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Back: Learning Objectives and Review Questions

Essay

1. Discuss the surface anatomy of the back.
2. Discuss the bony parts of the scapula.
3. Discuss the structure, relationships, innervation (sensory and motor), vasculature, and lymphatics of the cervical, thoracic, and lumbar vertebrae.
4. Discuss the stabilization of the vertebral column.
5. Discuss the attachments and relationships of the superior nuchal line.
6. Discuss the structure, relationships, innervation (sensory and motor), vasculature, and lymphatics of the superficial, intermediate, and deep muscles of the back.
7. Discuss rotation of the scapula by the trapezius muscle.
8. Discuss the anatomy of the erector spinae muscles. Include relationships, fascial specializations, vascularization, innervation, lymphatics, movements, and compensation in the case of nerve injury.
9. Discuss the anatomy of the superior and inferior posterior serratus muscles. Include relationships, fascial specializations, vascularization, innervation, lymphatics, movements, and compensation in the case of nerve injury.
10. Discuss the anatomy of the rhomboideus major and minor muscles. Include relationships, fascial specializations, vascularization, innervation, lymphatics, movements, and compensation in the case of nerve injury.
11. Discuss the anatomy of the levator scapula muscle. Include relationships, fascial specializations, vascularization, innervation, lymphatics, movements, and compensation in the case of nerve injury.

True/False

1. The anterior longitudinal ligament forms, in part, the anterior boundary of the spinal canal.
2. The superior and inferior vertebral notches form intervertebral foramina.
3. The anterior longitudinal ligament resists flexion of the back.
4. The denticulate ligaments are extensions of the arachnoidia.
5. The filum terminalis externus is derived from dura mater whereas the filum terminalis internus is derived from arachnoidia.
6. The dural sac extends inferiorly to the level of the 2nd and maybe 3rd lumbar vertebrae.
7. The internal anterior vertebral venous plexus is within the epidural fat.
8. The posterior vertebral venous plexus is within the subarachnoid space.
9. The internal vertebral venous plexus is valvless and, thus, provides part of a pathway for spread of infection from the ischioirectal fossa to the cranium.
10. The external vertebral venous plexus is demonstrated during dissection of the suboccipital region.
11. The spinal cord relies, in part, on radicular arteries for critical vascularization.
12. The intermediate muscles of the back are innervated by the long thoracic nerve.
13. Serratus posterior superioris pulls the upper ribs in the superior direction and is, thus, a muscle of inspiration.
14. Serratus posterior inferioris pulls the lower ribs downward and, thus, is a muscle of inspiration.

15. Paralysis of the rhomboids (dorsal scapular nerve) and the trapezius (spinal accessory nerve) is expected cause uncompenstated loss of retraction of the scapula.
16. Latissimus dorsi, a powerful extensor of the arm, can act as a flexor when the arm is fully extended.
17. The transversospinal group of muscles are innervated by the dorsal rami (segmental) of spinal nerves.
18. The action of levator scapular is to depress the scapula.
19. The thoracolumbar fascia provides a site of origin for the rhomboids and the levator scapula.
20. The longissimus muscle extends as far superiorly as the mastoid process of the skull.
21. Iliocostalis attaches to the ribs along the costotransverse joints.

Identification and Short Answer

1. Thoracolumbar fascia
2. Innervation of intrinsic (deep) muscles of the back
3. Nuchal ligament
4. Anterior longitudinal ligament
5. Posterior longitudinal ligament
6. Ligamentum flavum
7. Intervertebral disk
8. Superior nuchal line
9. pedicle
10. Superior and Inferior vertebral notches
11. Lamina
12. Transverse foramen
13. Vertebral foramen
14. Triangle of auscultation
15. Lumbar triangle

[Top](#)

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[Top](#)

-- [LorenEvey](#) - 17 Sep 2007

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Back - Laboratory Identifications

Thoracoappendicular Muscles and Related Structures

1. Trapezius - superior attachment at superior nuchal line (insertion and functional origin)
2. Trapezius - origin from cervical spines (ligamentum nuchae) and thoracic spines
3. Trapezius - upper fibers (superior nuchal line) insert on lateral scapular spine and on the acromion
4. Trapezius - inferior fibers (lower thoracic spines) insert on medial scapular spine
5. Trapezius - understand how trapezius effects upward rotation of the scapula
6. Serratus anterior - vertebral border and inferior angle of trapezius (contributes to upward rotation)
7. Latissimus dorsi - origin from thoracolumbar fascia, insertion at inferior angle scapula and at the humerus
8. Rhomboideus major - origin from spines of T2-T5, insertion on vertebral border of scapula, action is retraction
9. Rhomboideus minor - origin from spines C7-T1, insertion on vertebral scapula near superior angle, action is retraction and elevation
10. Levator scapulae - origin from transverse processes of C1-4, insertion on superior angle of scapular, action is elevation
11. Relations of levator scapulae - lateral: spinal accessory nerve and (superficial branch) transverse cervical artery
12. Relations of levator scapulae - medial: dorsal scapular nerve (nerve to the rhomboids) and dorsal scapular artery (deep branch of transverse cervical artery)

Intermediate muscles of the back

1. Serratus posterior superiorus - inhalation
2. Serratus posterior inferiorus - exhalation
3. Dorsal rami of spinal nerves providing motor and sensory innervation along the posterior axial border

Deep muscles of the back

1. Splenius capitus - deep to trapezius, from nuchal ligament (spines of C7-T6) to lateral occipital bone and mastoid process, inserts immediately inferior to superior nuchal line
2. Splenius cervicis - stops short of skull to insert on transvers processes of C1-C4
3. Semispinalis capitus - from upper thoracic transverse processes to occipital of skull between superior and inferior nuchal lines
4. Greater occipital nerve - passing posterior through the semispinalis muscle at the level of the axis
5. Erector spinae - three muscles arising from common tendon on posterior sacrum
6. Spinalis lateral to vertebral spines and anterior to transvers processes
7. Longissimus - immediately lateral to spinalis
8. Iliocostalis - origin at posterior iliac crest and insertion at the angle of the ribs
9. Appreciate that transversospinalis muscles exist (multifidus, rotatores, semispinalis) are cradled by the spines and transverse processes and must be dealt with during laminectomy

[Top](#)

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Surface Anatomy and Boundaries

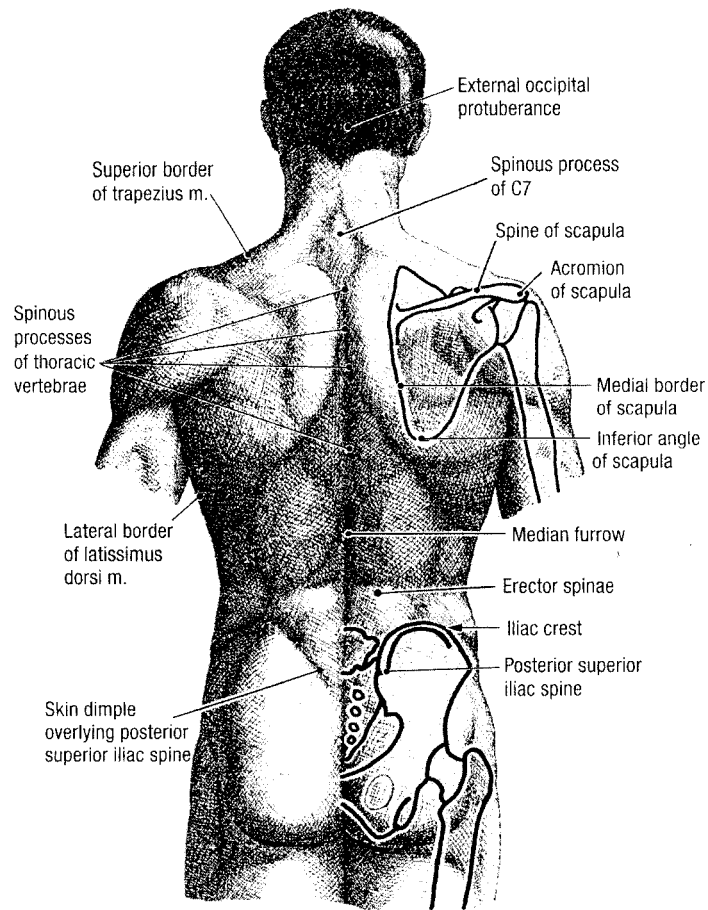


Figure 1.01. Surface anatomy of the back.

Skeleton of the Back - Overview

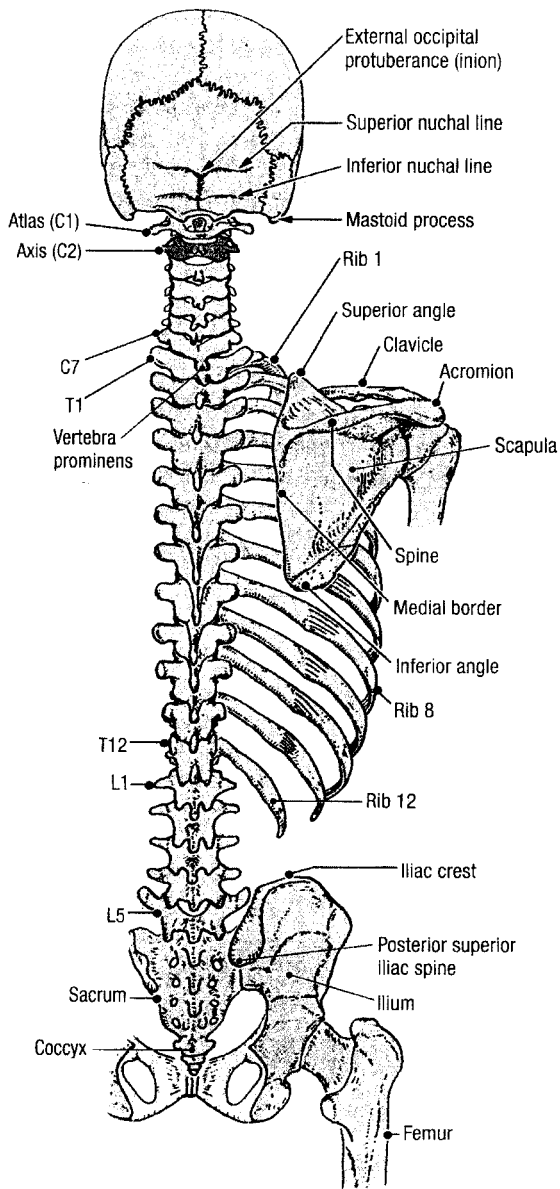


Figure 1.02. Skeleton of the back and vertebral column.

Greater Occipital Nerve and Artery

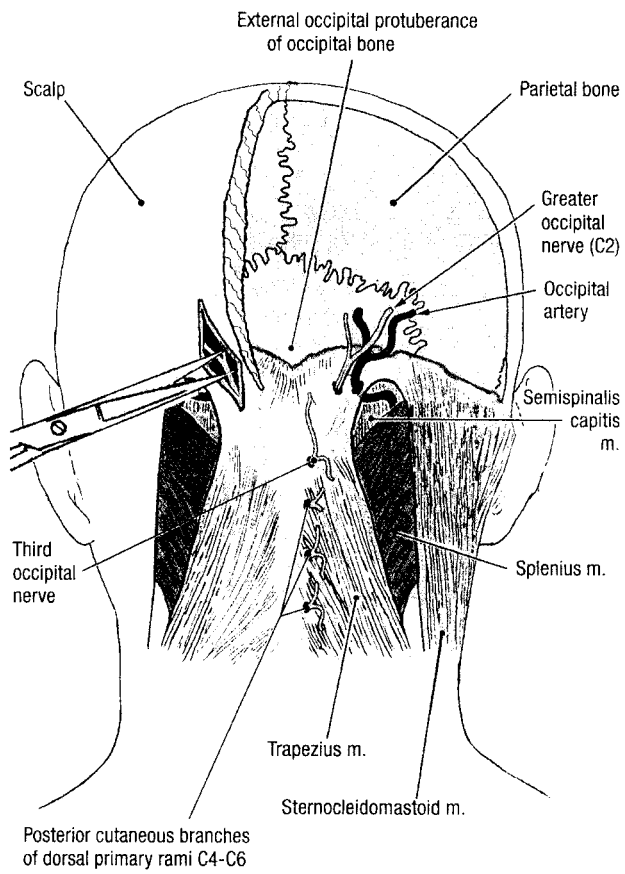


Figure 1.08. Greater occipital nerve and occipital artery.

Superficial Muscles of the Back – Trapezius and Latissimus Dorsi

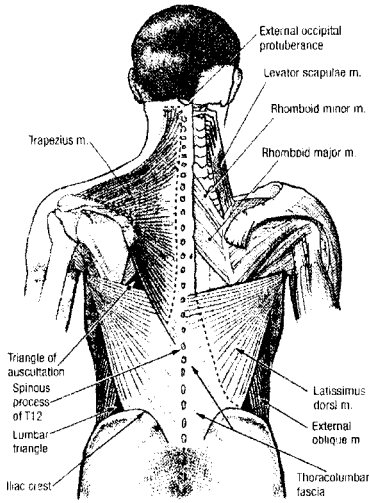


Figure 1.09 How to reflect the muscles of the back

Rotation of the Scapula

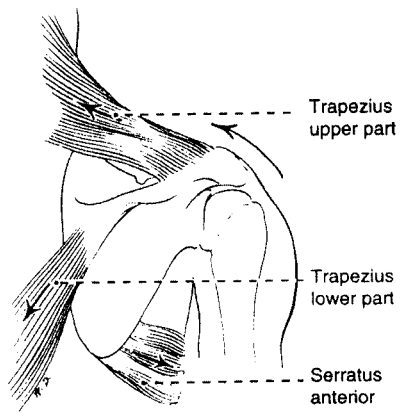


FIGURE 15-36.
The muscles that rotate the scapula upward during abduction of the arm.

Superficial Muscles of the Back – Rhomboids and Levator Scapulae

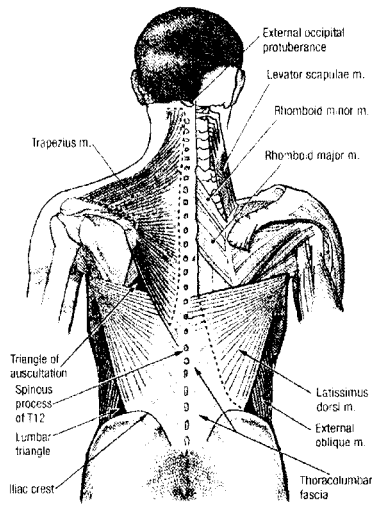
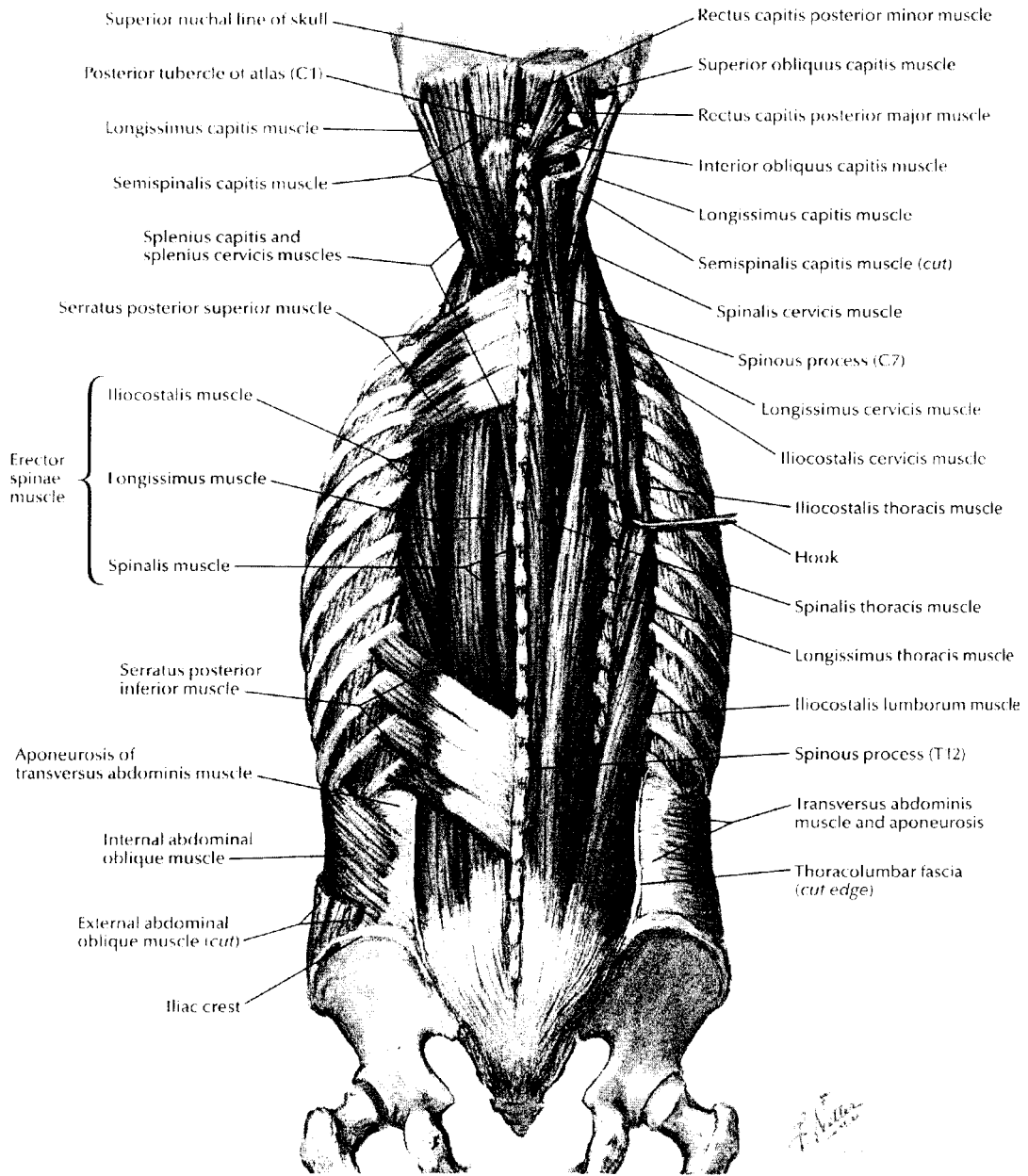
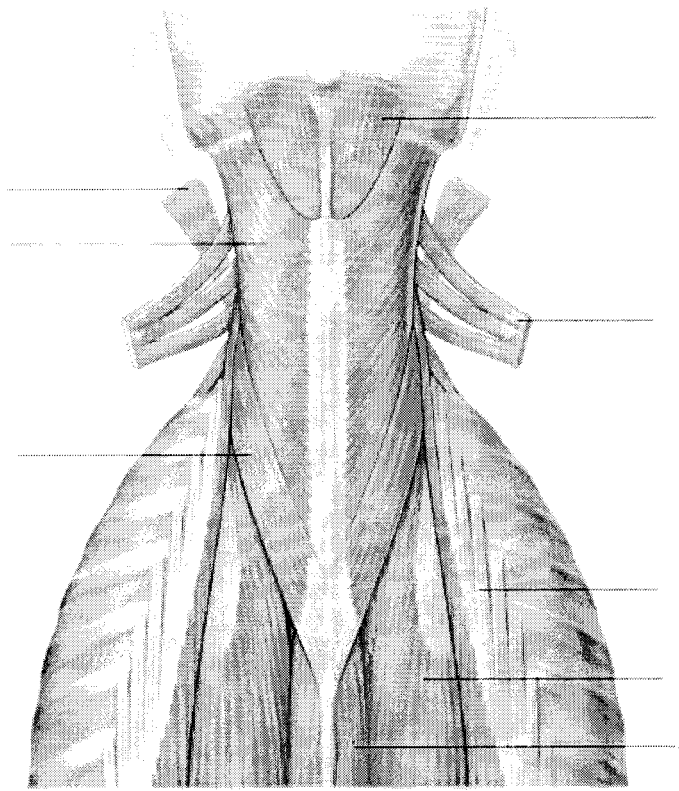


Figure 1.09. How to reflect the muscles of the back

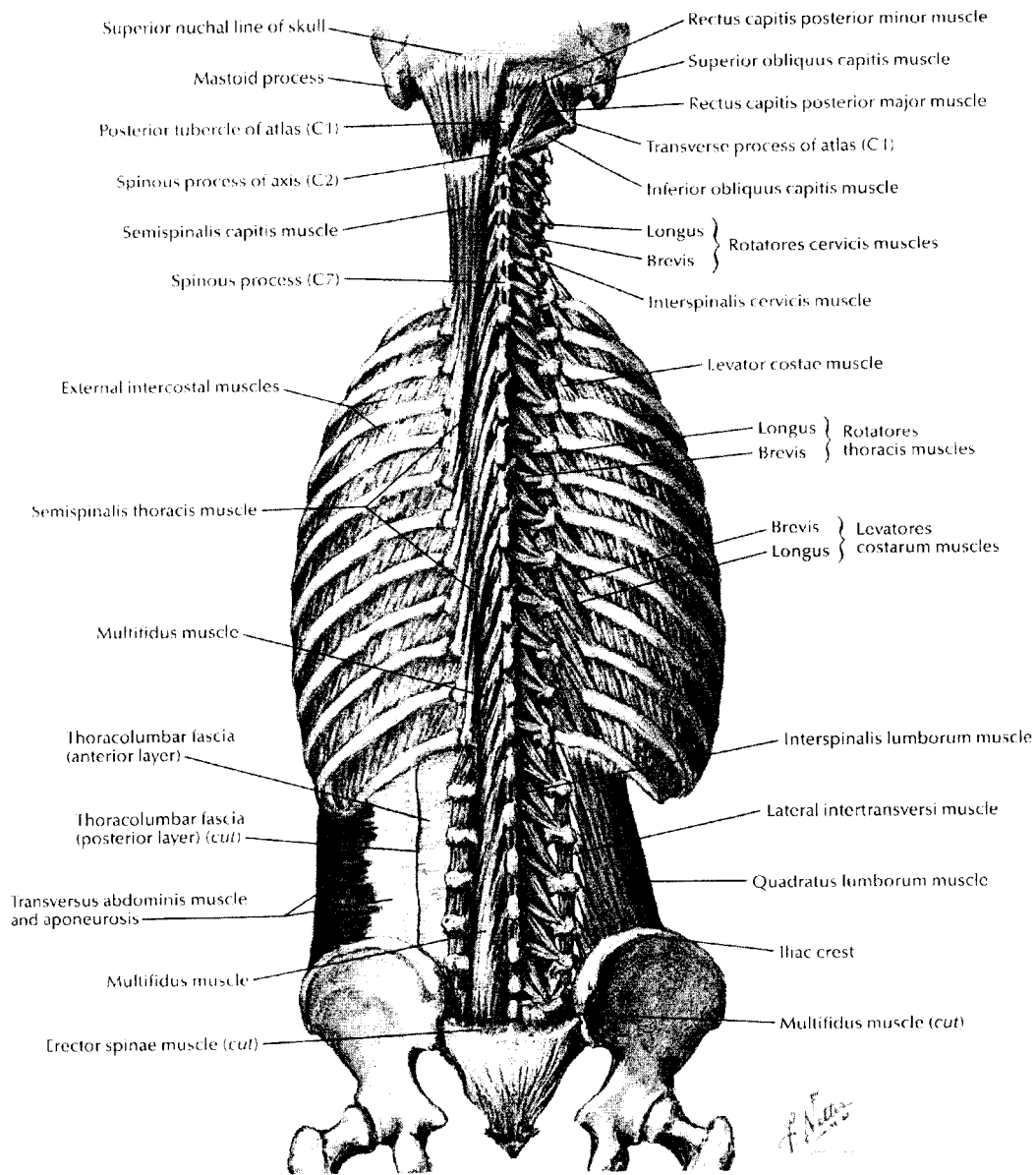
Intermediate and Deep Muscles of the Back – Serratus Posterior Superior and Serratus Posterior Inferior





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Deep Muscles of the Back – Transversospinal Group



Dissection – Laminectomy and Exposure of the Vertebral Canal

Dissection Instructions

1. *Wear eye protection for all steps that require the use of a chisel, bone saw, or bone forceps.*
2. Use a scalpel to remove the erector spinae muscles bilaterally from vertebral levels C4 to S3. The laminae must be clearly exposed. Use scraping motions with a chisel to clean the laminae after the muscles have been removed.
3. Use a chisel or power saw to cut the **laminae** of vertebrae T6 to T12 on both sides of the spinous processes (**Fig. 1.14**). Make this cut at the lateral end of the laminae to gain wide exposure to the vertebral canal. The cutting instrument should be angled at 45 degrees to the vertical.
4. Use a scalpel to cut the interspinous ligaments between vertebrae T5 and T6 and between vertebrae T12 and L1. Leave the remaining interspinous ligaments undisturbed to maintain the laminectomy specimen intact.
5. Use a chisel to pry the six spinous processes and their laminae out as a unit. The dura mater will be undamaged.
6. Observe the **ligamenta flava** on the deep surface of the laminectomy specimen. The ligamenta flava connect the laminae of adjacent vertebrae.
7. Continue the laminectomy procedure superiorly and inferiorly from the opening in the vertebral canal. Exercise caution in lower lumbar and sacral regions, because the vertebral canal curves sharply posteriorly (**Fig. 1.15A**). Do not drive the chisel or push the saw through the sacrum into the rectum.
8. When finished with the laminectomy, you should see the posterior surface of the dura mater from vertebral levels C4 to S2.

SPINAL MENINGES

1. Observe the **epidural (extradural) space**. Use blunt dissection to remove the **epidural fat** and the **posterior internal vertebral venous plexus** from the epidural space. [**N 163**]

Laminectomy and Exposure of Spinal Cord

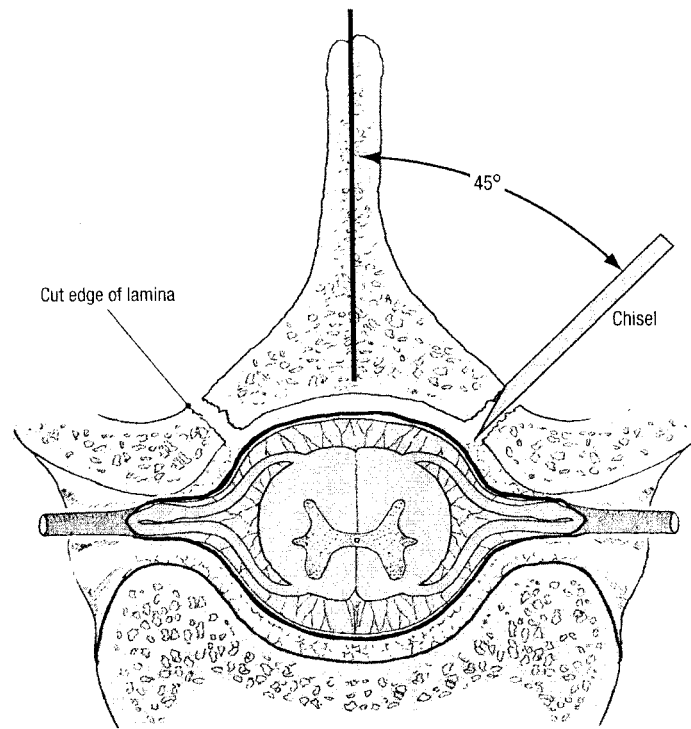
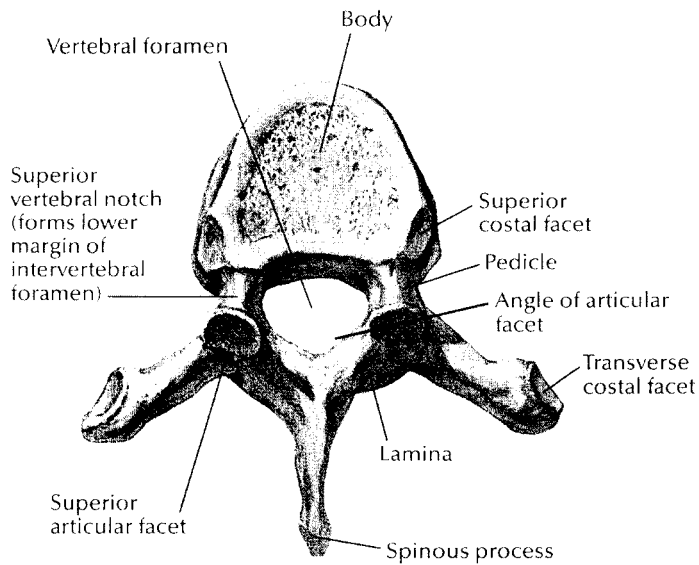
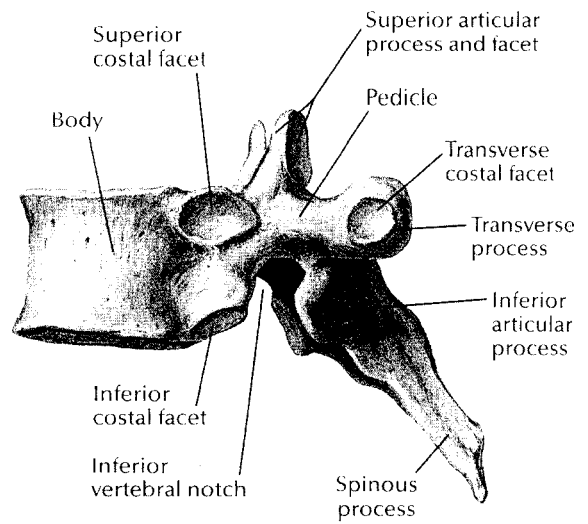


Figure 1.14. How to open the vertebral canal.

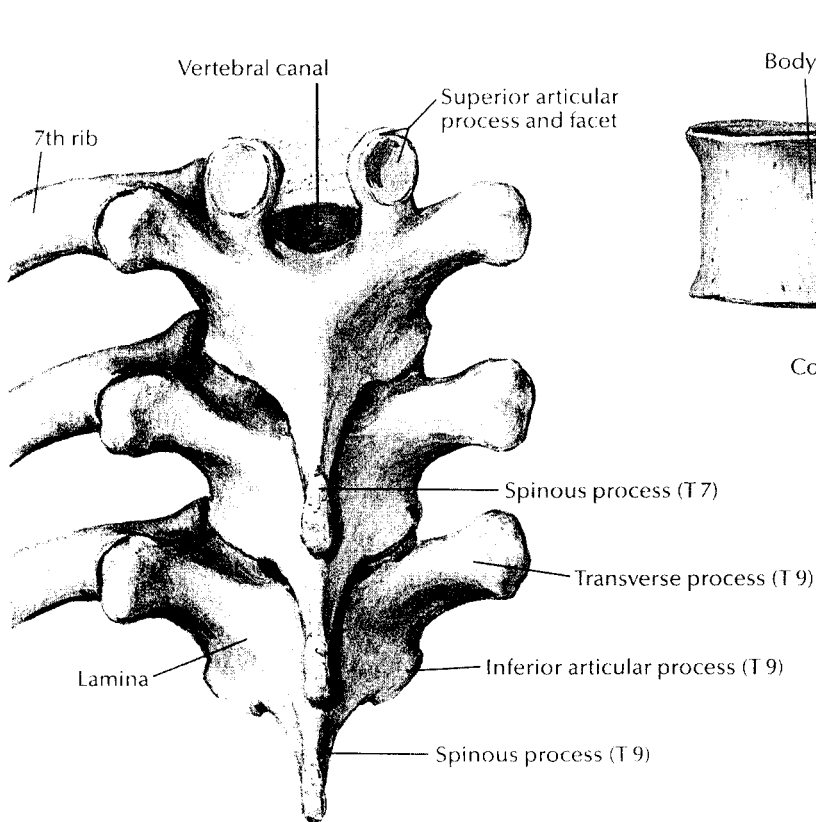
Vertebral Column - Thorax



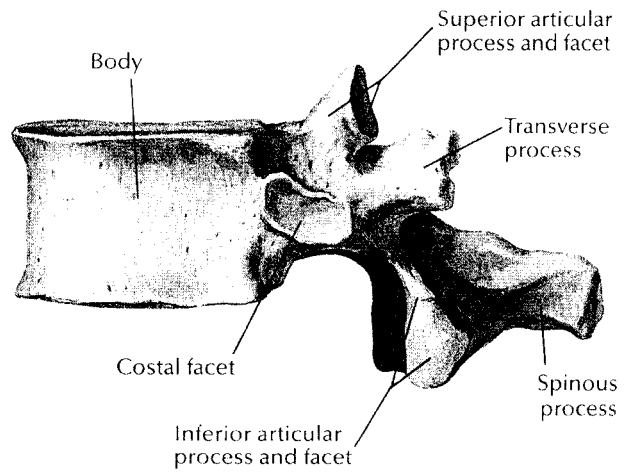
**6th thoracic vertebra:
superior view**



**6th thoracic vertebra:
lateral view**



**7th, 8th and 9th thoracic vertebrae:
posterior view**



**12th thoracic vertebra:
lateral view**

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Ligaments of the Vertebral Column – Saggital View

Left lateral view
(partially sectioned)

Anterior longitudinal ligament

Lumbar vertebral body

Intervertebral disc

Anterior longitudinal ligament

Posterior longitudinal ligament

Interior articular process

Capsule of zygapophyseal joint
(partially opened)

Superior articular process

Transverse process

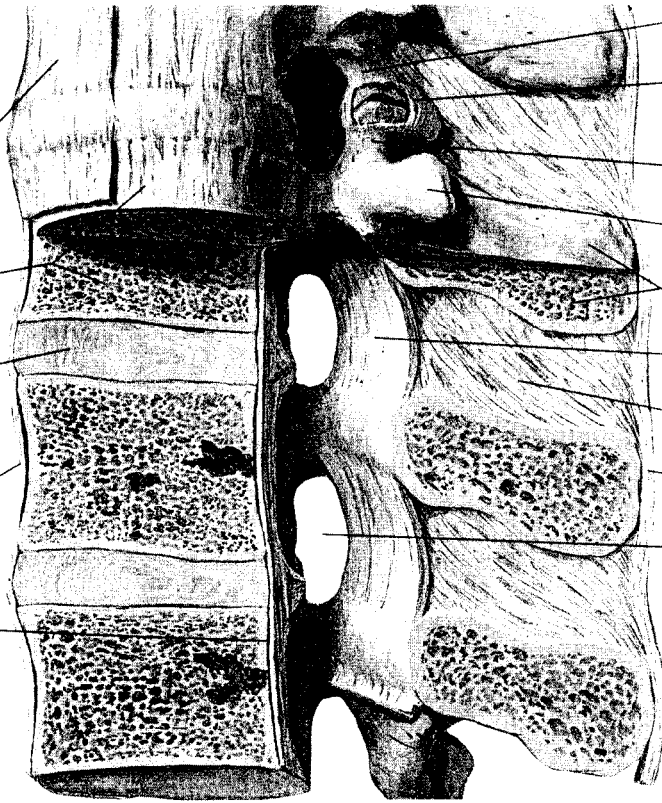
Spinous process

Ligamentum flavum

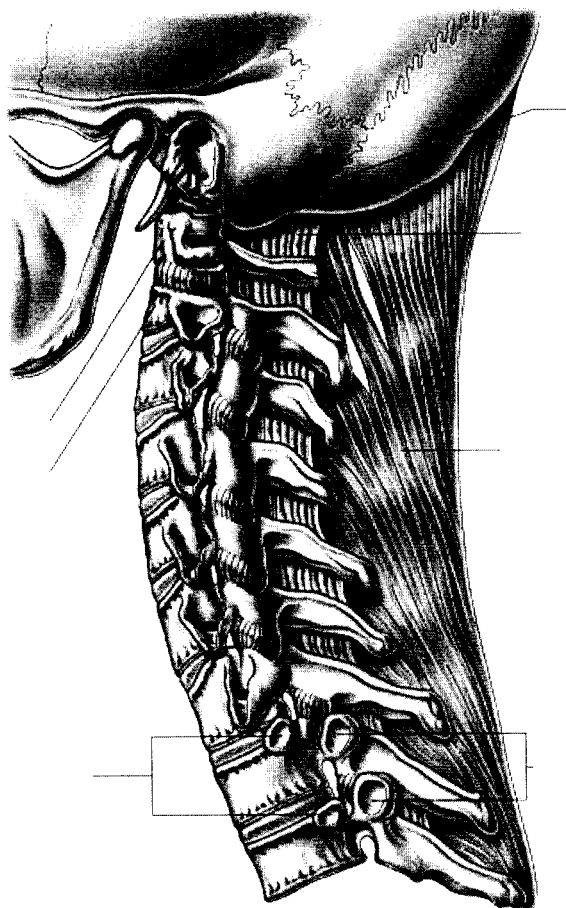
Interspinous ligament

Supraspinous ligament

Intervertebral foramen



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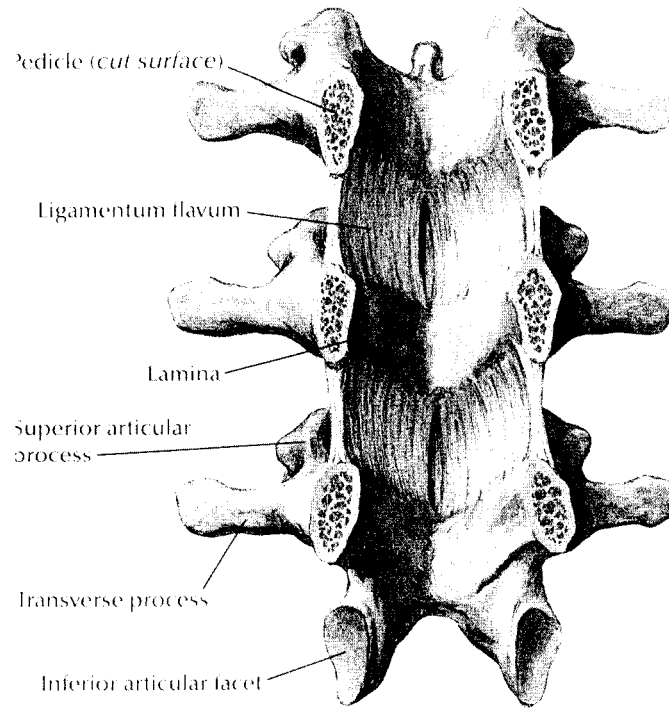


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Ligaments of the Vertebral Column – Posterior Vertebral Canal



Posterior vertebral segments:
anterior view



Ligaments of the Vertebral Column – Anterior Vertebral Canal

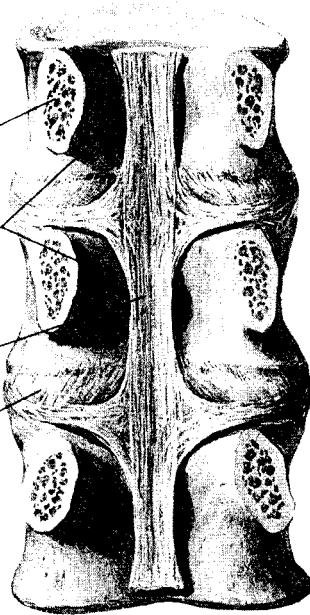
Anterior vertebral segments:
posterior view
(pedicles sectioned)

Pedicle (*cut surface*)

Posterior surface
of vertebral bodies

Posterior
longitudinal ligament

Intervertebral disc



Inferior Spinal Cord, Dural Sac, and Filum Terminale

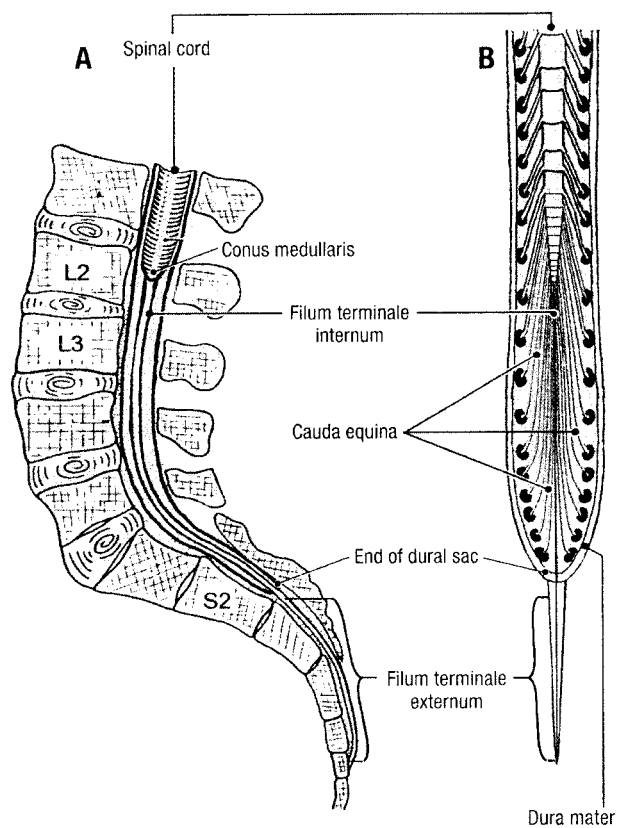
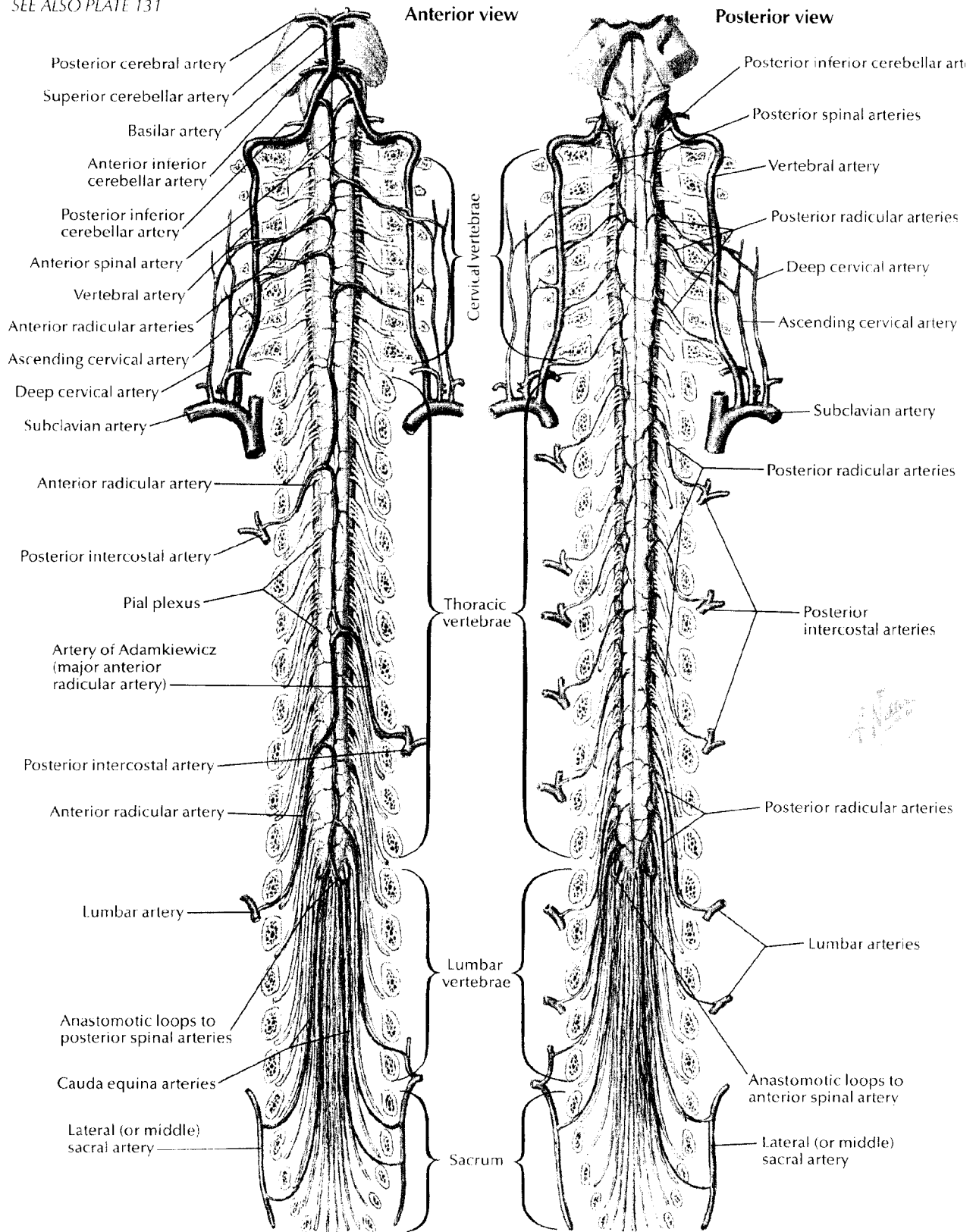


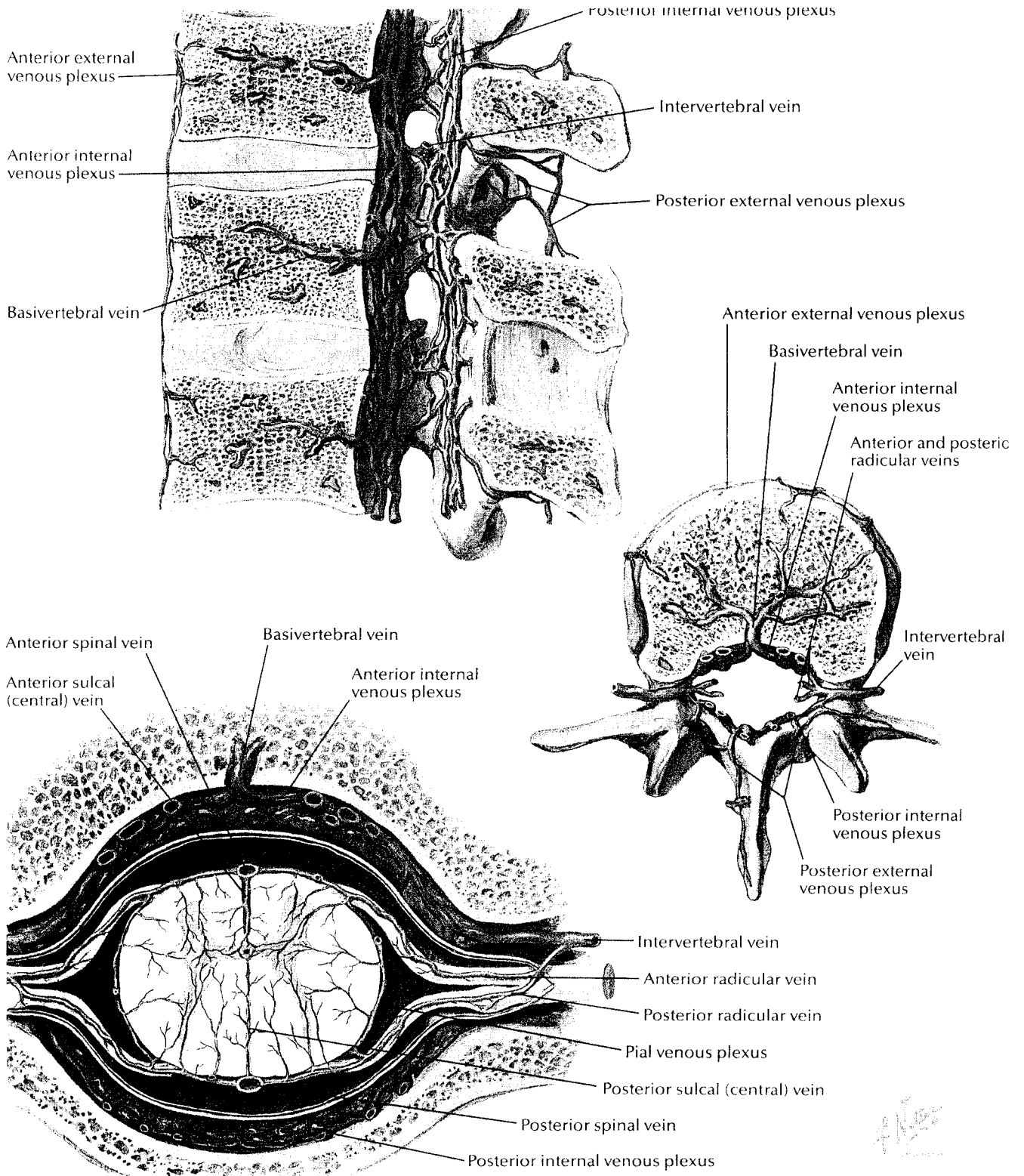
Figure 1.15. Lower portion of the vertebral canal and spinal cord. **A.** Lateral view. **B.** Posterior view.

Arteries of the Spinal Cord

SEE ALSO PLATE 131

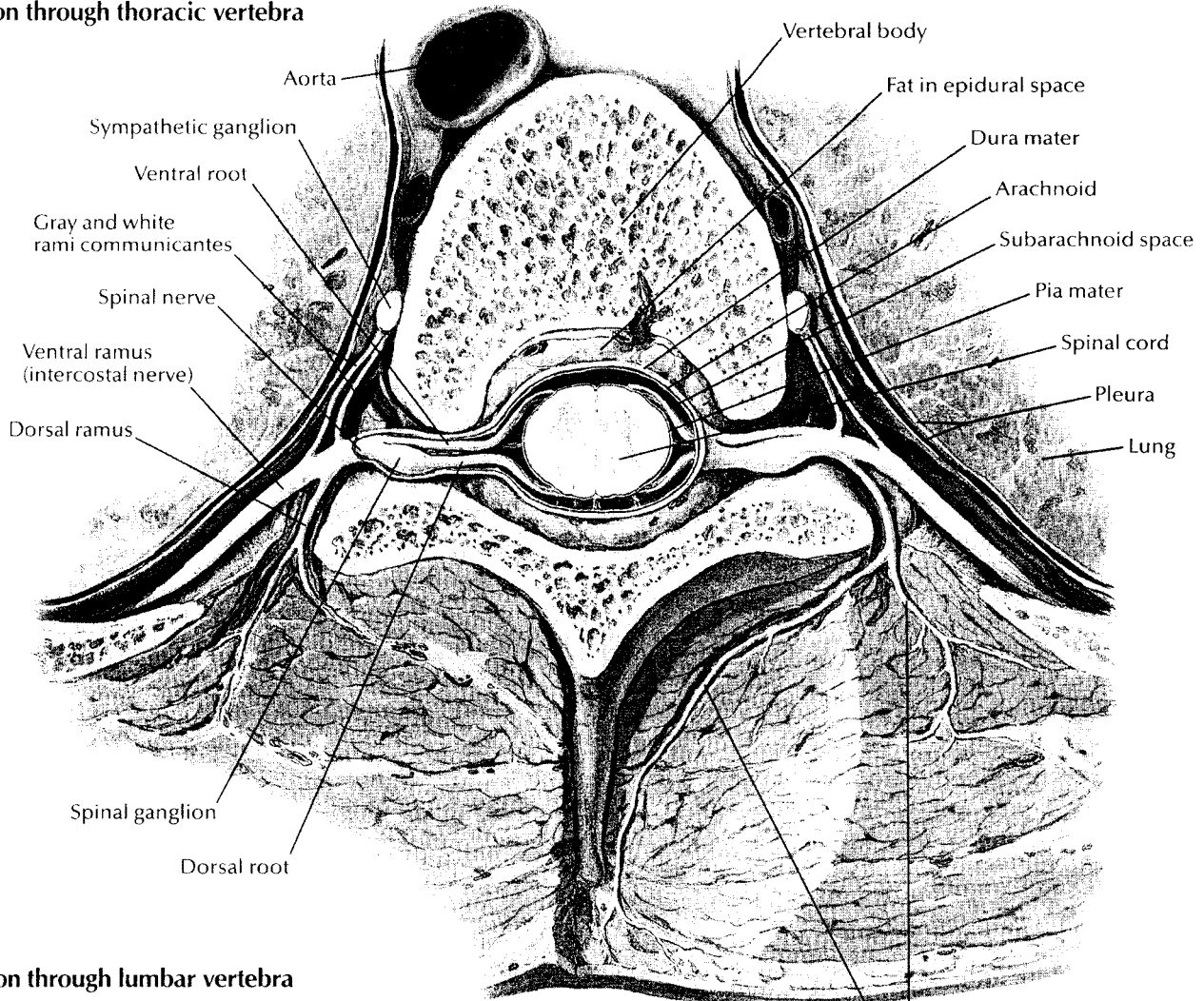


Anterior and Posterior Internal Vertebral Plexus

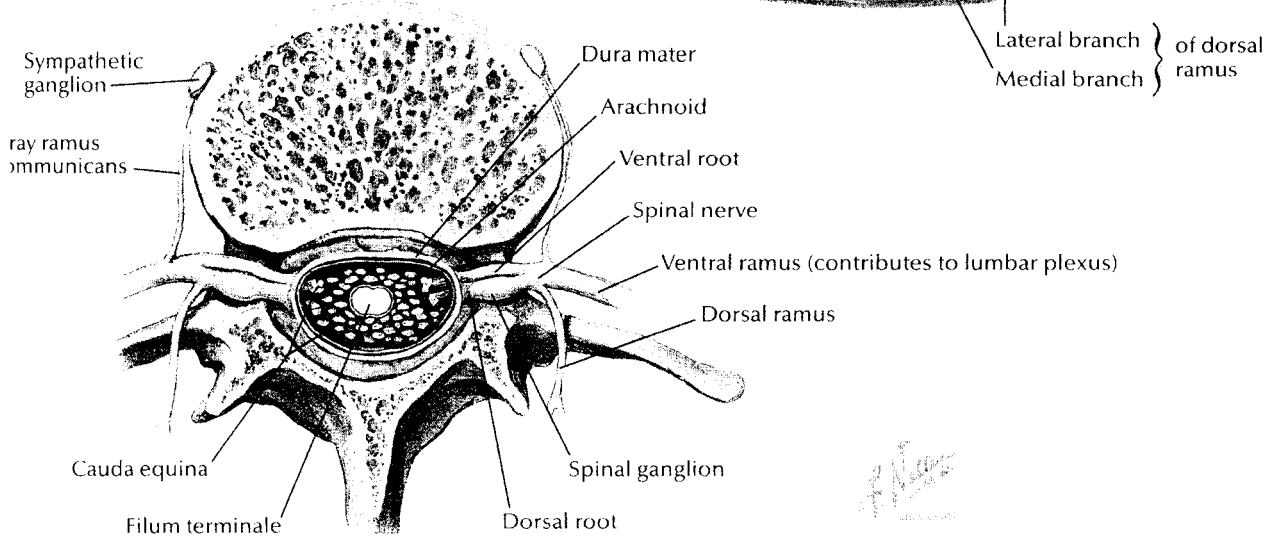


Vertebral Canal and Spinal Cord - Spaces

Section through thoracic vertebra



Section through lumbar vertebra



Drawing - Lumbar Puncture

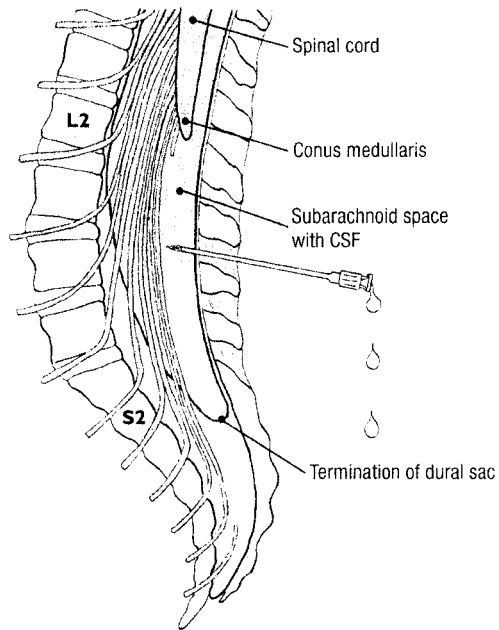


Figure 1.17. Lumbar puncture for removal of cerebrospinal fluid.