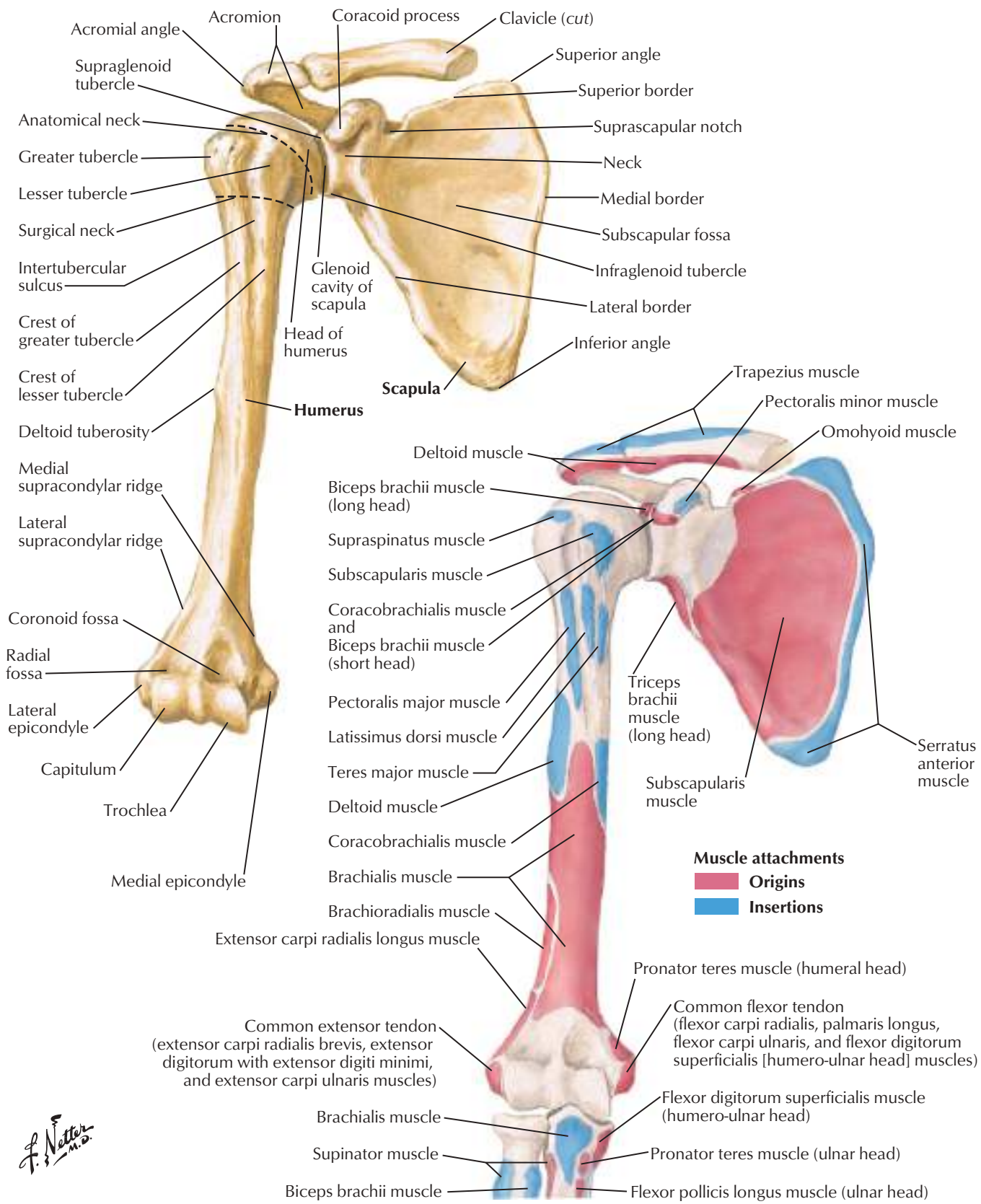
See also Plates 181, 455




Right clavicle
Superior surface
Acromial end
Posterior
Shaft
Sternal end
Anterior
Inferior surface
Acromial facet
Anterior
Impression for costoclavicular ligament
Trapezoid line
Posterior
Sternal facet
Conoid tubercle
Subclavian groove (for subclavius muscle)
Trapezius muscle
Muscle origins
Muscle insertions
Ligament attachments
Superior surface
Posterior
Sternocleidomastoid muscle
Deltoid muscle
Anterior
Inferior surface
Pectoralis major muscle
Anterior
Costoclavicular ligament
Coracoclavicular ligament
Trapezoid ligament
Posterior
Conoid ligament
Subclavius muscle
Sternohyoid muscle
Sternoclavicular joint
Anterior sternoclavicular ligament
Articular disc of sternoclavicular joint
Interclavicular ligament
Clavicle
Articular cavities of sternoclavicular joint
Subclavius muscle
Costoclavicular ligament
Costoclavicular ligament
Synchondrosis of 1st rib
1st rib
Manubrium
Costal cartilages
Sternocostal (synovial) joint
2nd rib
Radiate sternocostal ligament
Manubriosternal synchondrosis

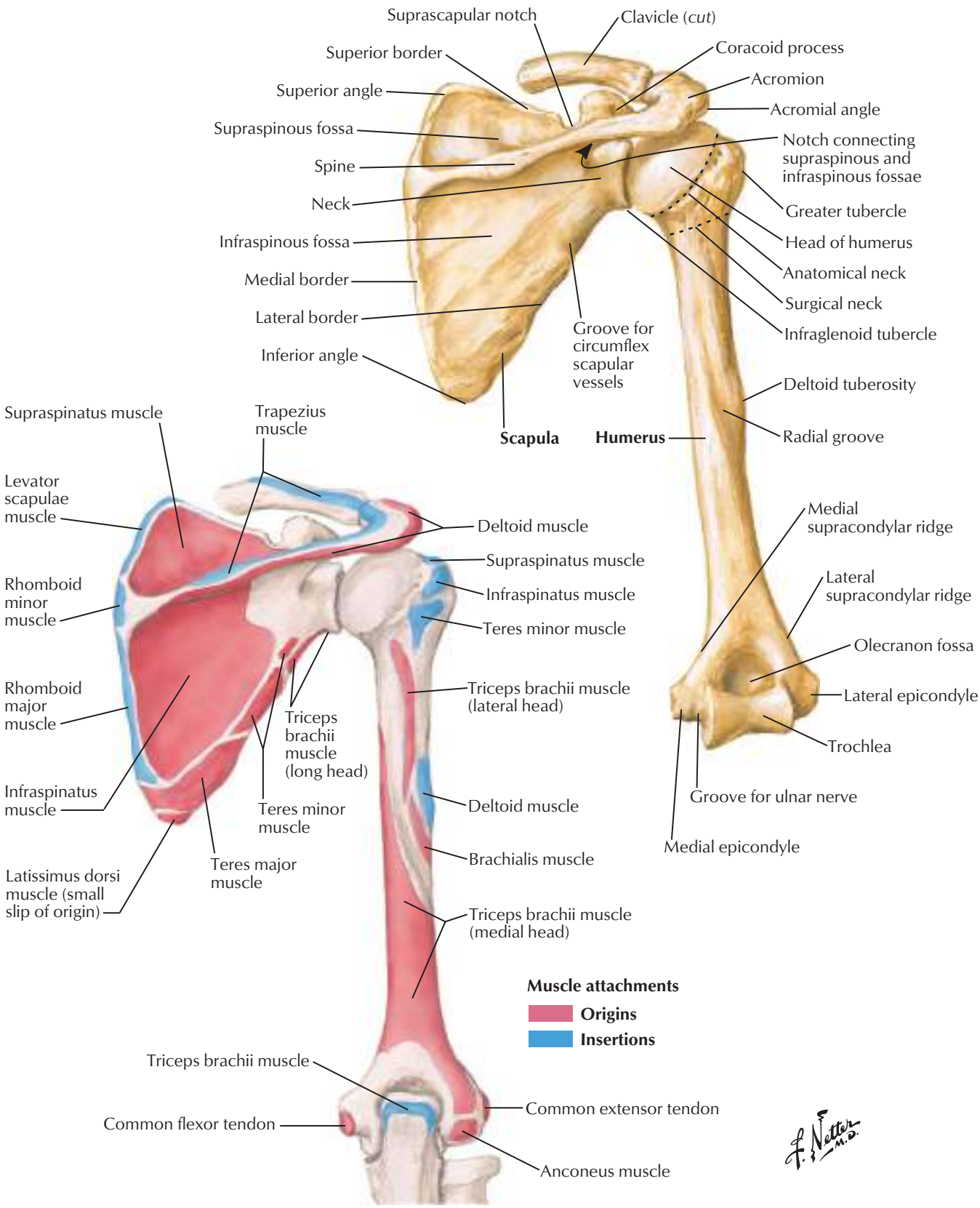
Humerus and Scapula: Anterior Views

See also **Plates 183, 407, 422**



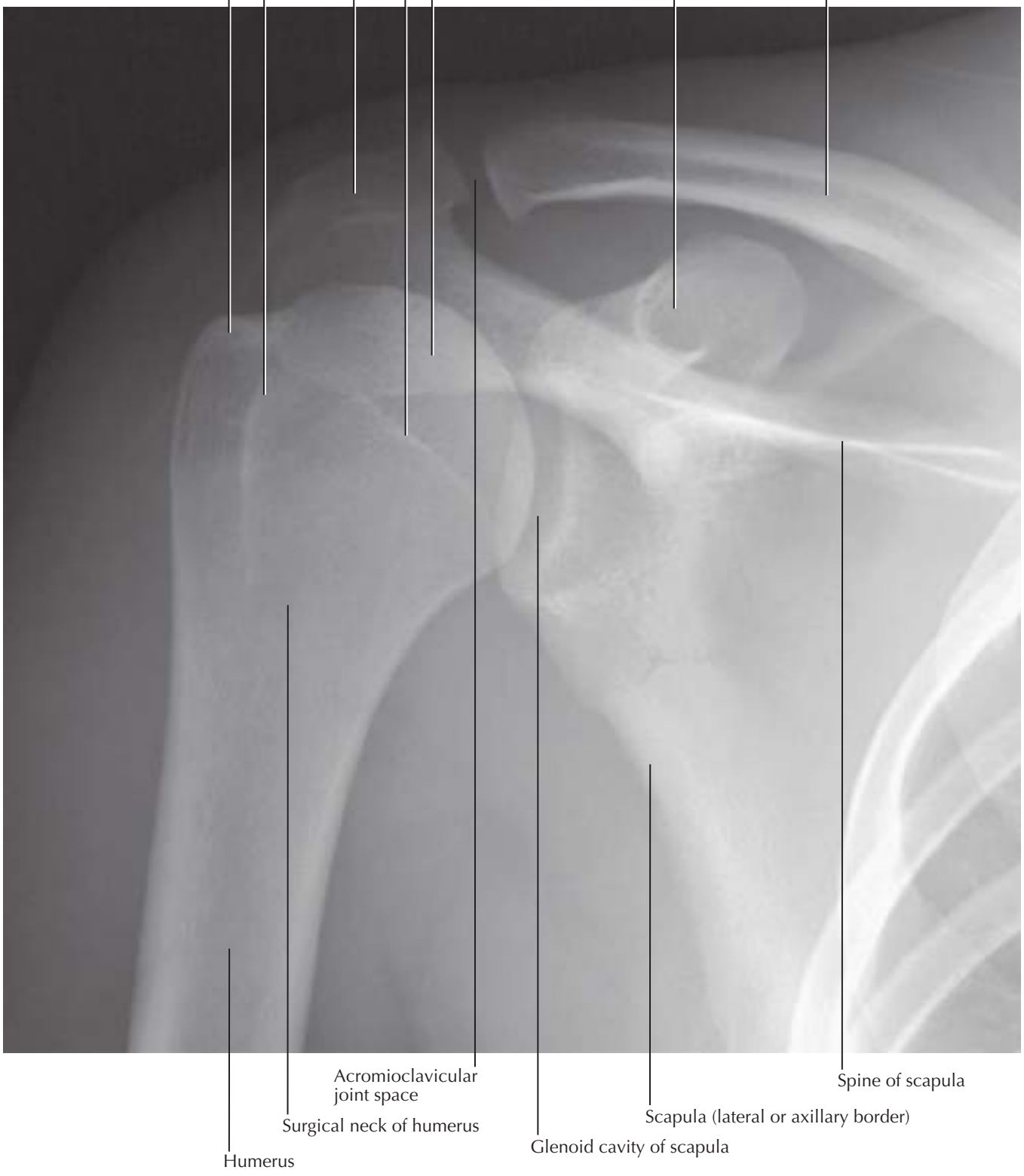
Humerus and Scapula: Posterior View

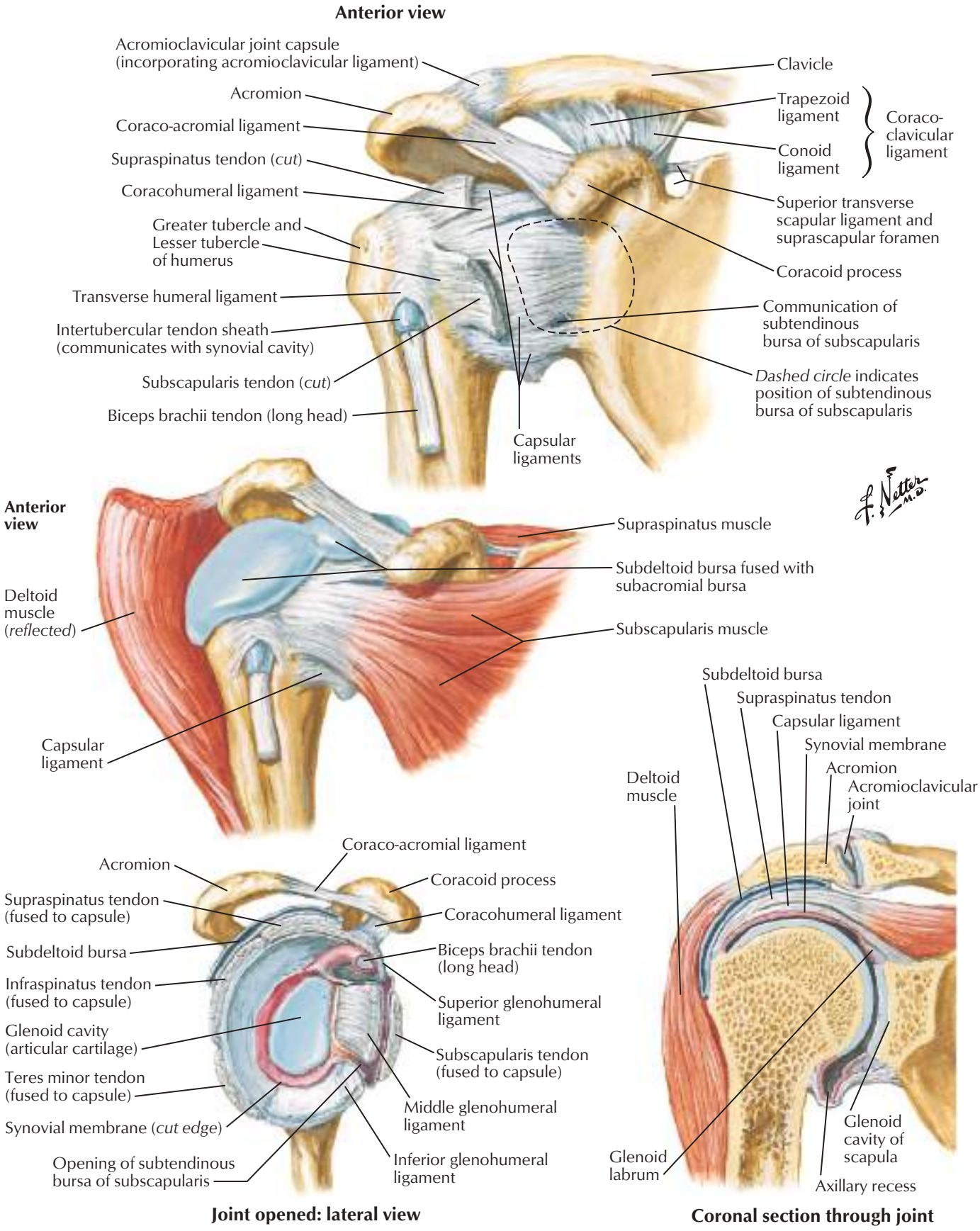
See also Plate 183



Shoulder: Anteroposterior Radiograph

See also **Plate 405**



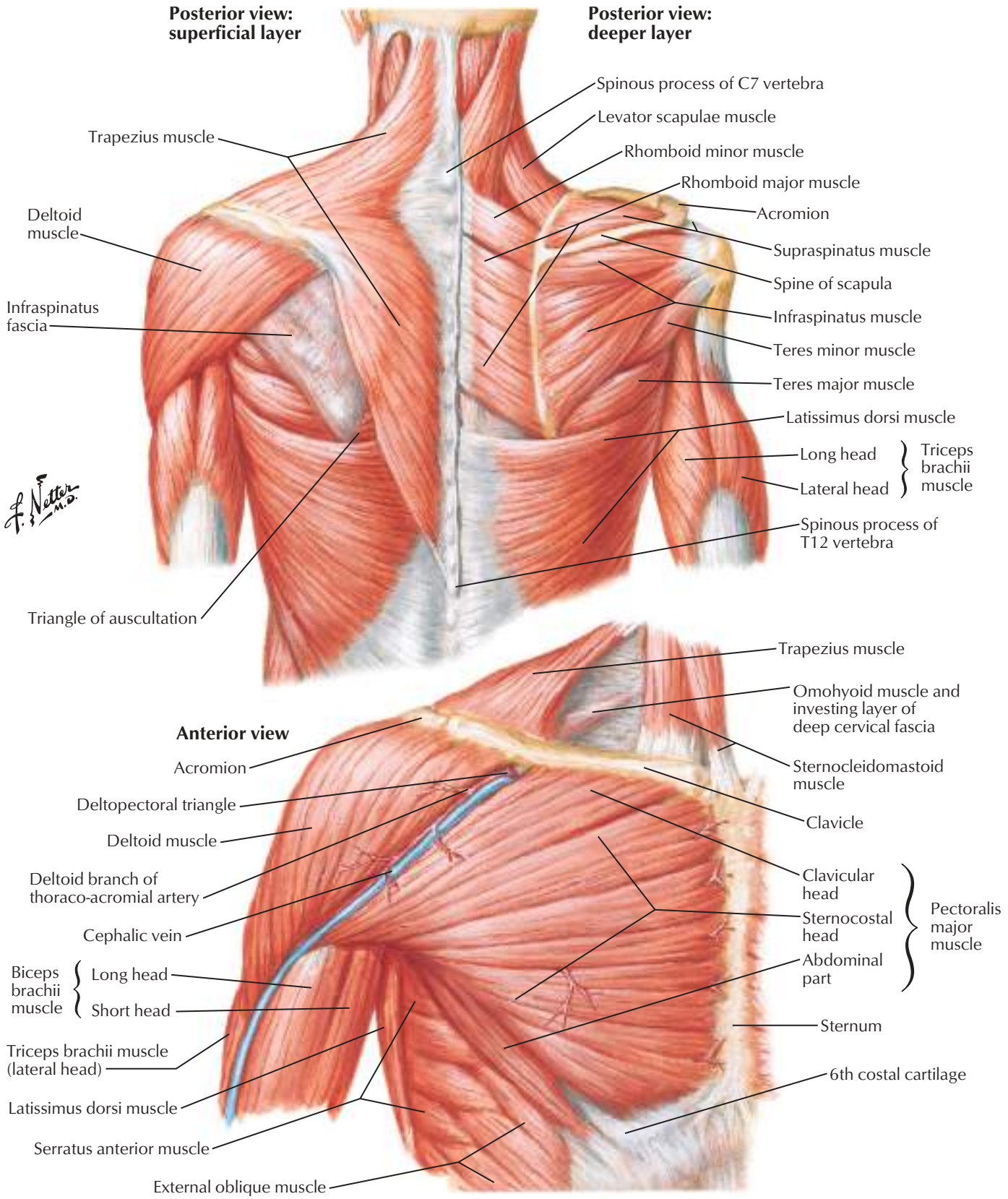


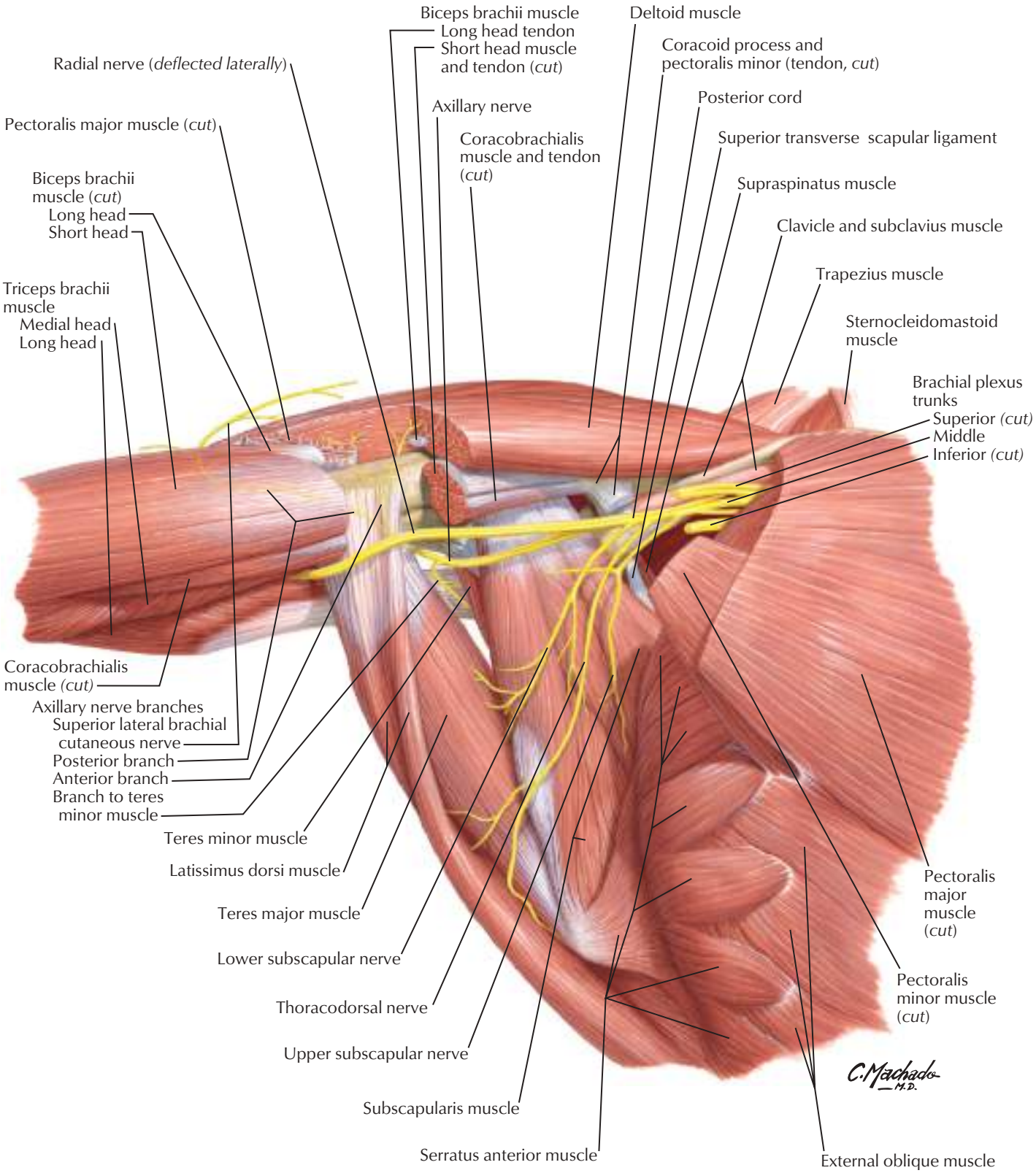
Joint opened: lateral view

Coronal section through joint

Muscles of Shoulder

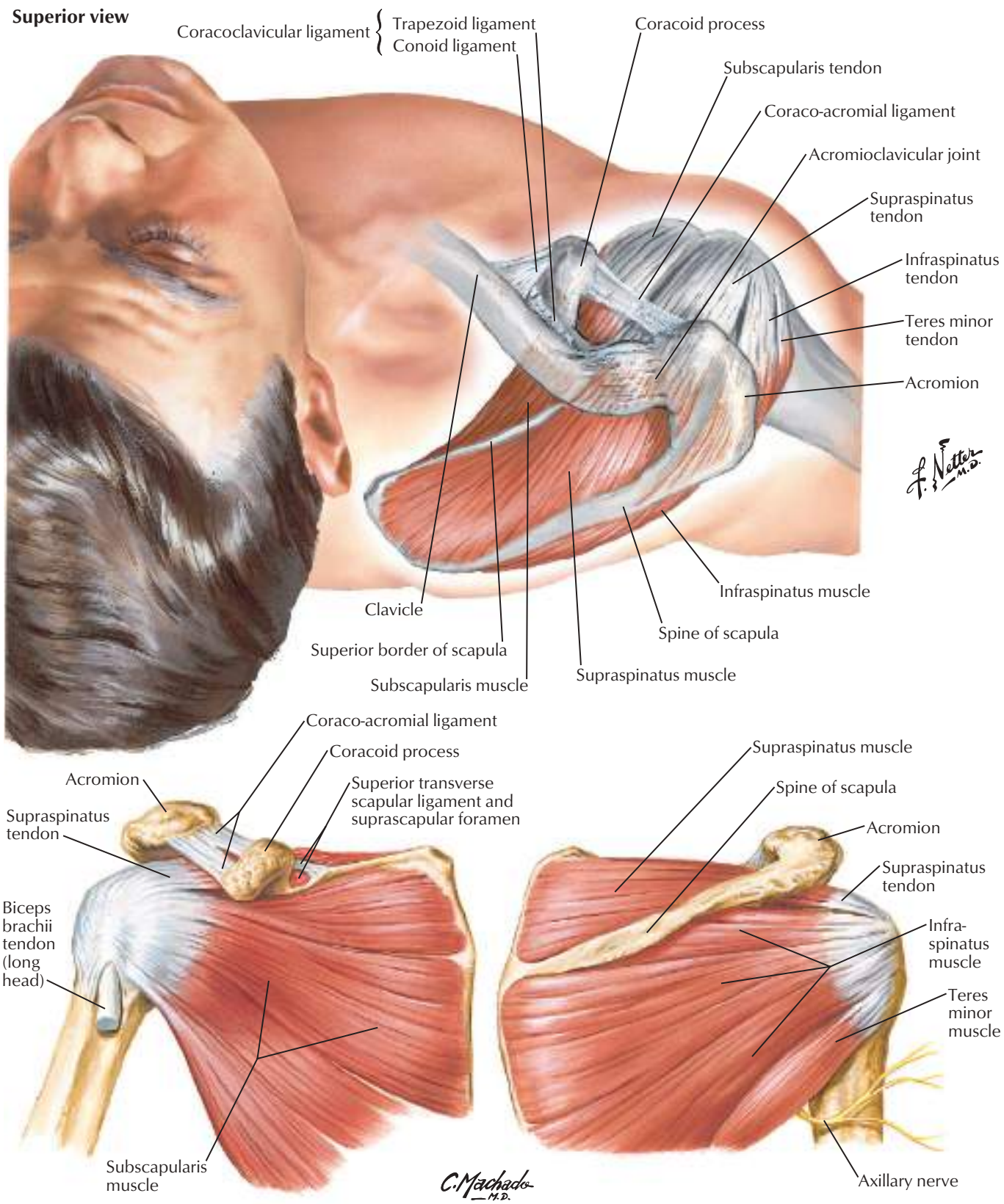
See also Plates 29, 171, 185

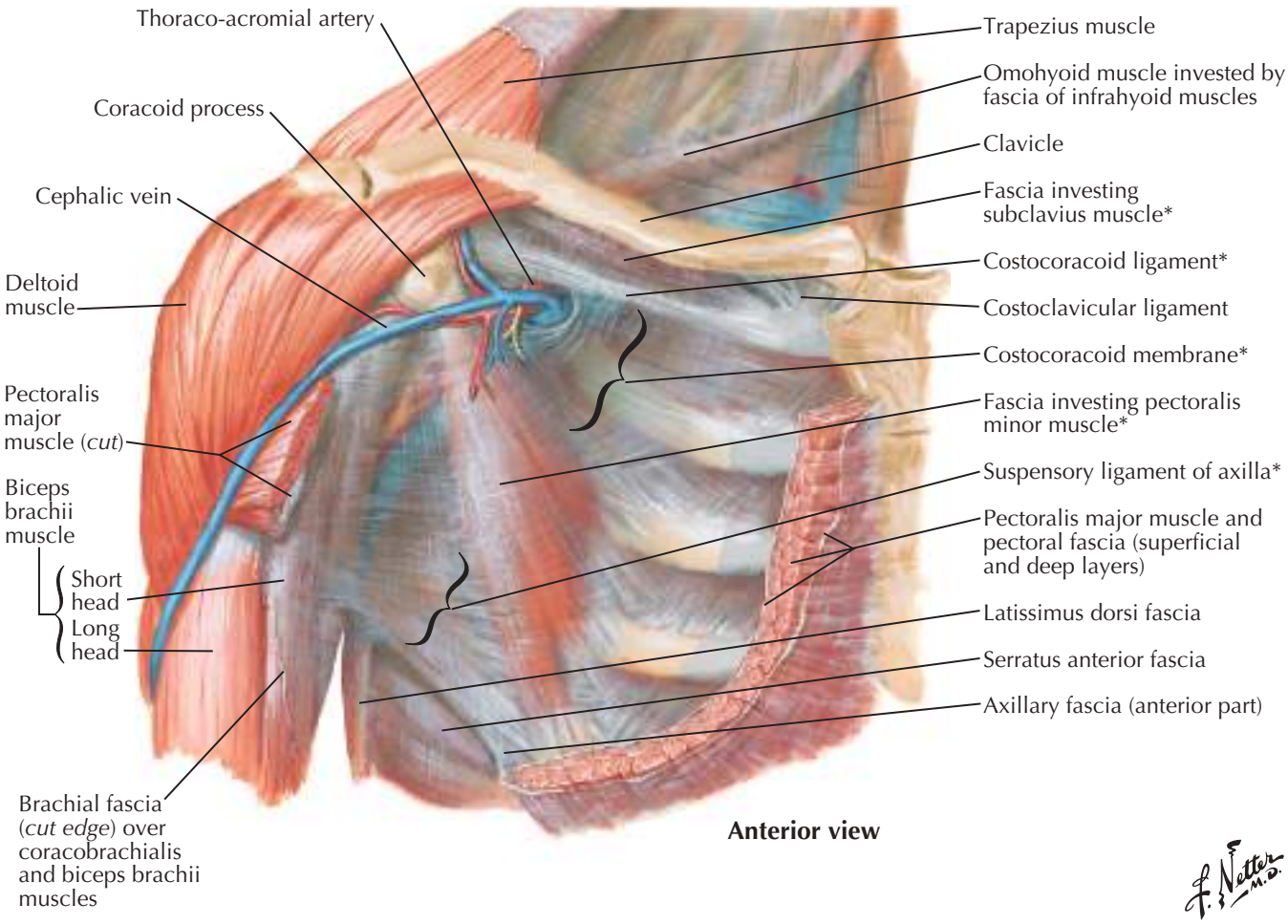



Biceps brachii muscle
Long head tendon
Short head muscle and tendon (cut)
Deltoid muscle
Radial nerve (deflected laterally)
Coracoid process and pectoralis minor (tendon, cut)
Axillary nerve
Posterior cord
Pectoralis major muscle (cut)
Coracobrachialis muscle and tendon (cut)
Superior transverse scapular ligament
Biceps brachii muscle (cut)
Long head
Short head
Supraspinatus muscle
Clavicle and subclavius muscle
Trapezius muscle
Triceps brachii muscle
Medial head
Long head
Sternocleidomastoid muscle
Brachial plexus trunks
Superior (cut)
Middle
Inferior (cut)
Coracobrachialis muscle (cut)
Axillary nerve branches
Superior lateral brachial cutaneous nerve
Posterior branch
Anterior branch
Branch to teres minor muscle
Teres minor muscle
Latissimus dorsi muscle
Teres major muscle
Lower subscapular nerve
Thoracodorsal nerve
Upper subscapular nerve
Subscapularis muscle
Serratus anterior muscle
Pectoralis major muscle (cut)
Pectoralis minor muscle (cut)
External oblique muscle
C. Machado M.D.

Muscles of Rotator Cuff

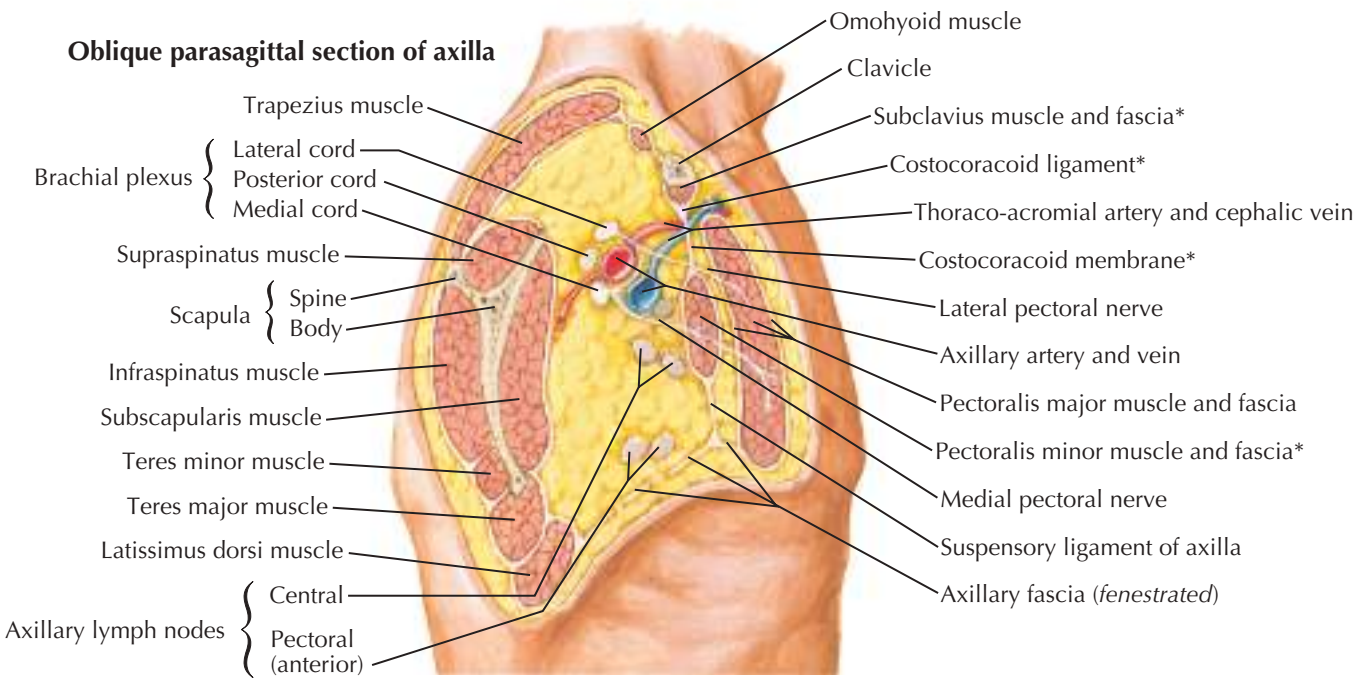
See also **Plates 408, 417, 418**





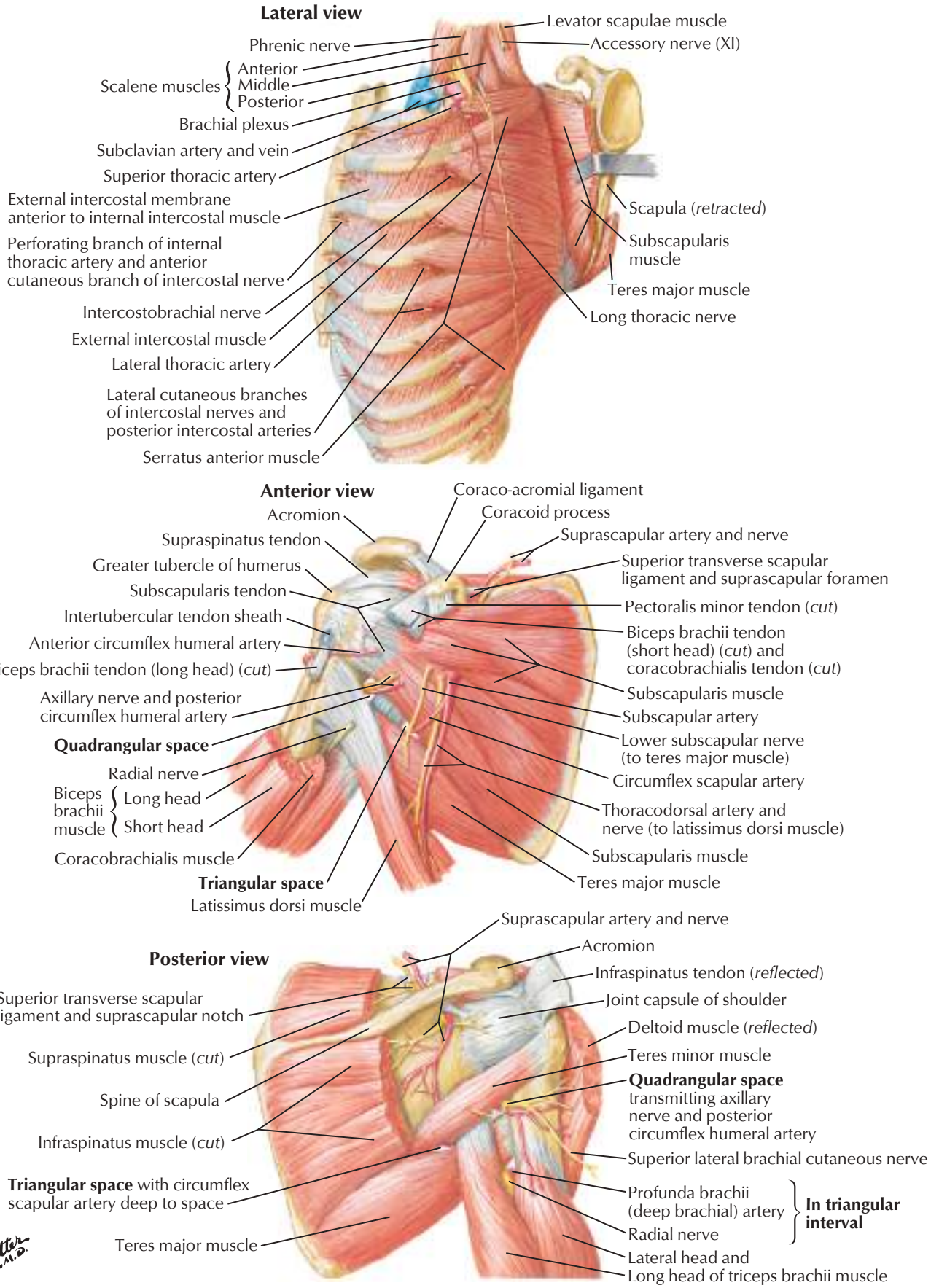
Anterior view

Oblique parasagittal section of axilla



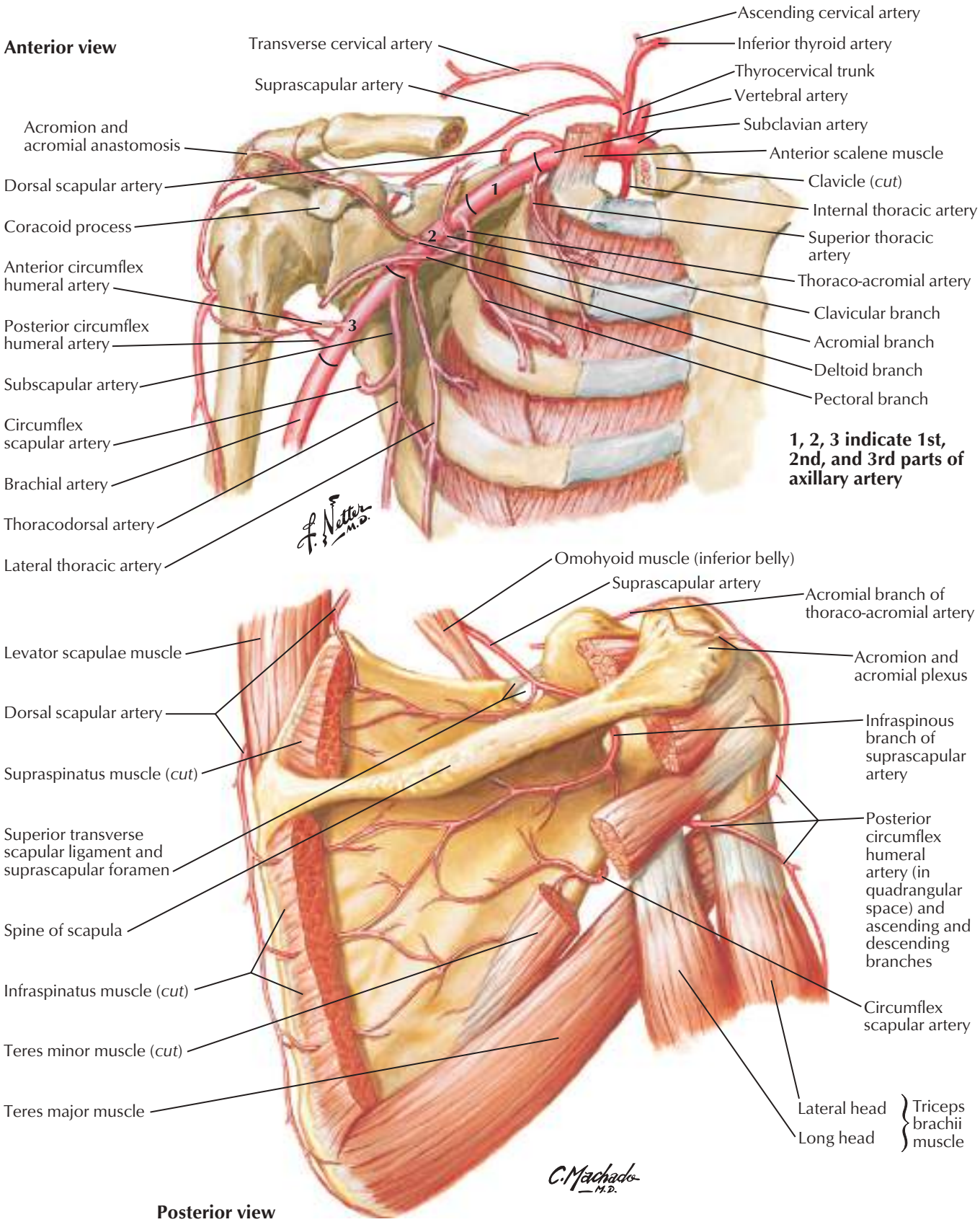
*Components of clavipectoral fascia

See also Plates 415, 465



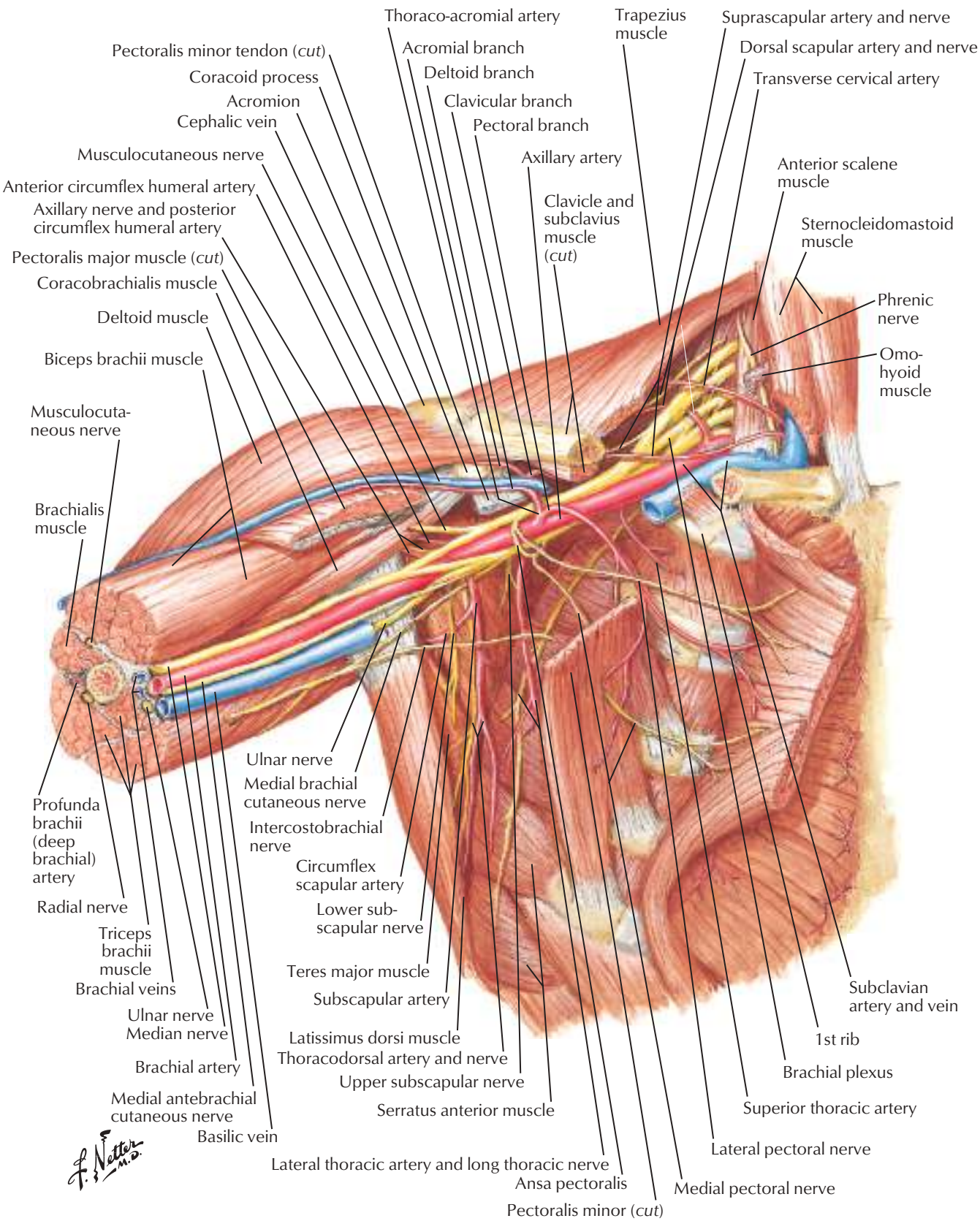
Axillary Artery and Anastomoses around Scapula

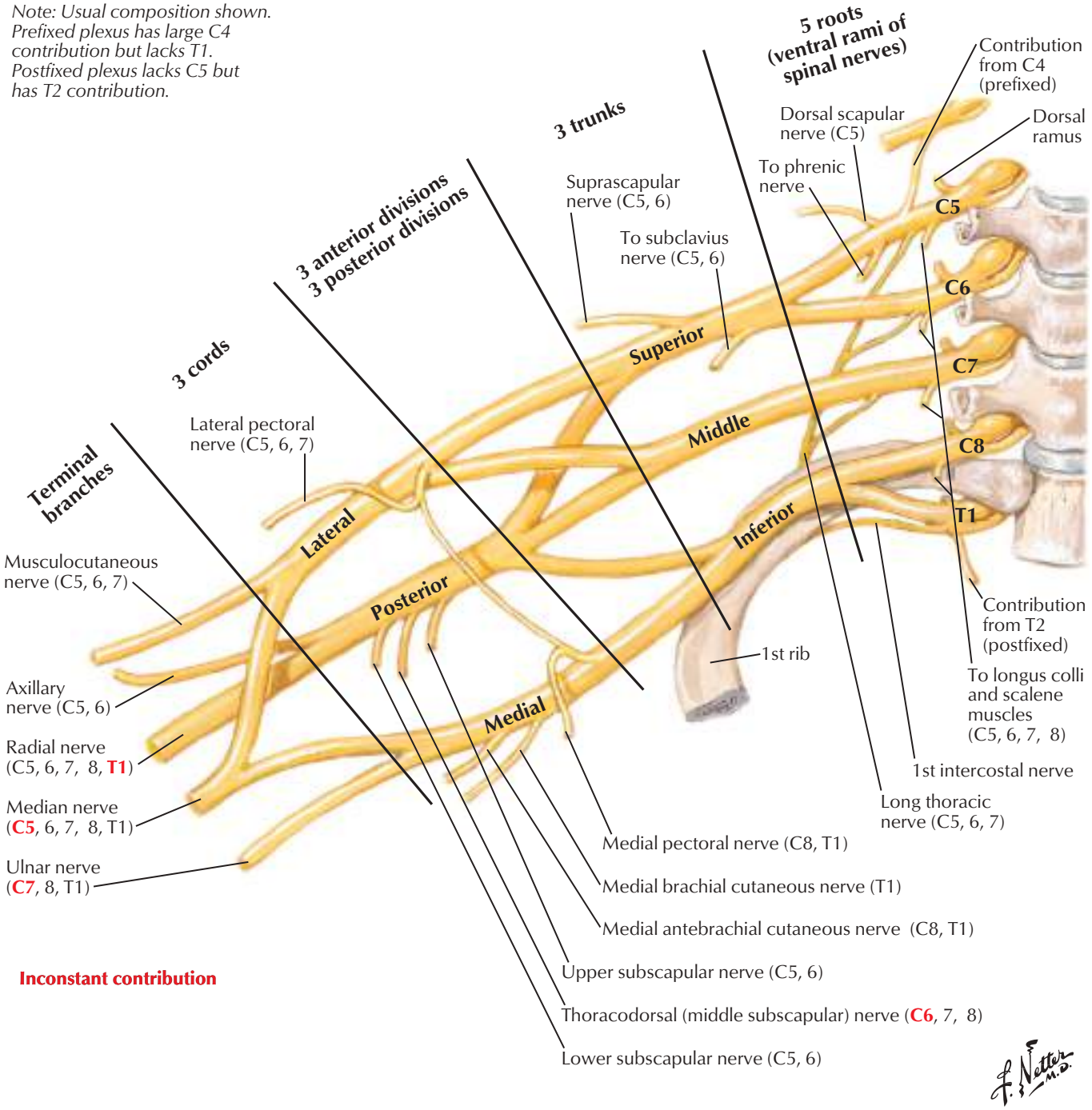
See also Plates 33, 420



Axilla (Dissection): Anterior View

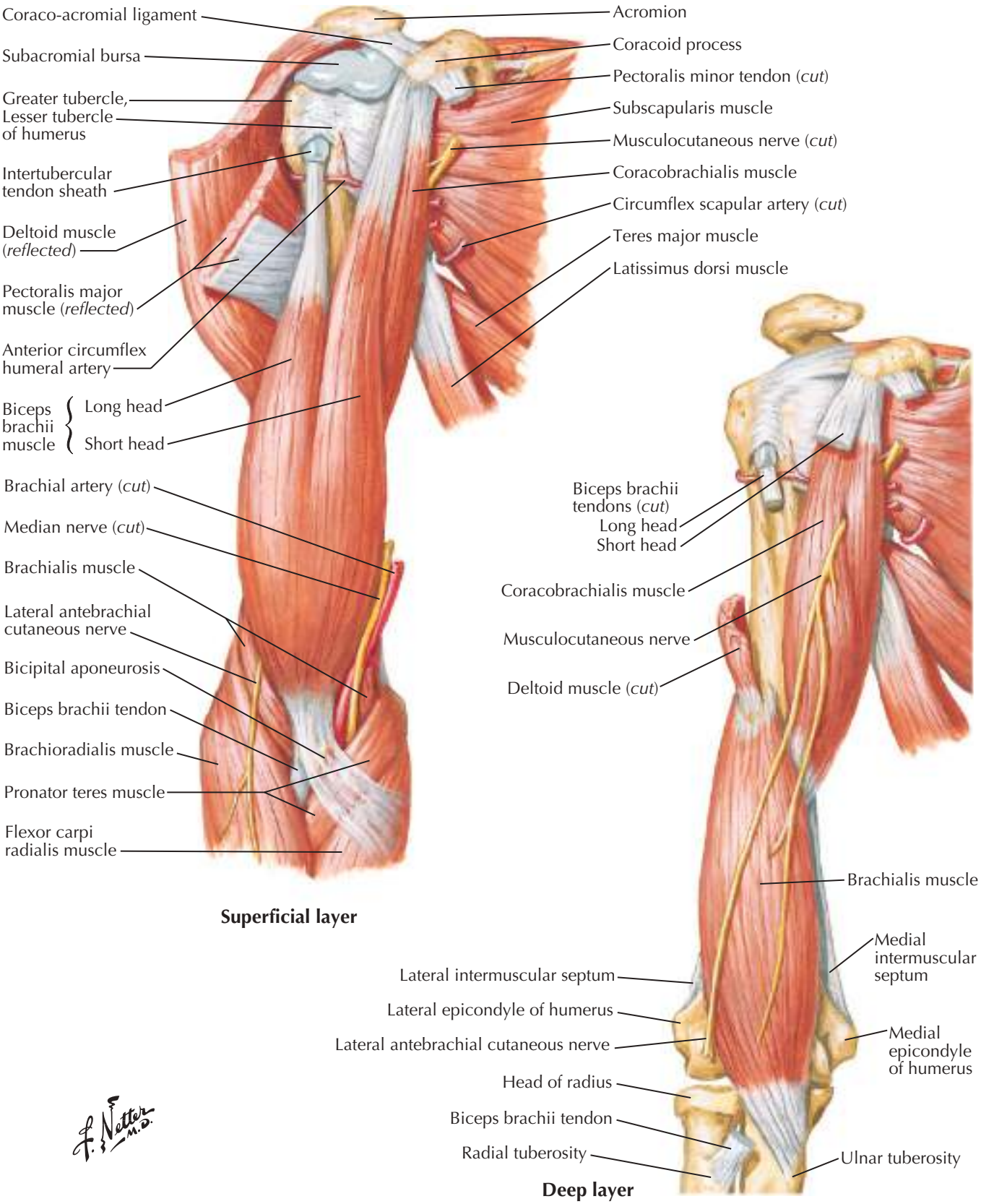
See also Plates 410, 413




Note: Usual composition shown. Prefixed plexus has large C4 contribution but lacks T1. Postfixed plexus lacks C5 but has T2 contribution.
5 roots (ventral rami of spinal nerves)
3 trunks
3 anterior divisions
3 posterior divisions
3 cords
Terminal branches
Contribution from C4 (prefixed)
Dorsal scapular nerve (C5)
Dorsal ramus
To phrenic nerve
Suprascapular nerve (C5, 6)
To subclavius nerve (C5, 6)
C5
C6
C7
C8
T1
Superior
Middle
Inferior
Lateral
Posterior
Medial
Lateral pectoral nerve (C5, 6, 7)
Musculocutaneous nerve (C5, 6, 7)
Axillary nerve (C5, 6)
Radial nerve (C5, 6, 7, 8, T1)
Median nerve (C5, 6, 7, 8, T1)
Ulnar nerve (C7, 8, T1)
1st rib
Contribution from T2 (postfixed)
To longus colli and scalene muscles (C5, 6, 7, 8)
1st intercostal nerve
Long thoracic nerve (C5, 6, 7)
Medial pectoral nerve (C8, T1)
Medial brachial cutaneous nerve (T1)
Medial antebrachial cutaneous nerve (C8, T1)
Upper subscapular nerve (C5, 6)
Thoracodorsal (middle subscapular) nerve (C6, 7, 8)
Lower subscapular nerve (C5, 6)
Inconstant contribution

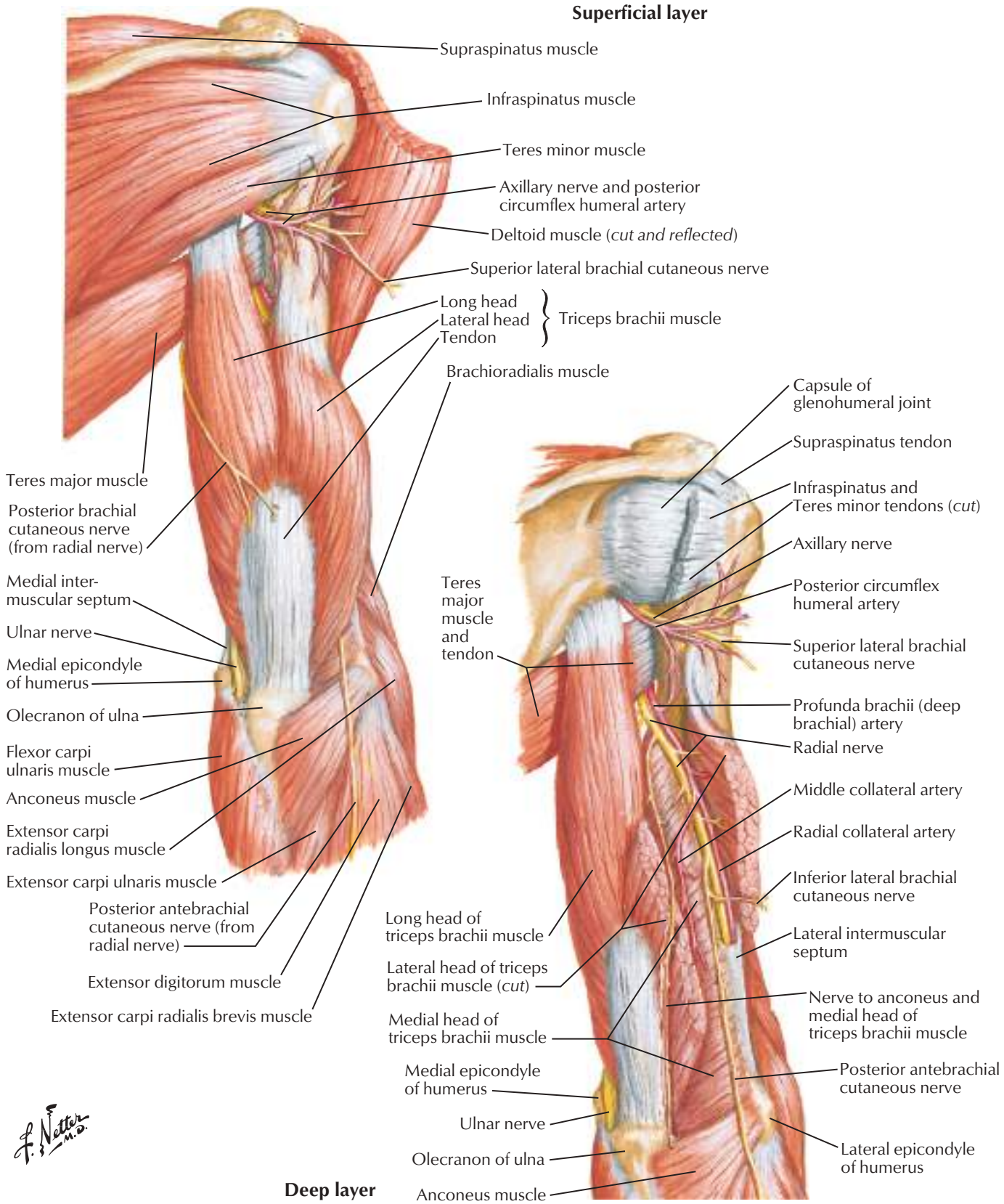
Muscles of Arm: Anterior Views

See also Plates 411, 462



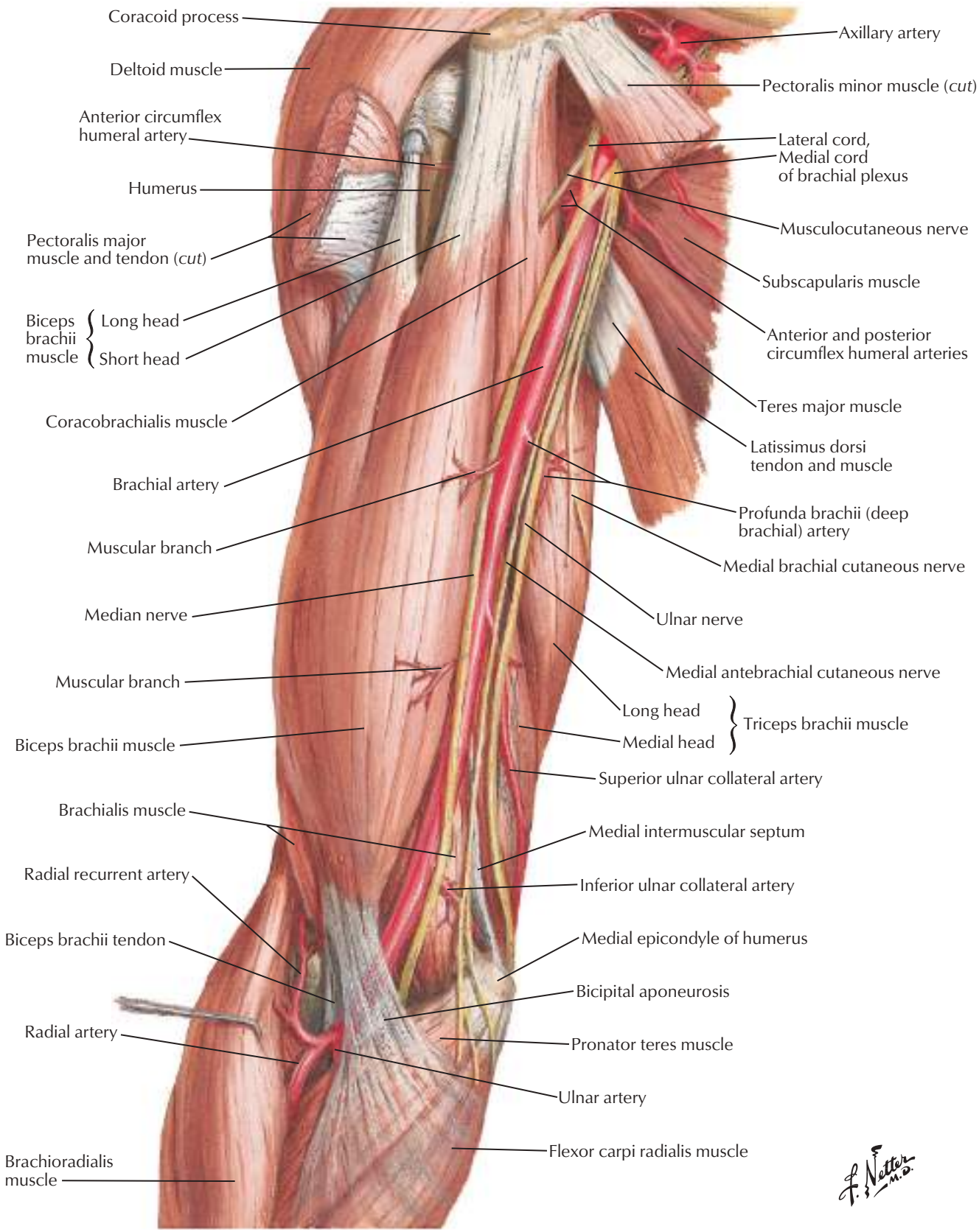
Superficial layer

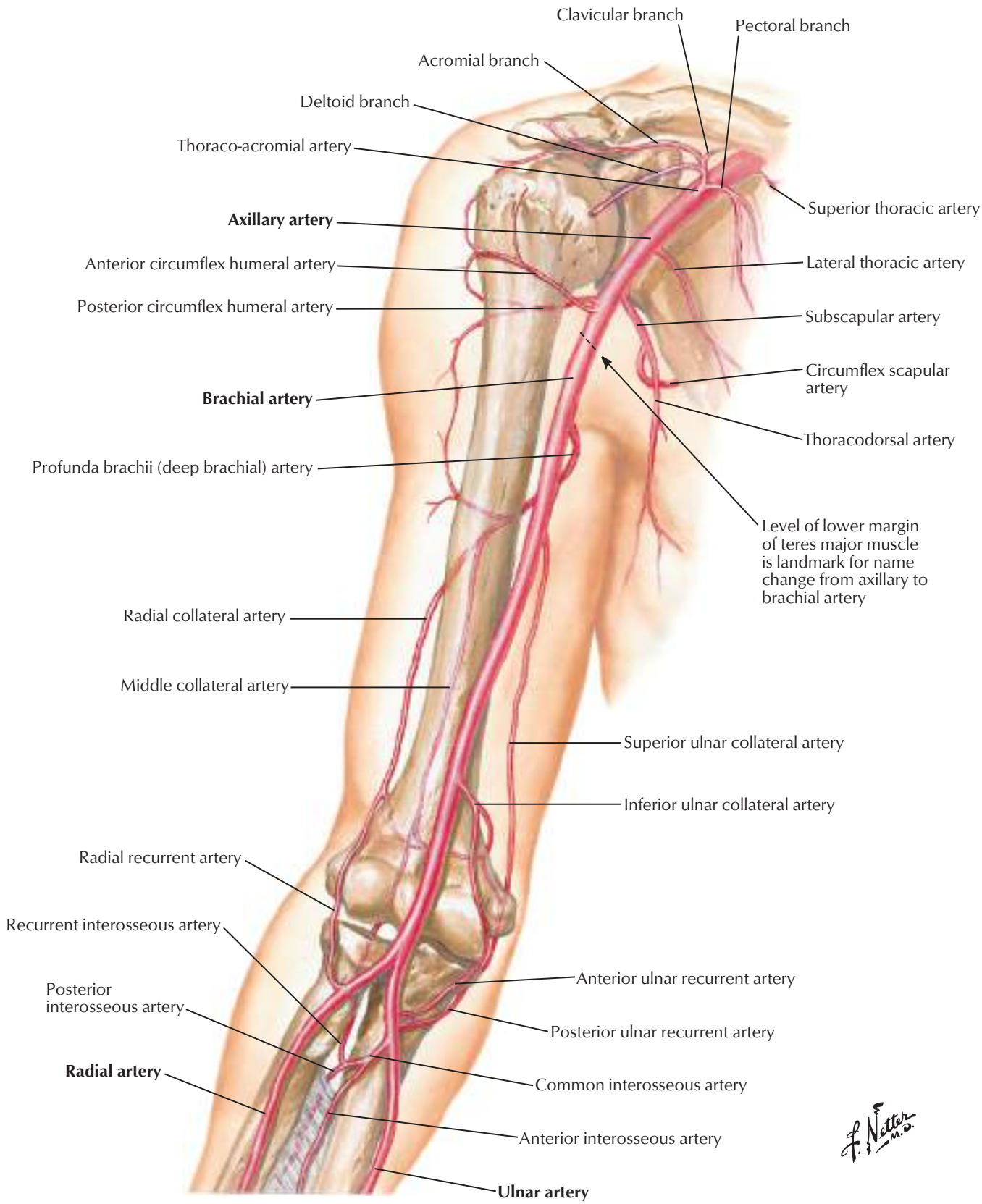
Deep layer

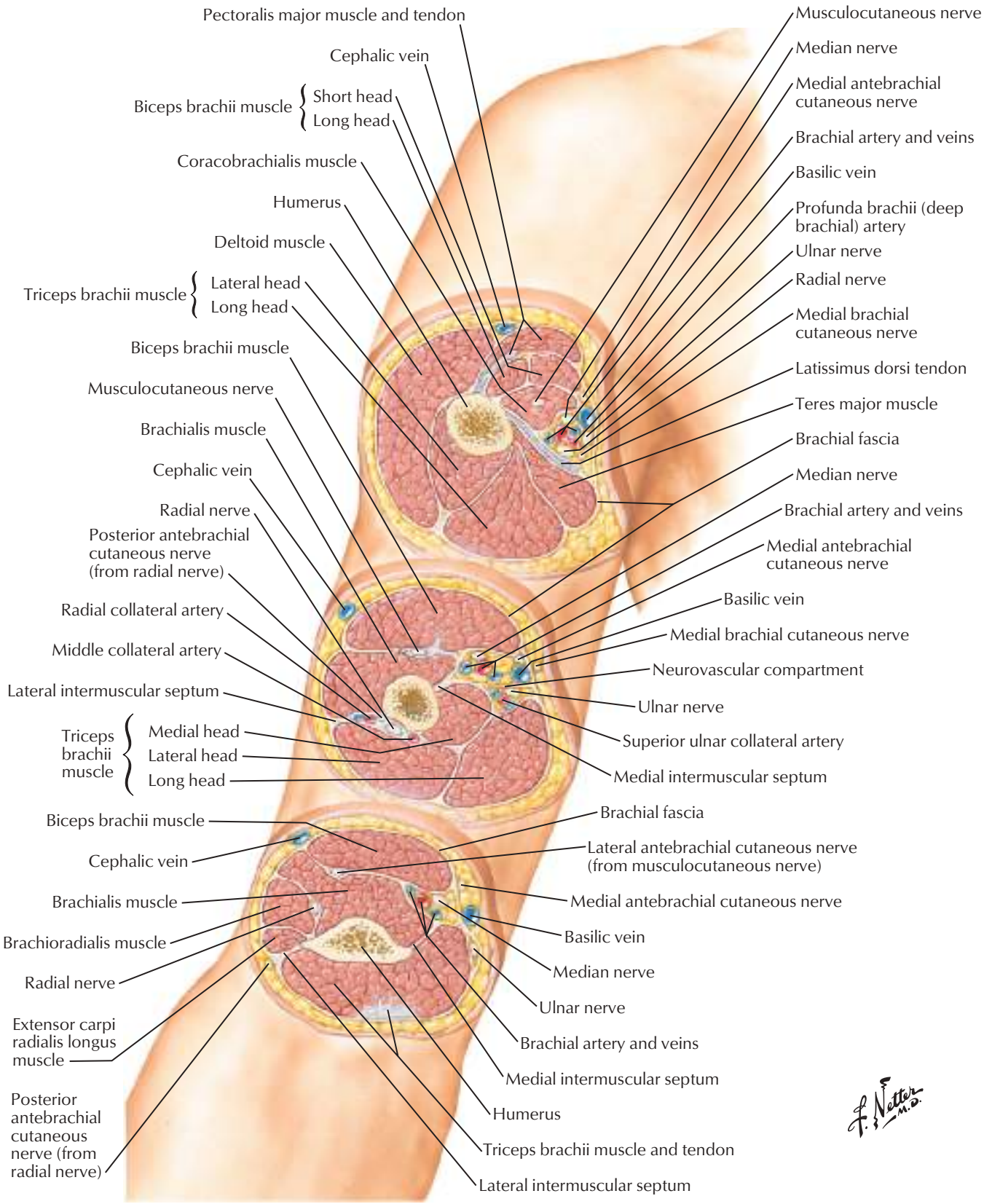

Superficial layer
Supraspinatus muscle
Infraspinatus muscle
Teres minor muscle
Axillary nerve and posterior circumflex humeral artery
Deltoid muscle (cut and reflected)
Superior lateral brachial cutaneous nerve
Long head
Lateral head
Tendon
Triceps brachii muscle
Brachioradialis muscle
Teres major muscle
Posterior brachial cutaneous nerve (from radial nerve)
Medial inter-muscular septum
Ulnar nerve
Medial epicondyle of humerus
Olecranon of ulna
Flexor carpi ulnaris muscle
Anconeus muscle
Extensor carpi radialis longus muscle
Extensor carpi ulnaris muscle
Posterior antebrachial cutaneous nerve (from radial nerve)
Extensor digitorum muscle
Extensor carpi radialis brevis muscle
Capsule of glenohumeral joint
Supraspinatus tendon
Infraspinatus and Teres minor tendons (cut)
Axillary nerve
Posterior circumflex humeral artery
Teres major muscle and tendon
Superior lateral brachial cutaneous nerve
Profunda brachii (deep brachial) artery
Radial nerve
Middle collateral artery
Radial collateral artery
Inferior lateral brachial cutaneous nerve
Lateral intermuscular septum
Long head of triceps brachii muscle
Lateral head of triceps brachii muscle (cut)
Nerve to anconeus and medial head of triceps brachii muscle
Medial head of triceps brachii muscle
Posterior antebrachial cutaneous nerve
Medial epicondyle of humerus
Ulnar nerve
Olecranon of ulna
Lateral epicondyle of humerus
Anconeus muscle
Deep layer

Brachial Artery in Situ

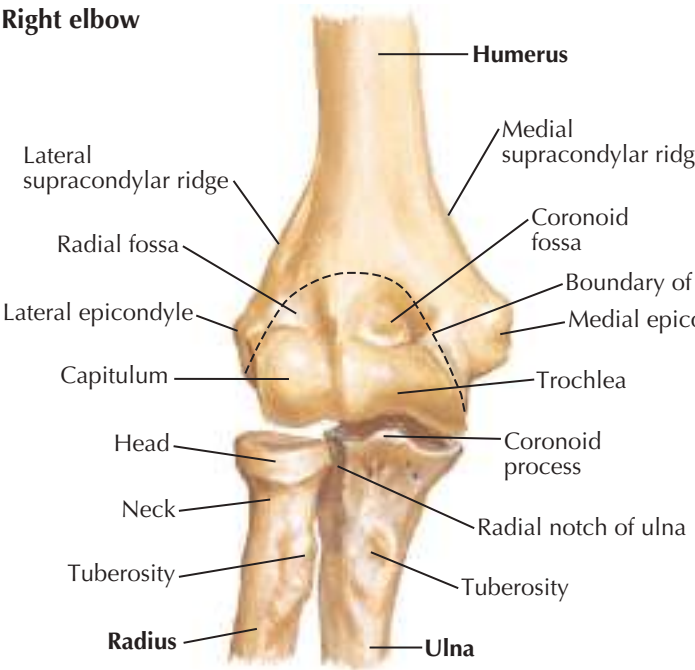
See also **Plate 401**



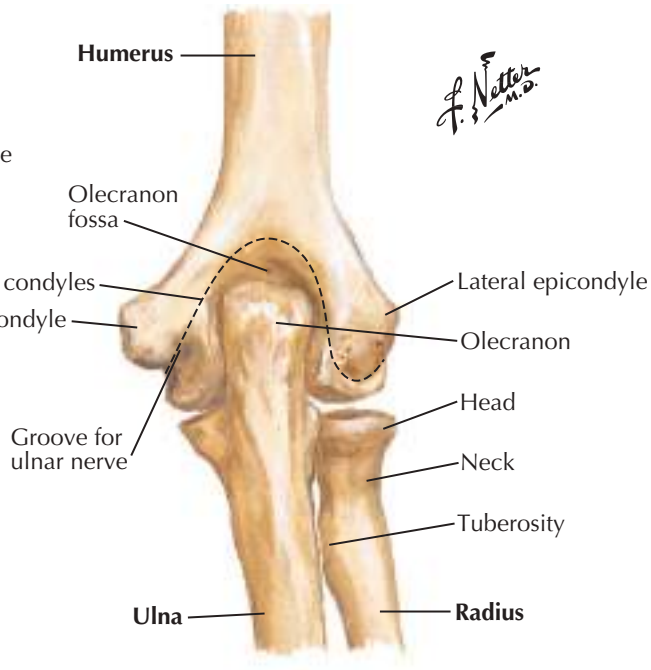

Clavicular branch
Pectoral branch
Acromial branch
Deltoid branch
Thoraco-acromial artery
Superior thoracic artery
Axillary artery
Anterior circumflex humeral artery
Lateral thoracic artery
Posterior circumflex humeral artery
Subscapular artery
Circumflex scapular artery
Brachial artery
Thoracodorsal artery
Profunda brachii (deep brachial) artery
Level of lower margin of teres major muscle is landmark for name change from axillary to brachial artery
Radial collateral artery
Middle collateral artery
Superior ulnar collateral artery
Inferior ulnar collateral artery
Radial recurrent artery
Recurrent interosseous artery
Anterior ulnar recurrent artery
Posterior interosseous artery
Posterior ulnar recurrent artery
Radial artery
Common interosseous artery
Anterior interosseous artery
Ulnar artery


Pectoralis major muscle and tendon
Cephalic vein
Biceps brachii muscle
Short head
Long head
Coracobrachialis muscle
Humerus
Deltoid muscle
Triceps brachii muscle
Lateral head
Long head
Biceps brachii muscle
Musculocutaneous nerve
Brachialis muscle
Cephalic vein
Radial nerve
Posterior antebrachial cutaneous nerve (from radial nerve)
Radial collateral artery
Middle collateral artery
Lateral intermuscular septum
Triceps brachii muscle
Medial head
Lateral head
Long head
Biceps brachii muscle
Cephalic vein
Brachialis muscle
Brachioradialis muscle
Radial nerve
Extensor carpi radialis longus muscle
Posterior antebrachial cutaneous nerve (from radial nerve)
Musculocutaneous nerve
Median nerve
Medial antebrachial cutaneous nerve
Brachial artery and veins
Basilic vein
Profunda brachii (deep brachial) artery
Ulnar nerve
Radial nerve
Medial brachial cutaneous nerve
Latissimus dorsi tendon
Teres major muscle
Brachial fascia
Median nerve
Brachial artery and veins
Medial antebrachial cutaneous nerve
Basilic vein
Medial brachial cutaneous nerve
Neurovascular compartment
Ulnar nerve
Superior ulnar collateral artery
Medial intermuscular septum
Brachial fascia
Lateral antebrachial cutaneous nerve (from musculocutaneous nerve)
Medial antebrachial cutaneous nerve
Basilic vein
Median nerve
Ulnar nerve
Brachial artery and veins
Medial intermuscular septum
Humerus
Triceps brachii muscle and tendon
Lateral intermuscular septum

Right elbow

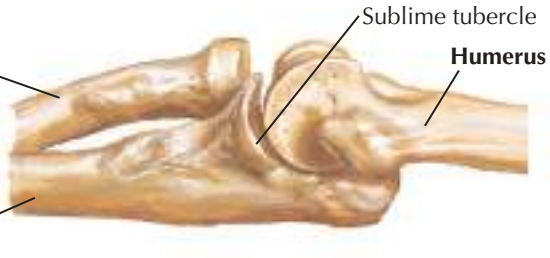


In extension: anterior view

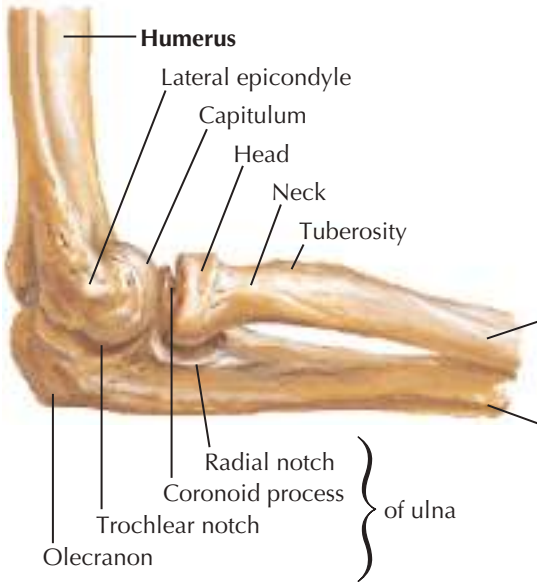


In extension: posterior view

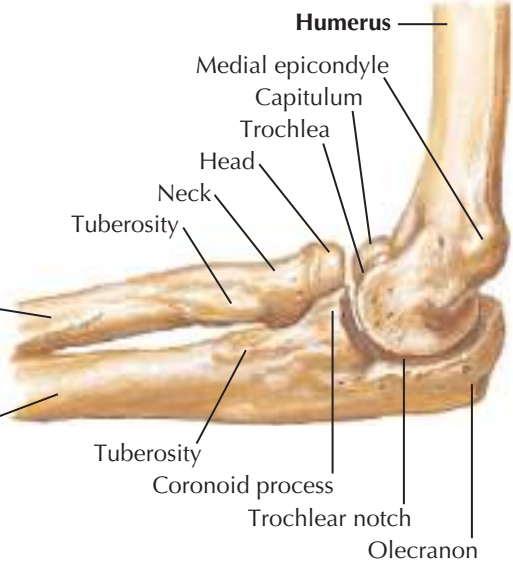
In extension: lateral view



In extension: medial view



In 90° flexion: lateral view

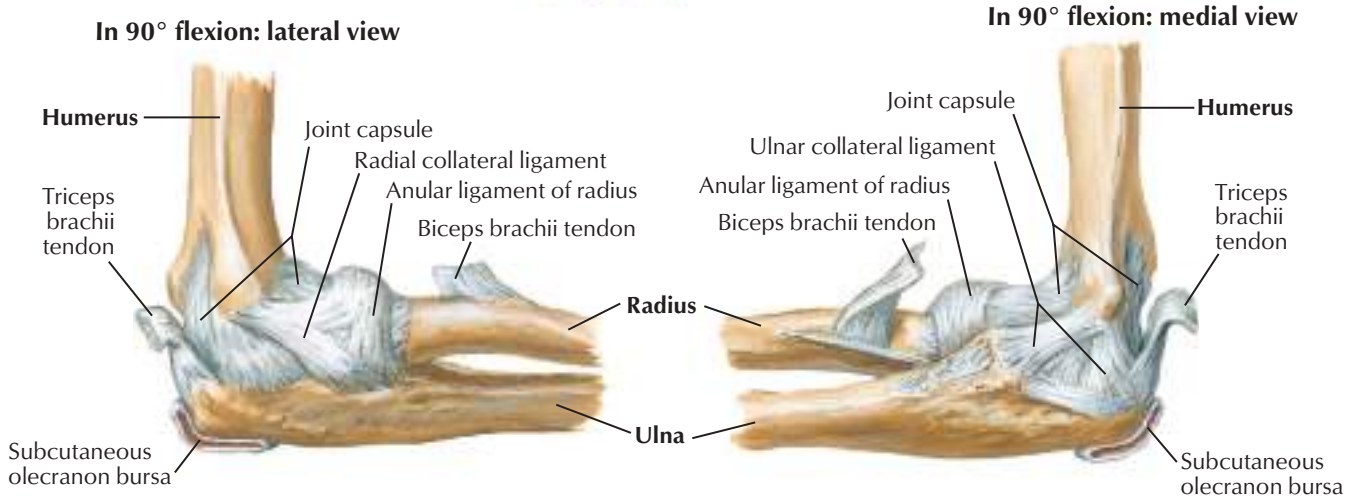


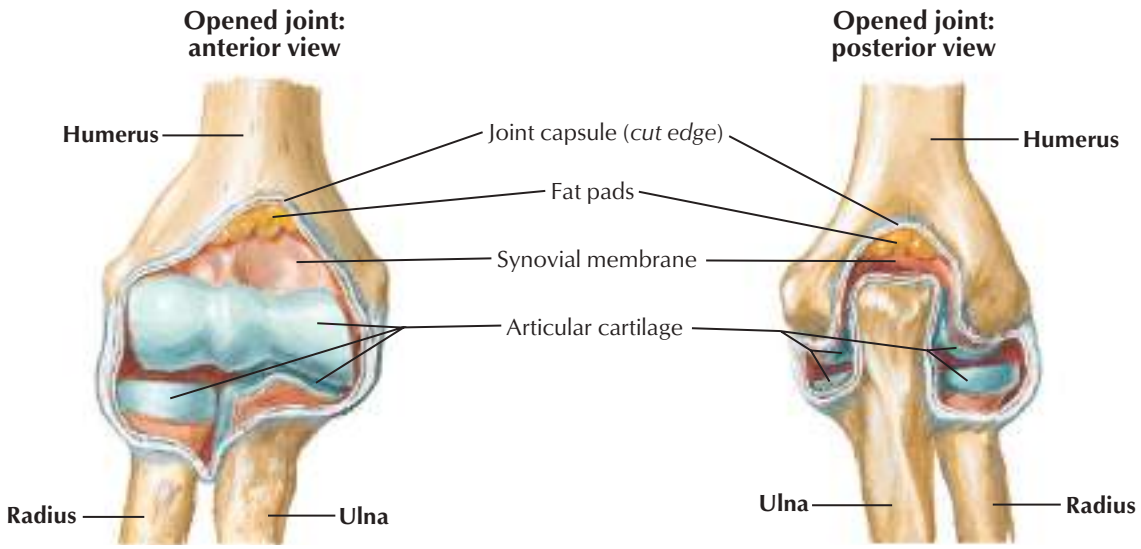
In 90° flexion: medial view

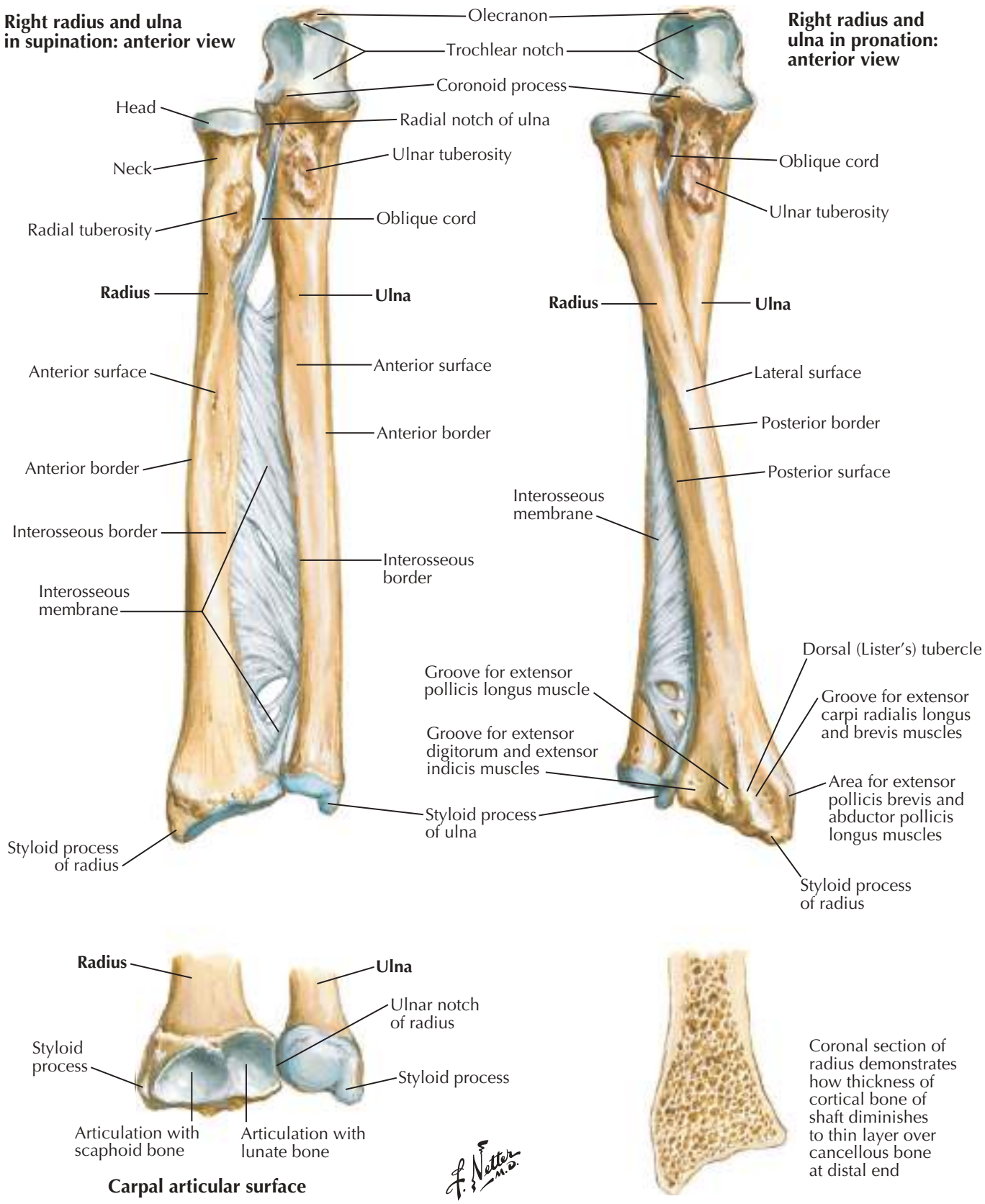
Anteroposterior radiograph

Lateral radiograph

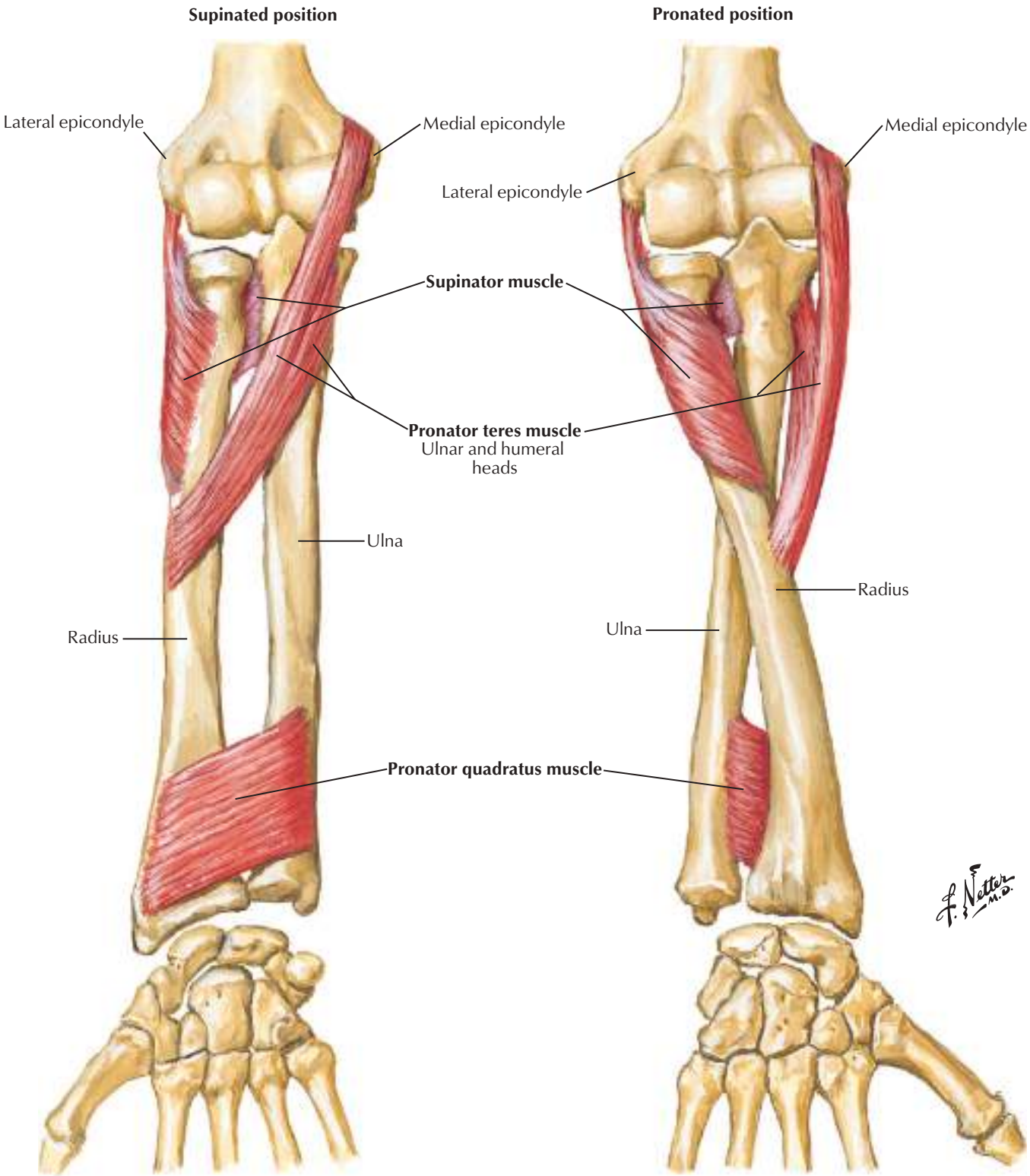
Right elbow: anterior view
Humerus
Joint capsule
Lateral epicondyle
Medial epicondyle
Radial collateral ligament
Ulnar collateral ligament
Anular ligament of radius
Quadrate ligament
Insertion of brachialis muscle
Biceps brachii tendon
Radius
Ulna


In 90° flexion: lateral view
Humerus
Joint capsule
Radial collateral ligament
Anular ligament of radius
Biceps brachii tendon
Triceps brachii tendon
Radius
Ulna
Subcutaneous olecranon bursa
In 90° flexion: medial view
Joint capsule
Humerus
Ulnar collateral ligament
Anular ligament of radius
Biceps brachii tendon
Triceps brachii tendon
Subcutaneous olecranon bursa

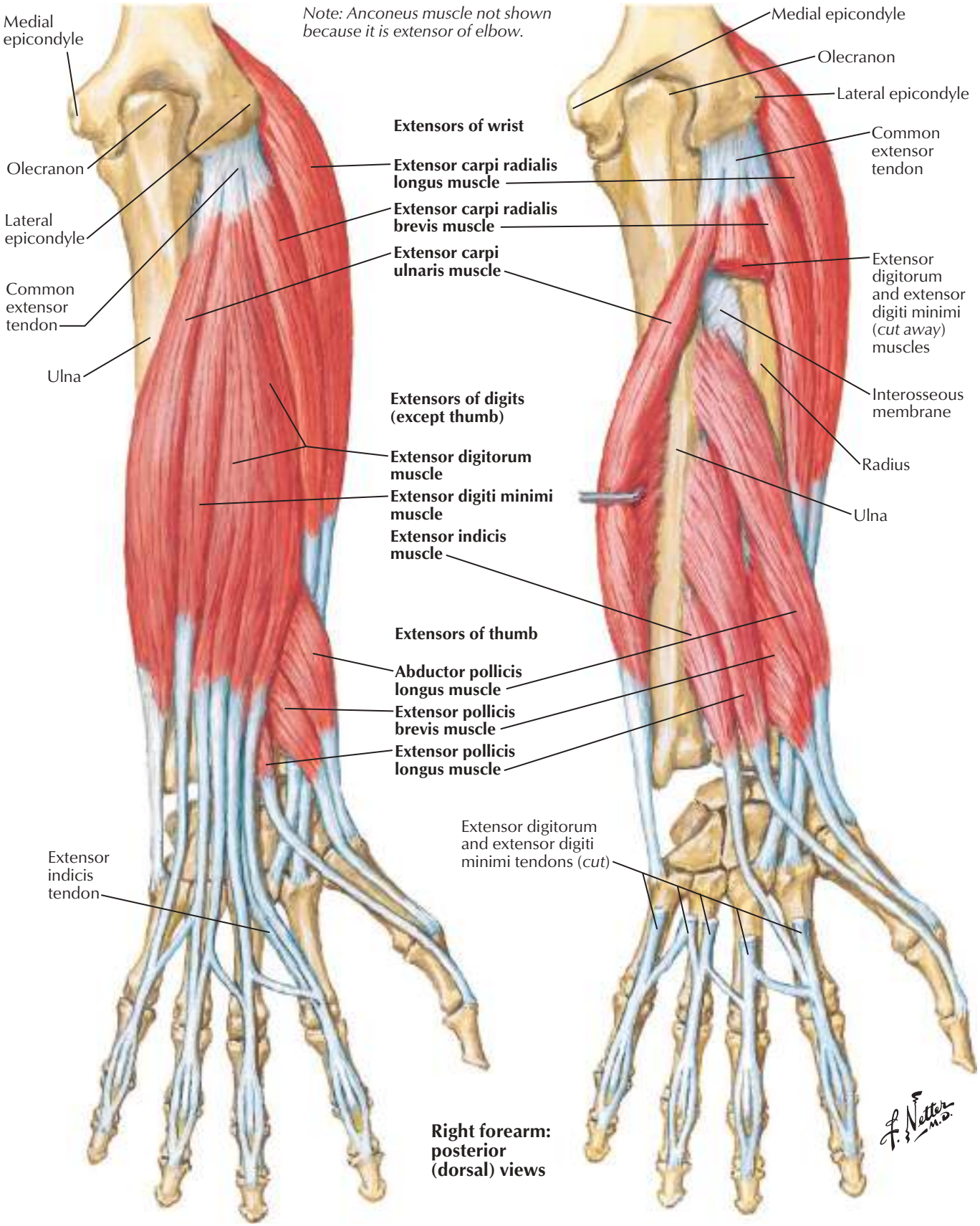

Opened joint: anterior view
Humerus
Joint capsule (cut edge)
Fat pads
Synovial membrane
Articular cartilage
Radius
Ulna
Opened joint: posterior view
Humerus
Ulna
Radius


Right radius and ulna in supination: anterior view
Olecranon
Trochlear notch
Coronoid process
Head
Radial notch of ulna
Neck
Ulnar tuberosity
Radial tuberosity
Oblique cord
Radius
Ulna
Anterior surface
Anterior surface
Anterior border
Anterior border
Interosseous border
Interosseous border
Interosseous membrane
Styloid process of radius
Styloid process of ulna
Right radius and ulna in pronation: anterior view
Oblique cord
Ulnar tuberosity
Radius
Ulna
Lateral surface
Posterior border
Posterior surface
Interosseous membrane
Dorsal (Lister's) tubercle
Groove for extensor pollicis longus muscle
Groove for extensor carpi radialis longus and brevis muscles
Groove for extensor digitorum and extensor indicis muscles
Area for extensor pollicis brevis and abductor pollicis longus muscles
Styloid process of radius
Radius
Ulna
Ulnar notch of radius
Styloid process
Styloid process
Articulation with scaphoid bone
Articulation with lunate bone
Carpal articular surface
Coronal section of radius demonstrates how thickness of cortical bone of shaft diminishes to thin layer over cancellous bone at distal end

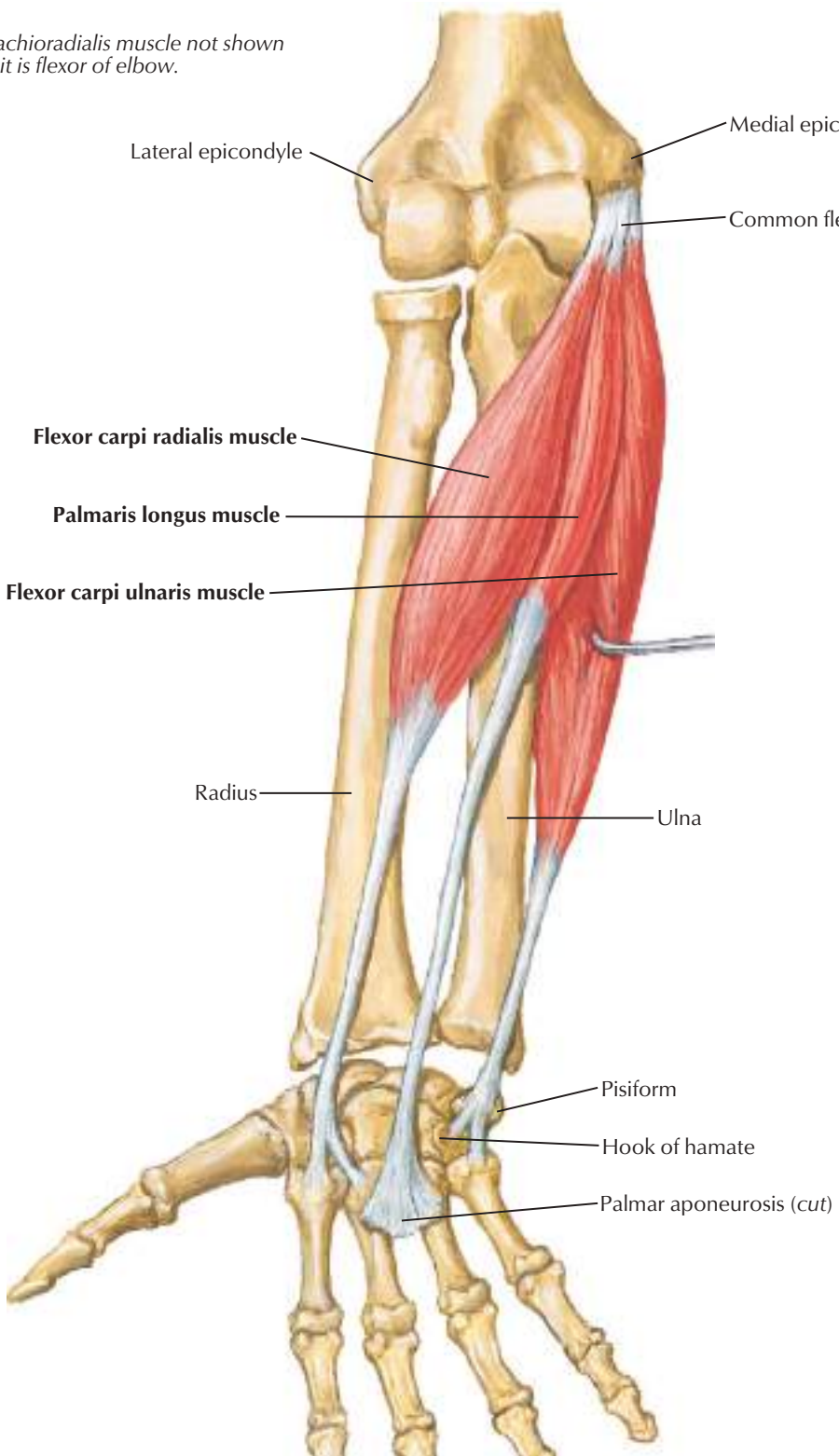
Right forearm: anterior view



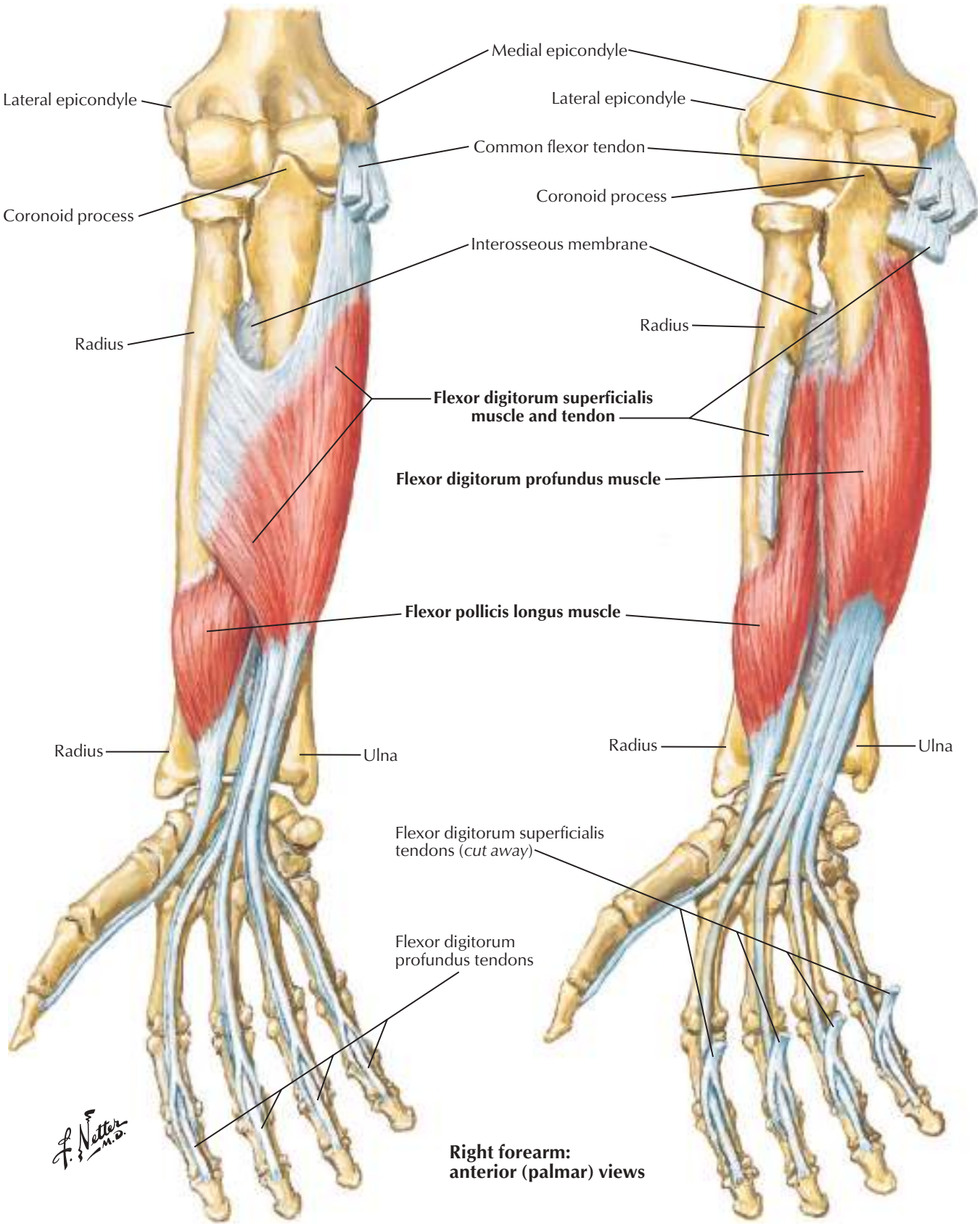
See also Plate 438



Note: Brachioradialis muscle not shown because it is flexor of elbow.



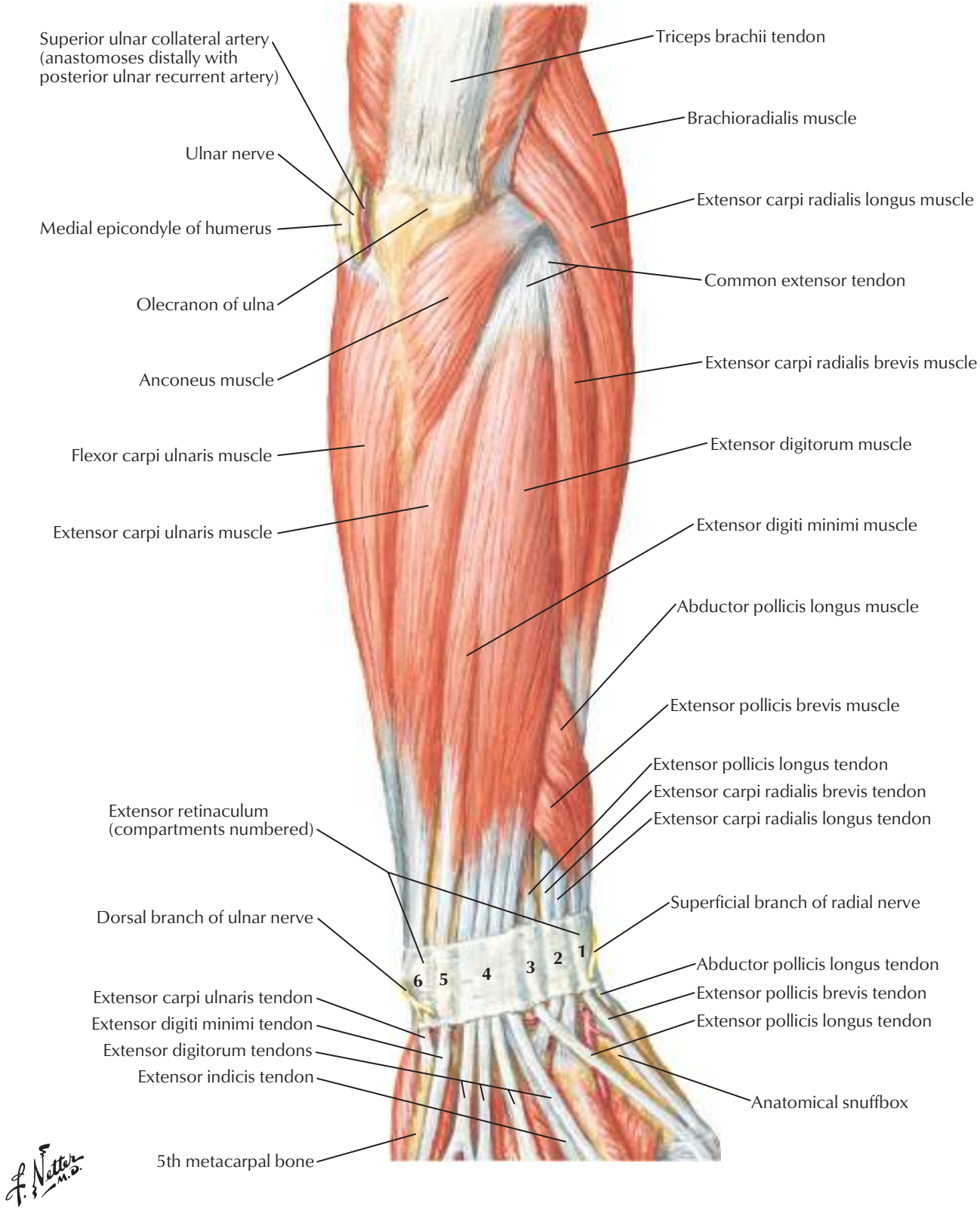
Right forearm: anterior (palmar) view



Right forearm: anterior (palmar) views

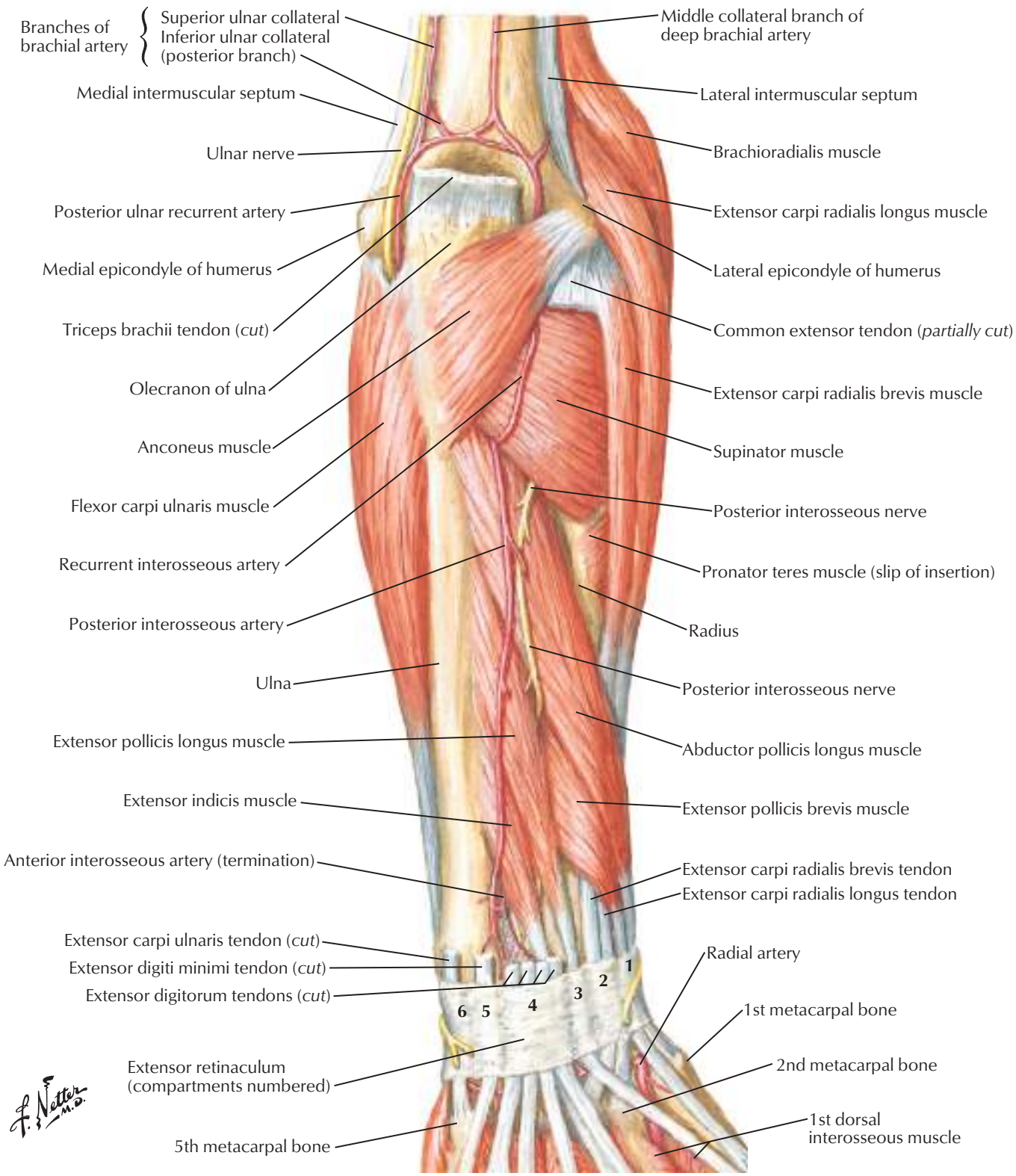
Muscles of Forearm (Superficial Layer): Posterior View

See also Plates 457, 466



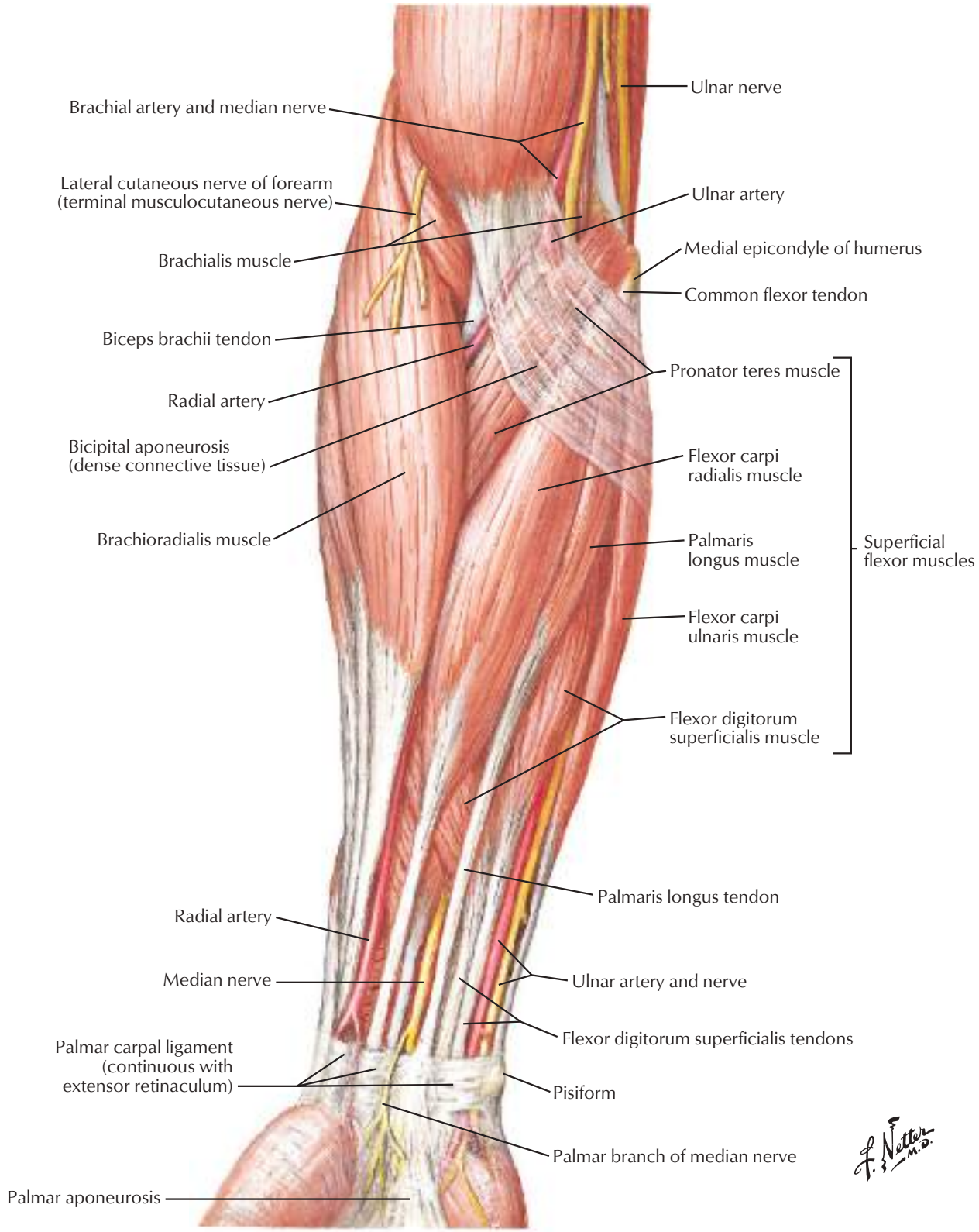
Muscles of Forearm (Deep Layer): Posterior View

See also **Plates 402, 457**



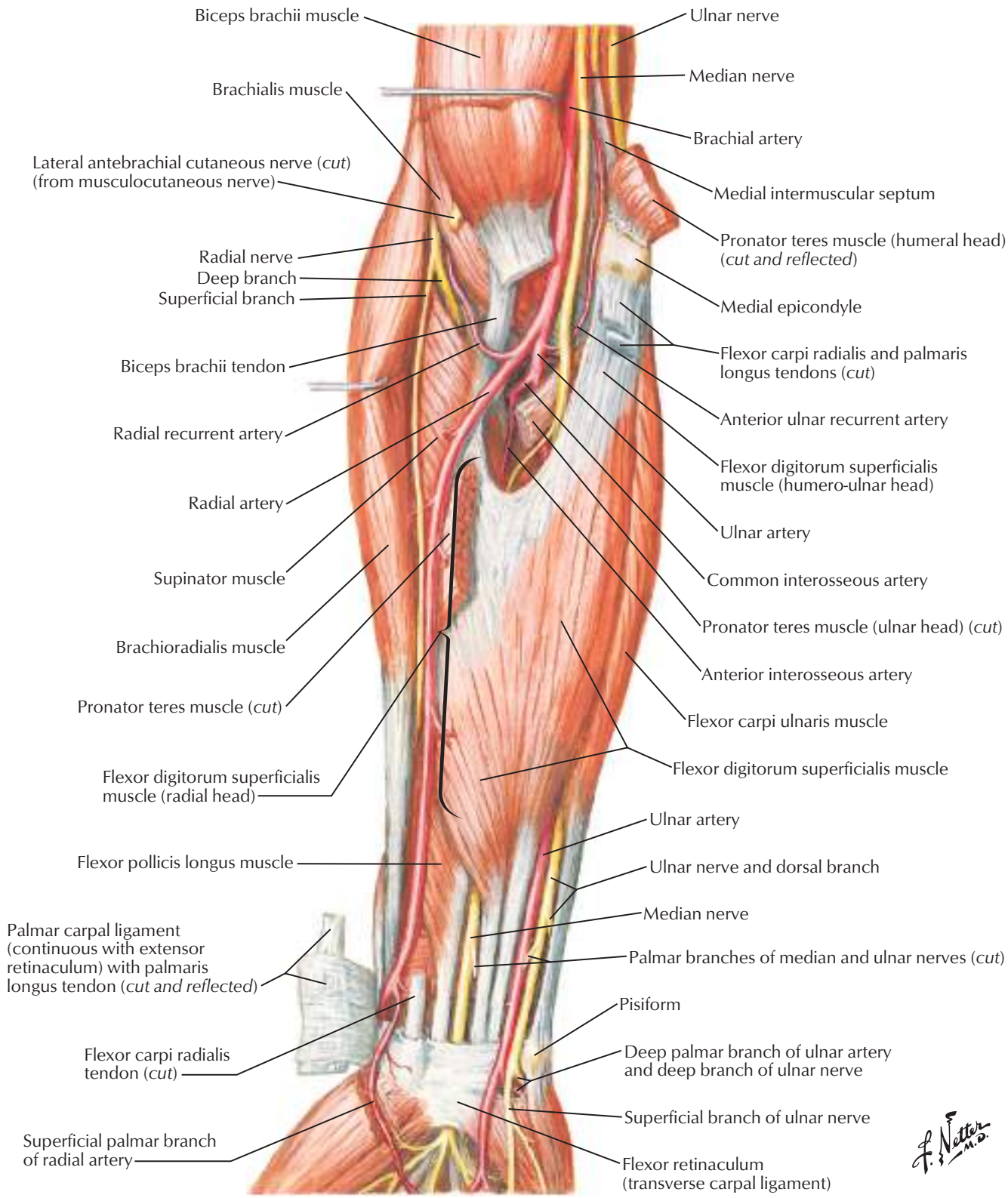
Muscles of Forearm (Superficial Layer): Anterior View

See also Plates 463, 464



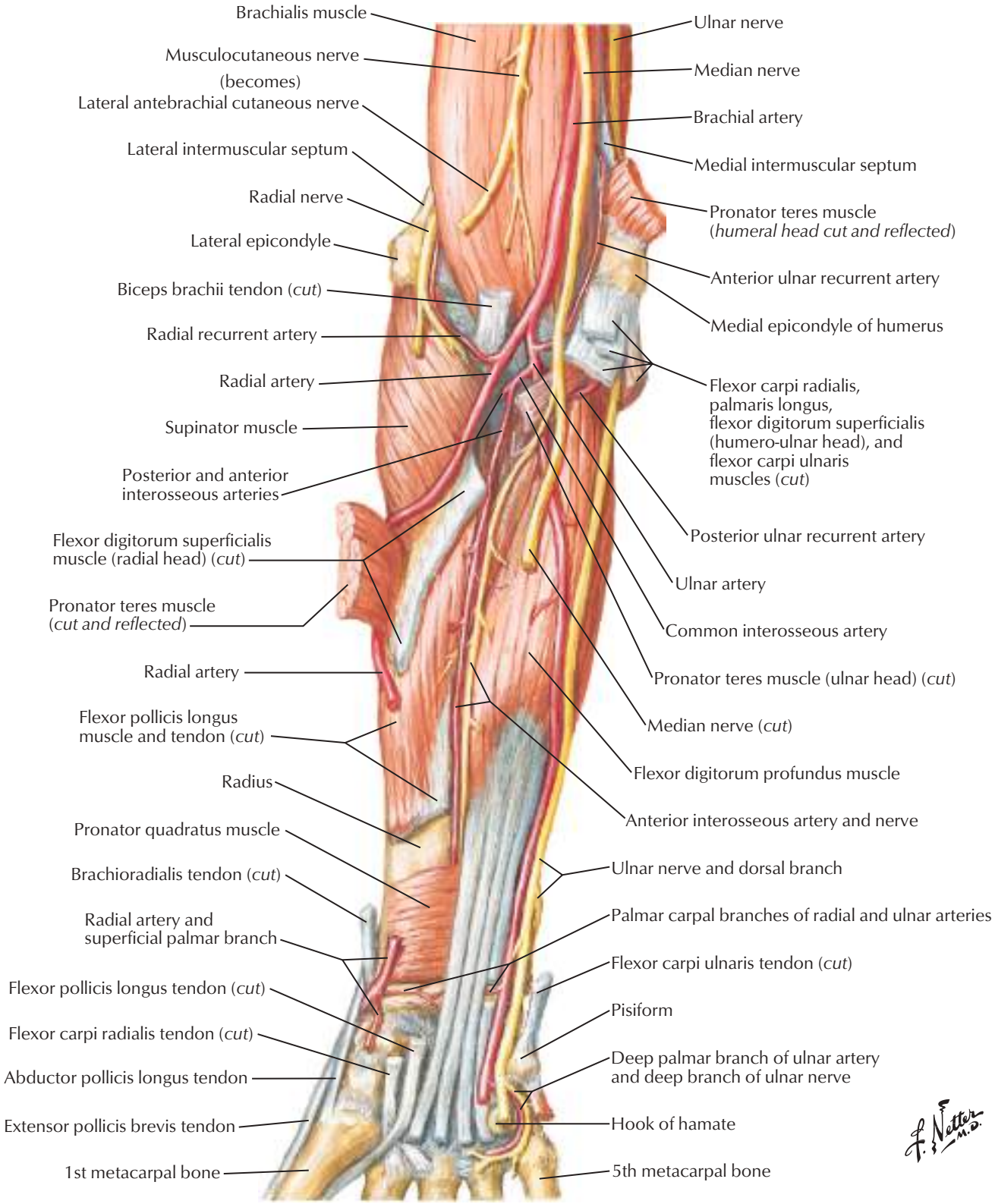
Muscles of Forearm (Intermediate Layer): Anterior View

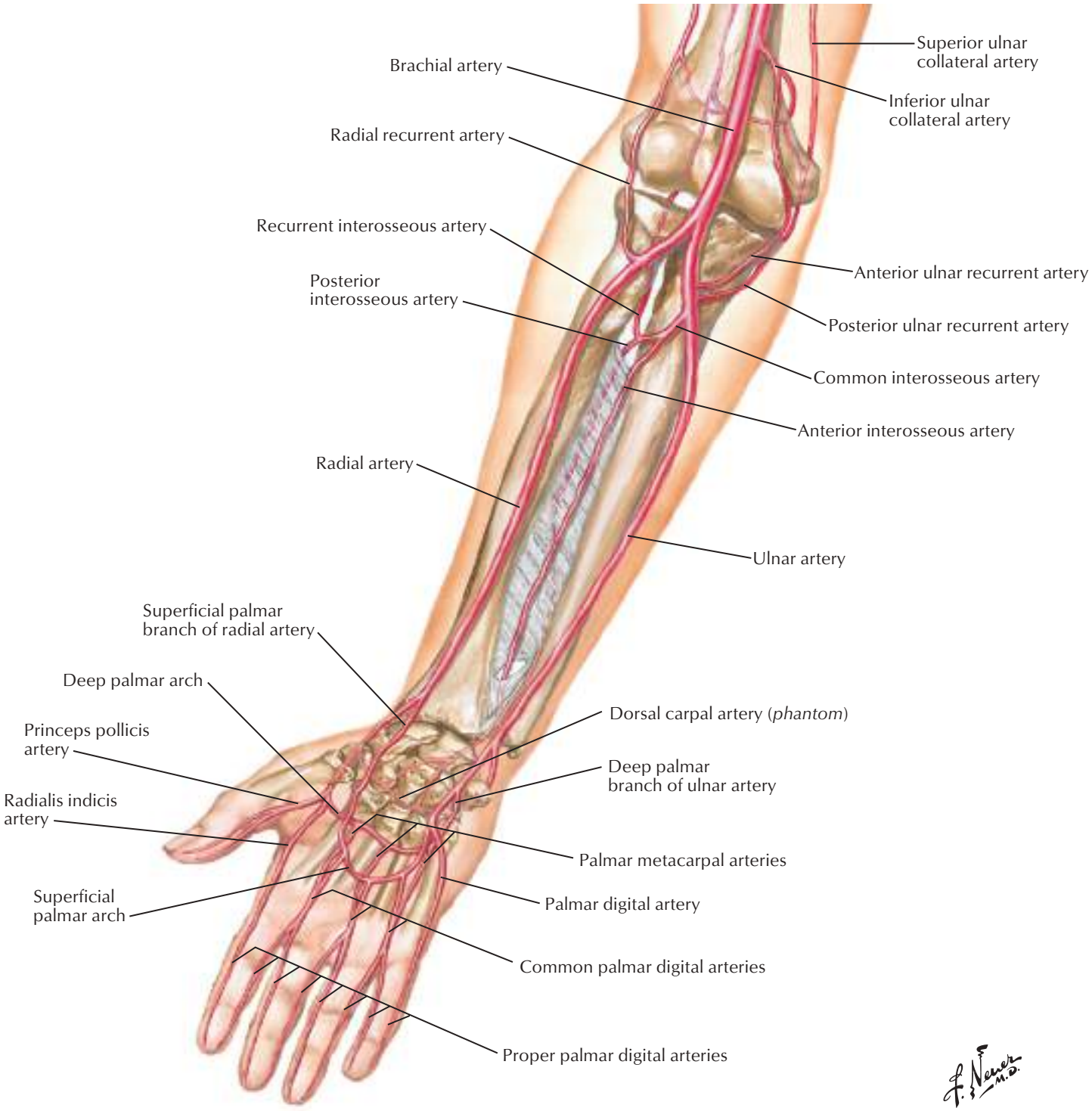
See also **Plates 420, 463, 464**

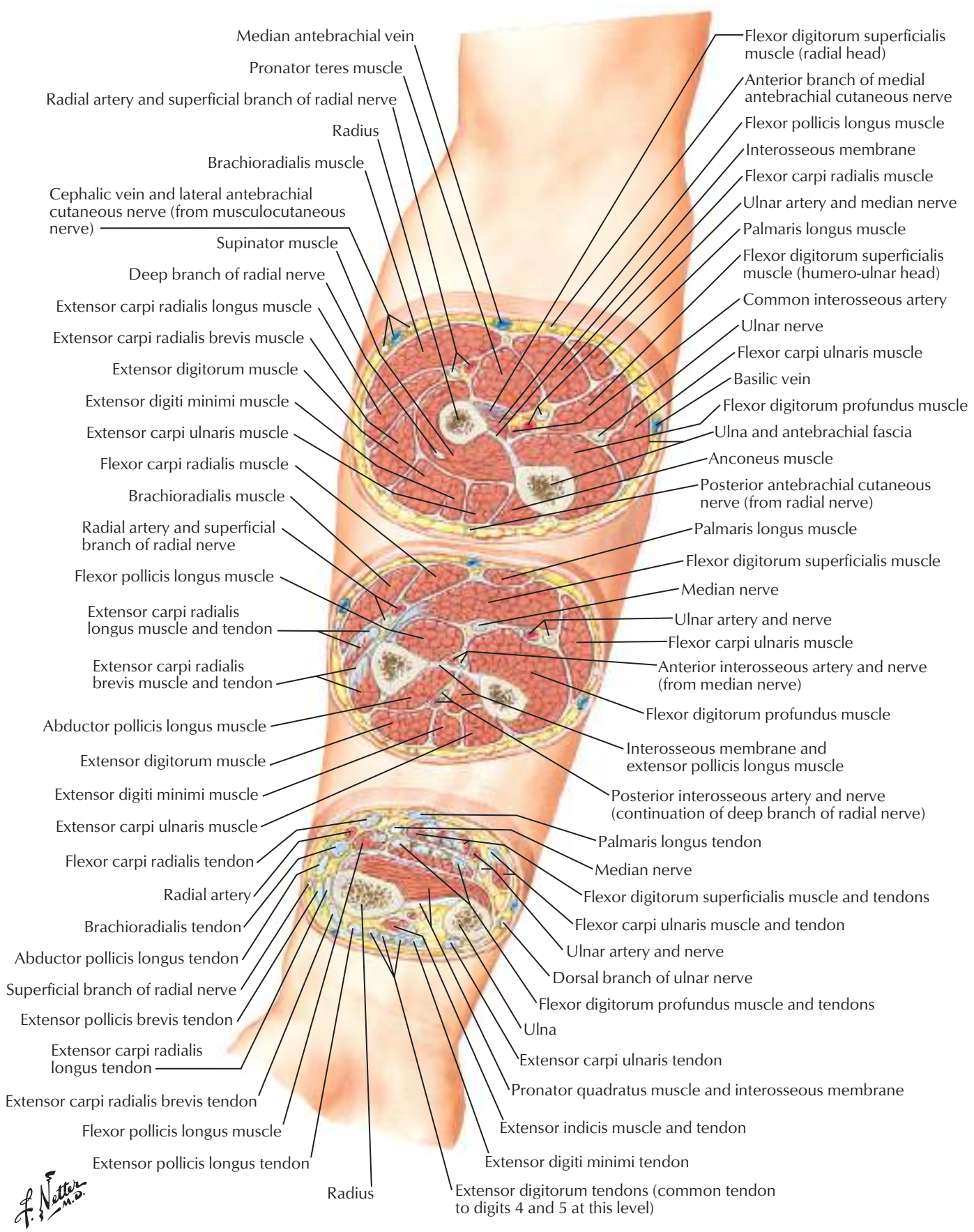


Muscles of Forearm (Deep Layer): Anterior View

See also Plates 426, 464

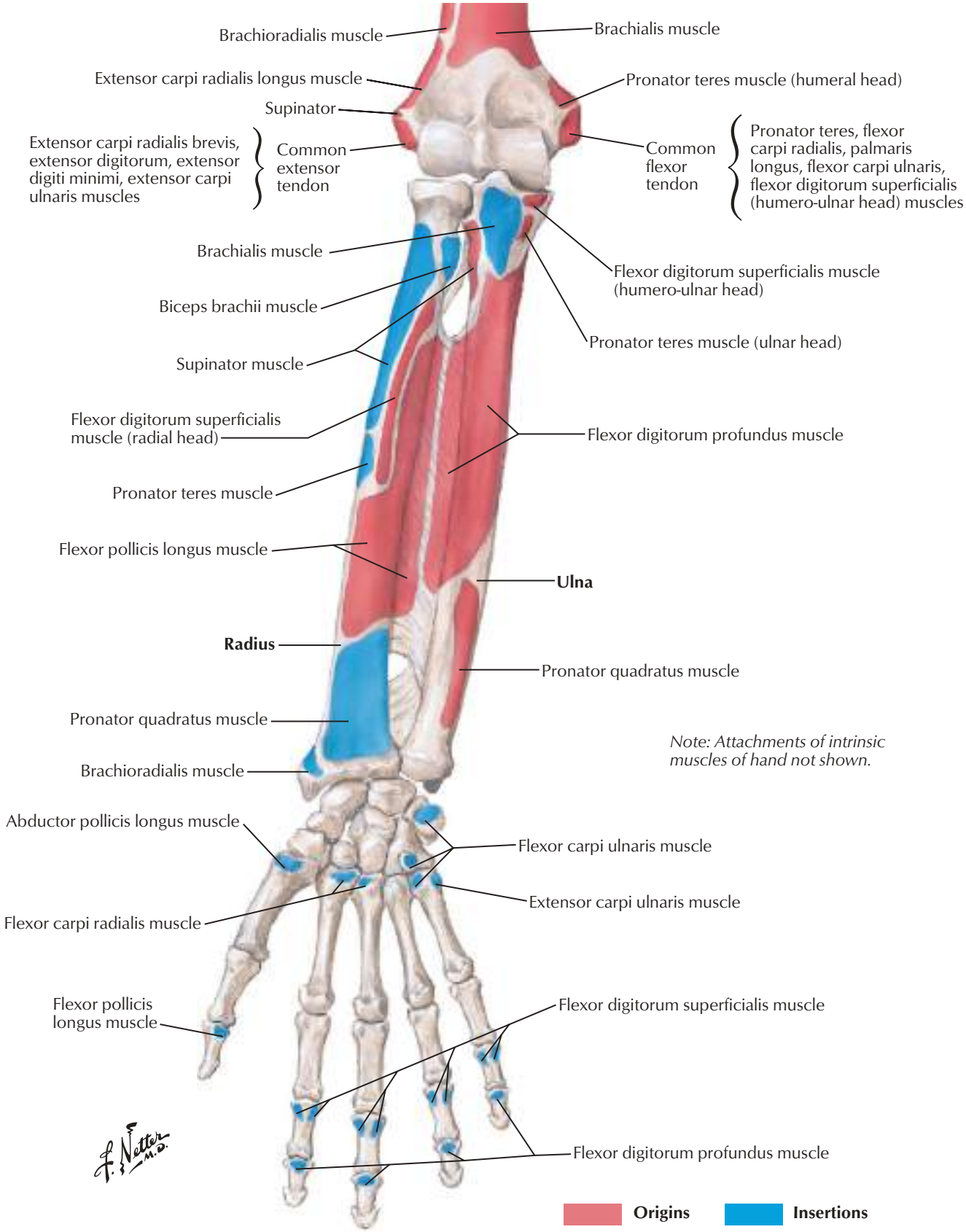



Brachial artery
Radial recurrent artery
Recurrent interosseous artery
Posterior interosseous artery
Radial artery
Superficial palmar branch of radial artery
Deep palmar arch
Princeps pollicis artery
Radialis indicis artery
Superficial palmar arch
Proper palmar digital arteries
Common palmar digital arteries
Palmar digital artery
Palmar metacarpal arteries
Dorsal carpal artery (*phantom*)
Deep palmar branch of ulnar artery
Ulnar artery
Common interosseous artery
Anterior interosseous artery
Posterior ulnar recurrent artery
Anterior ulnar recurrent artery
Inferior ulnar collateral artery
Superior ulnar collateral artery


Median antebrachial vein
Pronator teres muscle
Radial artery and superficial branch of radial nerve
Radius
Brachioradialis muscle
Cephalic vein and lateral antebrachial cutaneous nerve (from musculocutaneous nerve)
Supinator muscle
Deep branch of radial nerve
Extensor carpi radialis longus muscle
Extensor carpi radialis brevis muscle
Extensor digitorum muscle
Extensor digiti minimi muscle
Extensor carpi ulnaris muscle
Flexor carpi radialis muscle
Brachioradialis muscle
Radial artery and superficial branch of radial nerve
Flexor pollicis longus muscle
Extensor carpi radialis longus muscle and tendon
Extensor carpi radialis brevis muscle and tendon
Abductor pollicis longus muscle
Extensor digitorum muscle
Extensor digiti minimi muscle
Extensor carpi ulnaris muscle
Flexor carpi radialis tendon
Radial artery
Brachioradialis tendon
Abductor pollicis longus tendon
Superficial branch of radial nerve
Extensor pollicis brevis tendon
Extensor carpi radialis longus tendon
Extensor carpi radialis brevis tendon
Flexor pollicis longus muscle
Extensor pollicis longus tendon
Radius
Flexor digitorum superficialis muscle (radial head)
Anterior branch of medial antebrachial cutaneous nerve
Flexor pollicis longus muscle
Interosseous membrane
Flexor carpi radialis muscle
Ulnar artery and median nerve
Palmaris longus muscle
Flexor digitorum superficialis muscle (humero-ulnar head)
Common interosseous artery
Ulnar nerve
Flexor carpi ulnaris muscle
Basilic vein
Flexor digitorum profundus muscle
Ulna and antebrachial fascia
Anconeus muscle
Posterior antebrachial cutaneous nerve (from radial nerve)
Palmaris longus muscle
Flexor digitorum superficialis muscle
Median nerve
Ulnar artery and nerve
Flexor carpi ulnaris muscle
Anterior interosseous artery and nerve (from median nerve)
Flexor digitorum profundus muscle
Interosseous membrane and extensor pollicis longus muscle
Posterior interosseous artery and nerve (continuation of deep branch of radial nerve)
Palmaris longus tendon
Median nerve
Flexor digitorum superficialis muscle and tendons
Flexor carpi ulnaris muscle and tendon
Ulnar artery and nerve
Dorsal branch of ulnar nerve
Flexor digitorum profundus muscle and tendons
Ulna
Extensor carpi ulnaris tendon
Pronator quadratus muscle and interosseous membrane
Extensor indicis muscle and tendon
Extensor digiti minimi tendon
Extensor digitorum tendons (common tendon to digits 4 and 5 at this level)

Attachments of Muscles of Forearm: Anterior View

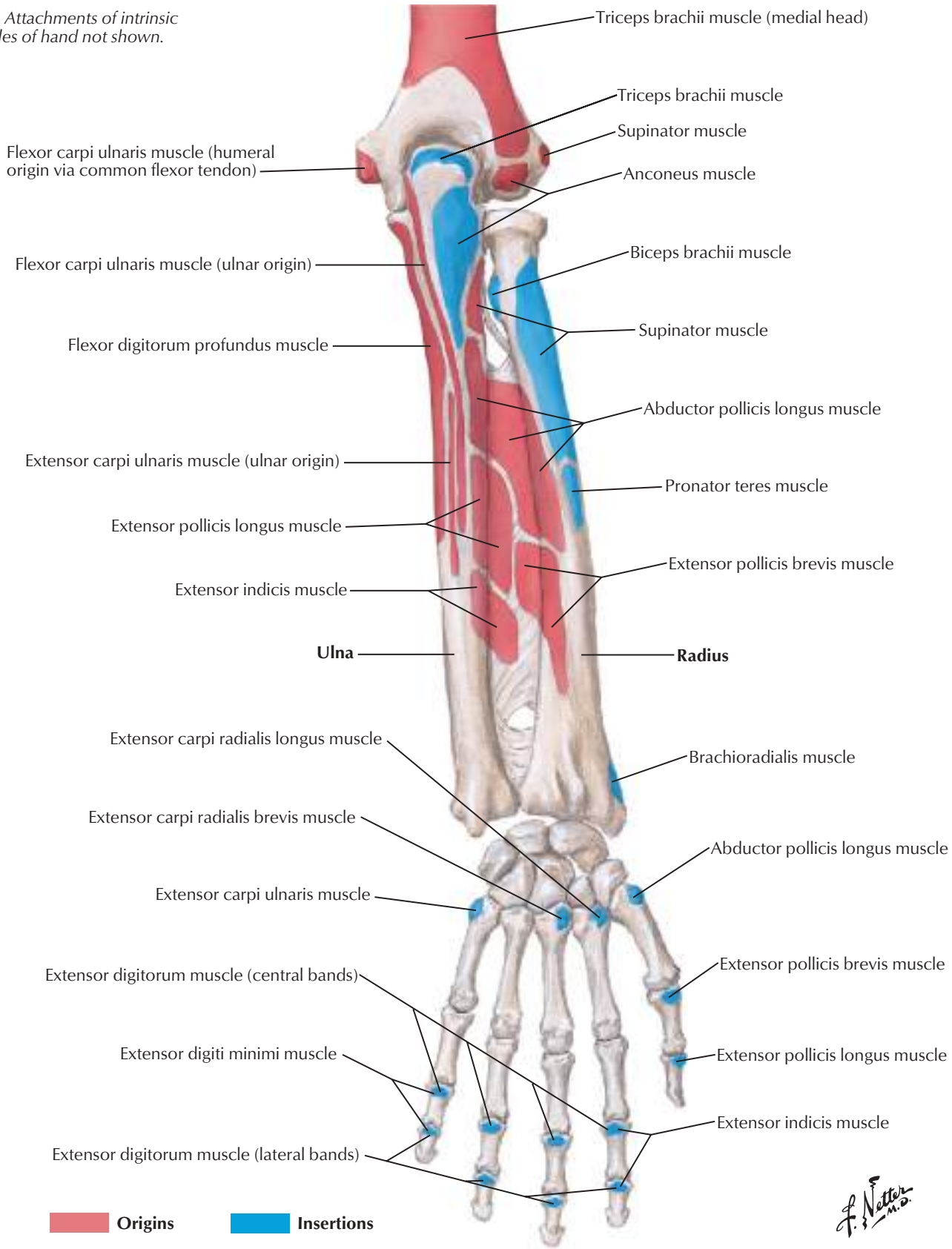
See also Plate 422

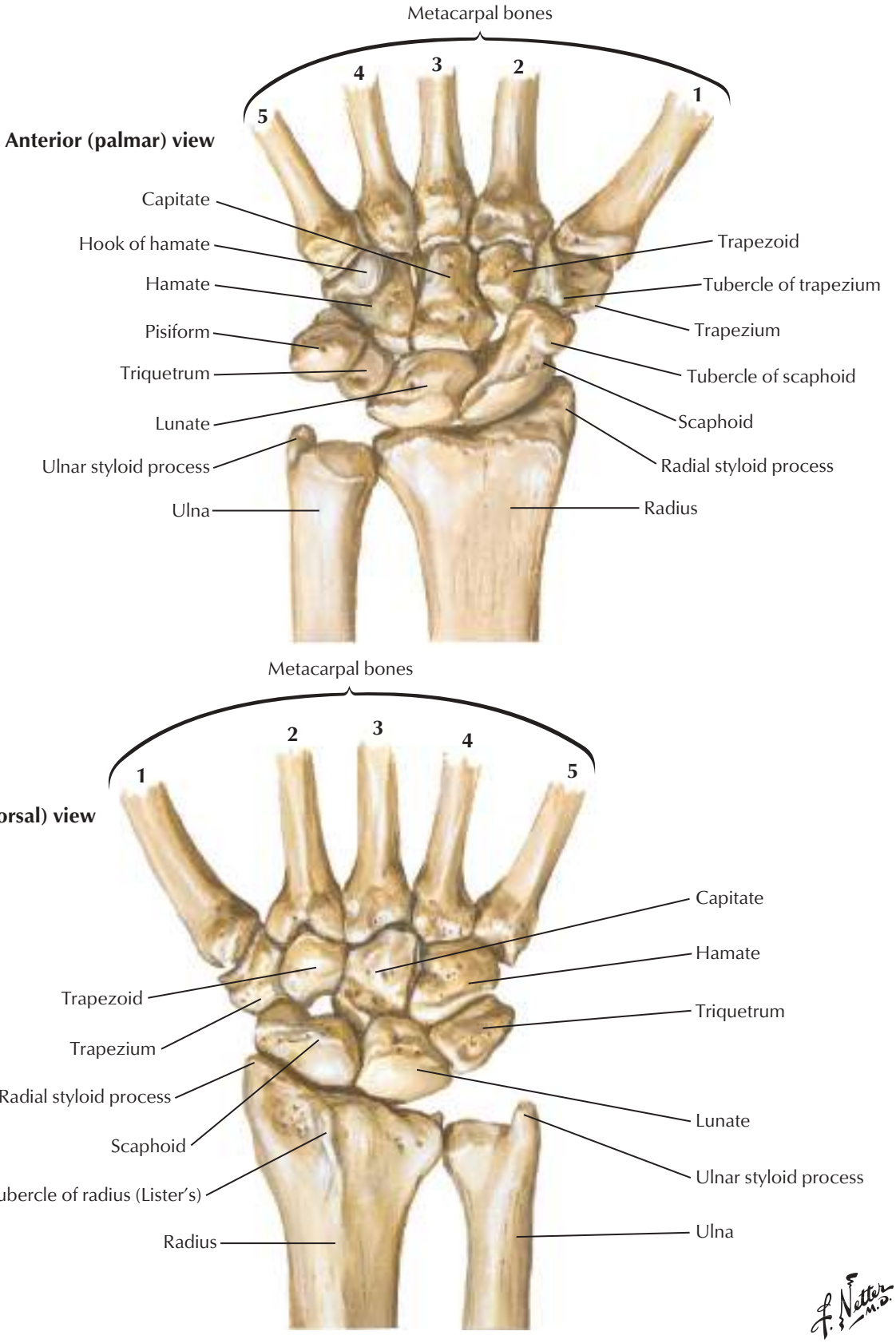


Attachments of Muscles of Forearm: Posterior View

See also Plate 427

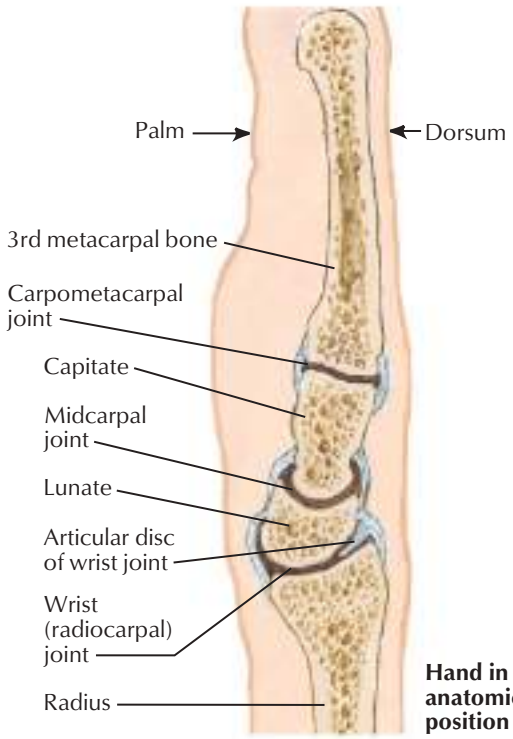
Note: Attachments of intrinsic muscles of hand not shown.



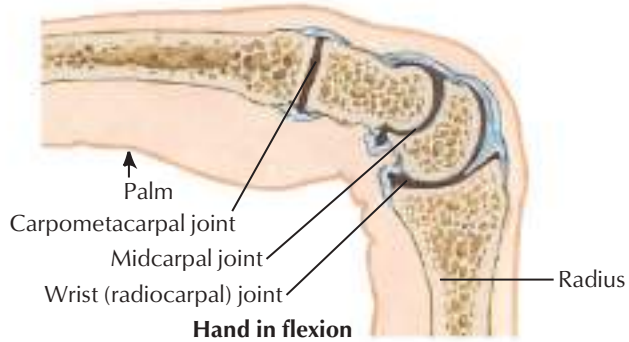

Metacarpal bones
5
4
3
2
1
Anterior (palmar) view
Capitate
Hook of hamate
Hamate
Pisiform
Triquetrum
Lunate
Ulnar styloid process
Ulna
Trapezoid
Tubercle of trapezium
Trapezium
Tubercle of scaphoid
Scaphoid
Radial styloid process
Radius
Metacarpal bones
1
2
3
4
5
Posterior (dorsal) view
Trapezoid
Trapezium
Radial styloid process
Scaphoid
Dorsal tubercle of radius (Lister's)
Radius
Capitate
Hamate
Triquetrum
Lunate
Ulnar styloid process
Ulna

Position of carpal bones with hand in abduction: anterior (palmar) view

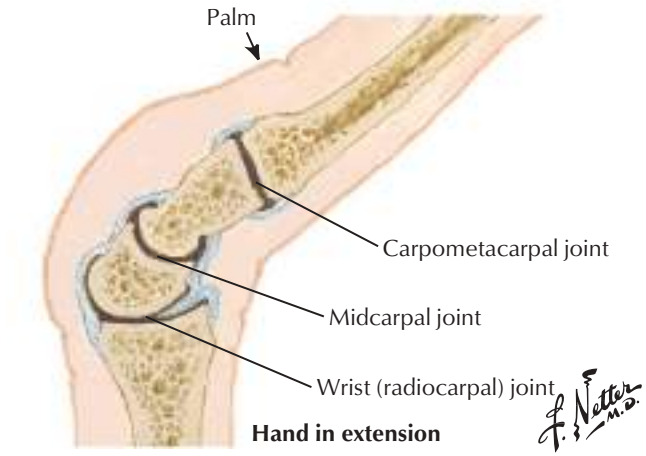
Position of carpal bones with hand in adduction: anterior (palmar) view



Sagittal sections through wrist and middle finger

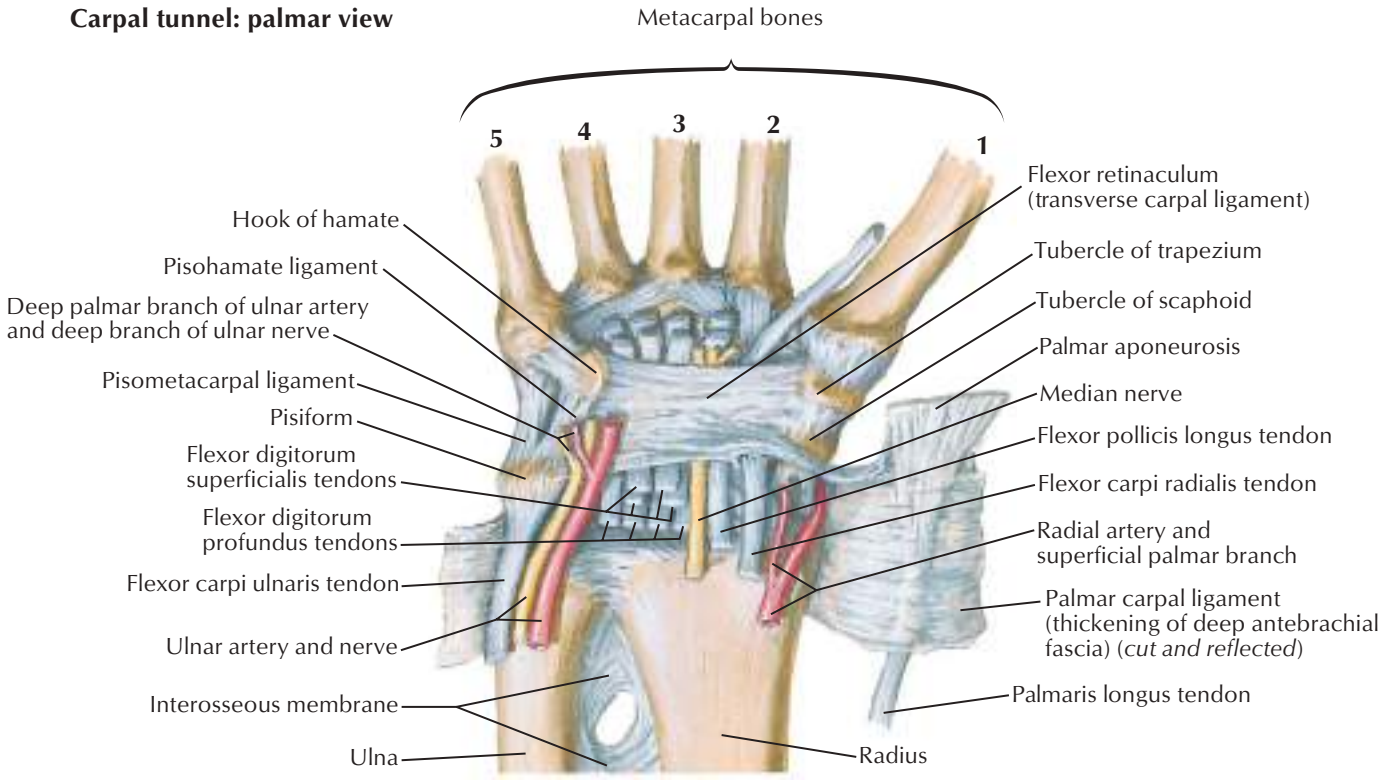


Hand in flexion

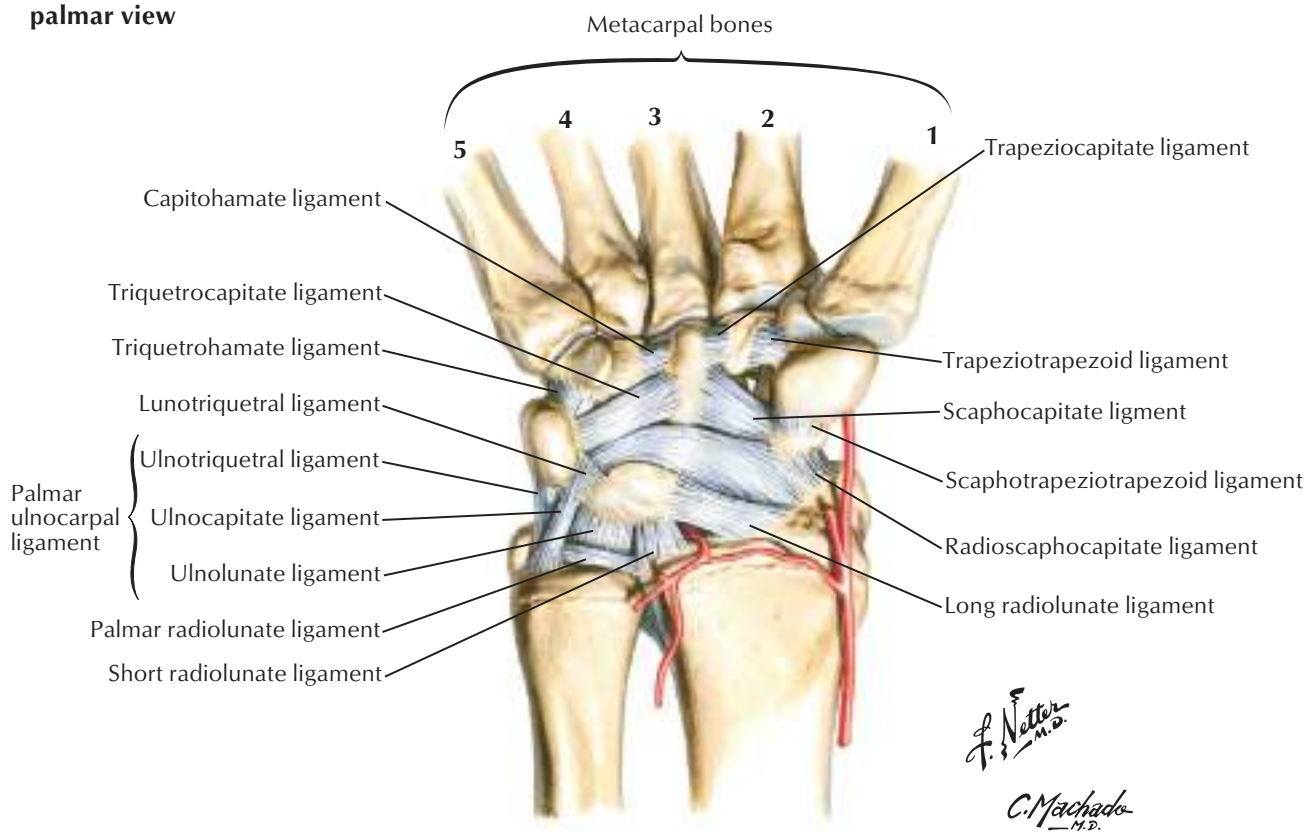


Hand in extension

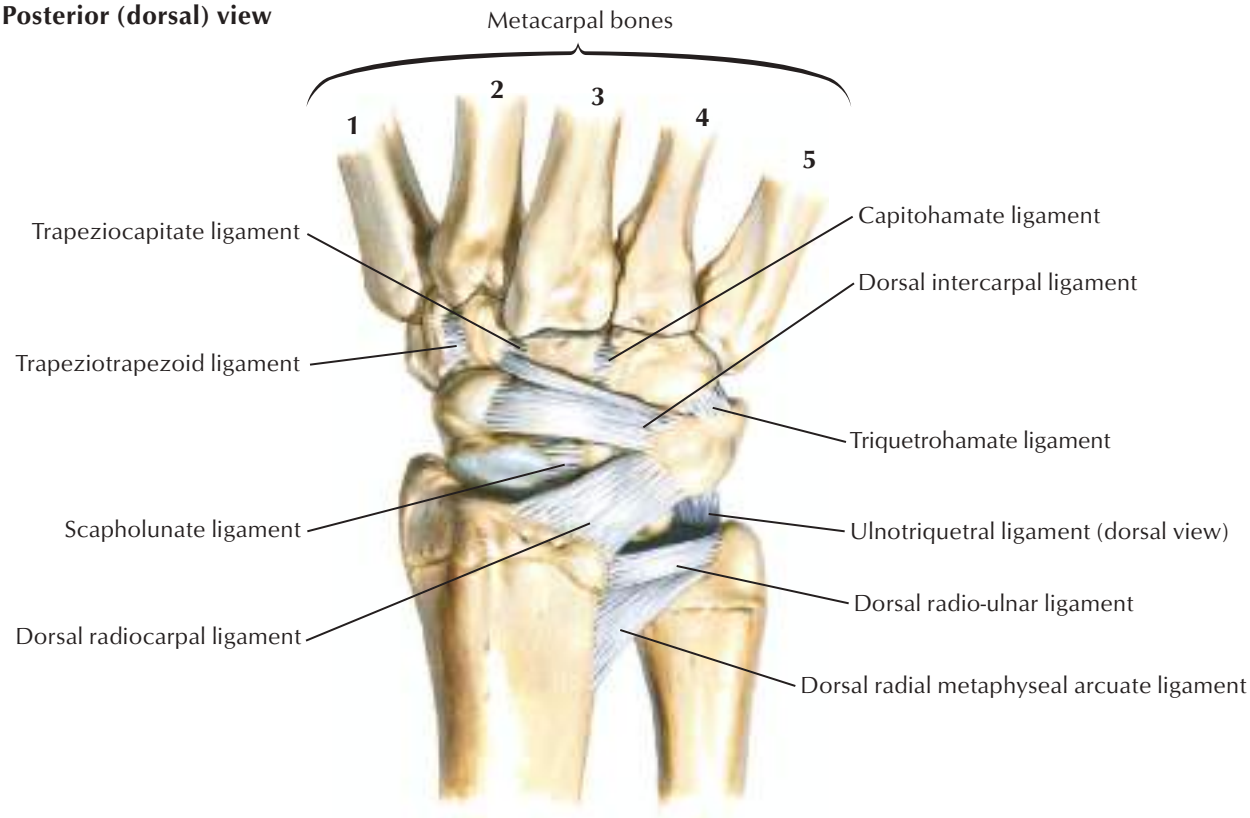
Carpal tunnel: palmar view



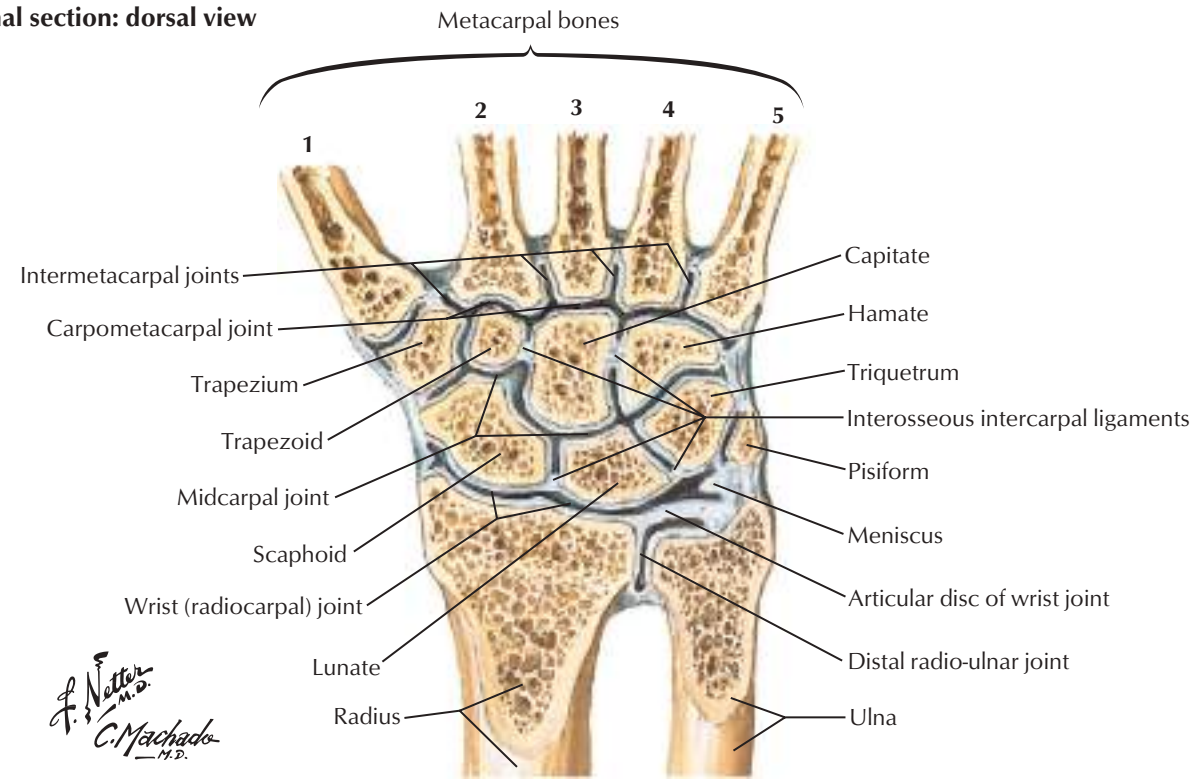
Flexor retinaculum removed: palmar view

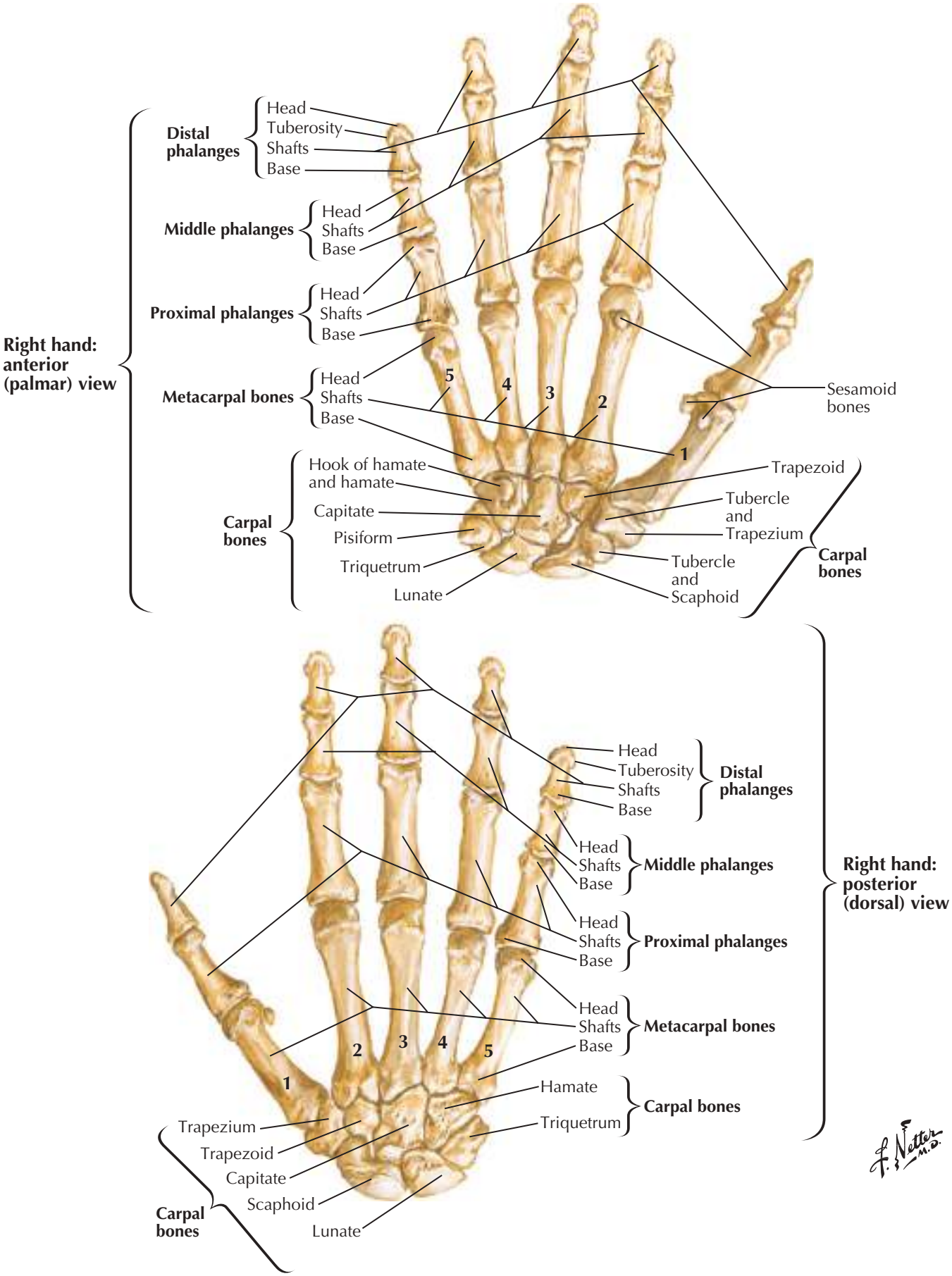


Posterior (dorsal) view



Coronal section: dorsal view



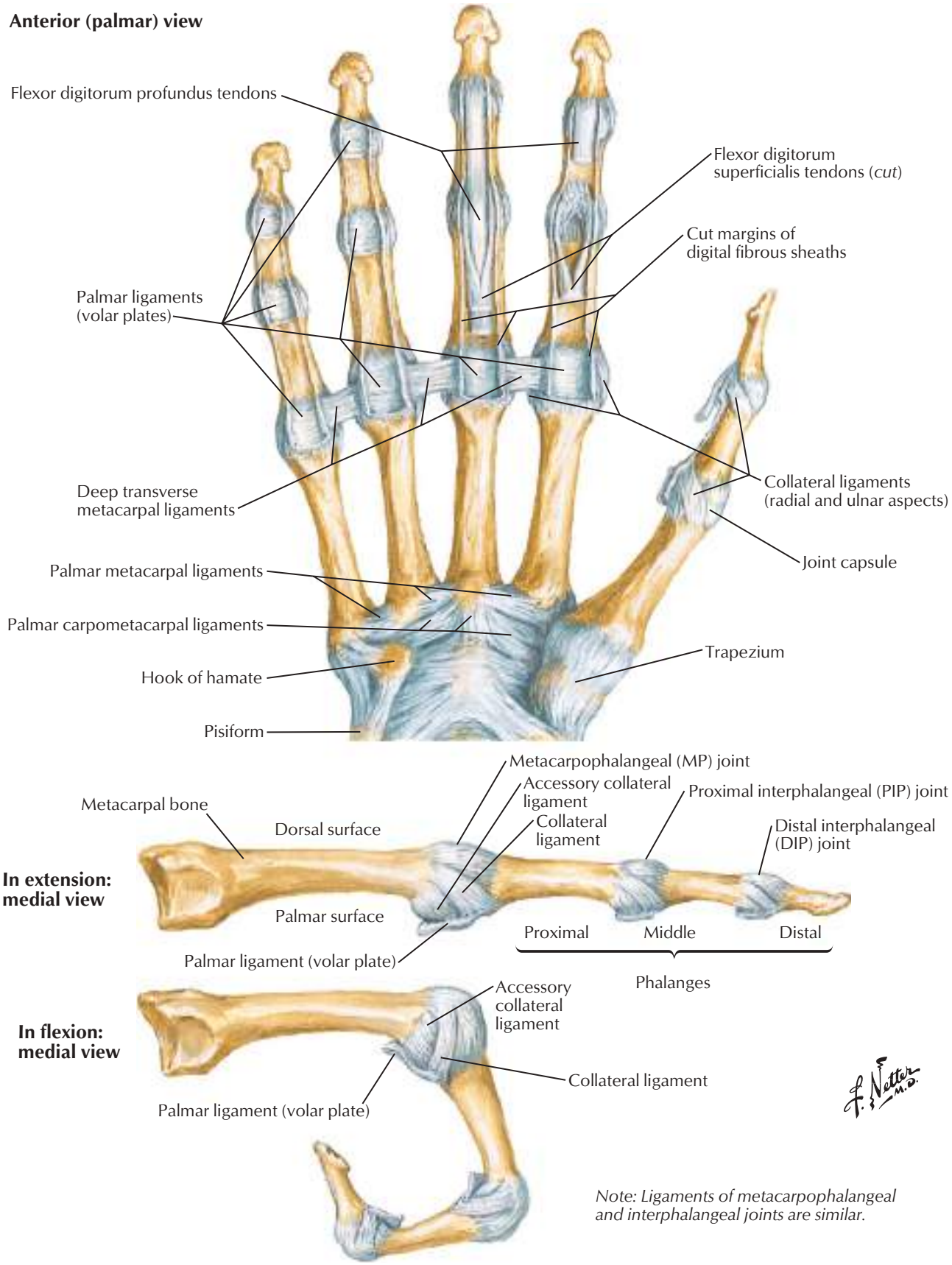

Right hand: anterior (palmar) view
Distal phalanges
Head
Tuberosity
Shafts
Base
Middle phalanges
Head
Shafts
Base
Proximal phalanges
Head
Shafts
Base
Metacarpal bones
Head
Shafts
Base
5
4
3
2
1
Sesamoid bones
Carpal bones
Hook of hamate and hamate
Capitate
Pisiform
Triquetrum
Lunate
Trapezoid
Tubercle and Trapezium
Tubercle and Scaphoid
Carpal bones
Right hand: posterior (dorsal) view
Distal phalanges
Head
Tuberosity
Shafts
Base
Middle phalanges
Head
Shafts
Base
Proximal phalanges
Head
Shafts
Base
Metacarpal bones
Head
Shafts
Base
2
3
4
5
1
Carpal bones
Hamate
Triquetrum
Trapezium
Trapezoid
Capitate
Scaphoid
Lunate
Carpal bones

Anteroposterior view

Lateral view

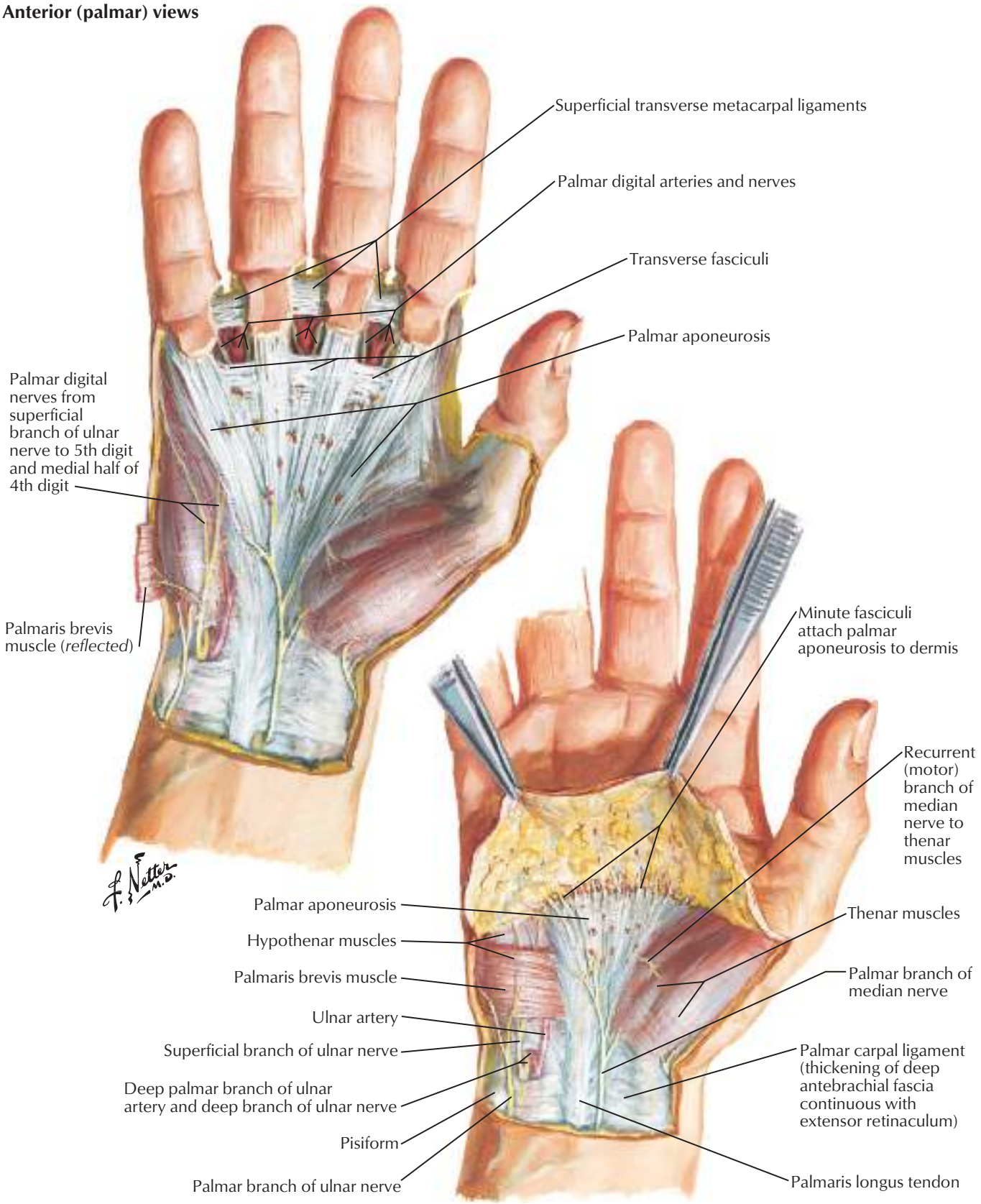
Metacarpophalangeal and Interphalangeal Ligaments

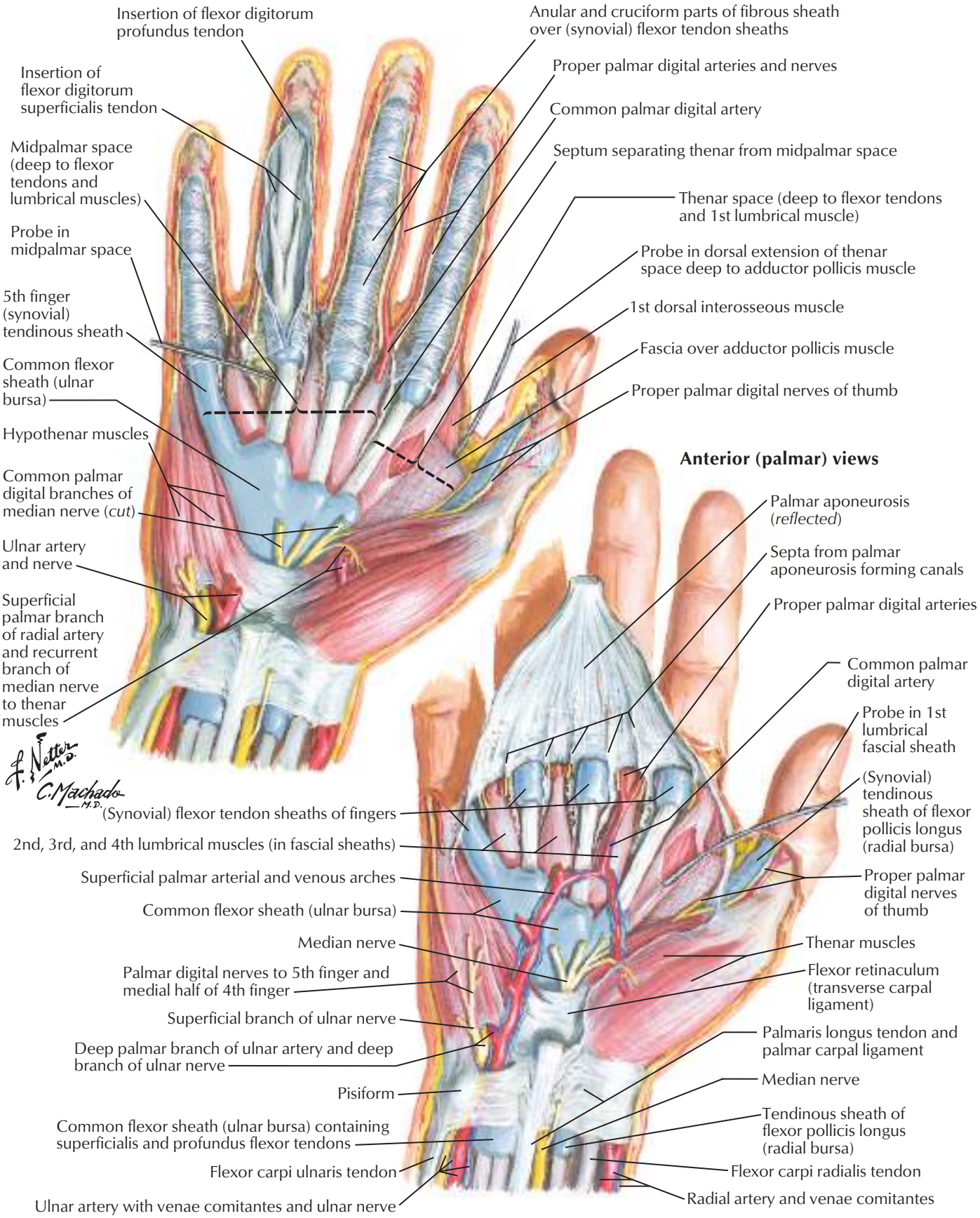
See also **Plates 448, 451**



Note: Ligaments of metacarpophalangeal and interphalangeal joints are similar.

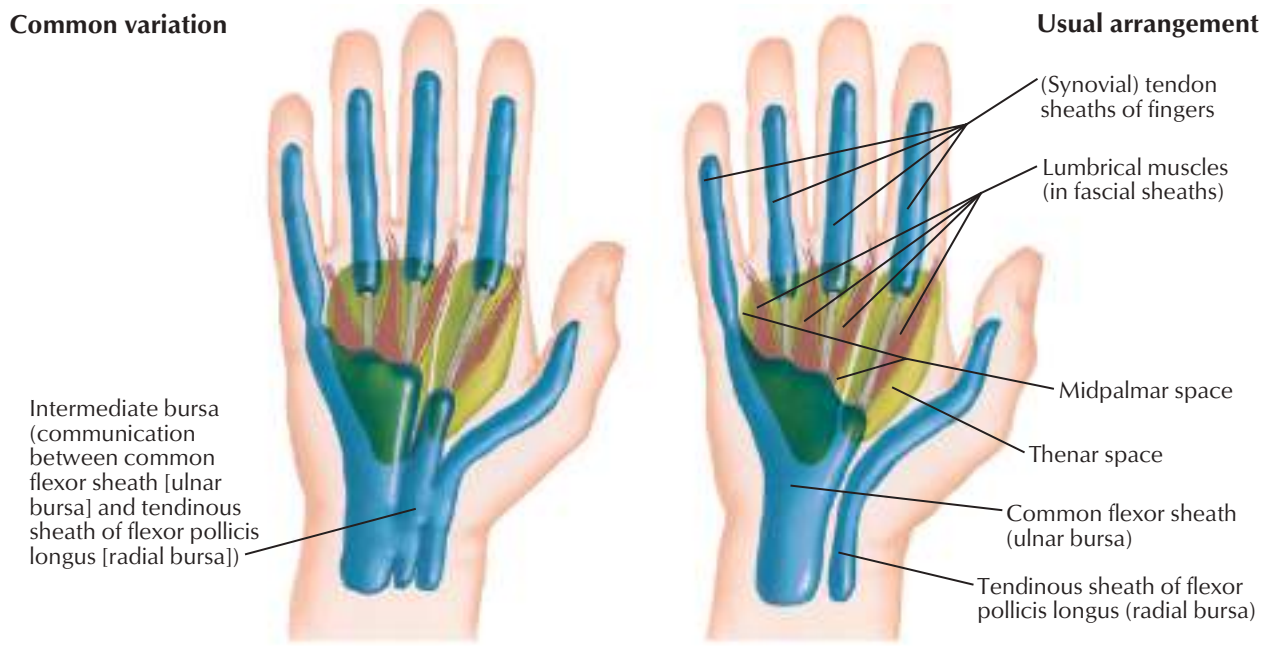
Anterior (palmar) views



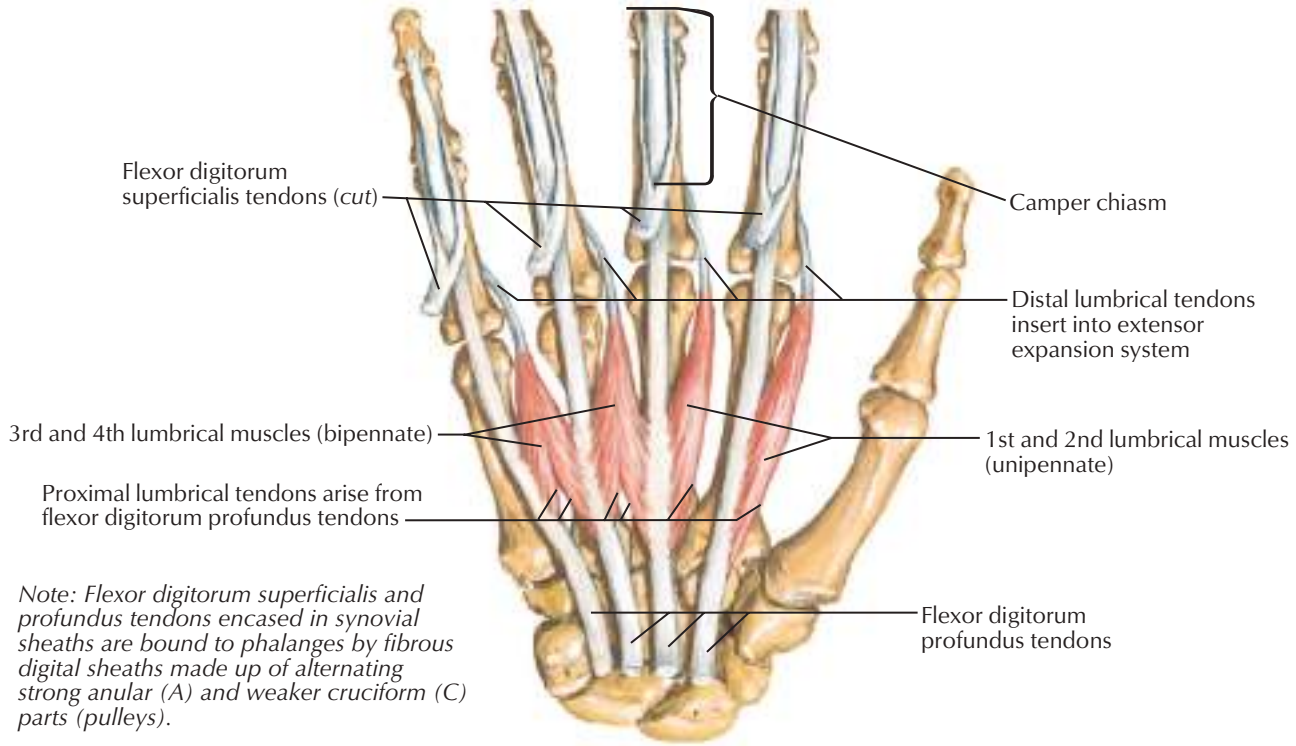

Insertion of flexor digitorum profundus tendon
Insertion of flexor digitorum superficialis tendon
Midpalmar space (deep to flexor tendons and lumbrical muscles)
Probe in midpalmar space
5th finger (synovial) tendinous sheath
Common flexor sheath (ulnar bursa)
Hypothenar muscles
Common palmar digital branches of median nerve (cut)
Ulnar artery and nerve
Superficial palmar branch of radial artery and recurrent branch of median nerve to thenar muscles
Anular and cruciform parts of fibrous sheath over (synovial) flexor tendon sheaths
Proper palmar digital arteries and nerves
Common palmar digital artery
Septum separating thenar from midpalmar space
Thenar space (deep to flexor tendons and 1st lumbrical muscle)
Probe in dorsal extension of thenar space deep to adductor pollicis muscle
1st dorsal interosseous muscle
Fascia over adductor pollicis muscle
Proper palmar digital nerves of thumb
F. Netter M.D.
C. Machado M.D.
Anterior (palmar) views
Palmar aponeurosis (reflected)
Septa from palmar aponeurosis forming canals
Proper palmar digital arteries
Common palmar digital artery
Probe in 1st lumbrical fascial sheath
(Synovial) tendinous sheath of flexor pollicis longus (radial bursa)
Proper palmar digital nerves of thumb
(Synovial) flexor tendon sheaths of fingers
2nd, 3rd, and 4th lumbrical muscles (in fascial sheaths)
Superficial palmar arterial and venous arches
Common flexor sheath (ulnar bursa)
Median nerve
Palmar digital nerves to 5th finger and medial half of 4th finger
Superficial branch of ulnar nerve
Deep palmar branch of ulnar artery and deep branch of ulnar nerve
Pisiform
Common flexor sheath (ulnar bursa) containing superficialis and profundus flexor tendons
Flexor carpi ulnaris tendon
Ulnar artery with venae comitantes and ulnar nerve
Thenar muscles
Flexor retinaculum (transverse carpal ligament)
Palmaris longus tendon and palmar carpal ligament
Median nerve
Tendinous sheath of flexor pollicis longus (radial bursa)
Flexor carpi radialis tendon
Radial artery and venae comitantes

Lumbrical Muscles and Bursae, Spaces, and Sheaths: Schema

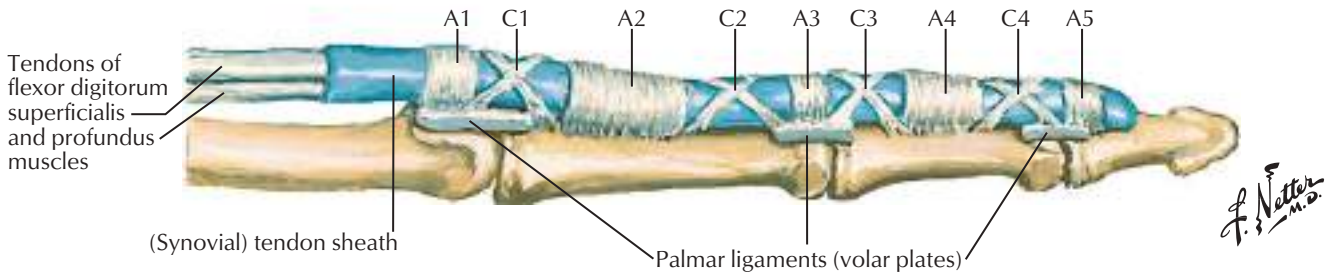
See also **Plate 445**



Lumbrical muscles: schema



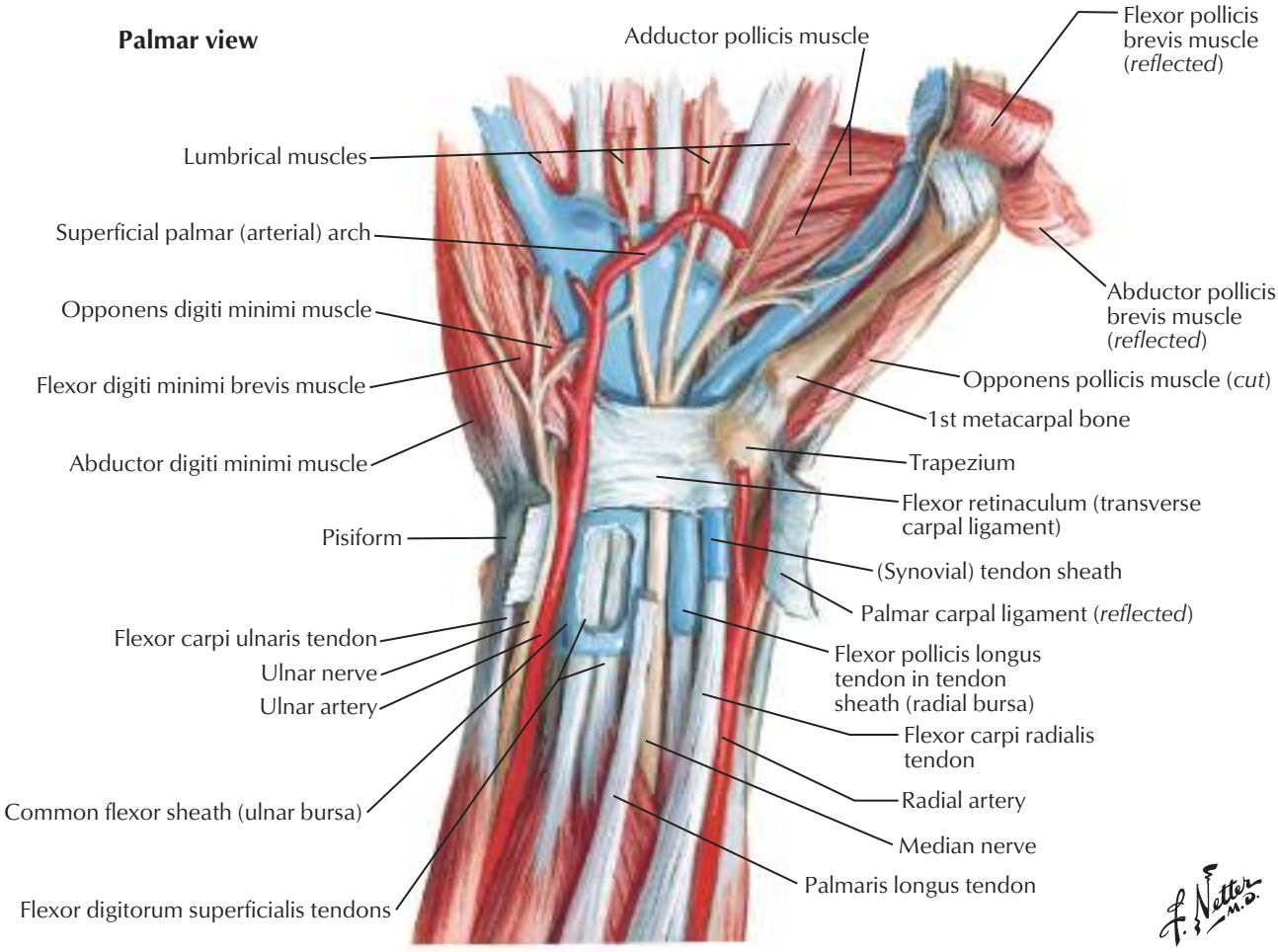
Note: Flexor digitorum superficialis and profundus tendons encased in synovial sheaths are bound to phalanges by fibrous digital sheaths made up of alternating strong anular (A) and weaker cruciform (C) parts (pulleys).



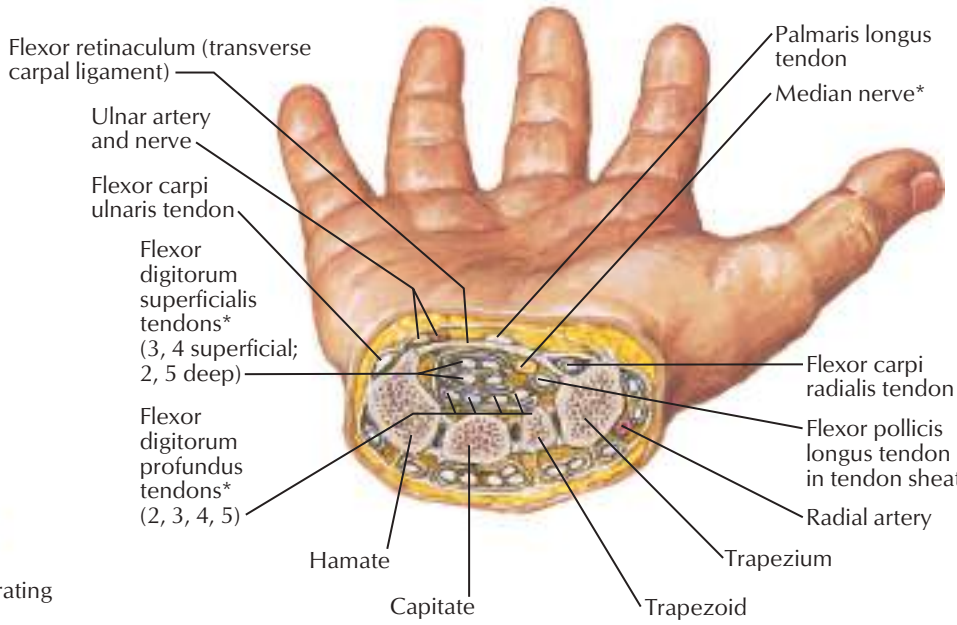
Flexor Tendons, Arteries, and Nerves at Wrist

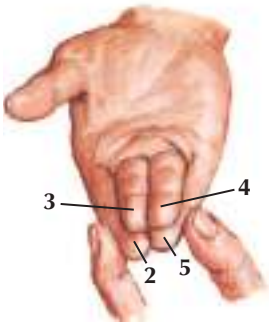
See also **Plates 459, 460**

Palmar view



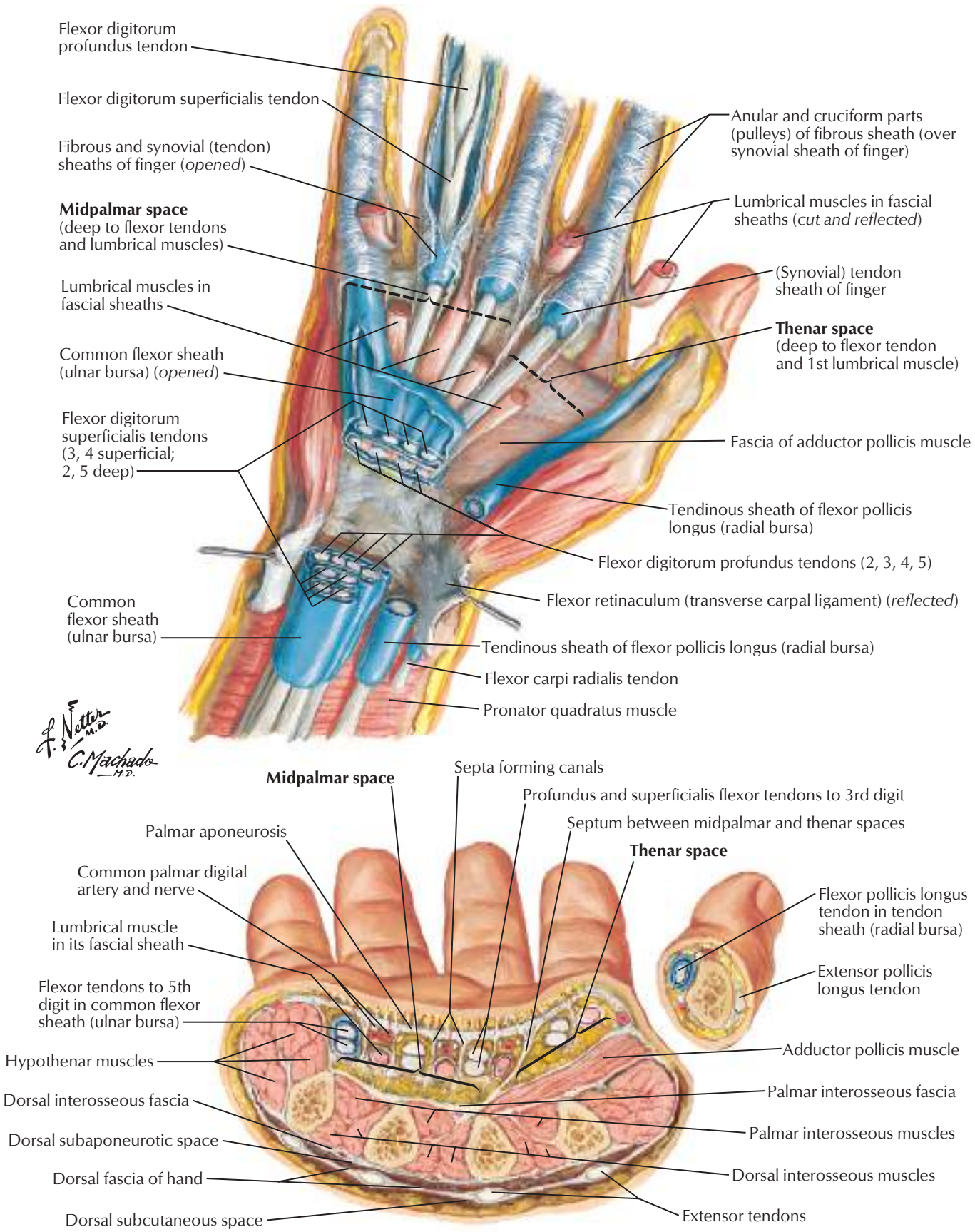
Cross section of wrist demonstrating carpal tunnel





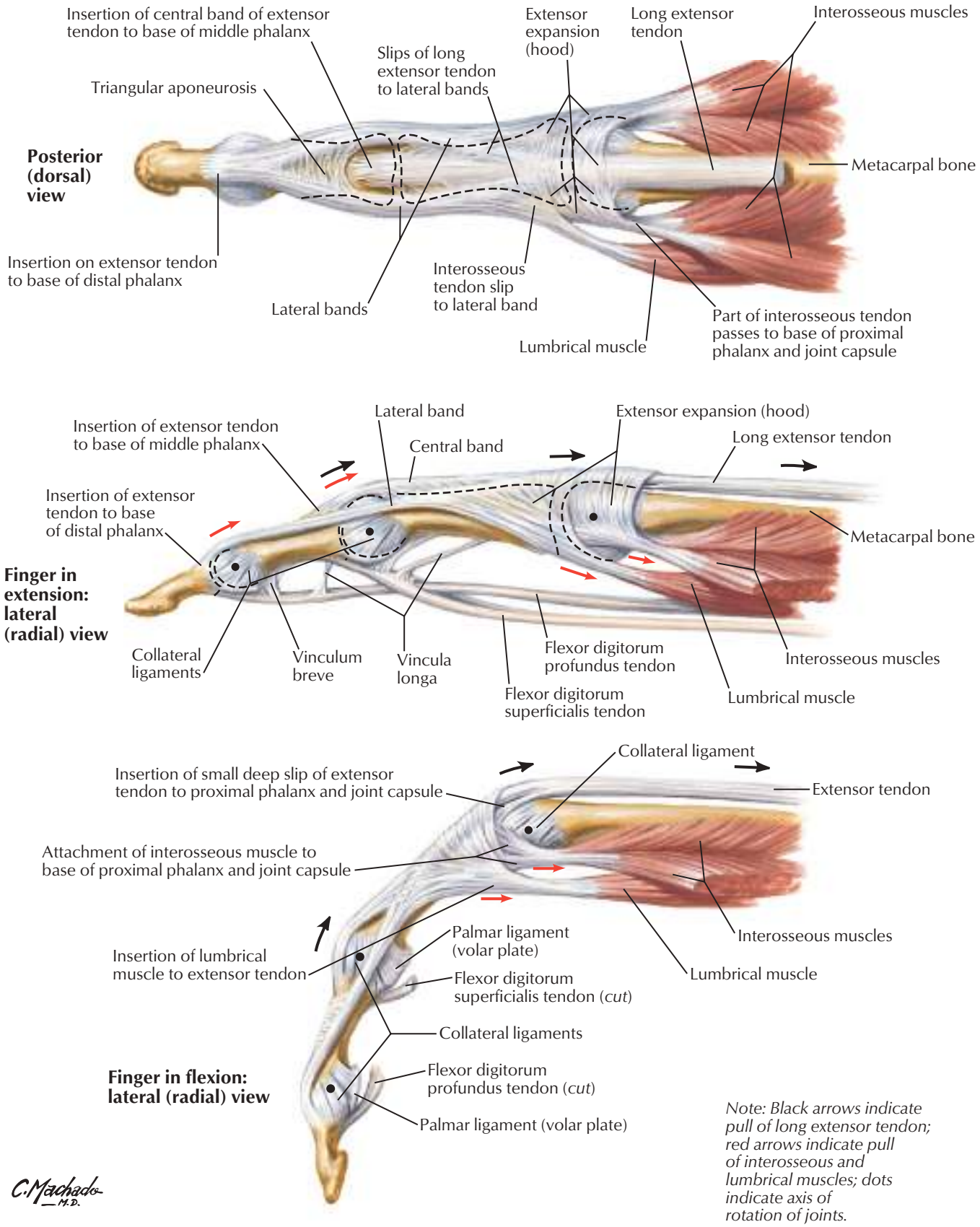
Simple method of demonstrating arrangement of flexor digitorum superficialis tendons within carpal tunnel

*Contents of carpal tunnel


Flexor digitorum profundus tendon
Flexor digitorum superficialis tendon
Fibrous and synovial (tendon) sheaths of finger (*opened*)
Midpalmar space (deep to flexor tendons and lumbrical muscles)
Lumbrical muscles in fascial sheaths
Common flexor sheath (ulnar bursa) (*opened*)
Flexor digitorum superficialis tendons (3, 4 superficial; 2, 5 deep)
Common flexor sheath (ulnar bursa)
Anular and cruciform parts (pulleys) of fibrous sheath (over synovial sheath of finger)
Lumbrical muscles in fascial sheaths (*cut and reflected*)
(Synovial) tendon sheath of finger
Thenar space (deep to flexor tendon and 1st lumbrical muscle)
Fascia of adductor pollicis muscle
Tendinous sheath of flexor pollicis longus (radial bursa)
Flexor digitorum profundus tendons (2, 3, 4, 5)
Flexor retinaculum (transverse carpal ligament) (*reflected*)
Tendinous sheath of flexor pollicis longus (radial bursa)
Flexor carpi radialis tendon
Pronator quadratus muscle
F. Netter M.D.
C. Machado M.D.
Midpalmar space
Septa forming canals
Profundus and superficialis flexor tendons to 3rd digit
Septum between midpalmar and thenar spaces
Thenar space
Palmar aponeurosis
Common palmar digital artery and nerve
Lumbrical muscle in its fascial sheath
Flexor tendons to 5th digit in common flexor sheath (ulnar bursa)
Hypothenar muscles
Dorsal interosseous fascia
Dorsal subaponeurotic space
Dorsal fascia of hand
Dorsal subcutaneous space
Flexor pollicis longus tendon in tendon sheath (radial bursa)
Extensor pollicis longus tendon
Adductor pollicis muscle
Palmar interosseous fascia
Palmar interosseous muscles
Dorsal interosseous muscles
Extensor tendons

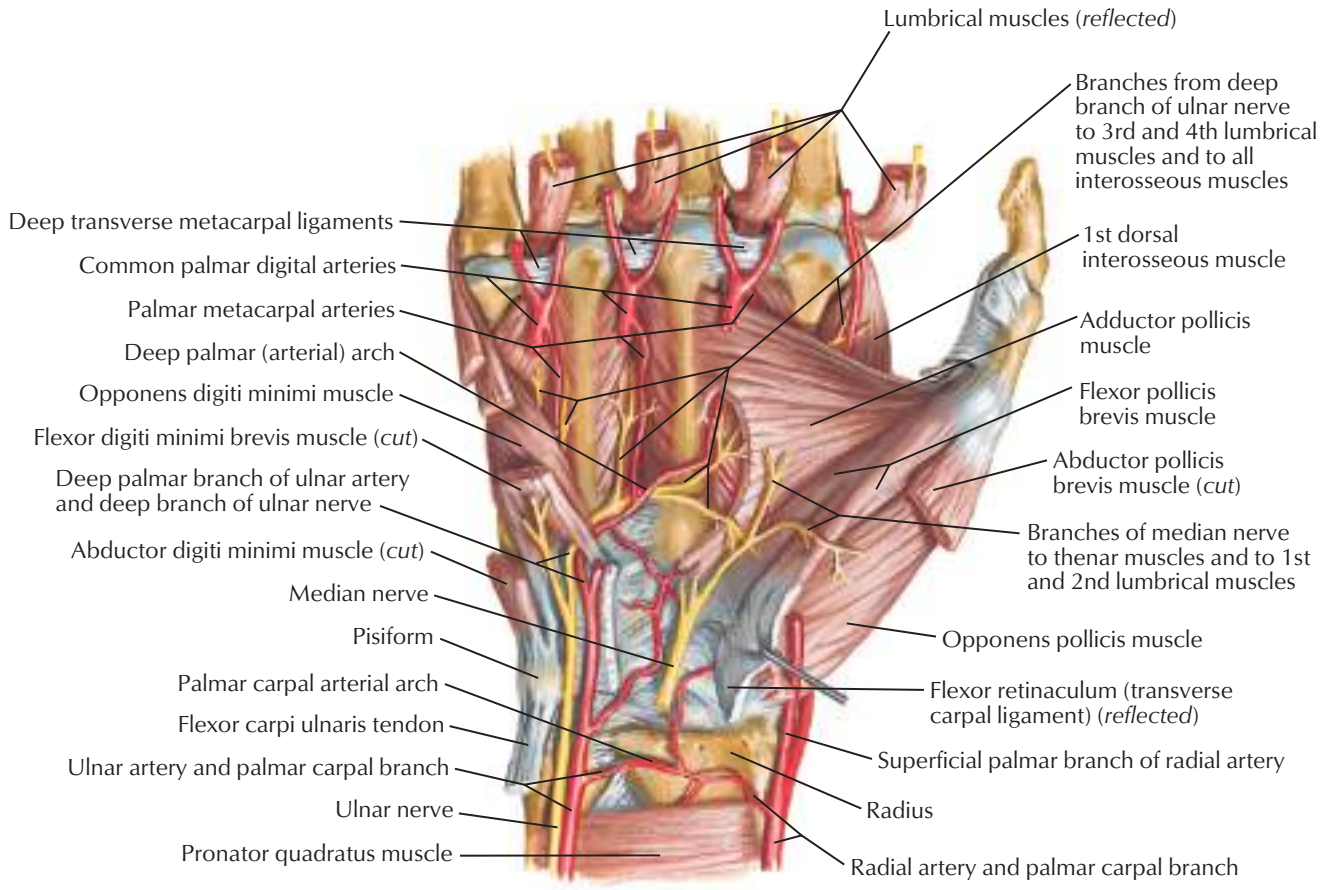
Flexor and Extensor Tendons in Fingers

See also **Plate 445**

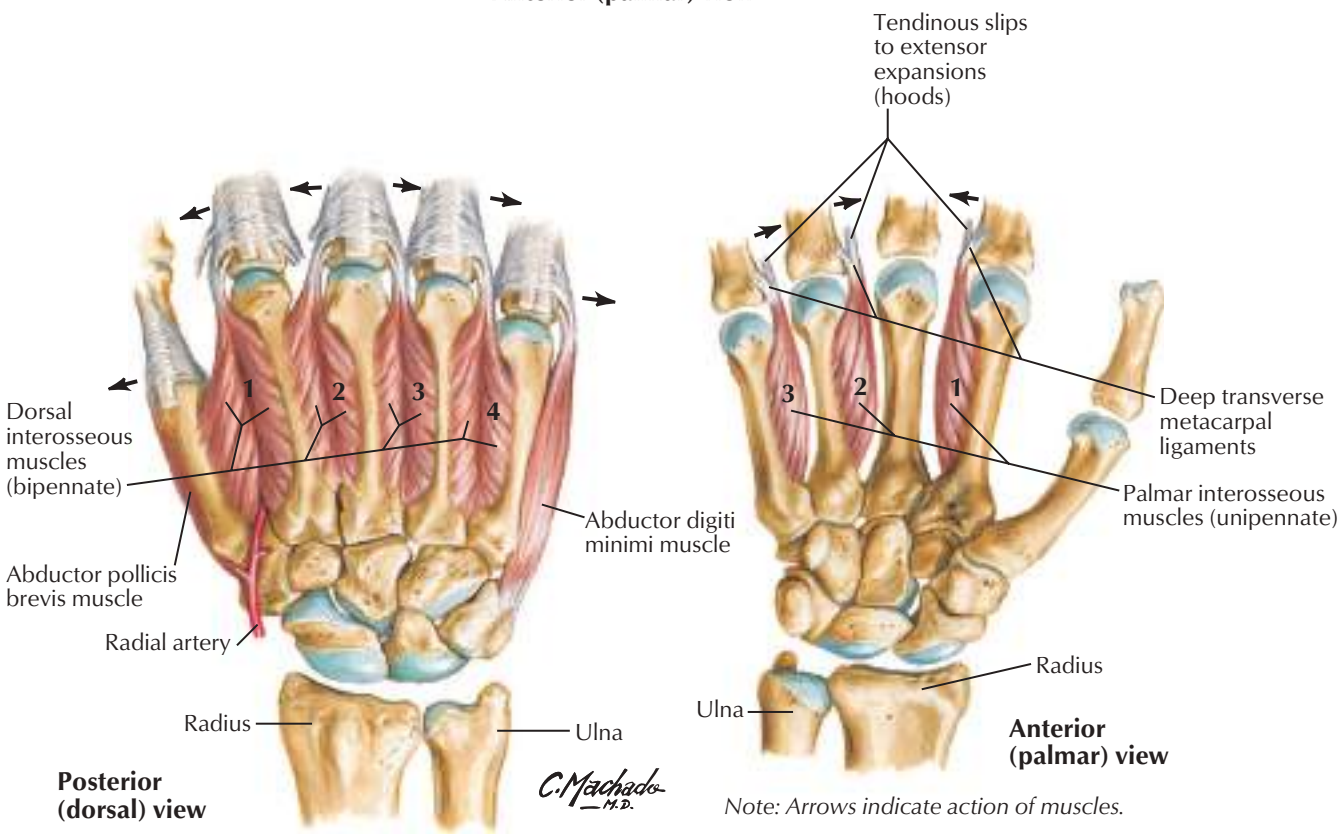


Note: Black arrows indicate pull of long extensor tendon; red arrows indicate pull of interosseous and lumbrical muscles; dots indicate axis of rotation of joints.

C. Machado M.D.



Anterior (palmar) view



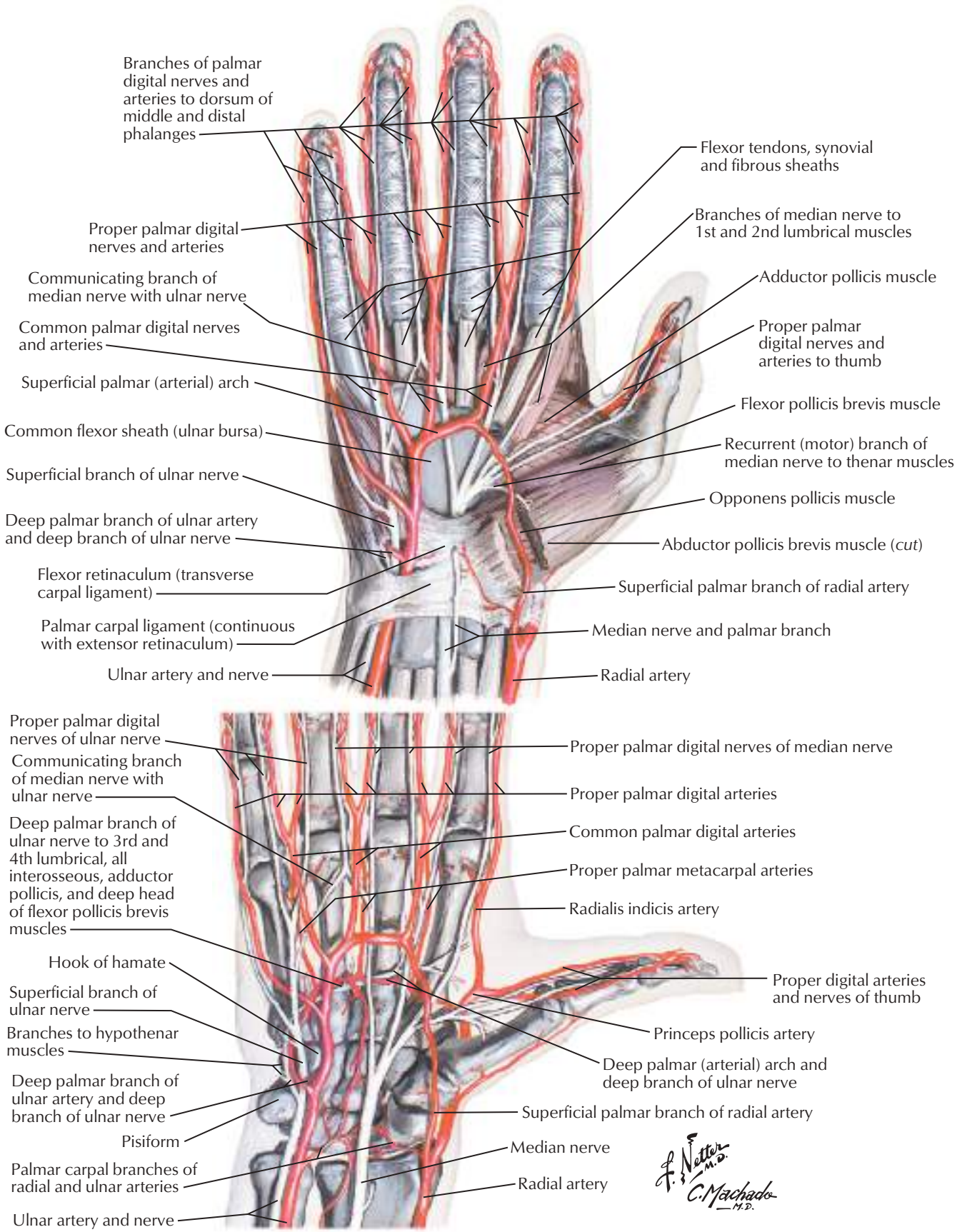
Posterior (dorsal) view

Anterior (palmar) view

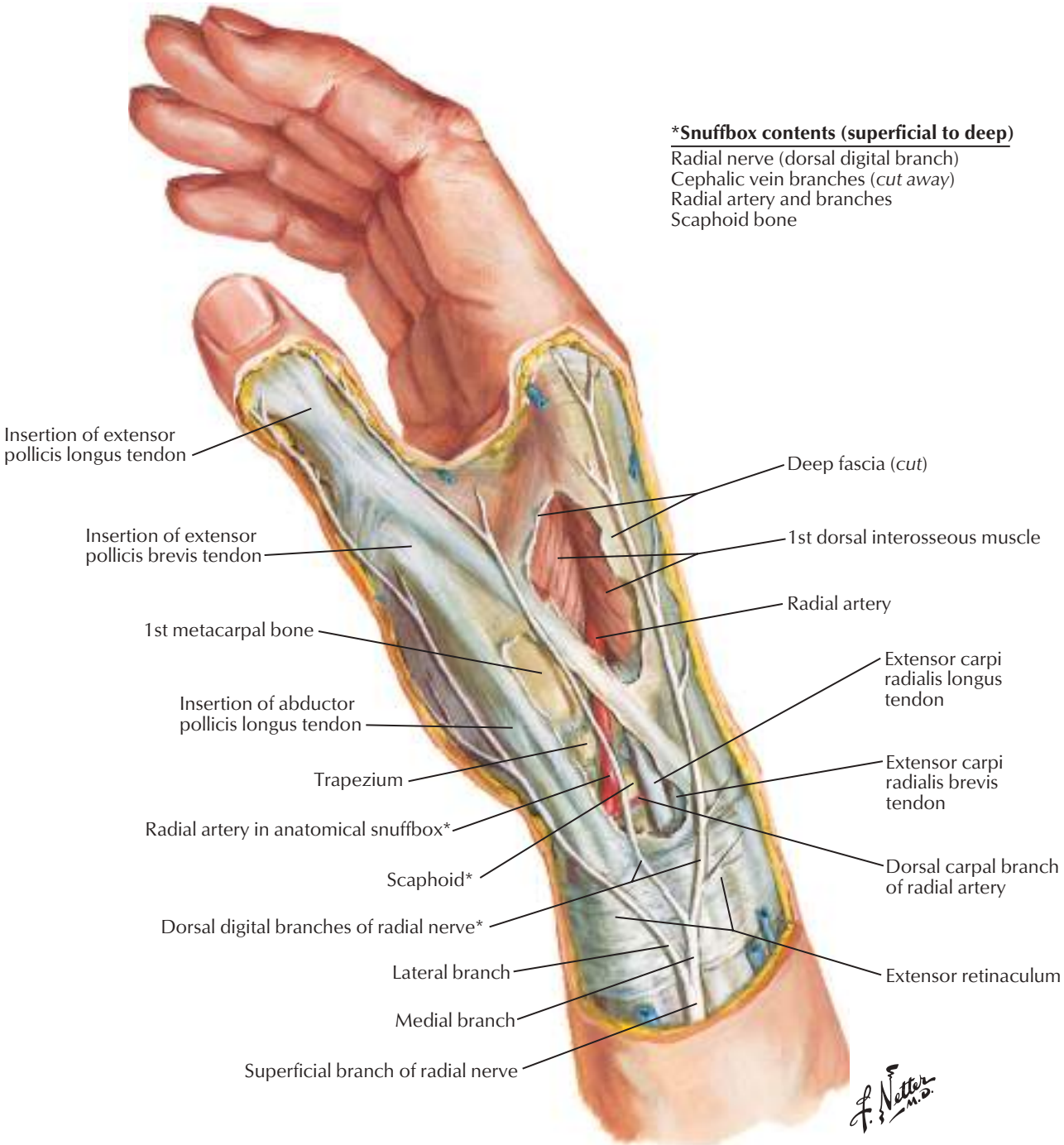
Note: Arrows indicate action of muscles.

Arteries and Nerves of Hand: Palmar Views

See also **Plate 420**

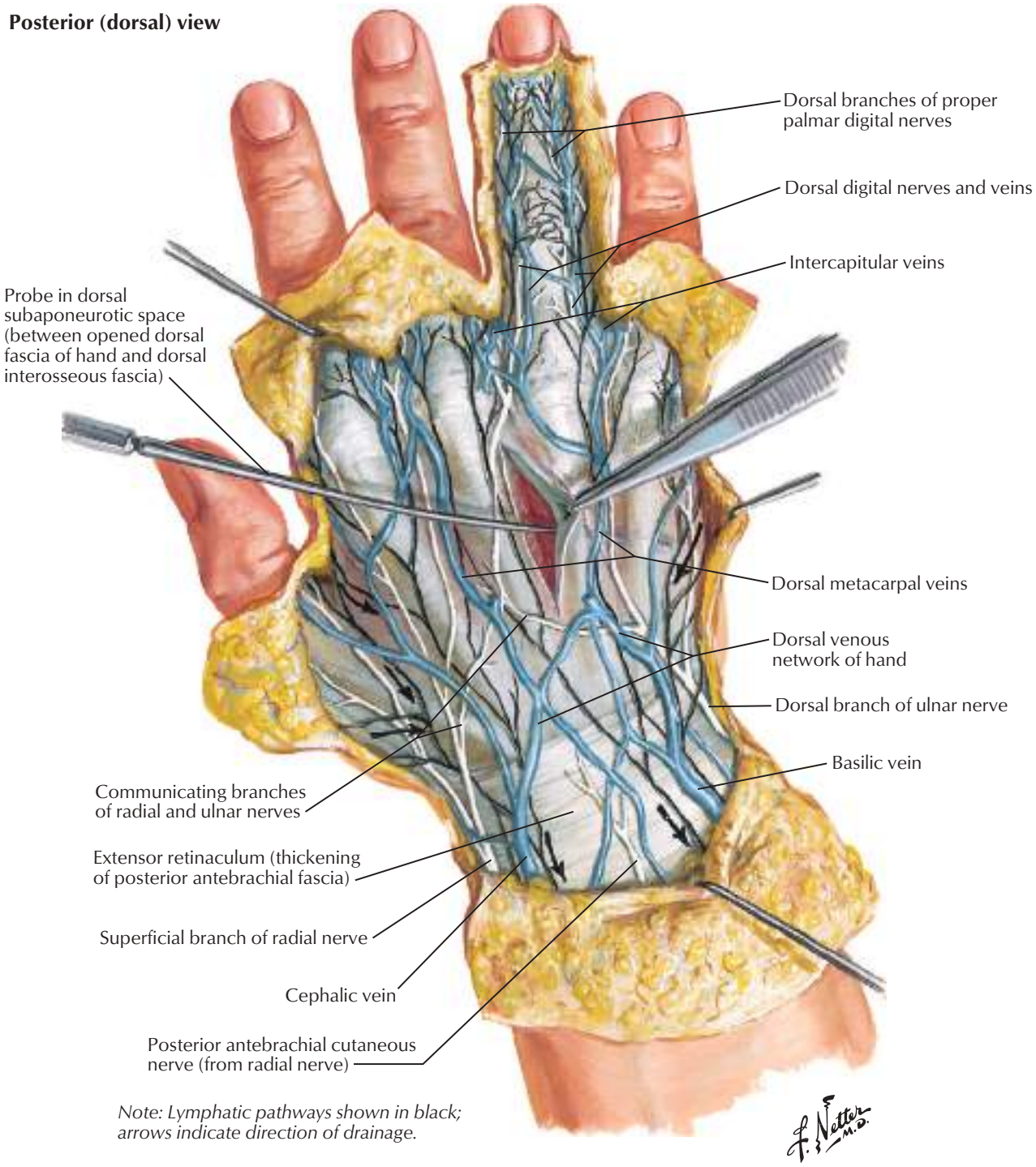


Lateral (radial) view

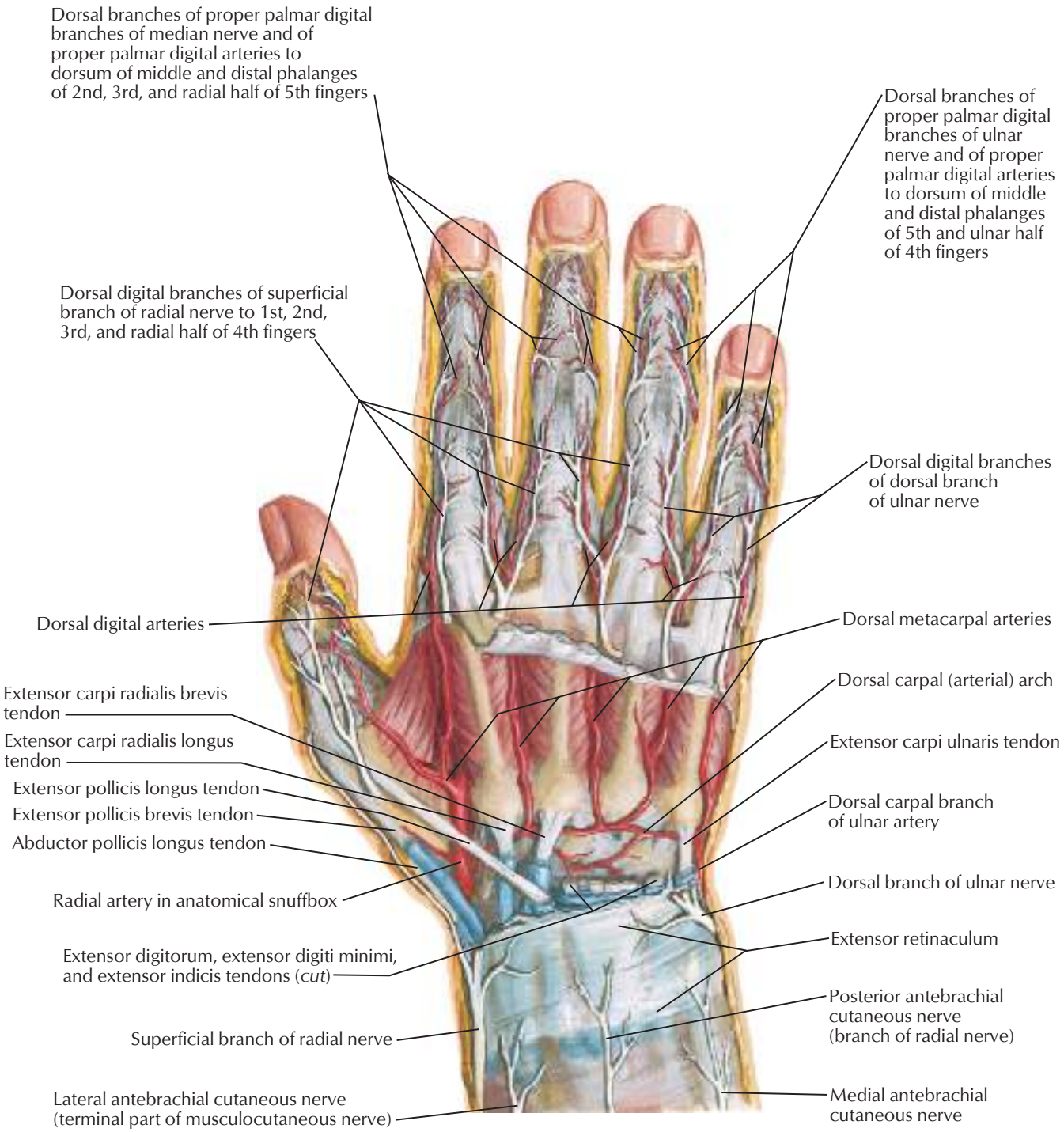


See also Plates 402, 403

Posterior (dorsal) view

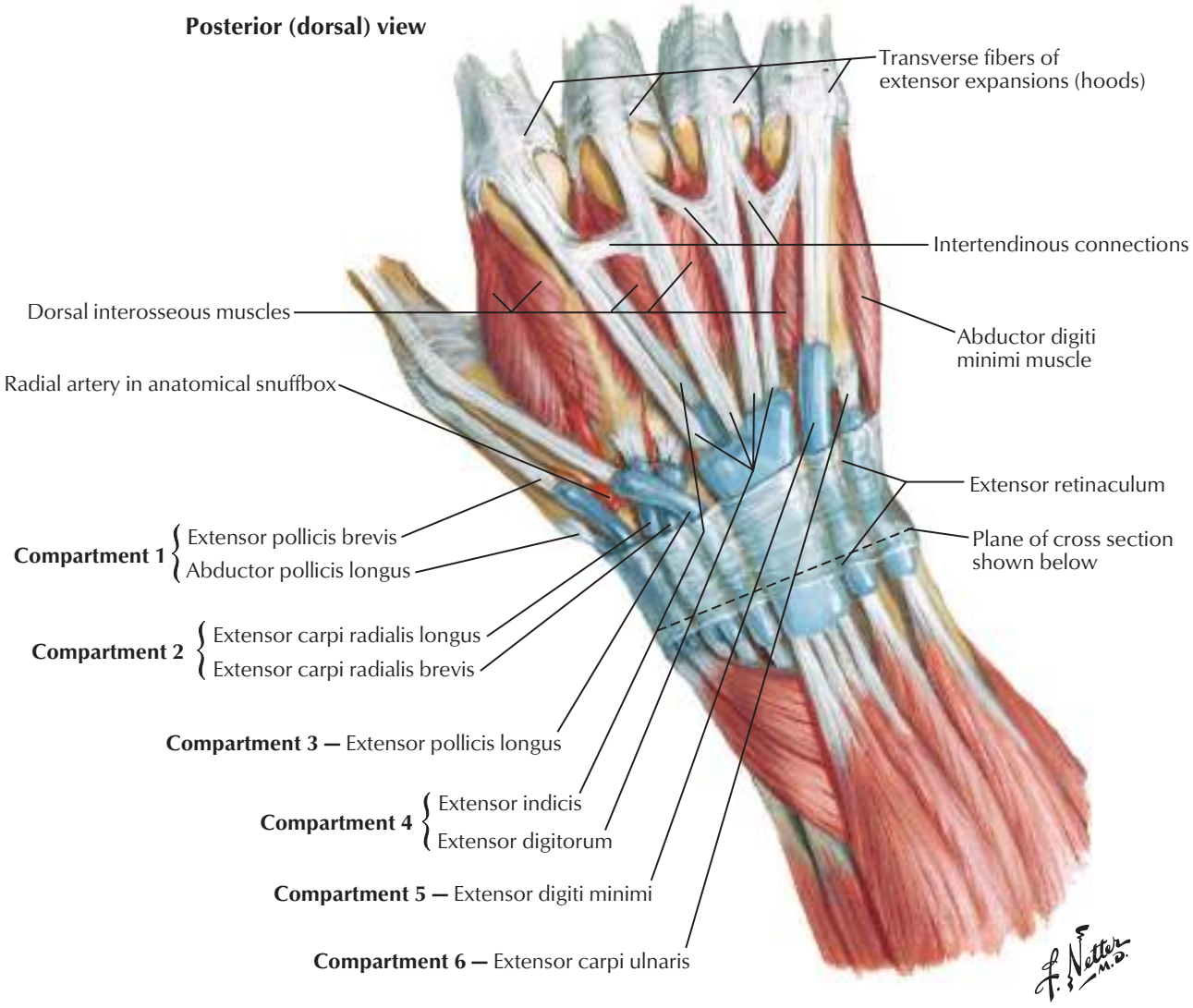


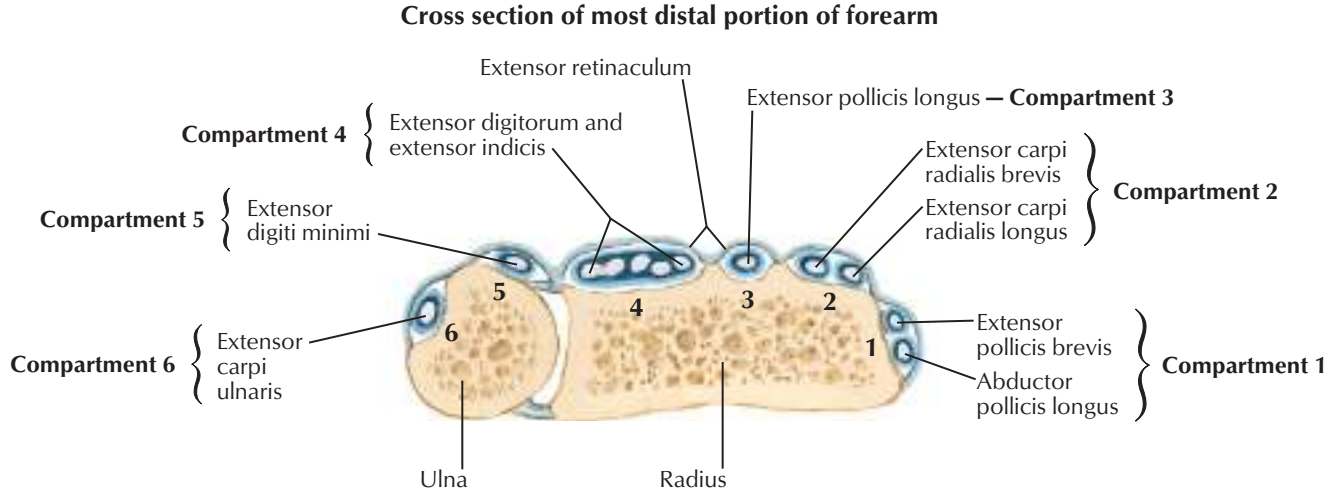
Note: Lymphatic pathways shown in black; arrows indicate direction of drainage.

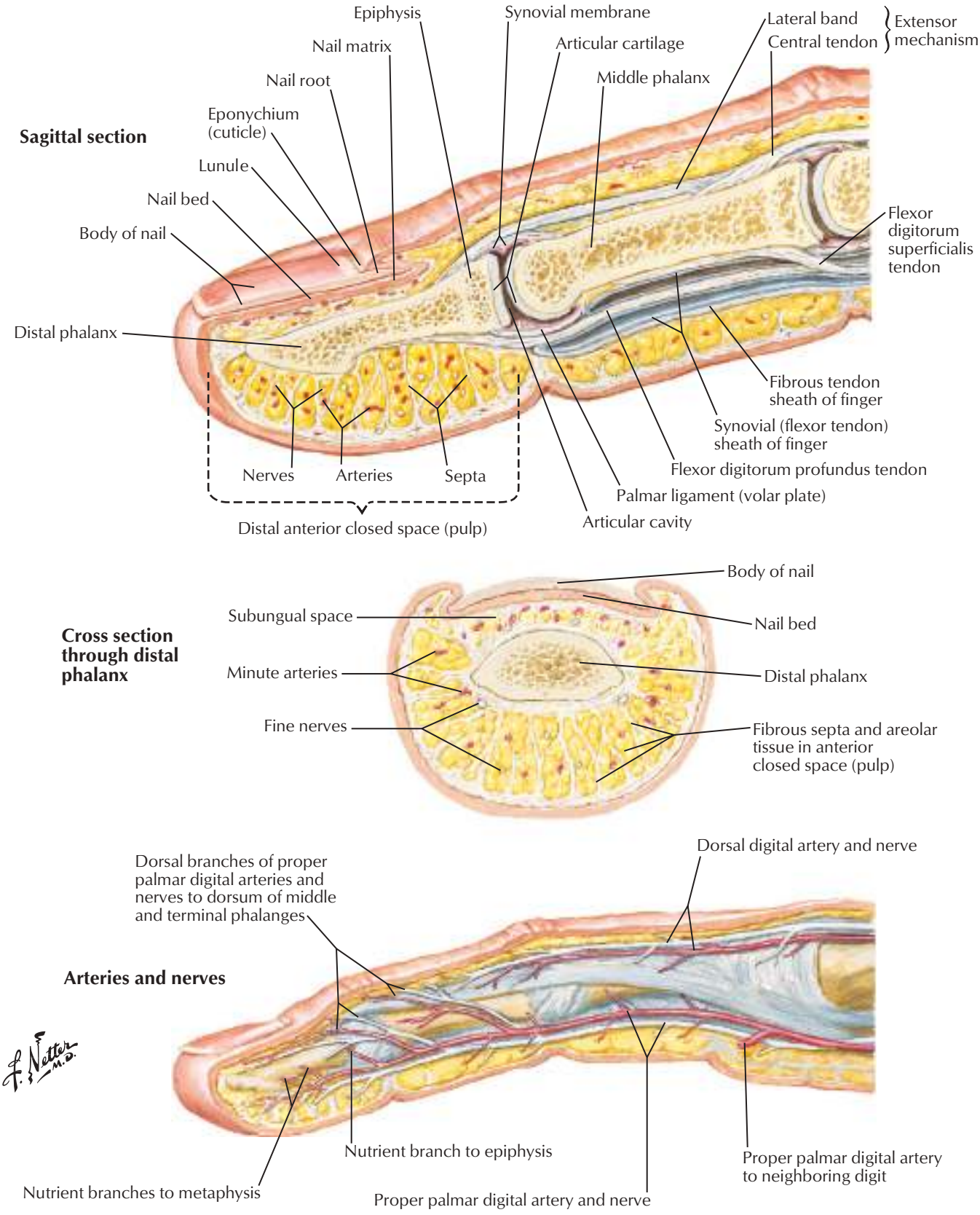


Posterior (dorsal) view

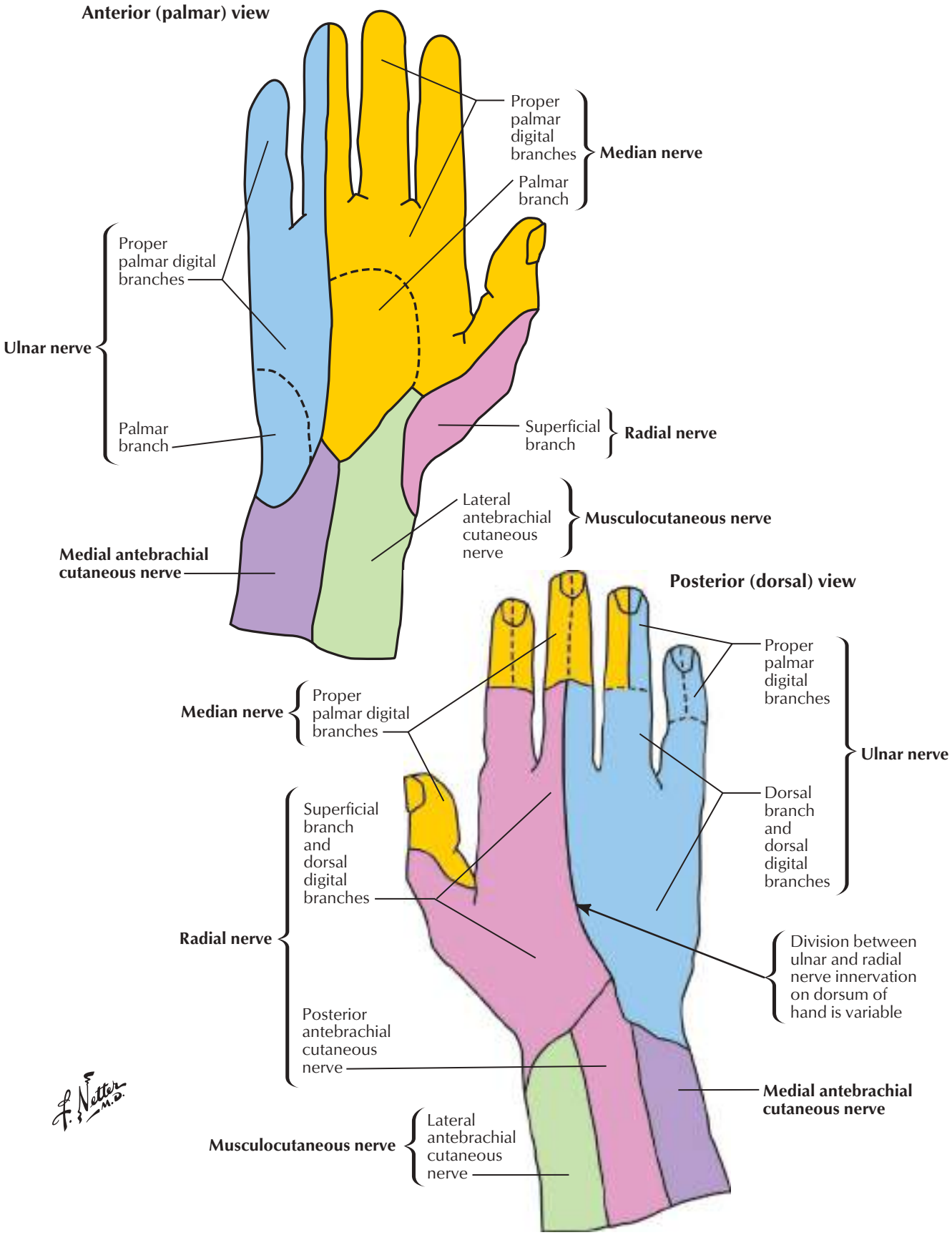
See also Plates 430, 431



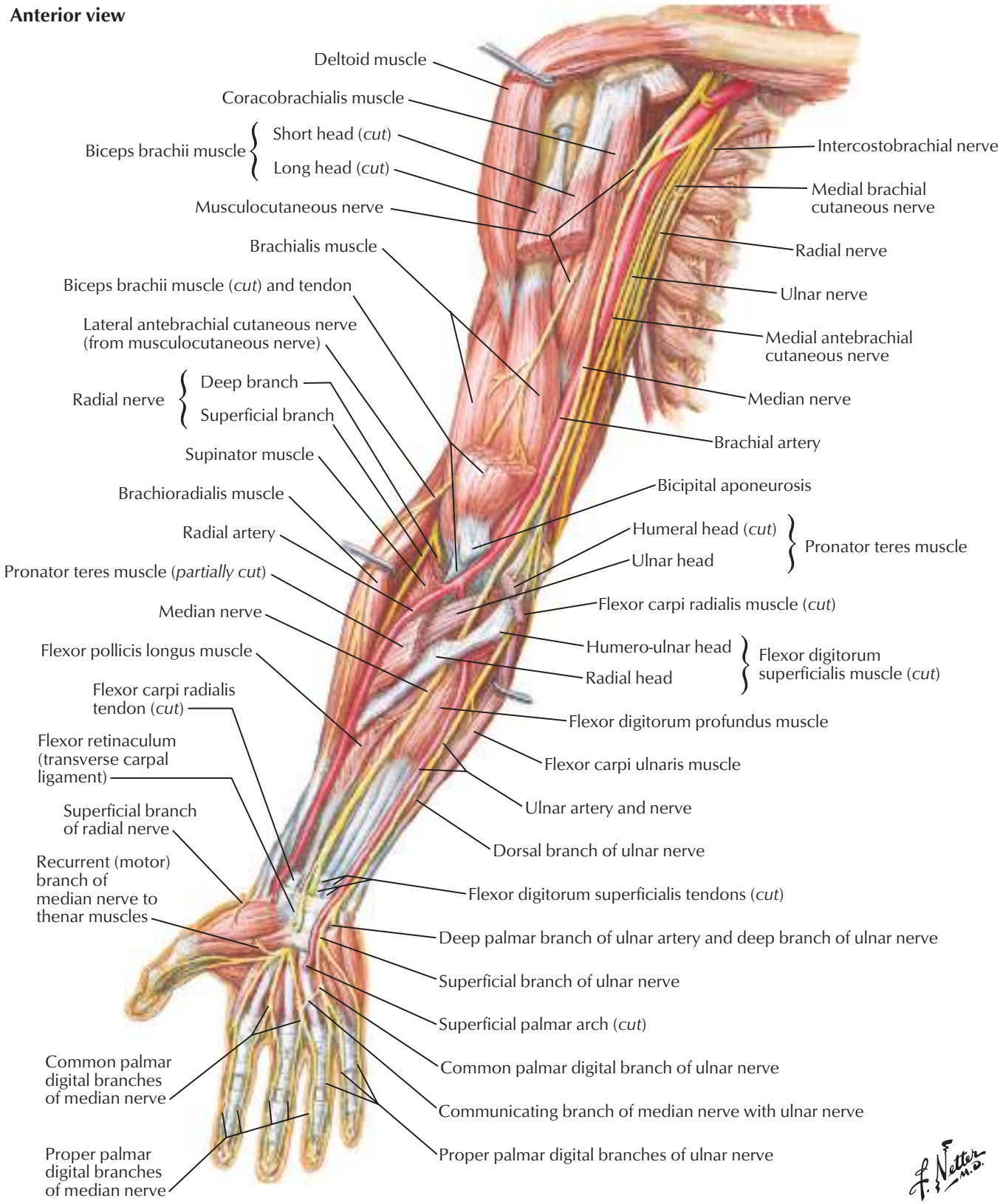



Sagittal section
Epiphysis
Synovial membrane
Lateral band
Extensor mechanism
Central tendon
Nail matrix
Articular cartilage
Nail root
Middle phalanx
Eponychium (cuticle)
Lunule
Nail bed
Body of nail
Flexor digitorum superficialis tendon
Distal phalanx
Fibrous tendon sheath of finger
Synovial (flexor tendon) sheath of finger
Flexor digitorum profundus tendon
Nerves
Arteries
Septa
Palmar ligament (volar plate)
Articular cavity
Distal anterior closed space (pulp)
Cross section through distal phalanx
Body of nail
Subungual space
Nail bed
Minute arteries
Distal phalanx
Fine nerves
Fibrous septa and areolar tissue in anterior closed space (pulp)
Arteries and nerves
Dorsal digital artery and nerve
Dorsal branches of proper palmar digital arteries and nerves to dorsum of middle and terminal phalanges
Nutrient branch to epiphysis
Proper palmar digital artery to neighboring digit
Nutrient branches to metaphysis
Proper palmar digital artery and nerve

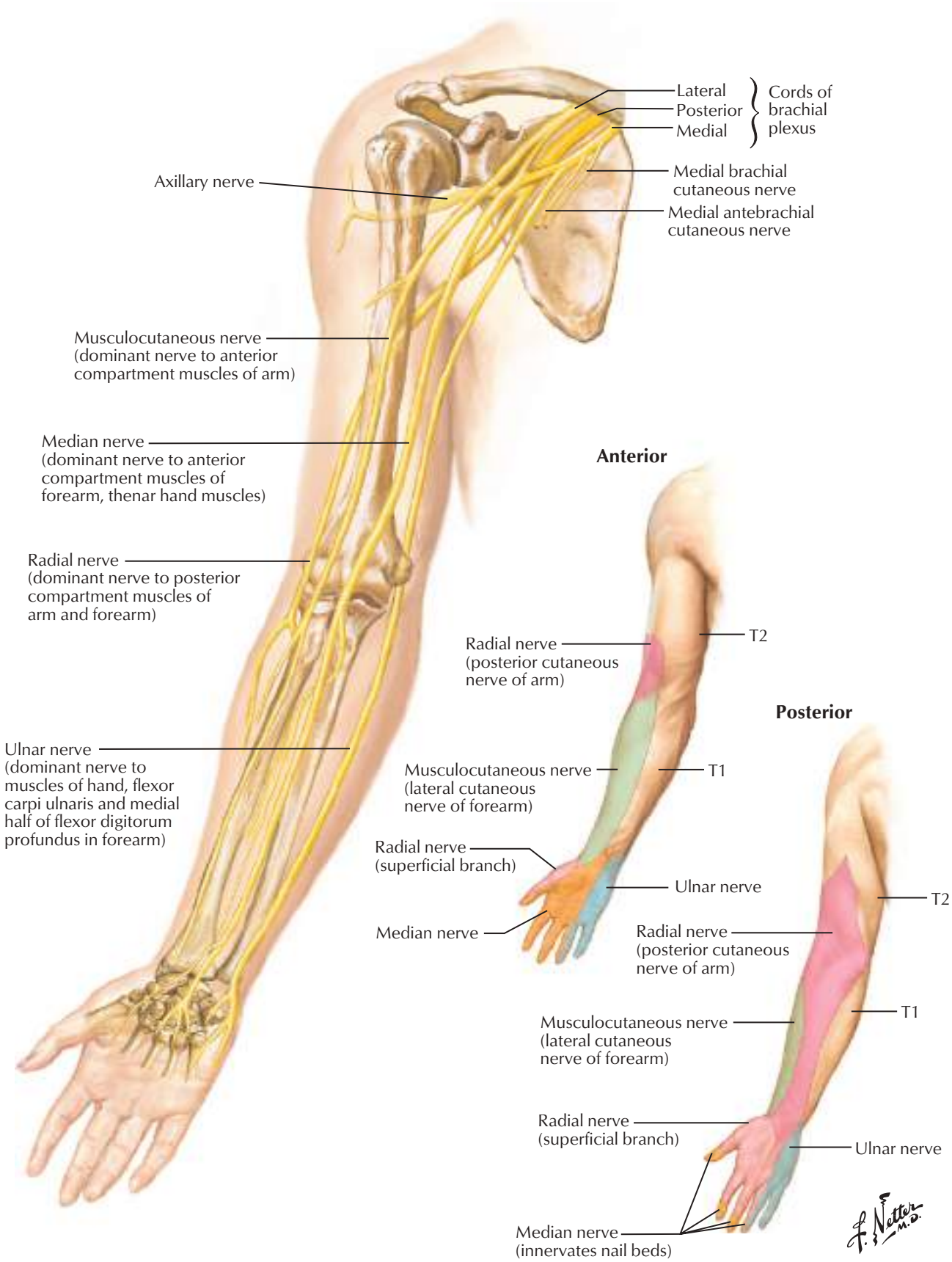
See also Plates 400, 449

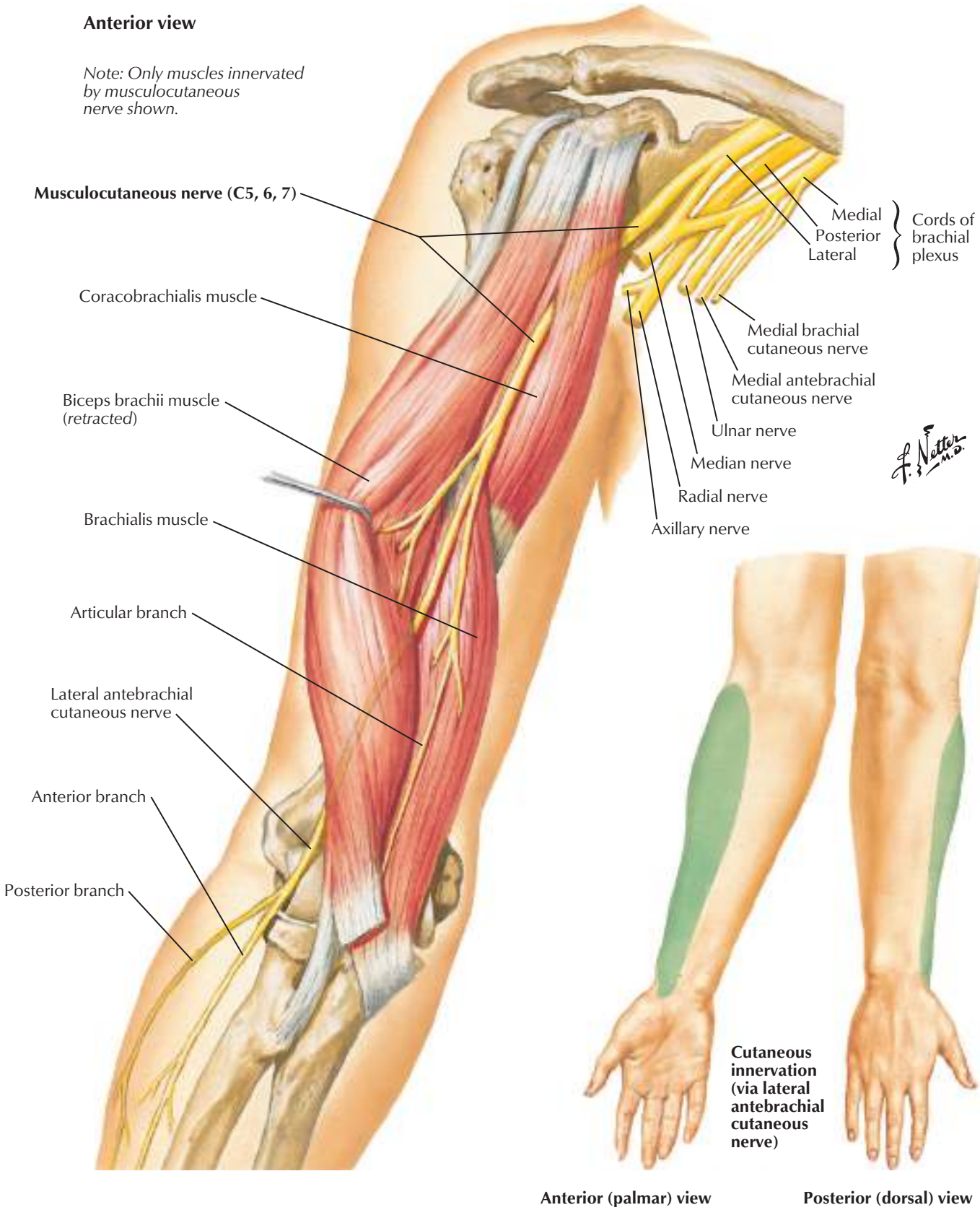


Anterior view



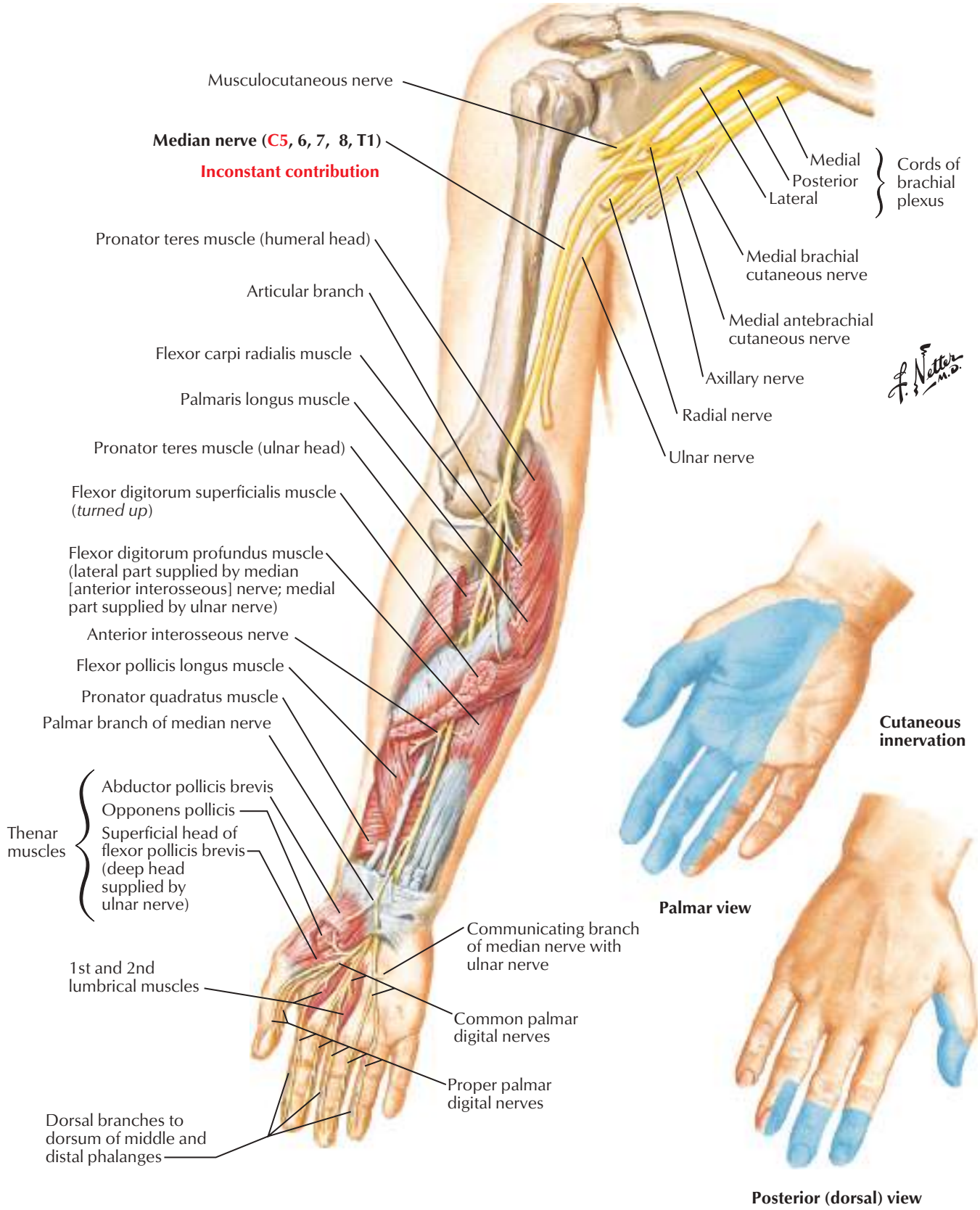
See also Plates 400, 410, 416

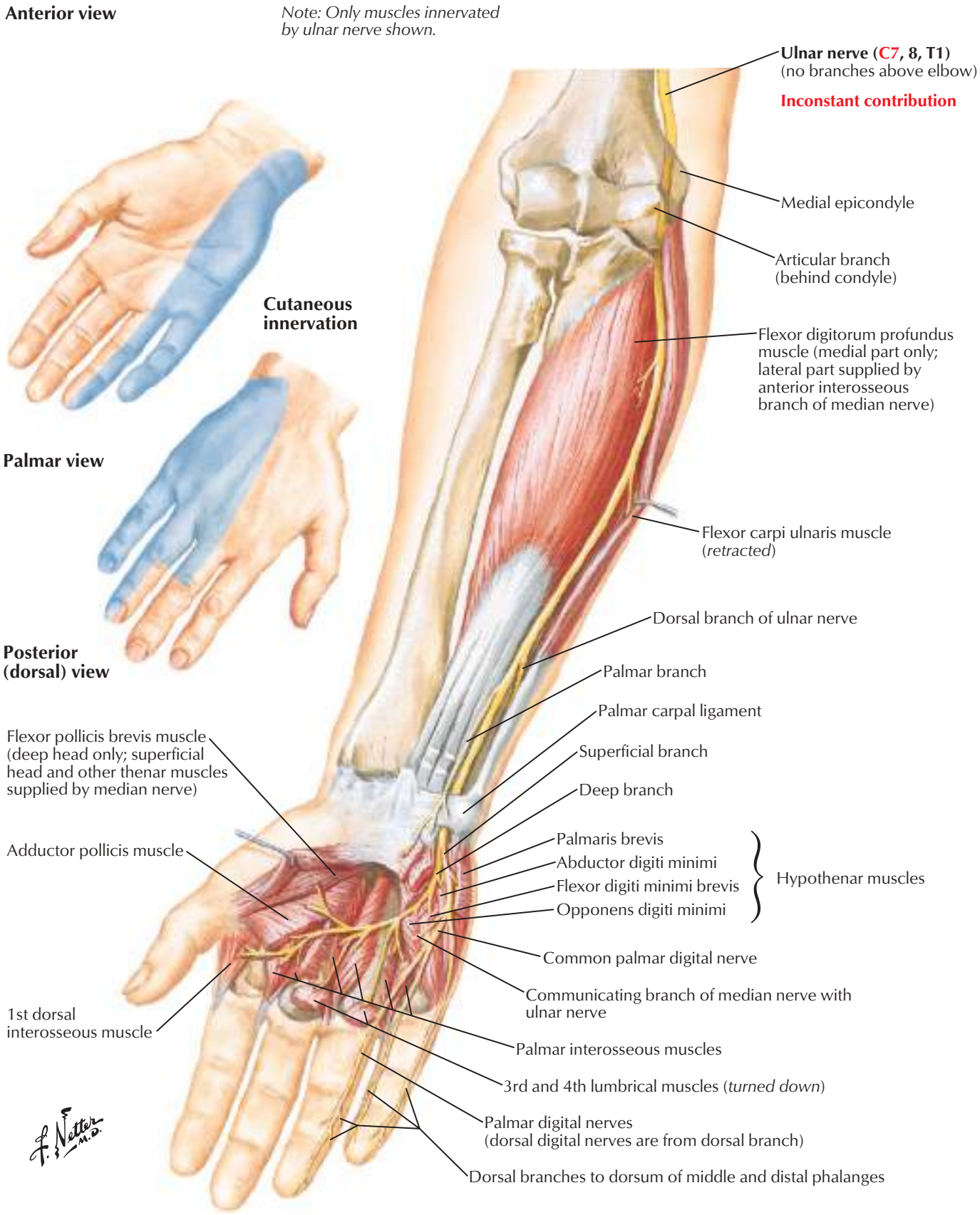



Anterior view
Note: Only muscles innervated by musculocutaneous nerve shown.
Musculocutaneous nerve (C5, 6, 7)
Coracobrachialis muscle
Biceps brachii muscle (retracted)
Brachialis muscle
Articular branch
Lateral antebrachial cutaneous nerve
Anterior branch
Posterior branch
Medial
Posterior
Lateral
Cords of brachial plexus
Medial brachial cutaneous nerve
Medial antebrachial cutaneous nerve
Ulnar nerve
Median nerve
Radial nerve
Axillary nerve
Cutaneous innervation (via lateral antebrachial cutaneous nerve)
Anterior (palmar) view
Posterior (dorsal) view

Anterior view

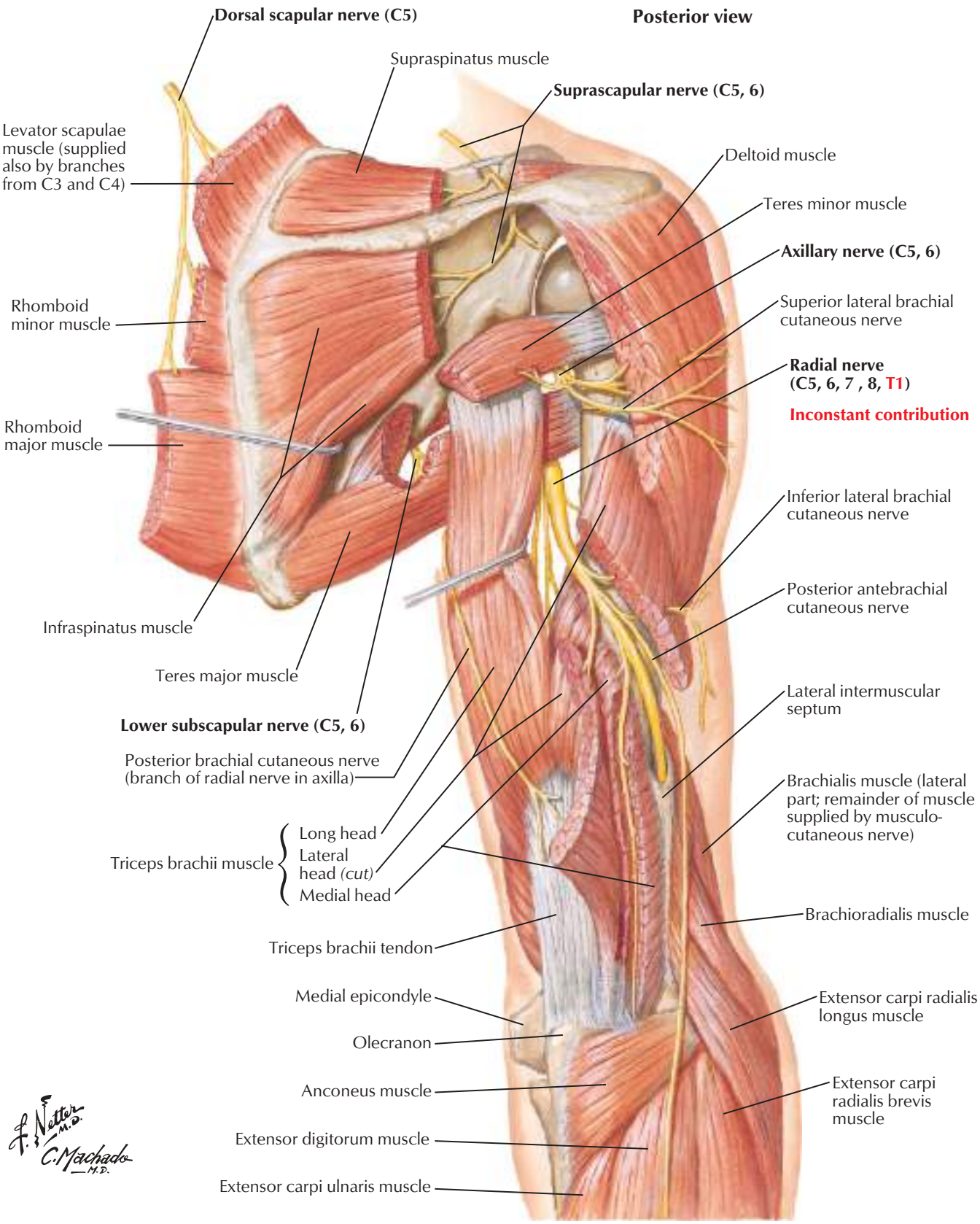
Note: Only muscles innervated by median nerve shown.

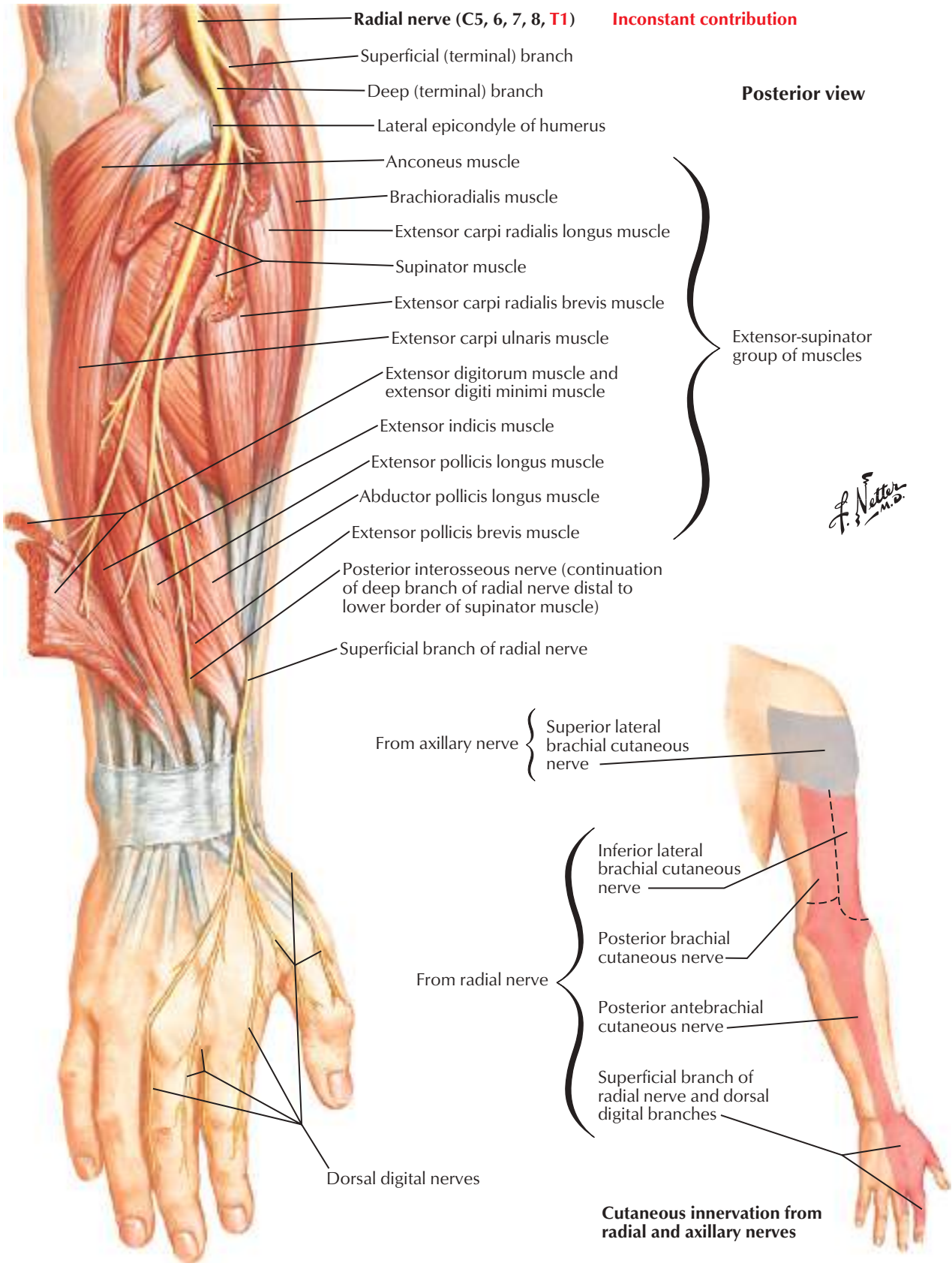



Anterior view
Note: Only muscles innervated by ulnar nerve shown.
Ulnar nerve (C7, 8, T1)
(no branches above elbow)
Inconstant contribution
Medial epicondyle
Articular branch
(behind condyle)
Cutaneous innervation
Flexor digitorum profundus muscle (medial part only; lateral part supplied by anterior interosseous branch of median nerve)
Palmar view
Flexor carpi ulnaris muscle (retracted)
Dorsal branch of ulnar nerve
Posterior (dorsal) view
Palmar branch
Palmar carpal ligament
Flexor pollicis brevis muscle (deep head only; superficial head and other thenar muscles supplied by median nerve)
Superficial branch
Deep branch
Adductor pollicis muscle
Palmaris brevis
Abductor digiti minimi
Flexor digiti minimi brevis
Opponens digiti minimi
Hypothenar muscles
Common palmar digital nerve
Communicating branch of median nerve with ulnar nerve
1st dorsal interosseous muscle
Palmar interosseous muscles
3rd and 4th lumbrical muscles (turned down)
Palmar digital nerves
(dorsal digital nerves are from dorsal branch)
Dorsal branches to dorsum of middle and distal phalanges

Radial Nerve in Arm and Nerves of Posterior Shoulder

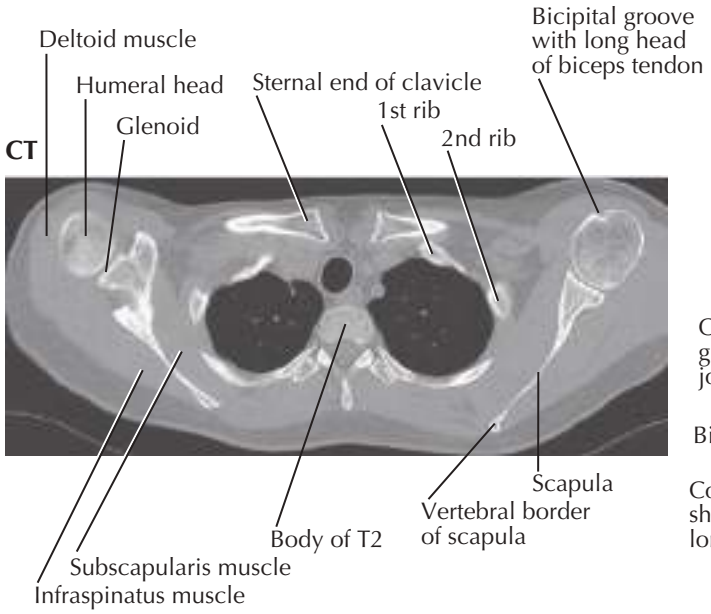
See also Plates 413, 418



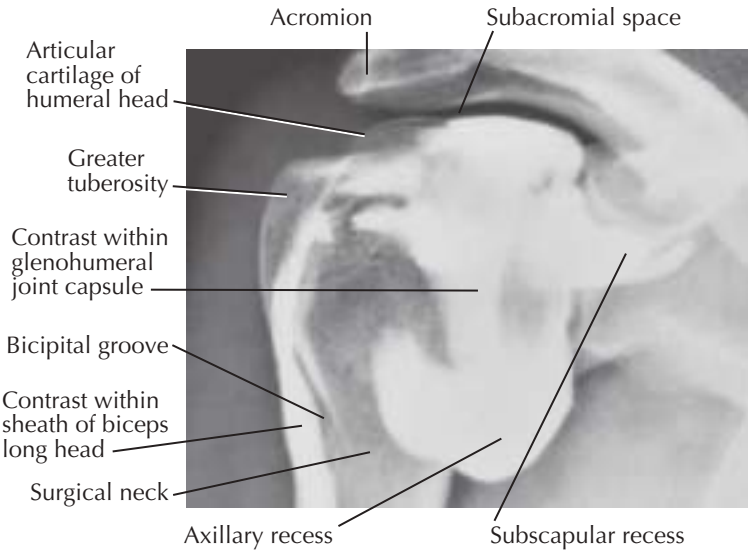

Radial nerve (C5, 6, 7, 8, T1)
Inconstant contribution
Superficial (terminal) branch
Deep (terminal) branch
Posterior view
Lateral epicondyle of humerus
Anconeus muscle
Brachioradialis muscle
Extensor carpi radialis longus muscle
Supinator muscle
Extensor carpi radialis brevis muscle
Extensor carpi ulnaris muscle
Extensor digitorum muscle and extensor digiti minimi muscle
Extensor indicis muscle
Extensor pollicis longus muscle
Abductor pollicis longus muscle
Extensor pollicis brevis muscle
Posterior interosseous nerve (continuation of deep branch of radial nerve distal to lower border of supinator muscle)
Superficial branch of radial nerve
Extensor-supinator group of muscles
F. Netter M.D.
From axillary nerve
Superior lateral brachial cutaneous nerve
Inferior lateral brachial cutaneous nerve
Posterior brachial cutaneous nerve
From radial nerve
Posterior antebrachial cutaneous nerve
Superficial branch of radial nerve and dorsal digital branches
Dorsal digital nerves
Cutaneous innervation from radial and axillary nerves

See also Plate 408

MRI



Arthrogram: glenohumeral joint



MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Abductor digiti minimi	Pisiform bone and tendon of flexor carpi ulnaris	Medial side of base of proximal phalanx of little finger (5th digit)	Ulnar nerve (deep branch)	Abducts little finger	Deep palmar branch of ulnar artery	Hand
Abductor pollicis brevis	Flexor retinaculum, tubercles of scaphoid and trapezium	Lateral side of base of proximal phalanx of thumb	Median nerve (recurrent branch)	Abducts thumb	Superficial palmar branch of radial artery	Hand
Abductor pollicis longus	Posterior surface of ulna, radius, and interosseous membrane	Base of 1st metacarpal	Radial nerve (posterior interosseous)	Abducts and extends thumb at carpometacarpal joint	Posterior interosseous artery	Posterior forearm
Adductor pollicis	*Oblique head*: bases of 2nd and 3rd metacarpals and capitate and adjacent bones *Transverse head:* anterior surface of 3rd metacarpal	Medial side of base of proximal phalanx of thumb	Ulnar nerve (deep branch)	Adducts thumb	Deep palmar arch	Hand
Anconeus	Posterior surface of lateral epicondyle of humerus	Lateral surface of olecranon and posterior proximal ulna	Radial nerve (C5–T1)	Assists triceps in extending elbow, abducts ulna in pronation	Deep brachial artery	Arm
Biceps brachii	*Long head:* supraglenoid tubercle of scapula *Short head:* tip of coracoid process of scapula	Radial tuberosity, fascia of forearm via bicipital aponeurosis	Musculocutaneous nerve (C5,C6)	Flexes and supinates forearm at elbow	Muscular branches of brachial artery	Arm
Brachialis	Distal half of anterior surface of humerus	Coronoid process and tuberosity of ulna	Musculocutaneous nerve and radial nerve (C7)	Flexes forearm at elbow	Radial recurrent artery, muscular branches of brachial artery	Arm
Brachioradialis	Proximal 2/3 of lateral supracondylar ridge of humerus	Lateral side of distal end of radius	Radial nerve	Weak flexion of forearm when forearm is midpronated	Radial recurrent artery	Posterior forearm
Coracobrachialis	Tip of coracoid process of scapula	Middle third of medial surface of humerus	Musculocutaneous nerve	Flexes and adducts arm at shoulder	Muscular branches of brachial artery	Arm
Deltoid	Lateral third of anterior clavicle, lateral acromion, inferior edge of spine of scapula	Deltoid tuberosity of humerus	Axillary nerve	*Clavicular part*: flexes and medially rotates arm *Acromial part:* abducts arm beyond initial 15 degrees done by supraspinatus *Spinal part:* extends and laterally rotates arm	Posterior circumflex humeral artery, deltoid branch of thoraco-acromial artery	Shoulder
Dorsal interosseous muscles	Adjacent sides of two metacarpal bones	Base of proximal phalanges, extensor expansion of digits 2–4	Ulnar nerve (deep branch)	Abduct digits from axial line of hand (3rd digit); flex digits at metacarpophalangeal joint and extend interphalangeal joints	Deep palmar arch	Hand
Extensor carpi radialis brevis	Lateral epicondyle of humerus	Dorsal base of 3rd metacarpal and slip to 2nd metacarpal	Radial nerve (deep branch)	Extends and abducts hand at wrist	Radial artery, radial recurrent artery	Posterior forearm
Extensor carpi radialis longus	Distal third of lateral supracondylar ridge of humerus	Dorsal base of 2nd metacarpal and slip to 3rd metacarpal	Radial nerve	Extends and abducts hand at wrist	Radial artery, radial recurrent artery	Posterior forearm

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Extensor carpi ulnaris	Lateral epicondyle of humerus and posterior border of ulna	Dorsal base of 5th metacarpal	Radial nerve (posterior interosseous)	Extends and adducts hand at wrist	Posterior interosseous artery	Posterior forearm
Extensor digiti minimi	Lateral epicondyle of humerus	Extensor expansion of 5th digit	Radial nerve (posterior interosseous)	Extends 5th digit	Posterior interosseous artery	Posterior forearm
Extensor digitorum	Lateral epicondyle of humerus	Extensor expansions of medial four digits	Radial nerve (posterior interosseous)	Extends medial four digits, assists in wrist extension	Posterior interosseous artery	Posterior forearm
Extensor indicis	Posterior surface of ulna and interosseous membrane	Extensor expansion of 2nd digit	Radial nerve (posterior interosseous)	Extends 2nd digit and helps extend hand at wrist	Posterior interosseous artery	Posterior forearm
Extensor pollicis brevis	Posterior surface of radius and interosseous membrane	Dorsal base of proximal phalanx of thumb	Radial nerve (posterior interosseous)	Extends proximal phalanx of thumb at carpometacarpal joint	Posterior interosseous artery	Posterior forearm
Extensor pollicis longus	Posterior surface of middle third of ulna, interosseous membrane	Dorsal base of distal phalanx of thumb	Radial nerve (posterior interosseous)	Extends distal phalanx of thumb at interphalangeal and metacarpophalangeal joints	Posterior interosseous artery	Posterior forearm
Flexor carpi radialis	Medial epicondyle of humerus	Base of 2nd metacarpal	Median nerve	Flexes and abducts hand at wrist	Radial artery	Anterior forearm
Flexor carpi ulnaris	*Humeral head:* medial epicondyle of humerus *Ulnar head:* olecranon and posterior border of ulna	Pisiform bone, hook of hamate, base of 5th metacarpal	Ulnar nerve	Flexes and adducts hand at wrist	Posterior ulnar recurrent artery	Anterior forearm
Flexor digiti minimi brevis	Flexor retinaculum and hook of hamate bone	Medial side of base of proximal phalanx of little finger	Ulnar nerve (deep branch)	Flexes proximal phalanx of little finger	Deep palmar branch of ulnar artery	Hand
Flexor digitorum profundus	Medial and anterior surface of proximal 3/4 of ulna and interosseous membrane	Palmar base of distal phalanges of medial four digits	*Medial part:* ulnar nerve *Lateral part:* median nerve	Flexes distal phalanges of medial four digits, assists with flexion of hand at wrist	Anterior interosseous artery, muscular branches of ulnar artery	Anterior forearm
Flexor digitorum superficialis	*Humero-ulnar head:* medial epicondyle of humerus and coronoid process of ulna *Radial head:* superior half of anterior radius	Bodies of middle phalanges of medial four digits	Median nerve	Flexes middle and proximal phalanges of medial four digits, flexes hand at wrist	Ulnar and radial arteries	Anterior forearm
Flexor pollicis brevis	Flexor retinaculum and tubercle of trapezium	Lateral side of base of proximal phalanx of thumb	Median nerve (recurrent branch)	Flexes proximal phalanx of thumb	Superficial palmar branch of radial artery	Hand
Flexor pollicis longus	Anterior surface of radius and interosseous membrane	Palmar base of distal phalanx of thumb	Median nerve (anterior interosseous)	Flexes phalanges of thumb	Anterior interosseous artery	Anterior forearm
Infraspinatus	Infraspinous fossa of scapula and deep fascia	Middle facet of greater tubercle of humerus	Suprascapular nerve	Lateral rotation of arm (with teres minor)	Suprascapular artery	Shoulder

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Latissimus dorsi	Spinous processes of T7–L5 vertebrae, thoracolumbar fascia, iliac crest, last 3 ribs	Intertubercular sulcus of humerus	Thoracodorsal nerve	Extends, adducts, and medially rotates humerus at shoulder	Thoracodorsal artery, dorsal perforating branches of 9th, 10th, and 11th posterior intercostal, subcostal, and first three lumbar arteries	Shoulder
Levator scapulae	Posterior tubercles of transverse processes of C1–C4	Medial border of scapula from superior angle to spine	Ventral rami of C3–C4 and dorsal scapular nerve	Elevates scapula medially, inferiorly rotates glenoid cavity	Dorsal scapular artery, transverse cervical artery, ascending cervical artery	Superficial back
Lumbrical, first and second	Lateral two tendons of flexor digitorum profundus	Lateral sides of extensor expansion of digits 2 and 3	Median nerve (digital branches)	Extend digits at interphalangeal joints, flex metacarpophalangeal joints	Superficial and deep palmar arches	Hand
Lumbrical, third and fourth	Medial three tendons of flexor digitorum profundus	Lateral sides of extensor expansion of digits 4 and 5	Ulnar nerve (deep branch)	Extend digits at interphalangeal joints, flex metacarpophalangeal joints	Superficial and deep palmar arches	Hand
Opponens digiti minimi	Flexor retinaculum and hook of hamate bone	Palmar surface of 5th metacarpal	Ulnar nerve (deep branch)	Draws 5th metacarpal anteriorly and rotates it to face thumb	Deep palmar branch of ulnar artery	Hand
Opponens pollicis	Flexor retinaculum and tubercle of trapezium	Lateral side of 1st metacarpal	Median nerve (recurrent branch)	Draws 1st metacarpal forward and rotates it medially	Superficial palmar branch of radial artery	Hand
Palmar interosseous muscles	Sides of metacarpals 2, 4, and 5	Bases of proximal phalanx and extensor expansion of digits 2, 4, and 5	Ulnar nerve (deep branch)	Adducts digits toward axial line of hand (3rd digit); flexes digits at metacarpophalngeal joint and extends interphalangeal joints	Deep palmar arch	Hand
Palmaris brevis	Palmar aponeurosis and flexor retinaculum	Skin of medial border of palm	Superficial palmar branch of ulnar nerve	Deepens hollow of hand, assists grip	Superficial palmar arch	Hand
Palmaris longus	Medial epicondyle of humerus	Distal half of flexor retinaculum and palmar aponeurosis	Median nerve	Flexes hand at wrist and tenses palmar aponeurosis	Posterior ulnar recurrent artery	Anterior forearm
Pectoralis major	Sternal half of clavicle, sternum to 7th rib, cartilages of true ribs, aponeurosis of external oblique muscle	Lateral lip of intertubercular sulcus of humerus	Medial and lateral pectoral nerves	Flexes and adducts arm, rotates arm medially	Pectoral branch of thoraco-acromial artery, perforating branches of internal thoracic artery	Pectoral region/ axilla
Pectoralis minor	Outer surface of upper margin of ribs 3–5	Coracoid process of scapula	Medial pectoral nerve	Lowers lateral angle of scapula and protracts scapula	Pectoral branch of thoraco-acromial and intercostal lateral thoracic arteries	Pectoral region/ axilla
Pronator quadratus	Distal fourth of anterior ulna	Distal fourth of anterior radius	Median nerve (anterior interosseous)	Pronates forearm	Anterior interosseous artery	Anterior forearm
Pronator teres	Two heads: medial epicondyle of humerus and coronoid process of ulna	Midway along lateral surface of radius	Median nerve	Pronates forearm and assists with elbow flexion	Anterior ulnar recurrent artery	Anterior forearm

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Rhomboid major	Spinous processes of T2–T5 vertebrae	Medial border of scapula below base of spine of scapula	Dorsal scapular nerve	Fixes scapula to thoracic wall and retracts and rotates it to depress glenoid cavity	Dorsal scapular OR deep branch of transverse cervical artery, dorsal perforating branches of the upper five or six posterior intercostal arteries artery	Superficial back
Rhomboid minor	Ligamentum nuchae, spines of C7 and T1 vertebrae	Medial border of scapula at spine of scapula	Dorsal scapular nerve	Fixes scapula to thoracic wall and retracts and rotates it to depress glenoid cavity	Dorsal scapular artery OR deep branch of transverse cervical artery, dorsal perforating branches of the upper five or six posterior intercostal arteries	Superficial back
Serratus anterior	Lateral surfaces of upper 8–9 ribs	Costal surface of medial border of scapula	Long thoracic nerve	Protracts and rotates scapula and holds it against thoracic wall	Lateral thoracic artery	Shoulder
Subclavius	Upper border of 1st rib and its cartilage	Inferior surface of middle third of clavicle	Nerve to subclavius	Anchors and depresses clavicle	Clavicular branch of thoraco-acromial artery	Shoulder
Subscapularis	Subscapular fossa	Lesser tubercle of humerus	Upper and lower subscapular nerves	Medially rotates arm at shoulder and adducts it, helps hold humeral head in glenoid cavity	Subscapular artery, lateral thoracic artery	Shoulder
Supinator	Lateral epicondyle of humerus, supinator crest of ulna	Lateral, posterior, and anterior surfaces of proximal third of radius	Radial nerve (deep branch)	Supinates forearm	Radial recurrent artery, posterior interosseous arteries	Posterior forearm
Supraspinatus	Supraspinous fossa of scapula and deep fascia	Superior facet of greater tubercle of humerus	Suprascapular nerve	Initiates arm abduction, acts with rotator cuff muscles	Suprascapular artery	Shoulder
Teres major	Posterior surface of inferior angle of scapula	Medial lip of intertubercular sulcus of humerus	Lower subscapular nerve	Adducts and medially rotates arm	Circumflex scapular artery	Shoulder
Teres minor	Upper 2/3 of posterior surface of lateral border of scapula	Inferior facet of greater tubercle of humerus	Axillary nerve	Laterally rotates arm	Circumflex scapular artery	Shoulder
Trapezius	Superior nuchal line, external occipital protuberance, nuchal ligament, spinous processes of C7–T12	Lateral third of clavicle, acromion, and spine of scapula	Accessory nerve (cranial nerve XI)	Elevates, retracts, and rotates scapula; lower fibers depress scapula	Transverse cervical artery, dorsal perforating branches of posterior intercostal arteries	Superficial back
Triceps brachii	*Long head:* infraglenoid tubercle of scapula *Lateral head:* upper half of posterior humerus *Medial head:* distal 2/3 of medial and posterior humerus	Posterior surface of olecranon process of ulna	Radial nerve	Extends forearm at elbow; long head stabilizes head of abducted humerus and extends and adducts arm at shoulder	Branch of profunda brachii artery	Arm

Section

7 LOWER LIMB

Topographic Anatomy

Plate 468

468 Lower Limb: Surface Anatomy

Cutaneous Anatomy

Plates 469–472

469 Dermatomes of Lower Limb

470 Superficial Nerves and Veins of Lower Limb: Anterior View

471 Superficial Nerves and Veins of Lower Limb: Posterior View

472 Lymph Vessels and Nodes of Lower Limb

Hip and Thigh

Plates 473–492

473 Hip (Coxal) Bone

474 Hip Joint

475 Hip Joint: Anteroposterior Radiograph

476 Femur

477 Bony Attachments of Muscles of Hip and Thigh: Anterior View

478 Bony Attachments of Muscles of Hip and Thigh: Posterior View

479 Muscles of Thigh: Anterior Views

480 Muscles of Thigh: Anterior Views (continued)

481 Muscles of Hip and Thigh: Lateral View

482 Muscles of Hip and Thigh: Posterior Views

483 Psoas and Iliacus Muscles

484 Lumbosacral and Coccygeal Plexuses
485 Lumbar Plexus
486 Sacral and Coccygeal Plexuses
487 Arteries and Nerves of Thigh: Anterior Views
488 Arteries and Nerves of Thigh: Anterior Views (continued)
489 Arteries and Nerves of Thigh: Posterior View
490 Nerves of Hip and Buttock
491 Arteries of Femoral Head and Neck
492 Thigh: Serial Cross Sections

Knee

Plates 493–499

493 Knee: Medial and Lateral Views
494 Knee: Anterior Views
495 Knee: Interior
496 Knee: Cruciate and Collateral Ligaments
497 Knee: Anteroposterior Radiograph and Posterior View
498 Knee: Posterior and Sagittal Views
499 Arteries of Thigh and Knee: Schema

Leg

Plates 500–510

500 Tibia and Fibula
501 Tibia and Fibula (continued)
502 Attachments of Muscles of Leg
503 Muscles of Leg (Superficial Dissection): Posterior View
504 Muscles of Leg (Intermediate Dissection): Posterior View
505 Muscles of Leg (Deep Dissection): Posterior View
506 Muscles of Leg: Lateral View
507 Muscles of Leg (Superficial Dissection): Anterior View
508 Muscles of Leg (Deep Dissection): Anterior View
509 Arteries of Knee, Leg, and Foot
510 Leg: Cross Sections and Fascial Compartments

Ankle and Foot

Plates 511–524

511 Bones of Foot
512 Bones of Foot (continued)
513 Calcaneus
514 Ligaments and Tendons of Ankle
515 Ligaments and Tendons of Foot: Plantar View
516 Tendon Sheaths of Ankle
517 Muscles of Dorsum of Foot: Superficial Dissection
518 Dorsum of Foot: Deep Dissection
519 Sole of Foot: Superficial Dissection
520 Muscles of Sole of Foot: First Layer
521 Muscles of Sole of Foot: Second Layer
522 Muscles of Sole of Foot: Third Layer
523 Interosseous Muscles and Deep Arteries of Foot
524 Interosseous Muscles of Foot

Neurovasculature

Plates 525–529

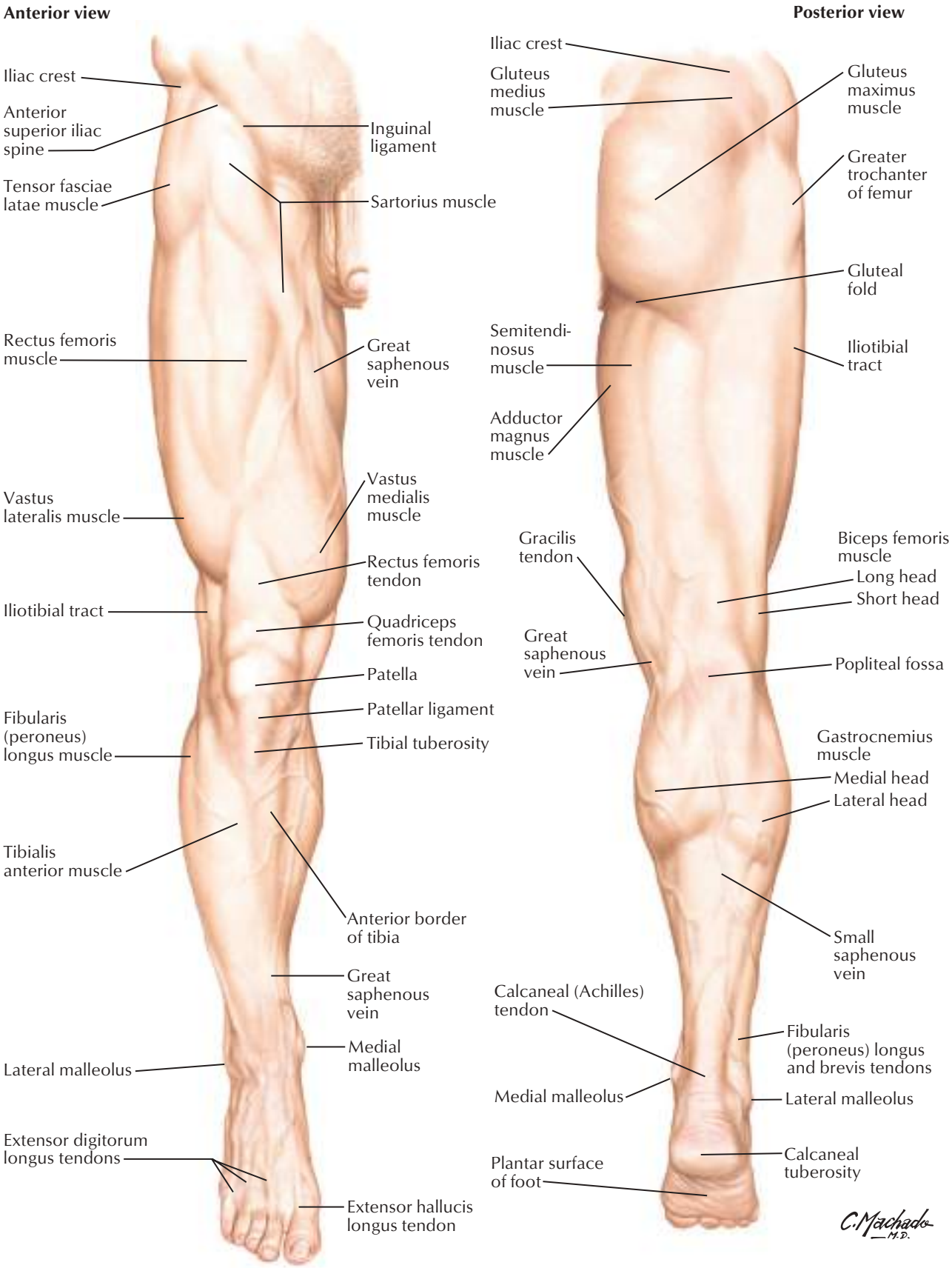
525 Femoral Nerve and Lateral Cutaneous Nerve of Thigh
526 Obturator Nerve
527 Sciatic Nerve and Posterior Cutaneous Nerve of Thigh
528 Tibial Nerve
529 Common Fibular (Peroneal) Nerve

Regional Scans

Plates 530–531

530 Hip Radiograph, Arthrogram, and MRI
531 Ankle: Radiographs

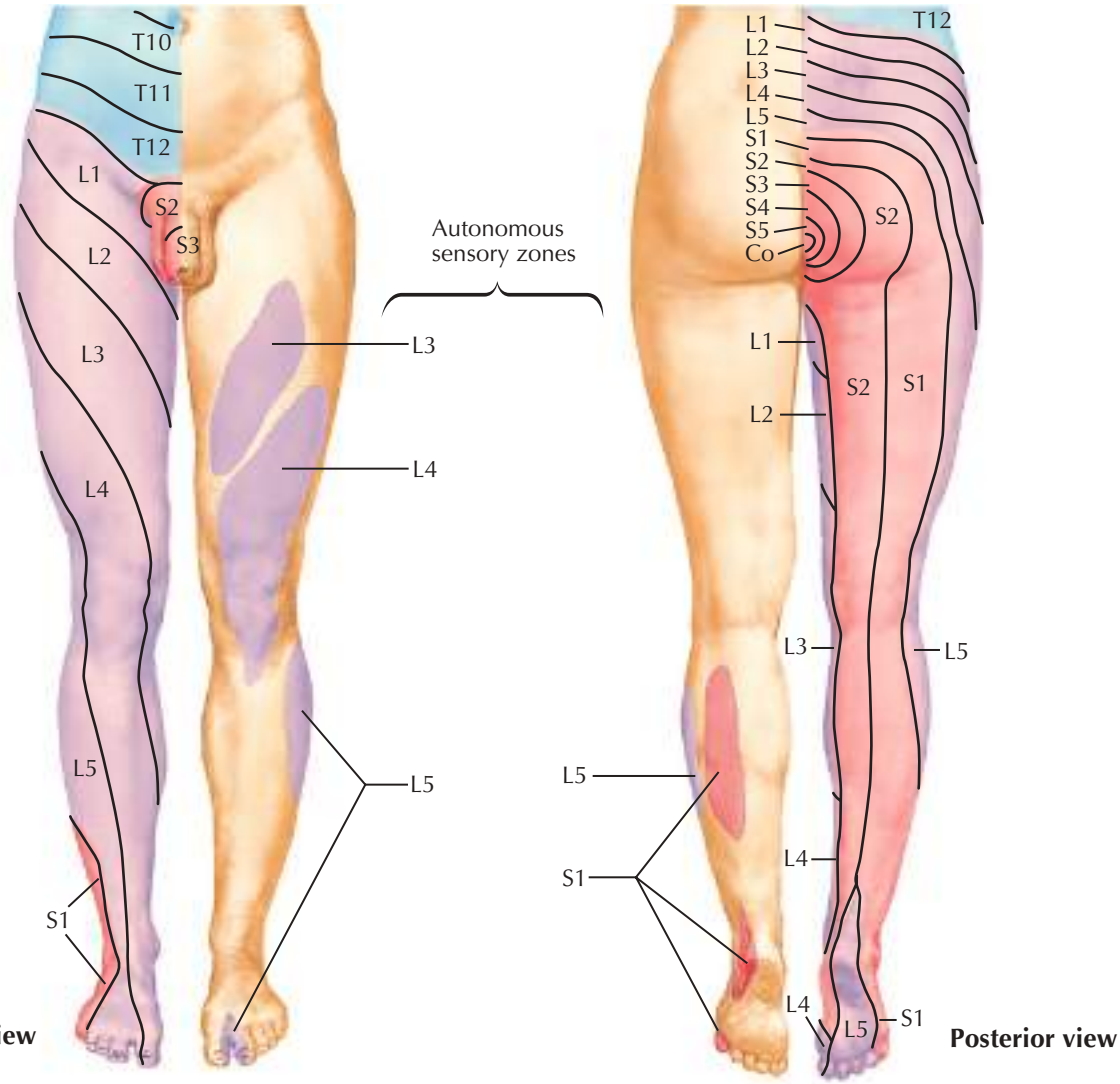
Muscle Tables


Anterior view
Iliac crest
Anterior superior iliac spine
Tensor fasciae latae muscle
Inguinal ligament
Sartorius muscle
Rectus femoris muscle
Great saphenous vein
Vastus lateralis muscle
Vastus medialis muscle
Rectus femoris tendon
Iliotibial tract
Quadriceps femoris tendon
Patella
Patellar ligament
Tibial tuberosity
Fibularis (peroneus) longus muscle
Tibialis anterior muscle
Anterior border of tibia
Great saphenous vein
Medial malleolus
Lateral malleolus
Extensor digitorum longus tendons
Extensor hallucis longus tendon
Posterior view
Iliac crest
Gluteus medius muscle
Gluteus maximus muscle
Greater trochanter of femur
Gluteal fold
Semitendinosus muscle
Iliotibial tract
Adductor magnus muscle
Gracilis tendon
Biceps femoris muscle
Long head
Short head
Great saphenous vein
Popliteal fossa
Gastrocnemius muscle
Medial head
Lateral head
Small saphenous vein
Calcaneal (Achilles) tendon
Fibularis (peroneus) longus and brevis tendons
Medial malleolus
Lateral malleolus
Calcaneal tuberosity
Plantar surface of foot
C. Machado M.D.

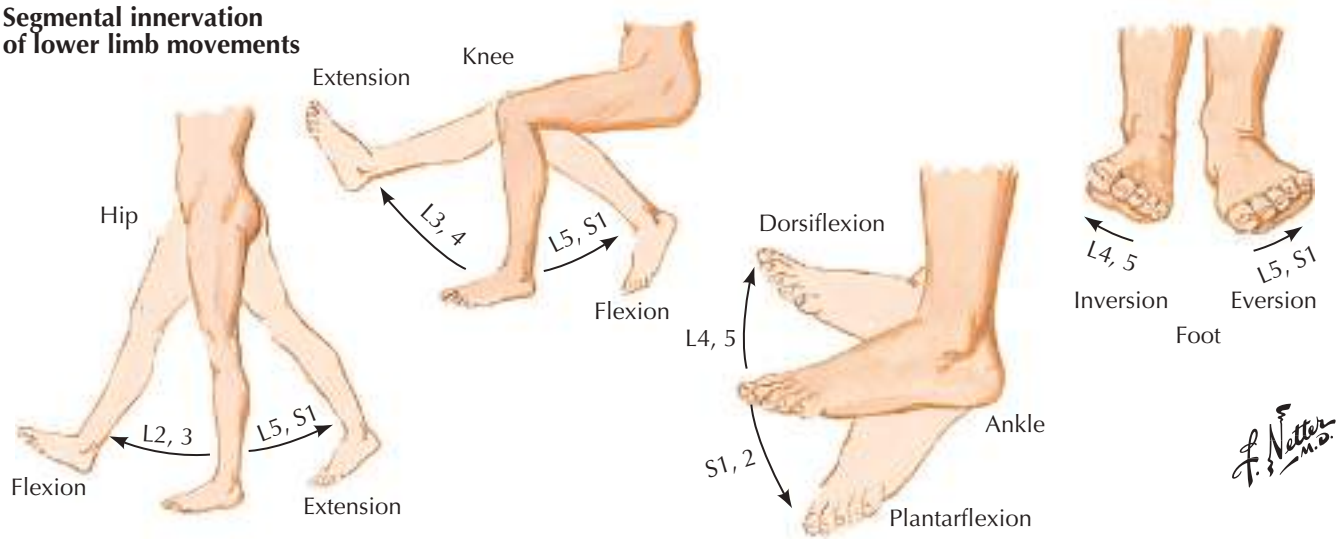
Dermatomes of Lower Limb

See also Plate 162

Schematic demarcation of dermatomes (according to Keegan and Garrett) shown as distinct segments. There is actually considerable overlap between any two adjacent dermatomes.

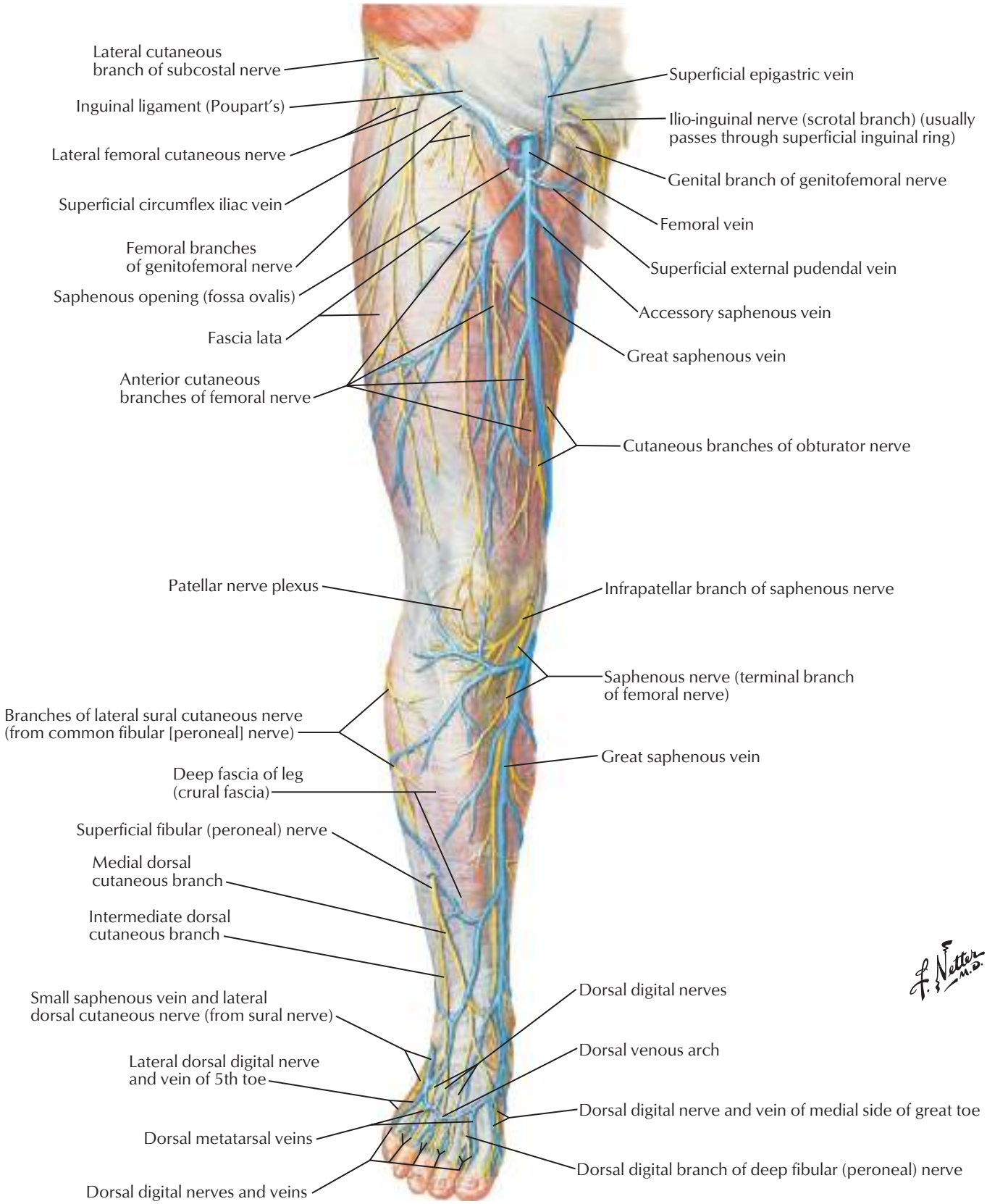


Segmental innervation of lower limb movements



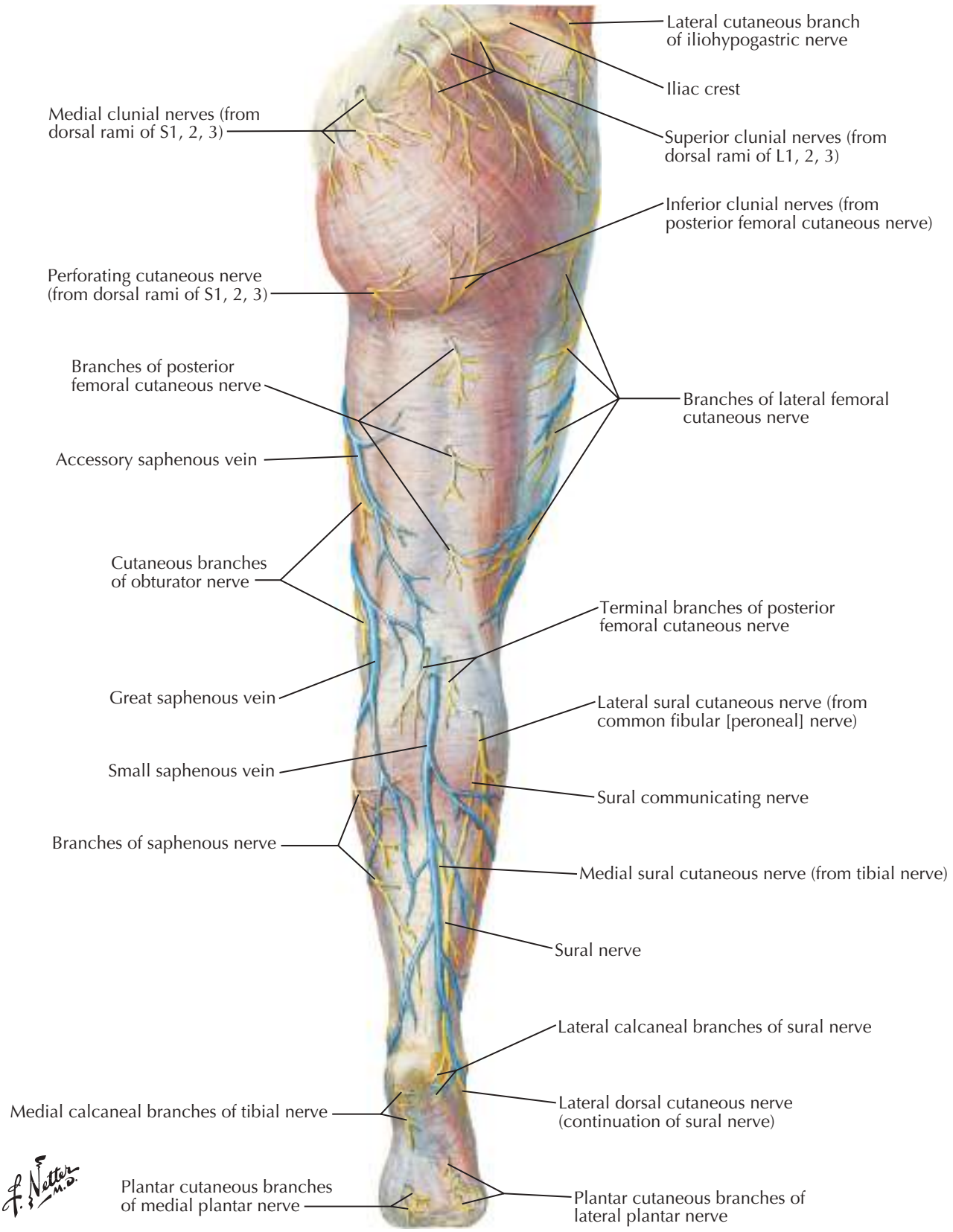
Superficial Nerves and Veins of Lower Limb: Anterior View

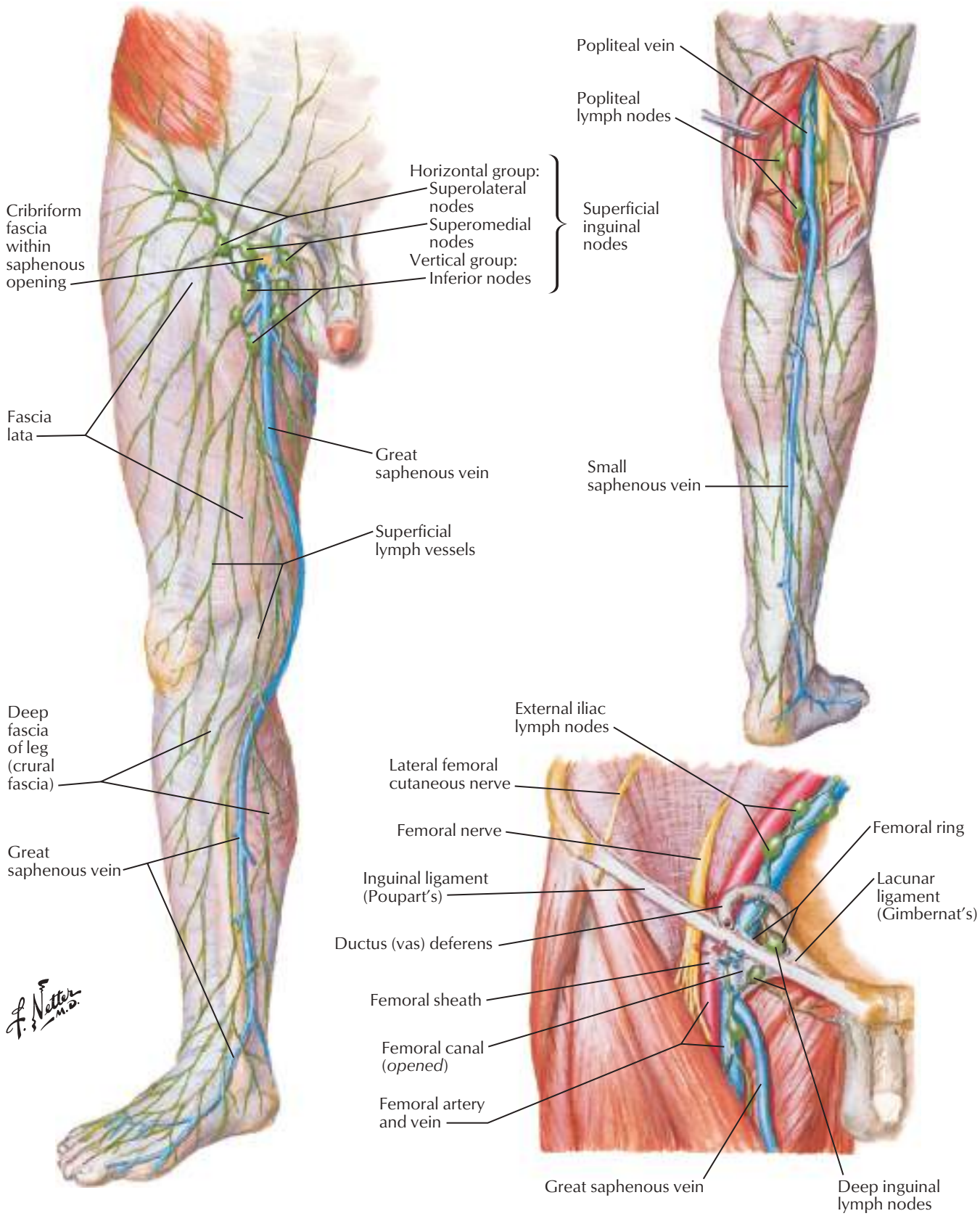
See also Plates 525, 526, 529



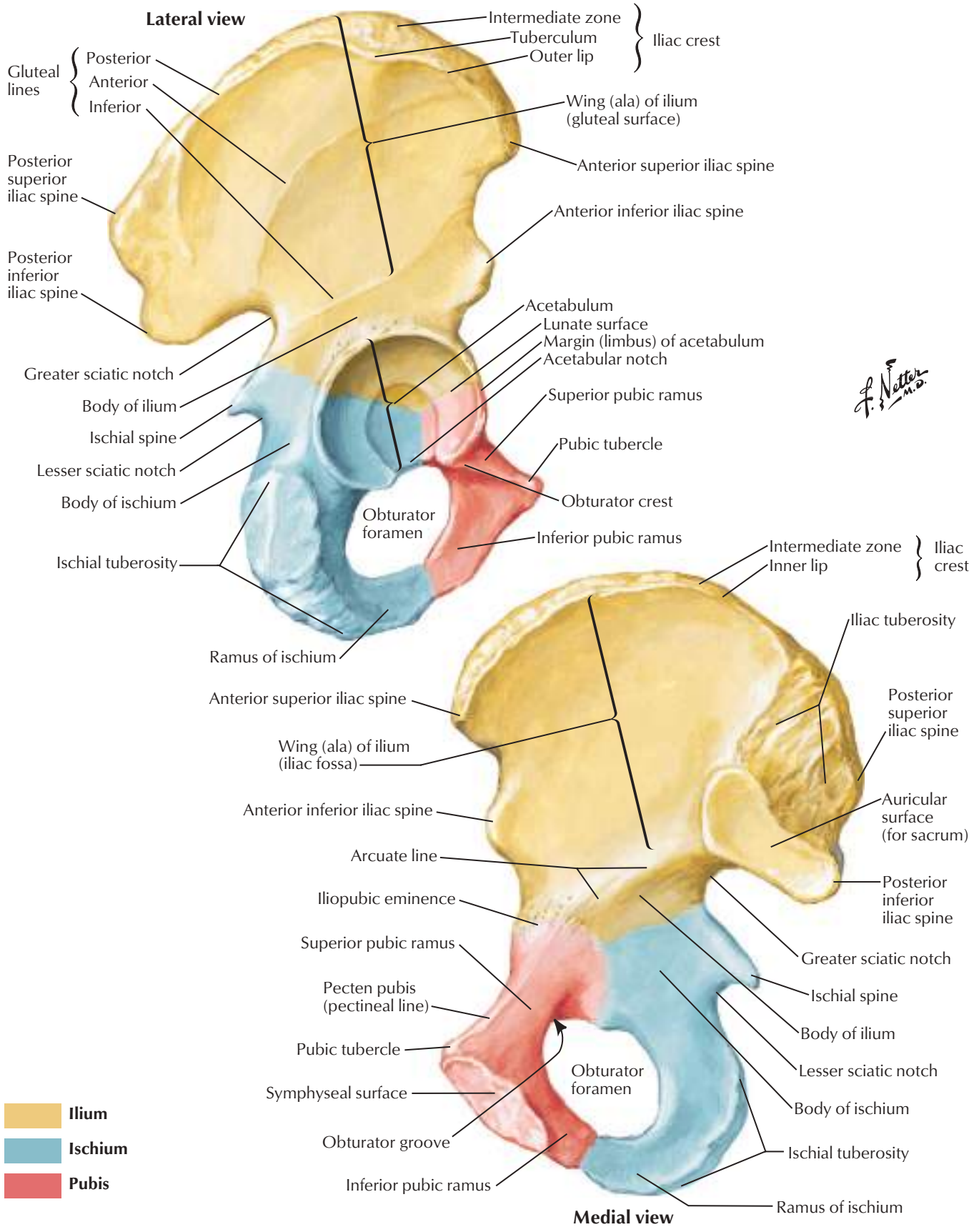
Superficial Nerves and Veins of Lower Limb: Posterior View

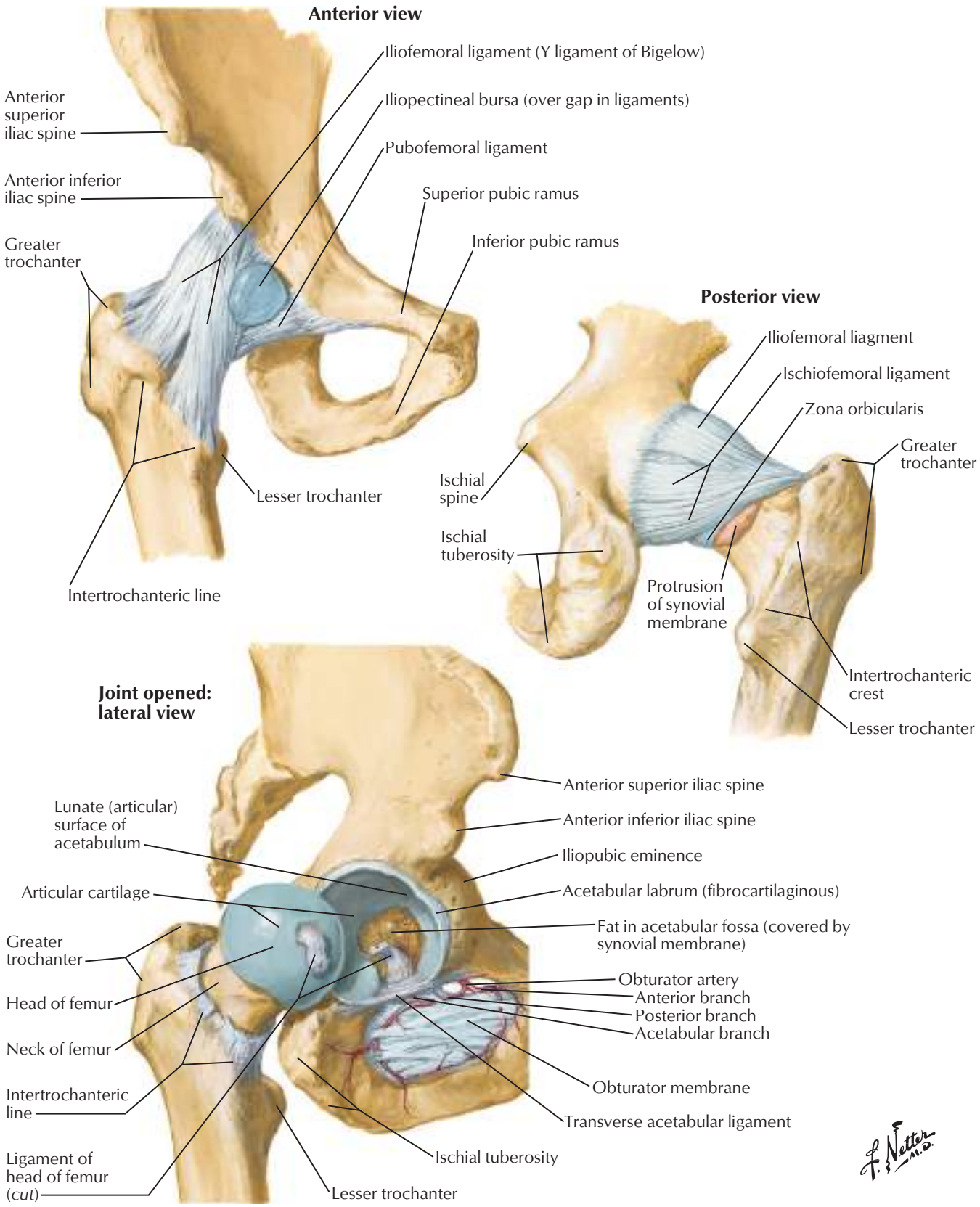
See also Plates 527, 528




Popliteal vein
Popliteal lymph nodes
Horizontal group:
Superolateral nodes
Superomedial nodes
Vertical group:
Inferior nodes
Superficial inguinal nodes
Cribriform fascia within saphenous opening
Fascia lata
Great saphenous vein
Small saphenous vein
Superficial lymph vessels
Deep fascia of leg (crural fascia)
Great saphenous vein
External iliac lymph nodes
Lateral femoral cutaneous nerve
Femoral nerve
Femoral ring
Inguinal ligament (Poupart's)
Lacunar ligament (Gimbernat's)
Ductus (vas) deferens
Femoral sheath
Femoral canal (opened)
Femoral artery and vein
Great saphenous vein
Deep inguinal lymph nodes

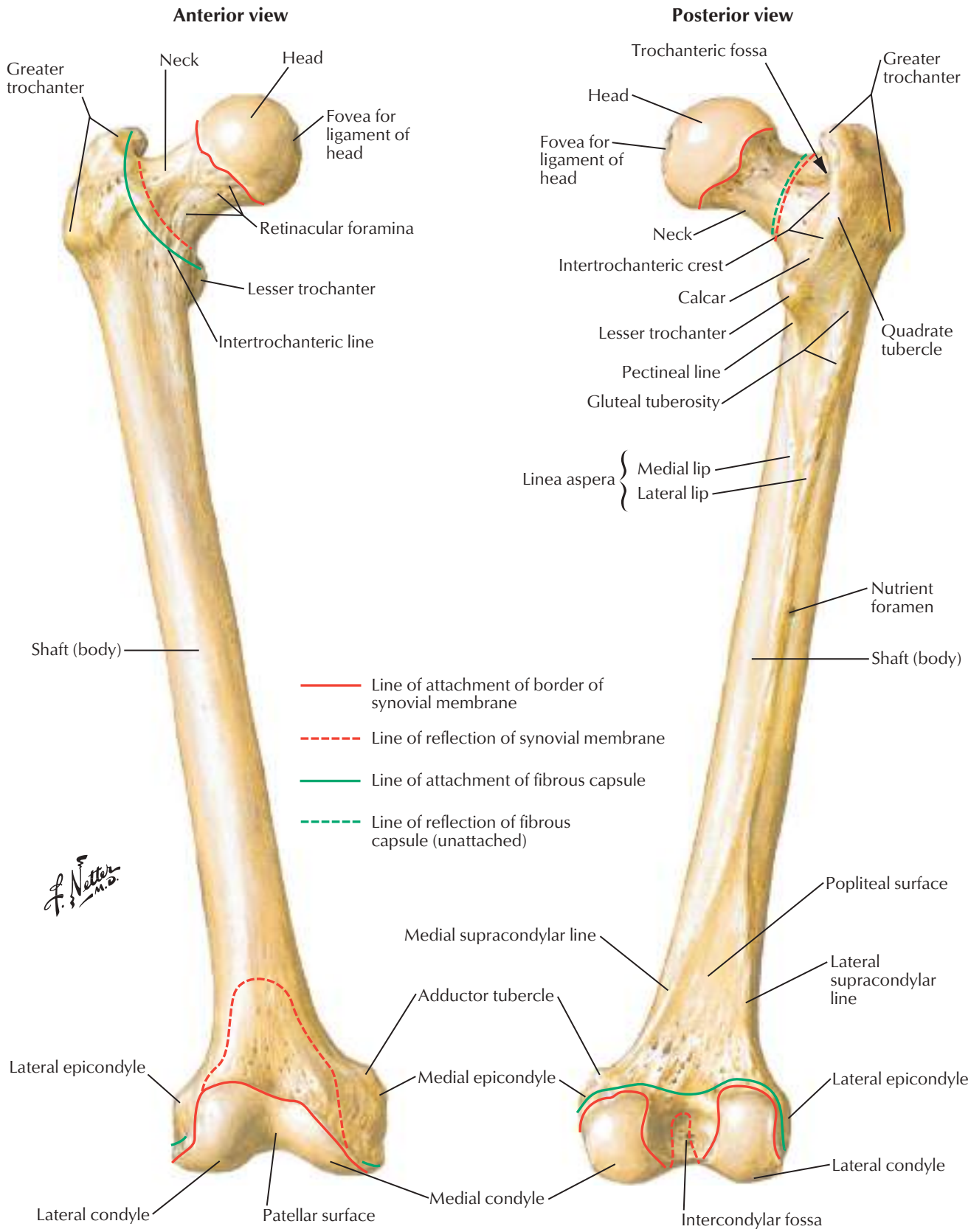
See also Plates 243, 333, 334




Anterior view
Iliofemoral ligament (Y ligament of Bigelow)
Iliopectineal bursa (over gap in ligaments)
Pubofemoral ligament
Superior pubic ramus
Inferior pubic ramus
Anterior superior iliac spine
Anterior inferior iliac spine
Greater trochanter
Lesser trochanter
Intertrochanteric line
Posterior view
Iliofemoral liagment
Ischiofemoral ligament
Zona orbicularis
Greater trochanter
Ischial spine
Ischial tuberosity
Protrusion of synovial membrane
Intertrochanteric crest
Lesser trochanter
Joint opened: lateral view
Anterior superior iliac spine
Anterior inferior iliac spine
Iliopubic eminence
Acetabular labrum (fibrocartilaginous)
Fat in acetabular fossa (covered by synovial membrane)
Obturator artery
Anterior branch
Posterior branch
Acetabular branch
Obturator membrane
Transverse acetabular ligament
Ischial tuberosity
Lesser trochanter
Lunate (articular) surface of acetabulum
Articular cartilage
Greater trochanter
Head of femur
Neck of femur
Intertrochanteric line
Ligament of head of femur (cut)

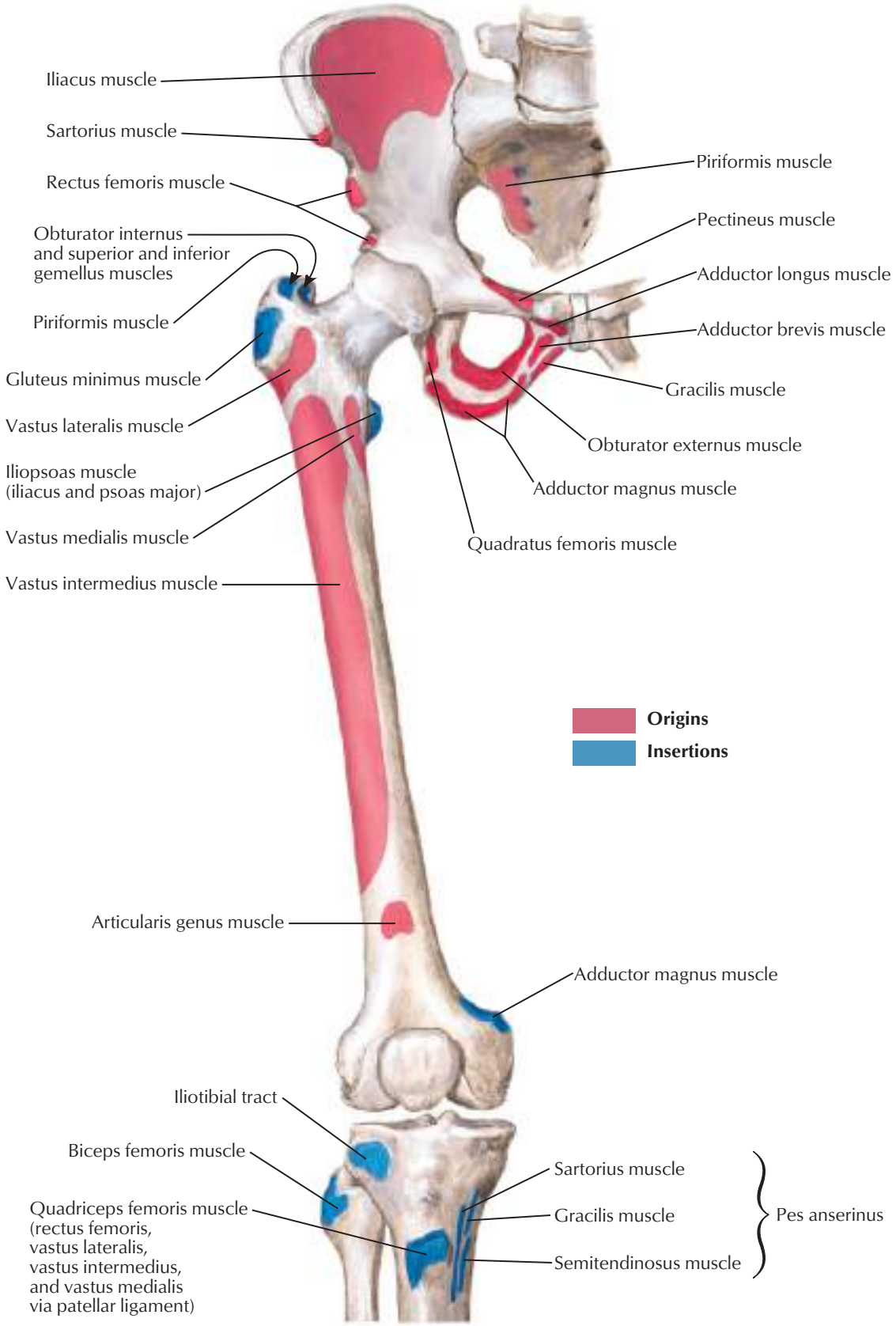
Hip Joint: Anteroposterior Radiograph

See also Plates 331, 474, 478


Anterior view
Greater trochanter
Neck
Head
Fovea for ligament of head
Retinacular foramina
Lesser trochanter
Intertrochanteric line
Shaft (body)
Lateral epicondyle
Lateral condyle
Patellar surface
Medial condyle
Adductor tubercle
Medial epicondyle
Posterior view
Trochanteric fossa
Greater trochanter
Head
Fovea for ligament of head
Neck
Intertrochanteric crest
Calcar
Lesser trochanter
Pectineal line
Gluteal tuberosity
Quadrate tubercle
Linea aspera
Medial lip
Lateral lip
Nutrient foramen
Shaft (body)
Popliteal surface
Medial supracondylar line
Lateral supracondylar line
Lateral epicondyle
Lateral condyle
Intercondylar fossa
Line of attachment of border of synovial membrane
Line of reflection of synovial membrane
Line of attachment of fibrous capsule
Line of reflection of fibrous capsule (unattached)

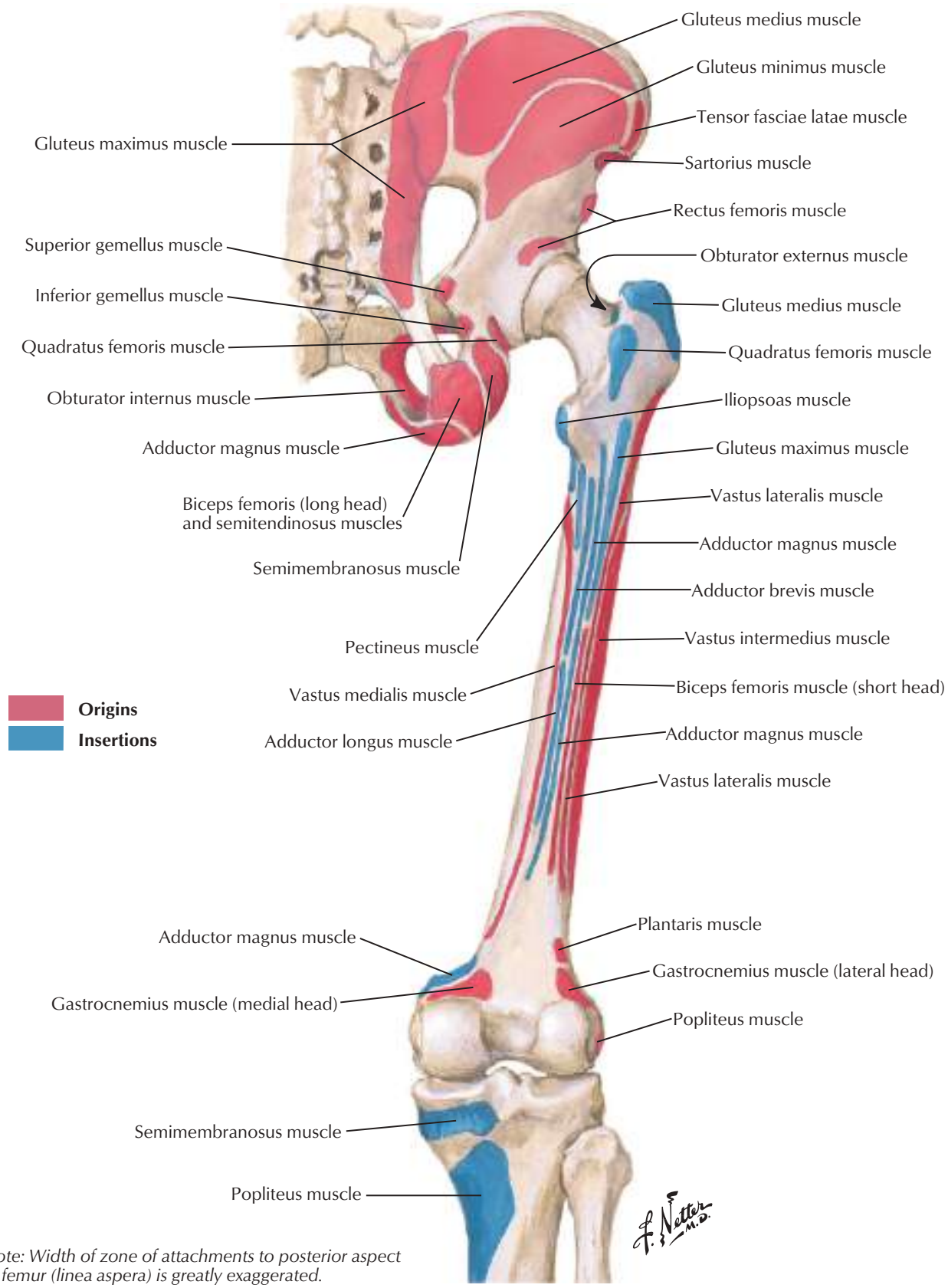
Bony Attachments of Muscles of Hip and Thigh: Anterior View

See also Plate 530



Bony Attachments of Muscles of Hip and Thigh: Posterior View

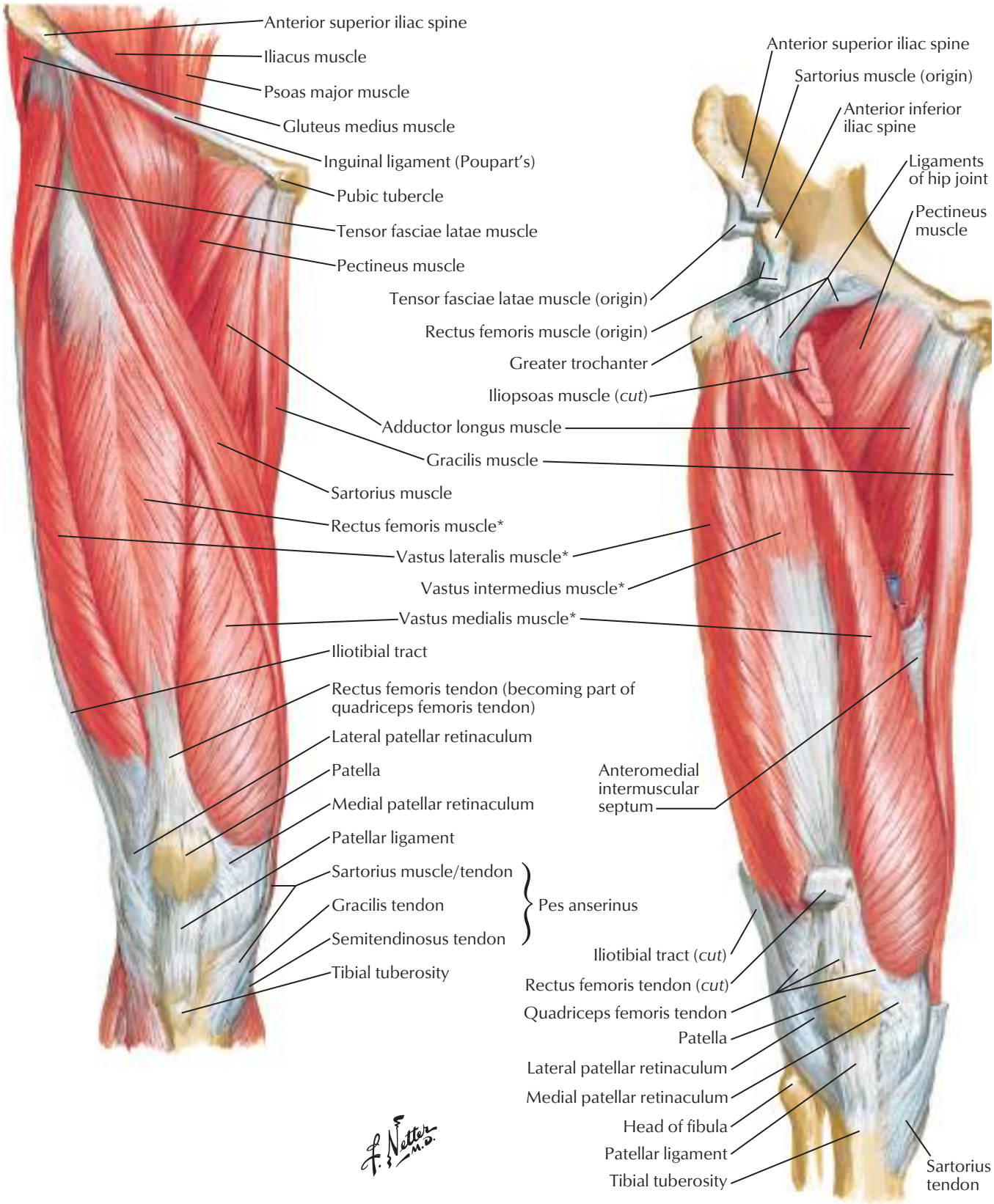
See also Plate 475



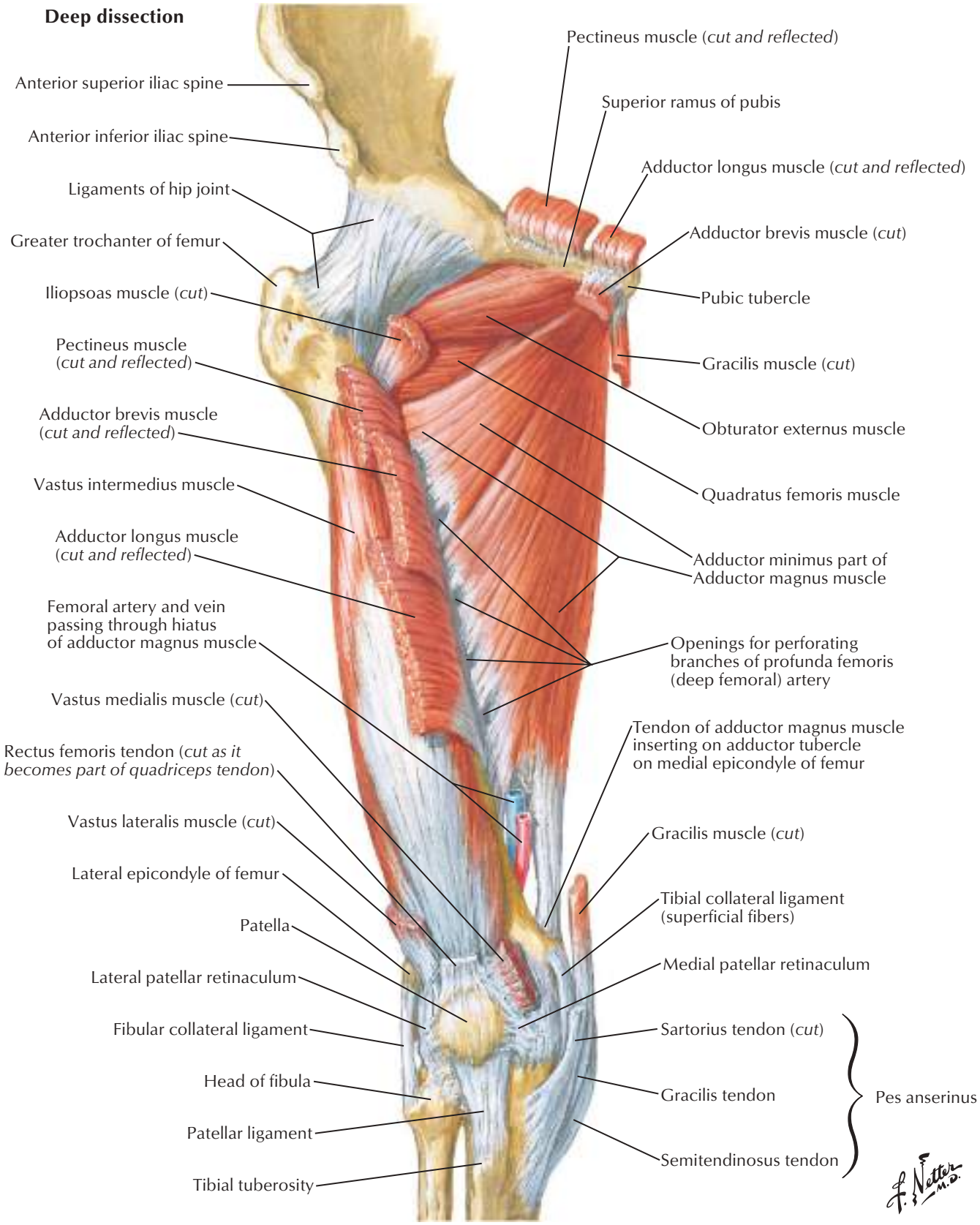
Note: Width of zone of attachments to posterior aspect of femur (linea aspera) is greatly exaggerated.

Muscles of Thigh: Anterior Views

See also Plate 258

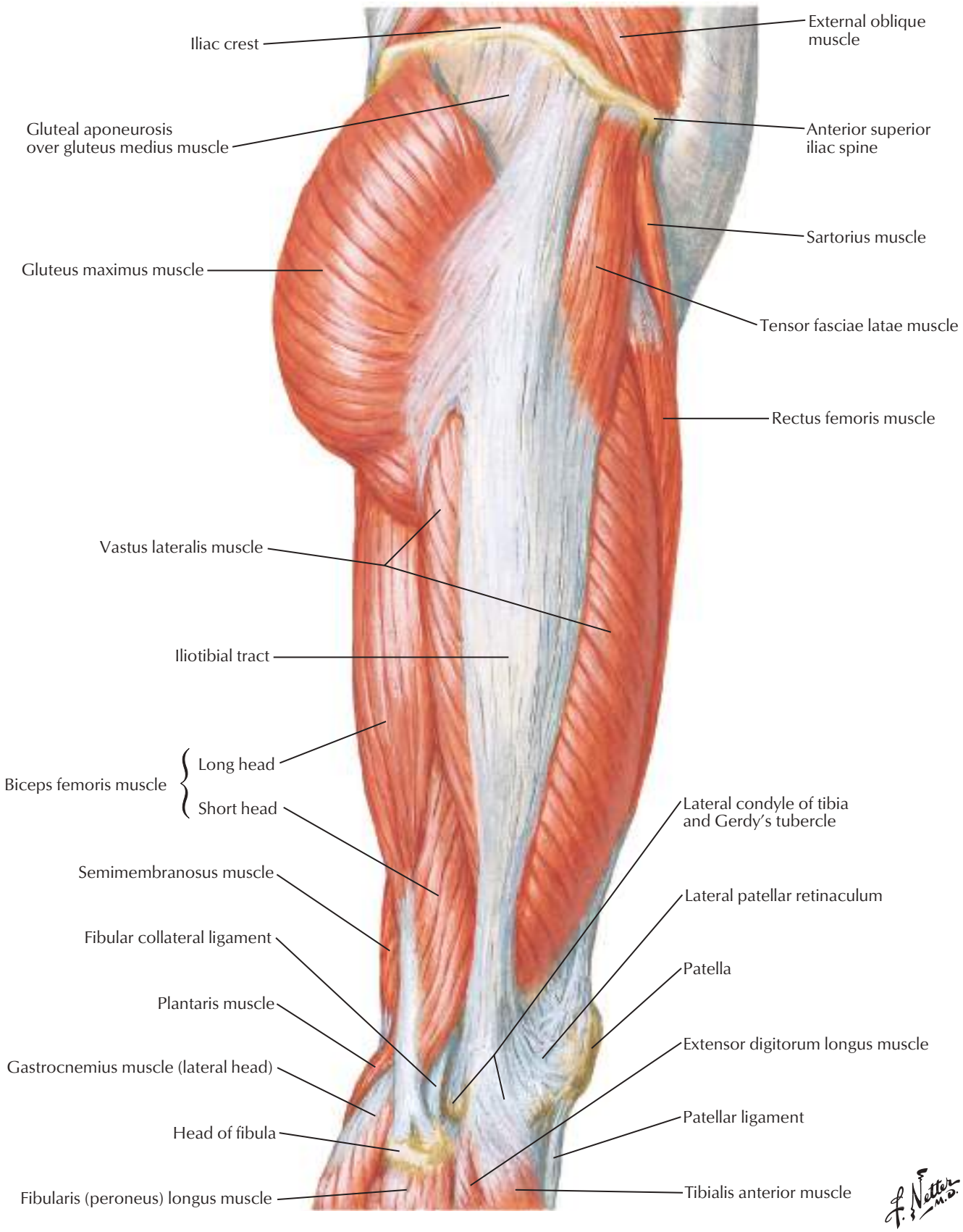


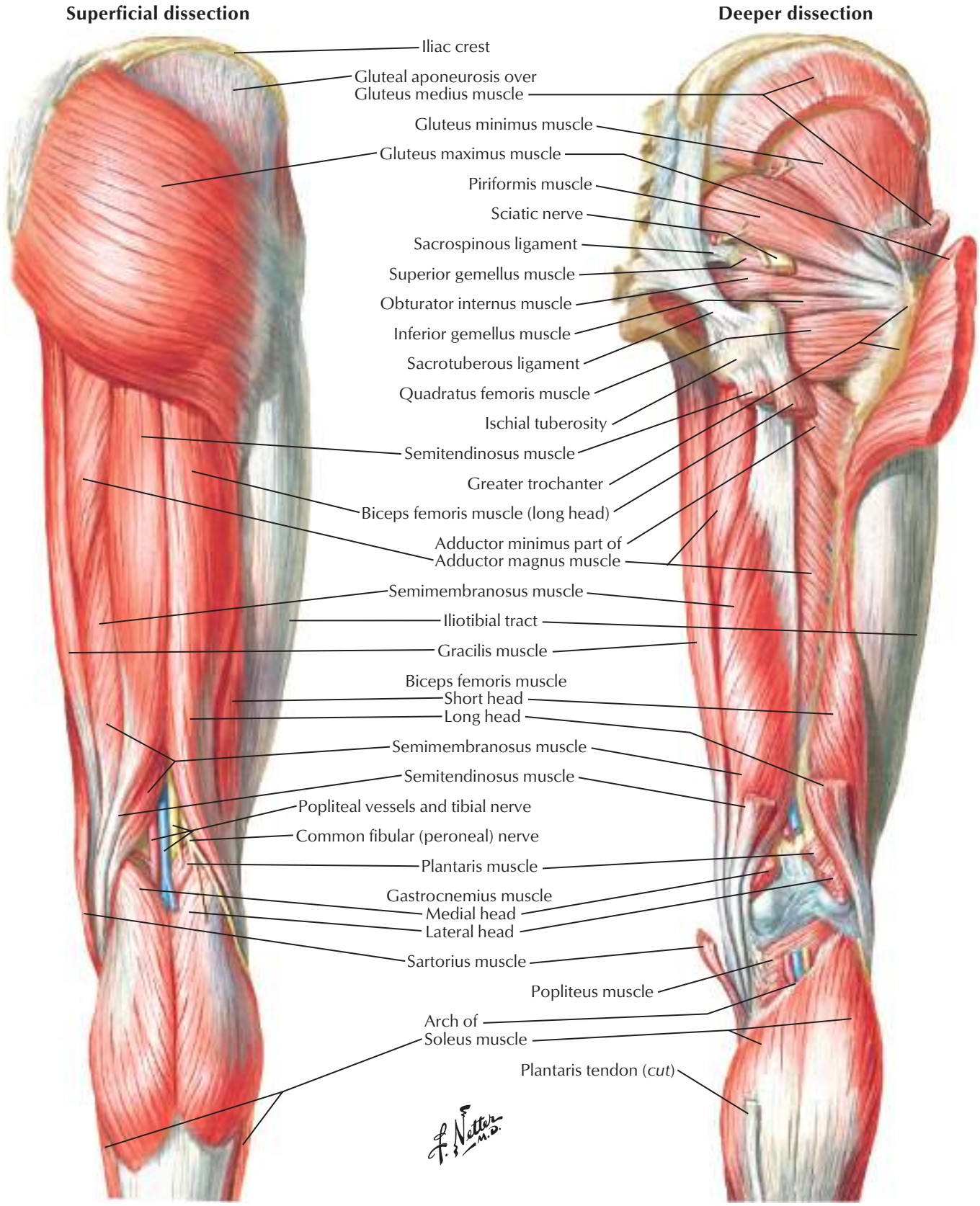
*Muscles of quadriceps femoris


Deep dissection
Anterior superior iliac spine
Anterior inferior iliac spine
Ligaments of hip joint
Greater trochanter of femur
Iliopsoas muscle (cut)
Pectineus muscle (cut and reflected)
Adductor brevis muscle (cut and reflected)
Vastus intermedius muscle
Adductor longus muscle (cut and reflected)
Femoral artery and vein passing through hiatus of adductor magnus muscle
Vastus medialis muscle (cut)
Rectus femoris tendon (cut as it becomes part of quadriceps tendon)
Vastus lateralis muscle (cut)
Lateral epicondyle of femur
Patella
Lateral patellar retinaculum
Fibular collateral ligament
Head of fibula
Patellar ligament
Tibial tuberosity
Pectineus muscle (cut and reflected)
Superior ramus of pubis
Adductor longus muscle (cut and reflected)
Adductor brevis muscle (cut)
Pubic tubercle
Gracilis muscle (cut)
Obturator externus muscle
Quadratus femoris muscle
Adductor minimus part of Adductor magnus muscle
Openings for perforating branches of profunda femoris (deep femoral) artery
Tendon of adductor magnus muscle inserting on adductor tubercle on medial epicondyle of femur
Gracilis muscle (cut)
Tibial collateral ligament (superficial fibers)
Medial patellar retinaculum
Sartorius tendon (cut)
Gracilis tendon
Semitendinosus tendon
Pes anserinus

Muscles of Hip and Thigh: Lateral View

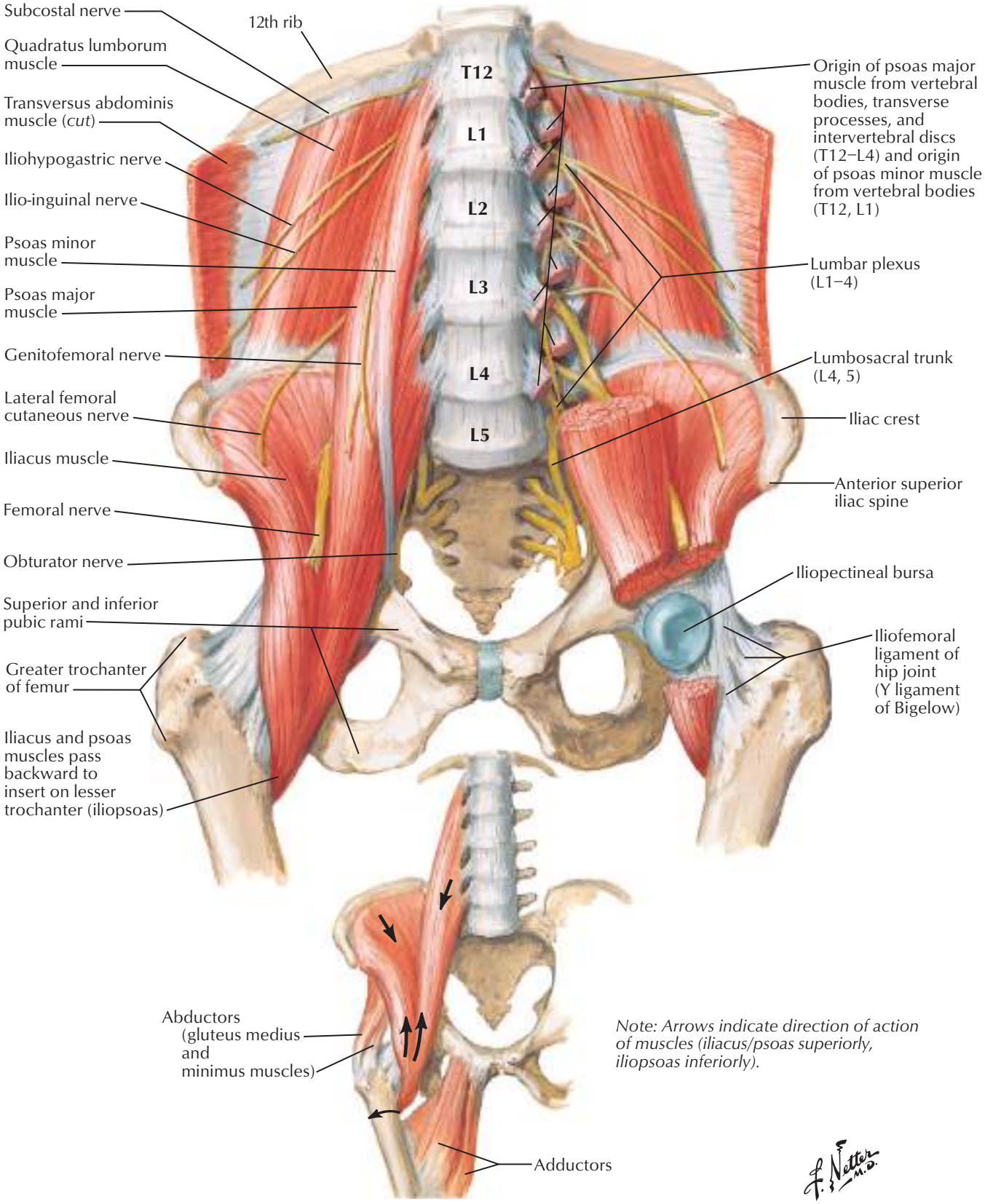
See also Plate 468

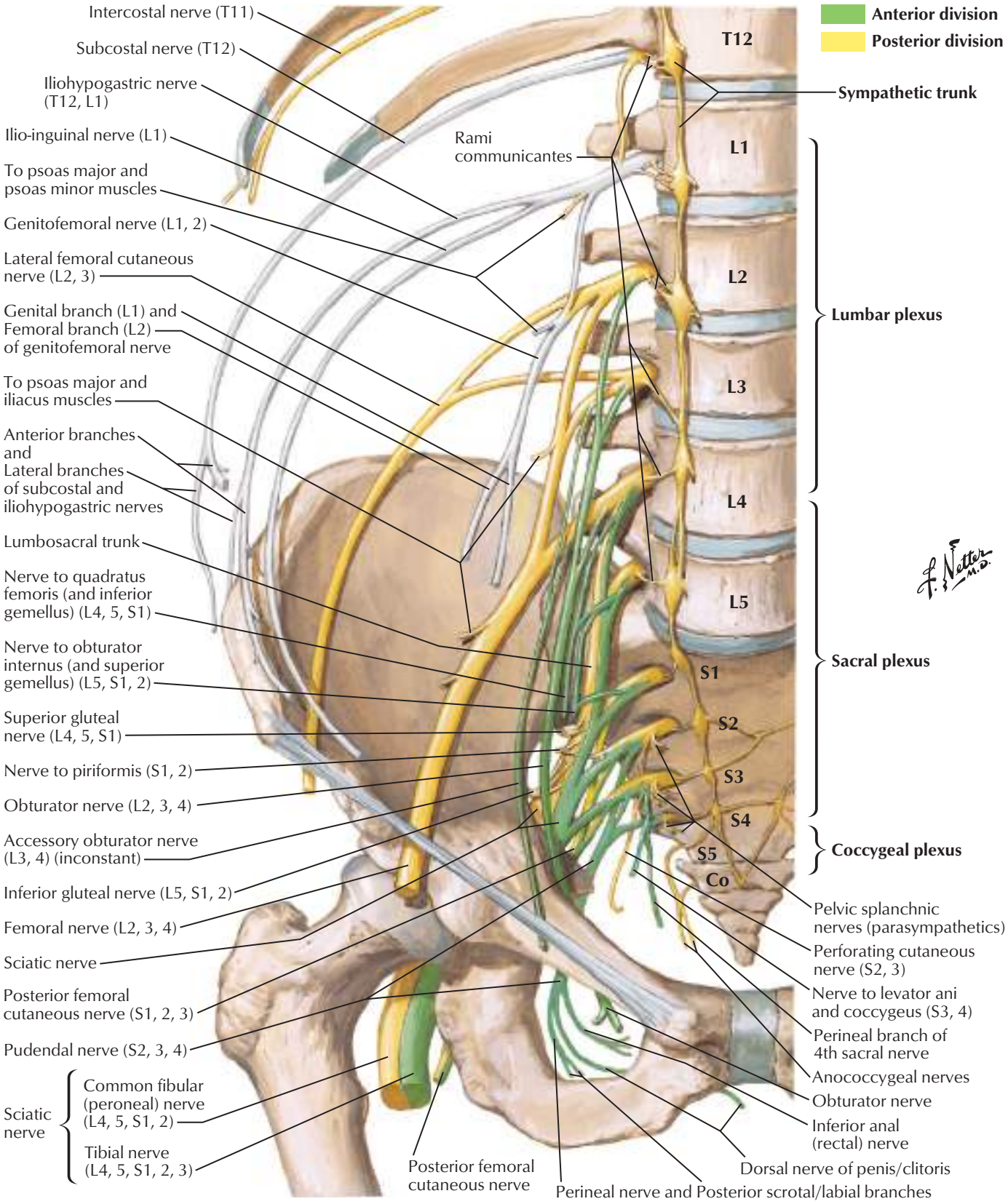



Superficial dissection
Deeper dissection
Iliac crest
Gluteal aponeurosis over Gluteus medius muscle
Gluteus minimus muscle
Gluteus maximus muscle
Piriformis muscle
Sciatic nerve
Sacrospinous ligament
Superior gemellus muscle
Obturator internus muscle
Inferior gemellus muscle
Sacrotuberous ligament
Quadratus femoris muscle
Ischial tuberosity
Semitendinosus muscle
Greater trochanter
Biceps femoris muscle (long head)
Adductor minimus part of Adductor magnus muscle
Semimembranosus muscle
Iliotibial tract
Gracilis muscle
Biceps femoris muscle
Short head
Long head
Semimembranosus muscle
Semitendinosus muscle
Popliteal vessels and tibial nerve
Common fibular (peroneal) nerve
Plantaris muscle
Gastrocnemius muscle
Medial head
Lateral head
Sartorius muscle
Popliteus muscle
Arch of Soleus muscle
Plantaris tendon (cut)
F. Netter M.D.

Psoas and Iliacus Muscles

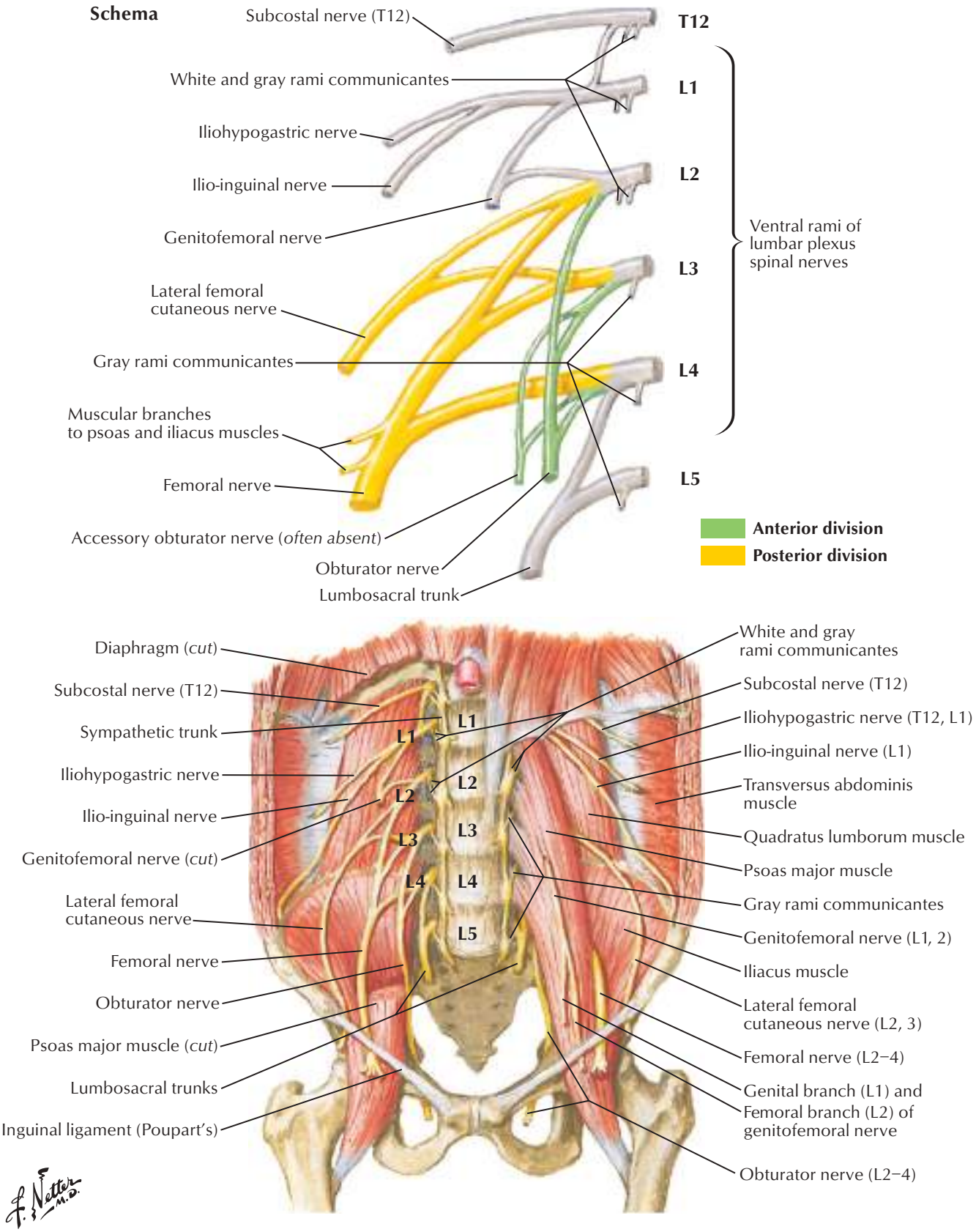
See also Plates 253, 258, 262

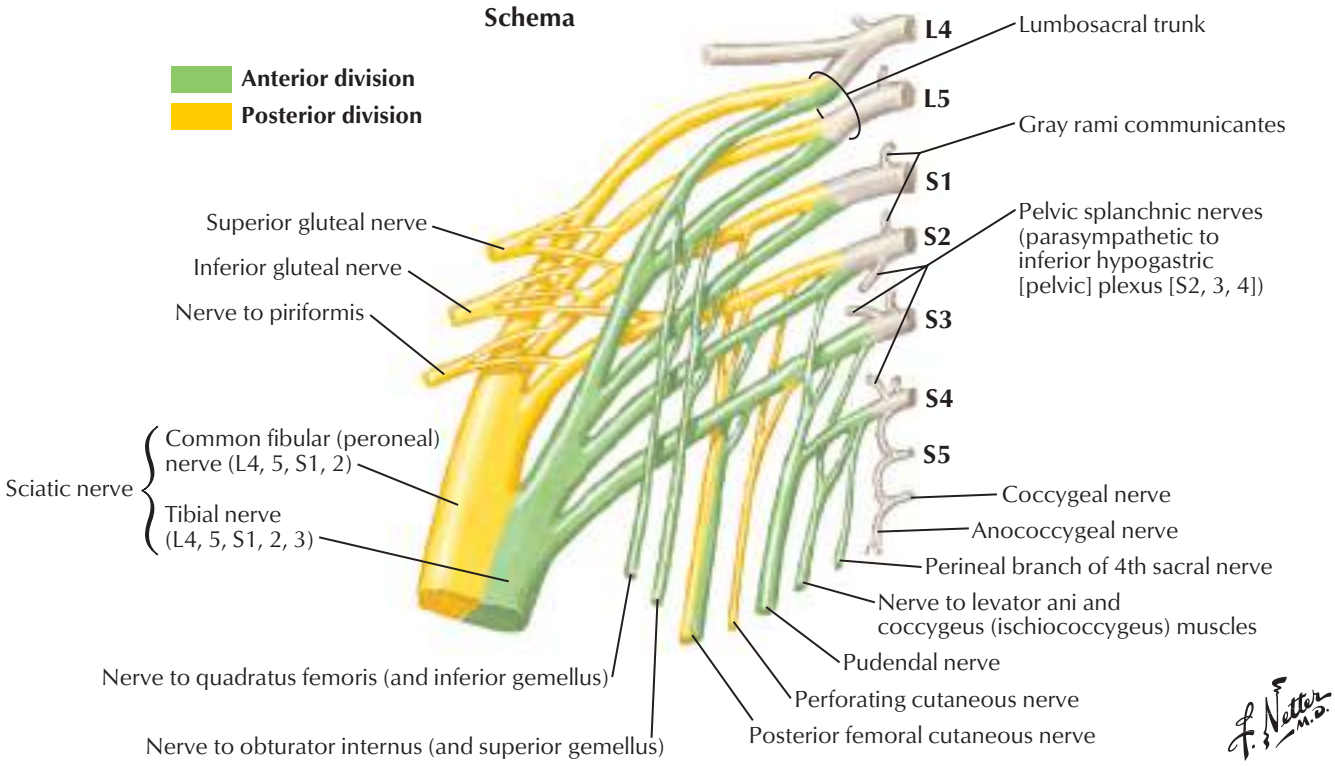


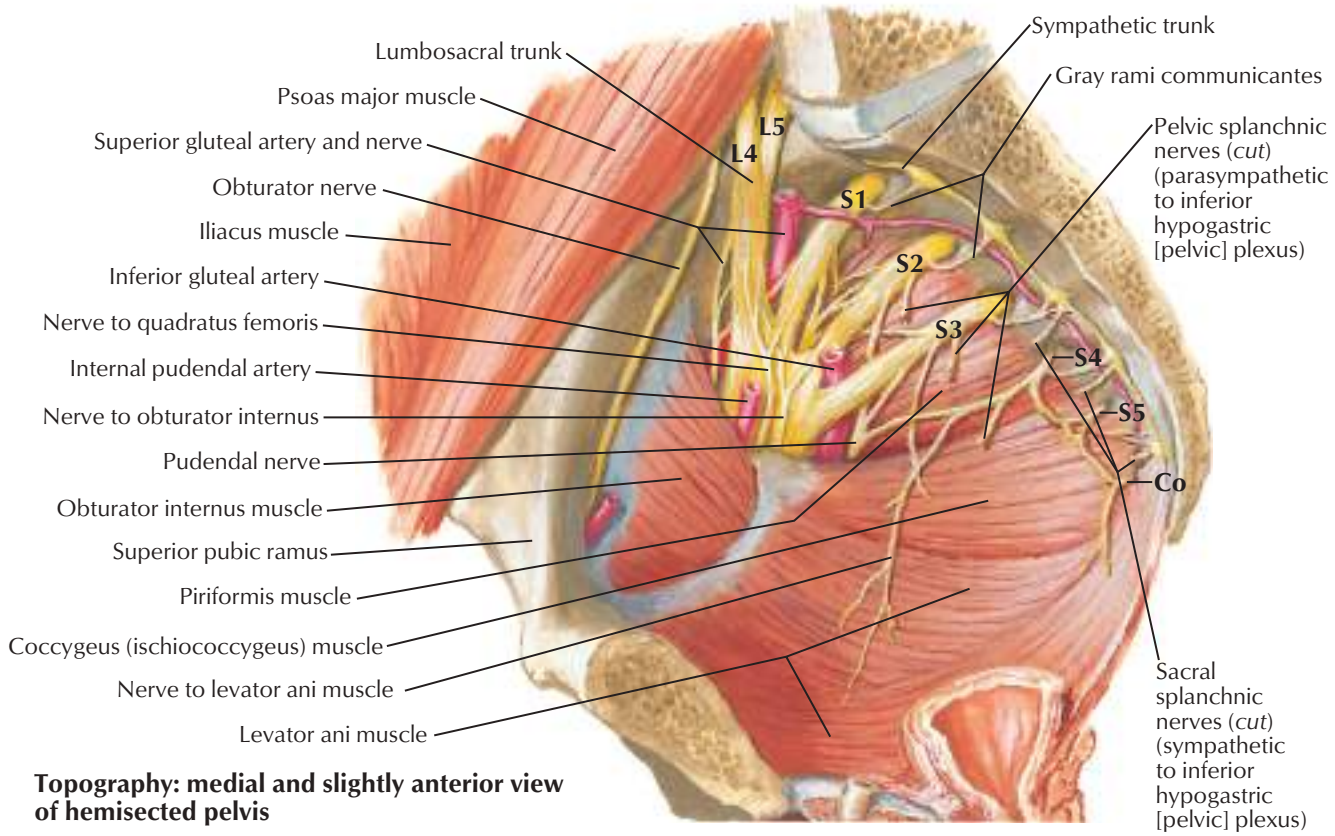

Intercostal nerve (T11)
Subcostal nerve (T12)
Iliohypogastric nerve (T12, L1)
Ilio-inguinal nerve (L1)
To psoas major and psoas minor muscles
Genitofemoral nerve (L1, 2)
Lateral femoral cutaneous nerve (L2, 3)
Genital branch (L1) and Femoral branch (L2) of genitofemoral nerve
To psoas major and iliacus muscles
Anterior branches and Lateral branches of subcostal and iliohypogastric nerves
Lumbosacral trunk
Nerve to quadratus femoris (and inferior gemellus) (L4, 5, S1)
Nerve to obturator internus (and superior gemellus) (L5, S1, 2)
Superior gluteal nerve (L4, 5, S1)
Nerve to piriformis (S1, 2)
Obturator nerve (L2, 3, 4)
Accessory obturator nerve (L3, 4) (inconstant)
Inferior gluteal nerve (L5, S1, 2)
Femoral nerve (L2, 3, 4)
Sciatic nerve
Posterior femoral cutaneous nerve (S1, 2, 3)
Pudendal nerve (S2, 3, 4)
Sciatic nerve
Common fibular (peroneal) nerve (L4, 5, S1, 2)
Tibial nerve (L4, 5, S1, 2, 3)
Rami communicantes
T12
L1
L2
L3
L4
L5
S1
S2
S3
S4
S5
Co
Anterior division
Posterior division
Sympathetic trunk
Lumbar plexus
Sacral plexus
Coccygeal plexus
Pelvic splanchnic nerves (parasympathetics)
Perforating cutaneous nerve (S2, 3)
Nerve to levator ani and coccygeus (S3, 4)
Perineal branch of 4th sacral nerve
Anococcygeal nerves
Obturator nerve
Inferior anal (rectal) nerve
Dorsal nerve of penis/clitoris
Posterior femoral cutaneous nerve
Perineal nerve and Posterior scrotal/labial branches

Lumbar Plexus

See also Plate 262

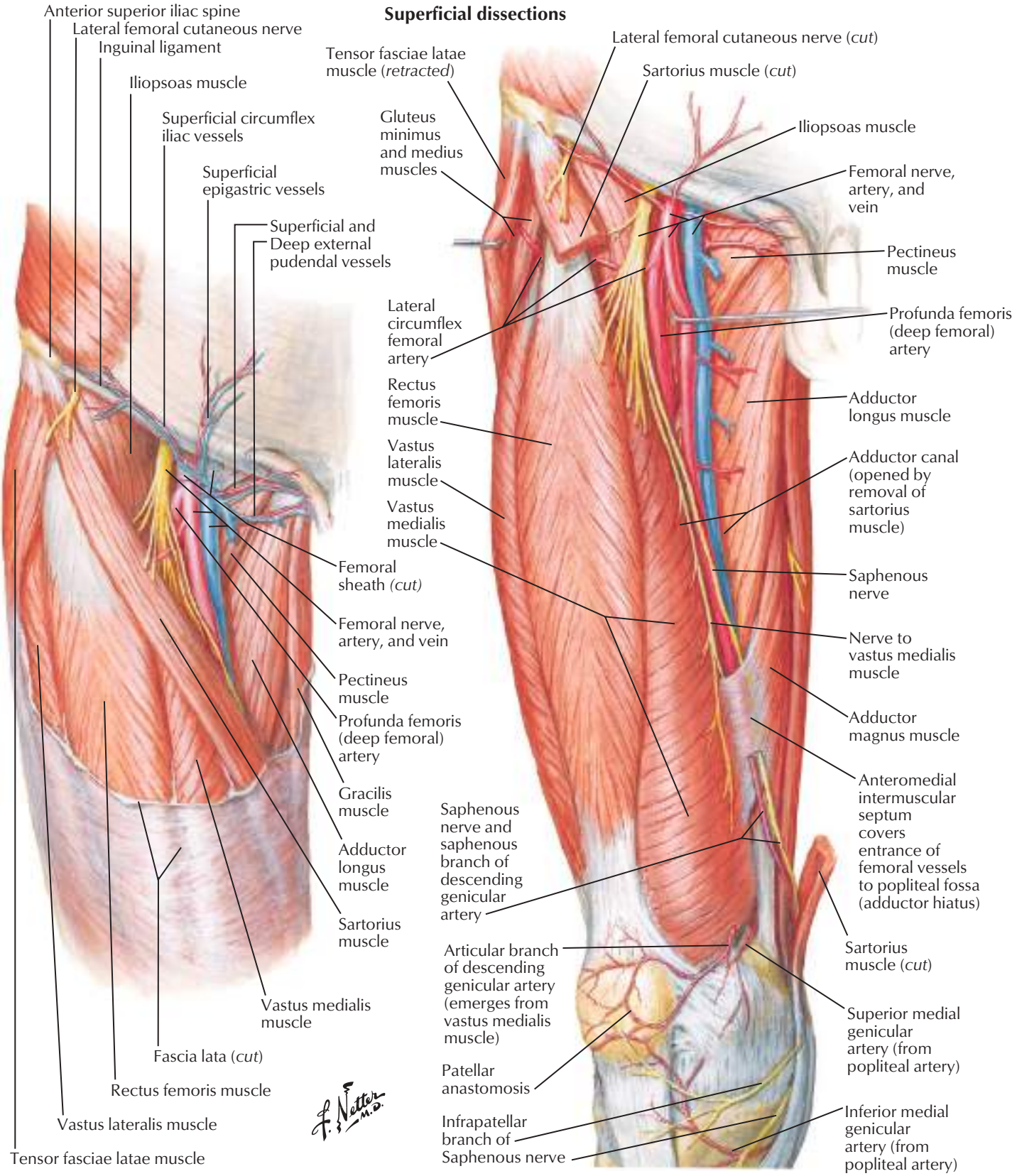




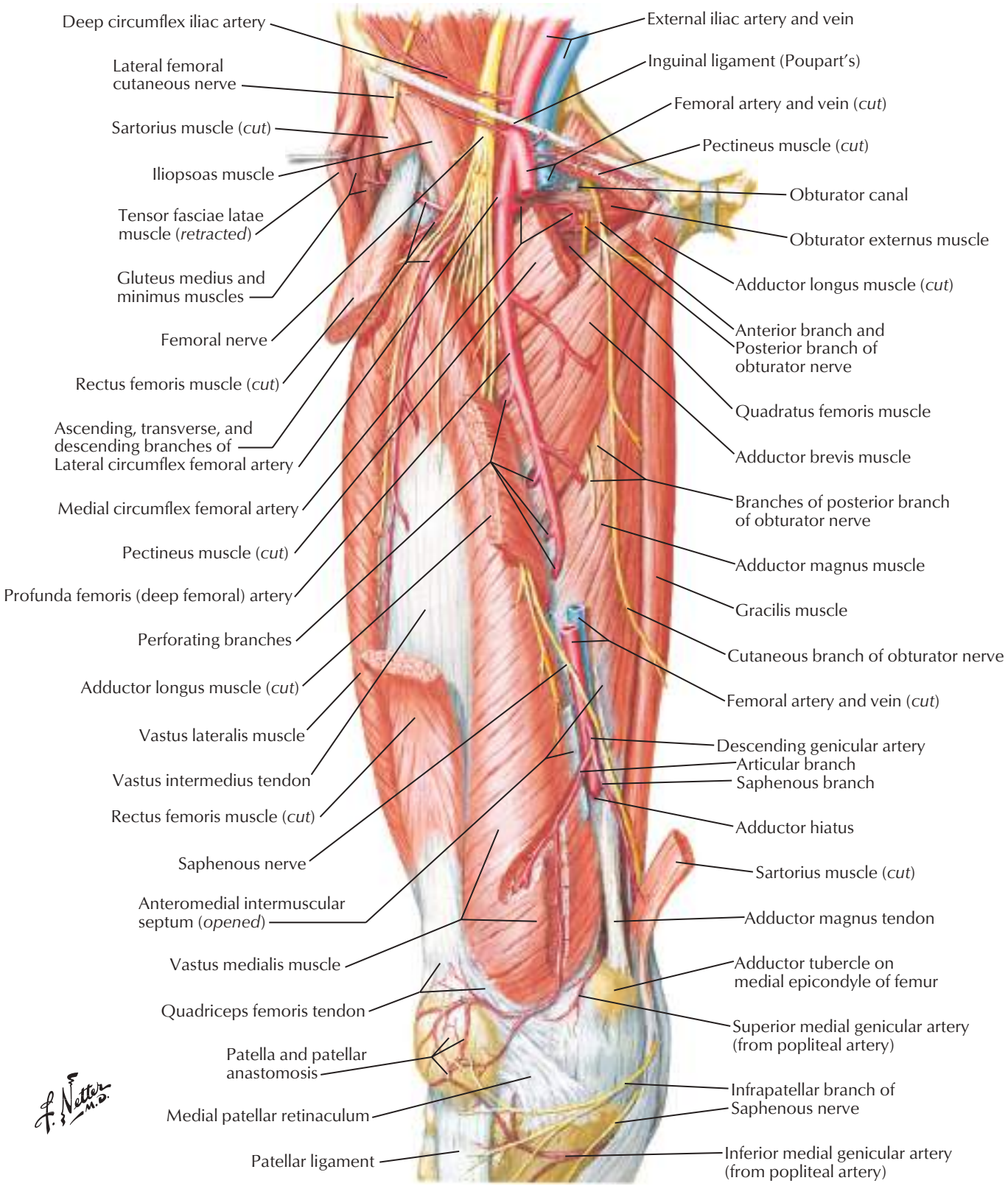


Topography: medial and slightly anterior view of hemisected pelvis

See also Plate 525



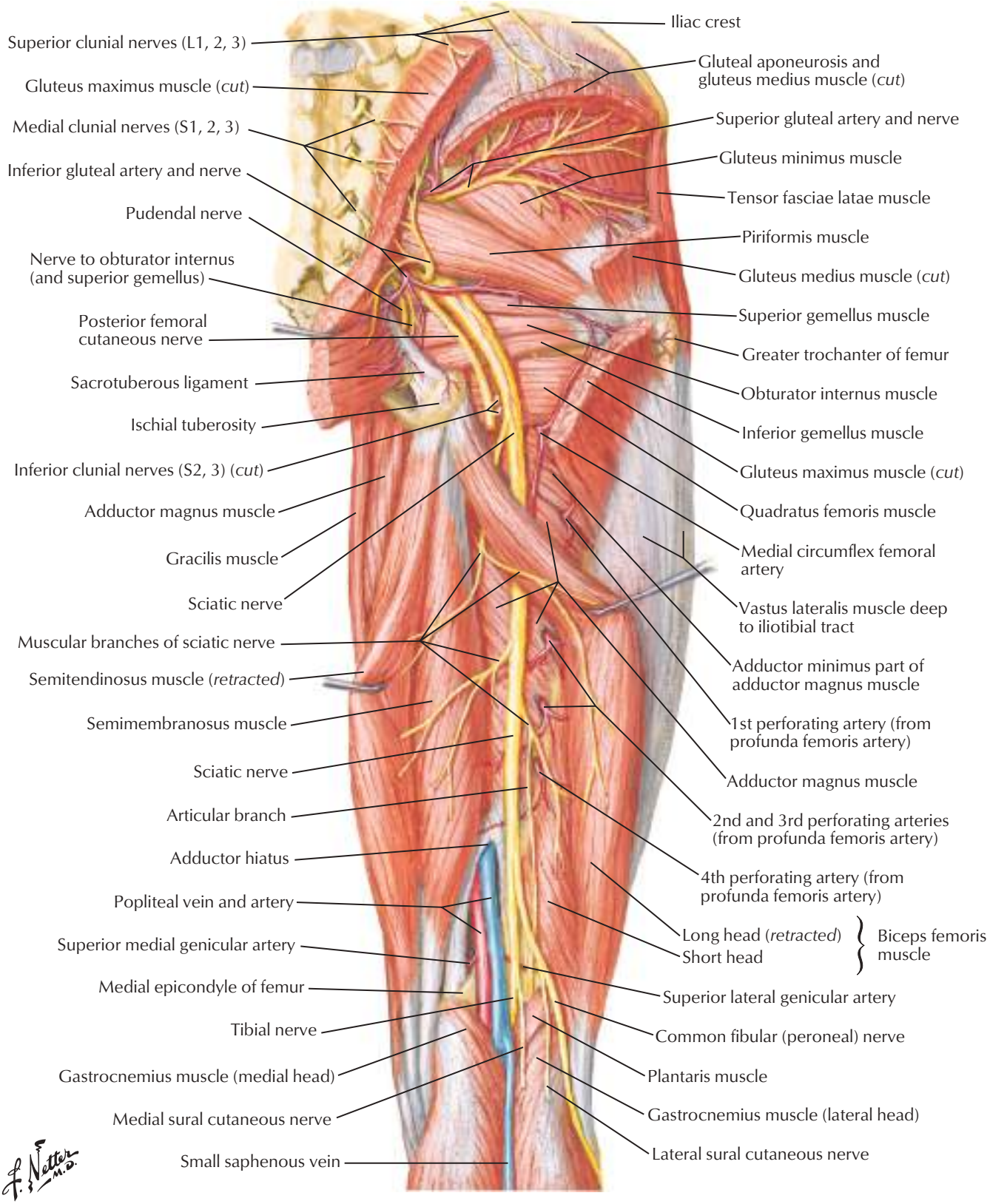
Deep dissection

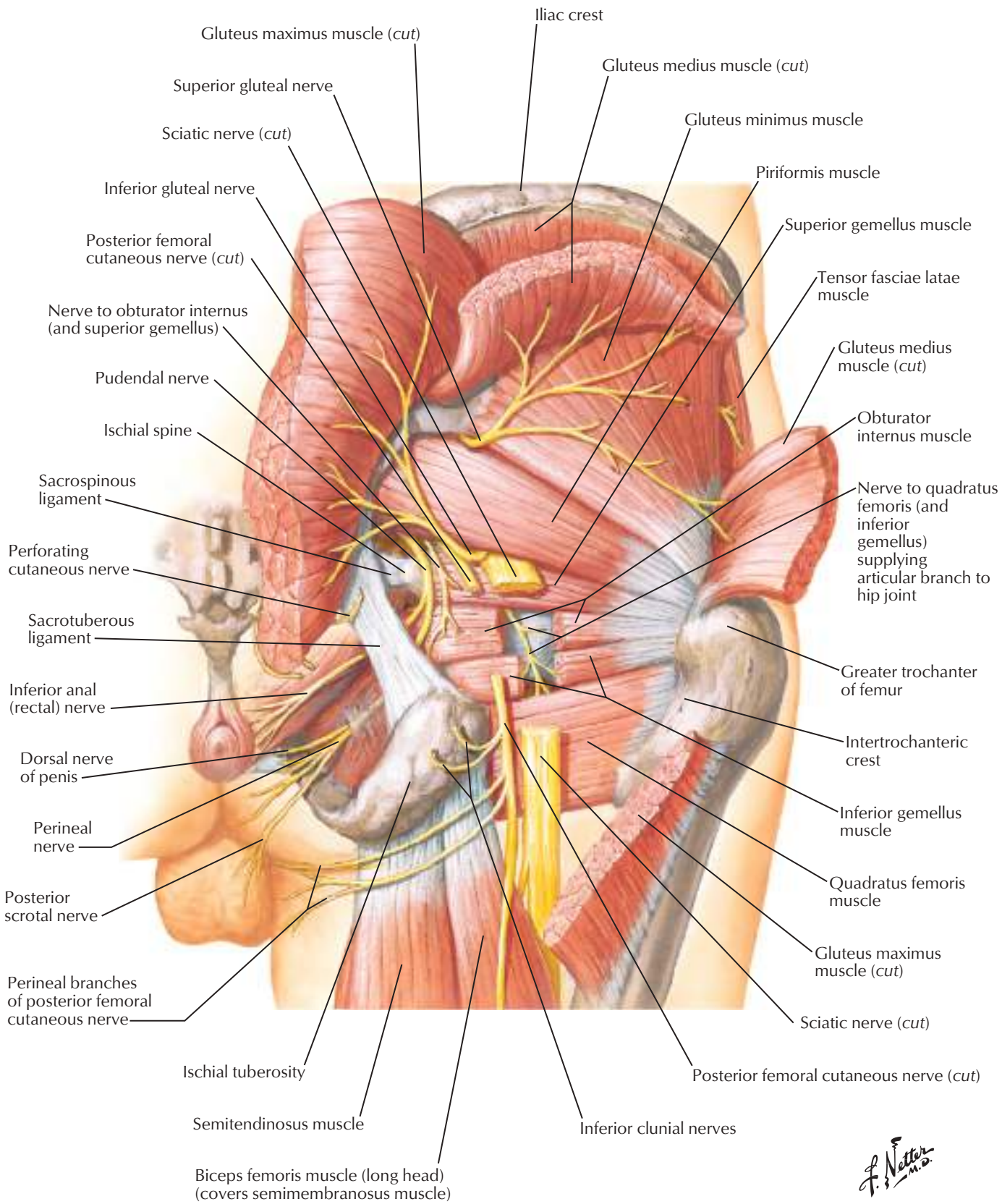


Arteries and Nerves of Thigh: Posterior View

See also Plate 527

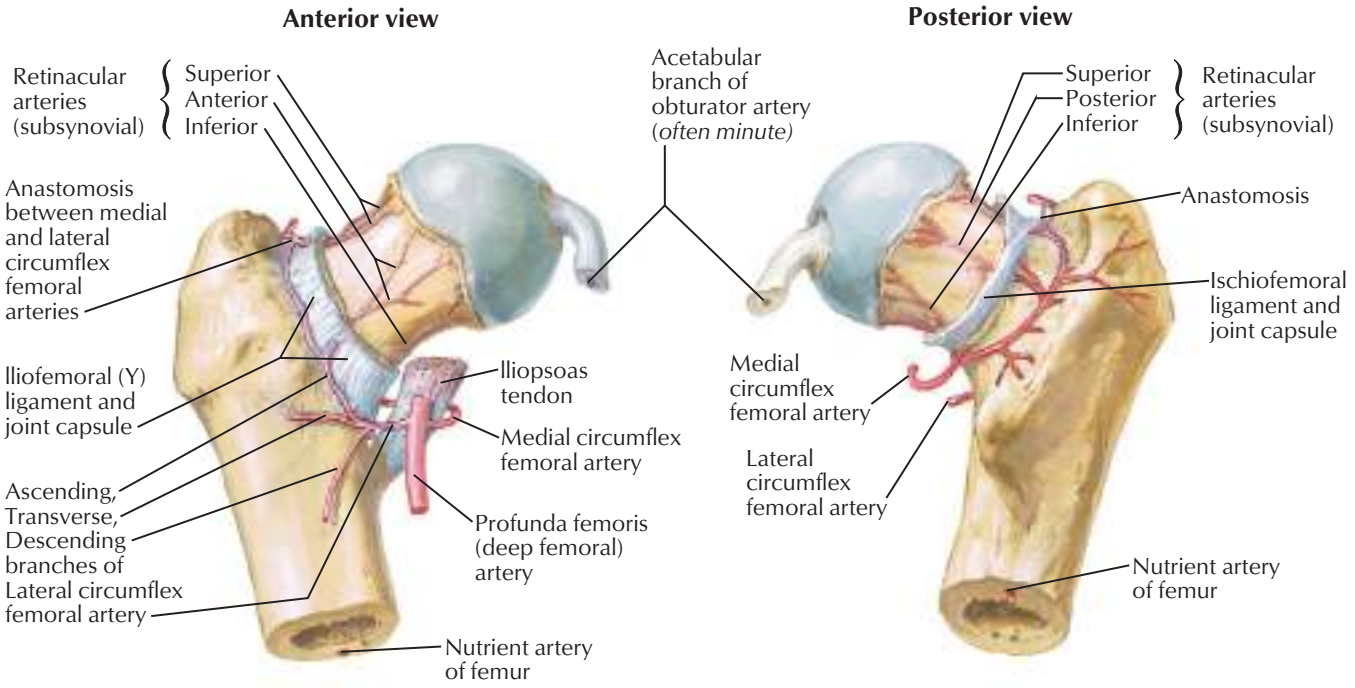
Deep dissection

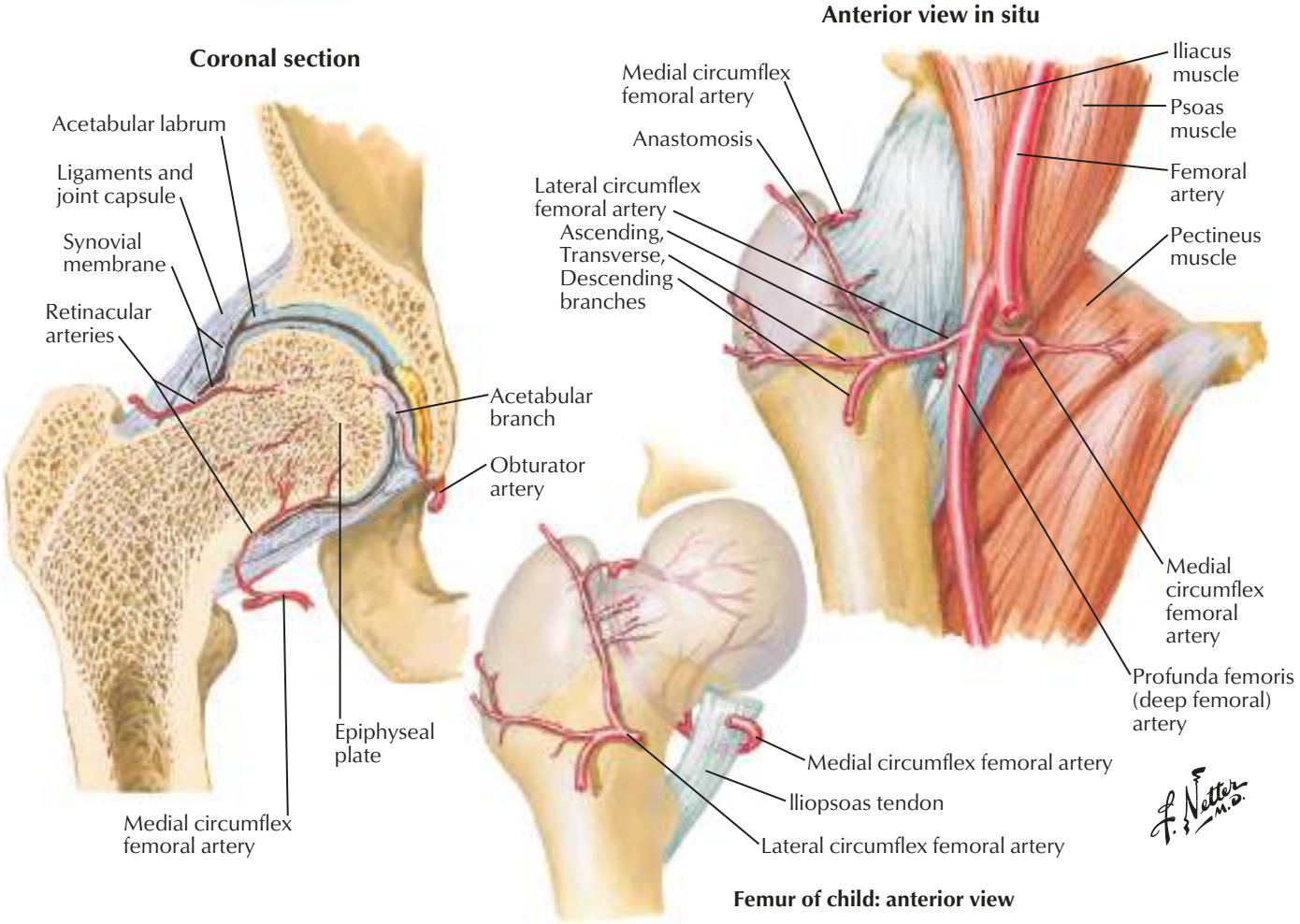


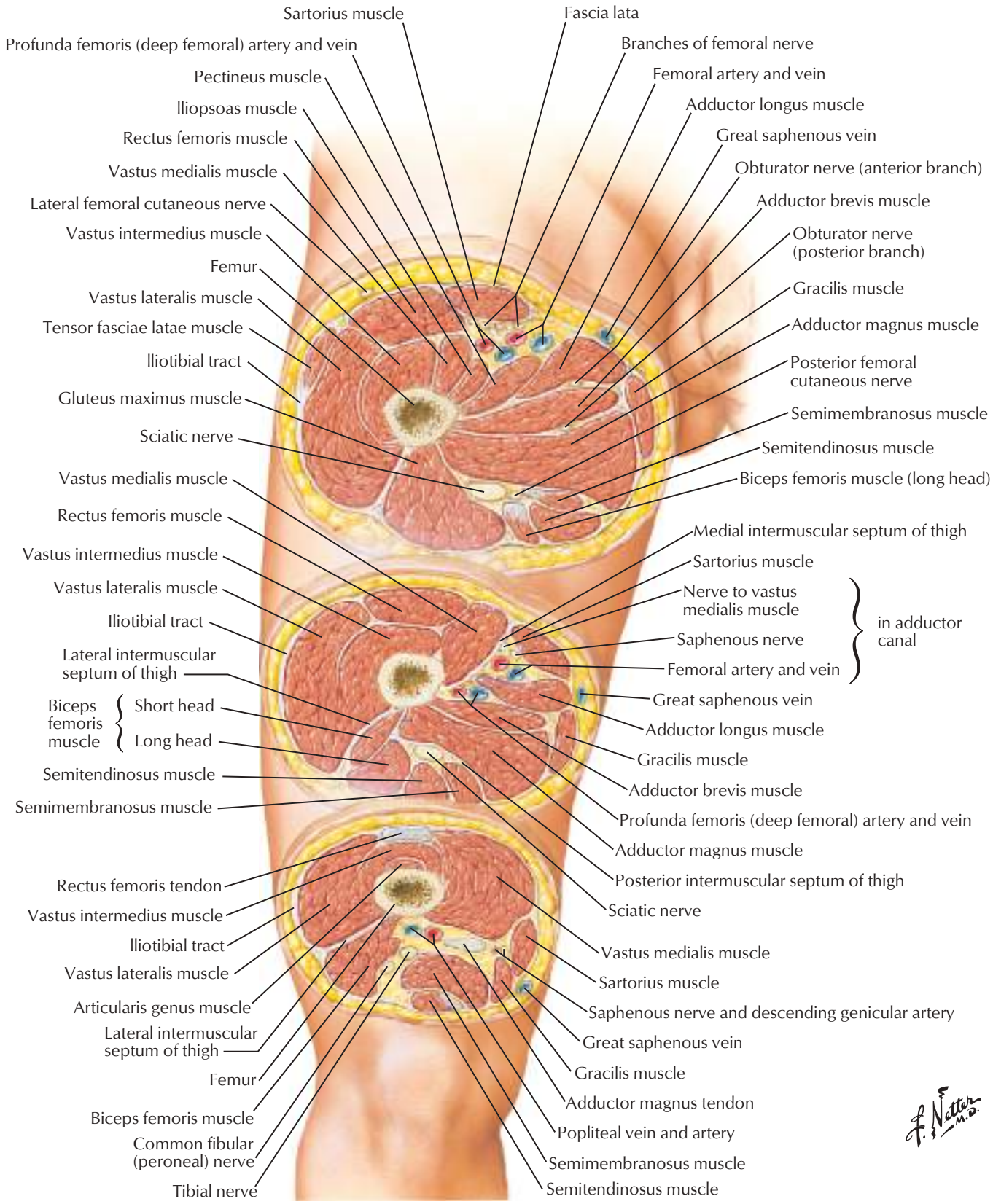

Iliac crest
Gluteus maximus muscle (*cut*)
Gluteus medius muscle (*cut*)
Superior gluteal nerve
Gluteus minimus muscle
Sciatic nerve (*cut*)
Piriformis muscle
Inferior gluteal nerve
Superior gemellus muscle
Posterior femoral cutaneous nerve (*cut*)
Tensor fasciae latae muscle
Nerve to obturator internus (and superior gemellus)
Gluteus medius muscle (*cut*)
Pudendal nerve
Ischial spine
Obturator internus muscle
Sacrospinous ligament
Nerve to quadratus femoris (and inferior gemellus) supplying articular branch to hip joint
Perforating cutaneous nerve
Sacrotuberous ligament
Greater trochanter of femur
Inferior anal (rectal) nerve
Intertrochanteric crest
Dorsal nerve of penis
Inferior gemellus muscle
Perineal nerve
Quadratus femoris muscle
Posterior scrotal nerve
Gluteus maximus muscle (*cut*)
Perineal branches of posterior femoral cutaneous nerve
Sciatic nerve (*cut*)
Ischial tuberosity
Posterior femoral cutaneous nerve (*cut*)
Semitendinosus muscle
Inferior clunial nerves
Biceps femoris muscle (long head) (covers semimembranosus muscle)

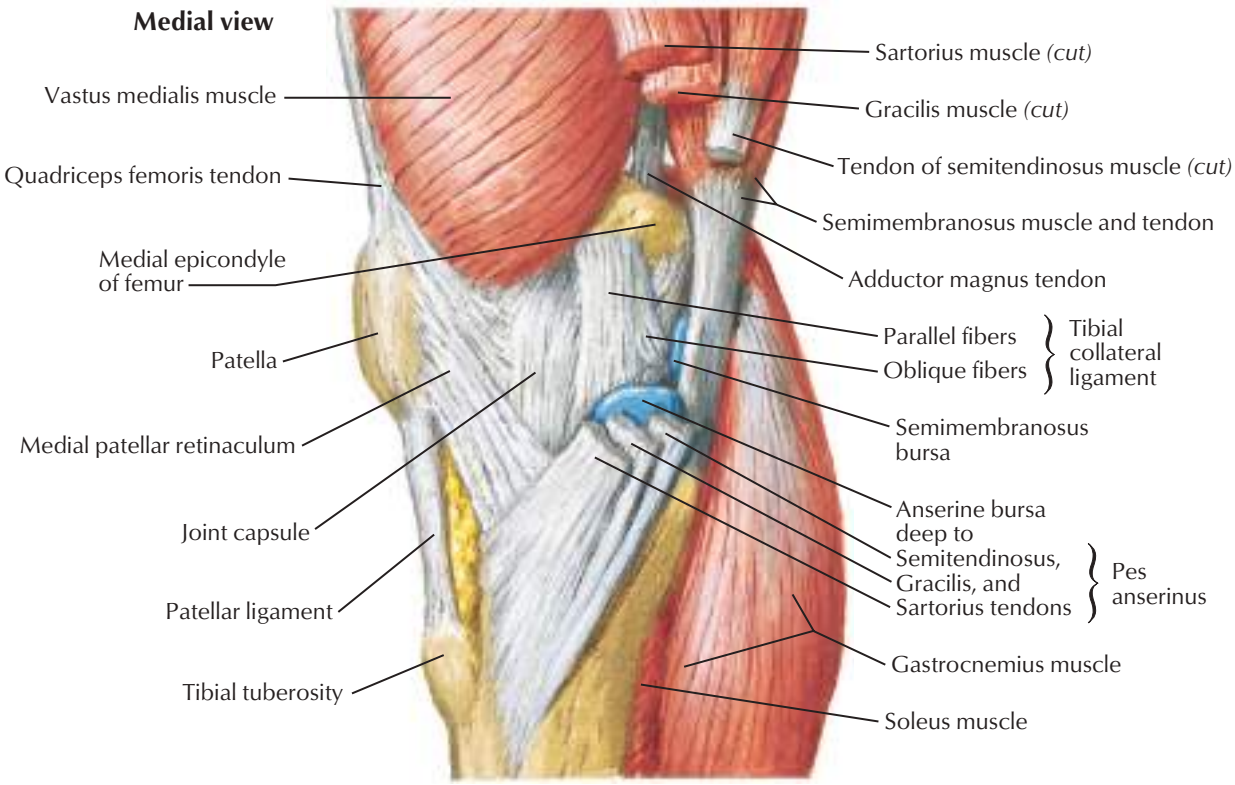
Arteries of Femoral Head and Neck

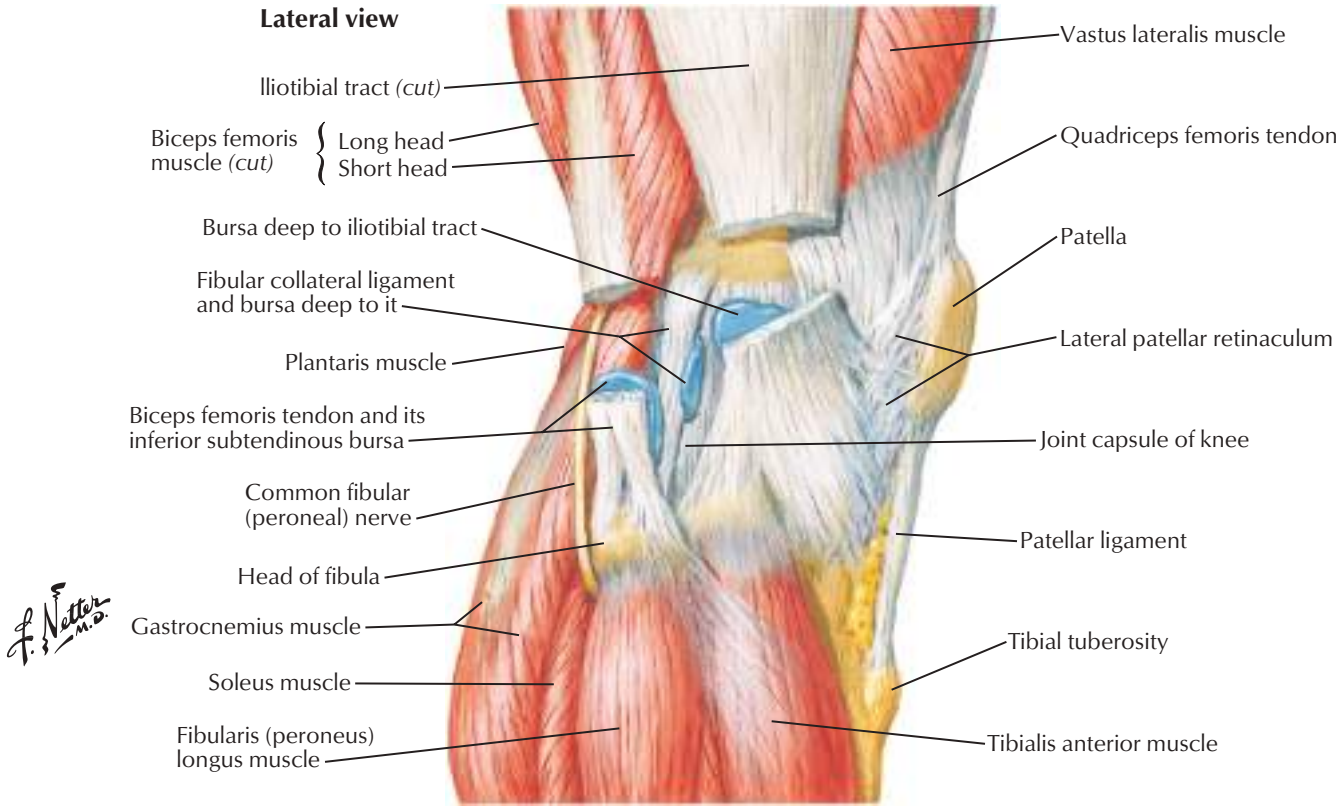
See also Plates 499, 530



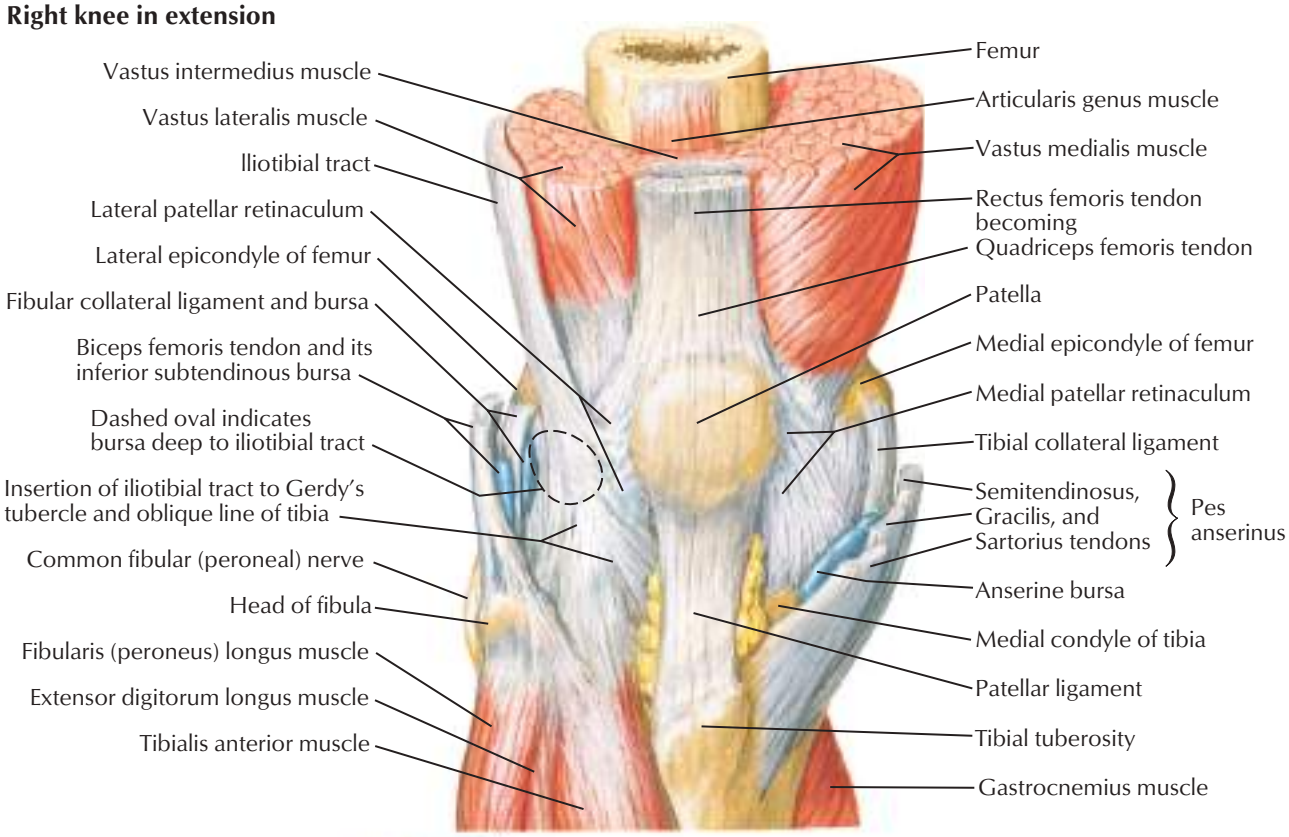



Sartorius muscle
Fascia lata
Profunda femoris (deep femoral) artery and vein
Branches of femoral nerve
Pectineus muscle
Femoral artery and vein
Iliopsoas muscle
Adductor longus muscle
Rectus femoris muscle
Great saphenous vein
Vastus medialis muscle
Obturator nerve (anterior branch)
Lateral femoral cutaneous nerve
Adductor brevis muscle
Vastus intermedius muscle
Obturator nerve (posterior branch)
Femur
Gracilis muscle
Vastus lateralis muscle
Adductor magnus muscle
Tensor fasciae latae muscle
Posterior femoral cutaneous nerve
Iliotibial tract
Semimembranosus muscle
Gluteus maximus muscle
Semitendinosus muscle
Sciatic nerve
Biceps femoris muscle (long head)
Vastus medialis muscle
Medial intermuscular septum of thigh
Rectus femoris muscle
Sartorius muscle
Vastus intermedius muscle
Nerve to vastus medialis muscle
Vastus lateralis muscle
Saphenous nerve
in adductor canal
Iliotibial tract
Femoral artery and vein
Lateral intermuscular septum of thigh
Great saphenous vein
Biceps femoris muscle
Short head
Adductor longus muscle
Long head
Gracilis muscle
Semitendinosus muscle
Adductor brevis muscle
Semimembranosus muscle
Profunda femoris (deep femoral) artery and vein
Adductor magnus muscle
Posterior intermuscular septum of thigh
Rectus femoris tendon
Sciatic nerve
Vastus intermedius muscle
Vastus medialis muscle
Iliotibial tract
Sartorius muscle
Vastus lateralis muscle
Saphenous nerve and descending genicular artery
Articularis genus muscle
Great saphenous vein
Lateral intermuscular septum of thigh
Gracilis muscle
Femur
Adductor magnus tendon
Biceps femoris muscle
Popliteal vein and artery
Common fibular (peroneal) nerve
Semimembranosus muscle
Tibial nerve
Semitendinosus muscle

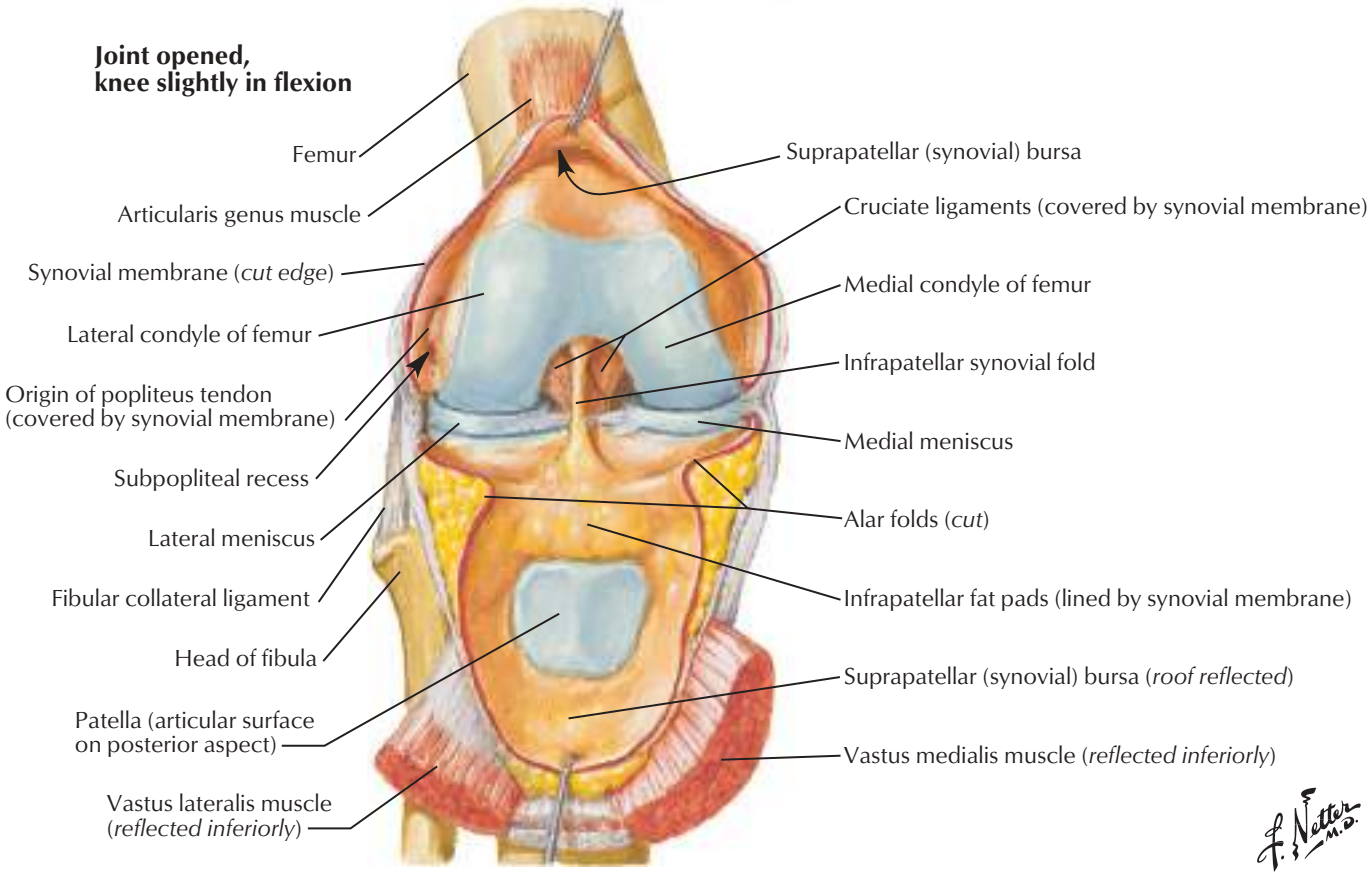

Medial view
Sartorius muscle (cut)
Vastus medialis muscle
Gracilis muscle (cut)
Quadriceps femoris tendon
Tendon of semitendinosus muscle (cut)
Semimembranosus muscle and tendon
Medial epicondyle of femur
Adductor magnus tendon
Parallel fibers
Oblique fibers
Tibial collateral ligament
Patella
Medial patellar retinaculum
Semimembranosus bursa
Joint capsule
Anserine bursa deep to Semitendinosus, Gracilis, and Sartorius tendons
Pes anserinus
Patellar ligament
Gastrocnemius muscle
Tibial tuberosity
Soleus muscle


Lateral view
Vastus lateralis muscle
Iliotibial tract (cut)
Biceps femoris muscle (cut)
Long head
Short head
Quadriceps femoris tendon
Bursa deep to iliotibial tract
Patella
Fibular collateral ligament and bursa deep to it
Lateral patellar retinaculum
Plantaris muscle
Biceps femoris tendon and its inferior subtendinous bursa
Joint capsule of knee
Common fibular (peroneal) nerve
Patellar ligament
Head of fibula
Gastrocnemius muscle
Tibial tuberosity
Soleus muscle
Fibularis (peroneus) longus muscle
Tibialis anterior muscle

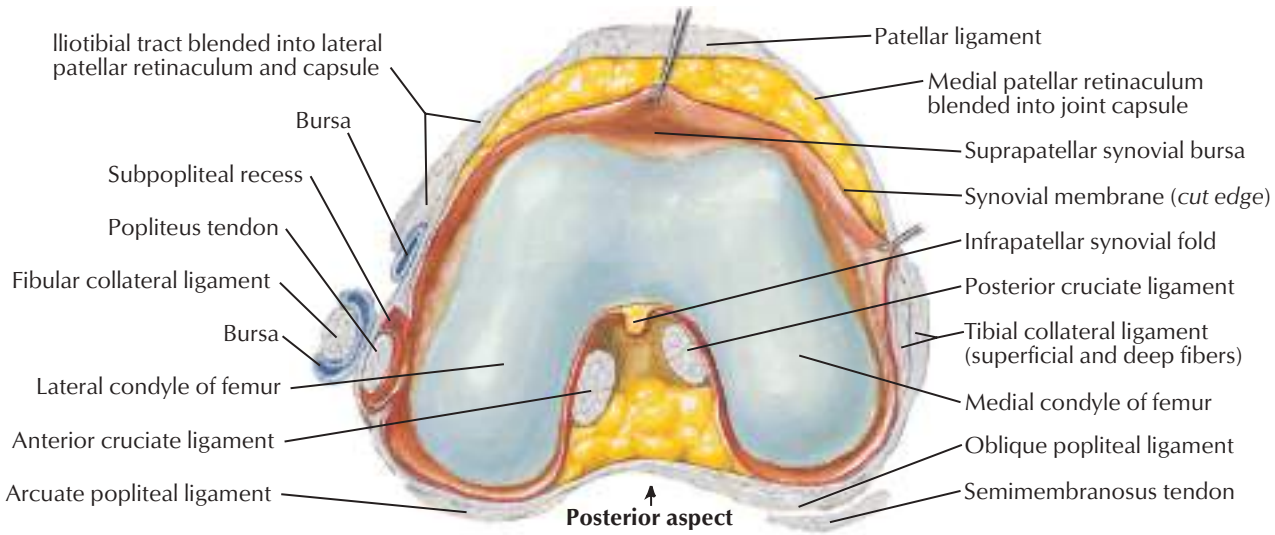
Right knee in extension



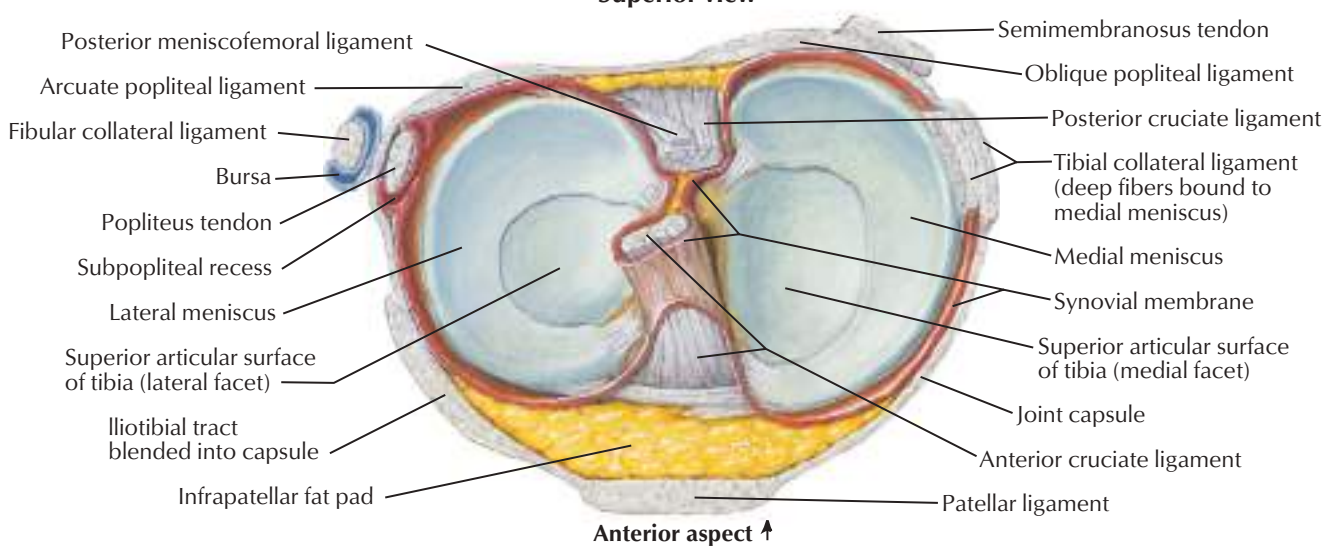
Joint opened, knee slightly in flexion



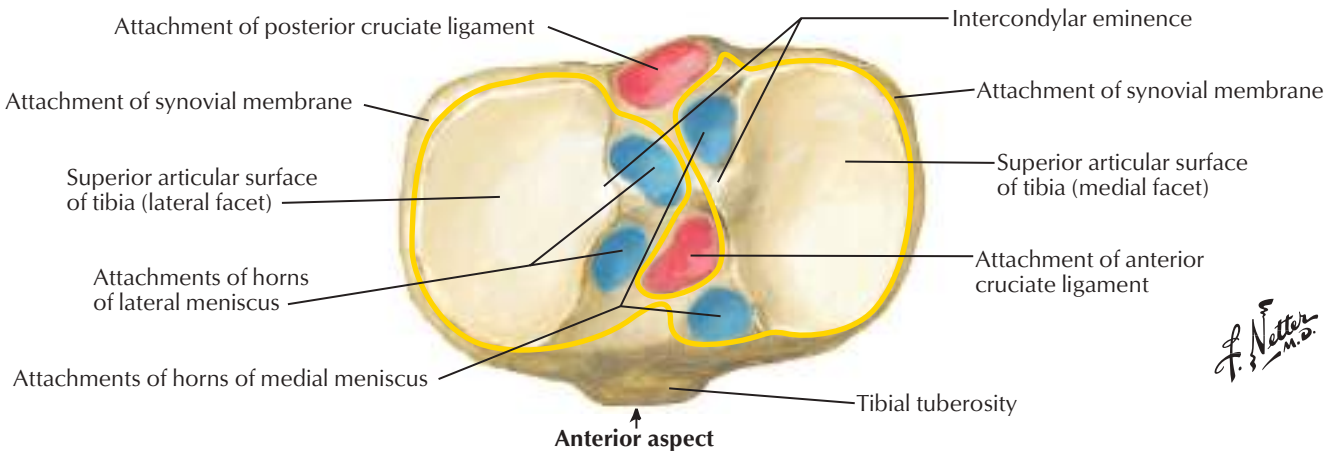
Inferior view



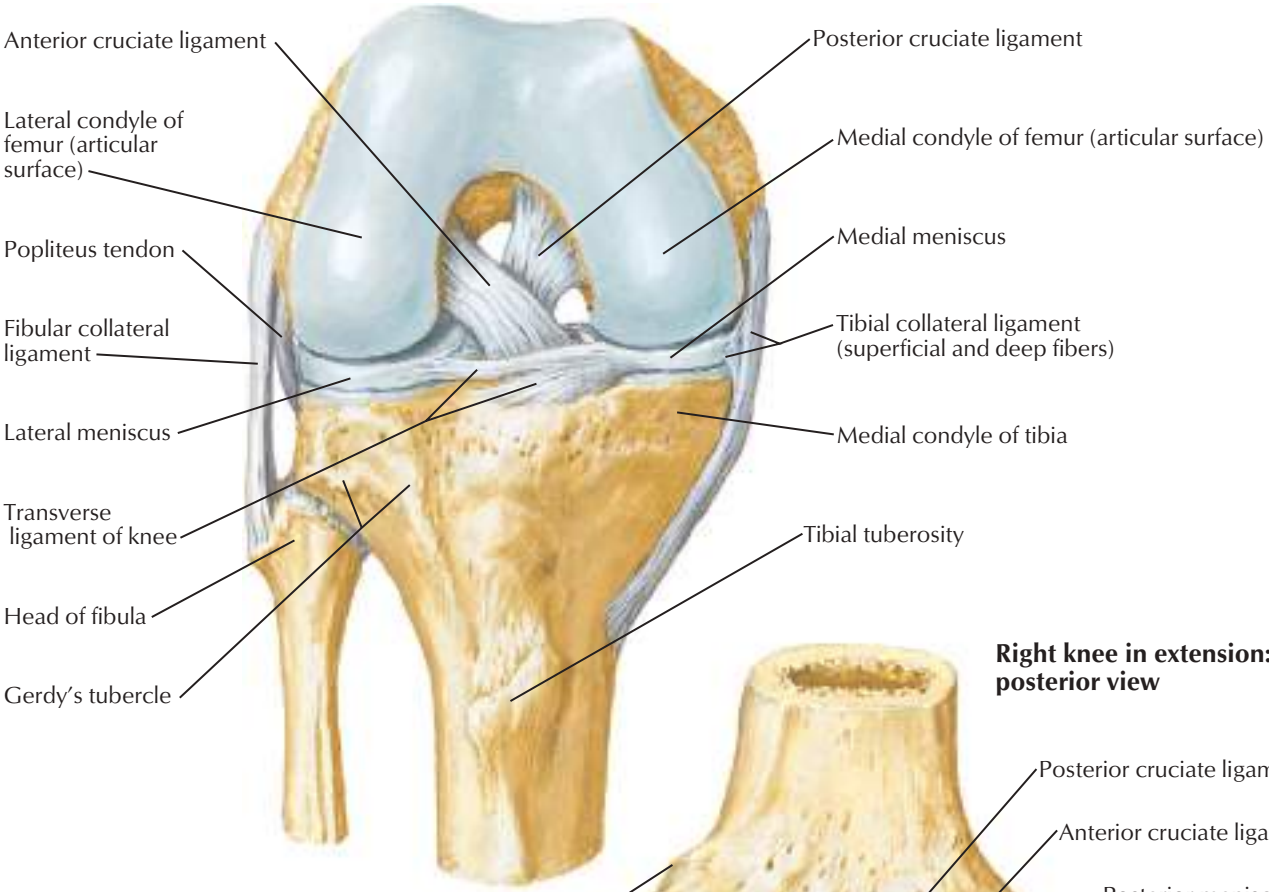
Superior view



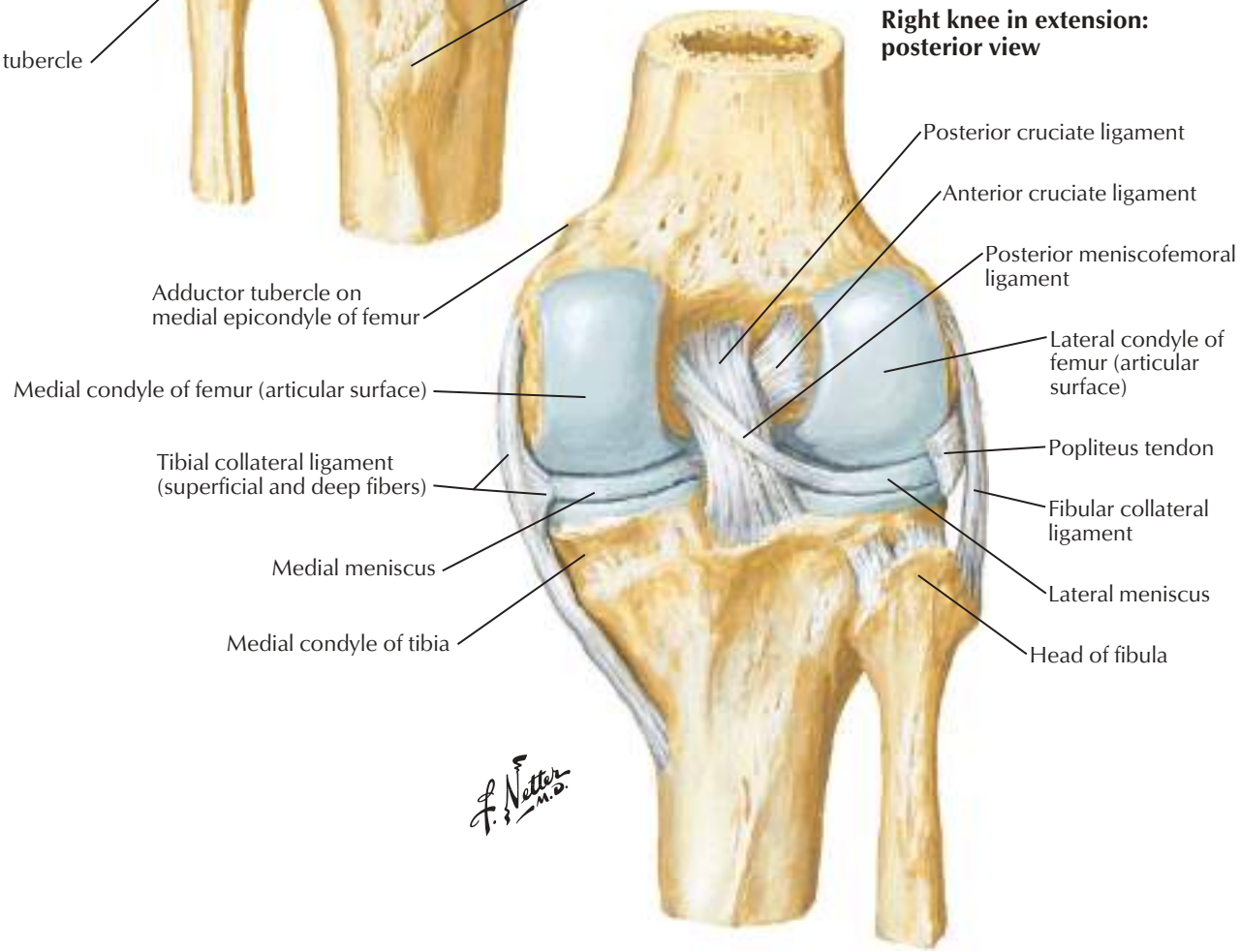
Superior view: ligaments and cartilage removed



Right knee in flexion: anterior view

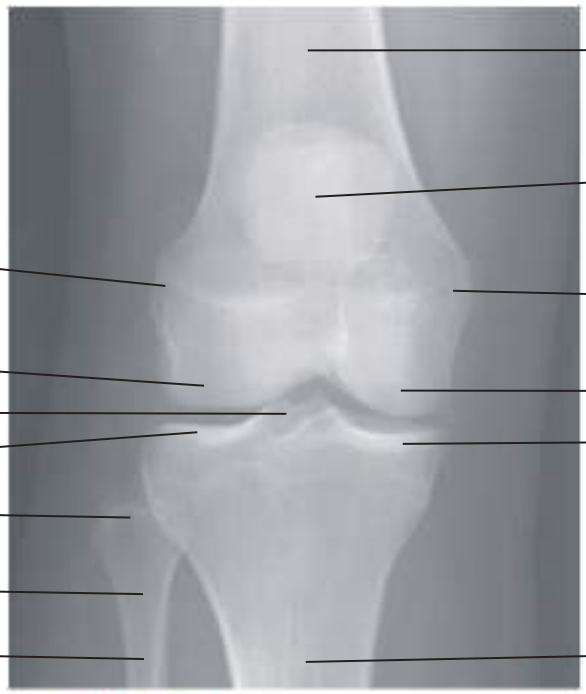


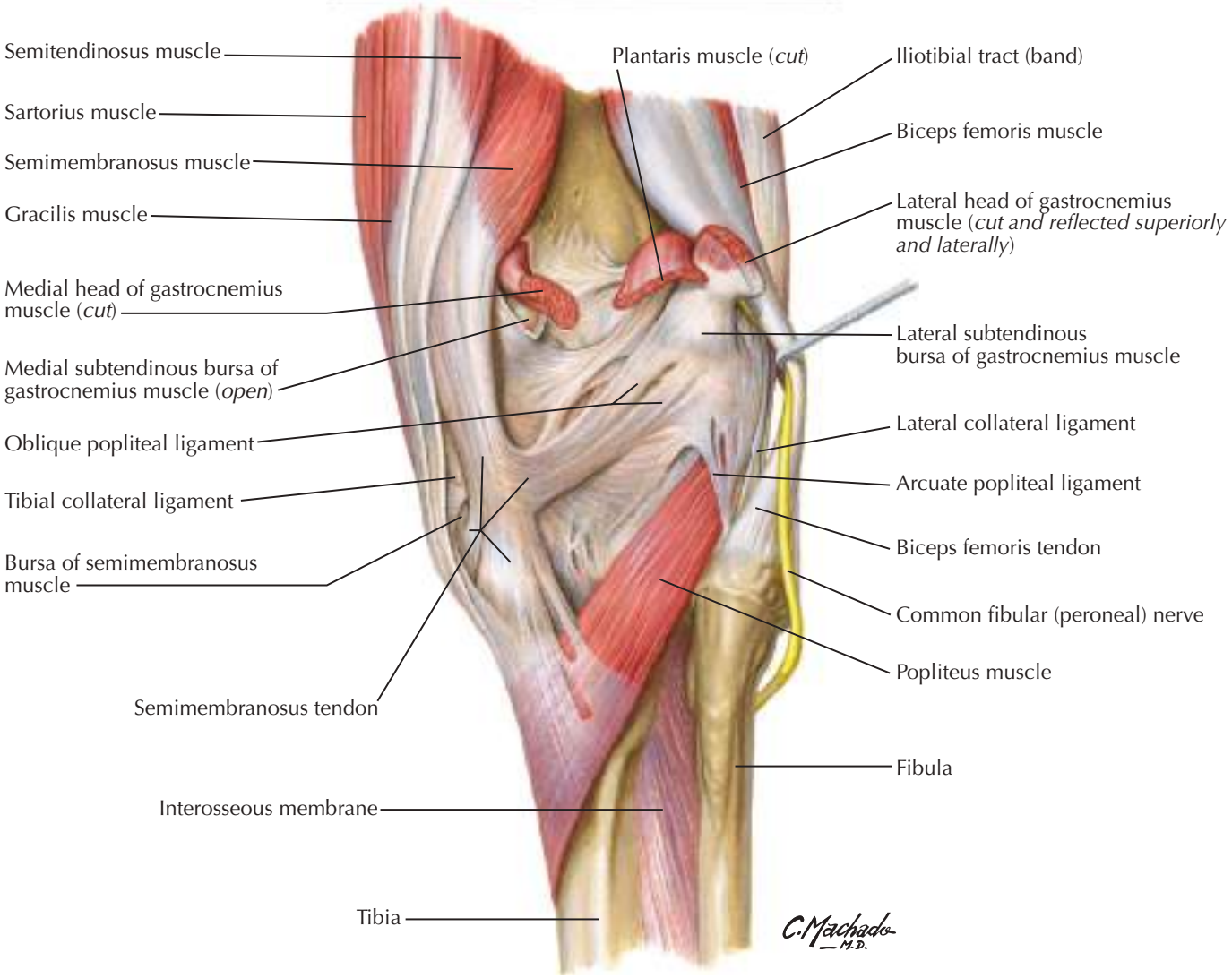
Right knee in extension: posterior view

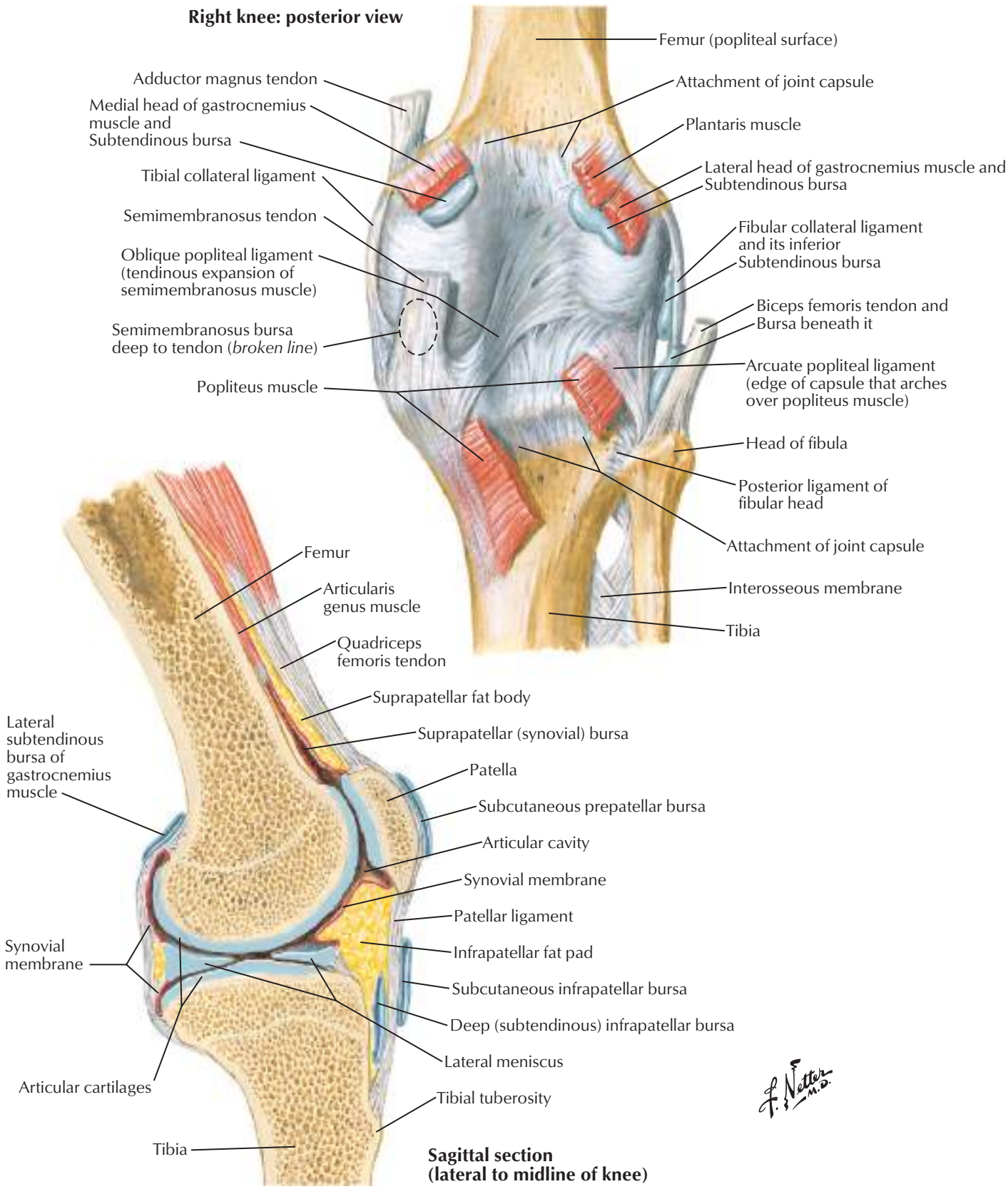


Knee: Anteroposterior Radiograph and Posterior View

See also Plate 494

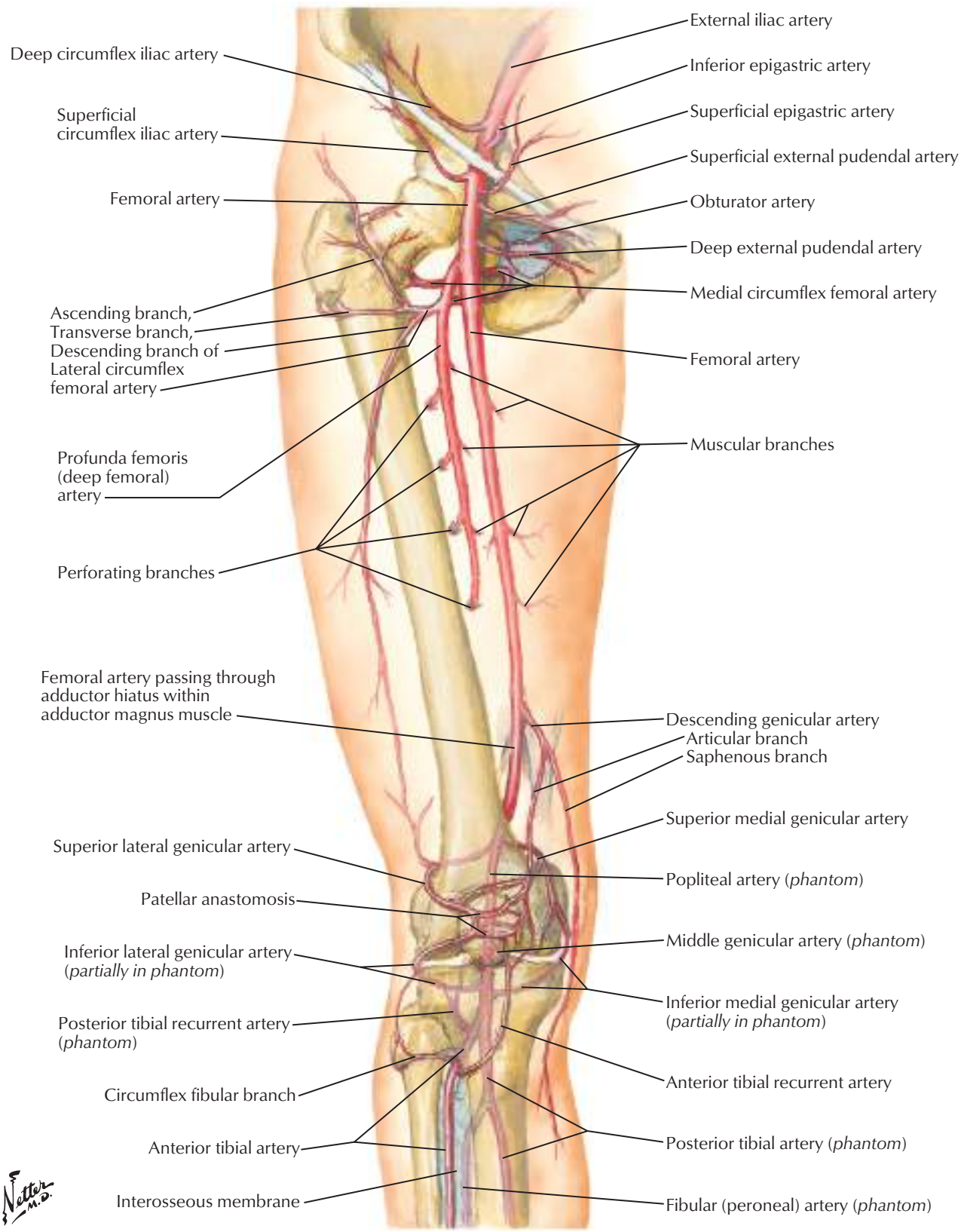


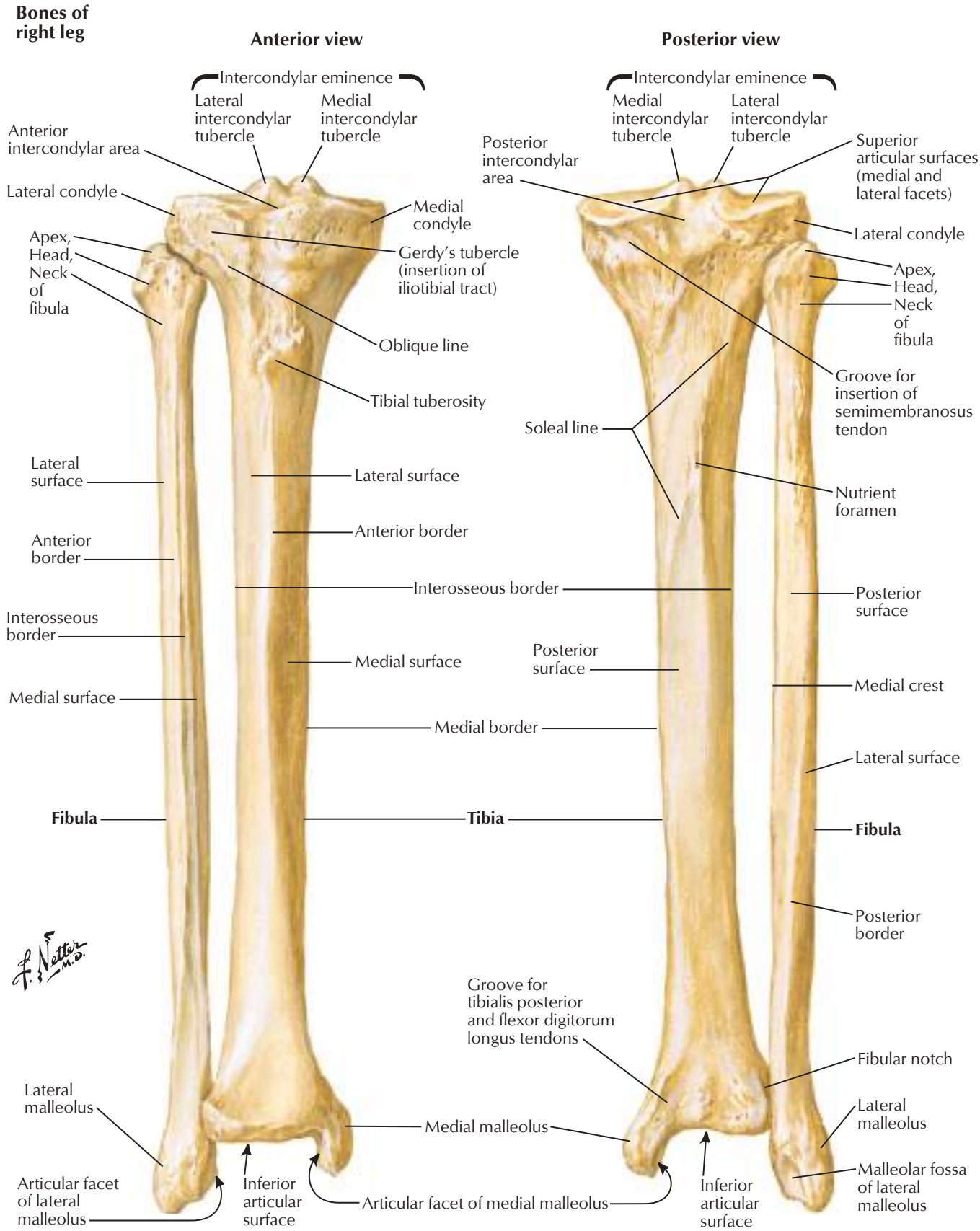



Right knee: posterior view
Femur (popliteal surface)
Attachment of joint capsule
Plantaris muscle
Lateral head of gastrocnemius muscle and Subtendinous bursa
Fibular collateral ligament and its inferior Subtendinous bursa
Biceps femoris tendon and Bursa beneath it
Arcuate popliteal ligament (edge of capsule that arches over popliteus muscle)
Head of fibula
Posterior ligament of fibular head
Attachment of joint capsule
Interosseous membrane
Tibia
Adductor magnus tendon
Medial head of gastrocnemius muscle and Subtendinous bursa
Tibial collateral ligament
Semimembranosus tendon
Oblique popliteal ligament (tendinous expansion of semimembranosus muscle)
Semimembranosus bursa deep to tendon (*broken line*)
Popliteus muscle
Femur
Articularis genus muscle
Quadriceps femoris tendon
Suprapatellar fat body
Suprapatellar (synovial) bursa
Patella
Subcutaneous prepatellar bursa
Articular cavity
Synovial membrane
Patellar ligament
Infrapatellar fat pad
Subcutaneous infrapatellar bursa
Deep (subtendinous) infrapatellar bursa
Lateral meniscus
Tibial tuberosity
Tibia
Lateral subtendinous bursa of gastrocnemius muscle
Synovial membrane
Articular cartilages
Sagittal section (lateral to midline of knee)

Arteries of Thigh and Knee: Schema

See also Plates 491, 508, 509, 518

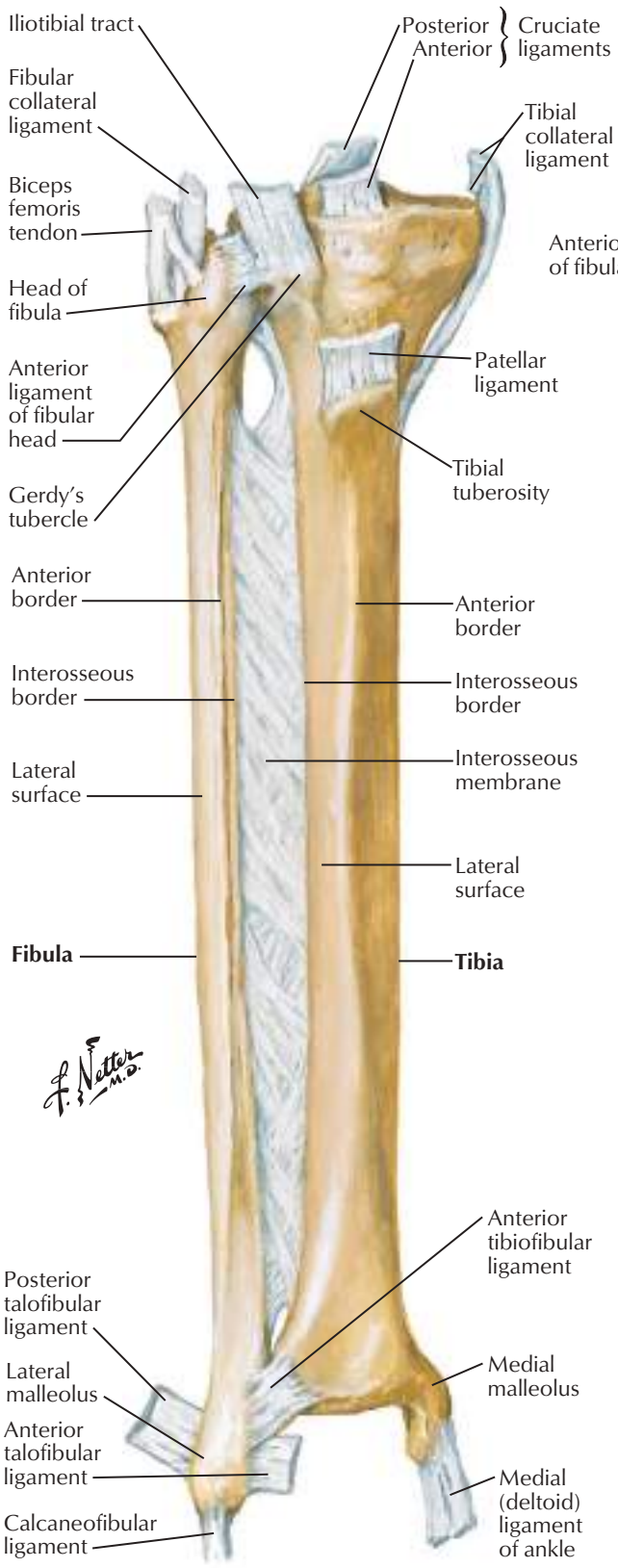



Bones of right leg
Anterior view
Posterior view
Intercondylar eminence
Lateral intercondylar tubercle
Medial intercondylar tubercle
Anterior intercondylar area
Lateral condyle
Medial condyle
Apex, Head, Neck of fibula
Gerdy's tubercle (insertion of iliotibial tract)
Oblique line
Tibial tuberosity
Lateral surface
Anterior border
Interosseous border
Medial surface
Medial border
Fibula
Tibia
Lateral malleolus
Medial malleolus
Articular facet of lateral malleolus
Inferior articular surface
Articular facet of medial malleolus
Posterior intercondylar area
Superior articular surfaces (medial and lateral facets)
Groove for insertion of semimembranosus tendon
Soleal line
Nutrient foramen
Posterior surface
Medial crest
Posterior border
Groove for tibialis posterior and flexor digitorum longus tendons
Fibular notch
Malleolar fossa of lateral malleolus

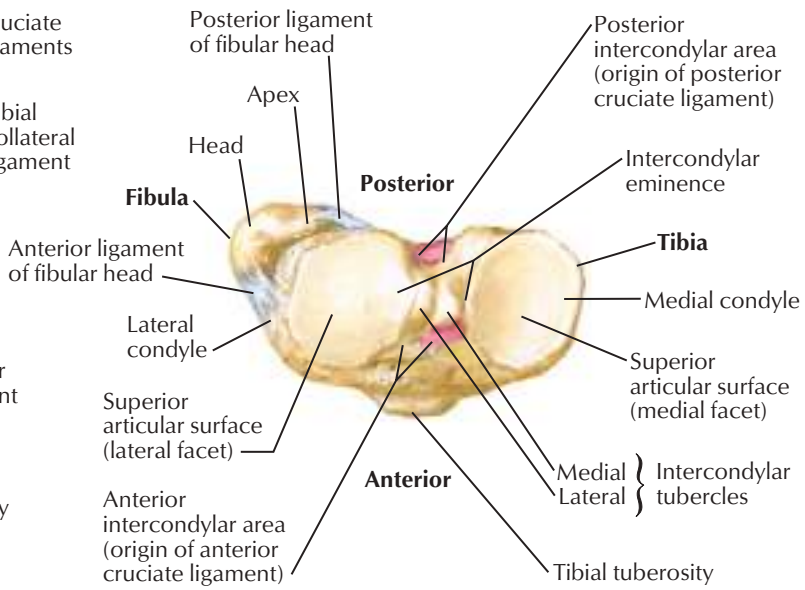
Tibia and Fibula (continued)

See also Plate 495

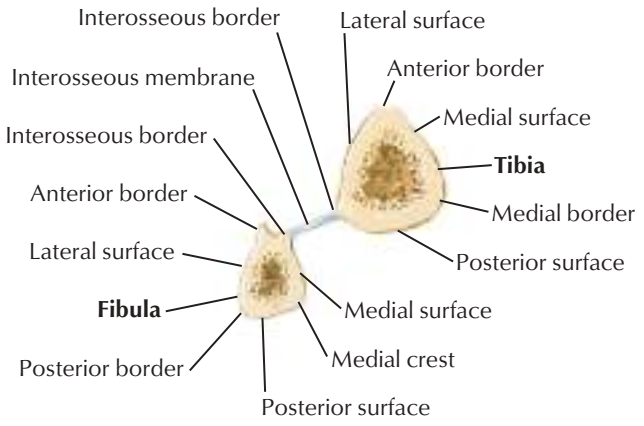
Anterior view with ligament attachments



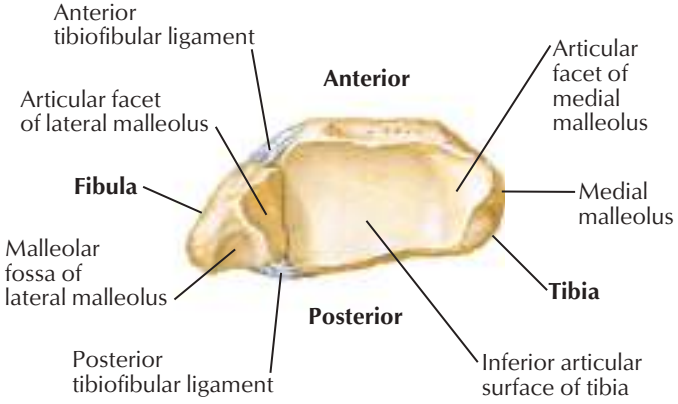
Superior view



Cross section

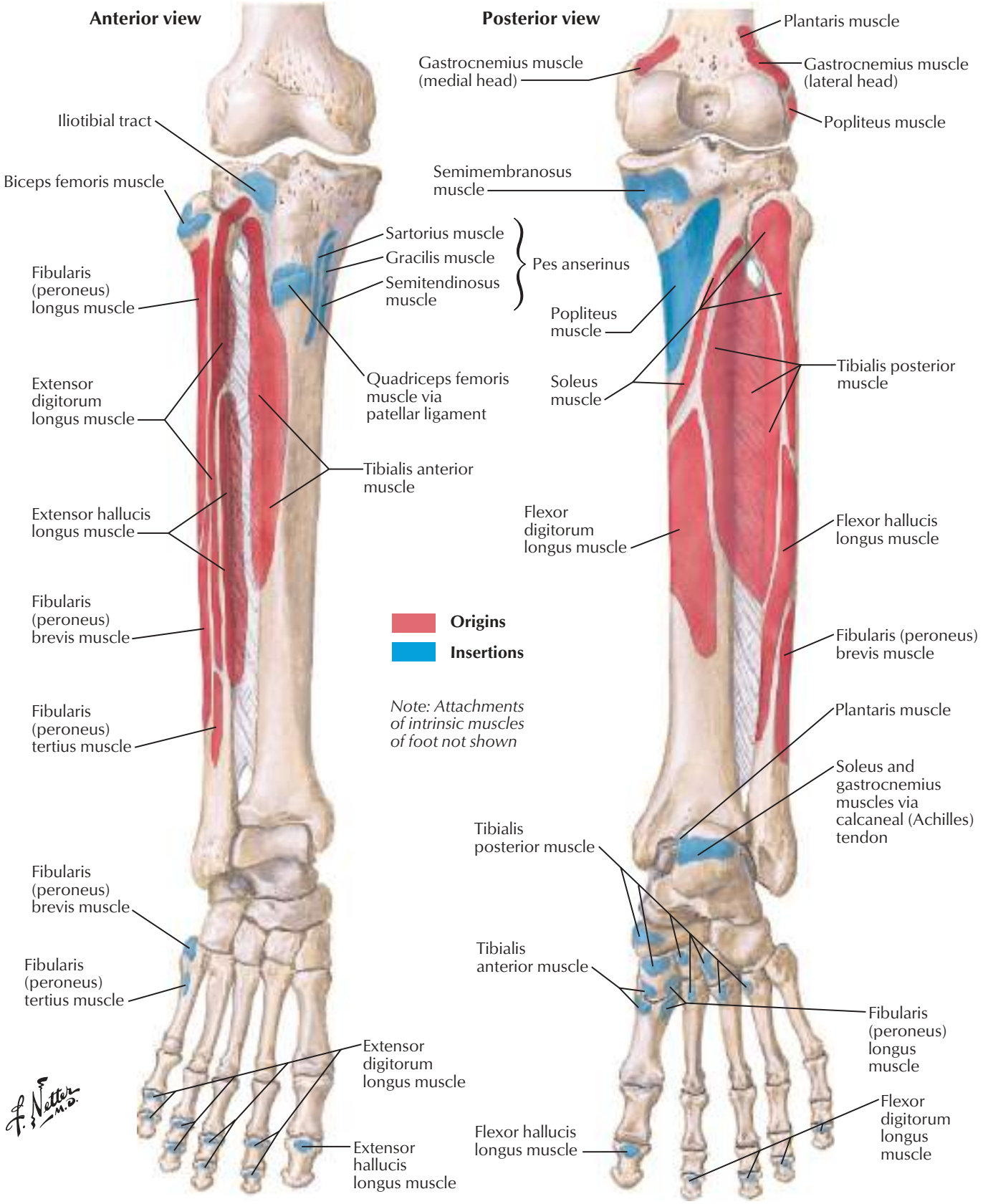


Inferior view



Attachments of Muscles of Leg

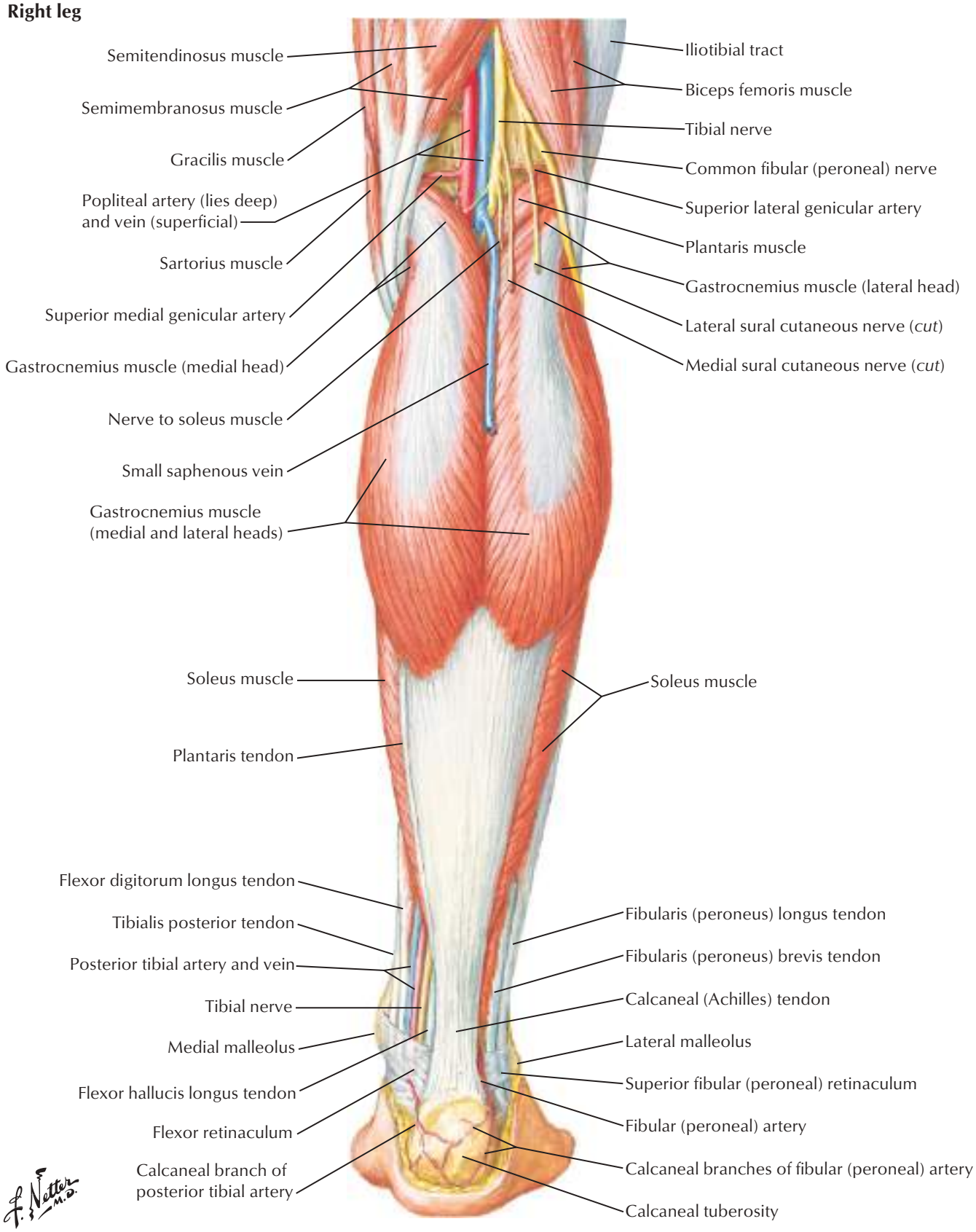
See also Plates 505, 508



Muscles of Leg (Superficial Dissection): Posterior View

See also Plate 528

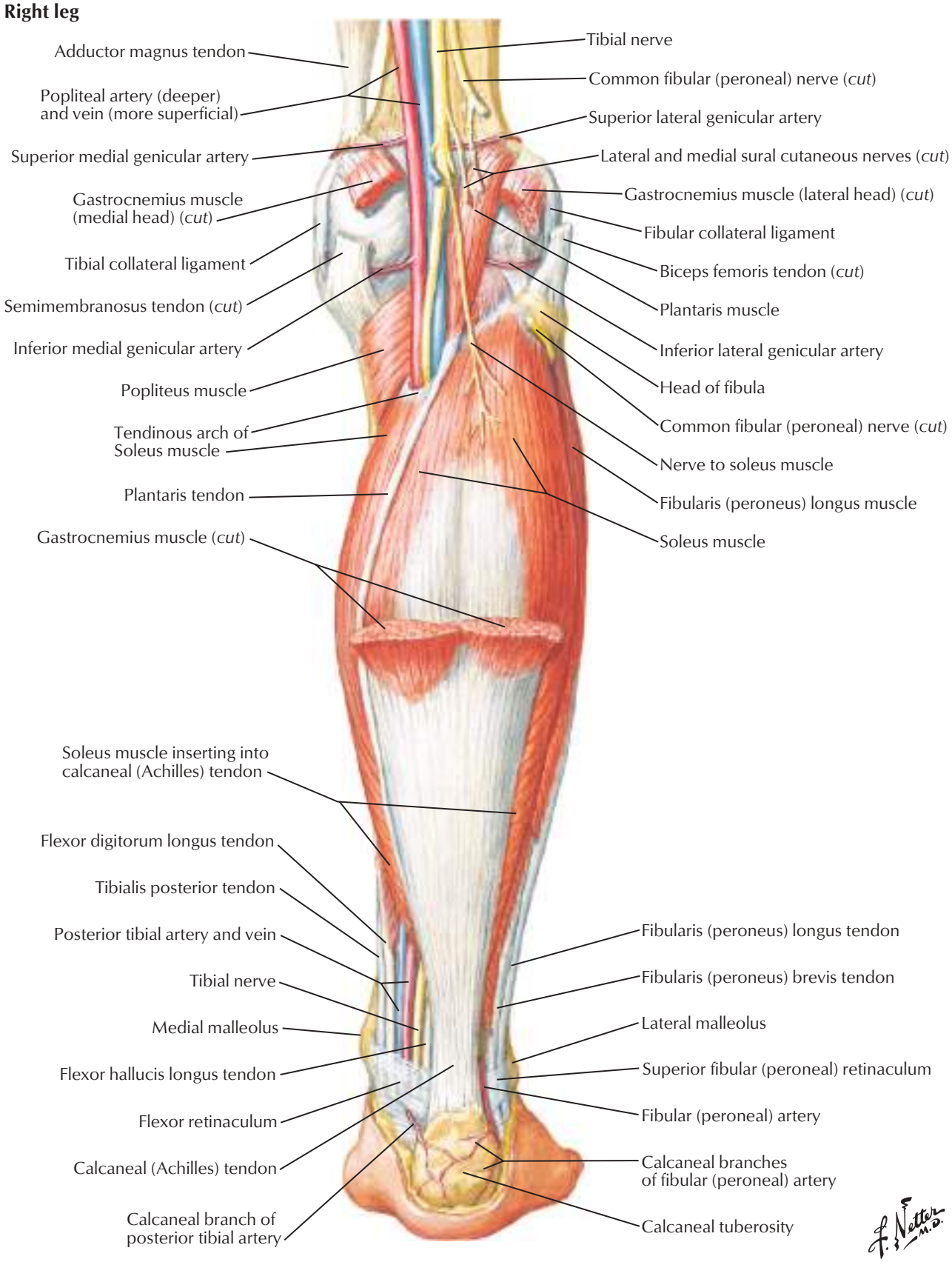
Right leg



Muscles of Leg (Intermediate Dissection): Posterior View

See also Plate 528

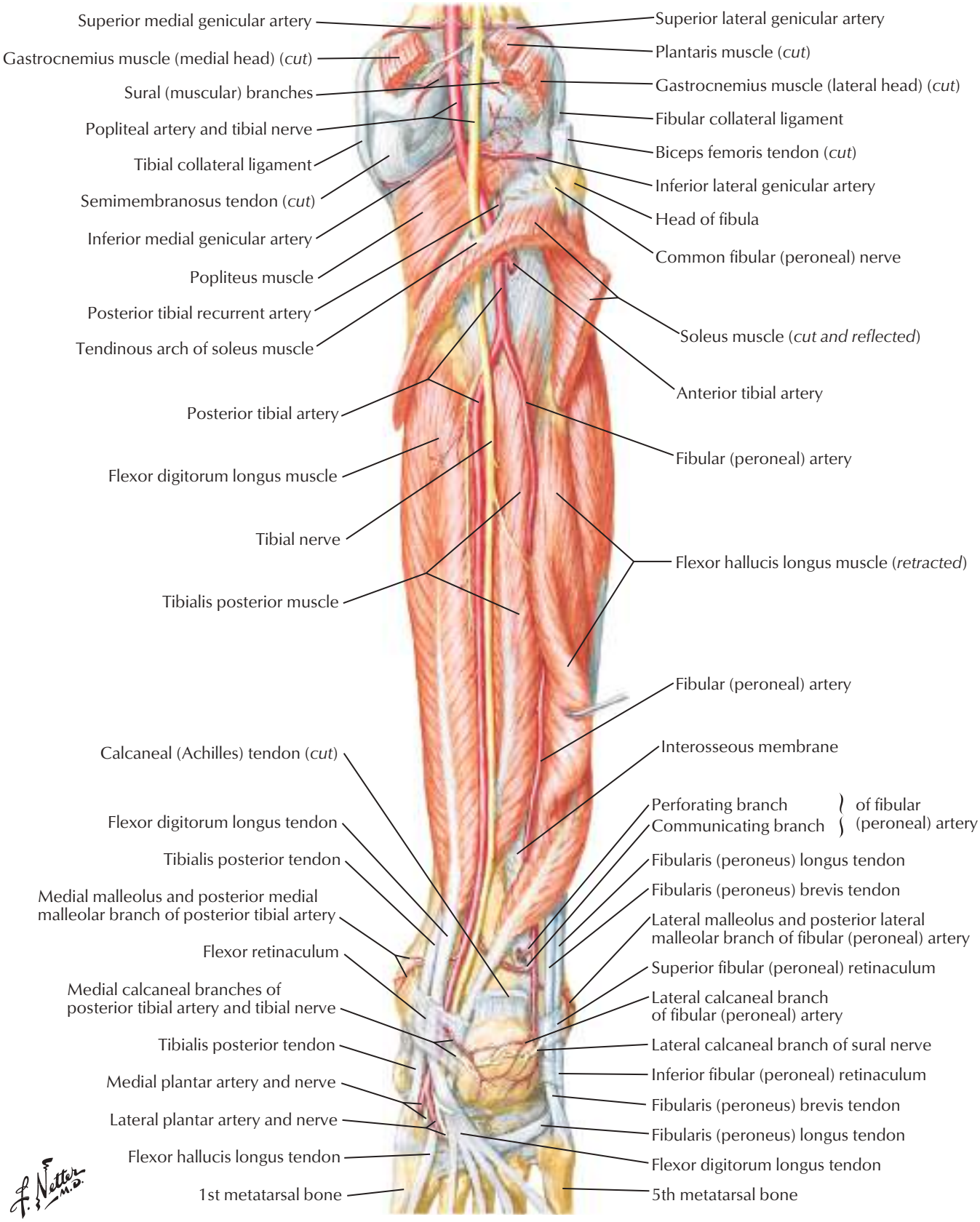
Right leg



Muscles of Leg (Deep Dissection): Posterior View

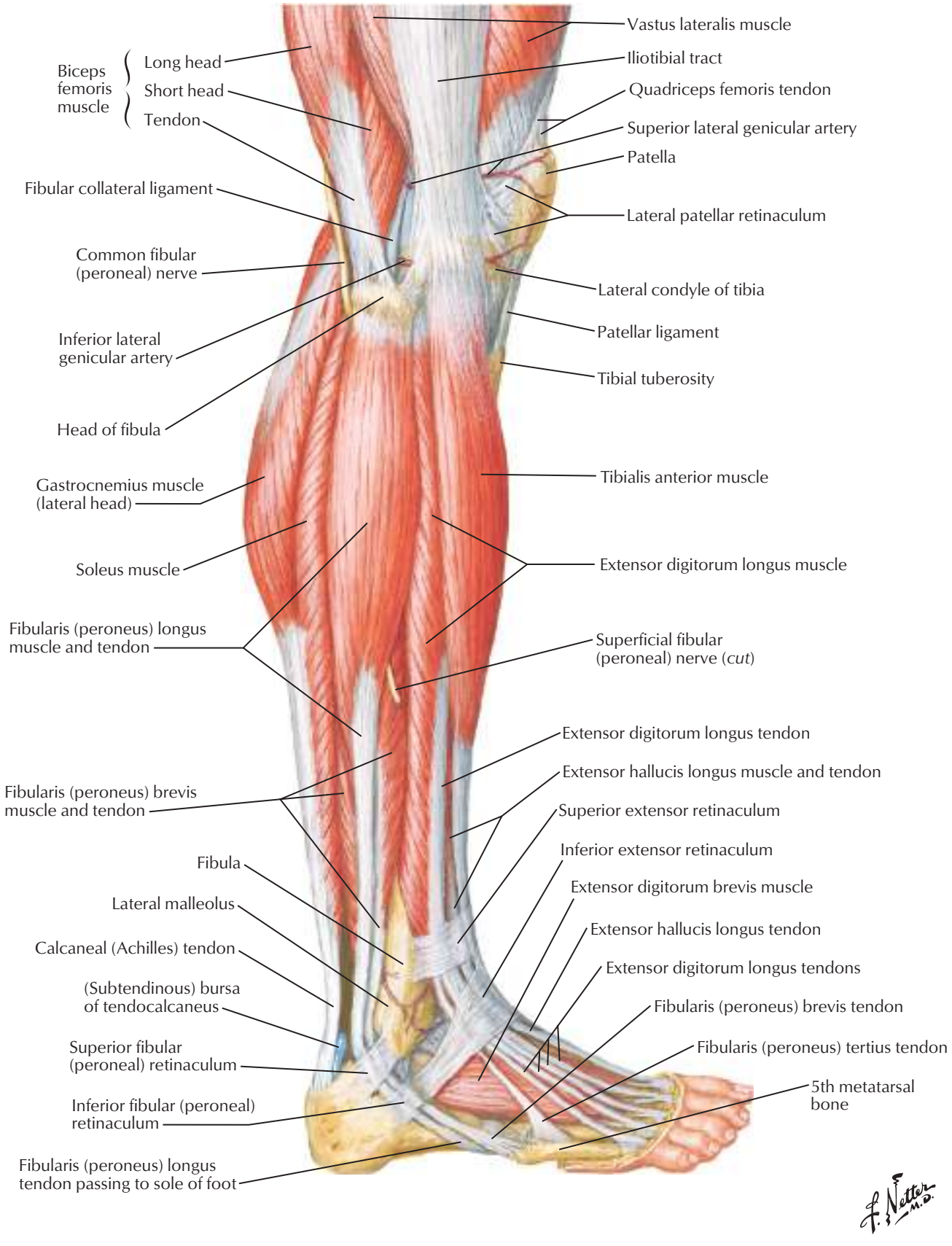
See also Plate 528

Right leg



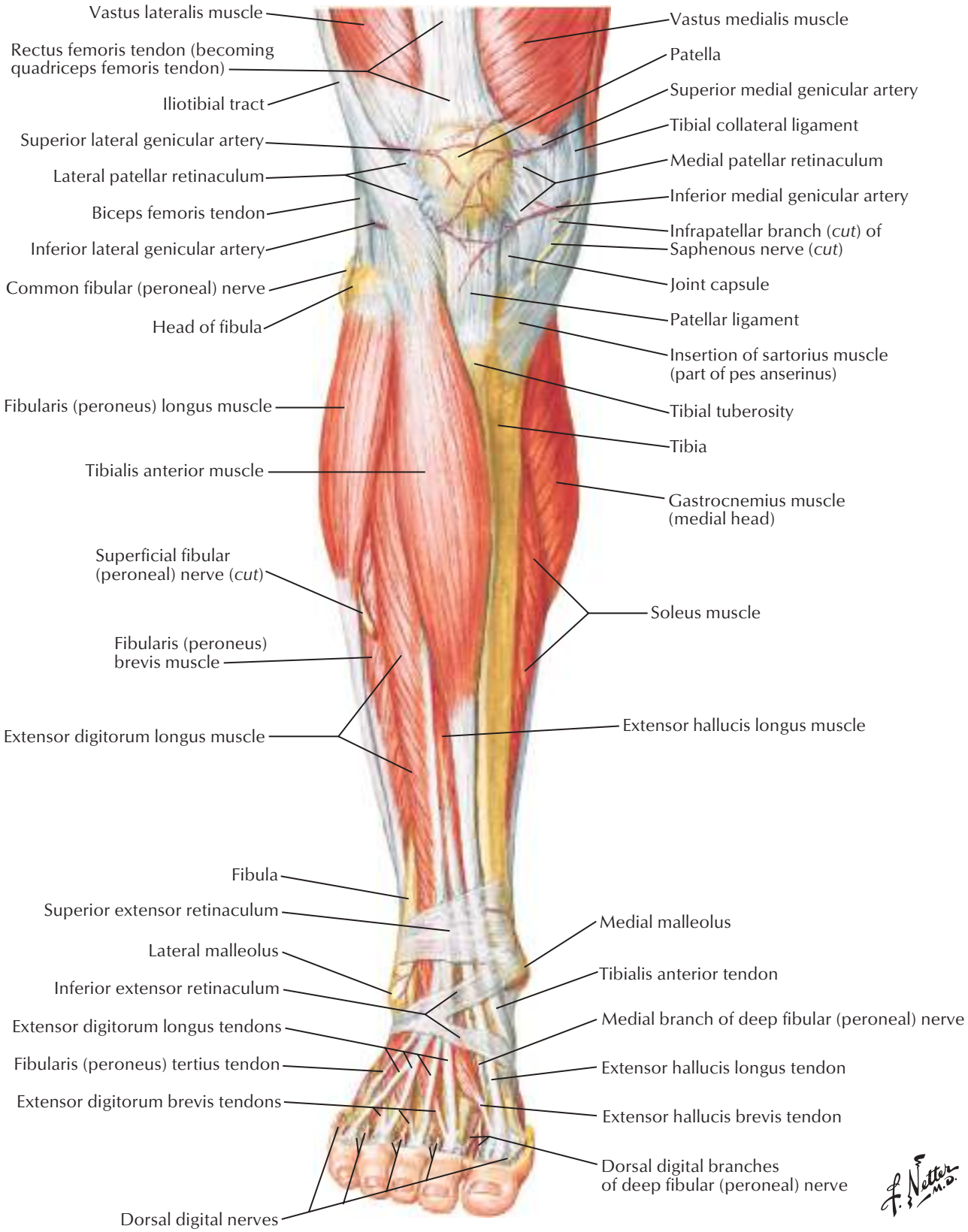
Muscles of Leg: Lateral View

See also Plates 516, 529



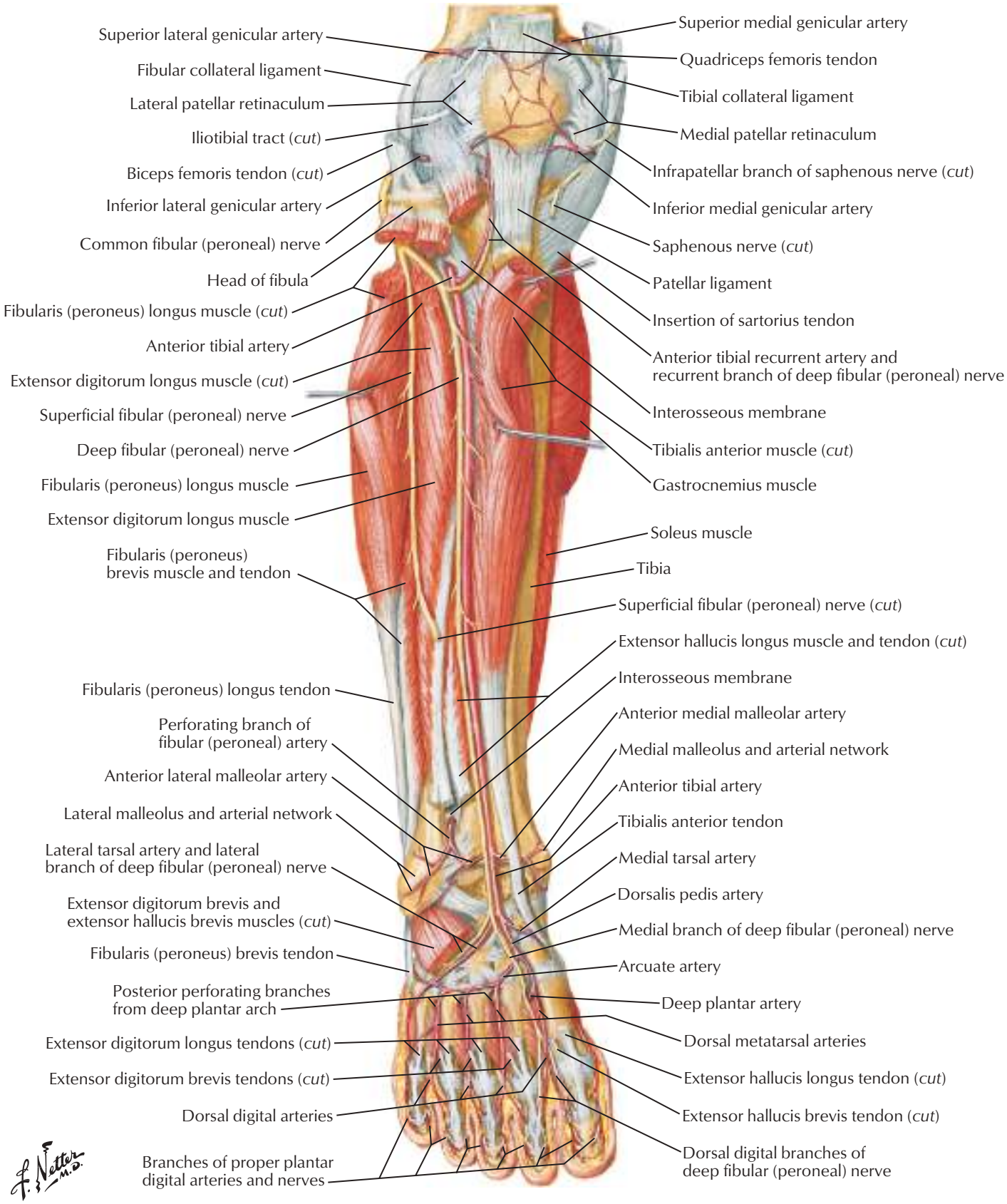
Muscles of Leg (Superficial Dissection): Anterior View

See also Plate 529

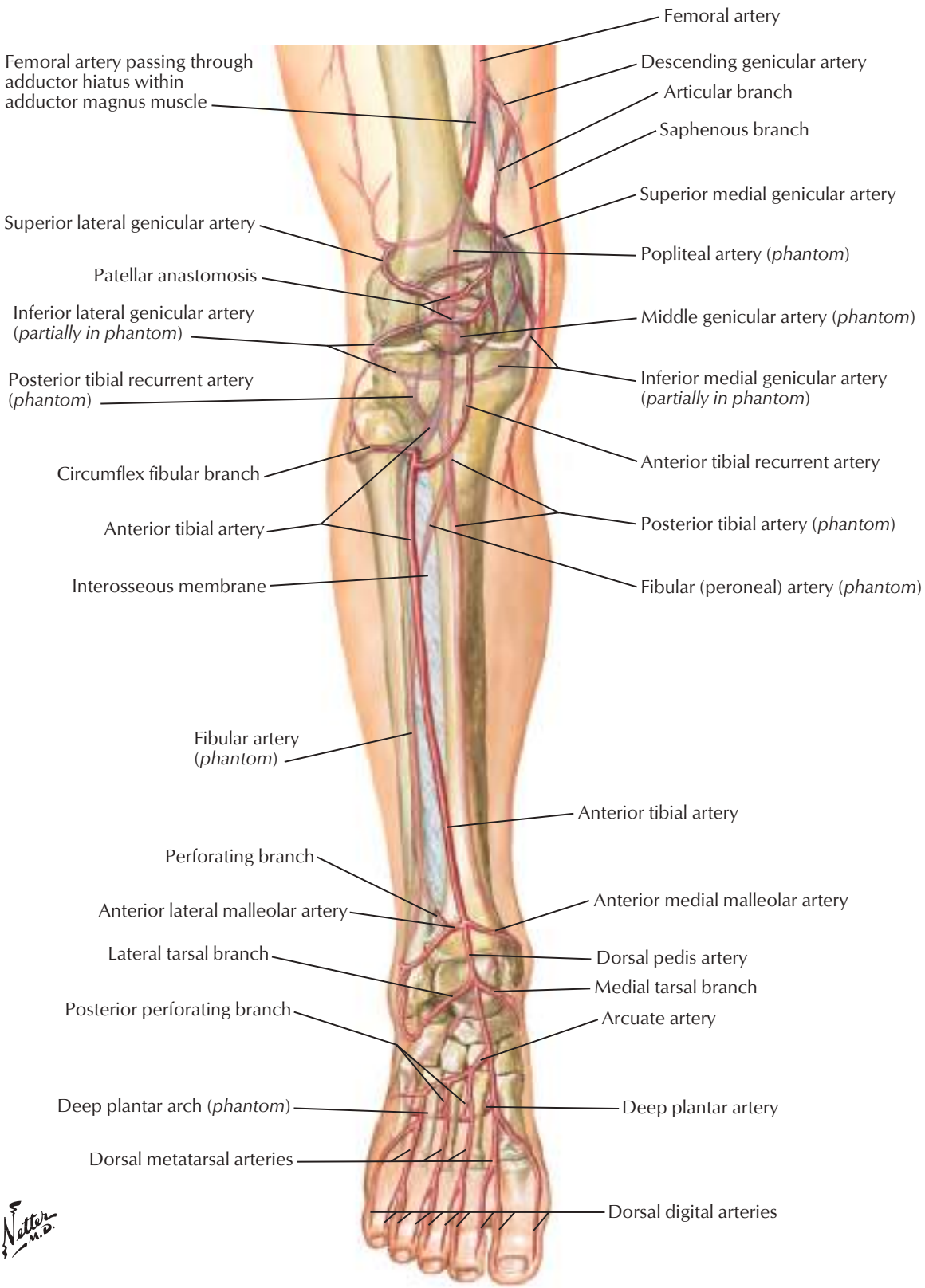


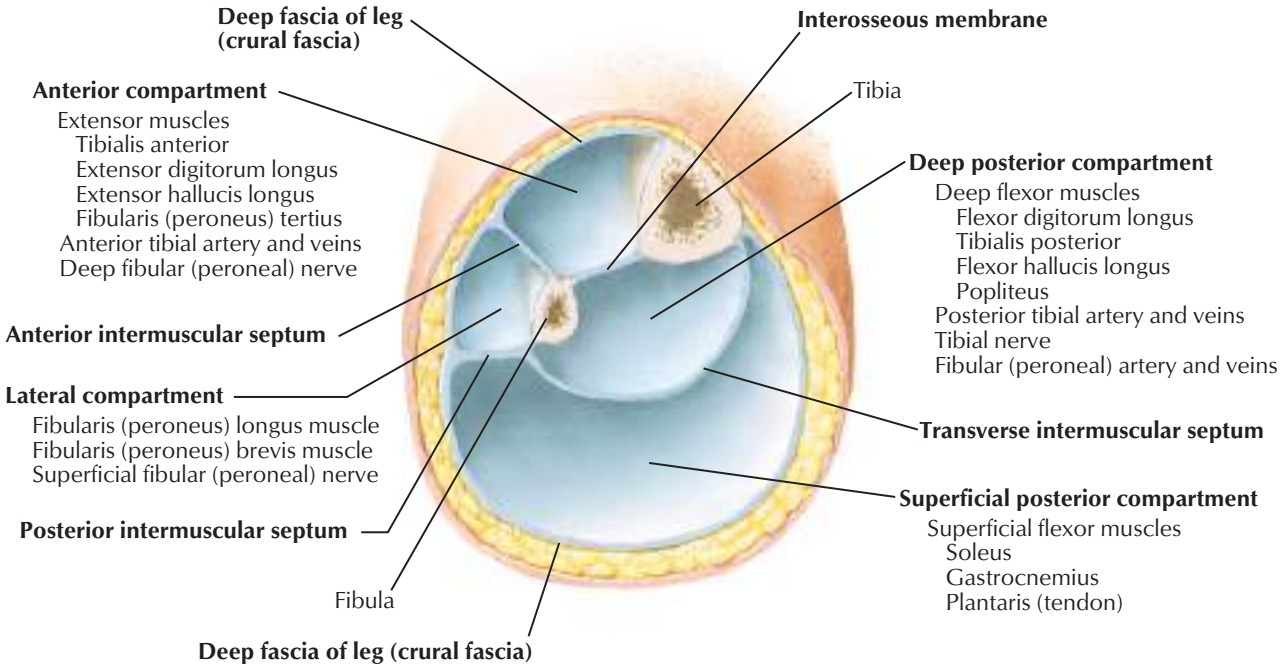
Muscles of Leg (Deep Dissection): Anterior View

See also Plates 499, 523, 529

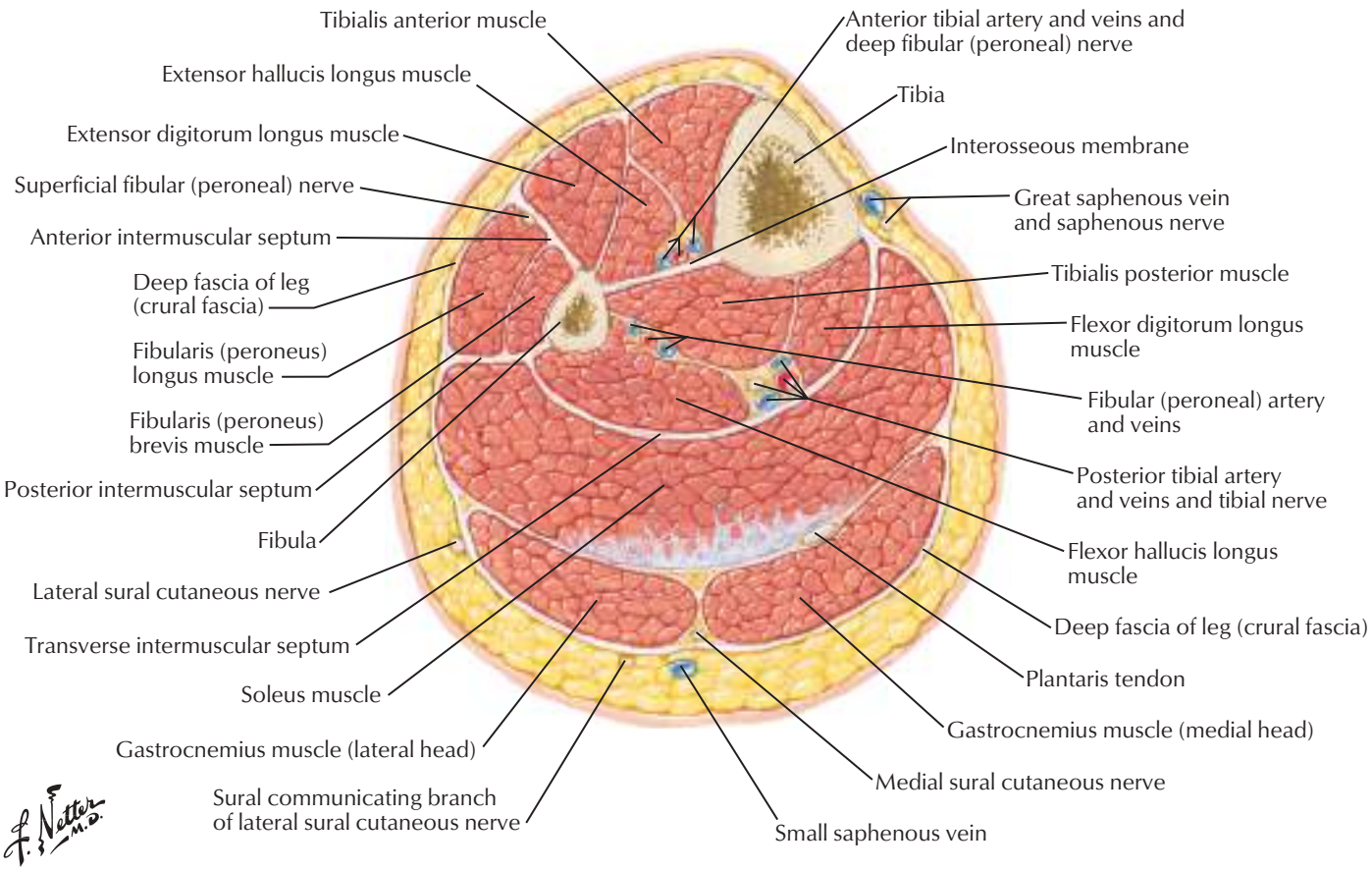


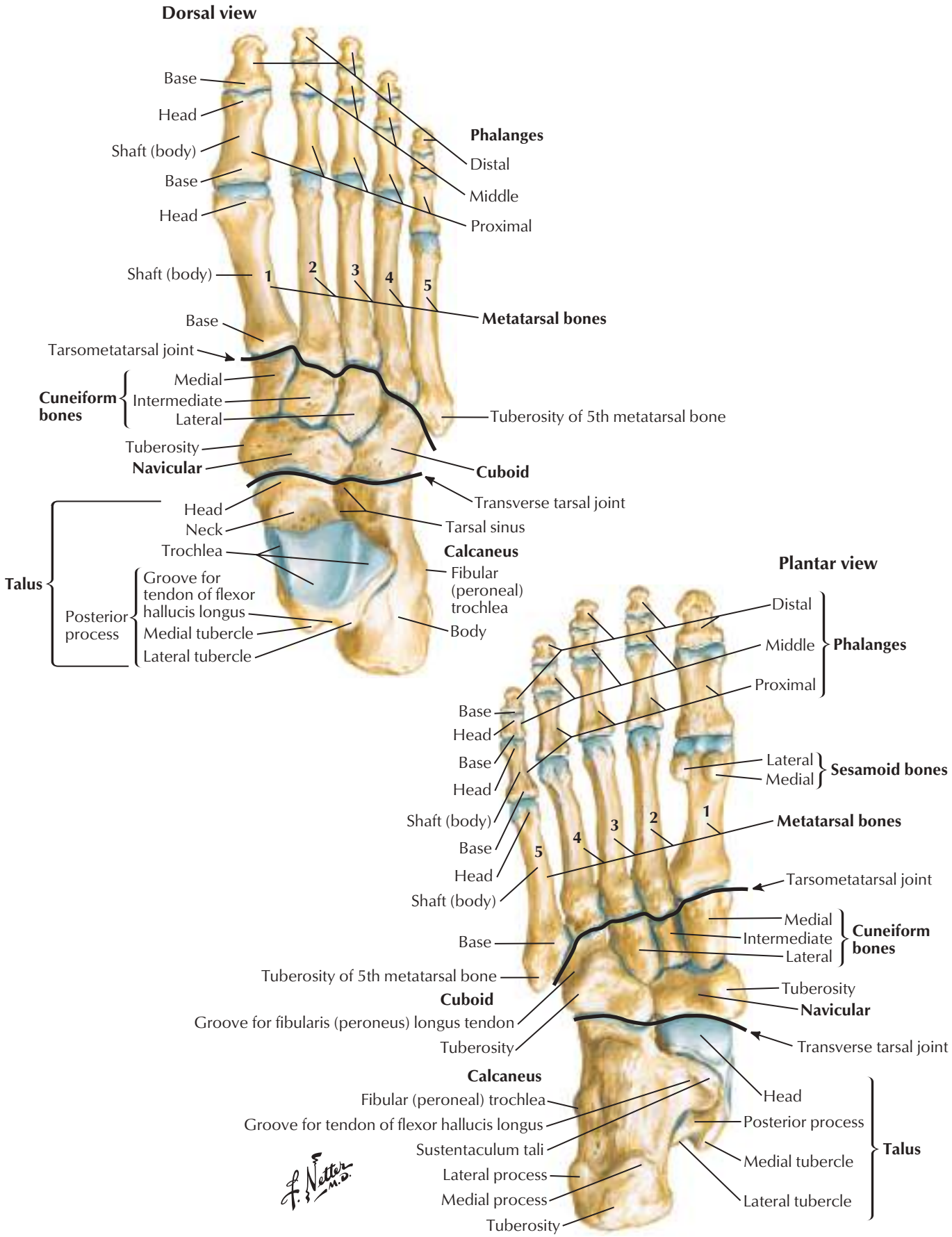
See also Plate 531

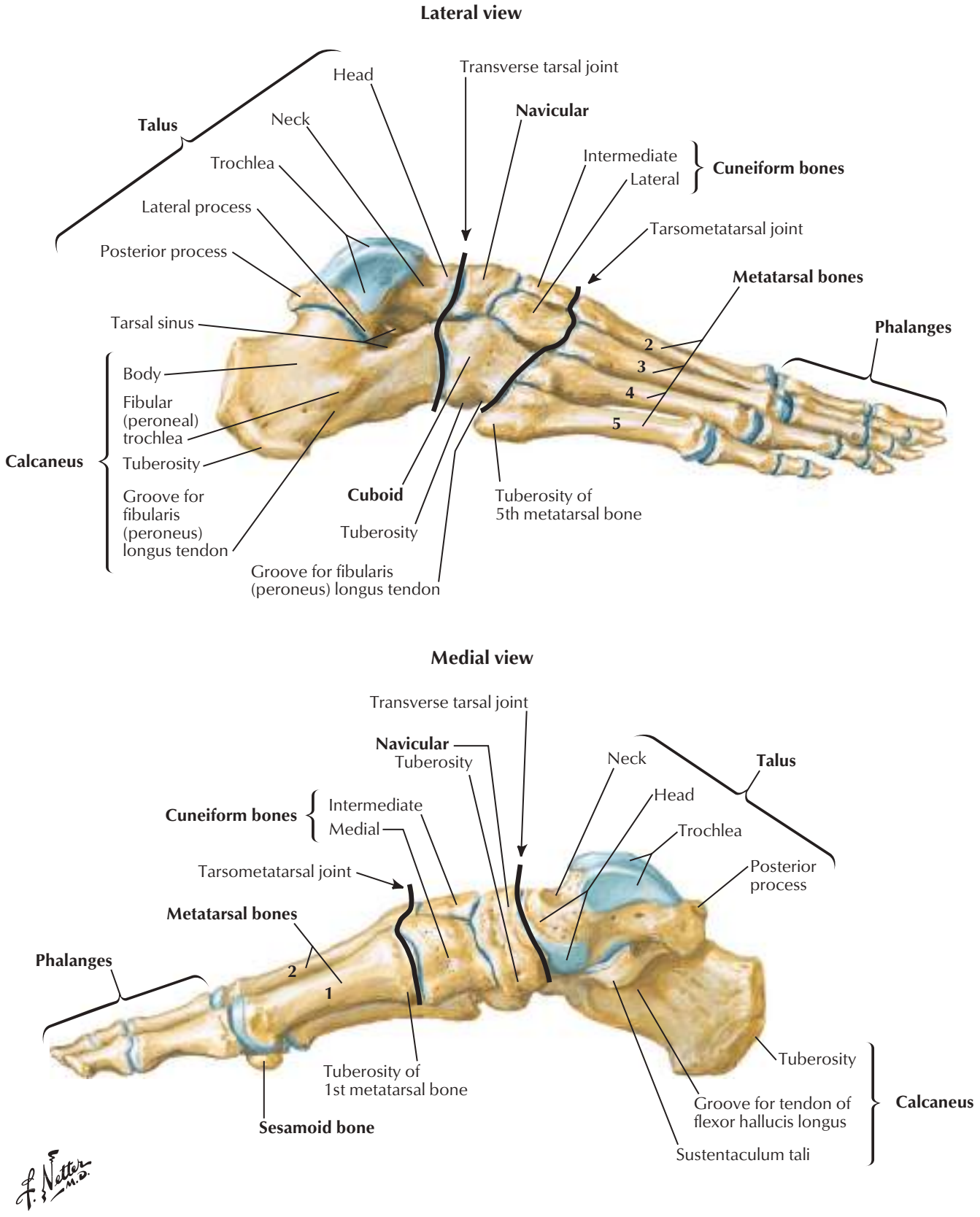




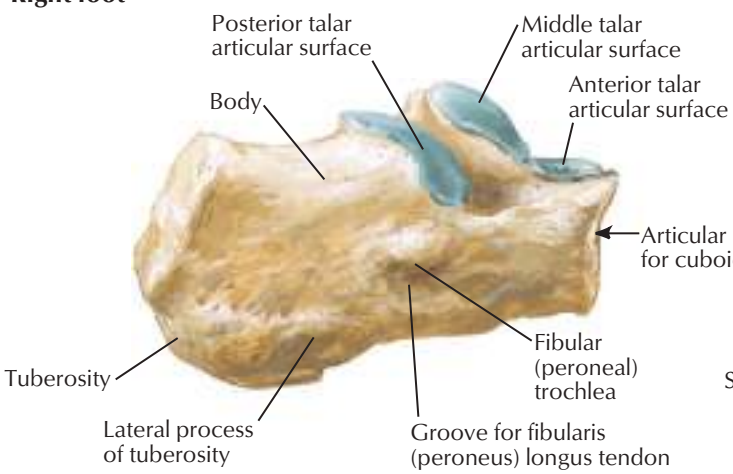
Cross section just above middle of leg




Dorsal view
Base
Head
Shaft (body)
Base
Head
Phalanges
Distal
Middle
Proximal
Shaft (body)
1
2
3
4
5
Metatarsal bones
Base
Tarsometatarsal joint
Cuneiform bones
Medial
Intermediate
Lateral
Tuberosity of 5th metatarsal bone
Tuberosity
Navicular
Cuboid
Transverse tarsal joint
Talus
Head
Neck
Trochlea
Tarsal sinus
Calcaneus
Fibular (peroneal) trochlea
Posterior process
Groove for tendon of flexor hallucis longus
Medial tubercle
Lateral tubercle
Body
Plantar view
Distal
Middle
Proximal
Phalanges
Base
Head
Base
Head
Lateral
Medial
Sesamoid bones
Shaft (body)
Base
Head
Shaft (body)
1
2
3
4
5
Metatarsal bones
Tarsometatarsal joint
Base
Medial
Intermediate
Lateral
Cuneiform bones
Tuberosity of 5th metatarsal bone
Cuboid
Tuberosity
Navicular
Groove for fibularis (peroneus) longus tendon
Tuberosity
Transverse tarsal joint
Calcaneus
Fibular (peroneal) trochlea
Groove for tendon of flexor hallucis longus
Sustentaculum tali
Lateral process
Medial process
Tuberosity
Head
Posterior process
Medial tubercle
Lateral tubercle
Talus

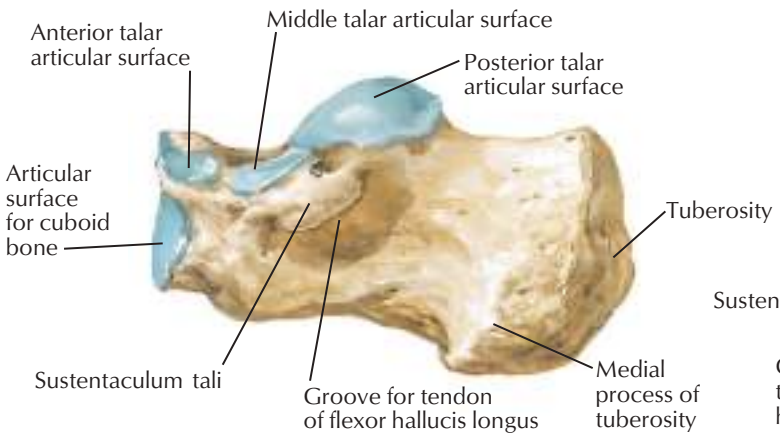

Lateral view
Talus
Head
Neck
Trochlea
Lateral process
Posterior process
Tarsal sinus
Calcaneus
Body
Fibular (peroneal) trochlea
Tuberosity
Groove for fibularis (peroneus) longus tendon
Transverse tarsal joint
Navicular
Intermediate
Lateral
Cuneiform bones
Tarsometatarsal joint
Metatarsal bones
Phalanges
2
3
4
5
Cuboid
Tuberosity
Groove for fibularis (peroneus) longus tendon
Tuberosity of 5th metatarsal bone
Medial view
Transverse tarsal joint
Navicular
Tuberosity
Cuneiform bones
Intermediate
Medial
Tarsometatarsal joint
Metatarsal bones
Phalanges
2
1
Tuberosity of 1st metatarsal bone
Sesamoid bone
Neck
Talus
Head
Trochlea
Posterior process
Tuberosity
Groove for tendon of flexor hallucis longus
Sustentaculum tali
Calcaneus
F. Netter M.D.

Right foot

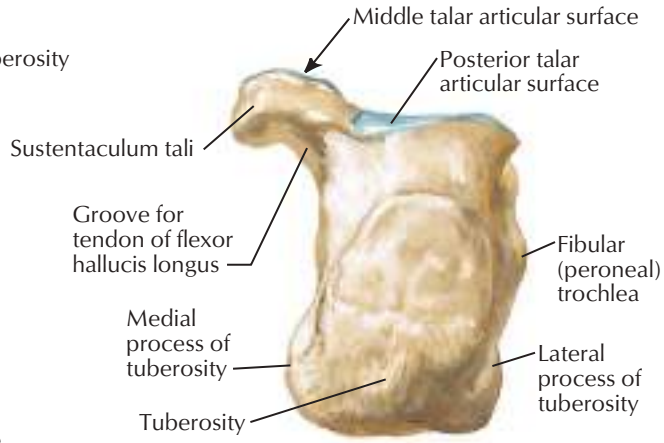


Lateral view

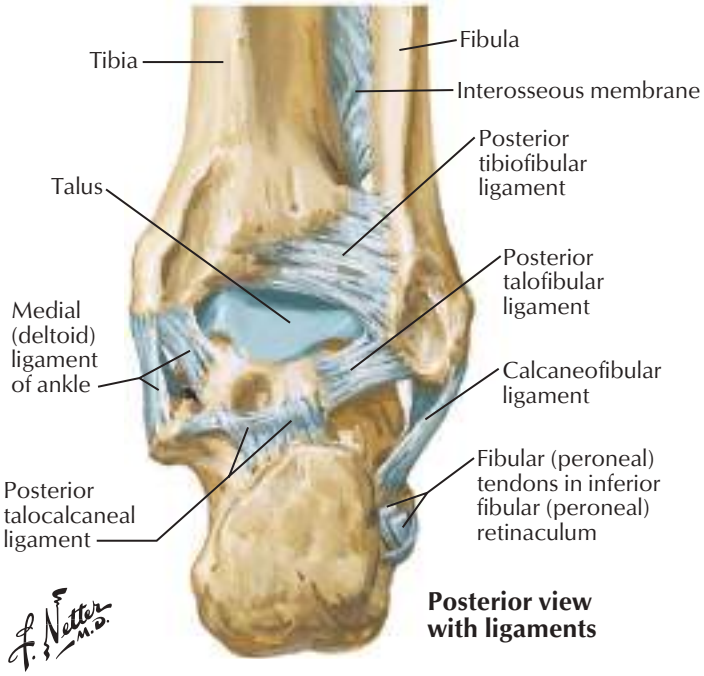
Superior view



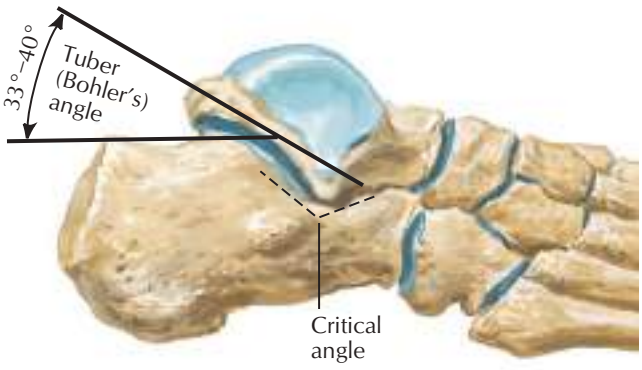
Medial view



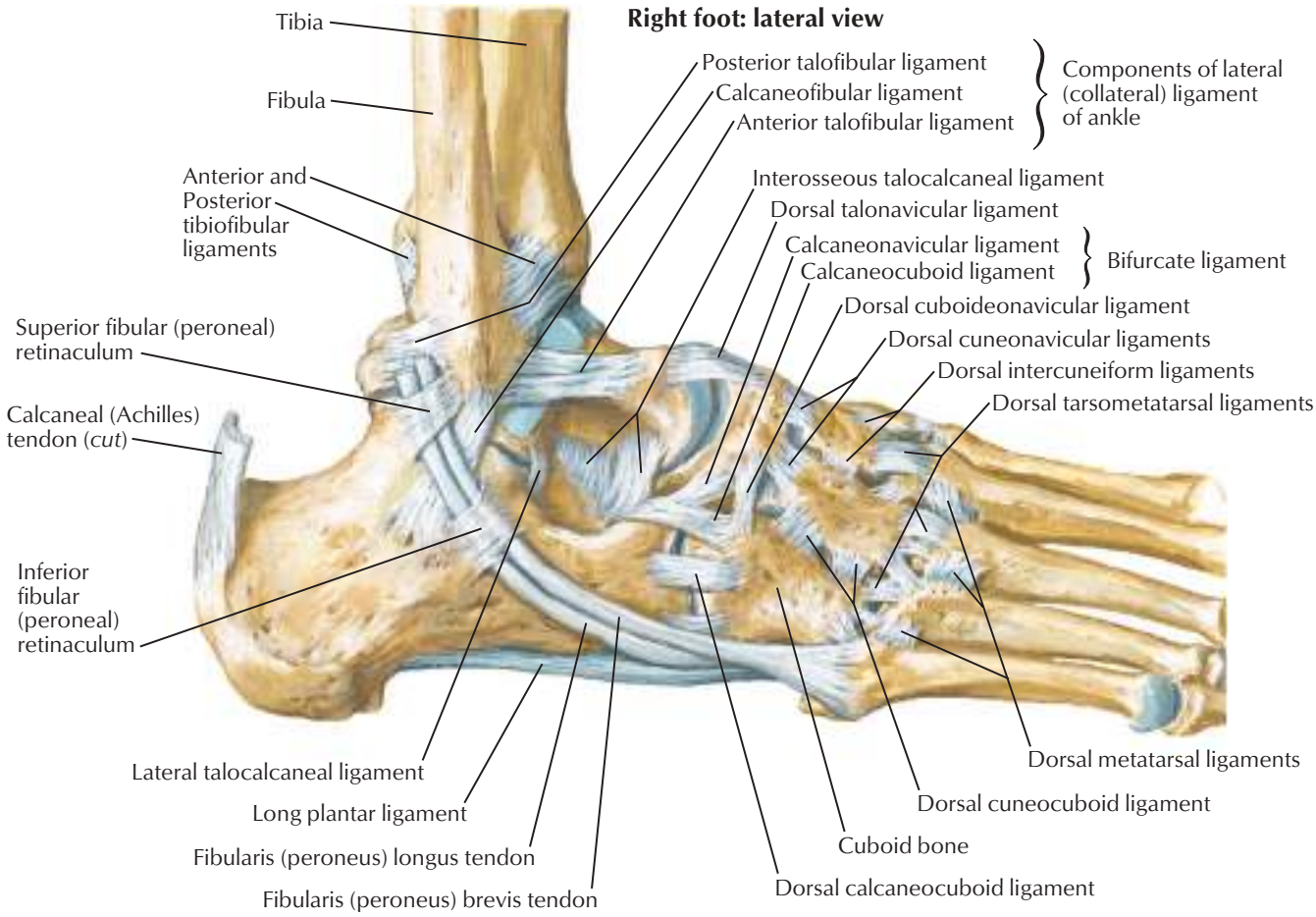
Posterior view

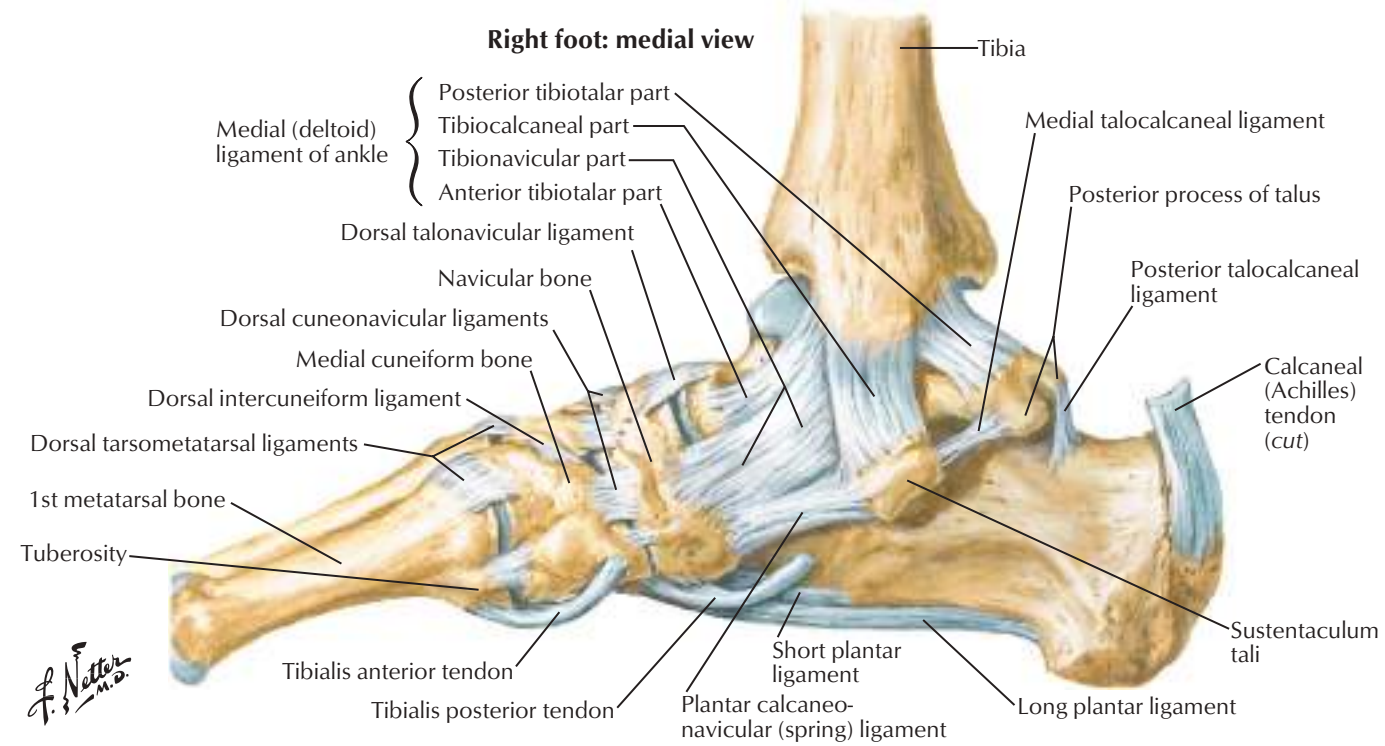


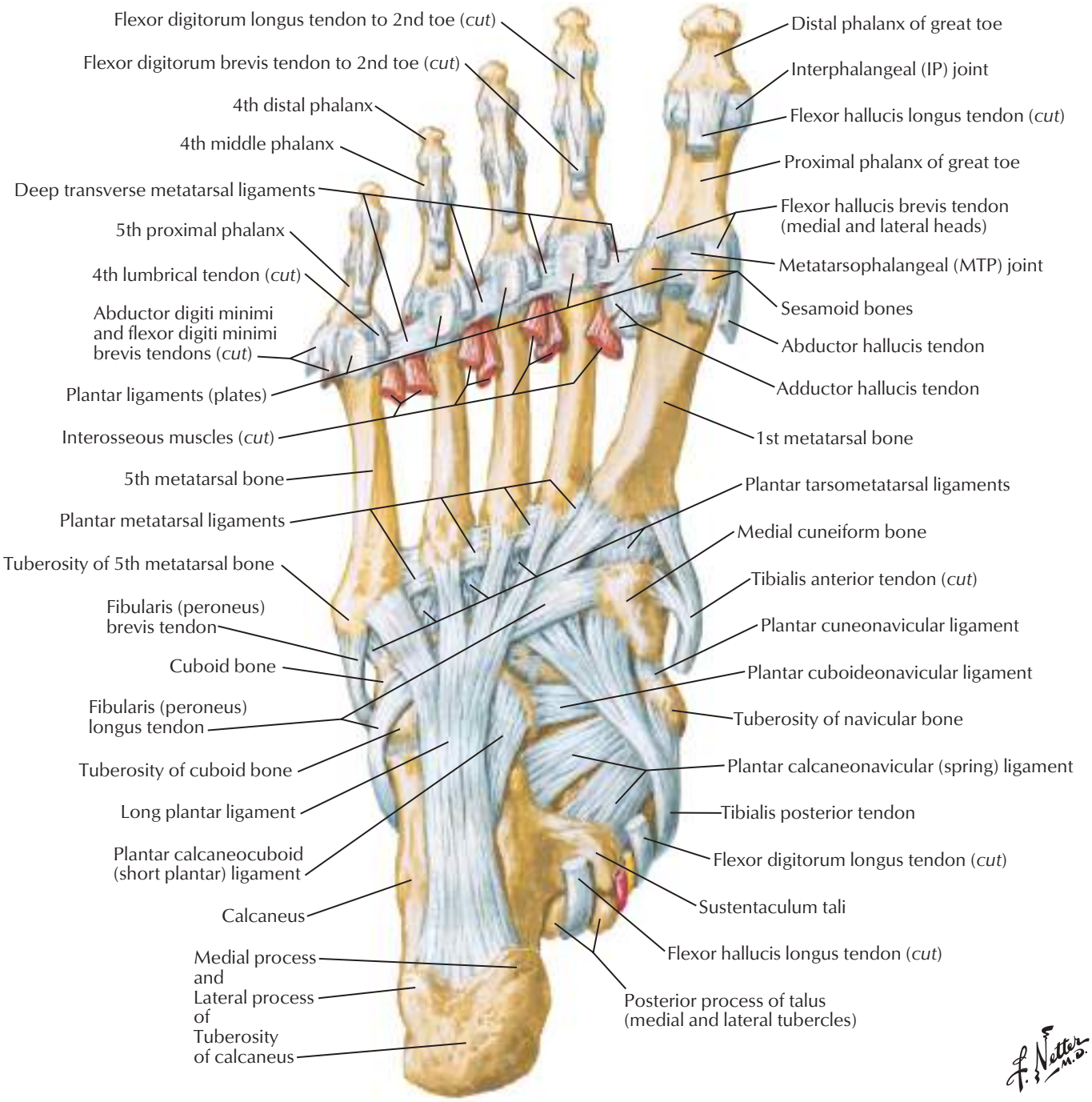
Posterior view with ligaments

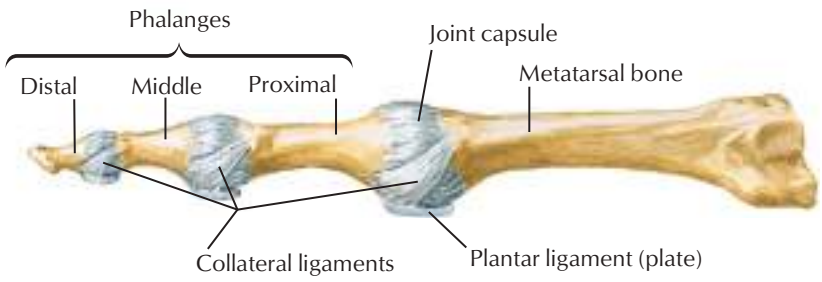


Functional relations of calcaneus

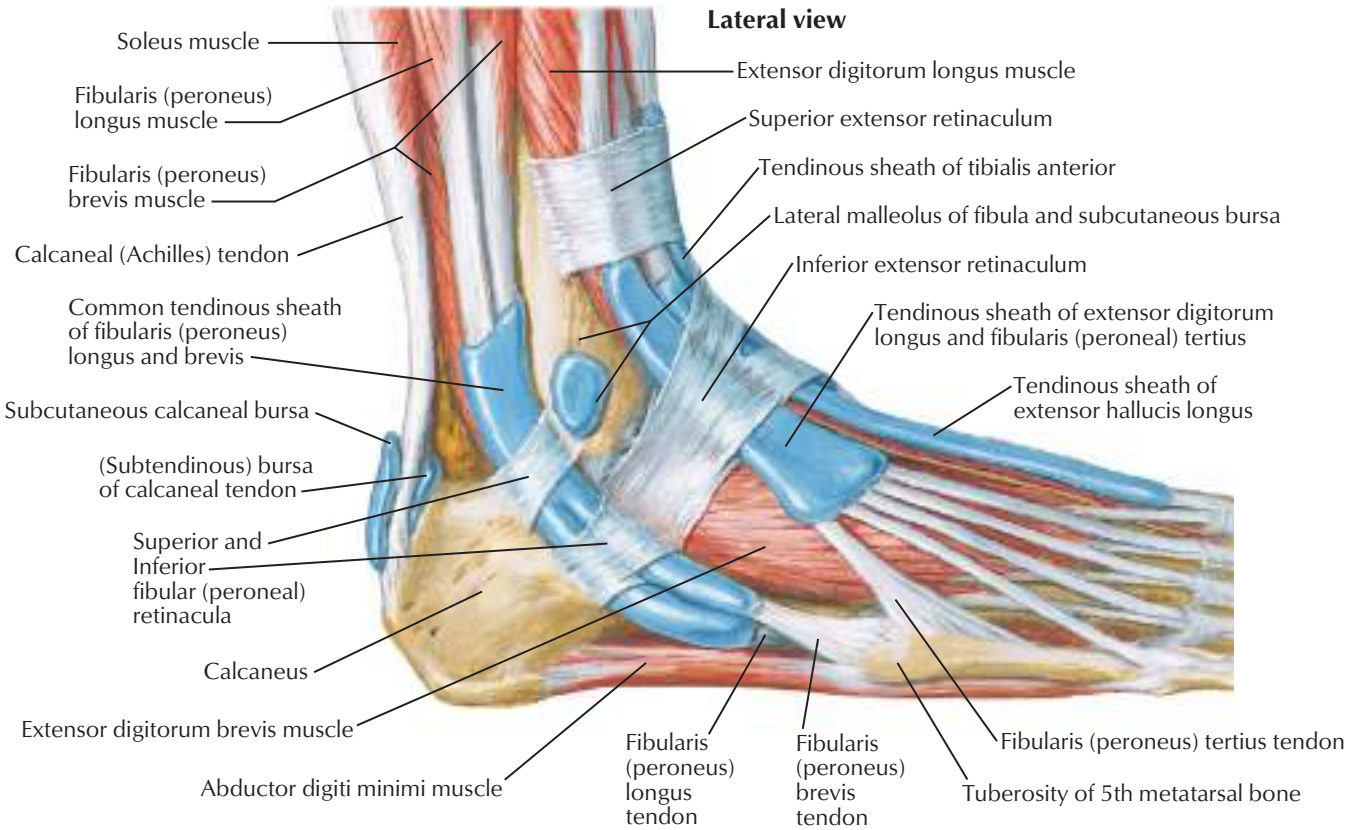

Right foot: lateral view
Tibia
Fibula
Anterior and Posterior tibiofibular ligaments
Superior fibular (peroneal) retinaculum
Calcaneal (Achilles) tendon (cut)
Inferior fibular (peroneal) retinaculum
Lateral talocalcaneal ligament
Long plantar ligament
Fibularis (peroneus) longus tendon
Fibularis (peroneus) brevis tendon
Posterior talofibular ligament
Calcaneofibular ligament
Anterior talofibular ligament
Components of lateral (collateral) ligament of ankle
Interosseous talocalcaneal ligament
Dorsal talonavicular ligament
Calcaneonavicular ligament
Calcaneocuboid ligament
Bifurcate ligament
Dorsal cuboideonavicular ligament
Dorsal cuneonavicular ligaments
Dorsal intercuneiform ligaments
Dorsal tarsometatarsal ligaments
Dorsal metatarsal ligaments
Dorsal cuneocuboid ligament
Cuboid bone
Dorsal calcaneocuboid ligament

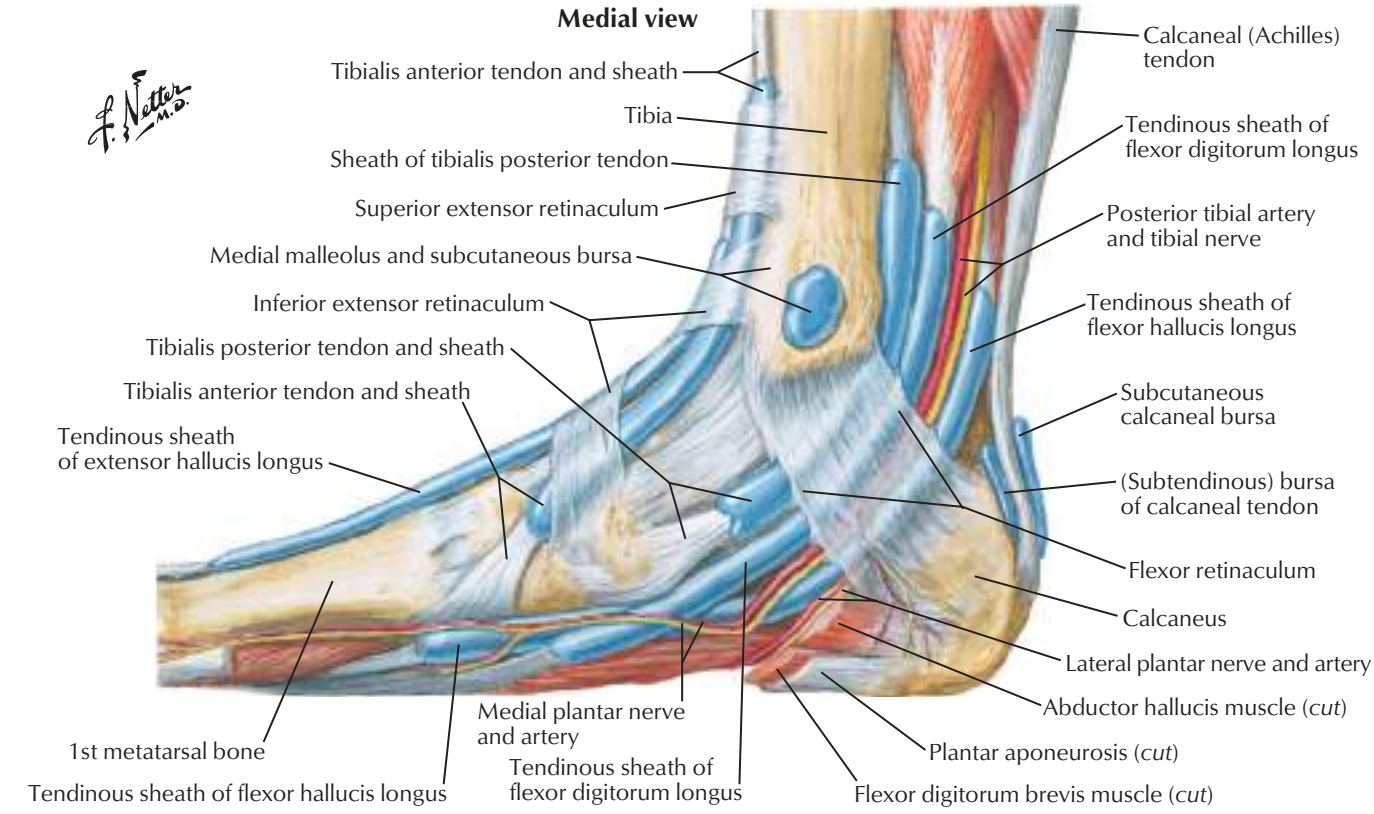

Right foot: medial view
Tibia
Medial (deltoid) ligament of ankle
Posterior tibiotalar part
Tibiocalcaneal part
Tibionavicular part
Anterior tibiotalar part
Medial talocalcaneal ligament
Posterior process of talus
Dorsal talonavicular ligament
Navicular bone
Posterior talocalcaneal ligament
Dorsal cuneonavicular ligaments
Medial cuneiform bone
Calcaneal (Achilles) tendon (cut)
Dorsal intercuneiform ligament
Dorsal tarsometatarsal ligaments
1st metatarsal bone
Tuberosity
Sustentaculum tali
Short plantar ligament
Tibialis anterior tendon
Tibialis posterior tendon
Plantar calcaneo-navicular (spring) ligament
Long plantar ligament





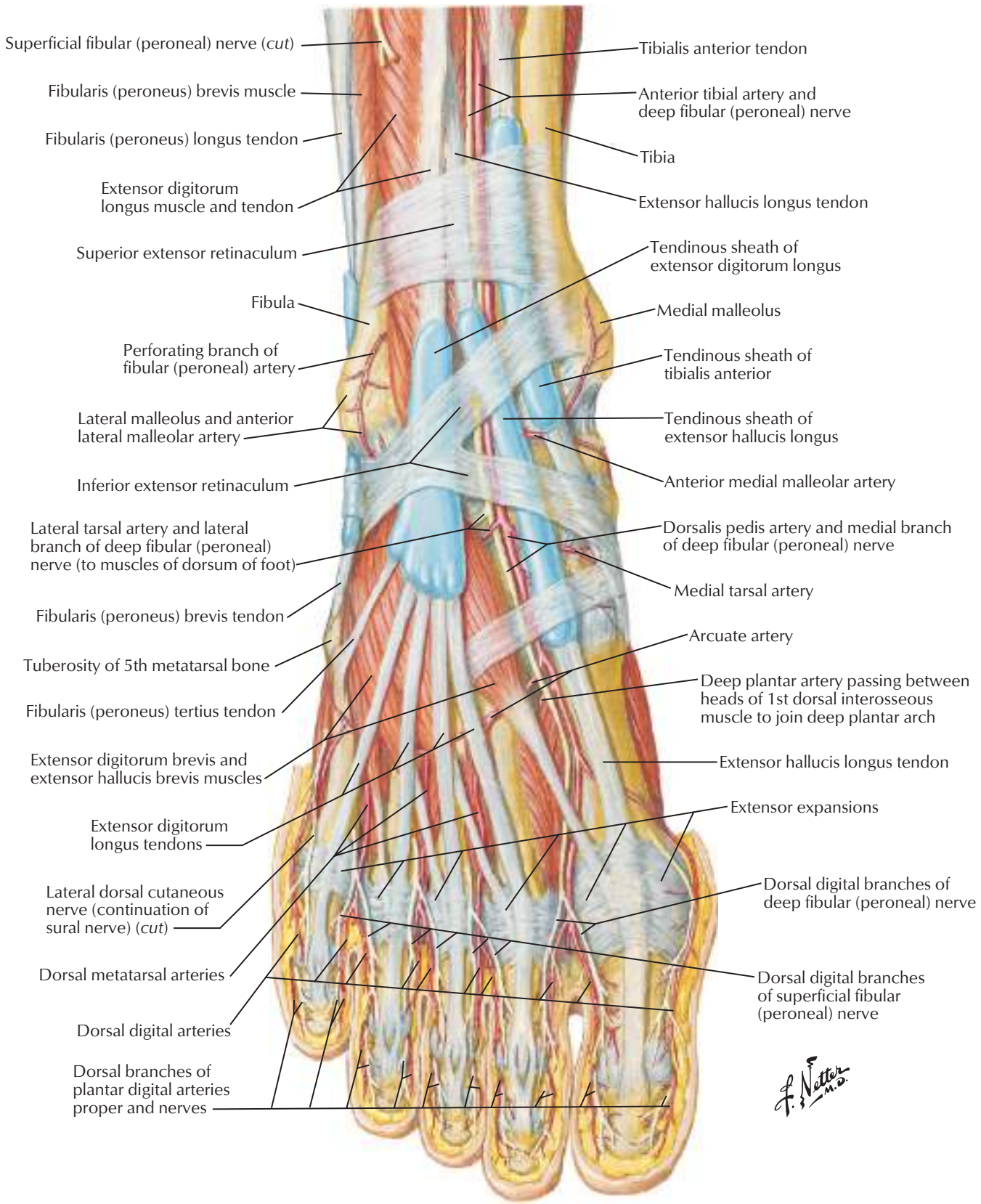
Capsules and ligaments of metatarsophalangeal and interphalangeal joints: lateral view

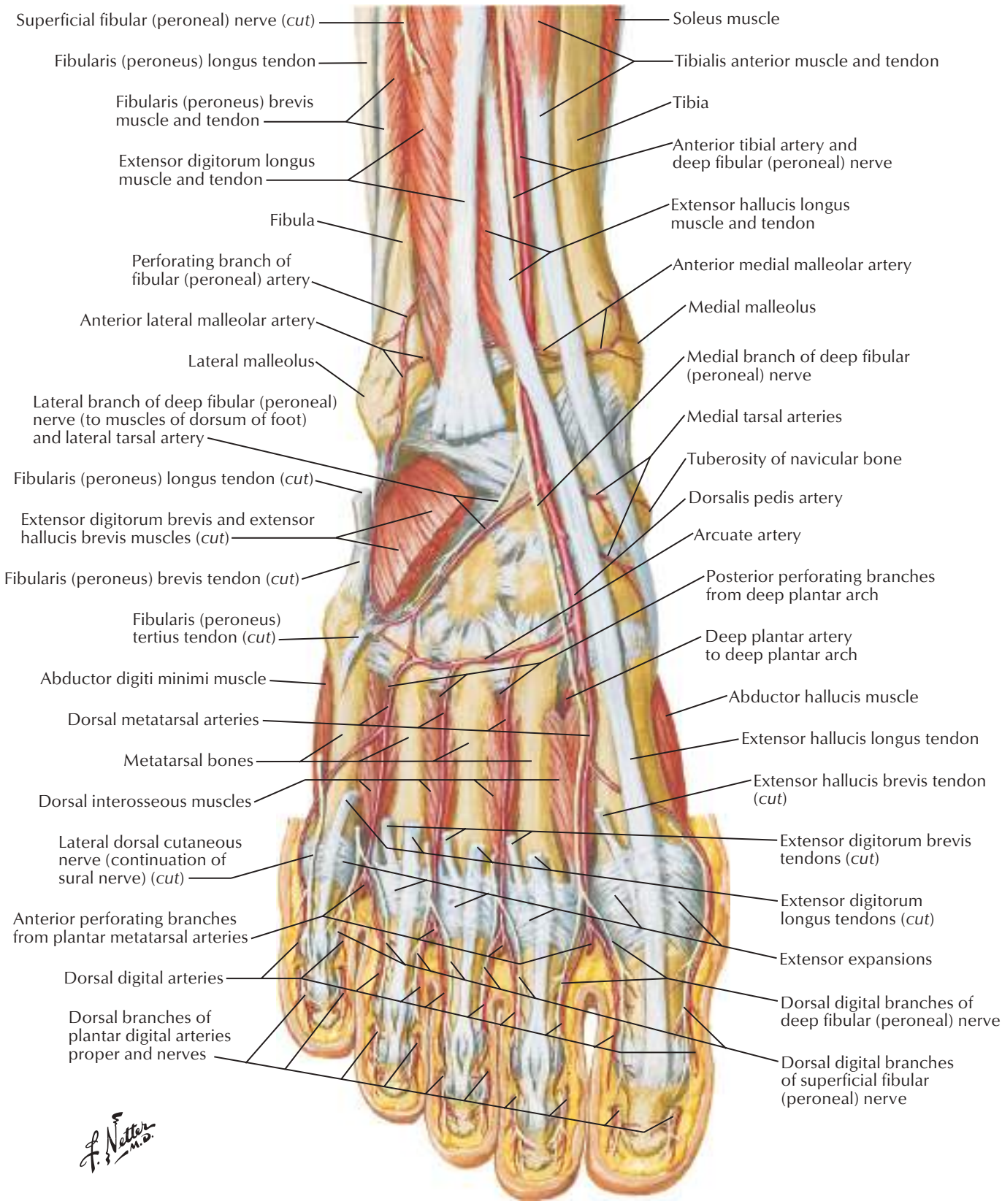

Lateral view
Soleus muscle
Fibularis (peroneus) longus muscle
Fibularis (peroneus) brevis muscle
Calcaneal (Achilles) tendon
Common tendinous sheath of fibularis (peroneus) longus and brevis
Subcutaneous calcaneal bursa
(Subtendinous) bursa of calcaneal tendon
Superior and Inferior fibular (peroneal) retinacula
Calcaneus
Extensor digitorum brevis muscle
Abductor digiti minimi muscle
Extensor digitorum longus muscle
Superior extensor retinaculum
Tendinous sheath of tibialis anterior
Lateral malleolus of fibula and subcutaneous bursa
Inferior extensor retinaculum
Tendinous sheath of extensor digitorum longus and fibularis (peroneal) tertius
Tendinous sheath of extensor hallucis longus
Fibularis (peroneus) longus tendon
Fibularis (peroneus) brevis tendon
Fibularis (peroneus) tertius tendon
Tuberosity of 5th metatarsal bone

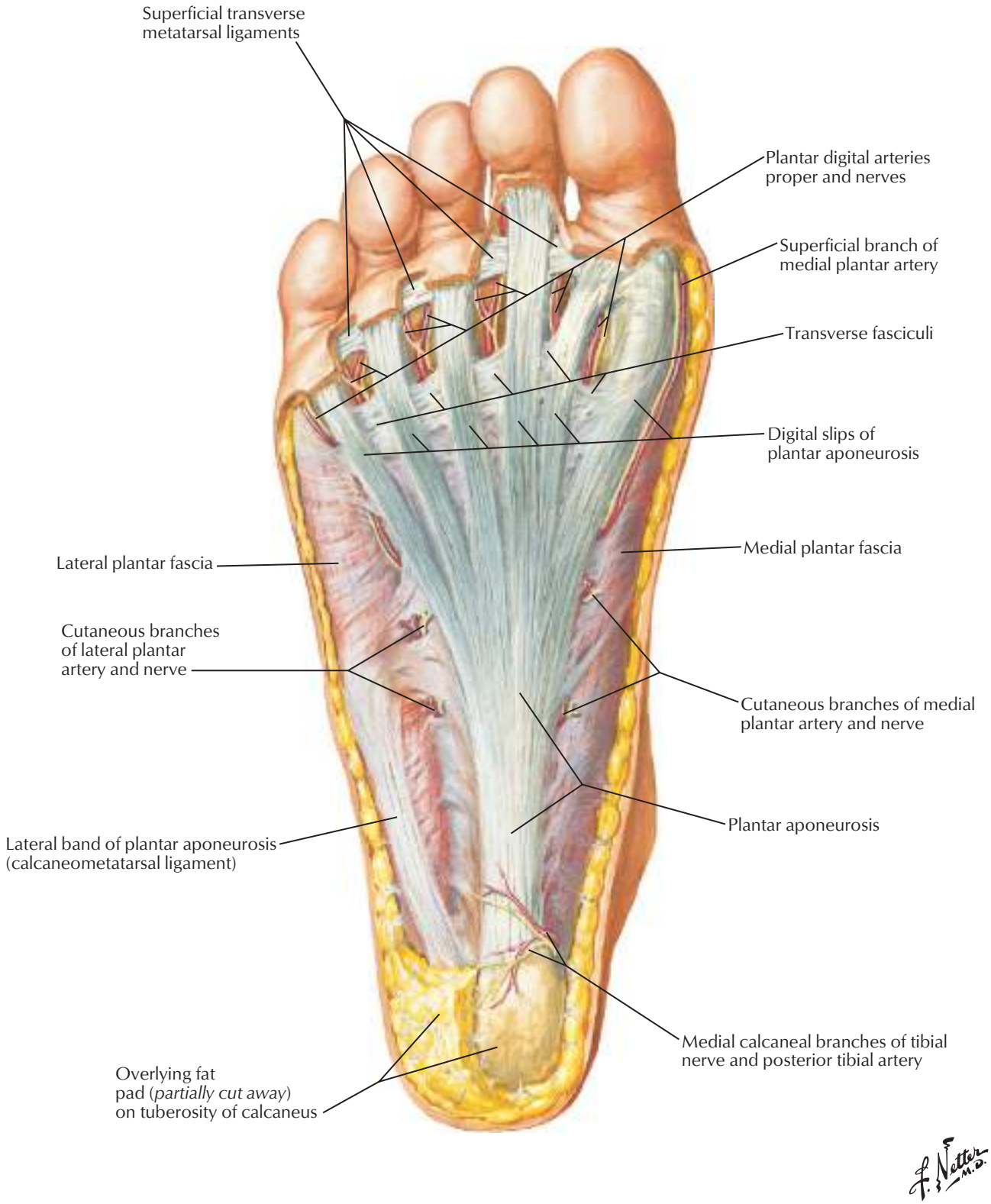

Medial view
Tibialis anterior tendon and sheath
Tibia
Sheath of tibialis posterior tendon
Superior extensor retinaculum
Medial malleolus and subcutaneous bursa
Inferior extensor retinaculum
Tibialis posterior tendon and sheath
Tibialis anterior tendon and sheath
Tendinous sheath of extensor hallucis longus
1st metatarsal bone
Tendinous sheath of flexor hallucis longus
Medial plantar nerve and artery
Tendinous sheath of flexor digitorum longus
Calcaneal (Achilles) tendon
Tendinous sheath of flexor digitorum longus
Posterior tibial artery and tibial nerve
Tendinous sheath of flexor hallucis longus
Subcutaneous calcaneal bursa
(Subtendinous) bursa of calcaneal tendon
Flexor retinaculum
Calcaneus
Lateral plantar nerve and artery
Abductor hallucis muscle (cut)
Plantar aponeurosis (cut)
Flexor digitorum brevis muscle (cut)

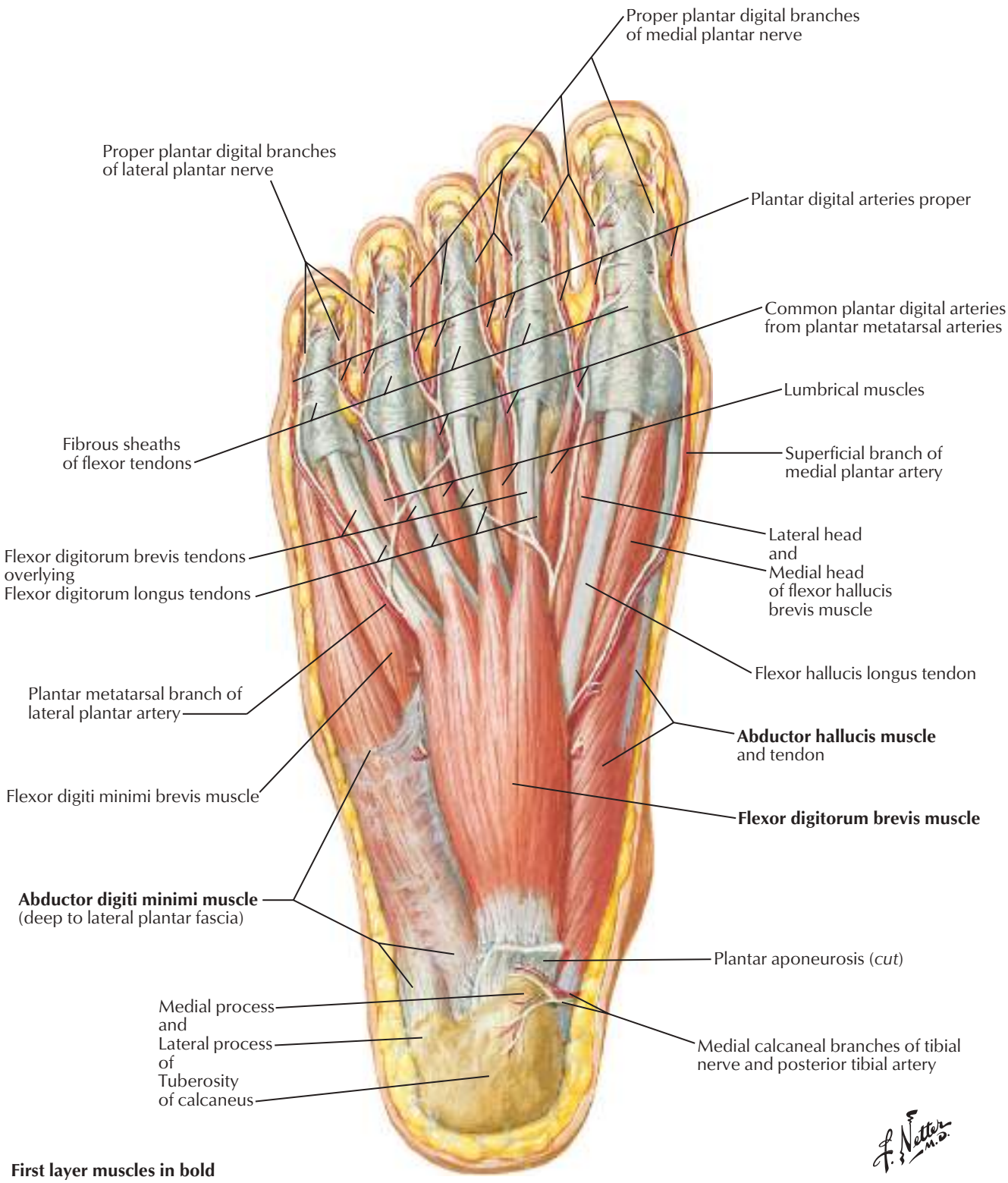
Muscles of Dorsum of Foot: Superficial Dissection

See also Plate 529




Superficial fibular (peroneal) nerve (*cut*)
Fibularis (peroneus) longus tendon
Fibularis (peroneus) brevis muscle and tendon
Extensor digitorum longus muscle and tendon
Fibula
Perforating branch of fibular (peroneal) artery
Anterior lateral malleolar artery
Lateral malleolus
Lateral branch of deep fibular (peroneal) nerve (to muscles of dorsum of foot) and lateral tarsal artery
Fibularis (peroneus) longus tendon (*cut*)
Extensor digitorum brevis and extensor hallucis brevis muscles (*cut*)
Fibularis (peroneus) brevis tendon (*cut*)
Fibularis (peroneus) tertius tendon (*cut*)
Abductor digiti minimi muscle
Dorsal metatarsal arteries
Metatarsal bones
Dorsal interosseous muscles
Lateral dorsal cutaneous nerve (continuation of sural nerve) (*cut*)
Anterior perforating branches from plantar metatarsal arteries
Dorsal digital arteries
Dorsal branches of plantar digital arteries proper and nerves
Soleus muscle
Tibialis anterior muscle and tendon
Tibia
Anterior tibial artery and deep fibular (peroneal) nerve
Extensor hallucis longus muscle and tendon
Anterior medial malleolar artery
Medial malleolus
Medial branch of deep fibular (peroneal) nerve
Medial tarsal arteries
Tuberosity of navicular bone
Dorsalis pedis artery
Arcuate artery
Posterior perforating branches from deep plantar arch
Deep plantar artery to deep plantar arch
Abductor hallucis muscle
Extensor hallucis longus tendon
Extensor hallucis brevis tendon (*cut*)
Extensor digitorum brevis tendons (*cut*)
Extensor digitorum longus tendons (*cut*)
Extensor expansions
Dorsal digital branches of deep fibular (peroneal) nerve
Dorsal digital branches of superficial fibular (peroneal) nerve

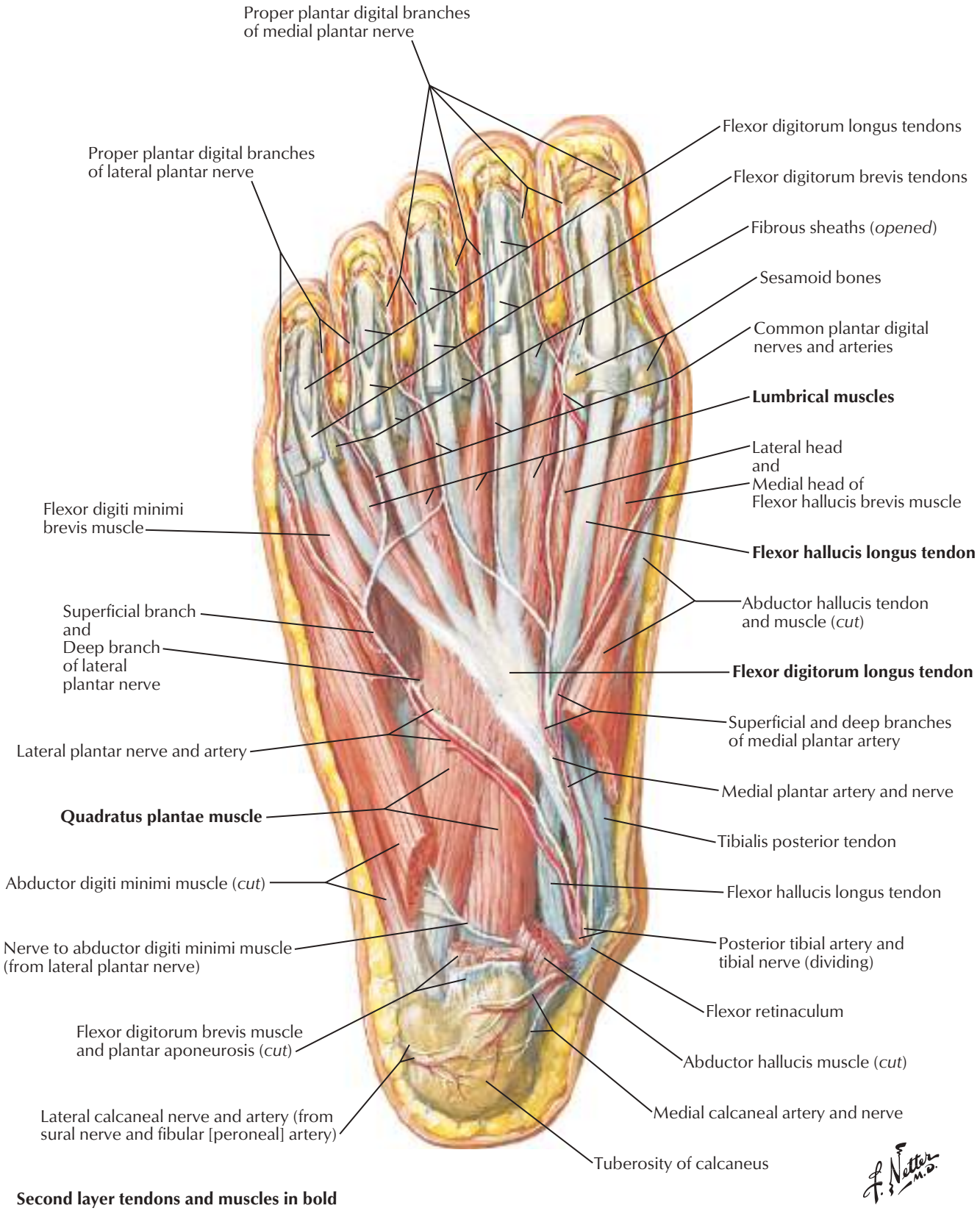

Superficial transverse metatarsal ligaments
Plantar digital arteries proper and nerves
Superficial branch of medial plantar artery
Transverse fasciculi
Digital slips of plantar aponeurosis
Lateral plantar fascia
Medial plantar fascia
Cutaneous branches of lateral plantar artery and nerve
Cutaneous branches of medial plantar artery and nerve
Plantar aponeurosis
Lateral band of plantar aponeurosis (calcaneometatarsal ligament)
Medial calcaneal branches of tibial nerve and posterior tibial artery
Overlying fat pad (*partially cut away*) on tuberosity of calcaneus



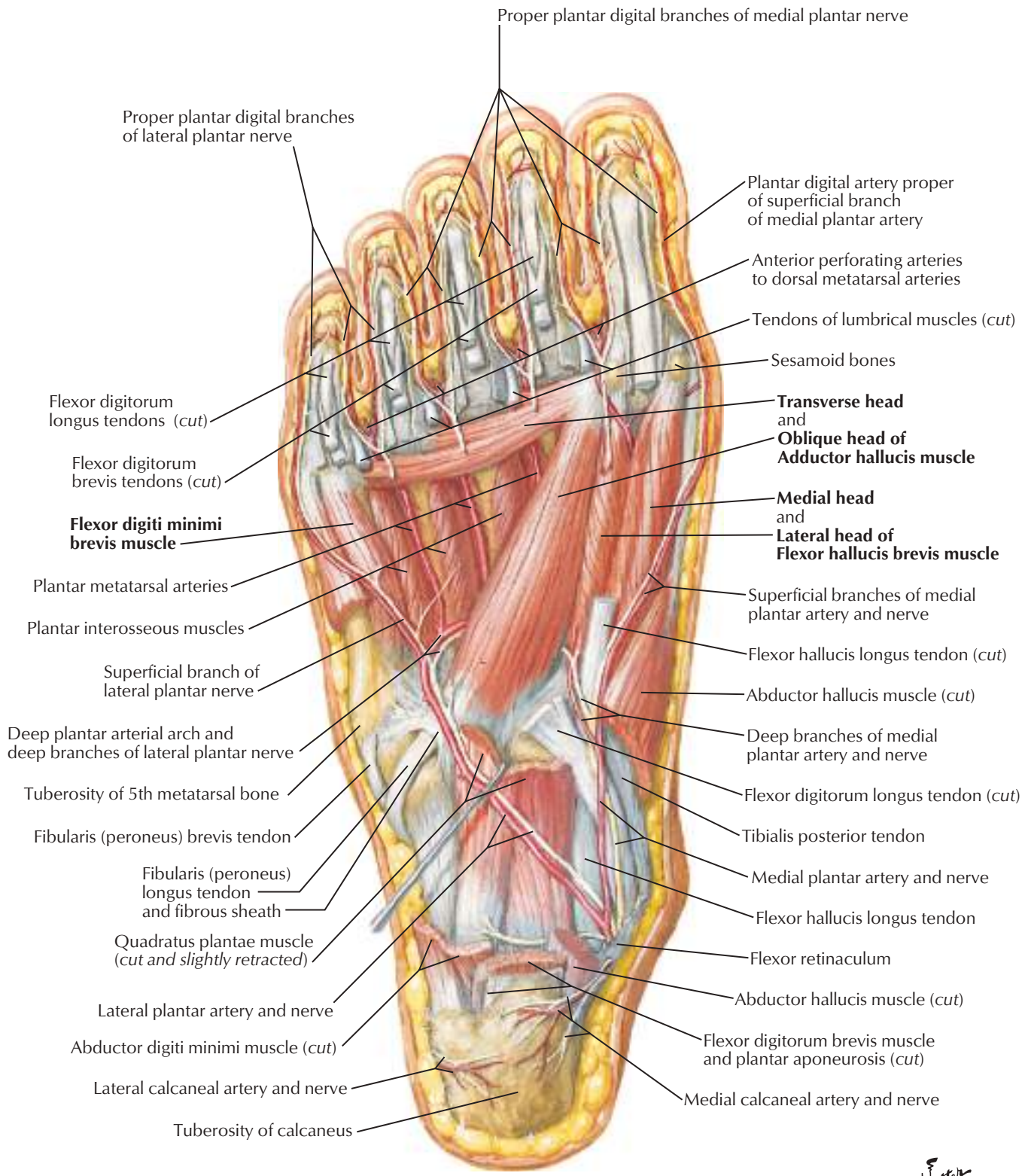
First layer muscles in bold

Muscles of Sole of Foot: Second Layer

See also Plate 528



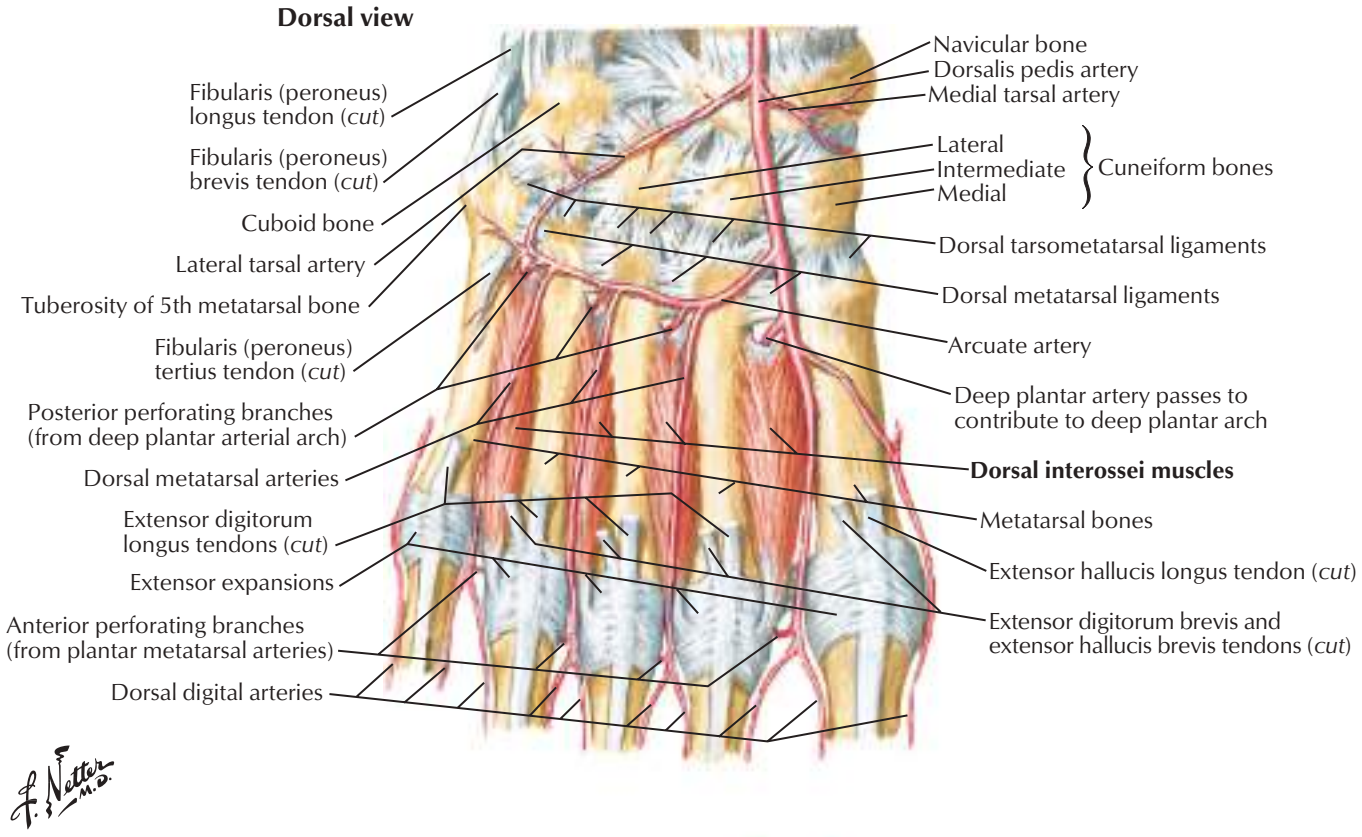
Second layer tendons and muscles in bold

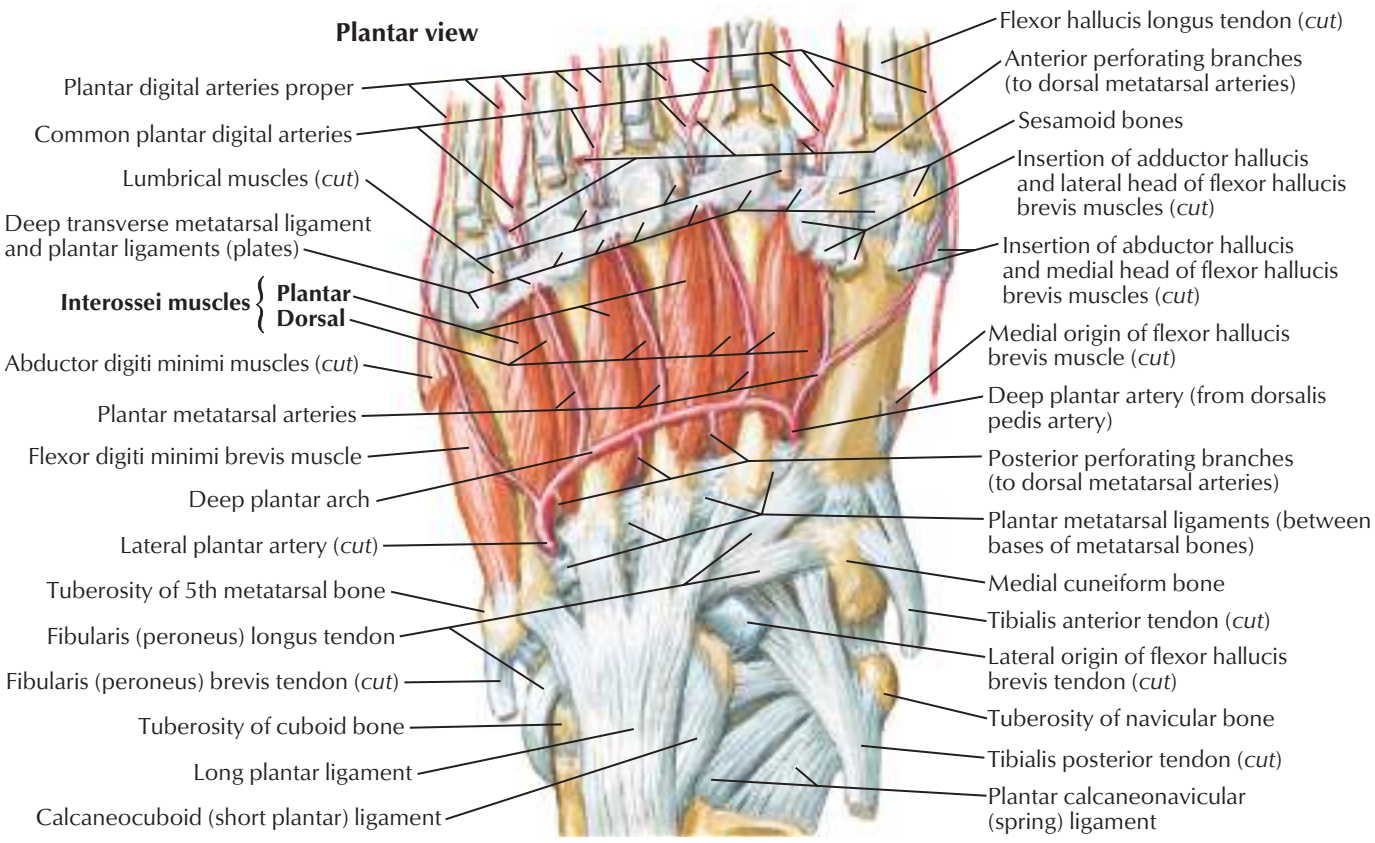


Third layer muscles in bold

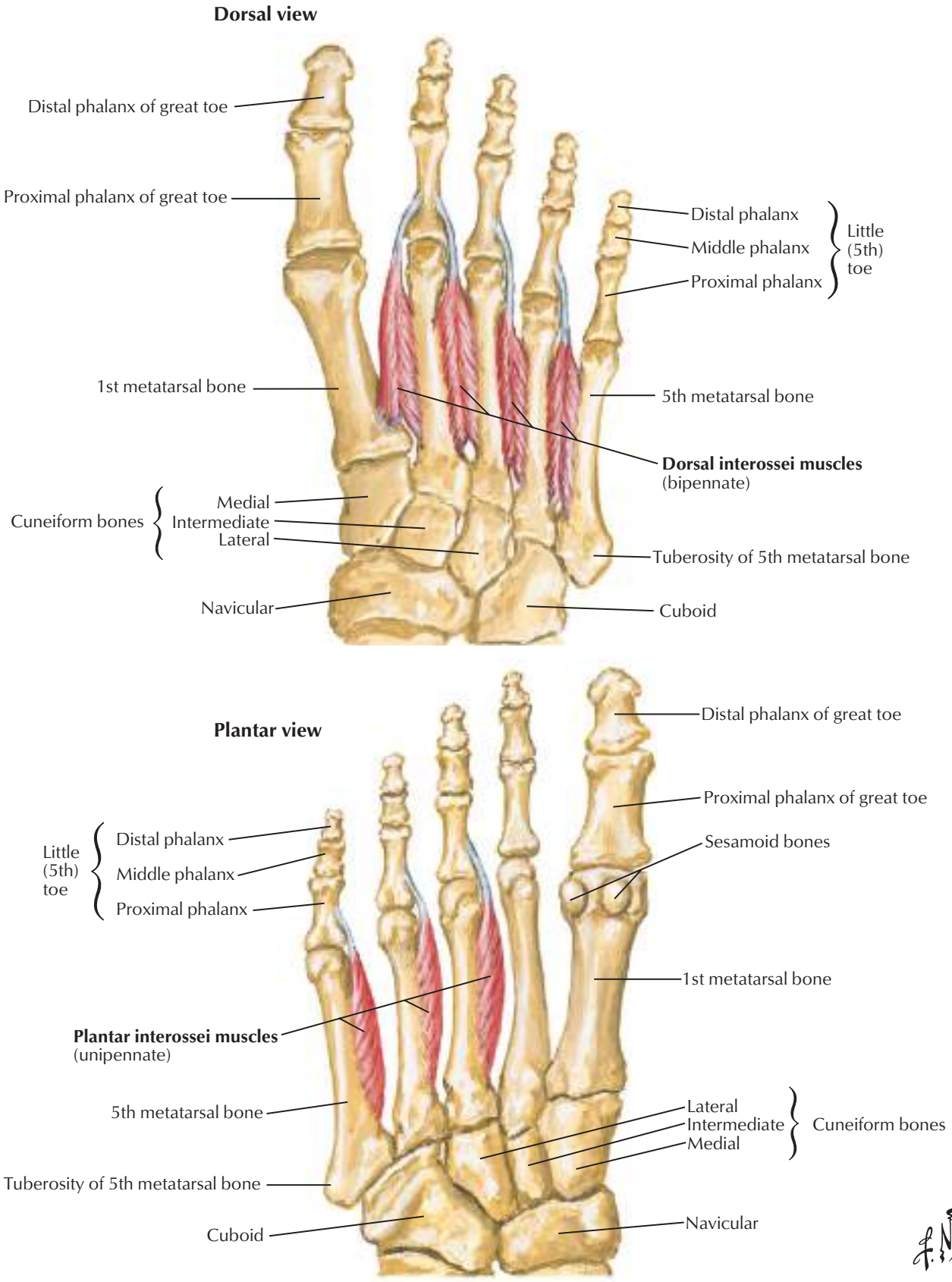
Interosseous Muscles and Deep Arteries of Foot

See also Plates 508, 518



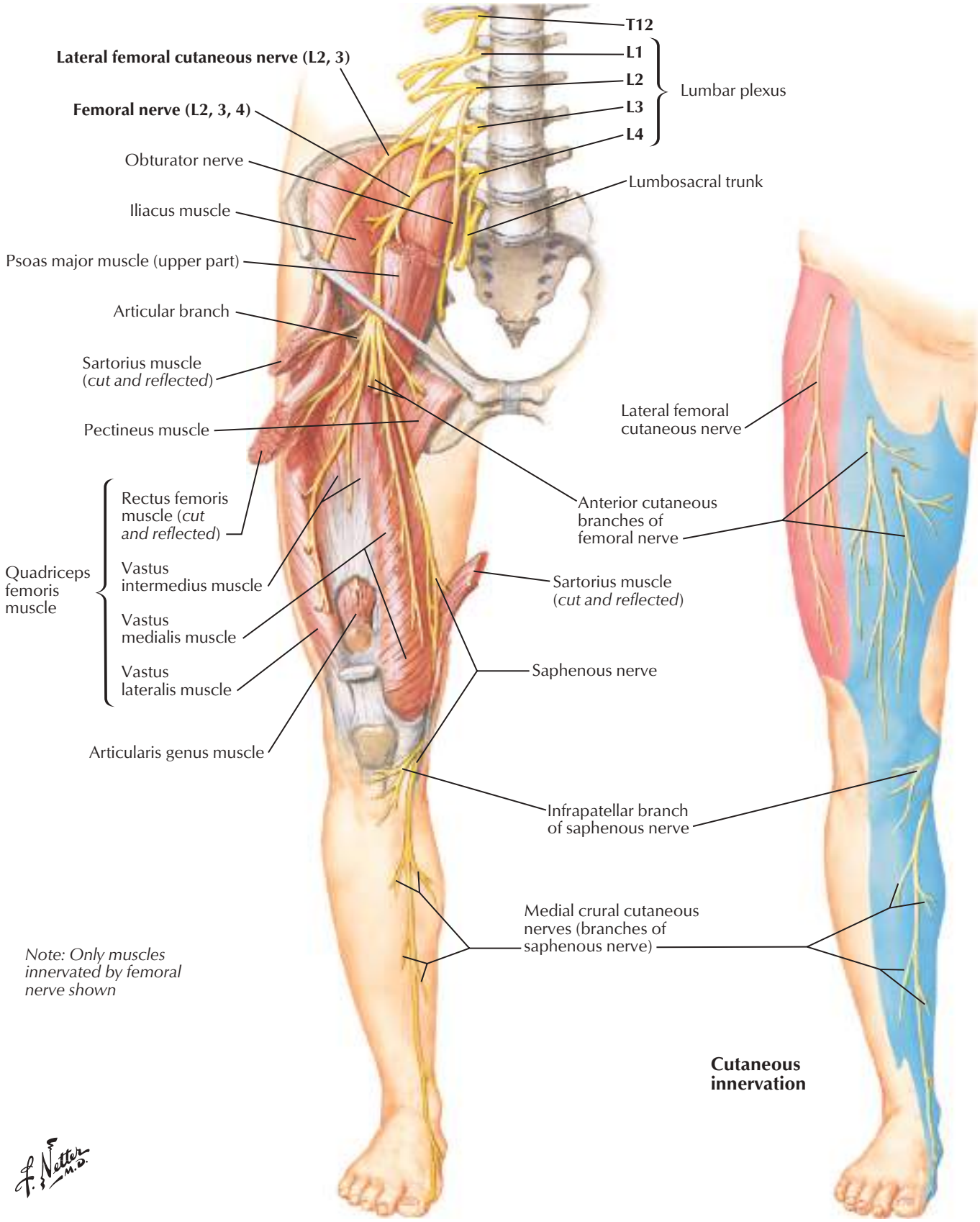


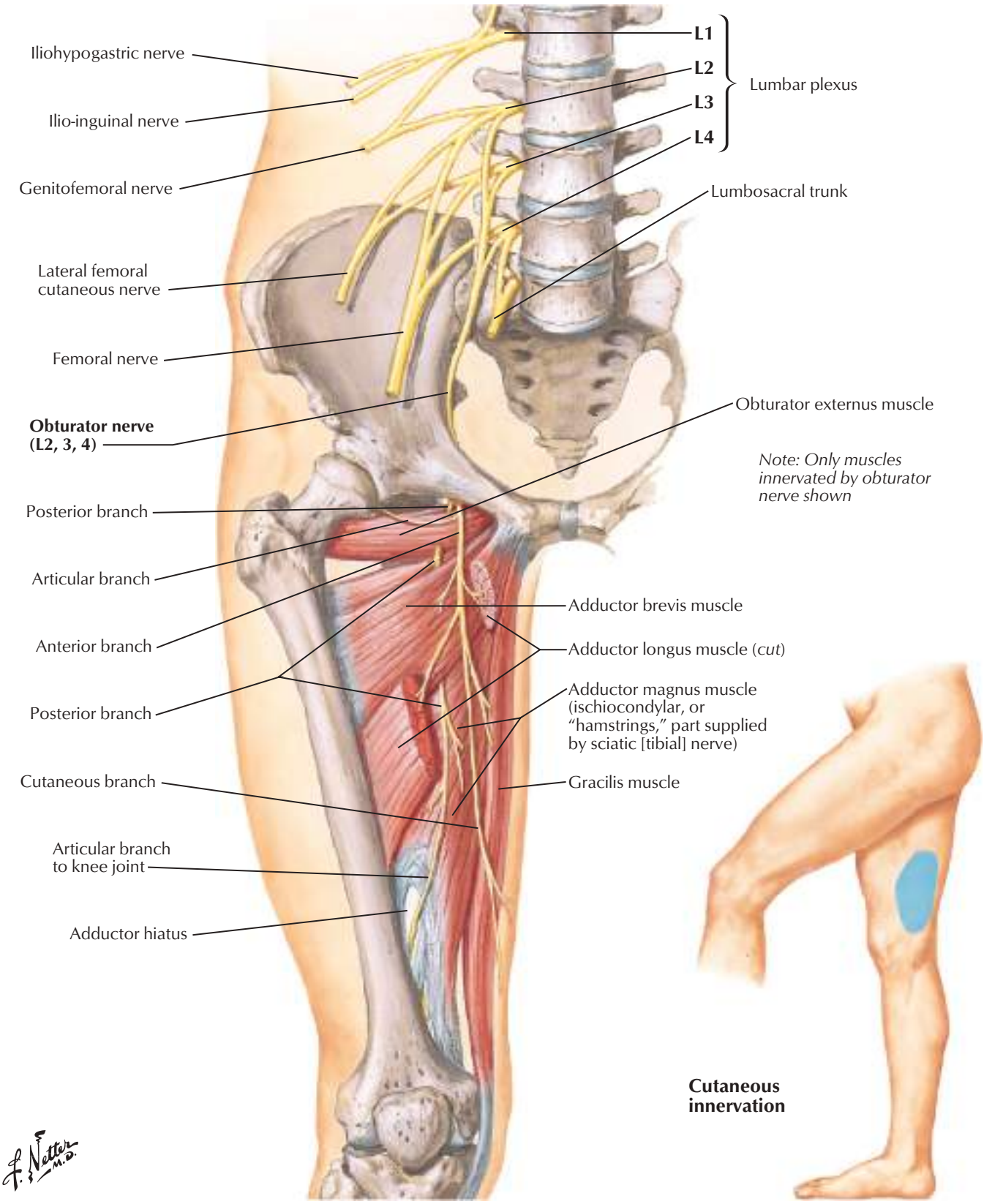
Fourth layer muscles in bold


Dorsal view
Distal phalanx of great toe
Proximal phalanx of great toe
Distal phalanx
Middle phalanx
Proximal phalanx
Little (5th) toe
1st metatarsal bone
5th metatarsal bone
Dorsal interossei muscles (bipennate)
Cuneiform bones
Medial
Intermediate
Lateral
Tuberosity of 5th metatarsal bone
Navicular
Cuboid
Plantar view
Distal phalanx of great toe
Proximal phalanx of great toe
Sesamoid bones
Little (5th) toe
Distal phalanx
Middle phalanx
Proximal phalanx
1st metatarsal bone
Plantar interossei muscles (unipennate)
5th metatarsal bone
Lateral
Intermediate
Medial
Cuneiform bones
Tuberosity of 5th metatarsal bone
Cuboid
Navicular

Femoral Nerve and Lateral Cutaneous Nerve of Thigh

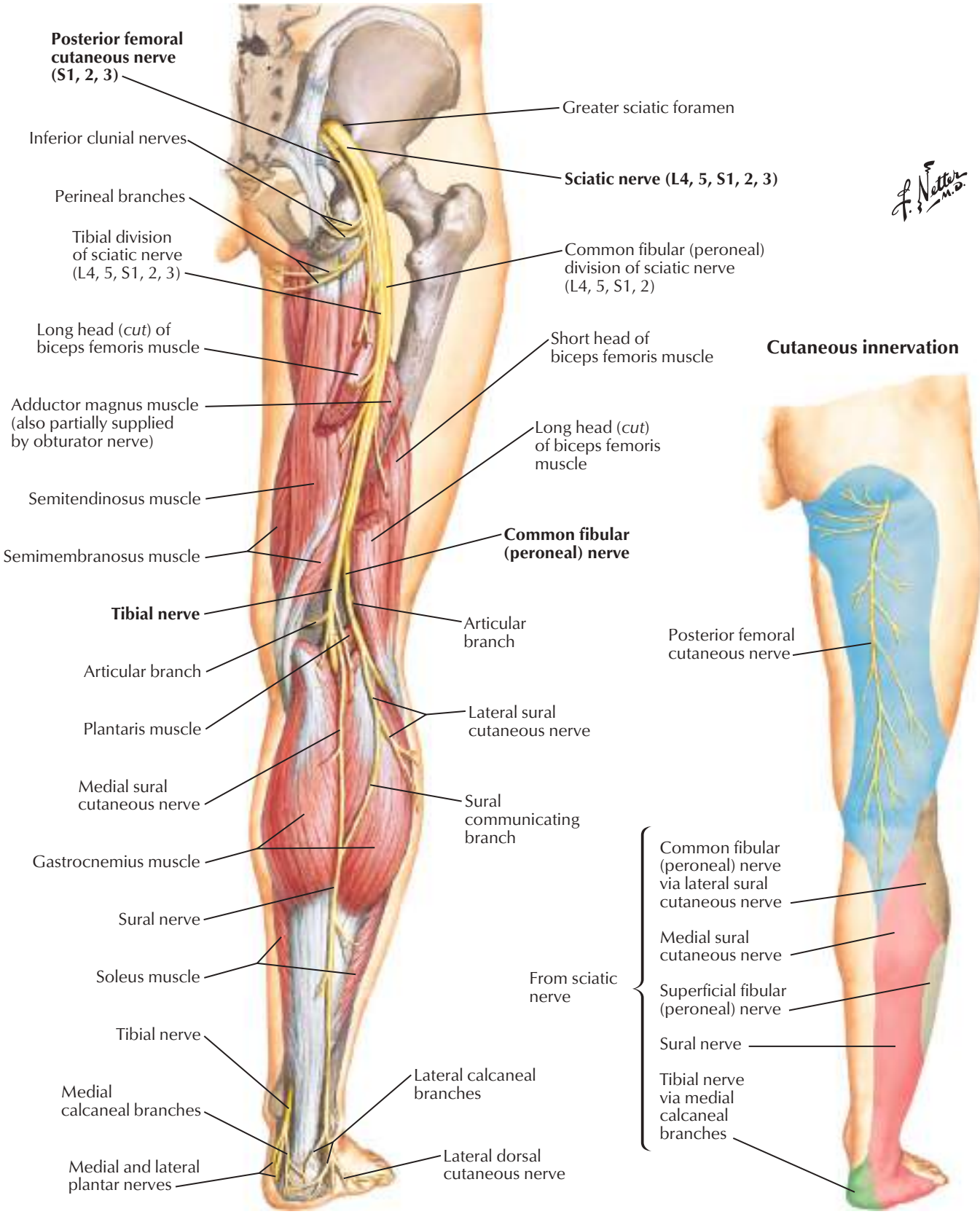
See also Plates 262, 487, 488

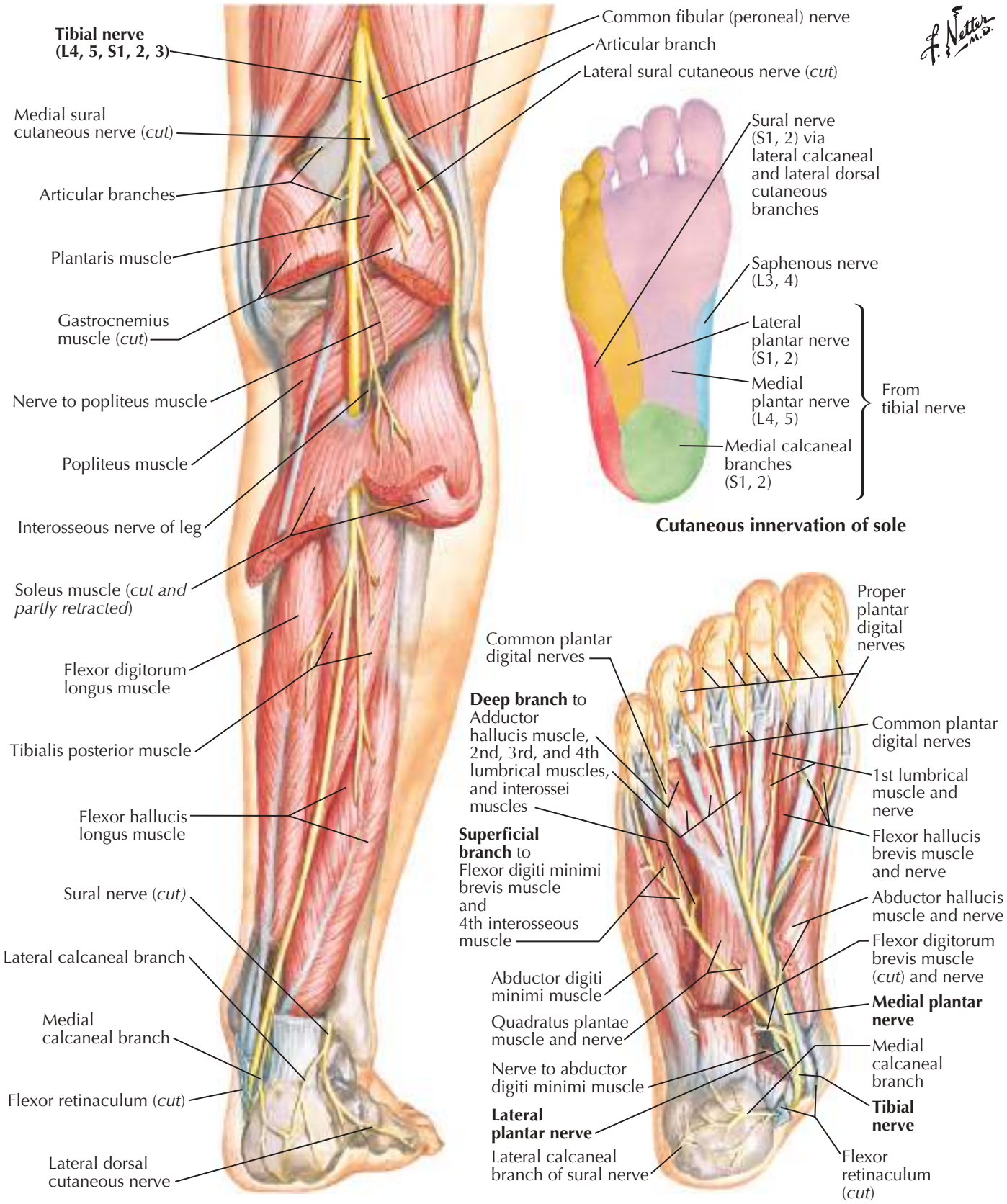



Iliohypogastric nerve
Ilio-inguinal nerve
Genitofemoral nerve
Lateral femoral cutaneous nerve
Femoral nerve
Obturator nerve (L2, 3, 4)
Posterior branch
Articular branch
Anterior branch
Posterior branch
Cutaneous branch
Articular branch to knee joint
Adductor hiatus
L1
L2
L3
L4
Lumbar plexus
Lumbosacral trunk
Obturator externus muscle
Note: Only muscles innervated by obturator nerve shown
Adductor brevis muscle
Adductor longus muscle (cut)
Adductor magnus muscle (ischiocondylar, or "hamstrings," part supplied by sciatic [tibial] nerve)
Gracilis muscle
Cutaneous innervation

Sciatic Nerve and Posterior Cutaneous Nerve of Thigh

See also Plate 489

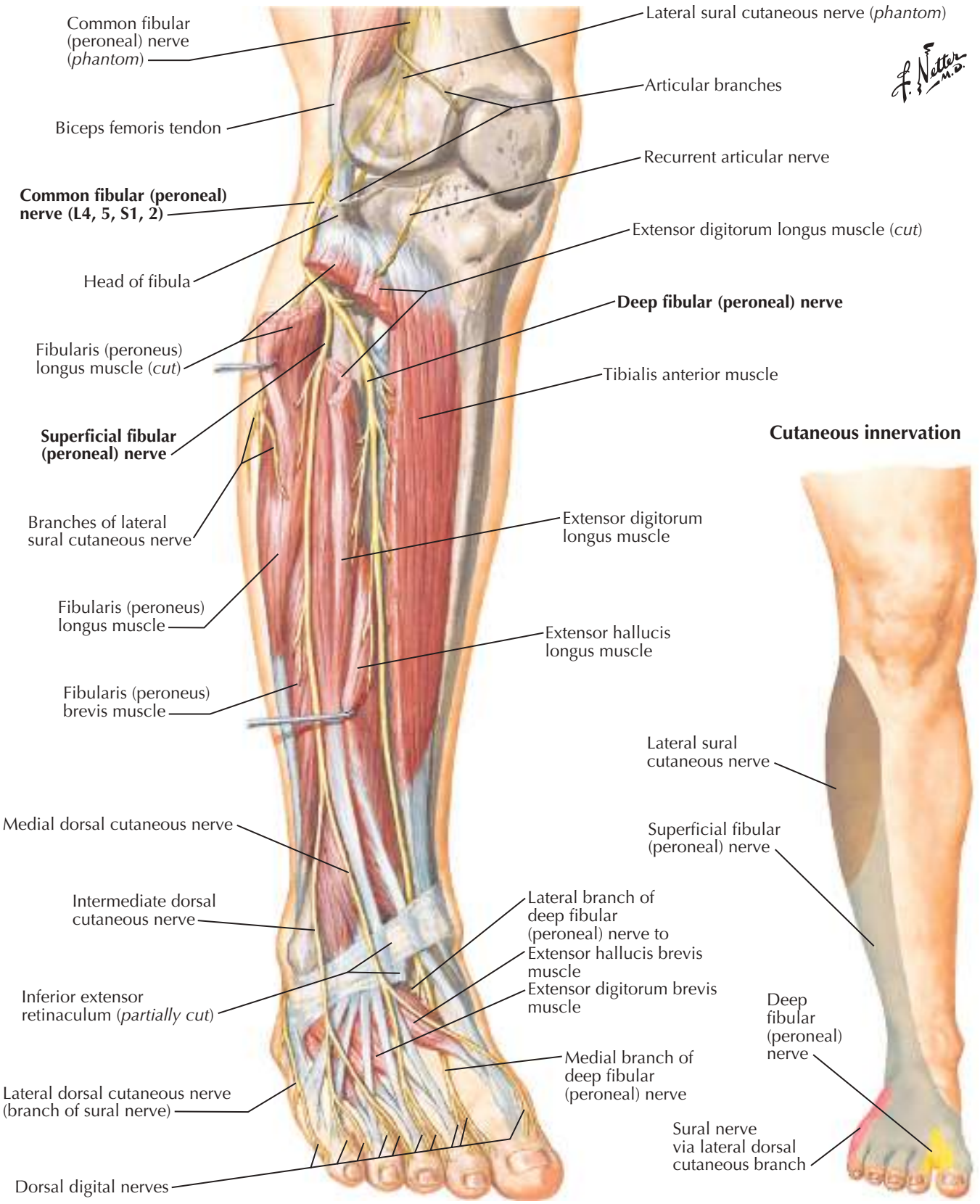




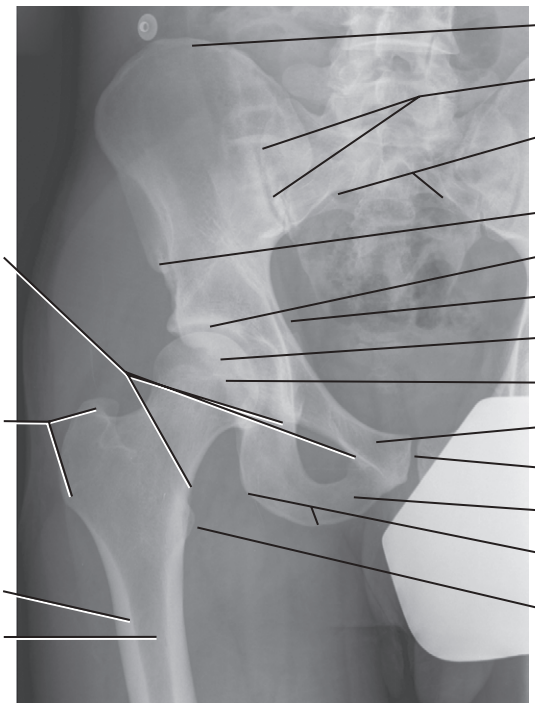
Note: Articular branches not shown

Common Fibular (Peroneal) Nerve

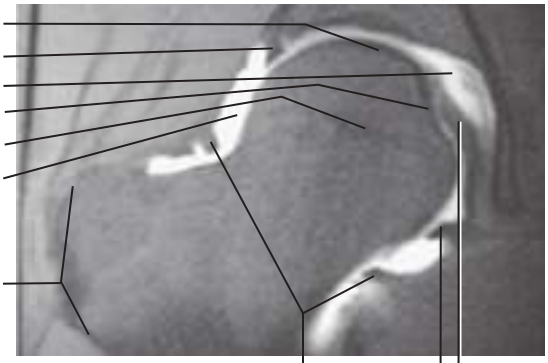
See also Plates 506, 508, 516



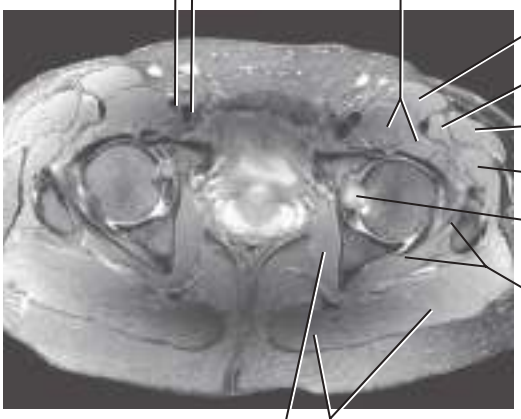
Radiograph



Arthrogram of hip



MRI



Ankle: Radiographs

See also Plates 506, 513, 514

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Abductor digiti minimi	Medial and lateral tubercles of tuberosity of calcaneus, plantar aponeurosis, and intermuscular septum	Lateral side of base of proximal phalanx of 5th digit	Lateral plantar nerve	Abducts and flexes 5th digit	Medial-lateral plantar artery, plantar metatarsal and plantar digital arteries to 5th digit	Foot
Abductor hallucis	Medial tubercle of tuberosity of calcaneus, flexor retinaculum, and plantar aponeurosis	Medial side of base of proximal phalanx of 1st digit	Medial plantar nerve	Abducts and flexes 1st digit	Medial plantar and 1st plantar metatarsal arteries	Foot
Adductor brevis	Body and inferior pubic ramus	Pectineal line and proximal part of linea aspera of femur	Obturator nerve	Adducts thigh at hip, weak hip flexor	Profunda femoris, medial circumflex femoral, and obturator arteries	Medial thigh
Adductor hallucis	*Oblique head:* bases of 2nd through 4th metatarsals *Transverse head:* ligaments of metatarsophalangeal joints of digits 3-5	Tendons of both heads lateral to side of base of proximal phalanx of 1st digit	Deep branch of lateral plantar nerve	Adducts 1st digit, maintains transverse arch of foot	Medial and lateral plantar arteries and plantar arch, plantar metatarsal arteries	Foot
Adductor longus	Body of pubis inferior to pubic crest	Middle third of linea aspera of femur	Obturator nerve (anterior division)	Adducts thigh at hip	Profunda femoris and medial circumflex femoral arteries	Medial thigh
Adductor magnus	Inferior pubic ramus, ramus of ischium *Hamstring part*: sciatic nerve (tibial division)	Gluteal tuberosity, linea aspera, medial supracondylar line *Hamstring part:* adductor tubercle of femur	*Adductor part:* obturator nerve *Hamstring part:* sciatic nerve (tibial division)	*Adductor part:* adducts and flexes thigh *Hamstring part:* extends thigh	Femoral, profunda femoris, and obturator arteries	Medial thigh
Articularis genus	Distal femur on anterior surface	Suprapatellar bursa	Femoral nerve	Pulls suprapatellar bursa superiorly with extension of knee	Femoral artery	Anterior thigh
Biceps femoris	*Long head:* ischial tuberosity *Short head:* Linea aspera and lateral supracondylar line of femur	Lateral side of head of fibula	*Long head:* sciatic nerve (tibial division) (L5–S2) *Short head:* sciatic nerve (common fibular division)	Flexes and laterally rotates leg, extends thigh at hip	Perforating branches of profunda femoris, inferior gluteal, and medial circumflex femoral arteries	Posterior thigh
Dorsal interossei (four muscles)	Adjacent sides of 1st through 5th metatarsals	*1st:* medial side of proximal phalanx of 2nd digit *2nd through 4th*: lateral sides of digits 2–4	Lateral plantar nerve	Abduct 2nd through 4th toes, flex metatarsophalangeal joints, and extend phalanges	Arcuate artery, dorsal and plantar metatarsal arteries	Foot
Extensor digitorum brevis and extensor hallucis brevis	Superolateral surface of calcaneus, lateral talocalcaneal ligament, cruciate crural ligament	First tendon into dorsal surface of base of proximal phalanx of great toe; other 3 tendons into lateral sides of tendons of extensor digitorum longus to digits 2-4	Deep fibular nerve	Aids the extensor digitorum longus in extending of 4 medial digits at the metatarsophalangeal and interphalangeal joints	Dorsalis pedis, lateral tarsal, arcuate, and fibular arteries	Anterior thigh

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Extensor digitorum longus	Lateral condyle of tibia, proximal 3/4 of anterior surface of interosseous membrane and fibula	Middle and distal phalanges of lateral four digits	Deep fibular nerve	Extends lateral four digits and dorsiflexes foot at ankle	Anterior tibial artery	Anterior leg
Extensor hallucis longus	Middle part of anterior surface of fibula and interosseous membrane	Dorsal aspect of base of distal phalanx of great toe	Deep fibular nerve	Extends great toe, dorsiflexes foot at ankle	Anterior tibial artery	Anterior leg
Fibularis peroneus brevis	Distal 2/3 of lateral surface of fibula	Dorsal surface of tuberosity on lateral side of 5th metatarsal	Superficial fibular nerve	Everts foot and weakly plantarflexes foot at ankle	Anterior tibial and fibular arteries	Lateral leg
Fibularis peroneus longus	Head and proximal 2/3 of lateral fibula	Plantar base of 1st metatarsal and medial cuneiform	Superficial fibular nerve	Everts foot and weakly plantarflexes foot at ankle	Anterior tibial and fibular arteries	Lateral leg
Fibularis peroneus tertius	Distal third of anterior surface of fibula and interosseous membrane	Dorsum of base of 5th metatarsal	Deep fibular nerve	Dorsiflexes foot at ankle and aids in eversion of foot	Anterior tibial artery	Anterior leg
Flexor digiti minimi brevis	Base of 5th metatarsal	Lateral base of proximal phalanx of 5th digit	Superficial branch of lateral plantar nerve	Flexes proximal phalanx of 5th digit	Lateral plantar artery, plantar digital artery to 5th digit, arcuate artery	Foot
Flexor digitorum brevis	Medial tubercle of tuberosity of calcaneus, plantar aponeurosis, and intermuscular septum	Both sides of middle phalanges of lateral four digits	Medial plantar nerve	Flexes 2nd through 5th digits	Medial and lateral plantar arteries and plantar arch, plantar metatarsal and plantar digital arteries	Foot
Flexor digitorum longus	Medial part of posterior tibia inferior to soleal line	Plantar bases of distal phalanges of lateral four digits	Tibial nerve	Flexes lateral four digits and plantarflexes foot at ankle; supports longitudinal arches of foot	Posterior tibial artery	Posterior leg
Flexor hallucis brevis	Plantar surfaces of cuboid and lateral cuneiform	Both sides of base of proximal phalanx of 1st digit	Medial plantar nerve	Flexes proximal phalanx of 1st digit	Medial plantar artery, first plantar metatarsal artery	Foot
Flexor hallucis longus	Distal 2/3 of posterior fibula and interosseous membrane	Base of distal phalanx of great toe (hallux)	Tibial nerve	Flexes all joints of great toe, weakly plantarflexes foot at ankle	Fibular artery	Posterior leg
Gastrocnemius	*Lateral head:* lateral aspect of lateral condyle of femur *Medial head:* popliteal surface above medial condyle of femur	Posterior aspect of calcaneus via calcaneal tendon	Tibial nerve	Plantarflexes foot at ankle joint, assists in flexion of knee joint, raises heel during walking	Popliteal and posterior tibial arteries	Posterior leg
Gluteus maximus	Ilium posterior to posterior gluteal line, dorsal surface of sacrum and coccyx, sacrotuberous ligament	Most fibers end in iliotibial tract that inserts into lateral condyle of tibia; some fibers insert into gluteal tuberosity of femur	Inferior gluteal nerve	Extends flexed thigh, assists in lateral rotation, and abducts thigh	Inferior gluteal arteries mainly, and superior gluteal arteries occasionally	Gluteal region

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Gluteus medius	Lateral surface of ilium between anterior and posterior gluteal lines	Lateral surface of greater trochanter of femur	Superior gluteal nerve	Abducts and medially rotates thigh at hips; steadies pelvis on leg when opposite leg is raised	Superior gluteal artery	Gluteal region
Gluteus minimus	Lateral surface of ilium between anterior and inferior gluteal lines	Anterior surface of greater trochanter of femur	Superior gluteal nerve	Abducts and medially rotates thigh at hips; steadies pelvis on leg when opposite leg is raised	Main trunk and deep branch of superior gluteal artery	Gluteal region
Gracilis	Body and inferior ramus of pubis	Superior part of medial surface of tibia	Obturator nerve	Adducts thigh, flexes and medially rotates leg	Profunda femoris artery, medial circumflex femoral artery	Medial thigh
Iliacus (Iliopsoas)	Superior 2/3 of iliac fossa, iliac crest, ala of sacrum, anterior sacro-iliac ligaments	Lesser trochanter of femur and shaft inferior to it, to psoas major tendon	Femoral nerve	Flexes thigh at hips and stabilizes hip joint, acts with psoas major	Iliac branches of iliolumbar artery	Anterior thigh
Inferior gamellus	Ischial tuberosity	Medial surface of greater trochanter of femur	Nerve to quadratus femoris	Laterally rotates extended thigh at the hip	Medial circumflex femoral artery	Gluteal region
Lumbricals	Tendons of flexor digitorum longus	Medial side of dorsal digital expansions of lateral 4 digits	*Medial one:* medial plantar nerve *Lateral three*: lateral plantar nerve	Flexes proximal phalanges at MTP joint, extends phalanges at PIP and DIP joints	Lateral plantar artery and plantar metatarsal arteries	Foot
Obturator externus	Margins of obturator foramen, obturator membrane	Trochanteric fossa of femur	Obturator nerve	Laterally rotates thigh, stabilizes head of femur in acetabulum	Medial circumflex femoral artery, obturator artery	Medial thigh
Obturator internus	Pelvic surface of obturator membrane and surrounding bone	Medial surface of greater trochanter of femur	Nerve to obturator internus	Laterally rotates extended thigh, abducts flexed thigh at hip	Internal pudendal and obturator arteries	Gluteal region
Pectineus	Superior ramus of pubis	Pectineal line of femur	Femoral nerve and sometimes obturator nerve	Adducts and flexes thigh at hip	Medial circumflex femoral artery, obturator artery	Medial thigh
Piriformis	Anterior surface of sacral segments 2–4, sacrotuberous ligament	Superior border of greater trochanter of femur	Ventral rami of L5, S1, S2	Laterally rotates extended thigh, abducts flexed thigh at hip	Superior and inferior gluteal arteries, internal pudendal artery	Gluteal region
Plantar interossei (three muscles)	Bases and medial sides of 3rd through 5th metatarsals	Medial sides of bases of proximal phalanges of 3rd through 5th digits	Lateral plantar nerve	Adduct digits (2–4) and flex metatarsophalangeal joint and extend phalanges	Lateral plantar artery and plantar arch, plantar metatarsal and plantar digital arteries	Foot
Plantaris	Inferior end of lateral supracondylar line of femur and oblique popliteal ligament	Posterior aspect of calcaneus via calcaneal tendon	Tibial nerve	Weakly assists gastrocnemius	Popliteal artery	Posterior leg
Popliteus	Lateral aspect of lateral condyle of femur, lateral meniscus	Posterior tibia superior to soleal line	Tibial nerve (L4–S1)	Weakly flexes knee and unlocks it by rotating femur on fixed tibia	Inferior medial and lateral genicular arteries	Posterior leg
Psoas major (Iliopsoas)	Transverse processes of lumbar vertebrae, sides of bodies of T12–L5 vertebrae, intervening intervertebral discs	Lesser trochanter of femur	Ventral rami of first lumbar nerve	Acting superiorly with iliacus, flexes hip; acting inferiorly, flexes vertebral column laterally; used to balance trunk in sitting position; acting inferiorly with iliacus, flexes trunk	Lumbar branches of iliolumbar artery	Anterior thigh
Quadratus femoris	Lateral margin of ischial tuberosity	Quadrate tubercle on intertrochanteric crest of femur	Nerve to quadratus femoris	Laterally rotates thigh at hip	Medial circumflex femoral artery	Gluteal region

MUSCLE	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	MAIN ACTIONS	BLOOD SUPPLY	MUSCLE GROUP
Quadratus plantae	Medial and lateral sides of plantar surface of calcaneus	Posterolateral edge of flexor digitorum longus tendon	Lateral plantar nerve	Corrects for oblique pull of flexor digitorum longus tendon, thus assists in flexion of toes	Medial and lateral plantar arteries and deep plantar arterial arch	Foot
Rectus femoris (quadriceps)	Anterior inferior iliac spine and ilium superior to acetabulum	Base of patella and to tibial tuberosity via patellar ligament	Femoral nerve	Extends leg at knee joint and flexes thigh at hip joint	Profunda femoris and lateral circumflex femoral arteries	Anterior thigh
Sartorius	Anterior superior iliac spine and superior part of notch below it	Superior part of medial surface of tibia	Femoral nerve	Abducts, laterally rotates, and flexes thigh; flexes knee joint	Femoral artery	Anterior thigh
Semimembranosus	Ischial tuberosity	Posterior part of medial condyle of tibia	Sciatic nerve (tibial division)	Flexes leg, extends thigh	Perforating branch of profunda femoris and medial circumflex femoral arteries	Posterior thigh
Semitendinosus	Ischial tuberosity	Superior part of medial surface of tibia	Sciatic nerve (tibial division)	Flexes leg, extends thigh	Perforating branch of profunda femoris and medial circumflex femoral arteries	Posterior thigh
Soleus	Posterior aspect of head of fibula, proximal 1/4 of posterior surface of fibula, soleal line of tibia	Posterior aspect of calcaneus via calcaneal tendon	Tibial nerve	Plantarflexes foot at ankle, stabilizes leg over foot	Popliteal, posterior tibial, and fibular arteries	Posterior leg
Superior gemellus	Outer surface of ischial spine	Medial surface of greater trochanter of femur	Nerve to obturator internus	Laterally rotates extended thigh at the hip	Inferior gluteal and internal pudendal arteries	Gluteal region
Tensor fasciae latae	Anterior superior iliac spine and anterior part of iliac crest	Iliotibial tract that attaches to lateral condyle of tibia	Superior gluteal nerve	Abducts, medially rotates, and flexes thigh at hip; helps to keep knee extended	Ascending branch of lateral circumflex femoral artery	Gluteal region
Tibialis anterior	Lateral condyle, proximal half of lateral tibia, interosseous membrane	Medial plantar surfaces of medial cuneiform and base of 1st metatarsal	Deep fibular nerve	Dorsiflexes foot at ankle and inverts foot	Anterior tibial artery	Anterior leg
Tibialis posterior	Posterior tibia below soleal line, interosseous membrane, proximal half of posterior fibula	Tuberosity of navicular bone, all cuneiforms, cuboid, and bases of 2nd through 4th metatarsals	Tibial nerve	Plantarflexes foot at ankle and inverts foot	Fibular artery	Posterior leg
Vastus intermedius (quadriceps)	Anterior and lateral surfaces of body of femur	Base of patella and to tibial tuberosity via patellar ligament	Femoral nerve	Extends leg at knee joint	Lateral circumflex femoral and profunda femoris arteries	Anterior thigh
Vastus lateralis (quadriceps)	Greater trochanter, lateral lip of linea aspera of femur	Base of patella and to tibial tuberosity via patellar ligament	Femoral nerve	Extends leg at knee joint	Lateral circumflex femoral and profunda femoris arteries	Anterior thigh
Vastus medialis (quadriceps)	Intertrochanteric line, medial lip of linea aspera of femur	Base of patella and to tibial tuberosity via patellar ligament	Femoral nerve	Extends leg at knee joint	Femoral and profunda femoris arteries	Anterior thigh

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Plates 105, 141
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Plates 117-119, 125
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Plates 339, 344
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Index

References are to plate numbers. In most cases, structures are listed under singular nouns

A

Abdomen
autonomic nerves and ganglia of, 297
axial CT images of, 322–323
bony framework of, 243
left lower quadrant, 244
left upper quadrant, 244
regions and planes of, 244
right lower quadrant, 244
right upper quadrant, 244
Scarpa's layer of, 245
subcutaneous tissue of, 245
surface anatomy of, 242
ureters in, 313
Abdominal aorta, 176, 192, 229, 259, 264, 267–268, 271, 283–284, 303, 308, 310, 314–315, 320–321, 341–342, 345, 376, 378–381, 390
arteriogram of, 285
axial CT images of, 323
transverse section of, 326–328
Abdominal ostium, 352
Abdominal viscera, 263
Abdominal wall
anterior
arteries of, 251
deep dissection of, 247
intermediate dissection of, 246
internal view of, 249
nerves of, 253
superficial dissection of, 245
veins of, 252
paramedian section of, 321
posterior
arteries of, 259
internal view of, 258
lymph vessels and nodes of, 261
nerves of, 262
peritoneum of, 268
veins of, 260
posterolateral, 250
Abdominis muscle
rectus, 242, 246, 249
transversus, 7, 172–173, 176, 247, 249, 483, 485
tendon of origin of, 172–173, 176
Abducent nerve (VI), 13, 55, 85–86, 88, 105, 115, 118, 122
distribution of, 119
lateral rectus muscle and, 122
schema of, 122
Abducent nucleus, 117–118, 122
Abductor digiti minimi muscle, 449, 452, 457, 464, 467, 516, 518, 520–523, 528, 531
nerve to, 521
Abductor digiti minimi tendon, 515
Abductor hallucis muscle, 516, 518, 520–523, 528, 531
Abductor hallucis tendon, 515, 520–521
Abductor pollicis brevis muscle, 427, 430, 449, 452–453, 463, 467
Abductor pollicis longus muscle, 427, 430–431, 436–438, 466–467
radial area for, 425
Abductor pollicis longus tendon, 430, 434, 436, 454, 456–457
Aberrant ductule, 368
Accessory hemi-azygos vein, 189, 204, 228, 234, 240
Accessory nerve (XI), 32–34, 42, 55, 71, 74–75, 105, 115, 117–118, 128, 130, 174
cranial root of, 128
distribution of, 119
inferior, 13
in jugular fossa, 12
schema of, 128
spinal roots of, 13, 128
in foramen magnum, 12
Accessory nucleus, 117–118
oculomotor, 117–118, 122, 133
Accessory process, 155
Acetabular fossa, 396, 474, 530
Acetabular labrum, 334, 474, 491, 530
Acetabular ligament, transverse, 334, 474
Acetabular margin, 333–334, 338
Acetabular notch, 334, 473
Acetabulum, 334, 473
lunate surface of, 396, 473–474
margin of, 473
radiograph of, 331, 475
Achilles tendon, 468, 502–506, 514, 516
Acinus, 201
Acoustic meatus
external, 6, 10, 15, 94–95, 98
internal, 8, 13, 94, 124–125
Acoustic opening, internal, 99
Acromial anastomosis, 414
Acromial angle, 405–406
Acromial plexus, 414
Acromioclavicular joint, 408, 411
Acromioclavicular joint capsule, 408
Acromioclavicular joint space, 407
Acromion, 29, 185, 398, 408–409, 411, 413–415, 417, 467
of scapula, 183, 405–407
Adamkiewicz, artery of, 167
Adductor brevis muscle, 477–478, 480, 488, 492, 526, 531
Adductor canal, 487, 492
Adductor hallucis muscle, 522–523, 528, 531
Adductor hallucis tendon, 515
Adductor hiatus, 488–489, 499, 509, 526
Adductor longus muscle, 396, 477–480, 487–488, 492, 526, 531
Adductor magnus muscle, 468, 477–478, 480, 482, 487–489, 492, 499, 509, 526–527, 531
adductor minimus part of, 480, 482, 489
Adductor magnus tendon, 492–493, 498, 504
Adductor pollicis muscle, 447, 449–450, 453, 464, 467
fascia of, 450
Adductor tubercle, 476, 488, 496
Adenohypophysis, 141, 148–149
Adenoid, 36
Aditus (laryngeal inlet), 64, 66, 69
Adnexa, 352
Afferent fibers, 117–118, 122–126, 128–130, 133
of autonomic reflex pathways, 304
of kidneys and upper ureters, 318
of liver and biliary tract, 306
from olfactory bulb, 120
of pancreas, 307
of reproductive organs, 393–394
of tracheobronchial tree, 207
of urinary bladder and lower ureter, 395
Agger nasi, 36–37
Aggregate lymphoid nodules (Peyer's patches), 272, 275
Airway, intrapulmonary
schema of, 201
structure of, 201
subdivisions of, 201
Ala, 10, 157
of ilium, 243, 330, 334, 338, 473
of nose, 1
of sacrum, radiograph of, 331
Alar cartilage
major, 37–38, 42
lateral crus, 35
medial crus, 35, 38
minor, 35
Alar fascia, 26
Alar fibrofatty tissue, 35, 37
Alar folds, 494
Alar ligaments, 23
posterior, 23
Alcock's, pudendal canal, 291, 370, 376, 380, 382–383, 389, 391
Alveolar artery
inferior, 40, 47, 51, 58, 73
lingual branch of, 72
mental branch of, 51, 72
mylohyoid branch of, 18, 72
superior
anterior, 51, 54
dental branches of, 54
middle, 51, 54
posterior, 51, 54, 72
Alveolar ducts, 201
opening of, 201
Alveolar foramen, 6
Alveolar nerve (V_2)
inferior, 18, 47, 49–51, 58, 61, 71, 123, 132, 135
superior, 61
anterior, 52, 71
dental branches of, 54
gingival branches of, 54
middle, 52, 54, 71
nasal branch of, 18
posterior, 52–54, 71
Alveolar periosteum, 63
Alveolar pores (of Kohn), 201
Alveolar process, 4, 6, 8, 16, 37
of maxilla, 43
Alveolar recess, 43
Alveolar sacs, 201
Alveolar vein
inferior, 47, 73
posterior superior, 73
Alveolar wall
capillary bed within, 202
capillary plexuses within, 202
Alveoli, 201
Alveus, of hippocampus, 113
Amacrine cells, 121
Ampulla
of ductus deferens, 362
of ear, 94, 98
anterior, 97
lateral, 97
posterior, 97
of fallopian tube, 352–353
of rectum, 346
of semicircular ducts
lateral, 125
posterior, 125
superior, 125
Amygdaloid body, 111, 113, 120, 136

Anal canal, 371
arteries of, male, 376
longitudinal muscle of, 338–339
muscularis mucosae of, 371–372
veins of, female, 377
Anal columns, 371
Anal crypt, 371
Anal glands, 371
Anal (rectal) nerves
branch of, 357
inferior, 388–389, 391–392, 484, 490
Anal pit, 366
Anal sinus, 371
Anal sphincter muscle
external, 276, 303, 321, 335, 340, 346, 355–356, 359–360, 370, 376, 382, 397
attachment of, 337
deep, 344, 369, 371–374
perineal views of, 373
subcutaneous, 344, 369, 371–374
superficial, 344, 369, 371–374
internal, 370–372
Anal triangle, 358
Anal tubercle, 366
Anal valve, 371
Anal verge, 371
Anastomosis
in arteries to brain, 139
internal to external carotid artery, 138
paravertebral, 168
prevertebral, 168
Anastomotic loops, 287, 290
to anterior spinal artery, 167
of ileal arteries, 272
of jejunal arteries, 272
to posterior spinal artery, 167
Anastomotic vein
inferior (of Labbé), 103, 146
superior (of Trolard), 103
Anatomical snuffbox, 398, 430, 454, 456–457
Anconeus muscle, 406, 418, 430–431, 436, 438, 465–467
nerve to, 418
Angle of mandible, 1, 15, 17, 66
Angular artery, 3, 35, 51, 72, 87, 139
Angular gyrus, 106
branch to, 142–143
Angular notch, 269
Angular vein, 3, 73, 87
Ankle
dorsiflexion of, 469
ligaments of, 514
medial ligament of, 501
plantarflexion of, 469
radiographs of, 531
tendon sheaths of, 516
tendons of, 514
Anococcygeal body (ligament), 337, 355–356, 360, 373–374
Anococcygeal nerve, 389, 391, 484, 486
Anocutaneous line, 370–372
Anoderm, 371
Anorectal hiatus, 338
Anorectal junction
circular muscle layer of, 339
conjoined longitudinal muscle of, 339
Anorectal line, 371
Anorectal musculature, 372
Ansa cervicalis, 31, 129–130
inferior root of, 32, 34, 71, 76, 129–130
superior root of, 32, 34, 71, 76, 129–130
Ansa of Galen, 82
Ansa pectoralis, 415
Ansa subclavia, 131, 206, 223–224, 236
Anserine bursa, 493–494
Antebrachial cutaneous nerves
lateral, 400–401
branches of, 401
medial, 400
branches of, 401
posterior, 400–401
Antebrachial fascia, 436
deep, 441
Antebrachial vein, median, 401–402, 436
Anterior chamber of eye, 83, 89–92
endothelium of, 90
Anterolateral central (lenticulostriate) arteries, 138, 140–142, 144
Anteromedial central (perforating) arteries, 141
Antihelix, 1, 95
crura of, 95
Antitragus, 1, 95
Anular ligament of radius, 424
Anular (intercartilaginous) ligaments, 199
Anulus fibrosus, 21, 155, 159
collagen lamellae of, 159
Anus, 337, 340, 354, 358, 360, 366, 373
Aorta, 26, 204, 216–217, 226, 258, 306, 309, 320
abdominal, 176, 192, 229, 259, 264, 267–268, 271, 283–284, 303, 308, 310, 314–315, 320–321, 341–342, 345, 376, 378–381, 390
arteriogram of, 285
axial CT images of, 323
transverse section of, 326–328
ascending, 139, 212, 214, 217, 220–222, 237, 240
coronal section of, 214
axial CT images of, 322
thoracic (descending), 139, 168, 188, 191, 213, 228–229, 233, 237, 240–241
lung groove for, 196
transverse section of, 324–325
ureteric branch from, 314
Aortic arch, 76–77, 139, 193, 203, 207–212, 218, 222, 228–230, 233, 239
lung groove for, 196
Aortic arch lymph node of ligamentum arteriosum, 205
Aortic heart valve, 210, 214, 218–222
left semilunar cusp of, 218–222
posterior semilunar cusp of, 218–222
right semilunar cusp of, 218–222
Aortic hiatus, 192
Aortic lymph nodes, lateral, 261, 316, 384
Aortic plexus, 300
Aortic sinus, 210, 220
Aorticorenal ganglion, 163, 262, 297, 299–303, 317–319, 387, 392–393, 395
left, 388, 394
Apical collecting vessels, 75
Apical foramina, 63
Apical ligament, of dens, 23, 64–65
Appendicular artery, 273, 287–288, 301–302
Appendicular lymph nodes, 296
Appendicular plexus, 301–302
Appendicular vein, 291–292
Appendix, 127, 275
of epididymis, 365, 367
fibrous, of liver, 277
omental (epiploic), 265
of testis, 365, 367
vermiform, 265, 273–276
orifice of, 274
vesicular, 352, 367
Arachnoid, 101, 103, 110
dura mater interface with, 103
superior cerebral veins penetrating, 103
Arachnoid granulations, 101–103, 110
granular foveolae for, 9
Arachnoid mater, 165–166
Arcuate arteries, 312, 517–518, 523
lymph vessels along, 316
Arcuate eminence, 11, 94
Arcuate ligament
dorsal radial metaphyseal, 442
lateral, 192, 258
medial, 192, 258
median, 192, 258
Arcuate line, 243, 247, 249, 251, 255, 330, 334–335, 338, 473
of ilium, 336
Arcuate (infundibular) nucleus, 148
Arcus tendineus fasciae pelvis, 351
Areola, 179
Areolar glands (of Montgomery), 179
Areolar tissue, 245, 344
loose, 103
Areolar venous plexus, 252
Arm
arteries of, 420
cutaneous nerves of, 401
muscles of
anterior view of, 417
posterior view of, 418
radial nerve in, 465
serial cross sections of, 421
superficial veins of, 401
Arrector pili muscles, innervation to, 163
Arteriae rectae, 288, 305
Arterial arch, deep plantar, 522
Arterial circle of iris
major, 90, 92–93
minor, 90, 92–93
Arterial rete, marginal, 96
Arteries. *See also specific arteries*
of abdominal wall
anterior, 251
posterior, 259
of anal canal, male, 376
of arm, 420
of brain, 137
frontal section of, 142
frontal view of, 142
inferior view of, 140
lateral view, 143
medial view, 143
schema of, 139
of duodenum, 284, 286
of esophagus, 233
of eye, intrinsic, 92
of face, 3
of femoral head and neck, 491
of foot, 509
deep, 523
of forearm, 435
of hand, 453
of head of pancreas, 286
of hypothalamus and hypophysis, 149
intrarenal, 312
of iris, 93
of knee, 499, 509
of large intestine, 288
of leg, 509
of liver, 283–284
of mallear stria, 96
of mammary gland, 180
to meninges, 137
of nasal cavity, 40
of oral and pharyngeal regions, 72
of orbit and eyelids, 87
of pancreas, 284
of pelvic organs, female, 378
of pelvis
female, 380
male, 381

Arteries *(Continued)*
of perineum, 382
male, 383
of posterior cranial fossa, 144
of proximal forearm, 420
of rectum, male, 376
of scalp, 3
of small intestine, 287
of spinal cord
intrinsic distribution of, 168
schema of, 167
of spleen, 283–284
of stomach, 283
of suprarenal glands, 320
of testis, 379
of thigh, 499
anterior view, 487–488
posterior view, 489
of upper limb, 460
of ureters, 314
of urinary bladder, 314
of uterus, 382
of wrist, 449
Arteriole
macular
inferior, 92
superior, 92
nasal retinal
inferior, 92
superior, 92
temporal retinal
inferior, 92
superior, 92
Artery of Adamkiewicz, 167
Articular cartilage, 424, 458, 467, 474, 498, 530
Articular cavities, 184, 458, 498
of sternoclavicular joint, 404
Articular disc, 184
inferior, 18
of sternoclavicular joint, 404
of temporomandibular joint, 48–49
of wrist joint, 439, 442
Articular facet
cervical
anterior, 19
inferior, 20
superior, 19–20
of dens, posterior, 23
for sacrum, 155, 157
thoracic
inferior, 154
superior, 154
for vertebral body
inferior, 184
superior, 184
transverse process of, 184
Articular nerve, recurrent, 529
Articular process
cervical
inferior, 20–21
superior, 20–21
lumbar
inferior, 155–156, 158–159
superior, 155, 158–159
sacral, superior, 157
thoracic
inferior, 154
superior, 154
Articular tubercle, 6, 10, 49
inferior, 18
Articularis genus muscle, 477, 492, 494, 498, 525, 531
Ary-epiglottic fold, 66–67, 80
Arytenoid cartilage, 79
muscular process of, 79–80
vocal process of, 79–80
Arytenoid muscle
oblique, 67, 69, 80, 82, 151
action of, 81
ary-epiglottic part of, 80, 82
transverse, 64, 67, 69, 80, 82, 151
action of, 81
Ascending aorta, 139, 212, 214, 217, 220–222, 237, 240
coronal section of, 214
Ascending connections, 224
Asterion, 6
Atlanto-axial joint
lateral, 22
capsule of, 22–23
median, 23
Atlanto-axial ligament, 23
Atlanto-occipital joint, capsule of, 22–23
Atlanto-occipital ligament, anterior, 23
Atlanto-occipital membrane
anterior, 22, 64–65
posterior, 22
Atlas (C1), 15, 22–23, 160
anterior view of, 21, 153
arch of
anterior, 7, 19, 21, 64
posterior, 19, 151, 175
articular facet for
anterior, 19
superior, 19
dens of, articular facet for, 19
groove for vertebral artery, 19
inferior view of, 19
lateral mass of, 19
lateral view of, 153
posterior view of, 153
spinal nerves relation to, 161
superior articular surface of lateral mass for occipital condyle, 19
superior view of, 19
transverse foramen of, 19
transverse ligament of, 23
transverse process of, 19, 22, 30, 173
tubercle of
anterior, 19, 21, 23
posterior, 19, 172–173
vertebral foramen of, 19
Atrioventricular (AV) bundle (of His), 222
Atrioventricular (AV) node, 222
Atrium, 221
left, 211–213, 218, 220–221, 241
oblique vein of (of Marshall), 211–212, 215, 218
right, 209–214, 217, 220–221, 227, 241
Auditory (pharyngotympanic, eustachian) tube. *See* Pharyngotympanic (auditory, eustachian) tube
Auerbach's plexus, 305
Auricle, 94, 99
concha of, 95
lobule of, 95
Auricle (atrial appendage)
left, 209, 211–212, 215–216, 218, 221–222
right, 209, 211, 217, 221
Auricular artery
anterior, 3
deep, 51, 72, 96
posterior, 3, 34, 51, 72, 96, 102, 137, 139, 175
Auricular cartilage, 42
Auricular muscles, nerve branches to, 124
Auricular nerve
anterior, 123
branches to muscles, 124
Auricular nerve *(Continued)*
great, 2, 31–33, 130, 174–175
posterior, 24, 50, 124
occipital branch of, 124
Auricular surface, 473
of sacrum, 157–158
Auricular tubercle (of Darwin), 95
Auricular vein, posterior, 3, 32, 73
Auricularis muscle
anterior, 25, 151
innervation of, 119
posterior, 25, 151
superior, 25, 151
Auriculotemporal nerve, 2, 18, 46, 49–51, 71–72, 123, 126, 135
Auscultation
of heart, 210
precordial areas of, 210
Auscultatory triangle, 152, 241, 250
Autonomic nerves
of abdomen, 297
of biliary tract, 306
of duodenum, 298–300
in head, 132
of kidneys, 317–318
of large intestine, 302–303
of liver, 306
of lower limb, 469
in neck, 131
of pancreas, 307
of small intestine, 301, 303
of stomach, 298–300
of suprarenal glands, 319
in thorax, 206
of ureters, 317–318
of urinary bladder, 317
Autonomic reflex pathways, 304
Axilla, 178
anterior view, 415
posterior wall of, 410
suspensory ligament of, 412
Axillary artery, 180, 186, 195, 214, 251, 412, 414–415, 419
acromial branch of, 420
clavicular branch of, 420
deltoid branch of, 420
left, 190
right, 190
Axillary fascia, 412
Axillary fold
anterior, 178
posterior, 178
Axillary fossa, 238–240
Axillary lymph node, 412
anterior, 181–182
apical, 181–182
central, 181–182
lateral, 181–182, 403
posterior, 181–182
Axillary nerve, 400, 410–411, 413, 415–416, 418, 461–463, 465–466
branches of, 410
superior lateral brachial cutaneous nerve from, 174, 400–401
Axillary recess, 408, 467
Axillary tail (of Spence), 180
Axillary vein, 186, 195, 214, 252, 403, 412
intercostal tributaries to, 252
Axis (C2), 15, 22–23, 47, 160
anterior view of, 19, 21, 153
body of, 19, 22
dens of, 7, 19, 21, 64
inferior articular facet for, 19
interarticular part of, 19
lateral view of, 153
pedicle of, 19

Axis (C2) *(Continued)*
posterior view of, 153
posterosuperior view of, 19
spinal nerves relation to, 161
spinous process of, 171, 173
transverse process of, 19
posterior tubercle, 30
Azygos vein, 189, 191, 203–204, 206, 213, 227, 229, 234, 237, 239–241
lung groove for, 196
transverse section of, 324

B

Back
lumbar region of, 176
muscles of
deep layers, 173
intermediate layers, 172
superficial layers, 171
nerves of, 174
surface anatomy of, 152
Bartholin's gland
greater, 356–357, 367, 382
primordium of, 367
opening of, 354
Basal collecting vessels, 75
Basal nuclei, 111
Basal vein (of Rosenthal), 145–147
Basilar artery, 137, 139–142, 144, 167
imaging of, 150–151
Basilar membrane, 98
Basilic vein, 398, 401–403, 415, 421, 436, 455
median, 402
Basivertebral vein, 169
Batson, vertebral venous plexus of, 104, 166, 169
Bertin, renal column of, 311
Biceps brachii muscle, 178, 239–240, 398, 405, 409–410, 412–413, 415, 417, 419, 421, 432–434, 437–438, 460, 462, 467
Biceps brachii tendon, 238–239, 408, 411, 413, 417, 424
Biceps femoris muscle, 468, 477–478, 481–482, 489–490, 492–493, 497, 502–503, 506, 527, 531
Biceps femoris tendon, 333, 493–494, 497–498, 501, 504–505, 507–508, 529
Bicipital aponeurosis, 402, 417, 419, 432, 460
Bifid spinous process, 20
Bifurcate ligament, 514
Bile canaliculi, 279
Bile ducts, 127, 267–268, 271–272, 277–279, 281, 283–284, 286
extrahepatic, 280
innervation of, 163–164
sphincter of, 280
transverse section of, 325–326
Biliary tract, autonomic nerves of, 306
Bipolar cells, 121
Biventer lobule, 114
Bladder. *See* Urinary bladder
Bladder-prostate junction, 396
Blood vessels. *See* Vessels
Bloodless fold of Treves, 273
Bohler's angle, 513
Bones
of elbow, 422
of foot, 511–512
of forearm, 425
of hand, 443
of nasal cavity, 45
of paranasal sinuses, 45
of pelvis, 333–334
around teeth, 63
of thorax, 183
of wrist, 439, 443
Bony labyrinths, 97–98
orientation of, 99
Bony spicule, 20
Brachial artery, 180, 414–415, 417, 419–421, 432–435, 460
branches of, 431
middle collateral branch of, 431
muscular branch of, 419
in situ, 419
Brachial cutaneous nerves
inferior lateral, 400–401
medial, 253, 400–401
posterior, 400–401
superior lateral, 174, 400–401
Brachial fascia, 412, 421
Brachial plexus, 1, 29–32, 71, 160, 180, 186, 190, 195, 203, 208, 225, 227–229, 412–413, 415
anterior divisions of, 416
communication to, 130
cords of, 461–463
lateral, 416, 419, 461–463
medial, 416, 419, 461–463
posterior, 416, 461–463
inferior trunks of, 71, 410, 416
lateral cord of, 214
middle trunks of, 71, 410, 416
posterior divisions of, 416
roots of, 416
schema of, 416
superior trunks of, 71, 410, 416
terminal branches of, 416
Brachial veins, 415, 421
Brachialis muscle, 405–406, 415, 417, 419, 421, 432–434, 437, 460, 462, 465, 467
insertion of, 424
Brachiocephalic trunk, 33, 76–78, 137, 139, 187, 190, 203, 208–211, 214, 229, 233, 238
Brachiocephalic vein, 73, 76, 187, 205
left, 77, 170, 189, 203, 208–209, 214, 227–229, 234, 238
lung groove for, 196
right, 77, 170, 189, 203, 208–209, 227, 234, 238
Brachioradialis muscle, 398, 405, 417–419, 421, 430–433, 436–438, 460, 465
Brachioradialis tendon, 434, 436
Brachium
of inferior colliculus, 112
of superior colliculus, 112
Brain, 43
arteries of, 137
frontal section of, 142
frontal view of, 142
inferior view of, 140
lateral view, 143
medial view, 143
schema of, 139
veins of
deep, 146
subependymal, 147
ventricles of, 109
Brainstem
cranial nerve nuclei in, 117–118
median sagittal section of, 116
posterior view of, 116
Breast
lymphatic drainage of, 182
pathway to/from opposite, 181
suspensory ligament of, 179
Bregma, 9
Bridging veins, 101, 103–104, 110
imaging of, 150
Broad ligament, 313, 340–342, 350, 367
anterior lamina of, 353
mesometrium of, 352
Broad ligament *(Continued)*
mesosalpinx of, 342, 352
mesovarium of, 352
posterior lamina of, 353
Bronchi, 201
cartilages of, 201
extrapulmonary, 199
inferior lobar, 199–200
anterior basal, 200
anteromedial basal, 200
lateral basal, 200
medial basal, 200
posterior basal, 200
innervation of, 119, 163–164
intermediate, 196
intrapulmonary, 199
large intrasegmental, 201
lingular, 199–200
inferior, 200
superior, 200
main
left, 196, 199–200, 203–204, 213, 228–231, 237, 240
right, 199–200, 204, 213, 227, 229, 237, 240
major, 199
middle lobar, 199–200
lateral, 200
medial, 200
nomenclature of, schema of, 200
right, 210
segmental, 201
small intrasegmental, 201
superior, 200
superior division, 199–200
anterior, 200
apicoposterior, 200
superior lobar (eparterial), 199–200
anterior, 200
apical, 200
posterior, 200
right, 196, 203
Bronchial artery, 202, 204
esophageal branch of, 204, 233
left, 196, 228
inferior, 204, 233
superior, 204, 233
right, 196, 204, 227, 233
Bronchial veins, 204
left, 204
right, 204
Bronchioles, 201
respiratory, 201–202
terminal, 201–202
elastic fibers of, 201
smooth muscle of, 201
Bronchomediastinal lymphatic trunk, 205
Bronchopulmonary (hilar) lymph nodes, 196, 205, 227–228
Bronchopulmonary segments, 197–198
anterior, 197–198
anterior basal, 197–198
anteromedial basal, 197–198
apical, 197–198
apicoposterior, 197–198
inferior lingular, 197–198
lateral, 197–198
lateral basal, 197–198
medial, 197–198
medial basal, 197–198
posterior, 197–198
posterior basal, 197–198
superior, 197–198
superior lingular, 197–198
Buccal artery, 51, 72
Buccal nerve (V_3), 2, 50–51, 61, 71, 123
Buccinator crest, of mandible, 70
Buccinator lymph nodes, 74

Buccinator muscle, 25, 43, 46–50, 57, 65, 70, 72, 124, 151
Buccopharyngeal fascia, 26, 47, 64–65
Bulb
of penis, 360–361, 363
artery of, 361, 383
of vestibule, 350, 356–357, 382
artery of, 350, 357, 382
Bulb of vestibule, 348
Bulbar conjunctiva, 83, 85, 89–90, 92
Bulbospongiosus muscle, 321, 344, 348, 350, 355–357, 359, 361, 373–374, 382–383, 395, 397
Bulbo-urethral duct, opening of, 362–363
Bulbo-urethral (Cowper's) gland, 249, 321, 344, 348, 361–363, 367
duct of, 361
primordium of, 367
Bulging septum, 36
Bundle
left, 222
right, 222
Bundle of His, 222
Burns, suprasternal space of, 26–27, 64
Buttock, nerves of, 490

C

Calcaneal artery
lateral, 521–522
medial, 521–522
Calcaneal bursa, subcutaneous, 516
Calcaneal nerve
lateral, 521–522
medial, 521–522
Calcaneal sulcus, 513
Calcaneal (Achilles) tendon, 468, 502–506, 514, 516
Calcaneal tuberosity, 468, 503–504
Calcaneocuboid ligament, 514, 523
dorsal, 514
Calcaneofibular ligament, 501, 513–514
Calcaneonavicular ligament, 514
Calcaneus bone, 511–513, 515–516, 531
tuberosity of, 515, 519–522, 531
Calcar avis, 112–113
Calcarine sulcus, 106–108, 112, 121
Callosomarginal artery, 142–143
Calot's triangle, 280, 284
Calvaria, 103
inferior view of, 9
superior view of, 9
Calyces
major, 311
transverse section of, 327
minor, 311
Camper chiasm, 448
Camper's (fatty) layer, 245, 321, 344, 355, 358
Canal of Schlemm, 89–90, 92–93
Canine teeth, 62–63
Capillary plexus, of infundibular process, 149
Capitate, 439, 442–443, 449
radiographs of, 444
Capitohamate ligament, 441–442
Capitulum, 405, 422–423
Capsular ligaments, 408
Cardiac impression, 196
Cardiac nerves
cervical, 206, 225, 236
inferior, 223–224
middle, 223–224
superior, 223
thoracic, 190, 206, 225, 236
Cardiac notch, 232, 269
of left lung, 195
Cardiac orifice, 270
Cardiac plexus, 127, 206, 223–224, 236
branches to, 206
Cardiac veins, 215
anterior, 215
great, 215
middle, 211, 215
small, 215
Cardinal (transverse cervical or Mackenrodt's) ligament, 342–343, 350–351
Carinal lymph nodes, inferior, 205
Caroticotympanic artery, 96, 138
Caroticotympanic nerve, 96, 124, 126
Carotid artery, 34
common, 3, 26, 30–31, 33–34, 55, 71–73, 76–78, 126, 129, 131–132, 134–135, 137, 139, 187, 195, 207, 229, 233
left, 170, 190, 203, 208–211, 214, 238
right, 170, 190, 203, 210
external, 3, 27–28, 31, 34, 46–47, 51, 54–55, 59, 71–73, 76–78, 96, 102, 126, 131–132, 134–135, 137, 139
indirect branch of, 138
internal to, 138
schema of, 34
internal, 3, 13, 34, 42, 47, 49, 53, 55, 71–72, 76–78, 87–88, 96, 100, 102, 124, 126, 129, 131–135, 137, 139–142
caroticotympanic branch of, 139
in carotid canal, 12
cavernous segment of, 105, 138
cerebral part of, 138
cervical part of, 138
to external, 138
imaging of, 150
left, 143–144
meningeal branch of, 138
meningohypophyseal trunk of, 102
nerve plexus and, 122
in petrous part of temporal bone, 138
petrous parts of, 138
right, 143
Carotid autonomic plexus, 12
Carotid body, 34, 126, 131, 137, 207
Carotid canal, 10, 12, 100
greater, 13
Carotid groove, 11
Carotid nerve
external, 163
internal, 53, 55, 131–132, 134, 163, 225
Carotid plexus
common, 131–132
external, 131–132, 134, 163
internal, 13, 53, 88, 96, 124, 132–133, 163
Carotid sheath, 26–27
Carotid sinus, 126, 131–132, 137, 207
Carotid sinus nerve (of Hering), 71, 126, 131
Carotid tubercle (of Chassaignac), 21–22
Carpal arch, dorsal, 456
Carpal artery, dorsal, 435
Carpal bones, 439, 443
Carpal ligament, transverse, 433, 441, 447, 449
Carpometacarpal joint, 439, 442
Carpometacarpal ligaments, palmar, 445
Cartilage
of pharyngotympanic (auditory, eustachian) tube, 42
of larynx, 79
thyroid, 1
Cartilage end plate, 159
Cauda equina, 160–161, 166, 176
transverse section of, 327
Caudal mesonephric tubules, 367
residua of, 367
Caudate nucleus, 111, 142
anterior vein of, 146–147
body of, 109, 111
head of, 111–113, 144, 146
imaging of, 151
posterior vein of, 146
terminal, 147
tail of, 109, 111, 113
transverse veins of, 146–147
Caudate process, 277
Caval opening, 192, 258
Cave of Retzius, 247, 321
Cavernous nerves, of penis, 388, 394
Cavernous plexus, 122
Cavernous sinus, 87, 105, 137, 141
efferent hypophyseal vein to, 149
emissary vein communicating with, 73
inferior, artery to, 138
Cavum septum pellucidum, 101
Cecal artery, 302
anterior, 273, 287–288
posterior, 273, 287–288
Cecal folds, 273, 341, 345
Cecal plexus, 302
Cecal vein
anterior, 291–292
posterior, 291–292
Cecum, 127, 263, 265, 273, 275–276, 341, 345
vascular fold of, 273
Celiac ganglion, 163–164, 236, 262, 297–304, 306–307, 317–319, 387–388, 392–395
Celiac lymph nodes, 235, 261, 293–295
Celiac plexus, 127, 236, 298–299, 301–302, 317–319, 388, 393
Celiac trunk, 192, 226, 229, 233, 259, 264, 268, 271, 281, 283–284, 286–287, 300, 303, 307–308, 310, 321, 388
arteriogram of, 285
axial CT images of, 322
transverse section of, 325–326
Cement of teeth, 63
Central arteries
anterolateral, 138, 140–142, 144
anteromedial, 141
posteromedial, 141
Central canal, of spinal cord, 109–110, 116, 118
Central collecting vessels, 75
Central lobule, 114, 116
Central sulcal arteries, 142–143
Central sulcus
of insula, 106
of Rolando, 106–107
Central tendon, of diaphragm, 191–192
Central vein, 278–279
Cephalic vein, 178, 185–186, 214, 252, 398, 401–403, 409, 412, 415, 421, 436, 455
accessory, 401–402
median, 402
Cerebellar artery
inferior
anterior, 137, 139–142, 144, 167
choroidal branch of, 144
posterior, 137, 139–140, 142, 144, 167
tonsillar branch of, 144
superior, 137, 139–142, 144, 167
lateral branch of, 144
vermian branch of, 144
Cerebellar hemispheric veins, inferior, 145
Cerebellar notch
anterior, 114
posterior, 114
Cerebellar nuclei
dentate, 114
emboliform, 114
fastigial, 114
globose, 114

Cerebellar peduncles
inferior, 114–116, 125, 145
middle, 114–116, 145
superior, 114–116, 145
decussation of, 114
Cerebellar vein
precentral, 145
superior, 145
Cerebellomedullary cistern, vein of, 145
Cerebellum, 99, 107, 112, 114, 147
anterior lobe of, 114
biventer lobule of, 114
central lobule of, 114
dentate nucleus of, 116
flocculonodular lobe of, 114
flocculus of, 114–115
fourth ventricle and, 114, 116
horizontal fissure of, 114
imaging of, 151
medullary velum of
inferior, 114
superior, 114
posterior lobe of, 114
posterolateral (dorsolateral) fissure of, 114
postlunate fissure of, 114
primary fissure of, 114
quadrangular lobule of, 114
retrotonsillar fissure of, 114
secondary (postpyramidal) fissure of, 114
semilunar lobule
inferior, 114
superior, 114
simple lobule of, 114
tonsil of, 114, 116
vermis of, 114
central lobule of, 114, 116
culmen of, 114, 116
declive of, 114, 116
folium of, 114, 116
lingula of, 114, 116
nodule of, 114, 116
pyramid of, 114, 116
tuber of, 114, 116
uvula of, 114, 116
Cerebral aqueduct, 107–110, 116, 118, 147–148
imaging of, 151
Cerebral arterial circle (of Willis), 140–141
Cerebral arteries, 103
anterior, 137–142, 144, 146
branches of, 142
cingular branches of, 143
imaging of, 150–151
left, 143
medial frontal branches of, 142–143
right, 143
terminal branches of, 143
middle, 137–142, 144
imaging of, 150
left, 143
occipitotemporal branches of, 143
temporal branches of, 142–143
terminal branches of, 143
posterior, 137–142, 144, 167
calcarine branch to, 143–144
dorsal branch of, 143–144
imaging of, 150
parieto-occipital branch to, 143–144
right, 143
temporal branches of, 143–144
terminal branches of, 143
Cerebral crus, 108, 114–115, 140, 146
Cerebral fissure, longitudinal, 108, 144, 146
imaging of, 151
Cerebral hemisphere, 103
Cerebral peduncle, 107, 116
Cerebral sulcus, lateral, 142
Cerebral veins, 101
anterior, 145–146
great (of Galen), 104–105, 107, 116, 145–147
imaging of, 150
inferior, 103, 105, 146
internal, 101, 109, 112, 145–147
imaging of, 150
middle
deep, 101, 145–147
superficial, 101, 103, 105, 146
superficial, 103
superior, 103
opening of, 102
Cerebrospinal fluid, circulation of, 110
Cerebrum
frontal lobe of, 106
frontal pole of, 106, 108
inferior margin of, 108
occipital lobe of, 106
occipital pole of, 106
parietal lobe of, 106
temporal lobe of, 106, 142
temporal pole of, 106, 108
Cervical artery
ascending, 33, 71–72, 76–78, 139, 167, 414
deep, 137, 139, 167
superficial, 76–77, 139, 174
transverse, 32–33, 78, 414–415
Cervical canal, 352
Cervical cardiac nerves, 206, 225, 236
inferior, 223–224
middle, 223–224
superior, 223
Cervical fascia, 185
deep
investing layer of, 409
superficial layer of, 64
investing layer of, 25–27
pretracheal layer of, 27
prevertebral layer of, 26
superficial layer of, 26
Cervical ganglion
middle, 71, 129, 223–224, 236
superior, 53, 55, 163, 223–224, 236
Cervical ligament, transverse, 342–343, 350–351
Cervical lordosis, 153
Cervical lymph nodes
anterior deep, 74
anterior superficial, 74
deep inferior, 205, 235
deep lateral, 75
inferior deep lateral, 74
posterior lateral superficial, 74
superior deep lateral, 74
superior lateral superficial, 74
transverse chain, 74
Cervical muscles, deep, 26
Cervical nerve, transverse, 2, 31–32, 130
Cervical (cupula, dome of) parietal pleura, 193–194, 227–228
Cervical plexus, 174–175
ansa cervicalis of, 129
branches from, 2
schema of, 33, 130
Cervical spinal nerves
C1, 128, 160
dorsal ramus of, 175
dorsal roots of, 115
ventral ramus of, 71, 129
vertebrae relation to, 161
C2, 128
dermatome of, 162
dorsal ramus of, 174–175
ventral ramus of, 32, 71, 129, 174
vertebrae relation to, 161
Cervical spinal nerves *(Continued)*
C3, 128
dermatome of, 162
dorsal ramus of, 174–175
ventral ramus of, 32, 129, 174, 190
vertebrae relation to, 161
C4, 128
dermatome of, 162
dorsal ramus of, 174–175
ventral ramus of, 71, 190
vertebrae relation to, 161
C5
dermatome of, 162
dorsal ramus of, 174–175
ventral ramus of, 32, 190
vertebrae relation to, 161
C6
dorsal ramus of, 174–175
transverse process of, 137
vertebrae relation to, 161
C7
dorsal ramus of, 174
vertebrae relation to, 161
C8, 160
dorsal ramus of, 174
vertebrae relation to, 161
dorsal rami of, 2, 22
enlargement of, 161
groove for, 20–21
Cervical sympathetic cardiac nerve
inferior, 131
middle, 131
superior, 131–132
Cervical sympathetic ganglion
middle, 33, 131
superior, 47, 126, 129, 131–134, 207
Cervical sympathetic trunk, 132, 236
Cervical sympathetic trunk ganglion, 225
Cervical triangle, posterior, 26
Cervical vein, deep
left, 170
right, 170
Cervical vertebrae
anterior view of, 21
anulus fibrosus of, 21
arteries of, 167
body of, 20–21, 156
C1 (*See* Atlas (C1))
C2 (*See* Axis (C2))
C3, 15, 19
bifid spinous process of, 20
costal lamella, 20
foramen transversarium of, 20
inferior articular facet for, 19–20
inferior articular process for, 21
inferior aspect of, 20
intervertebral foramen for, 21
lamina of, 20
pedicle of, 20
spinal nerves relation to, 161
transverse process of, 20, 30
vertebral body of, 20
vertebral foramen of, 20
C4, 19
anterior view of, 20
articular surface of, 20
body of, 20
foramen transversarium of, 20
inferior articular facet, 20
inferior articular process of, 20
lamina of, 20
spinal nerve groove, 20
spinal nerves relation to, 161
spinous process of, 20
superior articular facet, 20
superior articular process of, 20–21

Cervical vertebrae *(Continued)*
superior aspect of, 20
transverse process of, 20
uncinate process of, 20
C5, spinal nerves relation to, 161
C6
anterior tubercle of, 22
spinal nerves relation to, 161
C7, 15, 26, 160
anterior view of, 20, 153
articular surface of, 20
body of, 20
bony spicule of, 20
costal lamella of, 20
foramen transversarium of, 20
lamina of, 20
lateral view of, 153
pedicle of, 20
posterior view of, 153
spinal nerves relation to, 161
spinous process of, 20, 22, 152, 171–173, 409
superior articular process and facet of, 20
transverse process of, 20, 30
uncinate process of, 20
vertebral foramen of, 20
intervertebral disc of, 21–22
nucleus pulposus of, 21
transverse process of, 21
uncinate processes of, 21
uncovertebral joints, 21
upper, 19
Cervicofacial division, 24
Cervicothoracic (stellate) ganglion, 131, 206, 223–224, 236
Cervix, 351, 393
of uterus, 340, 342–343, 350, 352
Chassaignac, carotid tubercle of, 21–22
Check ligament, 85
Chest scans, axial CT images, 237
Chiasmatic cistern, 110
Choanae, 10, 16, 36, 38, 49, 57, 66–67, 100
Chorda tympani, 96
Chorda tympani nerve, 12, 50, 61, 71, 95, 123–125, 132, 134–136
Chordae tendineae, 217–218, 220
Choroid, 89, 91–92
Choroid plexus, 112–113, 116
of fourth ventricle, 107, 110, 115–116, 145
of lateral ventricle, 101, 109–111, 140, 144, 146
of third ventricle, 107, 109–110, 144
Choroid vein, superior, 146–147
Choroidal artery
anterior, 138, 140–142, 144
posterior lateral, 144
posterior medial, 140, 144
Choroidal veins, superior, 101
Ciliary arteries
anterior, 92–93
recurrent branch of, 93
posterior, 87
long, 92–93
short, 92–93
Ciliary body, 89–92
blood vessels of, 92
orbiculus ciliaris of, 91
Ciliary ganglion, 52, 55, 88, 122–123, 132–133, 164
nasociliary (sensory) root of, 88, 122–123, 132–133
oculomotor (parasympathetic) root of, 88, 122, 132–133
schema of, 133
sympathetic root of, 88, 122, 132–133
Ciliary muscle, 89–90, 122, 133, 151
circular fibers of, 90
innervation of, 119
meridional fibers of, 90
Ciliary nerves
long, 52, 88, 122–123, 132–133
short, 52, 88, 122–123, 132–133
Ciliary processes, 89–91
Ciliary vein, anterior, 90, 92–93
veins draining into, 93
Cingulate gyrus, 107
isthmus of, 107–108
Cingulate sulcus, 107
Circular esophageal muscle, 65, 67, 69, 231–232
in V-shaped area of Laimer, 69, 77
Circular fibers, 90
Circular folds (valves of Kerckring), 272, 280
Circular intramuscular plexus, 305
Circular muscle, 305
of anorectal junction, 339
of colon, 274
of duodenum, 270, 280
of ileum, 272, 274
of jejunum, 272
of rectum, 371–372
of stomach, 232, 270
of vermiform appendix, 275
Circular sulcus, 106
Circulation, prenatal and postnatal, 226
Cistern
chiasmatic, 110
of corpus callosum, 110
interpeduncular, 110
prepontine, 110
quadrigeminal, 110
Cisterna chyli, 261, 295, 297, 316
Claustrum, 111
Clavicle, 1, 25, 27–29, 31, 178–179, 183–187, 193–195, 210, 214, 227–228, 238, 398, 404–405, 408–412, 414–415
acromial end of, 404
acromial facet of, 404
anteroposterior radiograph of, 407
conoid tubercle, 404
shaft of, 404
sternal end of, 404, 467
sternal facet of, 404
subclavian groove, 404
trapezoid line of, 404
Clavicular head, 27, 29
of sternocleidomastoid muscle, 1
Clavipectoral fasciae, 185, 412
Cleft of Luschka, 21
Clinoid process
anterior, 8, 11
posterior, 11
Clitoris, 356, 373
body of, 340, 366
crus of, 340, 348, 350, 356–357
deep artery of, 357, 382
dorsal artery of, 357, 382
dorsal nerve of, 357, 391–392, 484
dorsal vein of, deep, 335–337, 340, 343, 346, 357
frenulum of, 354
glans of, 354, 366
prepuce of, 354
suspensory ligament of, 355–357
Clivus, 11, 23
Clunial nerves
inferior, 174, 389, 391, 471, 489–490, 527
medial, 471, 489
middle, 174
superior, 174, 250, 471, 489
Coccygeal cornu, 157
Coccygeal ligament, 160
Coccygeal nerve, 160–161, 486
Coccygeal plexus, 484, 486
Coccygeus (ischiococcygeus) muscle, 258, 335–339, 380, 388–390, 397, 486
nerve to, 484, 486
Coccyx, 157–158, 160–161, 243, 330, 333–336, 356, 369
anterior view of, 153
lateral view of, 153
measurements of, 332
posterior view of, 153
radiography of, 156
tip of, 337, 339, 358, 360, 373, 396
transverse process of, 157
Cochlea, 55, 94, 97, 99
helicotrema of, 94, 98
modiolus of, 98
osseous, 98
scala tympani of, 94
scala vestibuli of, 94
section through turn of, 98
Cochlear aqueduct, 98
Cochlear cupula, 97
Cochlear duct, 94, 97–99
Cochlear (spiral) ganglion, 125
Cochlear nerve, 94, 97–99, 119, 125
Cochlear nuclei
anterior, 117–118, 125
posterior, 117–118, 125
Cochlear recess, 97
Colic artery
ascending branch of, 288, 376
descending branch of, 265, 268, 288, 376
left, 259, 288, 297, 302, 313, 376
middle, 281, 284, 287–288, 301–302, 321
right, 287–288, 302, 313
Colic flexure
left (splenic), 263–266, 269, 271, 276, 278, 281, 302, 320
axial CT images of, 322
right (hepatic), 263, 265–266, 269, 271, 276, 278, 281, 315
transverse section of, 325
Colic impression, 277, 282
Colic lymph nodes
left, 296
middle, 296
right, 296
Colic plexus
left, 297, 302
middle, 301–302
right, 302
Colic vein
left, 291–292
middle, 281, 290, 292
right, 290–292
Collagen lamellae, of anulus fibrosus, 159
Collar of Helvetius, 232
Collateral artery
middle, 418, 420–421
radial, 418, 420–421
ulnar
inferior, 419–420, 431, 435
superior, 419–421, 430–431, 435
Collateral eminence, 112
Collateral ligaments, 445, 451, 496
accessory, 445
fibular, 480–481, 493–496, 498, 501, 504–506, 508
of foot, 515
lateral, 497
radial, 424
tibial, 480, 493–498, 501, 504–505, 507–508
ulnar, 424
Collateral sulcus, 107–108
Collateral trigone, 112

Colles' fascia, 344, 348, 350, 355–361, 369, 373–374, 382–383, 389
superficial, 359
Colliculus
facial, 116
inferior, 107, 112, 115–116
brachia of, 115
brachium of, 112
left, 145
seminal, 348
superior, 107–108, 112, 115–117, 133, 144
brachia of, 115
brachium of, 112
left, 145
Colon
ascending, 127, 265, 268, 271, 276, 309, 341, 345
transverse section of, 326–328
circular muscle of, 274
descending, 265, 271, 276, 302, 315, 341, 345
axial CT images of, 322–323
innervation of, 163–164
transverse section of, 325–328
innervation of, 163
radiography of, 156
sigmoid, 263, 265, 276, 302, 341–342, 345, 369–372, 390
innervation of, 163–164
transverse, 263–265, 267, 271, 276, 281–282, 290, 321
axial CT images of, 322–323
transverse section of, 325–328
tributary from, 291
Commissure
anterior, 107, 116, 120, 147–148
of fornix, 113
habenular, 107, 112, 116
of labia majora
anterior, 354
posterior, 354
of lips, 1
posterior, 107, 112, 116, 366
Common bony limbs, 97–98
Common membranous limbs, 97–98
Common tendinous ring (of Zinn), 85–86, 88, 122
Common trunk, 46, 73
Common-extensor tendon, 406
Communicating artery
anterior, 137–143
imaging of, 150
posterior, 105, 137–144
imaging of, 150
Communicating nerve, sural, 471
Communicating vein, 31, 170
Compressor urethrae muscle, 335, 350, 356–357, 382, 397
growth of, 347
Concha
of auricle, 95
inferior, 16
Conducting system, of heart, 222
Condylar canal, 10, 13
Condylar fossa, 10
Condylar process, of mandible, 15, 17
head of, 6
Condyles
of femur
lateral, 476, 494–497
medial, 476, 494–497
of mandible, 7
occipital, 8, 10–11, 16
of tibia
lateral, 481, 497, 500–501, 506
medial, 494, 496–497, 500–501
Cone of light, 95
Cones, 121
Conjoined longitudinal muscle, 370–372
Conjoint tendon, 246, 249, 255–256
Conjunctiva, 93
Conjunctival artery, posterior, 93
Conjunctival fornix
inferior, 83
superior, 83
Conjunctival vein, posterior, 93
Conjunctival vessels, 92
Connective tissue
of skull, 103
subserous, 305
Conoid ligament, 404, 408, 411
Conoid tubercle, 404
Conus arteriosus, 209, 217–219
Conus elasticus, 80, 82
Conus medullaris, 156, 160–161
transverse section of, 327
Cooper's ligament, 179, 246–247, 249, 255, 257–258
Coraco-acromial ligament, 408, 411, 413, 417
Coracobrachialis muscle, 239–240, 405, 410, 412–413, 415, 417, 419, 421, 460, 462, 467
Coracobrachialis tendon, 410, 413
Coracoclavicular ligament, 408, 411
Coracohumeral ligament, 408
Coracoid process, 185–186, 405–408, 410–415, 417, 419
of scapula, 183
Cornea, 83, 85, 89–90, 92–93
Corneal limbus, 83
Corneoscleral junction, 83
Corniculate cartilage, 79
Corniculate tubercle, 66–67, 80
Coronal sulcus, 366
Coronal suture, 4–9, 14
Coronary arteries, 215, 221
imaging of, 216
left, 215–216, 220
anterior interventricular branch of (left anterior descending artery), 215–216
circumflex branch of, 215–216, 219
interventricular branch of, 209
interventricular septal branches of, 215–216
left (obtuse) marginal branch of, 215–216
posterior left ventricular branch of, 215
posterolateral branches of, 216
right, 209, 211, 215–216, 219–220
atrial branch of, 215
AV nodal branch of, 216, 219
interventricular septal branches of, 215
posterior interventricular branch of (posterior descending artery), 211, 215–216, 219
right (acute) marginal branch of, 215–216
SA nodal branch of, 215–216
Coronary ligament, 277, 321
hepatorenal portion of, 277
of liver, 268
Coronary sinus, 211–213, 215, 218, 241
opening of, 214, 217, 220
valve (thebesian) of, 217
Coronary sulcus, 209, 211
Coronoid fossa, 405, 422
Coronoid process
of mandible, 6–7, 15, 17, 42
temporalis muscle insertion to, 6
of ulna, 422, 425, 429
radiographs of, 423
Corpora cavernosa, of penis, 360
Corpora quadrigemina, 108
Corpus albicans, 352
Corpus callosum, 107, 109, 112, 142, 144
cistern of, 110
dorsal vein of, 145, 147
genu of, 107–108, 111, 113, 147
imaging of, 151
imaging of, 151
posterior cerebral artery to, 143
rostrum of, 107, 142, 146
splenium of, 107–108, 111, 113, 116, 144–147
imaging of, 151
sulcus of, 107
trunk of, 107, 142
Corpus cavernosum, 344, 359, 361, 363
tunica albuginea of, 359, 363
Corpus luteum, 352
Corpus spongiosum, 344, 348, 359–361, 363
tunica albuginea of, 359, 363
Corpus striatum, 111, 142
Corrugator cutis ani muscle, 371–372
Corrugator supercilii muscle, 25, 124, 151
Corti
spiral ganglion of, 98
spiral organ of, 94, 98
Cortical lymph vessels, 316
Cortical radiate (interlobular) arteries, 312
lymph vessels along, 316
Costal cartilages, 183–184, 243, 404
fifth, 191, 213
first, 193, 238
second, 240
seventh, 195
sixth, 409
transverse section of, 324
Costal facet, 154
inferior, 154, 184
superior, 154, 184
transverse, 154, 184
Costal groove, 184
Costal impressions, 277
Costal lamella, 20
Costocervical trunk, 33, 137, 139, 170
Costochondral joints, 184
Costoclavicular ligament, 184, 404, 412
impression for, 404
Costocoracoid ligament, 412
Costocoracoid membrane, 412
Costodiaphragmatic recess, 193–195, 210, 214, 227–228, 309, 315
transverse section of, 324
Costomediastinal space, 195
Costotransverse joint, 238
Costotransverse ligament, 184
lateral, 184
superior, 184
Costoxiphoid ligament, 184
Cough receptors, 207
Cowper's gland, 249, 321, 344, 348, 361–363, 367
duct of, 361
primordium of, 367
Cranial base
foramina and canals of
inferior view of, 12
superior view of, 13
inferior view of, 10
nerves of, 55
superior view of, 11
vessels of, 55
Cranial fossa
anterior, 11
middle, 11
posterior, 11
arteries of, 144
veins of, 145
Cranial imaging, 150–151

Cranial mesonephric (Gartner's) duct, 367
Cranial mesonephric tubules, 367
Cranial nerves
motor and sensory distribution of, 119
nuclei of, in brainstem, 117–118
Cranial root
of accessory nerve, 128
of vagus nerve, 127
Craniocervical ligaments
external, 22
internal, 23
Cremaster fascia, 247, 365, 368
on spermatic cord, 256
Cremaster muscle, 247, 256, 365, 397
lateral origin, 246, 255
medial origin, 246, 255
on spermatic cord, 253, 256
Cremasteric arteries, 251, 256–257, 379
Cremasteric veins, 256, 379
Cribriform fascia
over saphenous opening, 252
within saphenous opening, 472
Cribriform plate, 8, 11, 36–39, 120
foramina of, 13
Crico-arytenoid muscle
lateral, 80, 82, 151
action of, 81
posterior, 67, 69, 80, 82, 151
action of, 81
Crico-esophageal tendon, 69
Cricoid cartilage, 15, 27–28, 64, 69–70, 76, 79–80, 82, 193, 203, 230–231
arch of, 79
arytenoid articular surface of, 79
lamina of, 79–80
prominence over, 66
Cricopharyngeus muscle, 65, 67, 69–70, 77–78, 82, 230
Cricothyroid artery, 72, 76
Cricothyroid joint, 79, 81
Cricothyroid ligament, 76, 79
median, 28, 70, 76, 79, 199
Cricothyroid muscle, 28, 70, 76, 80, 82, 127, 151
action of, 81
oblique part, 80
straight part, 80
Crista galli, 5, 8, 11, 38
Crista terminalis, 217, 222
Crown of tooth, 63
Cruciate ligaments, 23, 494, 496
anterior, 495–496, 501
attachment of, 495
posterior, 495–496, 501
attachment of, 495
Crura
of antihelix, 95
cerebral, 108, 114–115, 140, 146
of clitoris, 340, 348, 350, 356–357
of diaphragm, 176, 315
left, 229, 264
right, 229, 258, 264
transverse section of, 324–327
of fornix, 107, 111, 113, 144
of penis, 348, 359–361, 363
Crural artery
anterior, 96
posterior, 96
Crural fascia, 470, 510
Crux of helix, 95
Crypts of Lieberkühn, 275
Cubital fossa, 398
Cubital lymph nodes, 403
Cubital vein, median, 398, 401, 403
Cuboid bones, 511–512, 514, 523–524, 531
articular surface for, 513
tuberosity of, 515, 523
Cuboideonavicular ligament
dorsal, 514
plantar, 515
Culmen, 114, 116
Cuneate fasciculus, 115–116
Cuneate tubercle, 115–116
Cuneiform bones, 511–512, 523–524, 531
intermediate, 523–524
lateral, 523–524
medial, 514–515, 523–524
Cuneiform tubercle, 66–67, 80
Cuneocuboid ligament, dorsal, 514
Cuneonavicular ligaments
dorsal, 514
plantar, 515
Cuneus, 107
apex of, 108
Cupula of pleura, 76
parietal, 193–194, 227–228
Cuspid teeth. *See* Canine teeth
Cutaneous nerves
antebrachial
lateral, 400–402, 417, 421, 433–434, 436, 456, 459–460, 462
medial, 400–402, 415–416, 419, 421, 436, 456, 459–463
posterior, 400–402, 418, 421, 436, 455–456, 459, 465–466
of arm, 401
brachial
anterior, 410
inferior lateral, 400–401, 418, 465–466
medial, 253, 400–401, 415–416, 419, 421, 460–463
posterior, 401, 410, 418, 465–466
from posterior, 400
superior lateral, 174, 400–401, 410, 413, 418, 465–466
dorsal
intermediate, 529
lateral, 470–471, 517–518, 527–529
medial, 529
femoral
lateral, 253, 257, 262, 308, 387, 470–472, 483–485, 487–488, 492
posterior, 160, 174, 389, 391, 471, 484, 486, 489–490, 492, 527
of forearm, 402, 461–462
of hand, 459, 463–464
of head, 2
lateral
of forearm, 432
of thigh, 525
medial crural, 525
of neck, 2, 31
perforating, 389, 391, 471, 484, 486, 490
of shoulder, 401
sural
lateral, 470–471, 489, 503–504, 510, 527–529
medial, 471, 489, 503–504, 510, 527–528
of wrist, 459
Cuticle, 458
Cystic artery, 283–284
Cystic duct, 277, 280, 283–284
Cystic lymph nodes, 294
Cystohepatic (Calot's) triangle, 280, 284

D

Dartos fascia, 245, 344, 358–360, 365, 368, 373, 383
Darwin, auricular tubercle of, 95
Deciduous teeth, 62
Declive, 114, 116
Deep artery
of clitoris, 357, 382
of penis, 359, 363, 383
Deep cervical lymph nodes, inferior, 205, 235
Deep fascia, of leg, 470, 510
Deep (Buck's) fascia, of penis, 245–247, 321, 344, 358–361, 365, 373–374, 381, 383
intercavernous septum of, 359–360, 363
Deltoid muscle, 27, 29, 152, 171, 174, 178, 214, 238–240, 398, 404–406, 408–410, 412–413, 415, 417–419, 421, 460, 465, 467
Deltoid tuberosity, 405–406
Deltopectoral groove, 398
Deltopectoral lymph node, 403
Deltopectoral triangle, 409
Denonvilliers' fascia, 321, 339, 344, 362, 369, 374
Dens
apical ligament of, 23, 64–65
of atlas, 19
of axis, 7, 19, 21, 64
posterior articular facet of, 23
Dental plexus, inferior, 123
Dental pulp, 63
Dentate gyrus, 107, 109, 112–113, 120
Dentate line, 371
Dentate nucleus, of cerebellum, 116
Denticulate ligament, 165–166
Dentinal tubules of teeth, 63
Dentine of teeth, 63
Depressor anguli oris muscle, 25, 48, 124
Depressor labii inferioris muscle, 25, 48, 124, 151
Depressor septi nasi muscle, 25, 35, 124, 151
Dermatomes
levels of, 162
of lower limb, 469
schematic demarcation of, 162
of upper limb, 399
Descemet's membrane, 90
Descending artery
anterior, 215–216
posterior, 211, 215–216, 219
Descending pathway, 133
Diagonal conjugate, 332
Diaphragm, 187, 195, 203, 206, 208, 210, 214, 227–230, 232–234, 241, 249, 251, 258, 260, 266–267, 269, 277, 282, 306, 308–309, 315, 321, 328, 388, 485
abdominal surface of, 192
central tendon of, 191–192, 258
costal origin of, slips of, 187
costal part of, 192
crura of, 176, 315
left, 192, 229, 264
right, 192, 229, 258, 264
transverse section of, 324–327
dome of
left, 193–194
right, 193–194
lumbar part of, 192
pelvic, 369
female, 335–337, 340
inferior fascia of, 355–356, 360, 370
interior fascia of, 372
male, 338–339, 344
superior fascia of, 343, 346, 355, 370, 372
sternal part of, 187, 192
thoracic surface of, 191
transverse section of, 324
Diaphragmatic constriction, 230
Diaphragmatic fascia, 315
Diaphragmatic ligament, 367
Digastric fossa, 17
Digastric muscle, 27, 151
anterior belly of, 28–29, 31, 34, 43, 46, 50, 58, 70
innervation of, 119
mastoid notch for, 10

Digastric muscle *(Continued)*
phantom, 34
posterior belly of, 27–29, 34, 46–47, 50–51, 58–59, 67, 70, 75, 124
innervation of, 119
nerve to, 24
Digastric tendon, intermediate, 47, 59
fibrous loop for, 27–28, 58–59
Digital artery
dorsal, 456, 458, 508–509, 517, 523
palmar, 435
common, 435
proper, 435
proper, 453
Digital fibrous sheaths, 445
Digital nerves, dorsal, 402, 458, 466, 470, 507, 529
Digital veins, dorsal, 402, 470
Digits
extensors of, 427
flexors of, 429
Dilator pupillae muscle, 90, 122, 133, 151
Diploë, 9
Diploic veins, 101, 103
frontal, 101
occipital, 101
temporal
anterior, 101
posterior, 101
Direct vein, lateral, 146–147
Distal interphalangeal (DIP) joint, 398, 445
Distributing vein, 279
Dome of pleura, parietal, 193–194, 227–228
Dorsal artery
of clitoris, 357, 382
of penis, 359, 361, 383
deep, 379, 383
Dorsal nerve
of clitoris, 357, 391–392, 484
of penis, 359, 361, 383, 387–389, 394, 484, 490
Dorsal nucleus, of vagus nerve, 117
posterior, 118
Dorsal rami, 254
of cervical spinal nerves, 2, 22–24
of lumbar spinal nerves, 158, 174
of sacral spinal nerves, 174
of spinal nerves, 165–166
of thoracic spinal nerves, 174, 177, 250
Dorsal root ganglion, 129, 133, 166, 177, 188, 254, 300, 303–304, 306–307, 318, 395
Dorsal rootlets, of spinal nerves, 160
Dorsal vein
of clitoris, deep, 335–337, 340, 343, 346, 357
of corpus callosum, 145, 147
of penis
deep, 245, 339, 344, 359, 361, 379, 381
superficial, 245, 252, 329, 359, 381
Dorsal venous network, 402, 455
Dorsiflexion, of ankle, 469
Dorsum of foot, 518
Douglas, recto-uterine pouch of, 340, 342, 352, 369
Duct system, of liver, 278
Ductus arteriosus, 226
Ductus (vas) deferens, 249, 255–257, 259, 313, 344–345, 348, 362, 364–365, 367–369, 387, 394, 472
ampulla of, 362
artery to, 251, 259, 365, 376, 379, 381
inferior, 381
Ductus reuniens, 98
Ductus venosus, 226
Duodenal flexure
inferior, 272
superior, 272
Duodenal fold
inferior, 264, 271
superior, 264
Duodenal fossa
inferior, 264, 271
superior, 264
Duodenal impression, 277
Duodenal muscle fibers, 280
Duodenal papilla
major (of Vater), 272, 280
minor, 272, 280
Duodenojejunal flexure, 264, 271–272, 281, 315, 320
Duodenojejunal junction, 176
Duodenum, 127, 267–269, 271, 277–278, 281, 308, 313, 315, 320
arteries of, 284, 286
ascending part of, 264, 271–272
autonomic nerves of, 298–300
descending part of, 176, 264, 266, 271–272, 280
transverse section of, 326
inferior part of, 264, 271–272, 321
mucosa and musculature of, 272
in situ, 271
superior part of, 270–272
transverse section of, 325
suspensory muscle of, 264
transverse section of, 327
veins of, 289
Dura mater, 38, 95, 98, 102–103, 110, 120
arachnoid interface with, 103
endosteal layer, 103
meningeal layer, 101, 103
periosteal layer, 101
skull interface with, 101, 103
spinal, 160, 165–166, 170, 176
posterior intercostal artery branch to, 168
superior cerebral veins penetrating, 103
Dural sac, termination of, 160–161
Dural venous sinuses
sagittal section of, 104
superior view of, 105

E

Ear
ampulla of, 94, 98
bony and membranous labyrinths of, 97–98
orientation of, 99
external, 95
innervation of, 119
tympanic cavity of, 96
vestibule of, 94, 97–98
Edinger-Westphal nucleus, 117–118, 122, 133
Efferent ductules, 367–368
Efferent fibers, 117–118, 122–124, 126, 128–130
of autonomic reflex pathways, 304
to olfactory bulb, 120
Ejaculatory duct
beginning of, 362
opening of, 362–363, 367, 396
Elbow
bones of, 422
ligaments of, 424
radiographs of, 423
Elliptical recess, 97
Emissary vein, 13, 73, 101, 103
condylar, 170
mastoid, 3, 101, 170
in mastoid foramen, 12
occipital, 101
parietal, 3, 101
parietal foramen for, 9
to superior sagittal sinus, 13
Enamel of teeth, 63
Endolymphatic duct, 13, 97–99
Endolymphatic sac, 98
Endometrium, 352
Endopelvic fascia, female, 343
Enteric plexus, 304
Ependyma, 109
Epicolic lymph nodes, 296
Epicondyles
of femur
lateral, 476, 480, 497
medial, 476, 488–489, 493–494, 496–497
of humerus
lateral, 405–406, 417–418, 422–424, 426, 428–429, 431, 434, 466
medial, 405–406, 417–419, 422–424, 426–434, 464–465
Epicranial aponeurosis, 3, 25, 103, 175
Epicranius muscle, occipital belly of, 151
Epididymal duct, 368
Epididymis, 364, 368, 394
appendix of, 365, 367
body of, 365, 368
head of, 365, 368
sinus of, 368
tail of, 368
Epidural hematoma, site of, 101, 103
Epidural space, fat in, 166
Epigastric artery
inferior, 245, 247, 249, 251, 255–257, 259, 268, 314, 341, 343, 345, 376, 378–379, 381, 499
cremasteric branch of, 247, 249, 259
pubic branch of, 247, 249, 255, 259, 343, 345
transverse section of, 328
superficial, 186, 208, 245, 247, 251, 259, 487, 499
superior, 185, 187–188, 247, 251
Epigastric lymph nodes, inferior, 261
Epigastric region, 244
Epigastric veins
inferior, 245, 247, 249, 252, 255–257, 260, 268, 341, 345, 378–379, 381
pubic branch of, 255
transverse section of, 328
superficial, 186, 242, 245, 252, 260, 329, 470, 487
superior, 187, 189, 247, 252
Epiglottis, 15, 60, 64, 66–69, 78–80, 82, 136, 230
Epiphysis, 458
nutrient branches to, 458
Episcleral artery, 92
Episcleral space, 85, 89
Episcleral vein, 92–93
segment of, 93
Epithelial tag, 366
Epithelium, gingival, 63
Epitympanic recess, 94–95
Eponychium, 458
Epoöphoron, 352, 367
Erector spinae muscles, 152, 171–173, 176–177, 188, 238, 254, 309
transverse section of, 324, 328
Esophageal artery, 204
Esophageal hiatus, 192, 264
Esophageal impression, 277
Esophageal mucosa, 69, 232
Esophageal muscles, 64, 199
circular, 65, 67, 69
in V-shaped area of Laimer, 69, 77
longitudinal, 65, 67, 69, 77
attachment of, 69
cricoid attachment of, 65, 67
Esophageal plexus, 127, 203, 206, 213, 227–229, 234, 236, 300
nerve branches to, 236
sympathetic branch to, 206

Esophageal prominence, 212
Esophageal sphincter, inferior, 230
Esophageal submucosa, 69, 232
Esophageal veins, 292
Esophagogastric junction, 214, 232
  transverse section of, 324
Esophagus, 26, 64, 66, 70, 78, 80, 127, 191, 203–204, 213–214, 227–228, 232–234, 236, 238–241, 258, 260, 264, 268, 302, 308, 310, 321
  abdominal part of, 230, 233, 269
  arteries of, 233
  inferior phrenic artery recurrent branch to, 259
  longitudinal muscle of, 270
  lung area for
    left, 196
    right, 196
  lung groove for
    left, 196
    right, 196
  lymph vessels and nodes of, 235
  musculature of, 231
  nerves of, 236
  in situ, 229
  topography and constrictions of, 230
  veins of, 234
  zone of sparse muscle fibers, 69–70
Ethmoidal air cells, 43–44, 85
  anterior
    of newborn, 45
    openings of, 36–37
  middle
    of newborn, 45
    openings of, 36–37
  posterior
    of newborn, 45
    opening of, 36–37
Ethmoidal artery
  anterior, 13, 87
    anterior lateral nasal branch of, 40
    anterior meningeal branch of, 102
    anterior septal branch of, 40
    external nasal branch of, 40
  posterior, 13, 87, 102
    septal and lateral nasal branches of, 40
Ethmoidal bone, 4, 6, 8, 11
  anterior ethmoidal foramen of, 14
  cribriform plate of, 8, 11, 36–38, 120
  crista galli of, 8, 11, 38
  nasal concha of
    highest, 37
    middle, 4, 8, 37
    superior, 8, 37
  orbital plate of, 4, 6, 14
  perpendicular plate of, 4, 8, 38
  uncinate process of, 36–37, 44
    of newborn, 45
Ethmoidal bulla, 36–37
Ethmoidal foramen
  anterior, 4, 13–14
  posterior, 4, 13
Ethmoidal nerve (V_1)
  anterior, 13, 52, 88, 122–123
    external nasal branches of, 2, 39, 41, 52, 123
    internal nasal branches of, 123
    lateral internal nasal branch of, 39, 41
    medial internal nasal branch of, 39, 41
  posterior, 13, 52, 88, 122–123
Ethmoidal process, of inferior nasal concha, 37
Ethmoidal vein
  anterior, 13
  posterior, 13
Eustachian tube. *See* Pharyngotympanic (auditory, eustachian) tube
Eversion, of foot, 469
Extension
  of hip, 469
  of knee, 469, 494
Extensor carpi radialis brevis muscle, 398, 418, 427, 430–431, 436–438, 465–467
Extensor carpi radialis brevis tendon, 430–431, 436, 454, 456–457
Extensor carpi radialis longus muscle, 398, 405, 418, 421, 427, 430–431, 436–438, 465–467
  groove for, 425
Extensor carpi radialis longus tendon, 430–431, 436, 454, 456–457
Extensor carpi ulnaris muscle, 398, 427, 430, 436–438, 465–467
Extensor carpi ulnaris tendon, 430–431, 436, 456–457
Extensor digiti minimi muscles, 427, 430, 436–438, 466–467
Extensor digiti minimi tendon, 427, 430–431, 456–457
Extensor digitorum brevis muscle, 506, 508, 516–518, 529, 531
Extensor digitorum brevis tendon, 507–508, 518, 523
Extensor digitorum longus muscle, 506–508, 510, 516–518, 529, 531
Extensor digitorum longus tendon, 468, 481, 494, 502, 506–508, 517–518, 523
  tendinous sheath of, 517
Extensor digitorum muscle, 418, 427, 430, 436–438, 465–467
Extensor digitorum tendon, 398, 427, 430–431, 436, 456–457
Extensor expansion system, 448, 451–452, 457, 517–518, 523
Extensor hallucis brevis muscle, 508, 517–518, 529, 531
Extensor hallucis brevis tendon, 507–508, 518, 523
Extensor hallucis longus muscle, 506–508, 510, 518, 529, 531
Extensor hallucis longus tendon, 468, 502, 506–508, 517–518, 523
  tendinous sheath of, 516–517
Extensor indicis muscle, 427, 431, 436, 438, 466–467
Extensor indicis tendon, 398, 430, 436, 456–457
Extensor pollicis brevis muscle, 431, 438, 466–467
  radial area for, 425
Extensor pollicis brevis tendon, 430, 434, 436, 454, 456–457
Extensor pollicis longus muscle, 431, 436, 438, 466–467
  radial area for, 425
Extensor pollicis longus tendon, 398, 430, 450, 454, 456–457
Extensor retinaculum, 402, 430–433, 454–457
  inferior, 506–507, 516–517, 529
  superior, 506–507, 516–517
Extensor tendons, 450–451
  common, 405, 427, 430–431, 437
  in fingers, 451
  long, 451
  at wrist, 457
External capsule, 111
External jugular vein, 1
External occipital protuberance (inion), 6, 8, 10, 16, 152
External os, 352
Extrahepatic bile ducts, 280
Extraperitoneal fascia, 7, 176, 245, 256–257, 390
Extraperitoneal space, 370
Extreme capsule, 111
Eye
  anterior chamber of, 83, 89–92
    endothelium of, 90
  innervation of, 119, 163–164
  intrinsic arteries and veins of, 92
  posterior chamber of, 83, 89–92
  vascular supply of, 93
Eye muscle, extrinsic, 86, 92
Eyeball, 43, 89
  fascia of, 85
  fascial sheath of, 85, 89
Eyelashes (cilia), 83
Eyelids, 83
  arteries and veins of, 87
  tarsus of, 85

F

Face
  arterial supply sources of, 3
  muscles of, 124
    innervation of, 119
  superficial arteries and veins of, 3
Facial artery, 3, 31, 34–35, 42, 46–47, 51, 72–73, 77, 87, 132, 134, 137, 139
  inferior labial branch of, 35
  lateral nasal branch of, alar branches of, 3
  superior labial branch of, 35
    nasal septal branch of, 40
  tonsillar branch of, 68
  transverse, 3, 34–35, 46, 72, 87
Facial canal, 125
  prominence of, 95
Facial colliculus, 116
Facial expression muscles, 25, 47
Facial lymph nodes, 74
Facial nerve (VII), 13, 34, 42, 47, 50–51, 53, 55, 71, 94, 96, 99, 105, 115, 118, 123–124, 132, 135–136
  branches of, 24, 46, 164
  buccal branches of, 24
  cervical branch of, 24
  communication to, 126
  distribution of, 119
  geniculum of, 50, 53, 99, 117, 125–126, 132
  intermediate nerve (of Wrisberg), 61, 105, 115, 124–125, 132, 134, 136
    distribution of, 119
  internal genu of, 118
  marginal mandibular branch of, 24, 31
  motor nucleus of, 124–125
  schema of, 124
  stylomastoid foramen and, 12, 24
  temporal branches of, 24
  trunk of, 24
  zygomatic branches of, 24
Facial (intermediate) nerve (VIII), chorda tympani of, 12
Facial nucleus, 117–118
Facial plexus, 132
Facial vein, 3, 31–32, 42, 46–47, 59, 73, 87
  common, 3, 32
  common trunk for, 46, 59, 73
  deep, 3, 73, 87
  transverse, 3, 73
Falciform ligament, 7, 249, 263, 268–269, 277
  of liver, 251, 292
Fallopian tube. *See* Uterine (fallopian) tube
False cords. *See* Ventricular folds
False pelvis, 334, 341
False ribs, 183
Falx cerebelli, 104, 145
Falx cerebri, 38, 43, 103–105, 142, 145
Fascia
  of hand, 450
  of legs, 510
  of orbit and eyeball, 85

Fascia lata, 245–246, 385, 470, 472, 487, 492
Scarpa's layer attachment to, 245
of thigh, 350, 355, 358–359
Fascial ligaments, of uterus, 351
Fascial sheath, 85, 89, 450
Fasciculus
cuneate, 115–116
gracile, 115–116
longitudinal
dorsal, 148
medial, 114, 116
mammillothalamic, 107
Fat tissue, 179, 397
Fauces, 68
Femoral artery, 247, 251, 256, 259, 358, 379, 385, 396–397, 472, 480, 487–488, 492, 499, 509, 530
deep, 397
in femoral sheath, 257
lateral circumflex, 487–488, 491, 499
medial circumflex, 488–489, 491, 499
muscular branches of, 499
opening for, 258
perforating branches of, 499
Femoral canal, 472
lymph nodes in, 257
Femoral cutaneous nerves
lateral, 253, 257, 262, 308, 387, 525–526
posterior, 160, 174, 389, 527
perineal branch of, 391, 527
Femoral nerve, 160, 249, 255, 262, 385, 387, 396–397, 472, 483–485, 487–488, 525–526
anterior cutaneous branches of, 387, 470, 525
branches of, 492
deep to iliopsoas fascia, 257
of thigh, 525
Femoral ring, 255, 257, 341, 343, 345, 472
Femoral sheath, 246–247, 249, 257, 472, 487
femoral vessels in, 257
Femoral vein, 246–247, 252, 256, 260, 358, 379, 385, 396–397, 470, 472, 480, 487–488, 492, 530
in femoral sheath, 257
opening for, 258
Femur, 476, 492, 494, 498
adductor tubercle of, 476
condyles of
lateral, 476, 494–497
medial, 476, 494–497
epicondyles of
lateral, 476, 480, 497
medial, 476, 488–489, 493–494, 496–497
gluteal tuberosity, 476
head of, 396, 474–476, 530
arteries of, 491
ligament of, 474, 476
radiograph of, 331
intercondylar fossa of, 476
intertrochanteric crest of, 476
intertrochanteric line of, 476
lateral supracondylar line of, 476
ligaments of, 491
linea aspera of, 476
neck of, 396–397, 474–476
arteries of, 491
nutrient artery of, 491
nutrient foramen of, 476
patellar surface of, 476
pectineal line of, 476
popliteal surface of, 476, 498
quadrate tubercle of, 476
radiograph of, 331, 475, 497, 530
retinacular foramina of, 476
shaft of, 476
Femur *(Continued)*
trochanter of, 475
greater, 152, 243, 330, 468, 474, 476, 479–480, 483, 489–490, 530
lesser, 243, 258, 330, 474–476, 530
radiograph of, 331
trochanteric fossa of, 476
Fibroelastic membranes, of esophagus, 231
Fibromuscular stroma, 362
Fibrous appendix, of liver, 277
Fibrous capsule, 282, 315
Fibrous pericardium, 195, 208, 212, 227–228
Fibrous septum, 372
transverse, 371–373
Fibrous sheath, 450, 453, 458, 521
Fibrous tendon, 458
Fibrous trabecula, 148
Fibrous trigone
left, 219
right, 219
Fibula, 497, 500–501, 506–507, 513–514, 517–518
anterior border of, 500–501
anterior ligament of, 501
apex of, 500–501
head of, 479–481, 493–494, 496–498, 500–501, 504–508, 529
anterior ligament of, 501
posterior ligament of, 498
interosseous border of, 500–501
interosseous membrane of, 501
lateral malleolus of, 468, 500–501, 503–508, 517–518, 531
lateral surface of, 500–501
medial surface of, 500
neck of, 497, 500
posterior ligament of, 501
radiographs of, 497, 531
Fibula bursa, lateral malleolus of, 516
Fibular artery, 499, 503–505, 509–510, 521
calcaneal branches of, 503–505
communicating branch of, 505
perforating branch of, 505, 508, 517–518
posterior lateral malleolar branch of, 505
Fibular nerve, 529
common, 482, 484, 486, 489, 492–494, 497, 503–508, 527–529
articular branch of, 527–529
sural communicating branch of, 527
deep, 508, 510, 517–518, 529
dorsal digital branch of, 470, 507–508, 517–518
lateral branch of, 508, 517–518, 529
medial branch of, 507–508, 517–518, 529
recurrent branch of, 508
superficial, 470, 506–508, 510, 517–518, 527, 529
dorsal digital branches of, 517–518
intermediate dorsal cutaneous branch of, 470
medial dorsal cutaneous branch of, 470
Fibular notch, 500
Fibular retinaculum
inferior, 505–506, 514, 516
superior, 503–506, 514, 516
Fibular veins, 510
Fibularis (peroneus) brevis muscle, 506–508, 510, 516–518, 529, 531
Fibularis brevis tendon, 468, 502–506, 508, 514–518, 522–523
common tendinous sheath of, 516
Fibularis (peroneus) longus muscle, 468, 481, 493–494, 502–504, 506–508, 510, 516, 529, 531
Fibularis longus tendon, 468, 504–506, 508, 514–518, 522–523
common tendinous sheath of, 516
Fibularis (peroneus) tertius muscle, 502, 531
Fibularis tertius tendon, 506–507, 516–518, 523
Filiform papillae, 60
Filum terminale externum, 160, 166
Fimbriae, 111
of fallopian tube, 352–353
of hippocampus, 107, 109, 112–113, 120
Fimbriated fold, 56
Fingers, 458
anterior closed space of, 458
areolar tissue in, 458
arteries of, 458
articular cavity of, 458
cross section through, 458
dorsum of, lymph vessels passing to, 403
in extension, 451
extensor tendons in, 451
fibrous septa in, 458
fibrous tendon sheath of, 458
fine nerves of, 458
in flexion, 451
flexor tendons in, 451
minute arteries of, 458
nerves of, 458
posterior view of, 451
subungual space of, 458
tendon sheaths of, 448
Flank
left, 244
right, 244
Flexion
of hip, 469
of knee, 469
Flexor carpi radialis muscle, 417, 419, 428, 432, 434, 436–437, 460, 463, 467
Flexor carpi radialis tendon, 398, 433–434, 436, 441, 447, 449–450, 460
Flexor carpi ulnaris muscle, 398, 418, 430–434, 436–438, 460, 464, 467
Flexor carpi ulnaris tendon, 398, 434, 436, 441, 447, 449, 452
Flexor digiti minimi brevis muscle, 449, 452, 464, 467, 520–523, 528, 531
Flexor digiti minimi brevis tendon, 515
Flexor digitorum brevis muscle, 516, 520–522, 528, 531
Flexor digitorum brevis tendon, 515, 520–522
Flexor digitorum longus muscle, 502, 505, 510, 528, 531
Flexor digitorum longus tendon, 503–505, 515, 520–522
tendinous sheath of, 516
Flexor digitorum profundus muscle, 429, 434, 436–438, 460, 463–464, 467
Flexor digitorum profundus tendon, 429, 436, 445, 447–451, 458
Flexor digitorum superficialis muscles, 429, 432–434, 436–437, 460, 463, 467
Flexor digitorum superficialis tendons, 398, 405, 429, 432, 436, 441, 445, 447–451, 458, 460
Flexor hallucis brevis muscle, 520–523, 528, 531
Flexor hallucis brevis tendon, 523
Flexor hallucis longus muscle, 502, 505, 510, 528, 531
Flexor hallucis longus tendon, 503–505, 515, 520–523
groove for, 513
tendinous sheath of, 516
Flexor muscles, superficial, 432
Flexor pollicis brevis muscle, 449, 452–453, 463–464, 467

Flexor pollicis longus muscle, 405, 429, 433–434, 436–437, 447, 460, 463, 467
tendinous sheath of, 448, 450
Flexor pollicis longus tendon, 434, 436, 441, 449–450
Flexor retinaculum, 433, 441, 447, 449–450, 452–453, 460, 503–505, 516, 521–522, 528
Flexor sheath, common, 447–450, 453
Flexor tendon, 450, 453
common, 405–406, 428–429, 432, 437–438
fibrous sheaths of, 520
in fingers, 451
at wrist, 449
Flexor tendon sheath, 447
Floating ribs, 183
Flocculonodular lobe, 114
Flocculus, 114–115
Folds of iris, 90
Foliate papillae, 60, 136
Folium, 114, 116
Follicle (graafian), 352
Fontanelle
anterior, 14
posterior, 14
Foot
arteries of, 509
bones of, 511–512
deep arteries, 523
dorsum of, 518
muscles of, 517
eversion of, 469
interosseous muscles of, 523–524
inversion of, 469
ligaments of, 515
muscles of sole of
first layer, 520
second layer, 521
third layer, 522
plantar surface of, 468
sole of, 519
tendons of, 515
Foramen
interventricular (of Monro), 107, 109–110, 112, 116, 146–147
of Luschka, 109–110
of Magendie, 109–110, 116, 118
Foramen cecum, 11, 13, 60, 64
Foramen lacerum, 10, 13, 100
recurrent artery of, 138
Foramen magnum, 8, 10, 12–13, 100, 128
Foramen ovale, 6, 10, 12–13, 16, 49–50, 100, 226
branch to, 138
valve of, 218
Foramen rotundum, 5, 13, 52
branch to, 138
maxillary nerve entering, 53
Foramen spinosum, 10, 13, 16, 50, 100
accessory, 12
branch to, 138
Foramen transversarium, 20–21
bony spicule dividing, 20
septated, 20
Forearm
arteries of, 435
bones of, 425
cutaneous nerves of, 402, 461–462
muscles of
attachments of, 437–438
deep layer, 431, 434
extensors of wrist and digits, 427
flexors of digits, 429
flexors of wrist, 428
intermediate layer, 433
rotators of radius, 426
superficial layer, 430, 432
Forearm *(Continued)*
proximal, arteries of, 420
radial nerve in, 466
serial cross sections of, 436
superficial veins of, 402
Fornix, 107, 113, 148
anterior, 351
body of, 107, 109, 113, 116
columns of, 107, 111–113, 146
commissure of, 113
conjunctival
inferior, 83
superior, 83
crus of, 107, 111, 113, 144
imaging of, 151
vaginal, 352
anterior, 340
posterior, 340
Fossa ovalis, 214, 217, 226, 470
limbus of, 217
Fovea, inferior, 116
Fovea capitis, 530
Fovea centralis in macula, 89, 92
Free taenia, 265, 273–274, 276, 369, 372
Frenulum, 274
artery to, 59
of clitoris, 354
of labia minora, 354
of lower lip, 56
of penis, 360
of tongue, 46, 56
of upper lip, 56
Frontal artery, 3
polar, 142–143
Frontal bone, 1, 4, 6, 8–11, 35, 37, 83–84
foramen cecum of, 11
frontal crest of, 11
glabella of, 4, 6
groove for anterior meningeal vessels, 11
groove for superior sagittal sinus of, 11
growth of, 45
lateral view of, 14
nasal spine of, 37–38
of newborn, 14
orbital surface, 4
sinus of, 8, 37–38
squamous part of, 14, 37–38
superior surface of orbital part, 11
superior view of, 14
supra-orbital notch of, 4, 6
Frontal crest, 9, 11
Frontal gyrus
inferior
opercular part of, 106
orbital part of, 106
triangular part of, 106
medial, 107
middle, 106
superior, 106
Frontal (anterior) horn, 109
Frontal lobe, 106
Frontal nerve, 13, 52, 85, 88, 122–123, 132
Frontal operculum, 106
Frontal pole, 106, 108
Frontal sinus, 7, 36–38, 43–44, 64
growth of, 45
Frontal sulcus
inferior, 106
superior, 106
Frontal (metopic) suture, 14
Frontal vein, 3
Frontobasal artery
lateral, 140, 142–143
medial, 138, 140, 142–143
Frontonasal canal
infundibulum leading to, 37
opening of, 37
Frontonasal duct, 36
opening of, 44
Fundiform ligament, 245, 255, 344
Fundus
of gallbladder, axial CT images of, 323
of stomach, 230, 232, 269–270
transverse section of, 324
of urinary bladder, 344, 346, 348
of uterus, 340, 342, 346, 352
sagittal CT images of, 375
Fungiform papilla, 60, 136
Funiculus, lateral, 116

G

Galen, great cerebral veins of, 104–105, 107, 116, 145–147
imaging of, 150
Gallaudet's fascia, 344, 348, 350, 355–356, 359–361, 369
Gallbladder, 127, 193, 263, 266, 269, 277–278, 280–281, 284
axial CT images of, 322
fundus of, axial CT images of, 323
innervation of, 163–164
transverse section of, 325
Ganglion, of trigeminal nerve, 117–118, 132
Ganglion cells, 121
Gartner's duct, 367
Gasserian ganglion, 105, 117–118
Gastric artery
left, 233, 259, 266, 268, 283–284, 297–300, 388
arteriogram of, 285
esophageal branch of, 233, 236, 283
right, 272, 280, 283–284, 298–300
arteriogram of, 285
short, 268, 282–284, 300
Gastric canal, longitudinal folds of, 270
Gastric folds (rugae), 232, 270
transverse section of, 324
Gastric impression, 277, 282
Gastric lymph nodes, 235, 293–294
Gastric plexus, 388
left, 297–299
right, 298–299
Gastric veins
left, 234, 289–292
esophageal tributary of, 289
right, 234, 289–290, 292
short, 234, 268, 282, 289, 292
Gastrocnemius muscle, 478, 481, 489, 493–494, 502–508, 510, 527–528, 531
lateral head of, 468, 482, 497–498, 503
lateral subtendinous bursa of, 498
medial head of, 468, 482, 497–498, 503
Gastrocolic ligament, 266
anterior layers of, 266
posterior layers of, 266
Gastroduodenal artery, 272, 280, 283–284, 286–287, 300–301, 306
arteriogram of, 285
plexus on, 299
Gastroduodenal plexus, 301, 306
Gastro-omental (gastro-epiploic) artery, 268, 282
anastomosis of, 266
left, 283–284, 289, 292, 300
plexus on, 298–299
right, 266, 283–284, 286–287, 289, 292, 300
Gastro-omental (gastro-epiploic) lymph nodes, 293
Gastro-omental (gastro-epiploic) vein, 268, 282
left, 234
right, 234, 289, 291
Gastropancreatic fold, 266

Gastrophrenic ligament, 266, 268, 308
Gastrosplenic (gastrolienal) ligament, 266–267, 282
Gemellus muscle, 530
  inferior, 396–397, 477–478, 482, 489–490, 531
    nerve to, 490
  superior, 477–478, 482, 489–490, 531
    nerve to, 484, 489
Genial tubercle, 58
Genicular artery
  descending, 487–488, 492, 499, 509
  inferior
    lateral, 499, 504–509
    medial, 488, 499, 504–505, 507–509
  middle, 499, 509
  superior
    lateral, 489, 499, 503–509
    medial, 487–489, 499, 503–505, 507–509
Geniculate body
  lateral, 108, 111–112, 115–117, 121, 133, 140, 144–146
  medial, 108, 111–112, 115–116, 140, 144–146
Geniculate ganglion, 50, 53, 96, 99, 117, 124–126, 132, 136
Geniculate nucleus, dorsal lateral
  left, 121
  right, 121
Geniculum, of facial nerve, 50, 53, 99, 117, 125–126, 132
Genioglossus muscle, 43, 47, 59, 64, 129, 151
  superior mental spine for origin of, 58
Geniohyoid fascia, 26
Geniohyoid muscle, 26, 43, 58–59, 64, 129–130, 151
  communication with cervical plexus, 33
Genital cord, 367
Genital tubercle
  anal pit of, 366
  anal tubercle of, 366
  epithelial tag of, 366
  glans area of, 366
  lateral part of, 366
  urogenital fold of, 366
Genitalia
  external
    female, 354
    homologues of, 366
    innervation of, 163–164
    male, 358–359
  internal, homologues of, 367
  lymph vessels and nodes of
    female, 384
    male, 386
  nerves of
    female, 391
    male, 387
Genitofemoral nerve, 257, 262, 308, 313, 387, 483, 485, 526
  femoral branches of, 253, 257, 262, 387, 470, 484–485
  genital branch of, 253, 255–257, 262, 365, 387, 470, 484–485
  nerves to, 484
  transverse section of, 328
Genu
  of corpus callosum, 107–108, 111, 113, 147
    imaging of, 151
  internal, of facial nerve, 118
  of internal capsule, 111
Gerdy's tubercle, 481, 494, 496, 500–501
Gerota's fascia. *See* Renal (Gerota's) fascia
GI tract, innervation of, 119
Gimbernat's (lacunar) ligament, 246–247, 249, 255, 257–258, 472
Gingiva, lamina propria of, 63
Gingival epithelium, 63
Gingival groove, 63
Glabella, 1, 4, 6
Gland lobules, 179
Gland orifices, 280
Glans, of clitoris, 354, 366
Glans penis, 329, 344, 360, 363, 366
  corona of, 360
  neck of, 360
Glenohumeral joint, 408, 467
  capsule of, 418
Glenohumeral ligament
  inferior, 408
  middle, 408
  superior, 408
Glenoid cavity, of scapula, 183, 405, 407–408, 467
Glenoid labrum, 408, 467
Globus pallidus, 109, 111
Glomerulus, 120
Glossoepiglottic fold
  lateral, 60
  median, 60
Glossoepiglottic ligament, median, 80
Glossopharyngeal nerve (IX), 34, 42, 55, 61, 71–72, 105, 115, 117–118, 124, 126–127, 131–132, 134–136, 207
  branch of, 164
  carotid branch of, 34, 127, 132
  in carotid sheath, 47
  carotid sinus branch (of Hering), 71, 126, 131
  distribution of, 119
  inferior, 13
  inferior (petrosal) ganglion of, 55, 96, 126, 135–136, 207
  in jugular fossa, 12
  lesser petrosal nerve from, 123
  lingual branches of, 61, 126
  pharyngeal branches of, 126
  schema of, 126
  superior ganglion of, 126
  tonsillar branches of, 61, 68, 71, 126
  tympanic branch of, 12
Gluteal aponeurosis, 309, 481–482, 489
  over gluteus medius muscle, 250
Gluteal artery
  inferior, 259, 314, 376, 380–381, 486, 489
  superior, 259, 314, 376, 380–381, 486, 489
Gluteal fold, 152, 468
Gluteal lines
  anterior, 334, 473
  inferior, 334, 473
  posterior, 334, 473
Gluteal nerves
  inferior, 160, 484, 486, 489–490
  superior, 160, 484, 486, 489–490
Gluteal vein, superior, 260, 291
Gluteus maximus muscle, 152, 171, 174, 250, 309, 339, 356, 359–360, 373–374, 388–389, 391, 396, 468, 478, 481–482, 489–490, 492, 530–531
Gluteus medius muscle, 152, 309, 396–397, 468, 478–479, 482–483, 487–490, 530–531
  gluteal aponeurosis over, 250
Gluteus minimus muscle, 477, 482–483, 487–490, 531
Gluteus minimus tendon, 396
Gonads, 364, 367
Graafian follicle, 352
Gracile fasciculus, 115–116
Gracile tubercle, 115–116
Gracilis muscle, 477, 480, 482, 487–489, 492–493, 497, 502–503, 526, 531
Gracilis tendon, 468, 477, 479–480, 493–494
Granular foveolae, 9, 101, 103
Granule cell, 120
Gray matter
  imaging of, 151
  intermediolateral nucleus of, preganglionic sympathetic cell bodies in, 53, 133–135
  lateral horn of, 165–166, 319
  of spinal nerves, 165
Gray rami communicantes, 131, 133–135, 163, 166, 177, 188, 206, 224–225, 227–228, 236, 254, 262, 297, 300, 303–304, 317–318, 388, 390, 393–395, 485–486
  of spinal nerves, 165
  to and from sympathetic trunk, 165
Great auricular nerve, 2
Great cardiac vein, 215
Great cerebral veins (of Galen), 104–105, 107, 116, 145–147
  imaging of, 150
Great toe
  dorsal digital nerve and vein of, 470
  phalanx of, 515, 524
Great vessels
  pericardium at site of reflection from, 209
  of superior mediastinum, 203
Greater occipital nerve, 2
Groin
  left, 244
  right, 244
Gubernaculum, 364, 367
Gyrus
  angular, 106
    branch to, 142–143
  cingulate, 107
    isthmus of, 107
  dentate, 107, 109, 113, 120
  frontal
    inferior, 106
    medial, 107
    middle, 106
    superior, 106
  lingual, 107
  long, 106
  occipitotemporal
    lateral, 107–108
    medial, 107–108
  orbital, 108
  parahippocampal, 107–109, 120
  postcentral, 106
  precentral, 106
  straight, 108
  subcallosal, 107
  supramarginal, 106
  temporal
    inferior, 106, 108
    middle, 106
    superior, 106

H

Habenula, 111
Habenular commissure, 107, 112, 116
Habenular trigone, 112, 116
Hair cells
  inner, 98
  outer, 98
Hamate, 440, 442–443, 449
  hook of, 428, 434, 439, 441, 443–445, 453
  radiographs of, 444
Hand
  arteries of, 453
  bones of, 443
  bursae of, 450
  cutaneous nerves of, 459, 463–464
  deep dorsal dissection of, 456
  dorsum of, lymph vessels passing to, 403
  fascia of, 450
  intrinsic muscles of, 452
  nerves of, 453

Hand *(Continued)*
palmar dissections
deeper, 447
superficial, 446
radiographs of, 444
spaces of, 450
superficial dorsal dissection of, 455
superficial radial dissection of, 454
tendon sheaths of, 450
Handle of malleus, 95–96
Hard palate, 64, 68
Hasner's valve, 84
Haustra, 273, 276
Head
autonomic nerves in, 132
bony framework of, 15
cutaneous nerves of, 2
lymph vessels and nodes of, 74
of malleus, 95
skin of, 103
surface anatomy of, 1
Heart, 127, 230
anterior exposure of, 209
apex of, 209, 211, 241
base and diaphragmatic surface of, 211
conducting system of, 222
coronal section of, 214
diaphragmatic surface of, 215
fibrous skeleton of, 219–220
inferior border (acute margin) of, 209
innervation of, 119, 163–164
left border (obtuse margin) of, 193, 209
nerves of, 223–224
radiography of, 156
radiology and auscultation of, 210
right border of, 193
in situ, 208
sternocostal surface of, 215
Heart valves, 219–220
aortic, 210, 214, 218–222
mitral, 210, 213–214, 218–222, 241
pulmonary, 217, 219, 222
pulmonic, 210
tricuspid, 210, 213–214, 217, 219–222, 241
Helicotrema, 94, 97–98
Helix, 1, 95
crux of, 95
Hemi-azygos vein, 189, 191, 213, 234
accessory, 189, 204, 228, 234, 240
Hepatic artery, 278, 280, 283–284
branch of, 279
common, 259, 266, 272, 280–281, 283–284, 286–287, 297, 300, 306
arteriogram of, 285
intermediate, 284
proper, 267–268, 271–272, 277–278, 280–281, 283–284, 286, 300, 321
arteriogram of, 285
transverse section of, 325
Hepatic ducts, 280
common, 277–278, 280–281, 284
Hepatic lymph nodes, 293–294
Hepatic plexus, 298–299, 301, 306
common, 297
pyloric branch from, 127
vagal branch from, 298
vagal branch to, 236
Hepatic portal veins, 214, 226, 234, 267, 271–272, 277–278, 281, 283–284, 289–291, 294, 321
tributaries of, 292
Hepatic veins, 226, 234, 260, 268, 277–278
Hepatoduodenal ligament, 266–267, 269, 278
transverse section of, 325
Hepatogastric ligaments, 267, 269, 278
Hepatopancreatic ampulla (of Vater), 280
sphincter of, 280, 306
Hering-Breuer reflex, 207
Hesselbach's inguinal triangle, 249, 255
transversalis fascia within, 255
Heubner, recurrent artery of, 138, 140–143
Hilar lymph nodes, 196, 205, 227–228
Hilum, 196, 282, 311
of lungs
left, 209
right, 209
Hip
arthrogram of, 530
extension of, 469
flexion of, 469
magnetic resonance imaging of, 530
muscles of
attachments of, 477–478
lateral view, 481
posterior views, 482
nerves of, 490
radiograph of, 530
Hip (coxal) bone, 473
Hip joint, 474
anteroposterior radiograph, 475
articular branch to, 490
ligaments of, 479–480
Hippocampal sulcus, 113
Hippocampus, 111–113
alveus of, 113
fimbria of, 107, 109, 112–113, 120
Hook of hamate, 428, 434, 439, 441, 443, 445, 453
radiographs of, 444
Horizontal cells, 121
Horizontal fissure, 114
of lungs, right, 193–196
Horizontal plate, 8, 10, 16, 36–38, 57, 62, 100
Humeral artery
anterior circumflex, 413–415, 417, 419–420
posterior circumflex, 413–415, 418–420
Humeral ligament, transverse, 408
Humeral lymph nodes, 181–182
Humeral vein, posterior circumflex, superficial branches of, 401
Humerus, 419, 421, 429
anatomical neck of, 405–407
anterior view of, 405
anteroposterior radiograph of, 407
capitulum of, 405, 422–423
coronoid fossa of, 405, 422
deltoid tuberosity of, 405–406
epicondyles of
lateral, 405–406, 417–418, 422–424, 426, 428–429, 431, 434, 466
medial, 405–406, 417–419, 422–424, 426–434, 464–465
greater tubercle of, 405–407, 413, 417, 467
crest of, 405
head of, 405–407, 467
intertubercular sulcus, 405
lateral supracondylar ridge, 405–406
lesser tubercle of, 405–407, 417
crest of, 405
medial supracondylar ridge, 405–406, 422
olecranon fossa of, 406, 422–423
posterior view of, 406
radial fossa of, 405
radial groove of, 406
shaft of, 238–240
surgical neck of, 238, 405–407, 467
trochlea of, 405–406, 422–423
ulnar nerve groove, 406, 422
Hyaloid canal, 89
Hydatid of Morgagni, 352
Hymenal caruncle, 350, 354
Hyo-epiglottic ligament, 64, 79
Hyoglossus muscle, 28–29, 34, 58–59, 68, 70, 73, 129, 151
origin of, 58
Hyoid bone, 15, 27–29, 31, 34, 46–47, 59, 64, 67, 70, 76, 78–79, 82
body of, 15, 58
greater horn of, 15, 58, 70
prominence caused by, 66
tip of, 67, 77
lesser horn of, 15, 58
Hypochondriac region
left, 244
right, 244
Hypochondrium
left, 244
right, 244
Hypogastric nerves, 297, 302–303, 317–318, 387–388, 392–395
left, 390
right, 390
Hypogastric plexus, 486
inferior, 163, 297, 302–303, 317–318, 387–388, 390, 392–395
superior, 163, 297, 302–303, 317–318, 341, 345, 387, 390, 392–395
Hypogastric region, 244
Hypogastric (neurovascular) sheath, 343
Hypoglossal canal, 8, 10, 12, 129
Hypoglossal nerve (XII), 33–34, 42, 47, 50, 55, 59, 71–73, 75, 105, 115, 118, 129–130
in carotid sheath, 47
distribution of, 119
in hypoglossal canal, 12
meningeal branch of, 129
schema of, 129
vena comitans of, 47, 59, 73
Hypoglossal nucleus, 117–118, 129
Hypoglossal trigone, 116
Hypoglossus muscle, 47
Hypophyseal artery
inferior, 138, 141, 149
superior, 138, 141, 149
Hypophyseal fossa, 7
of newborn, 45
Hypophyseal portal veins
long, 141, 149
primary plexus of, 149
secondary plexus of, 149
short, 149
Hypophyseal veins, efferent, 141, 149
Hypophysis, 105, 107–108, 148
arteries and veins of, 149
in sella turcica, 36
Hypothalamic area, lateral, 136
Hypothalamic artery, 141
Hypothalamic sulcus, 107, 116, 148
Hypothalamic vessels, 149
Hypothalamohypophyseal tract, 148
Hypothalamus, 109, 148, 303
arteries and veins of, 149
principal nuclei of, 148
arcuate (infundibular), 148
dorsomedial, 148
mammillary body, 148
paraventricular, 148
posterior, 148
supra-optic, 148
ventromedial, 148
Hypothenar eminence, 398
Hypothenar muscles, 446–447, 450, 453, 464
Hysterosalpingogram, of uterus, 353

I

Ileal arteries, 287–288, 290
anastomotic loops of, 272
Ileal orifice, 276

Ileal papilla, 274
Ileal vein, 290–291
Ileocecal fold (bloodless fold of Treves), 273
Ileocecal junction, fibers around, 274
Ileocecal lips, 274
Ileocecal recess
inferior, 273
superior, 273
Ileocecal region, 273–274
Ileocolic artery, 273, 287–288, 301–302, 313
Ileocolic lymph nodes, 296
Ileocolic plexus, 301–302
Ileocolic vein, 290–292
Ileum, 263, 272, 276
fibers to, 274
terminal part of, 265, 273–274, 341
transverse section of, 327–328
Iliac artery
common, 259, 265, 268, 297, 308, 313–314, 376, 378–381, 390
ureteric branch from, 314
deep circumflex, 249, 257, 343, 381, 488, 499
ascending branch of, 251, 259
external, 249, 255–257, 259, 268, 273, 291, 297, 308, 313, 340–345, 350, 353, 370, 376, 378–381, 390, 488, 499
internal, 259, 288, 297, 308, 313–314, 343, 376, 378–381, 390
superficial circumflex, 245, 247, 251, 259, 487, 499
Iliac crest, 152, 158, 171–174, 242–243, 250, 308–309, 315, 329–330, 333, 468, 471, 481–483, 489–490, 530
inner lip of, 243, 330, 334, 473
intermediate zone of, 243, 330, 334, 473
outer lip of, 243, 330, 334, 473
tuberculum of, 243, 330, 473
Iliac fascia, 257, 343
Iliac fossa, 333–334, 341
Iliac lymph nodes
common, 261, 296, 316, 384, 386
external, 261, 296, 316, 386, 472
lateral, 384
medial, 384
internal, 261, 296, 316, 384, 386
Iliac plexus
common, 297, 390
external, 297, 390
internal, 297, 390
Iliac spine
anterior
inferior, 243, 258, 330, 333–334, 338, 473–474, 479–480
superior, 242–243, 245–246, 255–256, 258, 329–330, 333–334, 355, 358, 468, 473–474, 479–481, 483, 487
posterior
inferior, 158, 334, 473
superior, 152, 158, 333–334, 473
Iliac tubercle, 333–334
Iliac tuberosity, 330, 473
Iliac vein
common, 260, 265, 379, 381, 390
deep circumflex, 249, 257, 260, 343
tributaries to, 252
external, 249, 255–257, 260, 273, 291, 340–345, 350, 353, 370, 377, 379, 381, 488
internal, 260, 343, 377, 379, 381
superficial circumflex, 242, 245, 252, 260, 329, 470, 487
Iliacus fascia, 370
Iliacus muscle, 255, 258, 308, 328, 343, 370, 396–397, 477, 479, 483, 485–486, 491, 525, 530–531
nerves to, 484–485
Iliococcygeus muscle, 335–339, 350, 373
Iliocostalis cervicis muscles, 172
Iliocostalis lumborum muscles, 172
Iliocostalis muscles, 172
Iliocostalis thoracis muscles, 172
Iliofemoral ligament, 474, 483, 491
Iliohypogastric nerve, 160, 174, 262, 308–309, 387, 392, 483–485, 526
anterior branch of, 253
cutaneous branches of
anterior, 253, 262, 387
lateral, 250, 253, 471
transverse section of, 328
Ilio-inguinal nerve, 160, 253, 256, 262, 308–309, 387, 391–392, 470, 483–485, 526
anterior scrotal branch of, 253
scrotal branches of, anterior, 262
transverse section of, 328
Iliolumbar artery, 259, 314, 380–381
Iliolumbar ligament, 158, 309, 333
Iliolumbar vein, 260
Iliopectineal bursa, 474, 483
Iliopectineal line, 370
Iliopsoas fascia, 257, 487
Iliopsoas muscle, 249, 396–397, 477–480, 487–488, 492
Iliopsoas tendon, 491
Iliopubic eminence, 243, 330, 333–334, 338, 473–474
Iliopubic tract, 255, 341, 343, 345
Iliotibial tract, 468, 477, 479, 481–482, 489, 492–495, 497, 501–503, 506–508
Ilium
arcuate line of, 336
body of, 334, 473
radiography of, 156, 331
wing of, 243, 330, 334, 338, 473
Incisive canal, 8, 36–39, 41, 64
anastomosis in, 40, 51, 54
communication through, 41
Incisive fossa, 10, 12, 16, 57, 62
Incisive papilla, 57
Incisor teeth, 62–63, 230
Incus, 94–95, 98, 125
lenticular process of, 95
long limb of, 95
short limb of, 95
Inferior ganglion
of glossopharyngeal nerve, 55, 96, 126, 135–136, 207
of vagus nerve, 55, 127–129, 136, 207
Inferolateral trunk, 138
Infradiaphragmatic fascia, 232
Infraglenoid tubercle, 405–406
Infraglottic region, 82
Infrahyoid artery, 76
Infrahyoid fascia, 26–27
Infrahyoid muscles, 28
fascia of, 26, 412
Inframammary lymph nodes, 182
Infra-orbital artery, 3, 35, 51, 54, 72, 83, 87
Infra-orbital canal, infra-orbital nerve entering, 52
Infra-orbital foramen, 4, 6, 35
of newborn, 14
Infra-orbital groove, 4
Infra-orbital margin, 1
Infra-orbital nerve (V_2), 2, 35, 52–55, 71, 83, 85, 122–123
entering infra-orbital canal, 52
internal nasal branches of, 41
superior alveolar branches of, 123
Infra-orbital recess, 43
Infra-orbital vein, 3, 73
Infrapatellar bursa
deep, 498
subcutaneous, 498
Infrapatellar fat pads, 494–495, 498
Infrapatellar synovial fold, 494–495
Infraspinatus fascia, 171, 174, 409
Infraspinatus muscle, 152, 171, 177, 188, 238–240, 406, 409, 411–414, 418, 465, 467
Infraspinatus tendon, 408, 411, 413, 418
Infraspinous fascia, 250
Infraspinous fossa, 406
of scapula, 183
Infratemporal crest, 6
Infratemporal fossa, 6, 16
Infratrochlear nerve, 2, 35, 83, 88
from nasociliary nerve, 52
Infundibular nucleus, 148
Infundibular process, 148
capillary plexus of, 149
Infundibular recess, 109
Infundibular stem, 148
Infundibulum, 115, 141, 148
of fallopian tube, 352–353
leading to frontonasal canal, 37
Inguinal canal, 256–257
Inguinal falx, 246–247, 249, 255–256
Inguinal fold, 367
Inguinal hernia, 255
Inguinal ligament (Poupart's), 242, 245–247, 255–258, 329, 336, 355, 358–359, 385, 468, 470, 472, 479, 485, 488
reflected, 246–247, 255
Inguinal lymph node
deep, 384–386, 472
highest, 261, 384–386
superficial, 261, 296, 384–386, 472
Inguinal region
dissections of, 255
left, 244
right, 244
Inguinal ring
deep, 245, 249, 255–256, 341–343, 345, 364
lateral crus, 255
medial crus, 255
superficial, 245, 255–256, 355, 359, 364–365
Inguinal triangle (Hesselbach's), 249, 255
transversalis fascia within, 255
Inion, 6, 8, 10, 16, 152
Inlet venule, 279
Inner hair cell, 98
Insula (island of Reil), 106, 111, 142
central sulcus of, 106
circular sulcus of, 106
limen of, 106
long gyrus of, 106
short gyri of, 106
Interalveolar septa, 17
Interarytenoid notch, 66
Interatrial septum, 217, 241
Intercalated lymph nodes, 74–75
Intercapitular veins, 402
Intercarpal ligament, dorsal, 442
Intercartilaginous ligaments, 199
Intercavernous septum, of deep fascia of penis, 359–360, 363
Intercavernous sinuses
anterior, 104–105
posterior, 104–105
Interchondral joints, 184
Interclavicular ligament, 184, 404
Intercondylar eminence, 495, 497, 500–501
Intercondylar fossa, 476
Intercostal artery, 188
anterior, 187–188, 251
collateral branches of, 187
lower, anastomoses with, 251
posterior, 167–168, 185–186, 188, 227–228
branch to vertebral body and dura mater, 168
dorsal branch of, 168, 188
lateral cutaneous branch of, 188

Intercostal artery *(Continued)*
lateral mammary branches of lateral cutaneous branches of, 180
right, 188
spinal branch of, 168, 188
third right, 204, 233
supreme, 137, 139
Intercostal lymph nodes, 235
Intercostal membrane
external, 177, 185–186, 188, 254, 413
internal, 177, 188, 227–228, 254, 413
Intercostal muscles, 179, 195, 214, 238–240
external, 173, 177, 185–186, 188, 227–228, 241, 246, 251, 254, 413
innermost, 177, 187–188, 227–228, 241, 251, 254
internal, 177, 185–188, 241, 251, 254
Intercostal nerves, 160, 179, 186–188, 225, 227–228, 484
anterior branch of, 177, 254
cutaneous branches of
anterior, 177, 185, 187–188, 253, 413
anterior branch of lateral, 188
lateral, 174, 177, 185–186, 188, 253, 413
posterior, 177
dorsal ramus of, 177
eighth, 206
first, 224, 416
lateral branch of, 177
lower, 190
medial branch of, 177
posterior branch of, 177, 413
sixth, 206
third, 236
ventral ramus of, 177
Intercostal veins
anterior, 187, 189
collateral branches of, 187
internal, 252
posterior, 189, 227–228, 234
superior
left, 228, 234
right, 189, 227, 234
tributaries to axillary vein, 252
Intercostal vessels, 179
Intercostobrachial nerve, 186, 253, 400–401, 413, 415, 460
Intercrural fibers, 245, 255–256
Intercuneiform ligaments, dorsal, 514
Interdigitating fibers, of levator veli palatini muscle, 57
Interfoveolar ligament, 249
Interglobular spaces of teeth, 63
Intergluteal (natal) cleft, 152
Interlobar arteries, 312
lymph vessels along, 316
Interlobar lymph vessels, 205
Intermaxillary suture, 10, 35
Intermediate bursa, 448
Intermediate nerve (of Wrisberg), 61, 105, 115, 124–125, 132, 134, 136
distribution of, 119
Intermediolateral cell column, 304, 319
Intermediolateral nucleus, of gray matter, preganglionic sympathetic cell bodies in, 53, 133–135
Intermesenteric (para-aortic) plexus, 262, 297, 301–303, 317–318, 388, 390, 392–395
renal branches from, 317
transverse section of, 328
upper ureteric branches from, 317
Intermetacarpal joints, 442
Intermuscular septum
anterior, 510
anteromedial, 479, 487–488
lateral, 417–418, 421, 431, 434, 465, 492
medial, 417–419, 421, 431, 433–434, 492
transverse, 510
Intermuscular stroma, 305
Internal capsule, 109, 142
anterior limb of, 111
cleft for, 111
genu of, 111
posterior limb of, 111
retrolenticular part of, 111
Internal os, 352
Interosseous artery
anterior, 420, 431, 433–436
common, 420, 433–436
posterior, 431, 434–436
recurrent, 420, 431, 435
Interosseous fascia, dorsal, 450
Interosseous intercarpal ligaments, 442
Interosseous membrane, 425, 429, 436, 441, 497–499, 505, 508–510
Interosseous muscles, 451, 515, 523
attachment of, 451
dorsal, 447, 450, 452, 454, 457, 464, 467, 518, 523, 531
first, 431
of foot, 523–524
palmar, 450, 452, 464, 467
plantar, 522, 531
Interosseous nerve
anterior, 434, 436, 463
of leg, 528
posterior, 431, 436, 466
Interosseous talocalcaneal ligament, 514
Interosseous tendon, 451
Interpectoral (Rotter's) lymph nodes, 181–182
Interpeduncular cistern, 110
Interpeduncular fossa, posterior perforated substance in, 108
Interphalangeal (IP) joint, 515
Interphalangeal ligaments, 445
Interproximal spaces of teeth, 63
Intersigmoid recess, 265, 313
Intersphincteric groove, 370–372
Interspinalis cervical muscle, 173, 177
Interspinalis lumbar muscle, 173, 177
Interspinalis thoracic muscle, 177
Interspinous ligament, 158–159
Interspinous plane, 244
Interthalamic adhesion, 107, 109, 111–112, 116, 147–148
Intertragic notch, 95
Intertransversarii muscles, 173, 177
Intertransverse ligament, 184
Intertrochanteric crest, 474–476, 490
Intertrochanteric line, 474
Intertubercular plane, 244
Intertubercular sulcus, 405
Intertubercular tendon sheath, 408, 413, 417
Interureteric crest, 348
Interventricular artery, anterior, diagonal branch of, 215
Interventricular foramen (of Monro), 107, 109–110, 112, 116, 146–147
Interventricular septum, 221, 241
membranous part of, 217
muscular part of, 213, 217–218, 220–222
Interventricular sulcus
anterior, 209, 241
posterior, 211–212
Intervertebral discs, 158–159
cervical, 21–22
lumbar, 155
radiography of, 156
lumbosacral, 192, 334
thoracic, 191, 239–240
transverse section of, 326–328
Intervertebral foramen, 21, 154–155, 157–159
dorsal root of, 177
Intervertebral vein, 169
Intestinal glands, 305
Intestinal lymphatic trunk, 295
Intestinal trunk, 261
Intestines, 226. *See also* Large intestine; Small intestine
innervation of, 163–164
intrinsic autonomic plexuses of, 305
mesenteric relations of, 264–265
Intra-articular ligament, of head of rib, 184
Intraarticular sternocostal ligament, 184
Intraculminate vein, 145
Intralaminar nuclei, 112
Intralobular arteriole, 279
Intralobular bile ductule, 279
Intramuscular plexus
circular, 305
longitudinal, 305
Intraparietal lobule, 106
Intrapulmonary airways
schema of, 201
structure of, 201
subdivisions of, 201
Intrapulmonary blood circulation, schema of, 202
Intrapulmonary lymph nodes, 205
Intrarenal arteries, 312
Intrinsic autonomic plexuses, of intestines, 305
Intrinsic muscles, 60, 129
Inversion, of foot, 469
Investing fascia, 344, 348, 350, 355–356, 359–361, 369
Iridocorneal angle, 89–90, 92
trabecular meshwork and spaces of, 90
Iris, 83, 89, 91–92
arteries and veins of, 93
folds of, 90
major arterial circle of, 90, 92–93
minor arterial circle of, 90, 92–93
Irritant receptors, 207
Ischial spine, 158, 243, 258, 330, 333–338, 376, 389, 473–474, 490, 530
measurements of, 332
radiograph of, 331
Ischial tuberosity, 158, 243, 330, 333–334, 337, 339, 355–356, 358–361, 370, 373, 473–475, 482, 489–490, 530
measurements of, 332
Ischio-anal fossa, 356, 359–360, 370, 373
anterior recess of, 249, 348, 350, 374
communication in, 374
fat body of, 355, 358, 370, 396
posterior recess of, 374
pus in, 374
transverse fibrous septum of, 370, 372
Ischiocavernosus muscle, 340, 348, 350, 355–357, 359–361, 369, 373, 382–383, 397
Ischiococcygeus muscle, 258, 335–337
Ischiofemoral ligament, 474, 491
Ischiopubic ramus, 333–334, 339, 344, 350, 355–356, 358, 360–362, 373
Ischium, 397, 475
body of, 473
radiograph of, 331
ramus of, 473
Island of Reil. *See* Insula
Isthmus
of cingulate gyrus, 107–108
of fallopian tube, 352
of thyroid gland, 76
of uterus, 352

J

Jacobson, tympanic nerve of, 124, 126, 135
Jejunal arteries, 287–288, 290
  anastomotic loops of, 272
Jejunal vein, 290–291
Jejunum, 263–265, 271–272, 281
  axial CT images of, 323
  transverse section of, 325–328
Joint capsule
  of femur, 491
  of foot, 515
  of hand and fingers, 424, 445
  of knee, 493, 495, 507
    attachment of, 498
  of shoulder, 413
Jugular foramen, 8, 10, 13, 104–105, 126–128
Jugular fossa, 10, 12
Jugular lymph nodes
  anterior, 74
  external, 74
  internal, 74–75
Jugular nerve, 131
Jugular notch, 1, 27, 178, 193
  of sternum, 183
Jugular trunk, 74
  right, 295
Jugular vein
  anterior, 31, 73, 76
  external, 3, 31–32, 46, 73, 76, 195, 203, 208, 214, 234
  internal, 3, 26–28, 30–31, 33–34, 42, 46–47, 55, 59, 73, 75–78, 94, 96, 99, 129, 182, 186–187, 195, 208, 229, 234
    imaging of, 150
    inferior bulb of, 77, 170
    in jugular fossa, 12
    left, 209, 214
    right, 203
    superior bulb of, 170
Jugulodigastric lymph nodes, 74–75
Jugulo-omohyoid lymph nodes, 74–75
Jugum, 11

K

Keratinized tip, of papilla, 60
Kidneys, 176, 226, 266, 271, 278, 364, 378
  autonomic nerves of, 317–318
  cortex of, 311
    transverse section of, 326
  fibrous capsule of, 315
  gross structure of, 311
  hilum of, 311
  inferior pole of, 311
  innervation of, 163–164
  lateral border of, 311
  left, 194, 267, 281–282, 308, 313, 315, 320
    axial CT images of, 322
    transverse section of, 326–327
  lymph vessels and nodes of, 316
  major calyces of, 311
    transverse section of, 327
  medial border of, 311
  medulla (pyramids) of, 311
    transverse section of, 326
  minor calyces of, 311
  renal capsule of, 311
  renal papilla of, 311
  renal pelvis of, 311
    transverse section of, 327
  renal sinus of, 311
  right, 194, 267–269, 277, 281, 308–309, 313, 315, 320
    axial CT images of, 322
    transverse section of, 327
Kidneys *(Continued)*
  in situ
    anterior view of, 308
    posterior view of, 309
  superior pole of, 311
    transverse section of, 325–326
  vascular renal segments of, 312
Knee
  anterior view of, 494
  arteries of, 499, 509
  bursa of, 495
  cruciate and collateral ligaments, 496
  extension of, 469, 494
  flexion of, 469, 494
  interior of, 495
  lateral view of, 493
  medial view of, 493
  posterior view of, 497–498
  radiograph of, 497
  sagittal view of, 498
  transverse ligament of, 496

L

Labbé, inferior anastomotic vein of, 103, 146
Labia majora
  anterior commissure of, 354
  posterior commissure of, 354
Labia majus, 340
Labia minora, frenulum of, 354
Labia minus, 340
Labial arteries
  inferior, 35, 72
  posterior, 357, 382
  superior, 35, 72
    nasal septal branch of, 40
Labial nerve
  anterior, 391
  posterior, 391–392
Labial vein
  inferior, 73
  superior, 73
Labioscrotal swelling, 366
Labium majus, 340, 346, 350, 354, 366
Labium minus, 340, 346, 350, 354, 357, 366
Labyrinthine artery, 13, 96, 140–142, 144
  left, 137
Labyrinths
  bony, 97
  membranous, 97
  orientation of, 99
Lacrimal apparatus, 84
Lacrimal artery, 87, 139
  recurrent meningeal branch of, 102
Lacrimal bone, 4, 6, 8, 37
  of newborn, 14, 45
Lacrimal canaliculi, 84
Lacrimal caruncle, 83–84
Lacrimal gland, 85, 87–88, 134
  excretory ducts of, 84
  innervation of, 119, 163–164
  orbital part of, 84
  palpebral part of, 84
Lacrimal lake, 83–84
Lacrimal nerve (V_1), 13, 52, 54, 85, 88, 122–123, 132
  communicating branch of, 52
  cutaneous branch of, 52
  palpebral branch of, 2
Lacrimal papilla
  inferior, 83–84
  superior, 83–84
Lacrimal punctum
  inferior, 83–84
  superior, 83–84
Lacrimal sac, 83–84
  fossa for, 4, 6
Lactiferous duct, 179
Lactiferous sinus, 179
Lacuna, lateral (venous) of Trolard, 101–102
Lacuna magna, 363
Lacunar (Gimbernat's) ligament, 246–247, 249, 255, 257–258, 472
Lacus lacrimalis, 83
Lambda, 9
Lambdoid suture, 5–9, 14
Lamina
  cervical, 20
  lumbar, 155–156, 158–159
  of mesovarium, 353
  thoracic, 154
Lamina affixa, 112
Lamina cribrosa of sclera, 89
Lamina propria, of gingiva, 63
Lamina terminalis, 107–108, 116, 148
Large intestine
  arteries of, 288
  autonomic nerves of, 302–303
  innervation of, 163–164
  lymph vessels and nodes of, 296
  mucosa and musculature of, 276
  veins of, 291
Laryngeal artery
  inferior, 82
  superior, 34, 72, 76–78, 137
    foramen for, 80
    internal branch of, 69
Laryngeal inlet (aditus), 64, 66, 69
Laryngeal nerve
  inferior, 82
    anterior branches of, 82
    posterior branches of, 82
  recurrent, 26, 33, 69, 71, 82, 131, 229, 236
    left, 76–78, 127, 190, 203, 206–209, 223, 228–229, 236, 238–239
    right, 76–78, 82, 127, 209, 223, 236
  superior, 76, 82, 131–132, 136, 207, 236
    external branch of, 71, 76–78, 82, 127
    fold over internal branch of, 66
    internal branch of, 61, 65, 67, 69, 71, 76–78, 80, 82, 127
Laryngeal prominence, 79
Laryngeal vein, superior, 73
  foramen for, 80
  internal branch of, 69
Laryngopharyngeal sympathetic branch, 131
Laryngopharynx, 64, 66
Larynx, 136, 207
  cartilages of, 79
  infraglottic region of, 82
  innervation of, 119, 163–164
  muscles of, 80
    action of intrinsic, 81
  nerves of, 82
  sensory branches to, 82
  vestibule of, 82
Lateral aperture, 110
  of fourth ventricle, 147
  left, 109
Lateral direct vein, 146–147
Lateral funiculus, 116
Lateral ligament
  of ankle, 514
  of bladder, 343
Lateral process
  of malleus, 95
  of nasal septal cartilage, 35, 37–38
  of talus, 512
Lateral recess, 116
  left, 109
  vein of, 145

Lateral rectus plane
left, 244
right, 244
Lateral sulcus (of Sylvius), 108
anterior ramus of, 106
ascending ramus of, 106
posterior ramus of, 106
Latissimus dorsi muscle, 152, 171, 174, 176–178, 185, 241, 245–246, 250, 253–254, 309, 405–406, 409–410, 412–413, 415, 417, 419, 421, 467
digitations of costal origin of, 250
transverse section of, 324, 328
Latissimus dorsi tendon, 239–240
Left bundle, 222
Purkinje fibers of, 222
subendocardial branches of, 222
Leg
arteries of, 509
cross sections of, 510
deep fascia of, 470, 472, 510
fascial compartments of, 510
muscles of
attachments of, 502
deep dissection, 505, 508
intermediate dissection, 504
lateral view of, 506
superficial dissection, 503, 507
Lens, 83, 85, 89–92
axis of, 91
capsule of, 89–91
cortex of, 91
equator of, 91
nucleus of, 90–91
supporting structures of, 91
suspensory ligament of, 89–90
Lenticular process of incus, 95
Lenticulostriate arteries, anterolateral, 138, 140–142, 144
Lentiform nucleus, 109, 111, 142
globus pallidus of, 109, 111
putamen of, 109, 111
Lesser occipital nerve, 2
Levator anguli oris muscle, 48, 124, 151
Levator ani fascia, 374, 376, 389
superior, 343
Levator ani muscle, 249, 258, 276, 292, 303, 321, 340, 344, 348, 350, 355–356, 359–361, 369–372, 374, 380, 382, 388, 396–397, 486
fibromuscular extensions of, 339
growth of, 347
iliococcygeus muscle of, 335–339, 373
left, 335
levator plate (median raphe) of, 336
medial border (pillar) of, 339
median raphe of, 337
muscle fibers from, 338–339
nerve to, 484, 486
prerectal muscle fibers (of Luschka) from, 339
pubococcygeus muscle of, 335–339, 373
puborectalis muscle of, 335, 337–339, 369, 373
tendinous arch of, 258, 335–339, 343, 346, 348, 350, 356, 370
transverse section of, 397
Levator costarum, 241
Levator costarum muscle, 173
Levator labii superioris alaeque nasi muscle, 25, 48, 124, 151
Levator labii superioris muscle, 25, 48, 124, 151
Levator palpebrae superioris muscle, 83, 85–86, 88, 122, 151
insertion of, 83
Levator plate (median raphe), 336
Levator scapulae muscle, 26, 29, 32, 171, 174, 177, 406, 409, 413–414, 465, 467
communication with cervical plexus, 33
nerves to, 130
Levator veli palatini muscle, 42, 49, 57, 65, 67–68, 70, 127, 151
fold caused by, 66
interdigitating fibers of, 57
Levatores costarum muscles, 173
brevis, 173
longus, 173
Lieberkühn, crypts of, 275
Ligament of malleus
anterior, 95
superior, 95
Ligament of Treitz, 264
Ligamenta flava, 22
Ligaments
of ankle, 514
of elbow, 424
of foot, 515
of pelvis, 333–334
of uterus, 351
of wrist, 441–442
Ligamentum arteriosum, 203, 209, 218, 226, 228
aortic arch lymph node of, 205
Ligamentum flavum, 158–159
transverse section of, 328
Ligamentum nuchae, 22, 152
Ligamentum teres, 226, 249, 277–278, 530
axial CT images of, 322
fissure for, 277
Ligamentum teres uteri, 340
Ligamentum venosum, 226
fissure for, 277
Limbs of stapes, 94
Limen, of insula, 106
Limen nasi, 36
Limiting lamina, posterior, 90
Limiting plate, of portal space, 279
Linea alba, 7, 178, 185, 242, 245–246, 254–255, 329, 341, 345
transverse section of, 328
Linea semilunaris, 242, 329
left, 244
right, 244
Linea terminalis, 157, 350
of pelvis, 343, 345
Lingual artery, 3, 34, 47, 51, 59, 72, 77, 134, 137, 139
deep, 56, 59
dorsal, 59
tonsillar branch of, 68
Lingual glands, 60
Lingual gyrus, 107
Lingual minor salivary gland, 56
Lingual nerve, 46–47, 49–51, 56, 58–59, 61, 71, 123–124, 132, 134–136
inferior, 18
Lingual tonsil, 60, 64, 68, 80
Lingual vein, 3, 59, 73
common trunk for, 46, 59, 73
deep, 56
dorsal, 59, 73
vena comitans to, 47
Lingula, 17, 58, 196
of superior lobe, of left lung, 195
of superior vermis, 114, 116
Lip
commissure of, 1
lower, frenulum of, 56
philtrum, 1
superior, tubercle of, 1
upper
frenulum of, 56
tubercle of, 56
vermillion border, 1
Lister's tubercle, 425, 439
Littré, urethral glands of, 363
Liver, 127, 193–194, 210, 214, 226, 234, 237, 266, 271, 315, 320–321
arteries of, 283–284
autonomic nerves of, 306
bare area of, 315, 321
caudate lobe of, 266, 269, 277–278
connective tissue of, 279
coronary ligament of, 268
duct system of, 278
falciform ligament of, 251, 292
fibrous appendix of, 277
inferior border of, 269
innervation of, 163–164
left lobe of, 263, 277–278
axial CT images of, 322
left triangular ligament of, 268
pathway to, 181
quadrate lobe of, 269, 277–278
right lobe of, 263, 269, 277–278
axial CT images of, 322
round ligament of, 249, 269, 277–278, 292, 313
para-umbilical veins in, 252
transverse section of, 328
sagittal CT images of, 375
in situ, 278
structure of, 279
surfaces and bed of, 277
transverse section of, 324–327
vascular system of, 278
Lobule, 1, 201
of auricle, 95
biventer, 114
central, 114, 116
inferior parietal
angular gyrus of, 106
supramarginal gyrus of, 106
intraparietal, 106
paracentral, 107
quadrangular, 114
semilunar
inferior, 114
superior, 114
simple, 114
Locus caeruleus, 116
Long gyrus, 106
Long radiolunate ligament, 441
Longissimus capitis muscle, 172, 175
Longissimus cervicis muscle, 172
Longissimus muscle, 172
Longissimus thoracis muscle, 172
Longitudinal band
inferior, 23
superior, 23
Longitudinal bundle, 280
Longitudinal esophageal muscle, 65, 69, 77, 231–232
attachment of, 69
cricoid attachment of, 65, 67
Longitudinal fasciculus
dorsal, 148
medial, 114, 116
Longitudinal folds, 280
of gastric canal, 270
Longitudinal intramuscular plexus, 305
Longitudinal ligament
anterior, 22, 64–65, 158–159, 176, 184, 333, 341, 345
transverse section of, 328
posterior, 23, 158–159
Longitudinal muscle, 305
of anal canal, 338–339
of anorectal junction, 339
conjoined, 370–372
of duodenum, 270, 280
of esophagus, 270

Longitudinal muscle *(Continued)*
of ileum, 272, 274
inferior, 47, 151
of jejunum, 272
outer, of stomach, 232, 270
of rectum, 371–372
superior, 47, 151
of vermiform appendix, 275
Longitudinal pharyngeal muscles, 65, 67, 69
Longus capitis muscle, 29–30, 42, 47, 151
communication with cervical plexus, 33
nerves to, 130
Longus colli muscle, 26, 30, 151, 229
communication with cervical plexus, 33
innervation of, 416
nerves to, 130
Loop of Heiss, 347
Lower limb
dermatomes of, 469
lymph vessels and nodes of, 472
movements of, 469
superficial nerves of, 470–471
superficial veins of, 470–471
surface anatomy, 468
Lumbar artery, 167, 259
anastomoses with, 251
Lumbar cistern, 156
Lumbar ganglion, 297
first, 163
Lumbar lordosis, 153
Lumbar lymph nodes, 261, 384
Lumbar lymph trunks, 316
Lumbar lymphatic trunk, 295
Lumbar plexus, 160, 225, 483–485, 525–526
muscular branches from, 262
Lumbar region, 176
left, 244
right, 244
vertebral ligaments, 159
Lumbar spinal nerves, 176
dorsal and ventral roots of, 166
enlargement of, 161
L1, 160
dermatome of, 162
dorsal ramus of, 174
posterior rami of, 250
spinous process of, 176
ventral ramus of, 174, 388
vertebrae relation to, 161
L2
dermatome of, 162
dorsal ramus of, 174
ganglion of, 390
posterior rami of, 250
ventral ramus of, 158
vertebrae relation to, 161
L3
dermatome of, 162
dorsal ramus of, 174
posterior rami of, 250
ventral ramus of, 393
vertebrae relation to, 161
L4, 158
dermatome of, 162
vertebrae relation to, 161
L5, 160, 390
dermatome of, 162
dorsal ramus of, 158
ventral ramus of, 388
vertebrae relation to, 161
ventral ramus of, 485
Lumbar triangle (of Petit), 152, 250
internal oblique muscle in, 171
Lumbar trunk
left, 261
right, 261
Lumbar trunk ganglion
lower, 225
upper, 225
Lumbar veins, 310
ascending, 260, 310
right, 260
Lumbar vertebrae, 155, 243
arteries of, 167
articulated, lateral view of, 155
body of, 155, 159
L1, 160
body of, 158, 267
spinal nerve relation to, 161
L2
body of, 176
spinal nerve relation to, 161
superior view of, 155
L3
body of, 341, 345
posterior view of, 155
spinal nerve relation to, 161
L4
body of, 334
posterior view of, 155
spinal nerve relation to, 161
L5, 160
body of, 156, 158, 334
radiograph of, 331
sagittal CT images of, 375
spinal nerve relation to, 161
radiography of, 156
section through, 166
spinous process of, transverse section of, 328
transverse processes of, 243, 330
Lumbocostal ligament, 309
Lumbocostal triangle, 192
Lumbocostal trigone, 258
Lumbosacral intervertebral discs, 334
transverse process of, 192
Lumbosacral plexus, 262, 317, 484
Lumbosacral region, vertebral ligaments, 158
Lumbosacral trunks, 262, 317, 388, 483–486, 525–526
Lumbrical muscles, 448–452, 463–464, 467, 520–521, 523, 528, 531
tendons of, 522
Lumbrical tendon, 448, 515
Lumen, 305
Lunate bone, 439, 442–443
radiographs of, 444
Lunate sulcus, 106
Lunate (articular) surface, 334
Lungs, 179, 315
apex of, 193
innervation of, 119, 163–164
left, 196, 208, 212, 214, 238–240
anterior border of, 196
apex of, 194, 196
bronchopulmonary segments of, 197–198
cardiac impression of, 196
cardiac notch of, 193, 195
diaphragmatic surface of, 196
esophagus area of, 196
hilum of, 209
inferior border of, 193–194, 196
inferior lobe of, 195–198, 324
lymph vessels and nodes of, 205
oblique fissure of, 193–194, 196, 239
root of, 190
superior lobe of, 195–198, 213, 237
trachea area of, 196
lymph nodes of, 205
lymph vessels of, 205
lymphatic drainage routes of, 205
medial views of, 196
Lungs *(Continued)*
radiography of, 156
right, 196, 208, 210, 214, 238–240
anterior border of, 196
apex of, 196
bronchopulmonary segments of, 197–198
cardiac impression of, 196
diaphragmatic surface of, 196
esophagus area of, 196
hilum of, 209
horizontal fissure of, 193–196
inferior border of, 193–194, 196
inferior lobe of, 195–198, 324
lymph vessels and nodes of, 205
middle lobe of, 195–198, 213
oblique fissure of, 193–196
root of, 190
superior lobe of, 195–198, 237
trachea area of, 196
in situ, anterior view of, 195
topography of
anterior view of, 193
posterior view of, 194
Lunotriquetral ligament, 441
Lunula, 220
Lunule, 458
Luschka
cleft of, 21
foramen of, 109–110
prerectal muscle fibers of, 339
Lutea, 89
Lymph follicles, 60
Lymph nodes
of abdominal wall, posterior, 261
of esophagus, 235
in femoral canal, 257
of genitalia
female, 384
male, 386
of head and neck, 74
of kidneys, 316
of large intestine, 296
of lower limb, 472
of lung, 205
of mammary gland, 181
of pancreas, 294
of pelvis
female, 384
male, 386
of perineum, female, 385
of pharynx and tongue, 75
of small intestine, 295
of stomach, 293
transverse section of, 328, 397
of upper limb, 403
of urinary bladder, 316
Lymph vessels
of abdominal wall, posterior, 261
cortical, 316
of esophagus, 235
of genitalia
female, 384
male, 386
of head and neck, 74
of kidneys, 316
of large intestine, 296
of lower limb, 472
of lung, 205
of mammary gland, 181
medullary, 316
of pancreas, 294
of pelvis
female, 384
male, 386
of perineum, female, 385
of pharynx and tongue, 75
of small intestine, 295

Lymph vessels *(Continued)*
of stomach, 293
of upper limb, 403
of urinary bladder, 316
Lymphatic drainage, of breast, 182
Lymphatic drainage routes, of lungs, 205
Lymphatic duct, right, 182, 295
Lymphatic trunk
intestinal, 295
lumbar, 295

M

Mackenrodt's ligament, 342–343, 350–351
Macula, fovea centralis in, 89, 92
Macular arteriole
inferior, 92
superior, 92
Macular venule
inferior, 92
superior, 92
Macular zone, 121
Macule, 92
Magendie, foramen of, 109–110, 116, 118
Mallear fold
anterior, 95
posterior, 95
Mallear stria, arteries of, 96
Malleolar artery
anterior lateral, 508–509, 517–518
anterior medial, 508–509, 517–518
Malleolus
lateral, 468, 500–501, 503–508, 517–518, 531
medial, 468, 500–501, 503–505, 507–508, 516–518, 531
Malleus, 94–95, 98
anterior ligament of, 95
handle of, 95–96
head of, 95, 125
lateral process of, 95
superior ligament of, 95
Mammary gland
anterolateral dissection, 179
arteries of, 180
lymph nodes of, 181
lymph vessels of, 181
sagittal section of, 179
Mammillary body, 107–109, 113, 115, 148
Mammillary process, 155
Mammillothalamic fasciculus, 107
Mammillothalamic tract (of Vicq d'Azyr), 148
Mandible, 4, 6, 15, 26, 64
of aged person, 17
alveolar part of, 17
angle of, 1, 15, 17, 66
base of, 17
body of, 4, 6, 15, 17, 29, 43
buccinator crest of, 70
condylar process of, 15, 17
head of, 6
condyle of, 7
coronoid process of, 6–7, 15, 17, 42
digastric fossa of, 17
head of, 17
interalveolar septa of, 17
lingula of, 17
mandibular foramen of, 17
mandibular notch of, 6, 17
mental foramen of, 4, 6, 17
mental protuberance of, 1, 4, 17
mental spines of, 17
mental tubercle of, 4
mylohyoid groove of, 17
mylohyoid line of, 17
neck of, 17, 42
oblique line of, 6, 17, 70
pterygoid fovea of, 17
Mandible *(Continued)*
ramus of, 4–6, 15, 17, 24, 29, 47
temporalis muscle insertion to, 6
retromolar fossa of, 17
sublingual fossa of, 17
submandibular fossa of, 17
Mandibular canal, 47
Mandibular foramen, 17, 58
inferior alveolar nerve entering, 50
Mandibular fossa, 6, 10, 14, 100
inferior, 18
Mandibular lymph nodes, 74
Mandibular nerves (V_2), 88, 105, 122–123, 126, 132, 134–136
meningeal branch of, 88
Mandibular nerves (V_3), 2, 12–13, 18, 50, 71
anterior division of, 50
articular branch of, 123
lateral view of, 50
medial view of, 50
meningeal branch of, 12–13, 50, 123
motor root of, 50
parotid branches of, 123
posterior division of, 50
sensory root of, 50
superficial temporal branches of, 123
Mandibular notch, 6, 15, 17
Mandibular periosteum, 63
Manubriosternal joint, 184
Manubriosternal junction, 240
Manubriosternal synchondrosis, 404
Manubrium of sternum, 26–27, 29, 64, 183–184, 187, 195, 238–239, 404
Marginal artery, 288, 302, 376
left (obtuse), 215
right, 216
Marginal collecting vessels, 75
Marginal plexus, 302
Marginal sulcus, 107
Masseter muscle, 24, 27, 29, 42, 46–48, 151
deep part of, 48
insertion of, 6
superficial part of, 48
Masseteric artery, 6, 49, 51, 72
Masseteric fascia, 25
Masseteric nerve (V_3), 6, 49–51, 71, 123
Mastication, muscles involved in, 48–49
innervation of, 119
Mastoid air cells, 7, 42, 55, 96
Mastoid angle, 11
Mastoid antrum, 96
Mastoid canaliculus, 10, 12
Mastoid emissary vein, 3
in mastoid foramen, 12
Mastoid foramen, 10, 12–13, 16
Mastoid lymph nodes, 74
Mastoid notch, 10
Mastoid process, 6, 10, 15–16, 24, 27, 29–30, 58–59, 100, 173
Maxilla, 4, 6, 8, 10
alveolar process of, 4, 6, 8, 16, 37, 43
anterior nasal spine of, 4, 6, 8, 37
frontal process of, 4, 6, 35, 37, 83
incisive canal of, 8, 37–38
incisive fossa of, 10
infra-orbital foramen of, 4, 6
infratemporal surface of, 6
intermaxillary suture of, 10
nasal crest of, 38
nasal spine of, anterior, 35, 38
nasal surface of, 8
of newborn, 14, 45
orbital surface of, 4
palatine process of, 7–8, 10, 16, 36–38, 57, 62, 100
tuberosity of, 6, 16
zygomatic process of, 4, 10
Maxillary artery, 18, 34, 40, 49–51, 54–55, 71–72, 96, 102, 132, 134–135, 137, 139
posterior lateral nasal branch of, 51
Maxillary bone, 42
Maxillary nerve (V_2), 13, 39, 50, 52, 54–55, 71, 88, 105, 122–123, 132, 134–136
entering foramen rotundum, 53
meningeal branch of, 88, 123
nasal branches of
nasopalatine, 123
posterior inferior lateral, 39, 54
posterior superior, 53
posterior superior lateral, 39, 41, 54, 123
posterior superior medial, 123
pharyngeal branch of, 39, 123
Maxillary nerves (V_2), 2
Maxillary ostium, 55
Maxillary periosteum, 63
Maxillary plexus, 132
Maxillary sinus, 5, 7, 42, 44, 53, 55, 86
growth of, 45
middle, 43
of newborn, 45
opening of, 36–37, 43–44
postsynaptic fibers to, 53
recesses of, 43
transverse section of, 42
wall of, 54
Maxillary veins, 73, 87
McBurney's point, 275
Medial eminence, 116
Medial ligament, of ankle, 514
Median aperture, 109–110, 116, 118
of fourth ventricle, 147
Median nerve, 400, 415–417, 419, 421, 432–434, 436, 441, 447, 449, 452–453, 459–463
articular branch of, 463
communicating branch of, 453, 460, 463–464
digital branch, 400
palmar branch of, 400, 402, 432–433, 446, 453, 459, 463
palmar digital branches of, 400, 456, 459
common, 447, 460
proper, 460
recurrent branch of, 446–447, 453, 460
Median nuclei, 112
Median raphe
of levator ani muscle, 337
levator plate, 336
between mylohyoid muscles, 58
Median sulcus, 60
dorsal, 116
Mediastinal lymph nodes, 238
posterior, 235
Mediastinal nodes, anterior, pathway to, 181
Mediastinal pleurae, 191, 209
Mediastinum
anterior, 191
lung area for, 196
cross section of, 213
lateral view of
left, 228
right, 227
superior, great vessels of, 203
Mediastinum testis, 368
Medulla oblongata, 13, 42, 53, 107, 116, 125, 135, 164, 224, 303, 318
in foramen magnum, 12
lower part of, 136
nuclear layer of, 114
Medullary artery, segmental, 167–168
Medullary lamina
external, 112
internal, 112

Medullary lymph vessels, 316
Medullary vein
anteromedian, 145
segmental, 169
anterior, 169
posterior, 169
Medullary velum
inferior, 107, 114, 116
superior, 107, 114–116
Meibomian (tarsal) glands, 83
Meissner's plexus, 305
Membranous labyrinths, 97–98
orientation of, 99
Membranous septum
atrioventricular part of, 213, 217–222
interventricular part of, 213, 218–222
Meningeal arteries, 102
accessory, 12–13, 51, 96, 102
anterior, 87
dorsal, 138
middle, 13, 18, 49–51, 71–72, 96, 101–103, 105, 132, 137–139
branches of, 103
frontal branches of, 102
left, 137
parietal branches of, 102
posterior, 3, 13
in mastoid foramen, 12
Meningeal nerve, 13
Meningeal plexus, middle, 132
Meningeal sheath, 85–86, 93
Meningeal vein, middle, 13, 101, 103
Meningeal vessels
anterior, groove for, 11
middle, 12
groove for, 11
grooves for branches of, 8–9
posterior, groove for, 11
Meninges, 13, 101, 103
arteries to, 137
Meningohypophyseal trunk, 102, 138
cavernous sinus branches of, 102
meningeal branches of, 102
tentorial branches of, 102, 138
Meniscofemoral ligament, posterior, 495–496
Meniscus, 442
lateral, 494–496, 498
attachment of horns of, 495
medial, 494–496
attachment of horns of, 495
Mental foramen, 4, 6, 17
Mental nerve, 2, 50, 71, 123
Mental protuberance, 1, 4, 17
Mental vein, 73
Mentalis muscle, 25, 48, 124, 151
Meridional fibers, 90
Mesencephalic nucleus, of trigeminal nerve, 117–118, 123, 136
Mesencephalic vein
lateral, 145
posterior, 147
Mesenteric artery
inferior, 259, 264, 271, 288, 297, 302, 308, 310, 313–314, 376, 378–379, 388
superior, 176, 226, 259, 264, 268, 271–273, 281, 284, 286–288, 290, 294, 298–301, 307–308, 310, 313–315, 321, 388
arteriogram of, 285
axial CT images of, 322–323
transverse section of, 327–328
Mesenteric ganglia, 297
celiac, 127
inferior, 163, 297, 302–303, 317, 387–388, 392–395
superior, 127, 163–164, 262, 299–304, 307, 317–319, 387–388, 392–395
Mesenteric lymph nodes
inferior, 261, 296
superior, 261, 293–296
Mesenteric plexus
inferior, 297, 302, 388
superior, 297–299, 301, 307, 388
Mesenteric vein
inferior, 234, 264, 281, 289, 291–292, 294, 377
superior, 176, 234, 268, 271–272, 281, 287, 289–292, 294, 315
transverse section of, 326–328
Mesentericoparietal recess (fossa), 264
Mesentery, 176, 265, 272, 321
peritoneal layers of, 305
root of, 268, 271, 281, 313, 341, 345
transverse section of, 328
Meso-appendix, 273, 275, 301
Mesocolic taenia, 273–274, 276
Mesocolon
sigmoid, 265, 268, 276, 288, 308, 313, 369
transverse, 263–268, 271, 276, 281, 288, 290, 308, 321
attachment of, 281–282
Mesometrium, of broad ligament, 352
Mesonephric (wolffian) duct, 364, 367
Mesonephric tubules, 367
caudal, 367
residua of, 367
cranial, 367
Mesosalpinx
of broad ligament, 342, 352
laminae of, 353
Mesovarium, 350
of broad ligament, 352
laminae of, 353
Metacarpal arteries
dorsal, 456
palmar, 435, 452
Metacarpal bones, 439–443, 445, 451
fifth, 430–431, 434
first, 431, 434, 449, 454
radiographs of, 444
second, 431
Metacarpal ligaments
deep transverse, 445, 452
palmar, 445
superficial transverse, 402, 446
Metacarpal veins, dorsal, 455
Metacarpophalangeal joint, 445
Metacarpophalangeal ligaments, 445
Metaphysis, nutrient branches to, 458
Metatarsal arteries, dorsal, 509, 517–518, 523
Metatarsal bones, 511–512, 515, 523–524
fifth, 505–506
first, 505, 514
tuberosity of, 516–517, 522–523, 531
Metatarsal ligaments
deep transverse, 515, 523
dorsal, 514, 523
superficial transverse, 519
Metatarsal veins, dorsal, 470
Metatarsophalangeal (MTP) joint, 515
Midbrain, imaging of, 151
Midcarpal joint, 439, 442
Midclavicular line
left, 244
right, 244
Midline groove, 60
Midpalmar space, 447–448, 450
Minute fasciculi, 446
Mitral cell, 120
Mitral heart valve, 210, 213–214, 218–222
anterior cusp of, 213, 218–221
commissural cusp of, 219–220
leaflet of, 241
left fibrous ring of, 219
posterior cusp of, 213, 218–221
Mixed fibers, 117–118
Modiolus, 25
of cochlea, 98
Molar minor salivary glands, 57
Molar teeth, 62–63
growth of, 45
Monocular fields, 121
Monro, interventricular foramen of, 107, 109–110, 112, 116, 146–147
Mons pubis, 354
Morgagni
hydatid of, 352
urethral lacunae of, 363
Motor nucleus
of facial nerve, 124–125
of trigeminal nerve, 117–118, 123, 136
Mucosa, 305
of duodenum, 272
esophageal, 69, 232
of ileum, 272
of large intestine, 276
olfactory, 120
distribution of, 39
of stomach, 270
Mucous glands, 60
crypt of, 60
duct of, 60
innervation of, 164
Müllerian duct, 367
Müller's (tarsal) muscle, superior, 83
Multifidus lumborum muscles, 173
Multifidus muscles, 176–177
Multifidus thoracis muscles, 173
Muscles
anorectal, 372
of arm
anterior view of, 417
posterior view of, 418
of back
deep layers, 173
intermediate layers, 172
superficial layers, 171
of dorsum of foot, 517
of duodenum, 272
of esophagus, 231
of eye, extrinsic, 86
of face, 124
facial expression, 25, 47
innervation of, 119
of forearm
attachments of, 437–438
deep layer, 431, 434
extensors of wrist and digits, 427
flexors of digits, 429
flexors of wrist, 428
intermediate layer, 433
rotators of radius, 426
superficial layer, 430, 432
of hand, 452
of hip
attachments of, 477–478
lateral view, 481
posterior views, 482
of large intestine, 276
of larynx, 80
action of intrinsic, 81
of leg
attachments of, 502
deep dissection, 505, 508
intermediate dissection, 504
lateral view of, 506
superficial dissection, 503, 507

Muscles *(Continued)*
in mastication, 48–49
innervation of, 119
of neck
anterior view of, 27
infrahyoid and suprahyoid, 28
lateral view of, 29
scalene and prevertebral, 30
of pharynx
lateral view of, 70
partially opened posterior view of, 67
sagittal section, 65
of rotator cuff, 411
of shoulder, 409
of soft palate, 65
of sole of foot
first layer, 520
second layer, 521
third layer, 522
of thigh, 479–480
attachments of, 477–478
lateral view, 481
posterior views, 482
of tongue, 60, 129
inferior longitudinal, 129
superior longitudinal, 129
transverse, 129
vertical, 129
Muscular artery, 92–93
Muscular vein, 92
Muscularis mucosae, 305, 371
of anal canal, 371–372
of rectum, 372
Musculocutaneous nerve, 415–417, 419, 421, 433–434, 436, 459–463
anterior branch of, 462
articular branch of, 462
posterior branch of, 462
terminal part of, 400–401, 432
Musculofascial extensions
to urethra, 337
to vagina, 337
Musculophrenic arteries, 186–187, 195, 208, 251
Musculophrenic vein, 186–187, 252
Myelencephalon, 303
Myenteric (Auerbach's) plexus, 305
Mylohyoid artery, 51
mylohyoid nerve to, 51, 58
Mylohyoid groove, 17
Mylohyoid line, 17
Mylohyoid muscle, 27–29, 31, 34, 43, 46–47, 50, 58–59, 64, 70, 151
innervation of, 119
median raphe between, 58
nerve to, 49–50, 58, 123
Mylohyoid nerve, 18, 47, 51, 71
to mylohyoid artery, 51
Myometrium, 352

N

Nail bed, 458
Nail body, 458
Nail matrix, 458
Nail root, 458
Nares, 1
anterior, 1
Nasal aperture, posterior, 16, 38
Nasal artery
dorsal, 3, 35, 51, 72, 83, 87, 139
external, 35
lateral, 35
Nasal bone, 1, 4, 6, 8, 35, 37–38
of newborn, 14, 45
Nasal cartilage, accessory, 35
Nasal cavity, 43, 84–85
arteries of, 40
autonomic innervation of, 53
bones of, 45
floor of, 36
growth of, 45
innervation of, 119
lateral wall of, 36–37, 40–41
medial wall of, 38
nerves of, 39, 41
postsynaptic fibers to, 53
Nasal concha
highest, 37
of newborn, 45
inferior, 4–5, 8, 36–37, 42–44, 66, 84
ethmoidal process of, 37
growth of, 45
middle, 4, 8, 36–37, 43–44, 84
growth of, 45
of newborn, 45
superior, 8, 36–37
of newborn, 45
Nasal crest, 38
Nasal meatus
inferior, 36, 43, 84
middle, 36, 43
atrium of, 36
of newborn, 45
opening into, 44
superior, 36
of newborn, 45
Nasal nerve
external, 35
lateral
inferior, 132
posterior, 132
superior, 132
posterior, 134
Nasal retinal arteriole
inferior, 92
superior, 92
Nasal retinal venule
inferior, 92
superior, 92
Nasal septal cartilage, 35
lateral process of, 35, 37–38
Nasal septum, 5, 16, 38, 40–41, 43, 64, 66
bony, 8
growth of, 45
nerves of, 39
schematic hinge of, 40–41
Nasal slit, 13
Nasal spine, 37–38
anterior, 4, 6, 8, 37–38
posterior, 10, 37–38
Nasal vein
dorsal, 3
external, 73
Nasal vestibule, 36, 38, 42
Nasal wall, lateral view of, 8
Nasalis muscle, 124, 151
alar part of, 25, 35
transverse part of, 25, 35
Nasion, 4
Nasociliary nerve (V_1), 13, 52, 85, 88, 122–123, 132–133
Nasofrontal vein, 3, 73, 87
Nasolabial lymph nodes, 74
Nasolabial sulcus, 1
Nasolacrimal canal, opening of, 37
Nasolacrimal duct, 84
of newborn, 45
opening of, 36, 84
Nasolacrimal foramen, of newborn, 45
Nasopalatine nerve (V_2), 39, 41, 53, 61
greater palatine nerves communication with, 54
groove for, 38
Nasopalatine nerve (V_2) *(Continued)*
in incisive fossa, 12
septal branch of, 54
Nasopalatine vessels, groove for, 38
Nasopharynx, 64, 66, 94, 105
airway to, 36
Navicular bone, 511–512, 514, 523–524, 531
tuberosity of, 515, 518, 523
Navicular fossa, 344, 363
Neck
autonomic nerves in, 131
bony framework of, 15
cutaneous nerves of, 2, 31
fascial layers of, 26
lymph vessels and nodes of, 74
muscles of
anterior view of, 27
infrahyoid and suprahyoid, 28
lateral view of, 29
scalene and prevertebral, 30
nerves of, 32–33
of scapula, 183
skin of, 26
subcutaneous tissue of, 26
superficial veins of, 31
surface anatomy of, 1
triangle of, 175
posterior, 171, 185
vessels of, 32–33
Nerves. *See also specific nerves*
of abdominal wall
anterior, 253
posterior, 262
of back, 174
of buttock, 490
of esophagus, 236
of external genitalia
female, 391
male, 387
of hand, 453
of head, 2
of heart, 223–224
of hip, 490
of larynx, 82
of lower ureter, 395
of nasal cavity, 39, 41
of neck, 2, 32–33
of oral and pharyngeal regions, 71
of orbit, 88
of pelvic viscera
female, 390
male, 388
of perineum
female, 391
male, 389
of reproductive organs
female, 393
male, 394
of shoulder, 465
of teeth, 63
of thigh
anterior view, 487–488
posterior view, 489
of upper limb, 400, 460–461
of urinary bladder, 395
of wrist, 449
Nervus intermedius, 96
Neurohypophysis, 141, 148–149
Neurovascular compartment, 421
Neurovascular sheath, 343
Newborn, skull of, 14
Nipple, 178–179, 329
Node of Cloquet or Rosenmüller, 261
Nodule, of inferior vermis, 114, 116
Nose, 35
ala of, 1
innervation of, 164
transverse section of, 42

Nostril, 1
Nuchal line
inferior, 10, 16
superior, 10, 16, 171–173
Nucleus ambiguus, 117–118, 126–128
Nucleus of lens, 90–91
Nucleus pulposus, 21, 155, 159
Nutrient artery, of femur, 491
Nutrient foramen, of femur, 476

O

Obex, 116
Oblique fissure, of lungs
left, 193–194, 196, 239
right, 193–196
Oblique muscle
external, 7, 171–172, 174, 176, 178–179, 185, 188, 242, 245–247, 249–251, 253–256, 258, 309, 328–329, 341, 345, 409–410, 481
aponeurosis of, 7, 245–247, 253, 255, 257, 355, 359
aponeurotic part of, 7, 245–247, 253, 255, 257
deep fascia over, 358
muscular part of, 245
transverse section of, 326, 328
inferior, 85–86, 122, 151
internal, 7, 171–172, 176, 185, 246–247, 249–251, 255–256, 258, 309, 328, 341, 345
aponeurosis of, 7, 247, 253
aponeurotic part of, 7, 247, 253
in lumbar triangle (of Petit), 171
tendon of origin of, 176
transverse section of, 328
superior, 85–86, 88, 122, 151
innervation of, 119
Oblique vein, of left atrium, 211
Obliquus capitis inferior muscle, 172, 175, 177
Obliquus capitis superior muscle, 172–173, 175, 177
Obturator anastomotic artery, 345
Obturator artery, 249, 255, 259, 313–314, 342–343, 376, 378, 380–381, 388, 396, 491, 499
accessory, 255, 257, 376, 380
acetabular branch of, 474, 491
anterior branch of, 474
posterior branch of, 474
right, 381
Obturator canal, 334–336, 338, 342–343, 346, 380, 488
Obturator crest, 334, 473
Obturator externus muscle, 397, 477–478, 480, 488, 526, 531
Obturator fascia, 335–336, 338, 342, 346, 350, 356, 370, 380
Obturator foramen, 243, 330, 473, 475
radiograph of, 331
Obturator groove, 473
Obturator internus muscle, 249, 258, 335–339, 343, 346, 348, 350, 361, 370, 376, 380, 389, 396–397, 477–478, 482, 486, 489–490, 530–531
nerve to, 484, 486, 489–490
transverse section of, 397
Obturator internus tendon, 337, 530
Obturator lymph nodes, 384
Obturator membrane, 334, 350, 474
Obturator nerves, 249, 262, 313, 378, 388, 396, 483–486, 525–526
accessory, 262, 484–485
anterior branch of, 488, 492, 526
articular branch of, 526
Obturator nerves *(Continued)*
cutaneous branches of, 471, 488, 526
posterior branch of, 488, 492, 526
branches of, 488
Obturator vein, 249, 255, 260, 291, 377, 396
accessory, 255, 257
right, 381
Occipital artery, 3, 34, 72–73, 102, 137, 139, 175
descending branch of, 34, 175
groove for, 10
mastoid branch of, 102, 137
medial, 143
meningeal branch of, 3
sternocleidomastoid branch of, 34, 72
Occipital bone, 6, 8–11, 22, 160
basilar part of, 8, 10–11, 22, 30, 36–38, 57, 65–68
clivus, 11
condylar canal and fossa of, 10
foramen magnum of, 8, 10
groove for inferior petrosal sinus, 8, 11
groove for occipital sinus, 11
groove for posterior meningeal vessels, 11
groove for superior sagittal sinus, 11
groove for transverse sinus, 11
hypoglossal canal of, 8, 10
jugular foramen of, 8
jugular process of, 30
lateral view of, 14
of newborn, 14
nuchal line of
inferior, 10
superior, 10
occipital crest of
external, 10
internal, 11
occipital protuberance of
external, 8, 10
internal, 11
pharyngeal tubercle of, 10, 64
superior view of, 14
transverse sinus of, groove for, 8
Occipital condyle, 8, 10–11, 16, 30, 100, 129
lateral mass for, 19
superior articular surface for, 19
Occipital crest
external, 10, 16
internal, 11
Occipital groove, 10
Occipital horn, 109–113, 144, 147
Occipital lobe, 106
projection on, 121
Occipital lymph nodes, 74
Occipital nerve
greater, 2, 130, 174–175
lesser, 2, 32–33, 130, 174–175
third, 2, 174–175
Occipital pole, 106
Occipital protuberance
external (inion), 6, 8, 10, 16, 152
internal, 11
Occipital sinus, 104, 145
groove for, 11
Occipital sulcus, transverse, 106
Occipital vein, 3, 73
internal, 147
Occipitalis muscle, 175
innervation of, 119
Occipitofrontalis muscle
frontal belly of, 25, 35, 124, 151
occipital belly of, 25, 124, 175
Occipitomastoid suture, 16
Occipitotemporal gyrus
lateral, 107–108
medial, 107–108
Occipitotemporal sulcus, 107–108
Oculomotor nerve (III), 55, 86, 88, 105, 115, 117–118, 122, 132, 145
branch of, 164
distribution of, 119
inferior branch of, 85, 88, 122
schema of, 122
superior branch of, 13, 85, 88, 122
Oculomotor nucleus, 117–118, 122
accessory, 117–118, 122, 133
Odontoblast layer of teeth, 63
Olecranon, of ulna, 418, 422, 425, 427, 430–431, 465
radiographs of, 423
Olecranon bursa, subcutaneous, 424
Olecranon fossa, 406, 422
radiographs of, 423
Olfactory bulb, 39, 43, 108, 120
afferent fibers from, 120
cells of, 120
efferent fibers to, 120
Olfactory cells, 120
Olfactory mucosa, 120
distribution of, 39
Olfactory nerves (I), 13, 39, 41
distribution of, 119
fibers of, 120
schema of, 120
Olfactory nucleus, anterior, 120
Olfactory stria
lateral, 120
medial, 120
Olfactory sulcus, 108
Olfactory tract, 39, 107–108, 115, 120
lateral nucleus, 120
Olfactory trigone, 120
Olfactory tubercle, 120
Olivary complex, inferior, 118
Olive, 115
Omental (epiploic) appendices, 265, 276
transverse section of, 328
Omental bursa
cross section of, 267
lesser sac, 267, 321
stomach reflected, 266
superior recess of, 266, 268, 277, 321
Omental (epiploic) foramen (of Winslow), 266–267, 269, 278, 321
Omental taenia, 273, 276
Omental (epiploic) veins, 234
Omentum
greater, 262, 265, 267, 269, 276, 278, 321
transverse section of, 327–328
lesser, 267–269, 278, 299, 321
anterior layer of, 280, 298
posterior layer of, 298
right free margin of, 271–272, 281
Omohyoid muscle, 26, 28, 31, 58, 151, 185, 195, 405, 409, 412, 415
fascia of, 185
inferior belly of, 1, 27–29, 32, 129–130
communication with cervical plexus, 33
nerves to, 71
phantom, 34
superior belly of, 27–29, 31, 129–130
communication with cervical plexus, 33
nerves to, 71
Operculum
frontal, 106
orbital, 106
parietal, 106
Ophthalmic artery, 13, 51, 55, 72, 85, 87, 133, 137–139, 141, 144
continuation of, 87
inferior, 87
muscular branch of, 87
supra-orbital branch of, 72
supratrochlear branch of, 72
zygomatic branches of, 87

Ophthalmic nerve (V_1), 2, 50, 52, 55, 88, 105, 122–123, 132–136
frontal branch of, 13
lacrimal branch of, 13
nasociliary branch of, 13
tentorial branch of, 88, 123
Ophthalmic vein
inferior, 93
superior, 13, 73, 85, 87, 93, 105
Opponens digiti minimi muscle, 449, 452, 464, 467
Opponens pollicis muscle, 449, 452–453, 463, 467
Optic canal, 4, 8, 13, 85
Optic chiasm, 43, 105, 107–108, 115, 121, 138, 141–142, 146–148
Optic disc, 85, 92
Optic ganglion, 124
Optic nerve (II), 13, 43, 55, 85, 88–89, 92, 105, 107–108, 133, 144–145
distribution of, 119
internal sheath of, vessels of, 93
left, 138
meningeal sheath of, 86, 93
right, 138
schema of, 121
Optic radiation, 121
Optic tract, 108–109, 113, 115, 121, 140, 145
Ora serrata, 89, 91–92
Oral cavity, 38, 43, 64
afferent innervation of, 61
floor of, 58
inspection of, 56
roof of, 57
Oral region
arteries of, 72
nerves of, 71
veins of, 73
Orbicularis oculi muscle, 124, 151
orbital part of, 25
palpebral part of, 25, 83
Orbicularis oris muscle, 6, 25, 35, 47–48, 124, 151
Orbiculus ciliaris, 91
Orbit, 44
arteries and veins of, 87
fascia of, 85
frontal and slightly lateral view of, 4
growth of, 45
medial wall of, 43
nerves of, 88
surface of, 4
Orbital fat, 43
Orbital fat body, 85
Orbital fissure
inferior, 4, 6, 16, 85
superior, 4–5, 13, 85
branch to, 138
Orbital gyri, 108
Orbital muscles, 43
Orbital operculum, 106
Orbital plate, of newborn, 14
Orbital process, of palatine bone, 4, 37
Orbital septum, 83
Orbital sulci, 108
Orbitofrontal artery
lateral, 140, 142–143
medial, 138, 140, 142–143
Oropharynx, 26, 64, 66, 68, 230
Os
external, 352
internal, 352
Osseous cochlea, 98
Osseous spiral lamina, 97–98
Osteomeatal unit, 36, 44
Otic capsule, 97–98
Otic ganglion, 18, 49–50, 96, 123, 126, 132, 134–136, 164
schema of, 135
Outer hair cells, 98
Oval (vestibular) window, 14, 97
stapes in, 98
base of, 94
Ovarian arteries, 313–314, 341–343, 378, 382, 390, 393
tubal branches of, 382
ureteric branch from, 314
Ovarian plexus, 390, 393
Ovarian veins, 260, 313, 341–343, 378, 382
tubal branches of, 382
Ovary, 313, 340–342, 350, 352, 367, 378, 390, 393
corpus albicans of, 352
corpus luteum of, 352
follicle (graafian) of, 352
ligament of, 340–342, 350–352, 367
right, 353
suspensory ligament of, 340–343, 352–353, 367, 378

P

Palate
growth of, 45
hard, 64, 68
innervation of, 119, 164
postsynaptic fibers to, 53
soft, 36, 38, 56, 64, 66, 68
innervation of, 119
muscles of, 65
Palatine aponeurosis, 57, 65
Palatine artery
ascending, 51, 68, 72
tonsillar branches of, 51, 68
descending, 54–55, 72
greater, 40, 51, 54–55, 57
sphenopalatine artery anastomosis with, 54
lesser, 40, 51, 54–55, 68
tonsillar branch of, 68
Palatine bone, 8, 10, 37
horizontal plate of, 8, 10, 16, 36–38, 57, 62, 100
nasal crest of, 38
nasal spine of, posterior, 10, 38
of newborn, 14, 45
orbital process of, 4, 37
palatine foramen of
greater, 10, 12, 37–38
lesser, 10, 12, 37–38
perpendicular plate of, 8, 37–38
posterior nasal spine of, 37
pyramidal process of, 10, 14, 16
sphenoidal process of, 37
Palatine folds, transverse, 57
Palatine foramen
greater, 10, 12, 37–38, 40, 57, 62
lesser, 10, 12, 37–38, 40, 57, 62
Palatine glands, 57, 64, 68
Palatine nerves (V_2)
descending, 134
greater, 39, 41, 53–55, 57, 61, 71, 123, 132, 134
in greater palatine foramen, 12
nasopalatine nerve communication with, 54
posterior inferior lateral nasal branch of, 41
lesser, 39, 41, 53–55, 61, 71, 123, 132, 134
in lesser palatine foramen, 12
Palatine process, 7–8, 10, 16
of maxilla, 36–38, 57, 62, 100
Palatine raphe, 57
Palatine tonsil, 47, 56–57, 60, 64, 66, 68
Palatine vein, 73
external, 73
Palatine vessels, 12
Palatoglossal arch, 47, 56, 60, 68
Palatoglossus muscle, 47, 57, 59–60, 68, 127, 151
Palatomaxillary suture, 10
Palatopharyngeal arch, 47, 56, 60, 66, 68
Palatopharyngeal sphincter, 65
Palatopharyngeus muscle, 47, 57, 59–60, 65, 67–69, 127, 151
Palmar aponeurosis, 402, 428, 432, 441, 446–447, 450
Palmar arch
deep, 435, 452
superficial, 435, 449, 453
Palmar carpal arterial arch, 452
Palmar carpal ligament, 402, 432–433, 441, 446–447, 449, 453, 464
Palmar crease, proximal, 398
Palmar digital arteries, 435, 446, 453, 456
common, 435, 447, 450, 452–453
proper, 435, 447, 458
Palmar digital nerves, 402, 446–447, 453, 464
common, 450, 463–464
proper, 447, 453, 458, 463
Palmar digital veins, 402
Palmar ligaments, 445, 448, 451, 458
Palmar metacarpal arteries, 435
proper, 453
Palmar radiolunate ligament, 441
Palmar ulnocarpal ligament, 441
Palmaris brevis muscle, 446, 464, 467
Palmaris carpi ulnaris muscle, 428
Palmaris longus muscle, 428, 432, 434, 436, 463, 467
Palmaris longus tendon, 398, 433, 436, 441, 446–447, 449
Palmate folds, 352
Palpebral arterial arches
inferior, 87
superior, 87
Palpebral artery
lateral, 87
inferior, 87
superior, 87
medial, 87
inferior, 87
superior, 87
Palpebral conjunctiva, 83, 85
inferior, 83
superior, 83
Palpebral ligament
lateral, 83, 85
medial, 83, 85
Pampiniform venous plexus, 252, 365, 379, 381
Pancreas, 127, 176, 267–268, 281, 320–321
autonomic nerves of, 307
axial CT images of, 322
body of, 266, 281
axial CT images of, 322
head of, 266, 271–272, 281
arteries of, 286
axial CT images of, 323
innervation of, 163–164
lymph vessels and nodes of, 294
neck of, 281
in situ, 281
tail of, 266, 281–282, 308
artery to, 284
transverse section of, 325
uncinate process of, 281
transverse section of, 327

Pancreatic arteries, 284
anastomotic branch of, 284
dorsal, 283–284, 286–287
greater, 284, 286
inferior, 284, 286–287
Pancreatic duct, 280
accessory (of Santorini), 272, 281
main (of Wirsung), 272, 280–281
Pancreatic lymph nodes, 294
right superior, 293
Pancreatic notch, 281
Pancreatic veins, 289, 291
great, 289
Pancreaticoduodenal artery
anterior inferior, 284, 286, 300
plexus on, 298–299
anterior superior, 266, 283–284, 286–287, 300
plexus on, 298–299
inferior, 284, 286–288, 301
posterior inferior, 284, 286, 300
plexus on, 299
posterior superior, 283–284, 286–287, 300
plexus on, 299
Pancreaticoduodenal lymph nodes, 294
Pancreaticoduodenal plexus, inferior, 301
Pancreaticoduodenal vein
anterior inferior, 289, 291–292
anterior superior, 289, 291–292
posterior inferior, 289, 291
posterior superior, 289, 292
Papilla, 63
fibers to, 274
filiform, 60
foliate, 60, 136
fungiform, 60, 136
ileal, 274
incisive, 57
keratinized tip of, 60
lacrimal
inferior, 83–84
superior, 83–84
parotid, 56
renal, 311
vallate, 60, 136
Papillary muscle, 213, 241
anterior, 217–218, 220–222
posterior, 217–218, 220–222
Paracentral artery, 142–143
Paracentral lobule, 107
Paracentral sulcus, 107
Paracolic gutter
left, 265, 341, 345
transverse section of, 328
right, 265, 273, 341, 345
transverse section of, 328
Paracolic lymph nodes, 296
Paradidymis, 367
Paraduodenal fossa, 264
Parahippocampal gyrus, 107–109, 120
Paramedian arteries, posteromedial, 141
Paramesonephric (müllerian) duct, 367
Paranasal sinuses
bones of, 45
changes with age of, 45
coronal section, 43
horizontal section, 43
innervation of, 164
lateral dissection, 44
sagittal section, 44
Pararectal fossa, 341–342, 345, 370
Pararenal fat, 176, 315
transverse section of, 327
Parasternal lymph nodes, 181–182
Parasympathetic fibers, 122–124, 126, 133, 135
of autonomic reflex pathways, 304
of kidneys and upper ureters, 318
Parasympathetic fibers *(Continued)*
of liver and biliary tract, 306
of pancreas, 307
of reproductive organs, 393–394
of tracheobronchial tree, 207
of urinary bladder and lower ureter, 395
Parasympathetic nervous system, schema of, 164
Parathyroid gland, 78
inferior, 77–78
superior, 77–78
Paratracheal lymph nodes, 235
left, 205
right, 205
Para-umbilical veins, 249, 292
in round ligament of liver, 252
tributaries of, 252
Para-urethral (Skene's) ducts, 367
openings of, 354
primordium of, 367
Paravertebral anastomoses, 168
Paravesical endopelvic fascia, 348
Paravesical fossa, 342
Paravesical pouch, 350
Parietal artery, 3
anterior, 142–143
posterior, 142–143
Parietal bone, 4, 6, 8–11
groove for middle meningeal vessels, 11
lateral view of, 14
mastoid angle, 11
of newborn, 14
superior view of, 14
tuber of, 14
Parietal emissary vein, 3
Parietal foramen, 9
Parietal lobe, 106
Parietal lobule, inferior
angular gyrus of, 106
supramarginal gyrus of, 106
Parietal lymph nodes, posterior, 235
Parietal operculum, 106
Parietal peritoneum, 257, 265, 267–268, 321, 341, 344–346, 348
diaphragmatic part of, 306
transverse section of, 328
Parietal pleurae, 208
cervical (cupula, dome of), 193–194, 227–228
costal part of, 190–191, 195, 203, 208, 227–229
left border of, 194
right border of, 194
diaphragmatic part of, 190–191, 195, 203, 208, 229
mediastinal part of, 190–191, 195, 203, 208–209, 212–213, 227–229
Parietal vein, 3
Parieto-occipital sulcus, 106–107
Parolfactory area, 107
Paroöphoron, 367
Parotid duct (of Stensen), 24, 46, 48–49, 72
opening of, 56
Parotid fascia, 25
Parotid gland, 24, 27, 29, 31, 42, 46–47, 66, 94, 126, 135
accessory, 46
bed of, 47
innervation of, 163–164
Parotid lymph nodes
deep, 74
superficial, 74
Parotid papilla, 56
Parotid space, 34
Pars distalis, 148
Pars flaccida, 95
Pars interarticularis, 155
Pars intermedia, 148
Pars tensa, 95
Pars tuberalis, 148
Parturition, neuropathways in, 392
Passavant's ridge, 65
Patella, 468, 479–481, 488, 493–494, 498, 506–507
radiograph of, 497
Patellar anastomosis, 487–488, 499, 509
Patellar capsule, 495
Patellar ligament, 468, 479–481, 488, 493–495, 498, 501–502, 506–508
Patellar nerve plexus, 470
Patellar retinaculum, 495
lateral, 479–481, 493–494, 506–508
medial, 479–480, 488, 493–495, 507–508
Pecten, 371
Pecten pubis, 243, 330, 334, 338, 473
Pectinate ligament, 90
Pectinate line, 371
Pectinate muscles, 217
Pectineal fascia, 247
Pectineal ligament (Cooper's), 246–247, 249, 255, 257–258
Pectineal line, 243, 330, 334, 473
Pectineus muscle, 396–397, 477–480, 487–488, 491–492, 525, 531
Pectoral fasciae, 179, 412
Pectoral lymph nodes, 181–182
Pectoral nerve
lateral, 185, 412, 415–416
medial, 185, 412, 415–416
Pectoralis major muscle, 27, 29, 31, 179, 182, 185–186, 188, 195, 213–214, 238–242, 245–246, 398, 405, 409–410, 412, 415, 417, 419, 421, 467
abdominal part of, 409
clavicular head of, 178, 214, 409
fascia of, 412
pectoral fascia and, 179, 412
sternal head of, 178
sternocostal head of, 214, 409
Pectoralis major tendon, 419, 421
Pectoralis minor muscle, 182, 185–186, 195, 214, 238–241, 405, 410, 412–413, 415, 417, 419, 467
fascia of, 185, 412
Pectoralis minor tendon, 410, 415
Pedicle
cervical, 20
lumbar, 155–156, 158–159
thoracic, 154
Pedis artery, dorsal, 508, 517–518, 523
Peduncles
cerebellar
inferior, 114–116, 125, 145
middle, 114–116, 145
superior, 114–116, 145
cerebral, 107, 116
Pelvic brim, 350
sacral part of, 157
Pelvic diaphragm, 369
female, 335–337, 340
inferior fascia of, 355–356, 360, 370, 383
interior fascia of, 372
male, 338–339, 344
superior fascia of, 343, 346, 355, 370, 372
Pelvic fascia, tendinous arch of, 343, 346, 348
Pelvic inlet, radiograph of, 331
Pelvic ligaments, 353
Pelvic organs, arteries and veins of, female, 378
Pelvic outlet
anteroposterior diameter of, 332
transverse diameter of, 332
Pelvic viscera
female, 340, 342
male, 344

Pelvic viscera *(Continued)*
nerves of
female, 390
male, 388
Pelvis
bones of, 333–334
bony framework of, 330
false, 334, 341
female, 397
arteries of, 380
contents of, 341
diaphragm, 335–337, 340
lymph vessels and nodes of, 384
measurements of, 332
radiograph of, 331
viscera of, 340, 342
ligaments of, 333–334
linea terminalis of, 343, 345
male
arteries of, 381
bladder-prostate junction, 396
contents of, 345
diaphragm, 338–339
lymph vessels and nodes of, 386
measurements of, 332
radiograph of, 331
veins of, 381
viscera of, 344
sagittal CT images of, 375
surface anatomy of, 329
true, 334
ureters in, 313
Penis, 360
body (shaft) of, 329, 366
bulb of, 360–361, 363
artery of, 361, 383
cavernous nerves of, 388, 394
corpus cavernosum of, 359–360, 363
corpus spongiosum of, 359, 363
crus of, 348, 359–361, 363
deep artery of, 359, 363, 383
deep (Buck's) fascia of, 245–247, 321, 344, 358–361, 365, 373–374, 381, 383
intercavernous septum of, 359–360, 363
dorsal artery of, 359, 361, 383
deep, 379, 383
dorsal nerve of, 359, 361, 383, 387–389, 394, 484, 490
dorsal vein of
deep, 245, 339, 344, 359, 361, 379, 381
hiatus for, 338
superficial, 245, 252, 329, 359, 381
frenulum of, 360
fundiform ligament of, 245, 255, 344
glans, 329, 344, 360, 363, 366
corona of, 360
neck of, 360
lateral superficial vein of, 359
raphe of, 366
sagittal CT images of, 375
skin of, 358–360, 365
superficial fascia of, 245–247, 344, 358–360, 365
suspensory ligament of, 246, 344
transverse section through, 359
tunica albuginea of, 359, 363
Perforated substance
anterior, 108, 115, 120
male, 343
posterior, 108, 115
Perforating arteries, 489
anteromedial, 141
posteromedial, 141
Perforating cutaneous nerve, 389, 391
Perforating radiate (capsular) arteries, 312
Perforating veins, 401–402
anterior, 189
Peri-anal skin, 371–372
Peri-anal space, 370–371, 374
Peri-anal tissues, 366
Pericallosal artery, 142–143
posterior, 144
Pericardiacophrenic artery, 187, 203, 208–209, 213, 227, 251
left, 190–191, 228
right, 190–191
Pericardiacophrenic vein, 187, 203, 208–209, 213, 227
left, 191, 228
right, 191
Pericardiacophrenic vessels, 212
Pericardial cavity, 213
Pericardial reflection, 211, 217–218
Pericardial sac, 212
Pericardial sinus
oblique, 212–213, 241
transverse, 209, 212, 217–218
Pericardium, 26, 191, 203, 208–209, 212, 229–230
bare area of, 193
diaphragmatic part of, 212
fibrous, 195, 208, 212, 227–228
at site of reflection from great vessels, 209
sternocostal part of, 212
Perichoroidal space, 89–90
Pericranium, 103
Periglandular plexus, 305
Periglomerular cell, 120
Perimuscular rectal venous plexus, 291, 377
Perineal artery, 350, 357, 381–383
transverse, 383
Perineal body, 339, 344, 346, 355–356, 360–362, 369, 373, 383
growth of, 347
Perineal compartment, superficial, 374
Perineal fascia
deep, 344, 348, 350, 355–356, 359–361, 369, 374
superficial, 344, 348, 350, 355, 357–361, 369, 373–374, 382–383, 389
transverse, deep, 362, 369
Perineal flexure, 396
Perineal ligament, transverse, 336, 343–344, 346, 355, 361, 383
anterior thickening of, 338
Perineal lymph vessels, 296
Perineal membrane, 249, 258, 321, 335, 339–340, 344, 346, 348, 350, 355–357, 359–362, 373–374, 382–383, 389
anterior thickening of, 343–344, 346
superior aspect of, 381
Perineal muscle
deep, fascia of, 336
transverse
deep, 249, 321, 335, 340, 344, 356–357, 361–362, 369, 374, 382, 397
superficial, 321, 335, 355–357, 359–361, 369, 373–374, 382–383, 397
Perineal nerve, 357, 370, 388–389, 391, 484, 490
deep branches of, 357, 389, 391
superficial branches of, 357, 389, 391
Perineal raphe, 354, 366
Perineal space
female
deep, 357
superficial, 357
male, 361
superficial, 344, 350, 355–356, 359–361, 382–383
inferior fascia of, 344
Perineal vein, 383
Perineopelvic spaces, 374
Perineum
arteries of, 382
male, 383
female, 340, 354
deep perineum and, 356
interdigitating fibers of, 337
superficial dissection of, 355
lymph vessels and nodes of, female, 385
male, 344
deeper dissection, 359
superficial dissection, 358
nerves of
female, 391
male, 389
surface anatomy of, 329
veins of, 382
male, 383
Periodontium, 63
Periorbita, 85
Periosteum
alveolar, 63
mandibular, 63
maxillary, 63
Periportal arteriole, 279
Periportal bile ductule, 279
Periportal space, 279
Perirenal fat, 176, 315
transverse section of, 327
Perisinusoidal spaces, 279
Peritoneal fold, 266, 345
Peritoneal layers, of mesentery, 305
Peritoneal reflection, 369
Peritoneum, 7, 176, 232, 249, 256, 276, 301, 308, 315, 320, 340, 355, 378. *See also specific peritoneums*
inferior extent of, 393–394
of pararectal fossa, 370
of pelvic viscera, 390
of posterior abdominal wall, 268
Peritoneum reflection, 371
Peri-ureteric loops, 317
Perivascular fibrous capsule, 278
Permanent teeth, 62–63
Perpendicular plate, 8, 37–38
Pes anserinus, 477, 479–480, 493–494, 502
Pes hippocampi, 112–113
Petit, lumbar triangle of, 152, 250
internal oblique muscle in, 171
Petropharyngeus muscle, 67
Petrosal artery, superficial, 96
descending branch of, 96
Petrosal nerve
deep, 39, 53, 124, 126, 132, 134
greater, 13, 39, 53, 55, 61, 88, 96, 124–126, 132, 134, 136
in foramen lacerum, 12
groove for, 11, 99
hiatus for, 13
lesser, 12–13, 50, 88, 95–96, 123–124, 126, 135
groove for, 11
hiatus for, 13
Petrosal sinus
inferior, 13, 104–105
groove for, 8, 11
superior, 55, 99, 104–105, 145
groove for, 8, 11
Petrosal vein, 105, 145
Petrosquamous fissure, 14
Petrotympanic fissure, 10, 12
Peyer's patches, 272, 275
Phalanges
foot, 511–512
distal, 511, 515, 524
middle, 511, 515, 524
proximal, 511, 515, 524

Phalanges *(Continued)*
hand, 445
distal, 443–444, 458
middle, 443–444, 458
proximal, 443–444
Pharyngeal aponeurosis, 65, 67, 69
Pharyngeal artery, 51
artery of, 54
ascending, 34, 51, 55, 72, 96, 137, 139
meningeal branches of, 13, 102, 137
pharyngeal branch of, 68
tonsillar branch of, 68
Pharyngeal constrictor muscle, 64, 82
inferior, 29, 65, 67, 69–70, 77–78, 82, 127, 151, 231
cricopharyngeus part of, 69, 230–231
middle, 29, 59, 65, 67–70, 77, 127, 151
superior, 47, 49, 51, 57, 59, 65, 67–70, 72, 77, 127, 151
glossopharyngeal part of, 59, 65
Pharyngeal muscles, longitudinal, 65, 67, 69
Pharyngeal nerve, 134
Pharyngeal plexus, 61, 71, 126–127, 131–132
Pharyngeal raphe, 36, 64–65, 67–68, 77, 231
Pharyngeal recess, 36, 42, 66, 68
Pharyngeal region
arteries of, 72
nerves of, 71
veins of, 73
Pharyngeal tonsil, 36, 38, 64, 66–68
imaging of, 151
Pharyngeal tubercle, 10, 38, 64–65, 67–68
basilar part of, 22
Pharyngobasilar fascia, 57, 59, 65, 67, 70, 75
Pharyngo-epiglottic fold, 67, 69
fibers to, 65
Pharyngo-esophageal constriction, 230
Pharyngo-esophageal junction, 69
Pharyngotympanic (auditory, eustachian) tube, 94–96, 98, 100, 127
cartilage of, 42, 49, 57, 65, 67–68, 100
lateral lamina of, 100
medial lamina of, 100
groove for, 10
opening of, 36
pharyngeal opening of, 64, 66, 68, 126
Pharynx
afferent innervation of, 61
innervation of, 119
lymph vessels and nodes of, 75
median section of, 64
muscles of
lateral view of, 70
partially opened posterior view of, 67
sagittal section, 65
opened posterior view of, 66
posterior view of, 77
posterior wall of, 56
zone of sparse muscle fibers, 69, 77
Philtrum, 1, 56
Phrenic arteries, inferior, 229, 233, 236, 259, 283, 297–298, 320, 388
anterior branch of left, 192
lateral branch of left, 192
left, 192, 266, 268, 284, 299, 310, 319–320
recurrent branch of, 259, 283
right, 192, 284, 299, 310, 319
Phrenic ganglion, 192, 299
Phrenic lymph nodes
inferior, 261
pathway to, 181
juxta-esophageal, 235
superior, 235
Phrenic nerve, 26, 30–33, 71–72, 76, 130–131, 186–187, 190, 195, 203, 208–209, 213, 223, 227–229, 238, 251, 297, 319, 413, 415–416
afferent fibers, 190
efferent fibers, 190
left, 190–192, 212, 228
anterior branch of, 192
pericardial branch of, 190
phrenico-abdominal branches of, 190
right, 190–191, 212, 239, 306, 319
anterior branch of, 192
Phrenic plexus, inferior, 297–298, 388
left, 299, 319
right, 299, 319
Phrenic veins, inferior, 260, 310
Phrenicocolic ligament, 266, 268
Phrenico-esophageal ligament, 232
Physeal closure, 467
Pia mater, 101, 103, 109, 166
overlying spinal cord, 165
Pial arterial plexus, 168
Pial plexus, 167
peripheral branches from, 168
Pial venous plexus, 169
Pigment cells, 121
Pigment epithelium, 90
Pillar (rod) cells, 98
Pineal body, 107, 111–112, 115–116
Pineal gland, imaging of, 151
Pineal recess, 109
Piriform fossa, 66, 80, 230
Piriform lobe, 120
Piriformis muscle, 258, 335–338, 380, 388–389, 397, 477, 482, 486, 489–490, 531
nerve to, 484, 486
Pisiform bone, 428, 432–434, 439–443, 445–447, 449, 452
radiographs of, 444
Pisohamate ligament, 441
Pisometacarpal ligament, 441
Pituitary gland, 36, 105, 107–108, 148
adenohypophysis (anterior lobe) of, 141, 148–149
cleft of, 148
imaging of, 151
neurohypophysis (posterior lobe) of, 141, 148–149
Pituitary stalk, 115, 141, 148
Plantar aponeurosis, 516, 519–522
Plantar arch, deep, 509, 523
posterior perforating branches from, 508–509, 518
Plantar artery
deep, 508–509, 517, 523
lateral, 505, 516, 519, 522–523
plantar metatarsal branch of, 520
medial, 516, 519, 521–522
deep branches of, 521–522
proper plantar digital branch of, 522
superficial branch of, 520–521
Plantar calcaneocuboid ligament, 515
Plantar calcaneonavicular ligament, 514–515, 523
Plantar digital arteries, 519–521, 523
branches of, 508, 517–518
Plantar digital nerves, 519, 521, 528
branches of, 508
Plantar fascia
lateral, 519
medial, 519
Plantar ligaments, 515, 523
of foot, 515
long, 514–515, 523
short, 514
Plantar metatarsal arteries, 520, 522–523
perforating branches from, 518
Plantar metatarsal ligaments, 515, 523
Plantar nerve
lateral, 505, 516, 519, 521–522, 527–528
plantar cutaneous branches of, 471
plantar digital branches of, 520–522
superficial branch of, 522
medial, 516, 519, 521–522, 527–528
deep branches of, 522
plantar cutaneous branches of, 471
plantar digital branches of, 520–521
Plantar surface, of foot, 468
Plantarflexion, of ankle, 469
Plantaris muscle, 478, 481–482, 489, 493, 498, 502–505, 527–528, 531
Plantaris tendon, 482, 503–504, 510
Platysma muscle, 25–27, 31, 124, 151
Pleurae, 166, 196, 309
mediastinal, 191, 209
parietal, 208
cervical (cupula, dome of), 193–194, 227–228
costal part of, 190–191, 194–195, 203, 208, 227–229
diaphragmatic part of, 190–191, 195, 203, 208, 229
mediastinal part of, 190–191, 195, 203, 208–209, 212–213, 227–229
visceral, 202
Pleural cavity, 213
costodiaphragmatic recess of, 193–195, 227–228
costomediastinal recess of, 193
left, 191
right, 191
Pleural reflection, 193–195
Plica semilunaris, 83–84
Pons, 107, 115–116, 135–136
imaging of, 151
Pontine arteries, 140–142, 144
Pontine taste area, 136
Pontine vein
lateral, 145
transverse, 145
Pontomesencephalic vein, anterior, 145
Popliteal artery, 482, 487, 489, 492, 499, 503–505, 509
Popliteal fossa, 468, 487
Popliteal ligament
arcuate, 495, 497–498
oblique, 495, 497–498
Popliteal lymph nodes, 472
Popliteal tendon, origin of, 494
Popliteal vein, 472, 482, 489, 492, 503–504
Popliteus muscle, 478, 482, 497–498, 502, 504–505, 528, 531
nerve to, 528
Popliteus tendon, 495–496
Porta hepatis, 277
Portacaval anastomoses, 292
Portal arteriole, 279
Portal space, limiting plate of, 279
Portal triad, 267, 271, 278, 281
transverse section of, 325
Portal veins, 278
axial CT images of, 322–323
branch of, 279
hepatic, 214, 226, 234, 267, 271–272, 277–278, 281, 283–284, 289–291, 294, 321
tributaries of, 292
long hypophyseal, 141, 149
short hypophyseal, 149
transverse section of, 325
Postanal space
deep, 374
superficial, 374
Postcaval lymph nodes, 316
Postcentral gyrus, 106

Postcentral sulcal arteries, 142
Postcentral sulcus, 106, 143
Posterior chamber of eye, 83, 89–92
Posterolateral (dorsolateral) fissure, 114
Posteromedial central (paramedian) arteries, 141
Posteromedial central (perforating) arteries, 141
Postganglionic fibers, 53, 133, 135
of autonomic reflex pathways, 304
of kidneys and upper ureters, 318
of liver and biliary tract, 306
of pancreas, 307
of reproductive organs, 393–394
of urinary bladder and lower ureter, 395
Postlunate fissure, 114
Postnatal circulation, 226
Potential spaces, female, 343
Poupart's, Inguinal ligament, 242, 245–247, 255–258, 329, 336, 355, 358–359, 385, 468, 470, 472, 479, 485, 488
reflected, 255
Pre-aortic lymph nodes, 296, 384, 386
Precaval lymph nodes, 316
Prececal lymph nodes, 296
Precentral cerebellar vein, 145
Precentral gyrus, 106
Precentral sulcal arteries, 142–143
Prechiasmatic groove, 11
Precordial areas, of auscultation, 210
Preculminate vein, 145
Precuneal artery, 143
Precuneus, 107
Prefrontal artery, 140, 142
Prefrontal sulcal arteries, 143
Preganglionic fibers, 53, 133, 135
of autonomic reflex pathways, 304
of kidneys and upper ureters, 318
of liver and biliary tract, 306
of pancreas, 307
of reproductive organs, 393–394
of urinary bladder and lower ureter, 395
Preganglionic sympathetic cell bodies, 53, 133–135
Premammillary artery, 141
Premolar teeth, 62–63
Prenatal circulation, 226
Preoccipital notch, 106
Prepatellar bursa, subcutaneous, 498
Prepontine cistern, 110
Prepuce, 344, 366
of clitoris, 354
Preputial (Tyson's) gland, opening of, 360
Prepyloric vein, 289, 291
Prerectal muscle fibers (of Luschka), 339
Pre-rolandic arteries, 142–143
Presacral fascia, 343, 374
Presacral space, 343, 374
Pretracheal fascia, 26, 64
visceral layer of, 199
Pretracheal lymph nodes, 76
Prevertebral anastomoses, 168
Prevertebral fascia, 26, 47, 64–65
Prevertebral muscles, 30
Prevesical fascia, umbilical, 344
Prevesical lymph nodes, lateral, 316
Prevesical plexus, 386
Prevesical space, 374
Primary fissure, 114
Primary teeth, 62
Princeps pollicis artery, 435, 453
Procerus muscle, 25, 35, 124, 151
Processus vaginalis, 364
Profunda brachii artery, 415, 418–421
superior lateral, 413
Profunda femoris artery, 487–489, 491–492, 499
perforating branches of, 480, 488
Profunda femoris vein, 492
Promontorial (middle sacral) lymph nodes, 316, 384, 386
Promontory, 94
sacral, 157, 330, 333–334, 336, 340, 342, 345, 390
measurements of, 332
with tympanic plexus, 95
Pronator quadratus muscle, 426, 434, 436–437, 450, 452, 463, 467
Pronator teres muscle, 405, 417, 419, 426, 431–434, 436–438, 460, 463, 467
Proprioceptive fibers, 123
Prostate, 249, 321, 339, 344, 348, 361–363, 367, 369
apex of, 362
base of, 362
capsule of, 348
central zone of, 362
fibromuscular stroma of, 362
innervation of, 163–164
lymphatic drainage from, 386
peripheral zone of, 362
primordium of, 367
transitional zone of, 362
Prostate gland, 396
Prostatic ducts, openings of, 362–363
Prostatic plexus, 317, 388, 394–395
Prostatic sinus, 362–363
Prostatic urethra, 348, 363
Prostatic utricle, 362–363, 367
Prostatic venous plexus, 381
Proximal interphalangeal (PIP) joint, 398, 445
Psoas fascia, 176, 315
Psoas major muscle, 176, 192, 255, 258–260, 262, 271, 308–309, 315, 328, 341, 343, 345, 378, 479, 483, 485–486, 525, 530–531
nerves to, 484–485
origin of, 483
transverse section of, 327–328
Psoas minor muscle, 258, 328, 341, 345, 483
nerves to, 484–485
origin of, 483
Psoas muscles, 491
Pterion, 6
Pterygoid artery, 51
lateral, 51
medial, 51
Pterygoid canal, 54
artery of, 51, 54–55, 96, 138
nerve (vidian) of, 39, 41, 52–53, 55, 96, 123–124, 126, 132, 134, 136
Pterygoid fossa
inferolateral view of, 16
posterior view of, 16
Pterygoid fovea, 17
Pterygoid hamulus, 6, 10, 16, 37, 49–50, 57, 65, 68, 70, 100
of newborn, 45
Pterygoid muscle
lateral, 6, 42, 49–51, 151
medial, 24, 42, 47, 49–51, 57, 67, 71, 151
Pterygoid nerve (V_3)
lateral, 50, 71, 123
medial, 49–50, 71, 123
Pterygoid plate
lateral, 15–16, 42, 49, 70, 100
medial, 16, 49, 57, 65, 68, 100
hamulus of, 15
right, 55
Pterygoid plexus, 73, 87
deep facial vein from, 3
Pterygoid process
hamulus of, 6, 10, 16, 37
lateral plate of, 6, 8, 10, 16, 37–38
Pterygoid process *(Continued)*
medial plate of, 6, 8, 10, 16, 37–38
of newborn, 45
pterygoid fossa of, 10
scaphoid fossa of, 10
Pterygomandibular raphe, 15, 47, 49, 51, 57, 65, 68, 70
Pterygomaxillary fissure, 6
Pterygopalatine fossa, 6, 54
nasal branches in, 53
pterygopalatine ganglion in, 53
Pterygopalatine ganglion, 39, 41, 52, 54–55, 61, 71, 122–124, 126, 132, 134, 136, 164
ganglionic branches to, 52
pharyngeal branch of, 61
in pterygopalatine fossa, 53
schema of, 134
Pubic arch, 243, 330
measurements of, 332
Pubic bone, 321, 335–336, 361
growth of, 347
sagittal CT images of, 375
transverse section of, 397
Pubic crest, 255, 338
Pubic ligament, inferior, 243, 330, 336–339, 343–344, 346, 355, 361
Pubic ramus, 530
inferior, 243, 330, 337, 340, 348, 473–474, 483
superior, 243, 330, 333–334, 338, 340, 344, 360, 473–474, 480, 483, 486
radiograph of, 331
Pubic symphysis, 242–243, 255–256, 258, 329–330, 333, 336–340, 343–344, 346, 355, 357–358, 361, 380, 397, 530
measurements of, 332
radiograph of, 331
superior portion of, 396
Pubic tubercle, 242–243, 246–247, 256, 258, 329–330, 333–334, 338–339, 355, 360, 473, 479–480
Pubic vein, 260
Pubis, 244
body of, 396
radiograph of, 331, 475
symphyseal surface of, 390
Pubocervical fascia
horizontal portion of, 351
vertical portion of, 351
Pubococcygeus muscle, 335–339, 350, 373
Pubofemoral ligament, 474
Puboprostatic ligament
lateral, 346
medial, 346
Puborectalis muscle, 321, 335, 337–339, 373, 397
left, 335
Pubovesical ligament
lateral, 343, 346
medial, 343, 346
Pudendal artery, 370
external
deep, 251, 259, 379, 487, 499
superficial, 245, 251, 259, 379, 487, 499
internal, 259, 314, 357, 361, 376, 380–383, 396–397, 486
perineal branch of, 361
Pudendal canal (Alcock's), 291, 370, 376, 380, 382–383, 389, 391
Pudendal cleft, 354
Pudendal nerve, 160, 262, 303, 370, 383, 388–397, 484, 486, 489–490
Pudendal vein, 370
external, 252, 260
deep, 379, 487
superficial, 245, 379, 470, 487
internal, 260, 291, 377, 383, 396–397

Pudendum, 354
Pulmonary arteries, 202
left, 196, 203, 210–211, 218, 226, 228, 240
right, 196, 203, 209, 211, 217–218, 226–227, 240
Pulmonary heart valve, 217, 219, 222
anterior semilunar cusp of, 217, 219
left semilunar cusp of, 217, 219
right semilunar cusp of, 217, 219
Pulmonary ligament, 195–196, 205, 227–228
Pulmonary (intrapulmonary) lymph nodes, 205
Pulmonary plexus, 127, 207, 236
anterior, 206
branches to, 206
posterior, 206
Pulmonary trunk, 203, 209–210, 212, 217, 221–222, 226, 237, 240
bifurcation of, 214
Pulmonary veins, 202
inferior
left, 196, 211, 213
right, 196, 211, 213, 217, 241
left, 203, 212, 218, 221, 226, 228
right, 203, 212, 218, 222, 226–227
septum of, 202
superior
left, 196, 209, 211, 218
right, 196, 209, 211, 217, 221
Pulmonic heart valve, 210
Pulvinar, 111–112
left, 145
right, 145
of thalamus, 108, 112, 115–116, 140, 146
Pupil, 83
Purkinje fibers
of left bundle, 222
of right bundle, 222
Putamen, 109, 111
Pyloric antrum, 269
Pyloric canal, 269
transverse section of, 325
Pyloric lymph nodes, 294
Pyloric orifice, 272
Pyloric sphincter, 270
Pyloric zone, 270
Pylorus, 269–271
transverse section of, 325
Pyramid, cerebellar, 115
decussation of, 115–116
of inferior vermis, 114, 116
Pyramidal eminence, 96
Pyramidal lobe, of thyroid gland, 76
Pyramidal process, 10, 14, 16
Pyramidalis muscle, 246, 256, 328

Q

Quadrangular lobule, 114
Quadrangular space, 413–414
Quadrate ligament, 424
Quadrate tubercle, 476
Quadratus femoris muscle, 477–478, 480, 482, 488–490, 531
nerve to, 484, 486, 490
Quadratus lumborum fascia, 176, 192, 258–260, 262, 308, 315, 328, 341, 345
transverse section of, 328
Quadratus lumborum muscle, 173, 176, 309, 483, 485
Quadratus plantae muscle, 521–522, 528, 531
Quadratus plantae nerve, 528
Quadriceps femoris muscle, 502, 525
Quadriceps femoris tendon, 468, 477, 488, 493–494, 498, 506–508
Quadrigeminal cistern, 110
imaging of, 151

R

Radial artery, 419–420, 431–436, 441, 447, 449, 452–454, 456–457, 460
dorsal carpal branch of, 454
palmar branch of, 433, 453
superficial, 434–435, 441, 447, 452–453
palmar carpal branches of, 434, 452
Radial collateral artery, 418, 420–421
Radial collateral ligament, 424
Radial fossa, 405, 422
Radial groove, 406
Radial longitudinal crease, 398
Radial metaphyseal arcuate ligament, dorsal, 442
Radial nerve, 400, 410, 413, 415–416, 418, 421, 433–434, 454, 459–463, 465
in arm, 465
communicating branches of, 455
deep branch of, 433, 436, 460, 466
dorsal digital branches, 400, 454, 459, 466
in forearm, 466
inferior lateral brachial cutaneous nerve from, 400–401
lateral branch of, 454
medial branch of, 454
posterior antebrachial cutaneous nerve from, 400–401, 459
posterior brachial cutaneous nerve from, 400–401
superficial branch of, 400, 402, 430, 433, 436, 454–456, 459–460, 466
Radial notch, of ulna, 422, 425
Radial recurrent artery, 419–420, 433–435
Radial tuberosity, 417, 422, 425
radiograph of, 423
Radialis indicis artery, 435, 453
Radiate ligament, of head of rib, 184
Radiate sternocostal ligament, 184, 404
Radicular artery
anterior, 167–168
posterior, 168
Radicular vein, segmental, 169
anterior, 169
posterior, 169
Radiocarpal joint, 439, 442
articular disc of, 439, 442
Radiocarpal ligament, dorsal, 442
Radiology, of heart, 210
Radiolunate ligament
long, 441
palmar, 441
short, 441
Radioscaphocapitate ligament, 441
Radio-ulnar joint, distal, 442
Radio-ulnar ligament, dorsal, 442
Radius, 422, 426–429, 431, 434, 436–439, 441–442, 452
anterior border of, 425
anterior surface of, 425
dorsal (Lister's) tubercle of, 425
head of, 417, 422–423, 425
interosseous border of, 425
interosseous membrane of, 425, 429
neck of, 422–423, 425
posterior border of, 425
posterior surface of, 425
radiograph of, 423
rotators of, 426
styloid process of, 425, 439
radiographs of, 444
Rathke's pouch, 45
Rectal artery
inferior, 288, 376, 380–383
middle, 259, 288, 302, 313, 343, 376, 378, 380–381
Rectal artery *(Continued)*
superior, 259, 268, 288, 297, 302–303, 313, 376, 378
branch of, 288
Rectal fascia, 342–343, 355, 362, 369–372, 374
Rectal lymph nodes
middle, 296
superior, 296
Rectal nerves
inferior, 303, 388–389, 391–392, 484, 490
superior, 303
Rectal plexus, 302–303, 317, 388, 390
communication between, 377
external, 377
internal, 377
middle, 302
superior, 297, 302
Rectal vein
inferior, 292, 377
right, 291
middle, 260, 291–292, 377
right, 291
superior, 268, 291–292, 377
Rectal venous plexus, 260
external, 291, 371–372
internal, 371–372
perimuscular, 291
Rectocervical spaces, 342
Rectococcygeus muscle, 258
Rectoprostatic (Denonvilliers') fascia, 321, 339, 344, 362, 369, 374
Rectosigmoid arteries, 376
Rectosigmoid junction, 276, 369, 371–372
Recto-urethralis superior muscle, 339
Recto-uterine fold, 342
Recto-uterine ligament, 342
Recto-uterine pouch (of Douglas), 340, 342, 352, 369
Rectovaginal spaces, 342–343
Rectovesical fascia, 362, 374
Rectovesical pouch, 321, 344–345, 369
Rectovesical space, 374
Rectum, 258, 265, 268, 276, 308, 321, 335–337, 340–341, 343–346, 362, 371, 378, 390
ampulla of, 346
arteries of, male, 376
circular muscle layer of, 371–372
innervation of, 163–164
longitudinal muscle layer of, 371–372
muscularis mucosae of, 372
radiography of, 156
sagittal CT images of, 375
in situ, 369
transverse folds of, 371
transverse section of, 397
veins of, female, 377
Rectus abdominis muscle, 7, 178, 185–186, 188, 242, 246–247, 249, 251, 253–256, 321, 328–329, 341, 343–345, 355
axial CT images of, 322
sagittal CT images of, 375
transverse section of, 324, 328
Rectus capitis muscle
anterior, 30, 42, 75, 151
communication with cervical plexus, 33
nerves to, 130
lateral, 30, 151
communication with cervical plexus, 33
nerves to, 130
posterior
major, 172–173, 175, 177
minor, 172–173, 175, 177
Rectus femoris muscle, 396–397, 468, 477, 479, 481, 487–488, 492, 525, 530–531
Rectus femoris tendon, 468, 479–480, 494, 507

Rectus muscle
inferior, 85–86, 122, 151
branches to, 88
lateral, 85–86, 88, 151
abducent nerve and, 122
check ligament of, 85
innervation of, 119
tendon of, 89
medial, 85–86, 88, 122, 151
branches to, 88
check ligament of, 85
tendon of, 89
superior, 85–86, 88, 122, 151
tendon of, 93
Rectus sheath, 186, 245–246
anterior layer of, 7, 185, 245–246, 253, 255, 344, 355
cross section of, 7
posterior layer of, 7, 247, 251, 253, 255
transverse section of, 328
Recurrent artery
of foramen lacerum, 138
of Heubner, 138, 140–143
radial, 419–420, 433–435
tibial
anterior, 499, 508–509
posterior, 499, 505, 509
ulnar
anterior, 420, 433–435
posterior, 420, 431, 434–435
Recurrent interosseous artery, 435
Recurrent process, 120
Red nucleus, 108, 117–118
imaging of, 151
Reissner's membrane, 98
Renal artery, 297, 311–312, 314, 318, 321, 378–379, 395
anterior branch of, 312
capsular branches of, 312
left, 259, 302, 308, 310, 315, 320, 388
arteriogram of, 285
transverse section of, 327
ureteric branch of, 310
pelvic branch of, 312
perirenal branches of, 312
posterior branch of, 312
right, 259, 300, 308, 310
ureteric branch of, 310
in situ, 310
ureteric branch of, 312, 314
Renal capsule, 311
Renal column (of Bertin), 311
Renal (Gerota's) fascia, 315, 320
anterior layer, 176, 315
posterior layer, 176, 315
transverse section of, 327
Renal ganglion, 317–319, 394
Renal impression, 277, 282
Renal papilla, 311
Renal parenchyma, 311
Renal pelvis, 311
transverse section of, 327
Renal plexus, 297, 317–319, 395
left, 302, 388
Renal segments, 312
Renal sinus, 311
fat in, 311
Renal vein, 311, 314, 321, 378–379
left, 234, 260, 308, 310, 315, 320
axial CT images of, 323
transverse section of, 327
right, 234, 260, 308, 310
axial CT images of, 323
transverse section of, 327
in situ, 310
Reproductive organs, innervation of
female, 393
male, 394
Respiratory bronchioles, 201–202
Rete testis, 368
Reticular nucleus, 112
Retina, 92
ciliary part of, 89–91
nonpigmented and pigmented regions of, 93
optic part of, 89, 91
pigment epithelium of, 90
structure of, 121
Retinacular arteries, 491
Retinal arteriole
nasal
inferior, 92
superior, 92
temporal
inferior, 92
superior, 92
Retinal artery, 92
central, 87, 89, 92–93
Retinal vein, 92
central, 89, 92–93
Retinal venule
nasal
inferior, 92
superior, 92
temporal
inferior, 92
superior, 92
Retrobulbar fat, 85
Retrocecal recess, 265, 273
Retromandibular vein, 3, 31–32, 42, 46–47, 59, 87
anterior branch, 32, 46, 73
common trunk for, 46, 73
common trunk for, 59
posterior branch, 32, 46, 73
Retromolar fossa, 17
Retropharyngeal lymph nodes, 75
Retropharyngeal space, 26, 47, 64–65
Retropubic space, 321, 343, 346, 374
areolar tissue in, 344
fat in, 247, 339
vesical venous plexus in, 344
Retropubic venous plexus, 346
Retrotonsillar fissure, 114
Retrotonsillar vein
of cerebellomedullary cistern, 145
superior, 145
Retzius, retropubic space of, 247, 321, 346, 374
Rhinal sulcus, 107–108
Rhomboid fossa, of fourth ventricle, 115
Rhomboid major muscle, 171, 174, 177, 188, 238–240, 250, 406, 409, 465, 467
Rhomboid minor muscle, 171, 177, 406, 409, 465, 467
Ribs, 210, 237, 239–240
angle of, 183–184
associated joints and, 184
body of, 183
costal groove of, 184
eighth, 183–184, 213
eleventh, 183, 309
false, 183
fifth, 183–184, 210
first, 15, 21, 30, 76, 160, 183–184, 189, 193–194, 208, 210, 227–229, 238, 404, 415, 467
lung groove for, 196
floating, 183
fourth, 183–184
head of, 183–184
intra-articular ligament of, 184
radiate ligament of, 184
neck of, 183–184
ninth, 183, 282
second, 179, 183–184, 404, 467
Ribs *(Continued)*
seventh, 154, 183–184, 241
sixth, 179, 183–184
posterior view of, 184
tenth, 183
third, 183–184, 210
true, 183
tubercle of, 183–184
twelfth, 160, 171, 183, 192, 243, 309, 315
radiography of, 156
Right bundle, 222
Purkinje fibers of, 222
subendocardial branches of, 222
Risorius muscle, 25, 124, 151
Rod cells, 98, 121
Rolandic arteries, 142–143
Rolando, central sulcus of, 106–107
Root canal, 63
Rosenthal, basal vein of, 145–147
Rostrum, of corpus callosum, 107, 142, 146
Rotator cuff, muscles of, 411
Rotatores cervicis muscles, 173, 177
brevis, 173
longus, 173
Rotatores thoracis muscles, 173, 177
brevis, 173
longus, 173
Rotter's lymph nodes, 181–182
Round ligament
of liver, 249, 269, 277–278, 292, 313
transverse section of, 328
para-umbilical veins in, 252
of uterus, 260, 340–342, 350–351, 353, 355, 367, 378, 382
terminal part of, 350
Round (cochlear) window, 14, 94, 97–98
fossa of, 95

S

SA node. *See* Sinu-atrial node
Saccule, 94, 97–98, 125
Sacral artery
lateral, 167, 259, 314, 380–381
spinal branches of, 167
median, 259, 288, 314, 342–343, 376, 378, 380–381
Sacral canal, 157, 338
Sacral cornu, 157
Sacral crest
intermediate, 157
lateral, 157
median, 157, 334–335
Sacral foramina, 530
anterior, 157, 333, 338
posterior, 157, 333
radiograph of, 331
Sacral ganglion, first, 163, 297
Sacral hiatus, 157
Sacral kyphosis, 153
Sacral lymph nodes, 384, 386
lateral, 261
middle, 261, 386
Sacral nerve, perineal branch of, 486
Sacral plexus, 160, 225, 318, 388, 393–395, 484, 486
right, 302
Sacral promontory, 157, 330, 333–334, 336, 340, 342, 345, 390
measurements of, 332
Sacral spinal cord, 303
Sacral spinal nerves
dorsal and ventral roots of, 166
S1, 160
dermatome of, 162
dorsal ramus of, 174
ventral ramus of, 388, 392

Sacral spinal nerves *(Continued)*
S2
dermatome of, 162
dorsal ramus of, 174
S3
dermatome of, 162
dorsal ramus of, 174
S4, dermatome of, 162
S5, 160
dermatome of, 162
Sacral splanchnic nerves, 163
Sacral tuberosity, 157
Sacral vein
lateral, 260
median, 260, 291, 342, 378, 381
Sacral vertebrae
anterior view of, 153
lateral view of, 153
posterior view of, 153
S1, radiography of, 156
Sacrococcygeal ligaments
anterior, 333, 336, 338, 343–344
lateral, 158, 333–334
posterior, 158, 334
deep, 333
superficial, 333
Sacrogenital fold, 268, 345, 370
Sacro-iliac joint, 338, 530
measurements of, 332
radiograph of, 331
Sacro-iliac ligaments
anterior, 333
posterior, 158, 333–334
Sacrospinous ligament, 158, 333–335, 337, 339, 388, 482, 490
Sacrotuberous ligament, 158, 333–335, 337, 339, 356, 374, 380, 388–389, 391, 396, 482, 489–490
Sacro-uterine ligament, 342
Sacrum, 152, 158, 160–161, 243, 330, 337–338
ala of, radiograph of, 331
anterior view of, 153
apex of, 157
arteries of, 167
articular facet for, 155
auricular surface of, 158
base of, 157
lateral view of, 153
posterior view of, 153
radiography of, 156, 331
sagittal CT images of, 375
Sagittal sinus
inferior, 101, 104–105, 145–147
superior, 101–105, 107, 110, 146
emissary vein to, 13
groove for, 9, 11
imaging of, 150–151
superior cerebral veins entering, 103
Sagittal suture, 5, 9, 14
Salivary glands, 46–47. *See also* Sublingual glands; Submandibular glands
lingual minor, 56
molar minor, 57
Salivatory nucleus
inferior, 117–118, 126, 135
superior, 53, 117–118, 124, 134
Salpingopharyngeal fold, 66, 68
Salpingopharyngeus muscle, 65, 67–68, 127, 151
Santorini, accessory pancreatic duct of, 272, 281
Saphenous nerve, 487–488, 492, 508, 525, 528
branches of, 471
infrapatellar branch of, 470, 487–488, 507–508, 525
Saphenous opening, 246, 252, 355, 358, 470
cribriform fascia over, 252
Falciform margin of, 257
Saphenous vein, 487
accessory, 470–471
great, 245–246, 252, 260, 358, 397, 468, 470–472, 492, 510
small, 468, 470–472, 489, 503, 510
Sartorius muscle, 396–397, 468, 477, 479, 481–482, 487–488, 492–493, 497, 502–503, 507, 525, 530–531
Sartorius tendon, 479–480, 493–494, 508
Scala tympani, 94, 97–98
Scala vestibuli, 94, 97–98
Scalene lymph nodes, inferior, 205
Scalene muscle, 27–28, 30
anterior, 26, 29–33, 71–73, 76, 151, 186–187, 190, 195, 203, 208, 214, 227–229, 413–415
slips of origin of, 30
communication with cervical plexus, 33
innervation of, 416
middle, 26, 29–30, 32, 71–73, 151, 186, 413
nerves to, 130
posterior, 26, 29–30, 151, 186, 229, 413
slips of origin of, 30
Scalp
skin of, 3, 25, 103
subcutaneous tissue of, 25
superficial arteries and veins of, 3
Scaphocapitate ligament, 441
Scaphoid bone, 439, 442–443, 454
radiographs of, 444
tubercle of, 439, 441, 443
Scaphoid fossa, 95, 100
Scapholunate ligament, 442
Scaphotrapeziotrapezoid ligament, 441
Scapula, 177, 188, 210, 238–240, 413, 467
acromial angle of, 405–406
acromion of, 183, 405–407
anastomoses around, 414
anterior view of, 405
body of, 412
circumflex scapular vessel groove, 406
coracoid process of, 183, 405–407
glenoid cavity of, 183, 405, 407–408, 467
inferior angle of, 152, 241, 405–406
infraglenoid tubercle of, 405–406
infraspinous fossa of, 183, 406
lateral border of, 405–407
medial border of, 152, 405–406
neck of, 183, 405–406
posterior view of, 406
spine of, 152, 171, 174, 183, 194, 406–407, 409, 411–414
subscapular fossa of, 183, 405
superior angle of, 405–406
superior border of, 405–406, 411
supraglenoid tubercle of, 405
suprascapular notch of, 183, 405–406
supraspinous fossa of, 183, 406
vertebral border of, 467
Scapular artery
circumflex, 413–415, 417, 420
groove for, 406
dorsal, 32–33, 170, 414–415
Scapular ligament, superior transverse, 408, 410–411, 413–414
Scapular nerve, dorsal, 415–416, 465
Scapular vein, circumflex, groove for, 406
Scapulohumeral dissection, 413
Scapulothoracic dissection, 413
Scarpa, vestibular ganglion of, 97
Scarpa's layer, 245, 321, 344, 358–359
fascia lata attachment of, 245
Schlemm, canal of, 89–90, 92–93
Schwalbe's line, 90
Sciatic foramen
greater, 158, 333–335, 527
lesser, 158, 333–334
Sciatic nerve, 160, 397, 482, 484, 489–490, 492, 527
articular branch of, 489
common fibular division of, 527
left, 396
muscular branches of, 489
right, 396
Sciatic notch
greater, 243, 330, 473
lesser, 243, 330, 473
Sclera, 83, 85, 89–93
lamina cribrosa of, 89
Scleral spur, 89–90
Scleral venous sinus, 89–90, 92–93
veins draining, 93
Scrotal arteries, posterior, 381, 383
Scrotal fascia, superficial, 373
Scrotal ligament (gubernaculum), 367
Scrotal nerve
anterior, 387
posterior, 388–389, 490
Scrotal veins, anterior, 252
Scrotum, 329, 364, 366
contents of, 365
sagittal CT images of, 375
septum of, 344, 365, 368, 373, 383
skin of, 365, 368
superficial fascia of, 245–247, 344, 358, 365, 383
Sebaceous glands, 83
Secondary (postpyramidal) fissure, 114
Segmental artery
inferior, 312
anterior, 312
posterior, 312
superior, 312
anterior, 312
Segmental bronchus, 201
Sella turcica, 7–8, 11, 38, 64
dorsum sellae of, 11
hypophyseal fossa of, 11
hypophysis in, 36
posterior clinoid process of, 11
tuberculum sellae of, 11
Semicircular canals
anterior, 55, 97–98
plane of, 99
lateral, 97–99
prominence of, 94
posterior, 97–98
plane of, 99
Semicircular ducts, 94
anterior, 97–99
lateral, 97–99
ampulla of, 125
posterior, 97–99
ampulla of, 125
superior, ampulla of, 125
Semilunar fold, 68, 276
Semilunar ganglion. *See* Trigeminal ganglion
Semilunar hiatus, 36–37, 44
of newborn, 45
Semilunar lobule
inferior, 114
superior, 114
Semimembranosus bursa, 493, 498, 502–503, 527
Semimembranosus muscle, 478, 481–482, 489–490, 492–493, 497–498, 531
bursa of, 497
Semimembranosus tendon, 493, 495, 497–498, 504–505
groove for, 500
Seminal colliculus, 348, 362

Seminal vesicles, 249, 344–345, 362, 367, 369
Seminiferous tubules, 368
Semispinalis capitis muscle, 171–173, 175, 177
Semispinalis cervicis muscle, 173, 175, 177
Semispinalis thoracis muscle, 173, 177
Semitendinosus muscle, 468, 477–478, 482, 489–490, 492–493, 497, 502–503, 527, 531
Semitendinosus tendon, 479–480, 493–494
Sensory cortex, 136
Septa forming canals, 450
Septal area, 120
Septal cartilage, 35, 38
Septal nasal cartilage. *See* Nasal septal cartilage
Septal nuclei, 120
Septal papillary muscle, 217, 220–221
Septomarginal trabecula (moderator band), 217, 221–222
Septum
  bulging, 36
  fibrous, 372
    transverse, 371–373
  nasal, 5
  of pulmonary veins, 202
  of scrotum, 344, 365, 368, 373, 383
Septum pellucidum, 107, 109, 111–113, 142, 144, 146, 148
  anterior vein of, 146–147
  posterior veins of, 147
Serosa (visceral peritoneum), 272, 275, 282, 305
Serous glands of von Ebner, 60
Serratus fascia, anterior, 412
Serratus muscle
  anterior, 171, 177–179, 188, 214, 238–242, 245–246, 250, 253–254, 329, 398, 405, 409–410, 413, 415, 467
    digitations of, 185–186
    transverse section of, 324
  posterior
    inferior, 171–172, 176–177, 241, 250, 309
    superior, 171–172, 177, 241
Sesamoid bone
  foot, 511, 515, 521–523
  hand, 439, 443
Shenton's line, 530
Short radiolunate ligament, 441
Shoulder
  anteroposterior radiograph of, 407
  arthrogram of, 467
  computed tomography of, 467
  cutaneous nerves of, 401
  glenohumeral joint, 408
  joint capsule of, 413
  magnetic resonance imaging of, 467
  muscles of, 409
  nerves of, 465
  superficial veins of, 401
Sigmoid artery, 259, 268, 288, 302, 376
Sigmoid colon, 263, 265, 276, 302, 341–342, 345, 369–372, 390
  innervation of, 163–164
Sigmoid lymph nodes, 296
Sigmoid mesocolon, 265, 268, 276, 288, 308, 313, 369
Sigmoid plexus, 302
Sigmoid sinus, 55, 99, 104–105
  groove for, 8, 11
  imaging of, 150
  inferior, 13
Sigmoid vein, 268, 291–292, 377
Sinu-atrial (SA) nodal artery, 222
Sinu-atrial (SA) node, 215, 222
Sinuses, 44. *See also specific sinuses*
  confluence of, 99, 104–105, 146
  of newborn, 45
Sinusoids, 278–279
Skene's ducts, 367
  openings of, 354
Skin
  of neck, 26
  of penis, 358–360, 365
  peri-anal, 371–372
  of scalp, 3, 25, 103
  of scrotum, 365, 368
Skull
  anterior view of, 4
  anteroposterior radiograph of, 5
  base of, 66
  connective tissue of, 103
  dura mater interface with, 101, 103
  lateral radiograph of, 7
  lateral view of, 6
  midsagittal section of, 8
  of newborn, 14
  nuchal line of, superior, 171–173
Small intestine, 127, 263, 321
  arteries of, 287
  autonomic nerves of, 301, 303
  innervation of, 163–164
  lymph vessels and nodes of, 295
  transverse section of, 328
  veins of, 290
Soft palate, 36, 38, 56, 64, 66, 68
  innervation of, 119
  muscles of, 65
Sole
  of foot, 519
    cutaneous innervation of, 528
  muscles of
    first layer, 520
    second layer, 521
    third layer, 522
Soleus muscle, 482, 493, 502–508, 510, 516, 518, 527–528, 531
  arch of, 482
  nerve to, 503–504
  tendinous arch of, 504–505
Solitary lymphoid nodules, 272
Solitary tract nucleus, 117–118, 124, 126–127, 224, 318
  rostral part of, 136
Somatic efferent fibers, of urinary bladder and lower ureter, 395
Sound reception, pathway of, 94
Spaces
  of hand, 450
  of Retzius, 346
  triangular, 413
Spermatic cord, 249, 256, 359–360, 383, 396
  artery to ductus deferens in, 251
  cremaster fascia on, 256
  cremaster muscle on, 253, 256
  external spermatic fascia on, 245, 253, 255–256
  internal spermatic fascia on, 257
  testicular vessels in, 379
Spermatic fascia
  external, 246–247, 256, 344, 358–360, 365, 368, 383
    of spermatic cord, 245, 253, 255–256
  internal, 245, 247, 256, 365, 368
    on spermatic cord, 257
Spheno-ethmoidal recess, 36–37
Sphenoidal bone, 4, 6, 8, 10–11, 15, 42
  anterior clinoid process, 8, 11
  body of, 8, 11, 38
    jugum, 11
    prechiasmatic groove, 11
    sella turcica, 11
  carotid groove of, 11
Sphenoidal bone *(Continued)*
  clivus of, 11
  crest of, 38
  foramen ovale of, 10
  foramen spinosum of, 10
  greater wing of, 4, 6–8, 10–11
    groove for middle meningeal vessels, 11
    orbital surface of, 4
  infratemporal crest of, 6
  lesser wing of, 4–5, 8, 11
  of newborn, 45
  optic canal of, 8
  pterygoid hamulus of, 6, 10, 16, 37
  pterygoid process of, 10
    hamulus of, 6, 10, 16, 37
    lateral plate of, 6, 8, 10, 16, 37–38
    medial plate of, 6, 8, 10, 16, 37–38
    pterygoid fossa of, 10
    scaphoid fossa of, 10
  sella turcica of, 8, 11
    dorsum sellae, 11
    hypophyseal fossa, 11
    posterior clinoid process, 11
    tuberculum sellae, 11
  sphenoidal sinus of, 8, 37–38
  spine of, 10, 16, 100
Sphenoidal concha, of newborn, 45
Sphenoidal emissary foramen (of Vesalius) (inconstant), 13
Sphenoidal fontanelle, of newborn, 14
Sphenoidal process, of palatine bone, 37
Sphenoidal sinus, 8, 36–38, 43–44, 55, 64, 68, 85, 105, 138
  of newborn, 45
  opening of, 8, 36–37, 44
Sphenomandibular ligament, 18, 49, 51
  inferior, 18
Spheno-occipital synchondrosis, 64
Sphenopalatine artery, 40, 51, 54, 72
  posterior lateral nasal branches of, 40, 54
  posterior septal branch of, 40
  posterior septal branches of, 40, 51
    greater palatine artery anastomosis with, 54
Sphenopalatine foramen, 6, 8, 16, 37, 40–41, 51
  opening of, 37
Sphenopalatine vessels, in incisive fossa, 12
Sphenoparietal sinus, 104–105
  superficial middle cerebral vein draining to, 146
Spherical recess, 97
Sphincter pupillae muscle, 90, 122, 133, 151
  innervation of, 119
Sphincter urethrae muscle, 335, 339–340, 346, 348, 355–356, 374, 395, 397
  growth of, 347
Sphincter urethrovaginalis muscle, 346, 350, 355–357, 397
Spinal artery
  anterior, 139–140, 142, 144, 167–168
    anastomotic loops to, 167
    spinal segmental medullary branches of, 139
  posterior, 140, 142, 167–168
    anastomotic loops to, 167
    left, 144, 168
    right, 168
Spinal cord, 53, 238–239, 319
  arteries of
    intrinsic distribution of, 168
    schema of, 167
  central canal of, 109–110, 116, 118
  descending tracts in, 207
  dorsal horn of, 165
  gray matter of, 165–166

Spinal cord *(Continued)*
imaging of, 151
lateral horn of, 165–166, 319
lumbar part of, 395
pia mater overlying, 165
radiography of, 156
sacral, 303, 395
in situ, 160
termination of, 161
thoracic part of, 133, 207, 304, 306–307
thoracolumbar, 303
veins of, 169
ventral horn of, 165
white matter of, 165
Spinal dura mater, 160, 165–166, 170, 176
posterior intercostal artery branch to, 168
Spinal ganglion, dorsal root of, 165, 188
Spinal membranes, 165
Spinal meninges, 304
Spinal nerve roots, 300
posterior view of, 165
vertebrae relation to, 161
Spinal nerve trunk, 254
Spinal nerves, 26, 166, 177, 225, 304. *See also* Cervical spinal nerves; Lumbar spinal nerves; Sacral spinal nerves; Thoracic spinal nerves
dorsal ramus of, 165–166
lateral branch of, 166
medial branch of, 166
dorsal root of, 165–166, 188, 304, 395
dorsal rootlets of, 160, 165
groove for, 20–21
origin of, 166
cross section of, 166
recurrent (meningeal) branches of, 166
ventral ramus of, 165–166
ventral root of, 165–166, 188, 304, 395
ventral rootlets of, 165
Spinal perivascular plexus, 304
Spinal sensory ganglion, 300, 303–304, 318, 395
Spinal vein
anterior, 145, 169
posterior, 145, 169
Spinalis cervicis muscle, 172
Spinalis muscle, 172
Spinalis thoracis muscle, 172
Spino-umbilical line, 275
Spinous process, 237
cervical, 20, 22, 152, 171–173, 409
lumbar, 155–156, 158–159, 176
transverse section of, 328
thoracic, 154, 156, 171–172, 174, 194, 409
Spiral ganglion of Corti, 98
Spiral lamina
hamulus of, 97
osseous, 97–98
Spiral ligament, 98
Spiral organ of Corti, 94, 98
Splanchnic nerves
greater, 163, 192, 206, 227–228, 236, 254, 262, 297–304, 306–307, 317, 319, 387–388, 392–394
left, 191, 213, 236
right, 191, 236
least, 163, 192, 206, 262, 297, 299–304, 317–319, 387–388, 392–394
lesser, 163, 192, 206, 254, 262, 297–304, 317–319, 387–388, 392–394
lumbar, 163, 297, 302–303, 317–319, 387–388, 390, 392–395
pelvic, 164, 302–303, 317–318, 388, 390, 392, 394–395, 484, 486
sacral, 163, 303, 317, 388, 486
thoracic, 225, 319
Spleen, 193–194, 267, 269, 278, 281–282, 320
anterior extremity of, 282
arteries of, 283–284
axial CT images of, 322–323
hilum of, 282
inferior border of, 282
posterior extremity of, 282
superior border of, 282
transverse section of, 324–326
veins of, 289
Splenic artery, 259, 268, 271, 281–284, 286–287, 297–300, 306–307, 321
arteriogram of, 285
axial CT images of, 322
splenic branches of, 283
transverse section of, 325
Splenic lymph nodes, 293–294
Splenic plexus, 297–299
Splenic red pulp, 282
Splenic trabeculae, 282
Splenic vein, 234, 267–268, 282, 287, 289–292, 320–321
axial CT images of, 322–323
transverse section of, 325–326
Splenic white pulp, 282
Splenium, of corpus callosum, 107–108, 111, 113, 116, 144–147
imaging of, 151
Splenius capitis muscle, 29, 171–172, 175, 177
Splenius cervicis muscle, 171–172, 175, 177
Splenorenal (lienorenal) ligament, 266, 268, 282, 308
Spongy urethra, 363
bulbous portion of, 348
Squamous suture, 14
Stapedius muscle, 55, 96, 151
innervation of, 119, 124
pyramidal eminence and tendon of, 95
Stapes, 95–96
base of, in oval window, 94
footplate of, 95
limbs of, 94
Stellate ganglion, 131, 206, 223–224, 236
Stellate veins, 311
Stensen, parotid duct of, 24, 48–49, 72
opening of, 56
Sternal head, 27, 29
of sternocleidomastoid muscle, 1
Sternalis muscle (inconstant), 185
Sternoclavicular joint, 193, 238, 404
Sternocleidomastoid lymph nodes, 74
Sternocleidomastoid muscle, 26–27, 29, 31–32, 34, 46–47, 75, 128, 130, 151, 171, 175, 185, 195, 404, 409–410, 415
accessory nerve to, 128
clavicular head of, 1, 178
innervation of, 119
medial margin of, 76
sternal head of, 1, 178
Sternocostal articulations
anterior view of, 184
left anterolateral view of, 184
right posterolateral view of, 184
Sternocostal joint, 404
Sternocostal triangle, 187
Sternohyoid muscle, 26–29, 31, 58, 129, 151, 185, 187, 195, 404
communication with cervical plexus, 33
fascia of, 185
nerves to, 71
Sternothyroid muscle, 26–29, 31, 82, 129–130, 151, 185, 187, 195
communication with cervical plexus, 33
fascia of, 185
nerves to, 71
Sternum, 25, 177, 188, 191, 213, 237, 241, 409
angle of, 183
body of, 178, 183, 185, 187, 189, 242–243
jugular notch of, 183
manubrium of, 26–27, 29, 64, 183–184, 187, 195, 238–239
xiphoid process of, 178, 183, 185
Stomach, 193, 214, 229, 232–233, 263, 266–267, 277–278, 280–282, 321
air in, 210
arteries of, 283
autonomic nerves of, 298–300
axial CT images of, 322
body of, 269
axial CT images of, 322
cardiac part of, 230, 232, 269–270
fundus of, 230, 232, 269–270
transverse section of, 324
gastric zone of, 270
innervation of, 163–164
lymph vessels and nodes of, 293
mucosa of, 270
pyloric part of, 269, 298
radiography of, 156
in situ, 269
transverse section of, 325
vagal branches to, 236
veins of, 289
Straight arteries, 287–288
branch of, 305
Straight gyrus, 108
Straight sinus, 99, 104–105, 110, 145–147
imaging of, 150
in tentorium cerebelli, 107
Straight veins, 290
Strap muscles, innervation of, 119
Stretch receptors, 207
Stria medullaris, 112, 116
of thalamus, 107
Stria terminalis, 109, 112–113
Striate artery, distal medial, 138, 140–143
Striatum, 111
Styloglossus muscle, 42, 47, 51, 59, 65, 70, 129, 151
Stylohyoid ligament, 15, 59, 65, 68, 70
Stylohyoid muscle, 27–29, 34, 42, 46–47, 50–51, 58–59, 67, 70, 124
innervation of, 119
nerve to, 24
Styloid process, 6, 10, 14–16, 18, 29–30, 34, 42, 58–59, 66–67, 70, 96
of radius, 425, 439
radiographs of, 444
of ulna, 425, 439
radiographs of, 444
Stylomandibular ligament, 15, 18
inferior, 18
Stylomastoid artery, 96
posterior tympanic branch of, 96
stapedial branch of, 96
Stylomastoid foramen, 10, 12, 100, 124, 126
facial nerve from, 24
Stylopharyngeus muscle, 47, 59, 65, 67–70, 126–127, 151
Subacromial bursa, 408, 417
Subacromial space, 467
Subaponeurotic space, dorsal, 450
Subarachnoid space, 89, 101, 103, 110, 166
imaging of, 151
Subcallosal (parolfactory) area, 107, 120
Subcallosal gyrus, 107
Subcapsular lymphatic plexus, 316

Subclavian artery, 30, 32–33, 71–73, 76, 78, 131, 137, 139, 167, 180, 186–187, 195, 208–209, 229, 233, 251, 413–415
left, 77, 170, 203, 211, 228, 238
lung groove for, 196
right, 77, 127, 170, 203, 227
Subclavian groove, 404
Subclavian lymph nodes, 74, 181–182
Subclavian lymphatic trunk, 205
Subclavian trunk, 74
left, 295
right, 261, 295
Subclavian vein, 30, 32–33, 73, 76, 186–187, 195, 205, 208–209, 229, 234, 252, 413, 415
left, 77, 170, 203, 228
right, 77, 170, 203, 227
Subclavius fascia, 412
Subclavius muscle, 151, 179, 185–186, 214, 227–228, 404, 410, 412, 415, 467
fascia of, 185, 412
Subclavius nerve, 416
Subcostal artery, 259
anastomoses with, 251
Subcostal muscles, 241, 254
Subcostal nerve, 160, 262, 308–309, 387, 392, 483–485
cutaneous branches of
anterior, 253
lateral, 250, 253, 262
lateral cutaneous branch of, 470
right, 308
Subcostal plane, 244
Subcostal vein, 260
Subcutaneous bursa, 516
lateral malleolus of, 516
Subcutaneous space, dorsal, 450
Subcutaneous tissue
of abdomen, 7
fatty layer of, 179, 245, 321, 344, 355, 358
membranous layer of, 321, 344, 355, 358–359
of neck, 26
of scalp, 3
Scarpa's layer, 245, 321, 344, 355, 359
Subdeltoid bursa, 408
Subdiaphragmatic lymph nodes, pathway to, 181
Subhiatal fat ring, 232
Sublime tubercle, 422
Sublingual artery, 46, 59
Sublingual caruncle, 46, 56
Sublingual ducts, openings of, 46, 56
Sublingual fold, 46, 56
Sublingual fossa, 17
Sublingual glands, 43, 47, 50, 56, 58, 124, 134
innervation of, 119, 163–164
Sublingual nerve, 50
Sublingual vein, 46, 59
Sublobular vein, 278–279
Submandibular duct (of Wharton), 46–47, 56, 58–59
openings of, 46, 56
Submandibular fossa, 17
Submandibular ganglion, 46, 50, 59, 71, 123, 132, 134, 164
schema of, 134
Submandibular glands, 1, 27, 29, 31, 46–47, 50, 58, 66, 72–73, 124, 134
innervation of, 119, 163–164
Submandibular lymph nodes, 74–75
Submental artery, 51, 72
Submental lymph nodes, 74–75
Submental vein, 31, 73
Submucosa, 305
esophageal, 69, 232
of ileum, 272
of jejunum, 272
Submucosal glands, 305
Submucosal (Meissner's) plexus, 305
Submucous space, 370–371, 374
Suboccipital nerve, 22, 175
Suboccipital triangle, 175
Subparotid lymph nodes, 74
Subpleural capillaries, 202
Subpleural lymphatic plexus, 205
Subpopliteal recess, 494–495
Subpubic angle, radiograph of, 331
Subpyloric lymph nodes, 293
Subscapular artery, 413–415, 420
Subscapular fossa, 405
of scapula, 183
Subscapular lymph nodes, 181–182
Subscapular nerve
lower, 410, 413, 415–416, 465
upper, 410, 415
Subscapular recess, 467
Subscapularis muscle, 177, 188, 238–240, 405, 408, 410–413, 417, 419, 467
Subscapularis tendon, 408, 411, 413
subtendinous bursa of, 408
Subserous connective tissue, 305
Subserous plexus, 305
Substantia nigra, 108, 118
Subtendinous bursa, 493–494, 498, 516
of gastrocnemius muscle, 497
lateral, 498
medial, 497
opening of, 408
of subscapularis, 408
Sulcal arteries
central, 142–143, 168
postcentral, 142
precentral, 142–143
prefrontal, 143
Sulcal vein, central
anterior, 169
posterior, 169
Sulcus
calcarine, 106–108, 112, 121
central
of insula, 106
of Rolando, 106–107
cingulate, 107
circular, 106
collateral, 107–108
of corpus callosum, 107
frontal
inferior, 106
superior, 106
hippocampal, 113
hypothalamic, 107, 116, 148
intertubercular, 405
lateral (of Sylvius), 108
anterior ramus of, 106
ascending ramus of, 106
posterior ramus of, 106
lunate, 106
marginal, 107
median, 60
dorsal, 116
nasolabial, 1
occipital, transverse, 106
occipitotemporal, 107–108
olfactory, 108
orbital, 108
paracentral, 107
parieto-occipital, 106–107
postcentral, 106, 143
rhinal, 107–108
temporal
inferior, 106, 108
superior, 106
terminal, 60
Sulcus terminalis cordis, 211
Superciliary arch, 1
Superficial fascia, 356, 368
of penis, 245–247, 344, 358–360, 365
of scrotum, 245–247, 344, 358, 365, 383
Superficial nerves, of lower limb, 470–471
Superficial veins
of arm, 401
of forearm, 402
lateral, 359
of lower limb, 470–471
of shoulder, 401
Superficialis flexor tendon, 450
Superior bulb, in jugular fossa, 12
Superior ganglion
of glossopharyngeal nerve, 126
of vagus nerve, 127–128
Superior lip, tubercle of, 1
Supinator muscle, 405, 426, 431, 433–434, 436–438, 460, 466–467
Supraclavicular lymph nodes, 74
Supraclavicular nerves, 31–33, 400
intermediate, 130, 400–401
lateral, 130, 400–401
medial, 130, 400–401
Supracondylar ridge
lateral, 405–406, 422
medial, 405–406, 422
Supradiaphragmatic fascia, 232
Supraduodenal artery, 283–284, 286–287
Supraglenoid tubercle, 405
Suprahyoid artery, 59, 72
Suprahyoid lymph nodes, 74
Suprahyoid muscles, 28
Supramarginal gyrus, 106
Supramastoid crest, 6
Supra-optic recess, 107, 109
Supra-opticohypophyseal tract, 148
Supra-orbital artery, 3, 35, 51, 72, 83, 87, 139
Supra-orbital nerve, 2, 35, 52, 83, 88, 123
lateral branch, 88
medial branch, 88
Supra-orbital notch, 1, 4, 6
of newborn, 14
Supra-orbital vein, 3, 73, 87
Suprapatellar bursa, 494, 498
Suprapatellar fat body, 498
Suprapatellar synovial bursa, 495
Suprapineal recess, 109
Suprapleural membrane (Sibson's fascia), 228
Suprapyloric lymph nodes, 293
Suprarenal arteries
inferior, 259, 310, 312, 320
middle, 259, 310, 320
branches of, 320
superior, 259, 310, 320
left, 192
Suprarenal glands, 271, 277, 281–282, 315, 320, 364
arteries of, 320
autonomic nerves of, 319
cross section through, 320
innervation of, 163
left, 194, 266, 308, 319
transverse section of, 325–326
right, 194, 268, 308, 319
transverse section of, 325–326
veins of, 320
Suprarenal impression, 277
Suprarenal plexus, 297, 302
Suprarenal vein, 320
inferior, right, 260
left, 234, 260, 310
right, 310

Suprascapular artery, 32–33, 76–78, 139, 413–415, 467
Infraspinous branch of, 414
Suprascapular foramen, 408, 411, 413–414
Suprascapular nerve, 413, 415–416, 465, 467
upper, 416
Suprascapular notch, 405–406, 413
of scapula, 183
Suprascapular vein, 467
Supraspinatus muscle, 171, 174, 405–406, 408–414, 418, 465, 467
Supraspinatus tendon, 408, 411, 413, 418
Supraspinous fossa, 406
of scapula, 183
Supraspinous ligament, 22, 158–159, 176, 333–334
Suprasternal space (of Burns), 26–27, 64
Supratonsillar fossa, 68
Supratrochlear artery, 3, 35, 51, 72, 83, 87, 139
Supratrochlear nerve, 2, 35, 52, 83, 88, 123
Supratrochlear vein, 3, 73, 87
Supraventricular crest, 217, 221
Supravesical fossa, 249
Sural nerve, 470–471, 521, 527–529
calcaneal branches of, 528
lateral, 471, 505, 528
medial, 528
Suspensory ligament
of axilla, 412
of breast, 179
of clitoris, 355–357
diaphragmatic, 364
of lens, 89
of ovary, 340–343, 352–353, 367, 378
of penis, 246, 344
Suspensory muscle, of duodenum, 264
Sustentaculum tali, 512–515, 531
Sutural (wormian) bone, 6, 9
Sweat glands
innervation to, 163
in peri-anal skin, 371
Sylvius, lateral sulcus of, 108
anterior ramus of, 106
ascending ramus of, 106
posterior ramus of, 106
Sympathetic cardiac nerve
cervical
inferior, 131
middle, 131
superior, 131–132
postganglionic, 133
Sympathetic cell bodies, preganglionic, 53, 133–134
Sympathetic fibers, 122–124, 133, 135
of autonomic reflex pathways, 304
of kidneys and upper ureters, 318
of liver and biliary tract, 306
of pancreas, 307
of reproductive organs, 393–394
of tracheobronchial tree, 207
of urinary bladder and lower ureter, 395
Sympathetic ganglion, 166, 177, 188, 317, 388, 394
cervical
middle, 33, 131
superior, 47, 126, 129, 131–134
Sympathetic nerves
thoracic, 131
of tracheobronchial tree, 207
Sympathetic nervous system, schema of, 163
Sympathetic plexus, 55
Sympathetic trunk, 26, 42, 53, 71–73, 126, 134–135, 188, 192, 206–207, 227–228, 236, 254, 258, 262, 303–304, 306, 317, 341, 345, 388, 390, 393–395, 485–486
cervical, 132
ganglion of, 304, 318, 387, 392–393
first thoracic, 133
ninth thoracic, 300
sixth thoracic, 300
left, 191, 213, 297, 307, 319
lumbar, 302
transverse section of, 328
in lumbosacral and coccygeal plexuses, 484
right, 191, 297, 307, 319, 390
sacral, 302
Symphyseal surface, 334, 473
of pubis, 390
Synchondrosis, of first rib, 404
Synovial cavities, 23
Synovial membrane, 408, 424, 458, 491, 494–495
attachment of, 495
of knee, 498
protrusion of, 474
Synovial sheaths, 453, 458

T

Taenia
fibers to, 274
of fourth ventricle, 116
Talar articular surface, 513
Talocalcaneal ligament, 513
lateral, 514
medial, 514
posterior, 514
Talofibular ligament
anterior, 501, 514
posterior, 501, 514
Talonavicular ligament, dorsal, 514
Talus bone, 511–513, 531
posterior process of, 514, 531
Tarsal artery
lateral, 508, 517, 523
medial, 508, 517–518, 523
Tarsal (meibomian) glands, 83
openings of, 83
Tarsal joint, 512
Tarsal (Müller's) muscle, superior, 83
Tarsometatarsal joint, 512
Tarsometatarsal ligaments
dorsal, 514, 523
plantar, 515
Tarsus
of eyelid, 85
inferior, 83
superior, 83, 86
Taste
nerves for, 61
pathways for, 136
Taste buds, 60
furrow of, 60
Tectal (quadrigeminal) plate, 107, 116
Tectorial membrane, 23, 98
deeper part of, 23
Tectospinal tract, 133
Tectum, imaging of, 151
Teeth, 62–63
apical foramina of, 63
bone around, 63
canine, 62–63
cement of, 63
crown of, 63
deciduous, 62
Teeth *(Continued)*
dental pulp, 63
dentinal tubules of, 63
dentine of, 63
enamel of, 63
incisors, 62–63, 230
interglobular spaces of, 63
interproximal spaces of, 63
molar, 62–63
growth of, 45
neck of, 63
odontoblast layer of, 63
permanent, 62–63
premolar, 62–63
primary, 62
root canals of, 63
roots of, 44, 63
unerupted, 5
Tegmen tympani, 94–95
Tela choroidea, of third ventricle, 109, 112, 146
Temporal artery
deep, 72, 101
anterior, 51
posterior, 6, 51
middle, 3, 101
polar, 143
superficial, 34–35, 42, 46, 51, 54, 71–73, 96, 101–102, 135, 137, 139
frontal branch of, 3, 87, 101
parietal branch of, 3, 101
Temporal bone, 4, 6, 8, 10–11, 15
acoustic meatus of
external, 6, 10
internal, 8
articular tubercle of, 6, 10
carotid canal of, 10
groove for posterior deep temporal artery of, 6
inferior, 6
jugular fossa for, 10
lambdoid suture, 6
mandibular fossa of, 6, 10, 14
mastoid canaliculus of, 10
mastoid foramen of, 10
mastoid notch of, 10
mastoid process of, 6, 10
of newborn, 14
occipital groove of, 10
oval window of, 14
petrosquamous fissure of, 14
petrotympanic fissure of, 10
petrous part of, 8, 10–11, 14, 99–100
accessory muscle bundle from, 67
arcuate eminence, 11
groove for greater petrosal nerve, 11
groove for lesser petrosal nerve, 11
groove for sigmoid sinus, 11
groove for superior petrosal sinus, 11
internal carotid artery in, 138
trigeminal impression, 11
round window of, 14
sigmoid sinus, groove for, 8
squamous part of, 6, 8, 11, 14
styloid process of, 6, 10, 14
stylomastoid foramen of, 10
superior petrosal sinus, groove for, 8
supramastoid crest of, 6
tympanic canaliculus of, 10
tympanic part of, 14
vestibular aqueduct, opening of, 8
zygomatic process of, 6, 10, 14
Temporal fascia, 25, 48, 50
deep layer, 48
superficial layer, 48
Temporal fossa, 6, 15

Temporal gyrus
inferior, 106, 108
middle, 106
superior, 106
Temporal horn, 109, 112–113, 147
Temporal line
inferior, 6
superior, 6
Temporal lobe, 106, 115, 142
imaging of, 151
Temporal nerves (V_3), deep, 50–51, 71, 123
Temporal operculum, 106
Temporal pole, 106, 108
Temporal retinal arteriole
inferior, 92
superior, 92
Temporal retinal venule
inferior, 92
superior, 92
Temporal sulcus
inferior, 106, 108
superior, 106
Temporal vein
deep, 101
middle, 3, 101
superficial, 46, 73, 101
frontal branch of, 3, 101
parietal branch of, 3, 101
tributary of, 103
Temporalis muscle, 48, 50, 101, 103, 151
deep temporal nerves to, 123
insertion of, 48
Temporalis tendon, 46
Temporofacial division, 24
Temporomandibular joint, 18, 49
articular disc of, 48–49
joint capsule of, 18
Temporomandibular ligament, lateral, 18
Tendinous arch, 70
of levator ani muscle, 370
Tendinous intersection, 178, 242, 246, 329
Tendinous slips, 452
Tendocalcaneus bursa, 506
Tendon sheaths
of ankle, 516
of finger, 450
of hand, 450
of wrist, 449
Tendons
of ankle, 514
of foot, 515
Tenon's capsule, 85, 89
Tensor fasciae latae muscle, 396–397, 468, 479, 481, 487–490, 492, 530–531
Tensor tympani muscle, 50, 95–96, 151
innervation of, 119
tendon of, 95–96
Tensor tympani nerve, 50, 123
Tensor veli palatini muscle, 49–50, 57, 65, 68, 70, 95, 151
innervation of, 119
palatine aponeurosis from, 57, 65
Tensor veli palatini nerve, 50, 71, 123
Tensor veli palatini tendon, 57, 65, 68
Tentorial artery, 105
Tentorium cerebelli, 88, 104–105, 145–146
straight sinus in, 107
Teres major muscle, 152, 171, 174, 177, 239–240, 405–406, 409–410, 412–415, 417–419, 421, 465, 467
Teres major tendon, 418
Teres minor muscle, 171, 174, 188, 238–239, 406, 409–414, 418, 465, 467
Teres minor tendon, 408, 411, 418
Terminal bronchiole, 201–202
elastic fibers of, 201
smooth muscle of, 201
Terminal ileum, 265, 273–274, 341, 345
Terminal sulcus, 60
Testicular arteries, 251, 255–257, 259, 268, 313, 345, 365, 379, 381, 387, 394
left, 291, 308, 310
right, 291, 297, 310
in spermatic cord, 379
transverse section of, 328
Testicular plexus, 387, 394
right, 297
Testicular veins, 255–257, 260, 268, 313, 345, 379
left, 291, 308, 310
right, 291, 310
in spermatic cord, 379
transverse section of, 328
Testis, 321, 365, 367–368, 383, 394
appendix of, 365, 367
arteries of, 379
descent of, 364
lobules of, 368
mediastinum, 368
rete, 368
septa of, 368
tunica albuginea of, 359, 363, 368
tunica vaginalis, 321
veins of, 379
Thalamic veins, superior, 147
Thalamogeniculate arteries, 144
Thalamoperforating artery, 141, 144
Thalamostriate, superior, 101
Thalamostriate vein
inferior, 145, 147
posterior part of, 147
superior, 109, 112, 146–147
Thalamotuberal (premammillary) artery, 141
Thalamus, 109, 111–113, 115, 146, 148, 303
geniculate bodies of, 144
left, 145
nucleus of, 112
pulvinar of, 108, 112, 115–116, 140, 146
schematic representation of, 112
stria medullaris of, 107
third ventricle and, 107, 112, 116
ventral posteromedial nucleus of, 136
Thenar eminence, 398
Thenar muscles, 446–447, 453, 460, 463
Thenar space, 447–448
Thigh
arteries of, 499
anterior view, 487–488
posterior view, 489
fascia lata of, 350, 355, 358–359
muscles of, 479–480
attachments of, 477–478
lateral view, 481
posterior views, 482
nerves of
anterior view, 487–488
femoral, 525
lateral cutaneous, 525
posterior view, 489
posterior cutaneous nerve of, 527
serial cross sections of, 492
Third occipital nerve, 2
Thoracic (descending) aorta, 139, 168, 188, 191, 213, 228–229, 233, 237, 240–241
lung groove for, 196
transverse section of, 324–325
Thoracic aortic plexus, 236
Thoracic artery
internal, 77, 139, 180, 186–188, 195, 203, 208–209, 213, 229, 233, 239–241, 251, 414
anterior intercostal branches of, 186
left, 190–191, 228
medial mammary branches of, 180
perforating branch of, 180, 185, 187–188, 413
right, 190, 227
lateral, 180, 185–186, 251, 413–415, 420
lateral mammary branches of, 180
superior, 186, 413–415, 420
Thoracic cardiac nerves, 206, 225, 236
Thoracic constriction, 230
Thoracic duct, 74, 186, 191, 195, 203, 205–206, 208, 213, 228–229, 234–235, 238–241, 258, 261, 295, 297, 316
transverse section of, 324
Thoracic ganglion
first, 163
fourth, 223–224
second, 224
sixth, 206
third, 223, 236
Thoracic intervertebral discs, 239–240
T8, 191
T9, 191
Thoracic nerve
dorsal ramus of, 188
lateral branch of, 188
long, 180, 185–186, 253, 413, 415–416
medial branch of, 188
Thoracic plexus, 206
Thoracic spinal cord, 134–135, 207, 303
Thoracic spinal nerves
dorsal ramus of, 177
dorsal root of, 134–135, 177
T1, 133–135, 160
dermatome of, 162
dorsal ramus of, 174
vertebrae relation to, 161
T2, 134–135
dermatome of, 162
dorsal ramus of, 174
vertebrae relation to, 161
T3
dermatome of, 162
dorsal ramus of, 174
vertebrae relation to, 161
T4
dermatome of, 162
dorsal ramus of, 174
vertebrae relation to, 161
T5
dermatome of, 162
dorsal ramus of, 174
vertebrae relation to, 161
T6
dermatome of, 162
dorsal ramus of, 174
vertebrae relation to, 161
T7
dermatome of, 162
dorsal ramus of, 174, 250
dorsal rootlets of, 160
ventral ramus of, 392
vertebrae relation to, 161
T8
dermatome of, 162
dorsal ramus of, 174
dorsal rootlets of, 160
vertebrae relation to, 161

Thoracic spinal nerves *(Continued)*
T9
dermatome of, 162
dorsal ramus of, 174
vertebrae relation to, 161
T10, 388
dermatome of, 162
dorsal ramus of, 174
ventral ramus of, 388
vertebrae relation to, 161
T11
dermatome of, 162
dorsal ramus of, 174
ventral ramus of, 392
vertebrae relation to, 161
T12, 160
anterior ramus of, 250
dermatome of, 162
dorsal ramus of, 174
ventral ramus of, 174
vertebrae relation to, 161
typical, 177
ventral ramus of, 177, 188
ventral root of, 134–135, 177
Thoracic sympathetic nerves, 131
Thoracic sympathetic trunk, 236
Thoracic sympathetic trunk ganglion, first, 133
Thoracic trunk ganglion
lower, 225
upper, 225
Thoracic vein
internal, 77, 186–187, 189, 195, 209, 213, 239–241
left, 191
perforating branch of, 187
perforating tributaries to, 252
lateral, 252
Thoracic vertebrae, 154, 167, 227, 243
arteries of, 167
body of, 154, 166, 238, 241
radiography of, 156
section through, 166
T1, 15, 22, 160
anterior view of, 153
inferior articular facet for, 15
lateral view of, 153
posterior view of, 153
spinal nerves relation to, 161
spinous process of, 194
T2, spinal nerves relation to, 161
T3, spinal nerves relation to, 161
T4, spinal nerves relation to, 161
T5
anterior view of, 153
lateral view of, 153
posterior view of, 153
spinal nerves relation to, 161
T6
lateral view of, 154
spinal nerves relation to, 161
superior view of, 154
T7
posterior view of, 154
spinal nerves relation to, 161
T8, 213
posterior view of, 154
spinal nerves relation to, 161
T9
posterior view of, 154
spinal nerves relation to, 161
T10
body of, 324
spinal nerves relation to, 161
T11, spinal nerves relation to, 161
Thoracic vertebrae *(Continued)*
T12, 160
anterior view of, 153
lateral view of, 153–154
posterior view of, 153
spinal nerves relation to, 161
spinous process of, 152, 171–172, 174, 409
Thoracic wall
anterior, 185–186
internal view of, 187
internal, veins of, 189
Thoracoabdominal nerves, 254
cutaneous branches of, 185
Thoraco-acromial artery, 186, 412, 414–415, 420
acromial branch of, 414–415
clavicular branch of, 414–415
deltoid branch of, 409, 414–415
pectoral branch of, 185, 414–415
Thoraco-acromial vein, acromial branches of, 401
Thoracodorsal artery, 413–415, 420
Thoracodorsal nerve, 410, 413, 415–416
Thoraco-epigastric vein, 245, 252
Thoracolumbar fascia, 171, 174
anterior layer, 173, 176
middle layer, 176
posterior layer, 172–173, 176, 250, 309
transverse section of, 328
Thoracolumbar spinal cord, 303
Thorax
autonomic nerves in, 206
bony framework of, 183
coronal section of heart and ascending aorta, 214
cross section of
at T3 level, 238
at T3-4 disc level, 239
at T4-5 disc level, 240
at T7 level, 241
surface anatomy of, 178
Thumb, extensors of, 427
Thymus, 208, 227–228, 239
lung area for, 196
Thyro-arytenoid muscle, 80, 82, 151
action of, 81
thyro-epiglottic part of, 80, 82
Thyrocervical trunk, 32–34, 71–72, 76–78, 137, 139, 229, 233, 414
left, 170
right, 170
Thyro-epiglottic ligament, 79
Thyrohyoid membrane, 28, 64, 67, 69–70, 76, 78–79, 82
Thyrohyoid muscle, 27–29, 31, 58, 82, 129–130, 151
branch to, 34
communication with cervical plexus, 33
nerve to, 71, 130
Thyroid artery
inferior, 34, 72, 76–78, 137, 139, 223, 414
esophageal branch of, 233
superior, 31, 34, 72, 76–78, 137, 139
laryngeal branch of, 34
Thyroid articular surface, 80, 82
Thyroid capsule, 26
Thyroid cartilage, 1, 15, 27–28, 31, 64, 69–70, 76, 82, 193, 199, 203, 230–231
inferior horn of, 79
lamina of, 79–80
posterior border of, 67
laryngeal prominence of, 79
oblique line of, 28, 79
superior horn of, 67, 69–70, 79
prominence caused by, 66
Thyroid gland, 26, 28, 31, 33, 64, 76–78, 82, 193, 195, 203, 214
anterior view of, 76
fibrous capsule of, 78
isthmus of, 76
left lobe of, 76, 78
posterior view of, 77
pyramidal lobe of, 76
right lobe of, 76, 78
Thyroid lymph nodes, superior, 74
Thyroid notch, superior, 79
Thyroid vein
inferior, 31, 73, 76–78, 195, 208, 234
middle, 31, 73, 76, 78
superior, 31, 73, 76, 78, 82
Thyropharyngeus muscle, 69
Tibia, 497–498, 500–501, 507–508, 510, 513–514, 516–518
anterior border of, 468, 500–501
condyles of
lateral, 481, 497, 500–501, 506
medial, 494, 496–497, 500–501
fibular notch of, 500
Gerdy's tubercle of, 481, 494, 496, 500–501
intercondylar area of, 500
anterior, 501
posterior, 501
intercondylar tubercles of
lateral, 500–501
medial, 500–501
interosseous border of, 500–501
interosseous membrane of, 501
lateral surface of, 500–501
medial border of, 500
medial malleolus of, 468, 500–501, 503–505, 507–508, 516–518, 531
medial surface of, 500
nutrient foramen of, 500
oblique line of, 500
posterior intercondylar area of, 500
radiographs of, 497, 531
superior articular surface of, 495, 501
Tibial artery
anterior, 499, 505, 508–510, 517–518
circumflex fibular branch of, 499, 509
lateral tarsal branch of, 509
posterior, 499, 503–505, 509–510, 516, 520–521
calcaneal branch of, 503–504
medial calcaneal branches of, 505, 519
medial malleolar branch of, 505
Tibial nerve, 482, 484, 486, 489, 492, 503–505, 510, 521, 527–528
articular branch of, 527–528
lateral calcaneal branches of, 527
medial calcaneal branches of, 471, 519–520, 527–528
posterior, 516
Tibial tuberosity, 468, 479–480, 493–496, 498, 500–501, 506–507
Tibial vein
anterior, 510
posterior, 503–504, 510
Tibialis anterior muscle, 468, 481, 493–494, 502, 506–507, 510, 518, 529, 531
tendinous sheath of, 516
Tibialis anterior tendon, 508, 514–518, 523
tendinous sheath of, 517
Tibialis posterior muscle, 502, 505, 510, 528, 531
Tibialis posterior tendon, 503–504, 514–516, 521–523
Tibiofibular ligament
anterior, 501, 514
posterior, 514

Tongue, 38, 46–47, 59–60, 68
apex of, 60
body of, 43, 60, 64
dorsum of, 60
frenulum of, 46, 56
inferior longitudinal muscle of, 59
innervation of, 119
intrinsic muscles of, 60, 129
inferior longitudinal, 129
superior longitudinal, 129
transverse, 129
vertical, 129
lingual glands of, 60
longitudinal muscle of
inferior, 47, 151
superior, 47, 151
lymph follicles of, 60
lymph vessels and nodes of, 75
mucous glands of, 60
root of, 60, 64, 66–67, 69, 80
taste buds of, 60
transverse muscle of, 151
vertical muscle of, 151
Tonsil
of cerebellum, 114, 116
lingual, 60, 64, 68, 80
palatine, 47, 56–57, 60, 64, 66, 68
pharyngeal, 64, 66–68
imaging of, 151
Tonsillar artery, 51, 72
Torus levatorius, 66
Torus tubarius, 36, 38, 66, 68
posterior, opening of, 36
Trabecula, 149
artery of, 149
Trabeculae carneae, 217
Trabecular meshwork and spaces of iridocorneal angle, 90
Trachea, 15, 26, 28, 64, 70, 76–80, 127, 193, 195, 199–200, 203–204, 208, 210, 214, 227, 229–231, 233, 237–239
connective tissue sheath of, 199
cross section through, 199
elastic fibers of, 199
epithelium of, 199
glands of, 199
innervation of, 119, 163–164
lung area for
left, 196
right, 196
lymph vessels of, 199
nerves of, 199
small arteries of, 199
Tracheal cartilages, 199
Tracheal wall
anterior, 199
posterior, 199
mucosa of, 199
Trachealis muscle, 199
Tracheobronchial lymph nodes, 261
inferior, 235, 240
superior, 235, 239
left, 205
right, 205
Tracheobronchial (carinal) lymph nodes, inferior, 205
Tracheobronchial tree, innervation of, schema of, 207
Tracheo-esophageal groove, 70
Tragus, 1, 95
Transpyloric plane, 244
Transversalis fascia, 7, 176, 245, 249, 255–257, 259, 315, 321, 341, 343–344, 346, 355
within inguinal triangle, 255
transverse section of, 328
Transverse fasciculi, 446, 519
Transverse foramen, 19
Transverse ligament
of atlas, 23
of knee, 496
Transverse pericardial sinus, 209, 212, 217–218
Transverse process, 176, 184
cervical, 19, 22, 30, 173
anterior tubercle of, 20, 30
C6, 137
posterior tubercle of, 20, 30
of coccyx, 157
lumbar, 155–156, 158–159, 243, 330
lumbosacral, L1, 192
thoracic, 154
of vertebral body, articular facet for, 184
Transverse ridges, 157
Transverse sinus, 99, 104–105, 146
groove for, 8, 11
imaging of, 150
sigmoid sinus continuation of, 105
Transversospinalis muscle, 238
Transversus abdominis muscle, 7, 172–173, 176, 186–187, 245, 247, 249, 251, 253–256, 258, 262, 308–309, 328, 341, 345
aponeurosis of, 7, 251, 309
tendon of origin of, 172–173, 176, 250
transverse section of, 328
Transversus muscle, 151
Transversus thoracis muscle, 177, 186–188, 213, 241
Trapeziocapitate ligament, 441–442
Trapeziotrapezoid ligament, 441–442
Trapezium, 439, 442–443, 445, 449, 454
radiographs of, 444
tubercle of, 439, 441, 443
Trapezium bone, 439
Trapezius muscle, 1, 26–29, 31, 128, 130, 152, 171, 174–175, 177, 185–186, 188, 238–241, 250, 398, 404–406, 409–410, 412, 415, 467
accessory nerve to, 128
innervation of, 119
Trapezoid bone, 439, 442–443, 449
radiographs of, 444
Trapezoid ligament, 404, 408, 411
Treitz, ligament of, 264
Triangle
anal, 358
of auscultation, 241, 409
auscultatory, 152, 250
cystohepatic (Calot's), 280, 284
deltopectoral, 409
inguinal (Hesselbach's), 249, 255
transversalis fascia within, 255
lumbar (of Petit), 152, 250
internal oblique muscle in, 171
lumbocostal, 192
of neck, 175
posterior, 171, 185
sternocostal, 187
suboccipital, 175
urogenital, 358
Triangular aponeurosis, 451
Triangular fold, 68
Triangular fossa, 95
Triangular ligament
left, 268, 277
right, 268, 277
Triangular space, 413
Triceps brachii muscle, 152, 178, 405–406, 409–410, 413–415, 418–419, 421, 438, 465, 467
lateral head of, 152, 239–240, 398
long head of, 152, 238–240, 398
tendon of, 152, 398
Triceps brachii tendon, 424, 430–431, 465
Tricuspid heart valve, 210, 213–214, 219–221, 241
anterior cusp of, 213, 217, 219–221
posterior cusp of, 213, 217, 219–221
right fibrous ring of, 219, 222
septal cusp of, 213, 217, 219–221
Trigeminal (semilunar) ganglion, 50, 52, 88, 105, 133–136
Trigeminal impression, 11
Trigeminal nerve (V), 52, 55, 61, 99, 115, 123, 134–135, 145, 207
distribution of, 119
ganglion of, 117–118, 123, 132
mandibular division of, 2, 61
maxillary division of, 2, 61
mesencephalic nucleus of, 117–118, 123, 136
motor nucleus of, 117–118, 123, 132, 136
nuclei of, 123
ophthalmic division of, 2
schema of, 123
sensory root of, 115, 117–118, 123, 132
spinal nucleus of, 117–118, 123, 126–127
spinal tract of, 117–118, 123, 126–127
Trigeminal tubercle, 116
Trigonal ring, 347
Trigone
collateral, 112
habenular, 112, 116
hypoglossal, 116
olfactory, 120
of urinary bladder, 344, 346, 348, 362–363
vagal, 116
Triquetrocapitate ligament, 441
Triquetrohamate ligament, 441–442
Triquetrum bone, 439–440, 442–443
radiographs of, 444
Triticeal cartilage, 79
Trochanter of femur
greater, 152, 243, 330, 396–397, 468, 474–476, 479–480, 483, 489–490, 530
radiograph of, 331
lesser, 243, 258, 330, 474–476, 530
radiograph of, 331
Trochanteric fossa, 476
Trochlea, 86, 405–406, 422
fibular, 512–513
radiographs of, 423
of talus, 512, 531
Trochlear nerve (IV), 55, 85–86, 88, 105, 115–118, 122, 145
distribution of, 119
schema of, 122
superior, 13
Trochlear notch, of ulna, 425
Trochlear nucleus, 117–118, 122
Trolard
lateral lacuna of, 101–102
superior anastomotic vein of, 103
True cords. *See* Vocal fold
True pelvis, 334
True ribs, 183
Tubal artery, 96, 382
Tuber, of inferior vermis, 114, 116
Tuber (Bohler's) angle, 513
Tuber cinereum, 107–108, 115
median eminence of, 148
Tuberohypophyseal tract, 148
Tufted cell, 120
Tunica albuginea, 359, 363, 368
Tunica vaginalis
cavity of, 364
parietal layer of, 365, 368
testis, 321
visceral layer of, 365, 368

Turbinate, 36, 44
Tympanic artery
anterior, 51, 72, 96, 139
inferior, 55, 96
superior, 96
Tympanic canaliculus, 10, 12
Tympanic cavity, 53, 94–96, 98, 125–126
Tympanic membrane, 94–96, 98
Tympanic nerve, 55, 95
inferior, 96
of Jacobson, 124, 126, 135
Tympanic plexus, 96, 124, 126, 133, 135
promontory with, 95
tubal branch of, 126
Tyson's gland, opening of, 360

U

Ulna, 422, 426–429, 431, 436–439, 441–442, 452
anterior border of, 425
anterior surface of, 425
coronoid process of, 422, 425, 429
radiographs of, 423
interosseous border of, 425
interosseous membrane of, 425, 429
oblique cord of, 425
olecranon of, 398, 418, 422, 425, 427, 430–431, 465
radiographs of, 423
radial notch of, 422, 425
radiographs of, 423
styloid process of, 425, 439
radiographs of, 444
trochlear notch of, 425
Ulna fascia, 436
Ulnar artery, 419–420, 432–436, 441, 446–447, 449, 452–453, 460
carpal branch of, 456
deep palmar branch of, 433–435, 441, 446–447, 452–453, 460
palmar branch of, 453
palmar carpal branches of, 434, 452
Ulnar bursa, 449–450, 453
Ulnar collateral artery
inferior, 419–420, 431, 435
superior, 419–421, 430–431, 435
Ulnar collateral ligament, 424
Ulnar nerve, 400, 415–416, 418–419, 421, 430–434, 436, 441, 447, 449, 452–453, 459–464
articular branch of, 464
communicating branches of, 455
deep branch of, 434, 441, 446–447, 452–453, 460, 464
deep palmar branch of, 453
dorsal branch of, 400, 402, 430, 433–434, 436, 455–456, 459–460, 464
dorsal digital branch of, 400, 459
groove for, 406, 422
palmar branch of, 400, 402, 433, 446, 459, 464
palmar digital branch of, 400, 456, 459–460
superficial branch of, 433, 446–447, 453, 460, 464
superficial palmar arch of, 460
Ulnar recurrent artery
anterior, 420, 433–435
posterior, 420, 431, 434–435
Ulnar tuberosity, 417, 422, 425
Ulnocapitate ligament, 441
Ulnolunate ligament, 441
Ulnotriquetral ligament, 441–442
Umbilical artery, 226, 249, 259, 313, 376, 381
left, 249
occluded part of, 245, 257, 259, 268, 313, 343, 345, 378, 380–381
patent part of, 314, 378, 380–381
Umbilical fold
lateral, 249, 268, 341, 345
medial, 268, 341, 345, 378
median, 249, 268, 341, 345
right medial, 249
Umbilical ligament
medial, 226, 245, 249, 255–257, 259, 313–314, 341, 343, 345, 378, 380–381
left, 249
median, 256–257, 321, 341, 343, 345–346, 378, 381
Umbilical prevesical fascia, 249, 256, 343–344, 346
Umbilical region, 244
Umbilical vein, 226, 269
Umbilicus, 242, 249, 292, 329
sagittal CT images of, 375
Umbo, 95, 98
Uncal vein, 146
Uncinate process
cervical, 20
of ethmoidal bone, 36–37, 44
of newborn, 45
of pancreas, 281
transverse section of, 327
Uncovertebral joints, 21
Uncus, 107–108, 120
Unerupted teeth, 5
Upper limb
arteries of, 460
cutaneous innervation of, 400
dermatomes of, 399
lymph vessels and nodes of, 403
nerves of, 460–461
surface anatomy of, 398
Urachus, 249, 256–257, 268, 321, 341, 343–344, 346, 355, 378
median, 346
Ureteric fold, 341–342, 345
Ureteric orifice, 362
left, 348
right, 348
Ureteric plexus, 388
Ureteropelvic junction, transverse section of, 327
Ureters, 249, 257, 260, 265, 268, 297, 308, 311, 313–314, 340–346, 350, 352, 362, 369–370, 378–382, 388, 390, 395
in abdomen and pelvis, 313
arteries of, 314
autonomic nerves of, 317–318
in female, 313
innervation of, 395
left, 313
transverse section of, 328
in male, 313
retroperitoneal, 313
right, 313, 353
Urethra, 258, 335–337, 339–340, 346, 348, 351, 356, 359, 361–363, 367, 396
bulbous portion of, 363
floor of, 363
growth of, 347
hiatus for, 338
intermediate part of, 363
musculofascial extensions to, 337
pendulous portion of, 363
prostatic, 348, 363
roof of, 363
spongy, 363
bulbous portion of, 348
transverse section of, 397
Urethrae muscle
compressor, 335, 350, 356–357, 382, 397
growth of, 347
sphincter, 335, 339, 356, 374, 395, 397
growth of, 347
Urethral artery, 361, 383
Urethral crest, 362–363
Urethral fold, 366
Urethral glands (of Littré), 363
Urethral lacunae, of Morgagni, 363
Urethral meatus, external, 344
Urethral orifice, external, 329, 340, 354, 357, 360, 363, 366, 373
Urethral sphincter muscle
external, 249, 344, 361–363, 381
internal, 348, 362–363
Urethrovaginal sphincter muscle, 335
growth of, 347
Urinary bladder, 249, 256–257, 263, 268, 302, 308, 313, 321, 340, 342, 361–362, 364, 369, 378, 390, 395–396
apex of, 344, 346
arteries of, 314
autonomic nerves of, 317
body of, 344, 346
fascia of, 344
female, 341, 343, 348
growth of, 347
fundus of, 344, 346, 348
innervation of, 163–164, 395
lateral ligament of, 343
loop of Heiss, 347
lymph vessels and nodes of, 316
male, 344–345, 348
neck of, 344, 346, 348
orientation and supports of, 346
posterior loop of, 347
sagittal CT images of, 375
trigonal ring of, 347
trigone of, 344, 346, 348, 362–363
ureteric orifice of, 346
uvula of, 348, 362–363
Urinary bladder-prostate junction, 396
Urogenital fold, 366
Urogenital groove, 366
Urogenital hiatus, growth of, 347
Urogenital sinus, 367
Urogenital triangle, 358
Uterine artery, 313–314, 342, 350, 352–353, 378, 380, 382
branches of, 382
ovarian branches of, 353
vaginal branches of, 382
Uterine fascia, 343
Uterine ostium, 352
Uterine (fallopian) tube, 340–342, 350–352, 367, 378, 390, 393
abdominal ostium of, 352
ampulla of, 352–353
fimbriae of, 352–353
folds of, 352
infection of, 353
infundibulum of, 352–353
isthmus of, 352
uterine part of, 352
Uterine vein, 260, 342, 350, 352, 382
ovarian branches of, 353
superior, 377
Uterosacral fold, 313, 341, 370
Uterosacral ligament, 340, 343, 351–352
Uterovaginal fascia, 342, 350, 355
Uterovaginal plexus, 390, 392–393
Uterovaginal venous plexus, 260
Uterovesical pouch. *See* Vesico-uterine pouch

Uterus, 341, 346, 350, 367, 369, 378, 390, 393
adnexa and, 352
arteries of, 382
body of, 340, 342, 352
cervix of, 340, 342–343, 350, 352
fascial ligaments of, 351
fundus of, 340, 342, 346, 352
sagittal CT images of, 375
growth of, 349
hysterosalpingogram of, 353
isthmus of, 352
round ligament of, 260, 340–342, 350–351, 353, 355, 367, 378, 382
terminal part of, 350
supporting structures of, 350
veins of, 382
Utricle, 94, 97–98, 125
prostatic, 362
Uvula, 56, 66–68
of bladder, 348
of inferior vermis, 114, 116
of urinary bladder, 362–363
Uvular muscle, 57, 151

V

Vagal cardiac nerves, 131
Vagal fibers, 127
Vagal trigone, 116
Vagal trunk, 258, 297
anterior, 127, 206, 229, 236, 298–302, 306–307, 317, 319, 388
celiac branch of, 127, 298–299, 301
gastric branches of, 127, 298
hepatic branch of, 127, 298–299, 302, 306
posterior, 236, 299–302, 306–307, 317, 319, 388
celiac branch of, 127, 298–301, 388
gastric branch of, 299
Vagina, 335–337, 340, 346, 350, 352, 356, 367, 369, 373, 378, 393
growth of, 347
horizontal portion of, 351
musculofascial extensions to, 337
sagittal CT images of, 375
supporting structures of, 350
transverse section of, 397
vertical portion of, 351
vestibule of, 350, 354, 367
Vaginal artery, 313, 350, 353, 378, 380, 382
inferior, 343, 346
Vaginal fascia, 369
Vaginal fornix, 352
anterior, 340
posterior, 340
Vaginal orifice, 340, 354, 357, 366
Vaginal vein, 377
Vaginal venous plexus, 377, 397
Vaginal wall, 350–351
Vaginorectal fascial fibers, 343
Vagus nerve (X), 26, 32–34, 42, 55, 61, 71–72, 76–78, 105, 115, 117–118, 126–128, 131–132, 136, 164, 203, 206–208, 224, 229, 236, 303–304, 318
auricular branch of, 2, 12, 127
communication to, 126
in carotid sheath, 47
celiac branch of, 300
cervical cardiac branch of
inferior, 127
superior, 71–72, 127, 131–132
communicating branch of, 127
communication with cervical plexus, 33
cranial root of, 127
distribution of, 119
Vagus nerve (X) *(Continued)*
dorsal nucleus of, 117, 127, 303
posterior, 118
ganglion of
inferior, 55, 127–129, 236
superior, 127–128, 236
inferior, 13
inferior (nodose) ganglion of, 136, 207
in jugular fossa, 12
left, 77, 190, 203, 209, 223, 228, 238–239
meningeal branch of, 127
pharyngeal branch of, 126–127, 131–132, 236
posterior (dorsal) nucleus of, 224, 318
right, 77, 190, 203, 209, 223, 227, 238
schema of, 127
sympathetic trunk and, 73, 126
thoracic cardiac branch of, 127, 206, 223–224
vagal branches of, 236
Vallate papillae, 60, 136
Vallecula, 60, 68
Valves. *See* Heart valves
Valves of Houston, 371
Valves of Kerckring, 272, 280
Vas deferens, 249
Vascular fold, of cecum, 273
Vascular smooth muscle, innervation to, 163
Vascular system, of liver, 278
Vastus intermedius muscle, 477–480, 488, 492, 494, 525, 531
Vastus lateralis muscle, 397, 468, 477–481, 487, 489, 492–494, 506–507, 525, 531
Vastus medialis muscle, 468, 477–478, 480, 487–488, 492–494, 507, 525, 531
nerve to, 487, 492
Vater
hepatopancreatic ampulla of, 280
major duodenal papilla of, 272, 280
Veins. *See also specific veins*
of abdominal wall
anterior, 252
posterior, 260
of anal canal, female, 377
of brain
deep, 146
subependymal, 147
of duodenum, 289
of esophagus, 234
of eye, intrinsic, 92
of face, 3
of hypothalamus and hypophysis, 149
of internal thoracic wall, 189
of iris, 93
of large intestine, 291
of oral and pharyngeal regions, 73
of orbit and eyelids, 87
of pancreas, 289
of pelvic organs, female, 378
of pelvis, male, 381
of perineum, 382
male, 383
of posterior cranial fossa, 145
of rectum, female, 377
of scalp, 3
of small intestine, 290
of spinal cord, 169
of spleen, 289
of stomach, 289
of suprarenal glands, 320
of testis, 379
of uterus, 382
of vertebral column, 169–170
Vena cava, 380
inferior, 176, 203, 206, 211–212, 214, 217–218, 220, 222, 226–227, 229, 234, 237, 260, 266–268, 271, 277, 281, 286, 289, 308–310, 315, 320, 341, 345, 376, 378–379, 381, 390
axial CT images of, 322–323
groove for, 277
lung groove for, 196
transverse section of, 324–328
valve (eustachian) of, 217
superior, 76–77, 190, 203, 208–214, 217, 221–222, 226–227, 234, 237, 239–241
lung groove for, 196
Vena comitans, of hypoglossal nerve, 47, 59, 73
Venae comitantes, 59, 447
Venae rectae, 290
Venous arch, dorsal, 470
Venous plexus, 353
basilar, 104–105
external, 370
communication with, 377
in foramen magnum, 12
internal, 370
communication with, 377
of internal carotid artery, 55
pampiniform, 252, 365, 379, 381
prostatic, 344, 381
rectal, 260
external, 291
perimuscular, 291
vaginal, 377, 397
vertebral (of Batson), 104
internal, 166
around vertebral artery, 170
vesical, 381
Venous sinuses, dural
sagittal section of, 104
superior view of, 105
Ventral posteromedial nucleus, of thalamus, 136
Ventral rami
of cervical spinal nerves, 32, 71, 129, 174, 190
of lumbar spinal nerves, 158, 174, 388, 393, 485
of sacral spinal nerves, 388, 392
in situ, 160
of spinal nerves, 165–166
of thoracic spinal nerve, 174, 177, 388, 392
Ventricles (cardiac), 221
left, 209–214, 216, 218, 221, 237, 241
posterior vein of, 215
right coronary artery branches to back of, 216
right, 209, 211–214, 217, 221, 237, 241
Ventricles (cerebral), 109
fourth, 109, 116, 144, 147
cerebellum and, 114, 116
choroid plexus of, 107, 110, 115–116, 145
choroidal branch to, 144
imaging of, 151
lateral apertures of, 147
left lateral aperture of, 109
left lateral recess of, 109, 116
median apertures of, 109, 147
rhomboid fossa of, 115
taenia of, 116
vein of lateral recess of, 145
interventricular foramen (of Monro), 109–110
lateral, 109, 111, 113, 140, 147
central part of, 109
choroid plexus of, 101, 109–111, 140, 144, 146
frontal (anterior) horn of, 109
imaging of, 151

Ventricles (cerebral) *(Continued)*
lateral vein of, 147
medial vein of, 147
occipital (posterior) horn of, 109–113, 144, 147
temporal (inferior) horn of, 109, 112–113, 147
third, 109, 111–112, 116, 147
choroid plexus of, 107, 109–110, 144
imaging of, 151
infundibular recess of, 109
interthalamic adhesion of, 109
pineal recess of, 109
supra-optic recess of, 109
suprapineal recess of, 109
tela choroidea of, 109, 112, 146
thalamus and, 107, 112, 116
Ventricular folds, 80
Ventricular veins
hippocampal, 147
inferior, 147
Venule
macular
inferior, 92
superior, 92
nasal retinal
inferior, 92
superior, 92
temporal retinal
inferior, 92
superior, 92
Vermian artery, inferior, 144
Vermian vein
inferior, 145
superior, 145, 147
Vermiform appendix, 265, 273–276
orifice of, 274
Vermillion border, 1
Vermis
inferior
nodule of, 114, 116
pyramid of, 114, 116
tuber of, 114, 116
uvula of, 114, 116
superior, 114
central lobule of, 114, 116
culmen of, 114, 116
declive of, 114, 116
folium of, 114, 116
lingula of, 114, 116
Vertebrae, spinal nerve root relation to, 161
Vertebral arteries, 13, 22, 32–34, 71, 77–78, 131, 139–142, 167, 170, 175, 223, 233, 414
cervical part of, 137
in foramen magnum, 12
imaging of, 150–151
intracranial part of, 137
left, 144, 170
meningeal branches of, 13
anterior, 102, 137, 144
posterior, 102, 137, 144
right, 170
Vertebral artery, venous plexus around, 170
Vertebral body, 237
articular facet for
inferior, 184
superior, 184
transverse process of, 184
cervical, 20–21, 156
lumbar, 155, 159, 176, 267, 334, 341, 345
posterior intercostal artery branch to, 168
thoracic, 154, 166, 227, 238, 241, 324
Vertebral canal, 154–155
Vertebral column, 153
veins of, 169–170
Vertebral foramen, 19
cervical, 20
lumbar, 155
thoracic, 154
Vertebral ganglion, 131, 223–224
Vertebral ligaments
lumbar region, 159
lumbosacral region, 158
Vertebral notch
inferior, 154–155
superior, 154
Vertebral plexus, 131
Vertebral vein, 234
accessory, 170
anterior, 170
left, 170
right, 170
Vertebral venous plexus, 104
external, 169
anterior, 170
internal, 166, 169
anterior, 170
Vertebrocostal (lumbocostal) trigone, 258
Verticalis muscle, 151
Vesical artery
inferior, 259, 313–314, 343, 346, 376, 378, 380–381
prostatic branches of, 381
ureteric branch of, 314
superior, 249, 259, 313–314, 343, 376, 378, 380–381
ureteric branch from, 314
Vesical fascia, 342–344, 348, 355, 374
Vesical fold, transverse, 249, 341, 345, 353
Vesical lymph nodes, lateral, 316
Vesical plexus, 302, 317, 388, 390, 392, 394–395
Vesical vein, superior, 260, 377
Vesical venous plexus, 260, 348, 381
in retropubic space, 344
Vesicocervical fascial fibers, 343
Vesicocervical space, 343
Vesicosacral (sacrogenital) fold, 345
Vesico-uterine pouch, 340, 342, 346, 353, 369
Vesicovaginal space, 343
Vesicular appendix, 352, 367
Vessels
of ciliary body, 92
innervation of, 225
of neck, 32–33
of teeth, 63
Vestibular aqueduct
endolymphatic duct in, 98
internal opening of, 97
opening of, 8, 13, 99
Vestibular area, 116
Vestibular fold, 82
Vestibular fossa, 354
Vestibular ganglion (of Scarpa), 97, 125
Vestibular (Bartholin's) gland
greater, 356–357, 367, 382
primordium of, 367
opening of, 354
Vestibular (Reissner's) membrane, 98
Vestibular nerve, 94, 97, 99, 119, 125
inferior part of, 97, 99, 125
superior part of, 97, 99, 125
Vestibular nuclei, 117–118
inferior, 125
lateral, 125
medial, 125
superior, 125
Vestibule
bulb of, 348, 350, 356–357, 382
artery of, 350, 357, 382
of ear, 94, 97–98
of larynx, 82
nasal, 36, 38, 42
of vagina, 350, 354, 367
Vestibulocochlear nerve (VIII), 13, 94, 97, 99, 105, 115, 117–118, 125, 132
distribution of, 119
schema of, 125
Vestigial mesonephric tubule, 368
Vidian, 39, 41, 52–53, 55, 96, 123–124, 126, 132, 134, 136
Vincula longa, 451
Vinculum breve, 451
Viscera, paramedian section of, 321
Visceral (pre-aortic) lymph nodes, 261
Visceral peritoneum, 267, 272, 305, 374
Visceral pleura, 202
Visual pathway, 133
Vitreous body, 89
Vitreous chamber, 92
Vocal fold, 64, 80, 82
Vocal ligament, 79–80
Vocalis muscle, 80, 82, 151
action of, 81
Volar plates, 445, 448, 451, 458
Vomer, 4, 10, 38, 42
Vomeronasal organ, 36
Vorticose veins, 87, 92–93
anterior tributaries of, 93
bulb of, 93
posterior tributaries of, 93
suprachoroidal tributaries forming, 93
V-shaped area of Laimer, circular esophageal muscle in, 69, 231
Vulva, 354

W

White matter
imaging of, 151
of spinal nerves, 165
White rami communicantes, 131, 133–135, 163, 166, 177, 188, 206, 224–225, 227–228, 236, 254, 262, 297, 300, 303–304, 318, 388, 390, 393–395, 485
of spinal nerves, 165
to and from sympathetic trunk, 165
Willis, cerebral arterial circle of, 140–141
Winslow, omental (epiploic) foramen of, 266–267, 269, 321
Wirsung, pancreatic duct of, 272, 280–281
Wolffian duct, 364, 367
Wormian bone, 6, 9
Wrisberg, intermediate nerve of, 61, 105, 115, 124–125, 132, 134, 136
distribution of, 119
Wrist
arteries of, 449
bones of, 443
cutaneous nerves of, 459
deep dorsal dissection of, 456
extensor tendons at, 457
extensors of, 427
flexor tendons at, 449
flexors of, 428
ligaments of, 441–442
movements of, 440
nerves of, 449
palmar dissections
deeper, 447
superficial, 446
radiographs of, 444
superficial dorsal dissection of, 455
superficial radial dissection of, 454

Wrist (radiocarpal) joint, 439, 442
articular disc of, 439, 442

X

Xiphoid process, 178, 184, 187, 193, 195, 242–243, 245
of sternum, 183, 185
transverse section of, 324

Z

Zigzag line, 232, 270
Zinn, common tendinous ring of, 85–86, 88, 122
Zona orbicularis, 474, 530
Zonular fibers, 89–92
equatorial, 91
postequatorial, 91
preequatorial, 91
Zygapophysial joint, 22, 241
capsule of, 22–23, 159
Zygomatic arch, 6, 15–16, 48
Zygomatic bone, 1, 4, 6, 10, 83
frontal process of, 4
of newborn, 14
orbital surface of, 4
temporal process of, 4, 6
zygomaticofacial foramen of, 4, 6, 14
Zygomatic nerve (V_2), 52, 54, 122–123
zygomaticofacial branch of, 71, 123
zygomaticotemporal branch of, 71, 123
Zygomatic process, 14
of maxilla, 4, 10
of temporal bone, 6, 10
Zygomatic recess, 43
Zygomaticofacial artery, 3, 87
Zygomaticofacial foramen, 4, 6, 14
Zygomaticofacial nerve, 2, 52, 54, 71, 123
Zygomaticofacial vein, 3
Zygomatico-orbital artery, 3, 87
Zygomaticotemporal artery, 3
Zygomaticotemporal nerve, 2, 52, 54, 71, 123
Zygomaticotemporal vein, 3
Zygomaticus major muscle, 25, 48, 124, 151
Zygomaticus minor muscle, 25, 48, 124, 151

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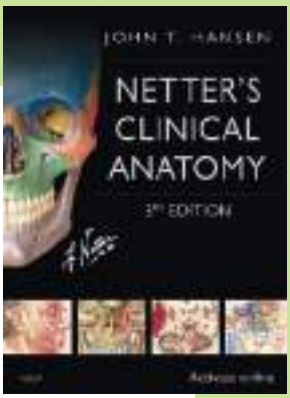

chapter 6

Lower Limb

1. INTRODUCTION
2. SURFACE ANATOMY
3. HIP
4. GLUTEAL REGION
5. THIGH
6. LEG
7. ANKLE AND FOOT
8. LOWER LIMB MUSCLE SUMMARY AND GAIT
9. LOWER LIMB ARTERY AND VEIN SUMMARY
10. LOWER LIMB NERVE SUMMARY
11. EMBRYOLOGY

CHALLENGE YOURSELF QUESTIONS

1. INTRODUCTION

As with the upper limb in Chapter 7, this chapter approaches our study of the lower limb by organizing its anatomical structures into functional compartments. The thigh and leg each are divided into three functional compartments, each containing muscles and neurovascular structures. The lower limb subserves the following features:

- **Popliteal fossa:** the region behind the knee.
- **Gastrocnemius muscles:** the muscle mass that forms the calf.
- **Calcaneal (Achilles) tendon:** the prominent tendon of several calf muscles.
- **Saphenous vein:** drains blood from the dorsal venous arch and posterior aspect of the leg to the popliteal vein posterior to the knee.

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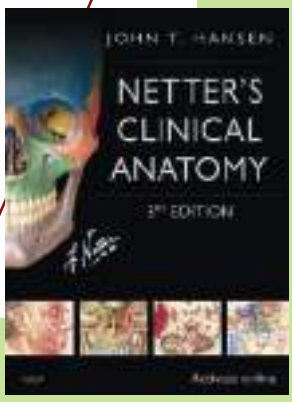
Challenge Yourself Questions

1. An elderly patient who has been minimally ambulatory is transported to the clinic with a swollen lower limb and evidence of a deep vein thrombosis. Your examination reveals a sizable clot in her small saphenous vein, and you are concerned that a thromboembolus might originate from this clot and pass to her heart and lungs. After it exits the small saphenous vein, the thromboembolus would next pass into which of the following veins on its journey to the heart?
   A. Deep femoral
   B. External iliac
   C. Femoral
   D. Great saphenous
   E. Popliteal

2. An obese 48-year-old woman presents with a painful lump in her proximal thigh, just medial to the femoral vessels. Examination reveals the herniation of some abdominal viscera, which passes under the inguinal ligament. Through which of the following openings has this hernia passed to enter her thigh?
   A. Deep inguinal ring
   B. Femoral ring
   C. Fossa ovalis
   D. Obturator
   E. Superficial inguinal ring

4. A football player receives a blow to the lateral aspect of his weight-bearing right leg and immediately feels his knee give way. Under extreme pain, he is carried from the field and immediately examined by the team physician, who is able to move the player's right tibia forward excessively compared to the uninjured leg. Which of the following ligaments is injured?
   A. Anterior cruciate
   B. Fibular collateral
   C. Posterior cruciate
   D. Tibial collateral
   E. Transverse

5. During a routine physical exam, the physician taps a patient's patellar ligament with a hammer and elicits a knee-jerk reflex. Which of the following nerves



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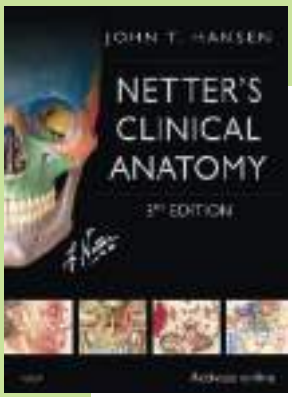

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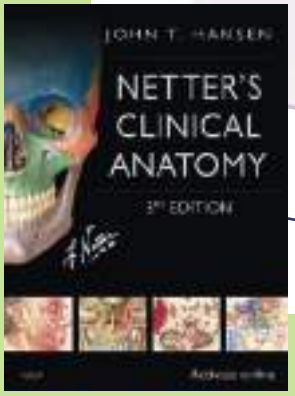

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Chapter 2 Back

Clinical Focus 2-6

Intervertebral Disc Herniation—cont'd

The most common sites for disc herniation in the cervical region are the C5-C6 and C6-C7 levels, resulting in shoulder and upper limb pain. In the lumbar region the primary sites are the L4-L5 and L5-S1 levels. Lumbar disc herniation is much more common than cervical herniation and results in pain over the sacro-iliac joint, hip, posterior thigh, and leg.

Intervertebral disc

Nucleus pulposus

Posterior longitudinal lig.

Annulus fibrosus

Cartilage end plate

Collagen lamellae of annulus fibrosus

Anterior longitudinal lig.

Disc rupture and nuclear herniation

Nucleus pulposus

Rim lesion

Tears in internal annular lamellae

Shattered disc space

Herniated nucleus pulposus

Peripheral tear of annulus fibrosus and cartilage end plate (rim lesion) initiates sequence of events that weaken and tear internal annular lamellae, allowing extrusion and herniation of nucleus pulposus.

Level of herniation

Clinical features of herniated lumbar disc

Pain

Numbness

Weakness

Atrophy

Reflexes

L4-L5 disc; 5th lumbar n. root

L5-S1 disc; 1st sacral n. root

Sagittal MRI of an intervertebral disc herniation

Herniation of L4–L5 intervertebral disc (white arrow) with some displacement of the posterior longitudinal ligament (black arrow). The two discs above this site show the normal hydrated appearance of the nucleus pulposus.

Herniation of a lumbar disc

Herniated nucleus pulposus

Nerve root compressed by herniated disc

Disc material removed

Portion of lamina and facet removed

Disc material removed to decompress nerve root

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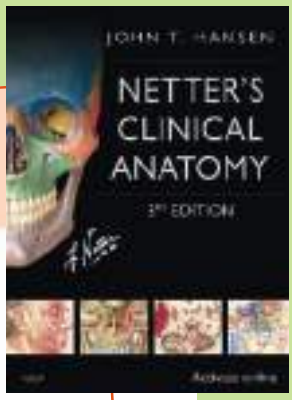

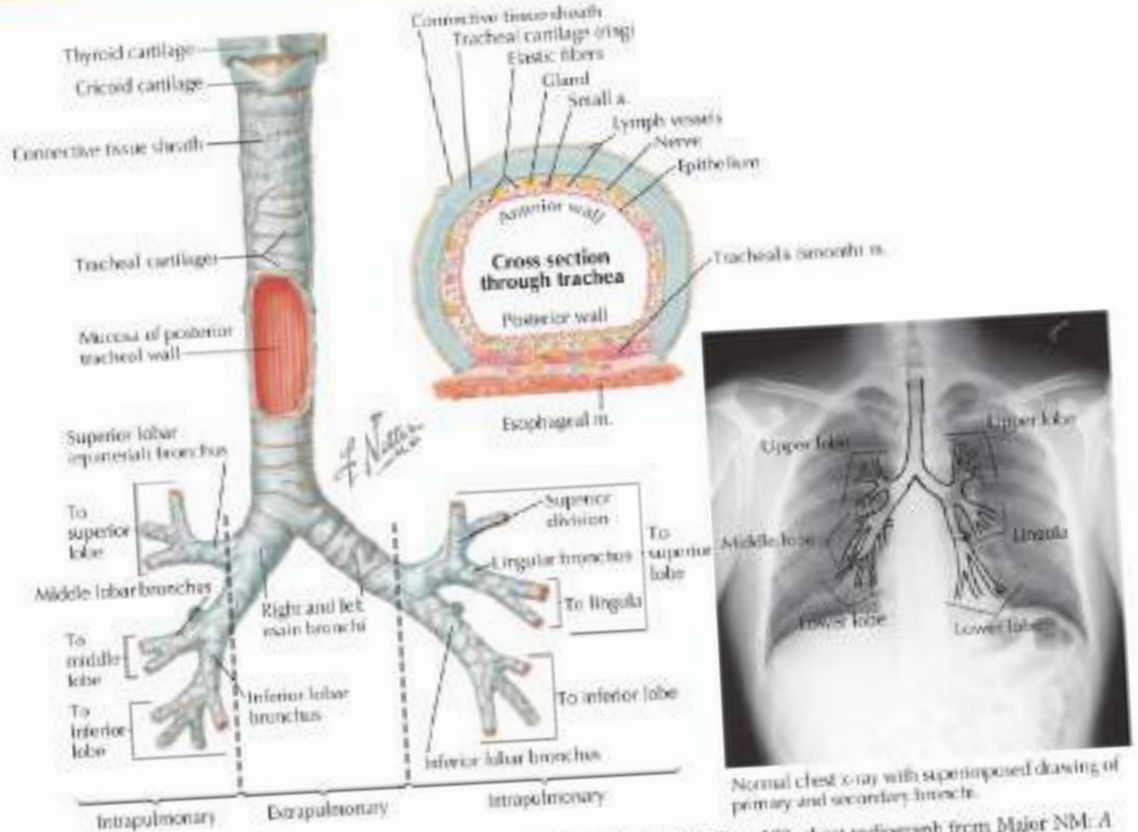

Normal chest x-ray with superimposed drawing of primary and secondary bronchi.

FIGURE 3-13 Trachea and Bronchi. (From *Atlas of human anatomy*, ed 6, Plate 199; chest radiograph from Major NM: *A practical approach to radiology*. Philadelphia, 2006, Saunders.)

TABLE 3-8 Features of the Trachea and Bronchi

STRUCTURE	CHARACTERISTICS
Trachea	Approximately 5 inches (10 cm) long and 1 inch in diameter; courses inferiorly anterior to esophagus and posterior to aortic arch
Cartilaginous rings	Are 16-20 C-shaped rings
Bronchus	Divides into right and left main (primary) bronchi at level of sternal angle of Louis
Right bronchus	Shorter, wider, and more vertical than left bronchus; aspirated foreign objects more likely to
	...o right bronchus
	...keel-like cartilage at
	...ation of trachea
	...lobes of each lung (three
	...ht; two on left)
	...bronchopulmonary
	...nts (10 for each lung)

5. PERICARDIUM AND HEART

The Pericardium

The pericardium and heart lie within the **middle mediastinum.** The heart is enclosed within a fibroserous pericardial pouch that extends and blends into the adventitia of the great vessels that enter or leave the heart. The pericardium has a **fibrous outer layer** that is lined internally by a serous layer, the **parietal serous layer,** which then reflects onto the heart and becomes the **visceral serous layer,** which is the outer covering of the heart itself, also known as the **epicardium** (F... 3-14 and Table 3-9). These two serous layers for... a potential space known as the **pericardial s...** **(cavity).**

The Heart

The heart is essentially two muscular pumps... series. The two atria contract in unison, follow...

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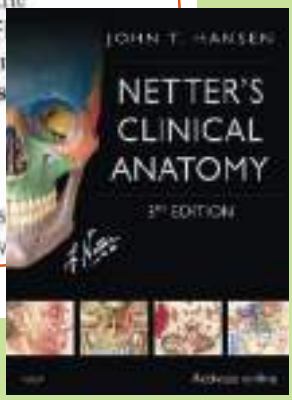

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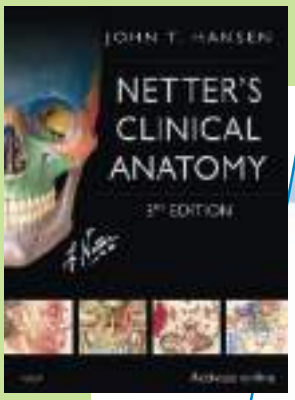

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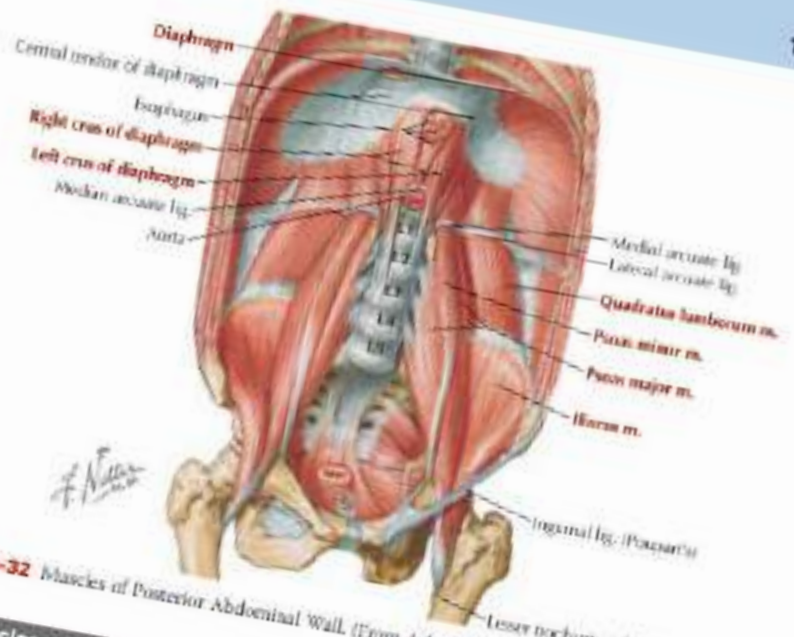

FIGURE 4-32 Muscles of Posterior Abdominal Wall. (From Atlas of human anatomy, ed 6, Plate 258.)

TABLE 4-10 Muscles of Posterior Abdominal Wall

MUSCLE	SUPERIOR ATTACHMENT (ORIGIN)	INFERIOR ATTACHMENT (INSERTION)	INNERVATION	ACTIONS
Psoas major	Transverse processes of lumbar vertebrae; sides of bodies of T12-L5 vertebrae, and intervening intervertebral discs	Lesser trochanter of femur	Lumbar plexus via ventral branches of L2-L4 nerves	Acting unilaterally with iliacus, flexes hip; acting inferiorly, flexes vertebral column laterally; used to balance trunk in sitting position; acting inferiorly with iliacus, flexes trunk
Iliacus	Superior two thirds of iliac fossa, ala of sacrum, and anterior sacro iliac ligaments	Lesser trochanter of femur and shaft inferior to it and to psoas major tendon	Femoral nerve (L2-L4)	Flexes hip and stabilizes hip joint; acts with psoas major
Quadratus lumborum	Medial half of inferior border of 12th rib and tips of lumbar transverse processes	Iliolumbar ligament and internal lip of iliac crest	Ventral branches of T12 and L1-L3 nerves	Extends and laterally flexes vertebral column; fixes 12th rib during inspiration
Diaphragm	Thoracic outlet: xiphoid, inner six costal cartilages, L1-L3 vertebrae	Converges into central tendon	Phrenic nerve (C3-C5)	Draws central tendon down and forward during inspiration

abdominal aorta. The **inferior vena cava** passes through the diaphragm at the T8 vertebral level to enter the right atrium of the heart. The right phrenic ve may accompany the IVC as it passes diaphragm, which it innervates. The passes through the diaphragm at the level, along with the anterior and l trunks and left gastric vessels. The through the diaphragm at the T12 vertebral level and is accompanied by the thora duct and often the azygos vein superiorly.

Kidneys and Adrenal (Suprarenal) Glands

The kidneys and adrenal glands are neal organs that receive a rich arterial supply

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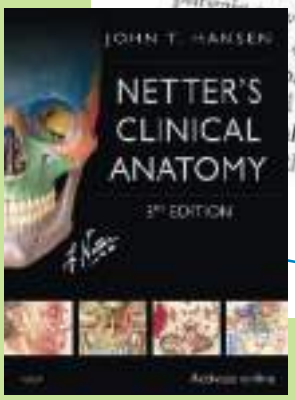

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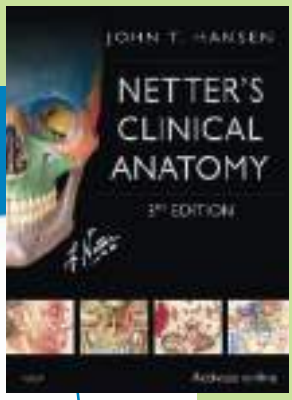

inguinal region, rectus sheath, and lateral thoracic wall. Most of its connections ultimately drain into the **axillary vein (4)** and then into the **subclavian vein, brachiocephalic veins,** which form the **superior vena cava,** and then into the **heart (6).** The inferior epigastric veins (from the external iliac veins) enter the posterior rectus sheath and course cranially above the umbilicus as the superior epigastric veins and then anastomose with the internal thoracic veins that drain into the subclavian veins (Fig. 4–3).

The superficial veins can become enlarged during portal hypertension, when the venous flow through the liver is compromised. Important **portosystemic anastomoses** between the portal system and caval system can allow venous blood to gain access to the caval veins (both deep and superficial veins) to assist in returning blood to the heart.

Variations in the venous pattern and in the number of veins and their size are common, so it is best to understand the major venous channels and realize that smaller veins often are more variable.

Hepatic Portal System of Veins

The hepatic portal system of veins drains the abdominal GI tract and two of its accessory organs (pancreas and gallbladder) and the spleen (immune system organ) (Fig. 4–40). This blood then collects largely in the liver, where processing of absorbed GI contents takes place. (However, most fats are absorbed by the lymphatics and returned via the thoracic duct to the venous system in the neck, at the junction of the left internal jugular and left

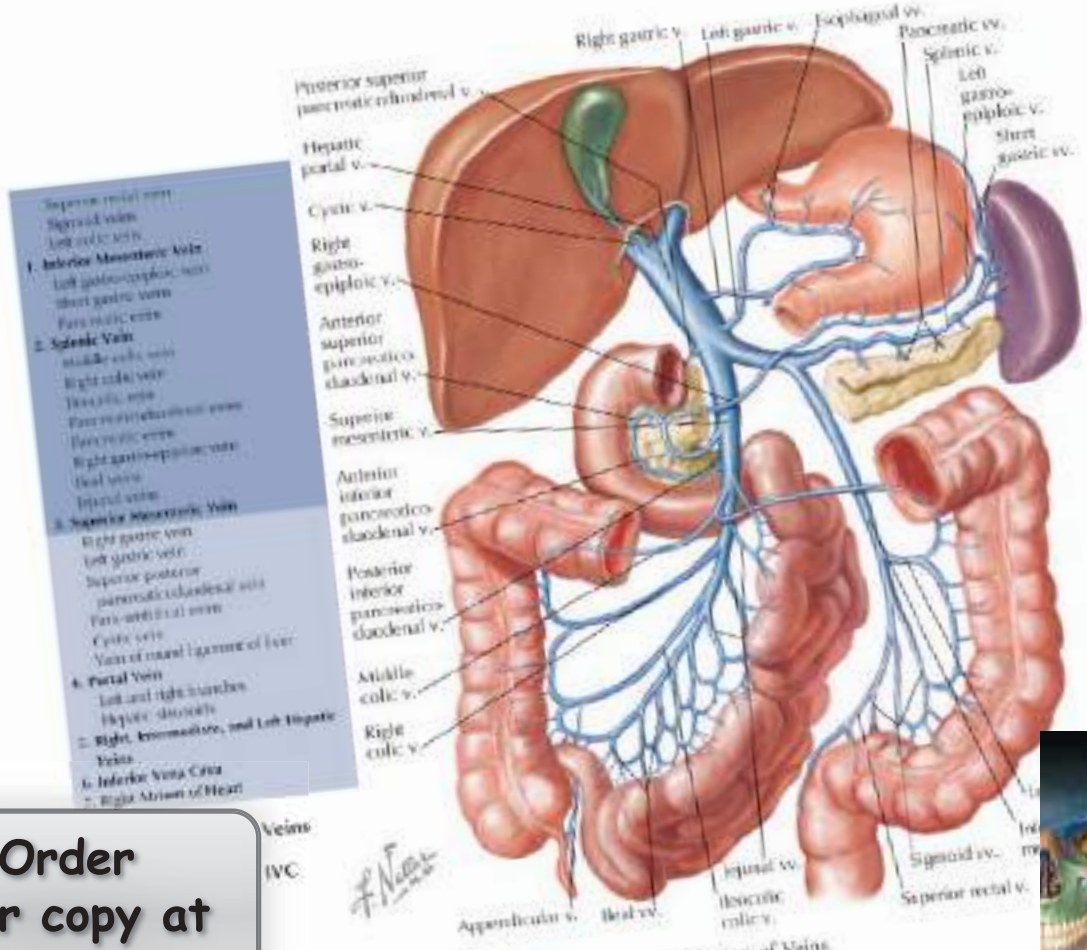

FIGURE 4–40 Hepatic Portal System of Veins.

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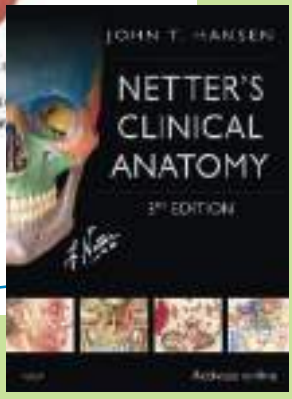

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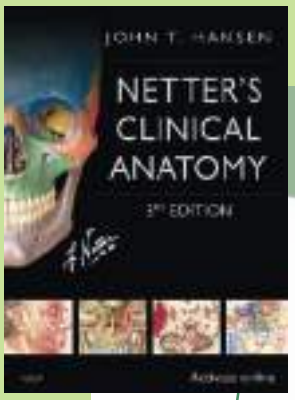
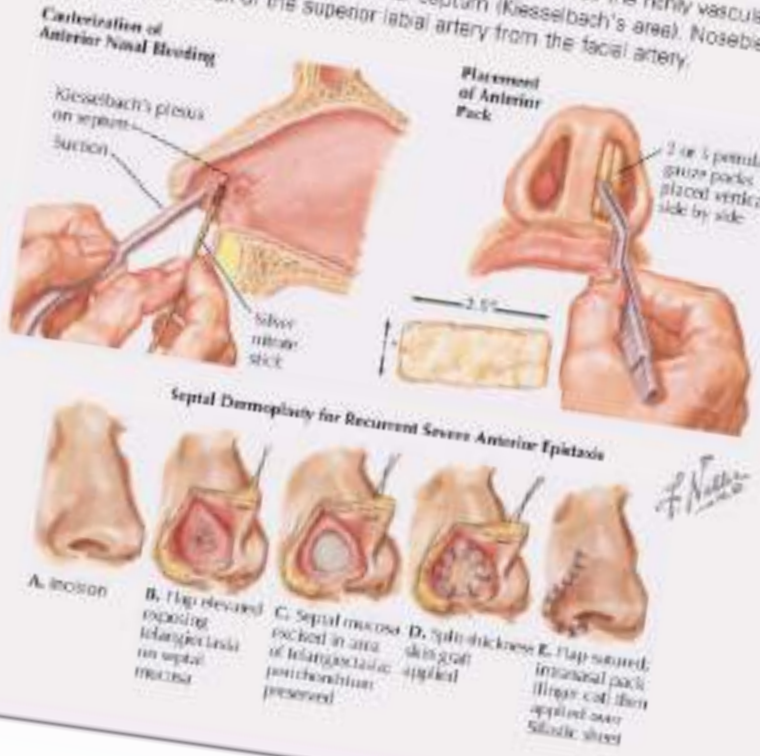


Clinical Focus 8-33

Nosebleed

A nosebleed, or **epistaxis**, is a common occurrence and often involves the richly vascularized region of the vestibule and the anteroinferior aspect of the nasal septum (Kiesselbach's area). Nosebleeds usually result from trauma to the septal branch of the superior labial artery from the facial artery.



- **Frontal:** unpaired bone that contains the frontal sinus; forms part of the roof and septum of the cavity.
- **Vomer:** unpaired bone that contributes to the septum.
- **Nasal:** paired bones that form part of the anterior roof and lateral wall.
- **Maxilla:** paired bones that form the floor, septum, and lateral walls of the cavity.
- **Palatine:** paired bones that form the floor, septum, and lateral walls of the cavity.
- **Lacrimal:** bone that forms part of the lateral wall of the nasal cavity.
- **Inferior nasal concha:** paired bones that part of the lateral wall.

ly and Innervation

to the nasal cavities originates from major arteries (Fig. 8-33):

- **Ophthalmic:** anterior and posterior ethmoidal arteries
- **Maxillary:** sphenopalatine (terminal branch of the maxillary) and its septal branches, and the greater palatine arteries
- **Facial:** lateral nasal, septal branches, and superior labial artery

Corresponding veins drain the floor, lateral walls, and nasal septum, with most of the venous return passing into the **pterygoid plexus of veins** (Fig. 8-33). Some venous drainage also passes into the facial vein anteriorly and into the inf thalmic veins superiorly.

The innervation of the nasal cavit following (Fig. 8-34; see also Fig. 8-7

- **Olfactory:** CN I (olfactory recep sense of smell) in the olfactory convey axons that pass from the part

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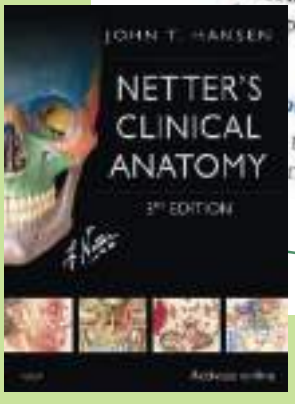

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