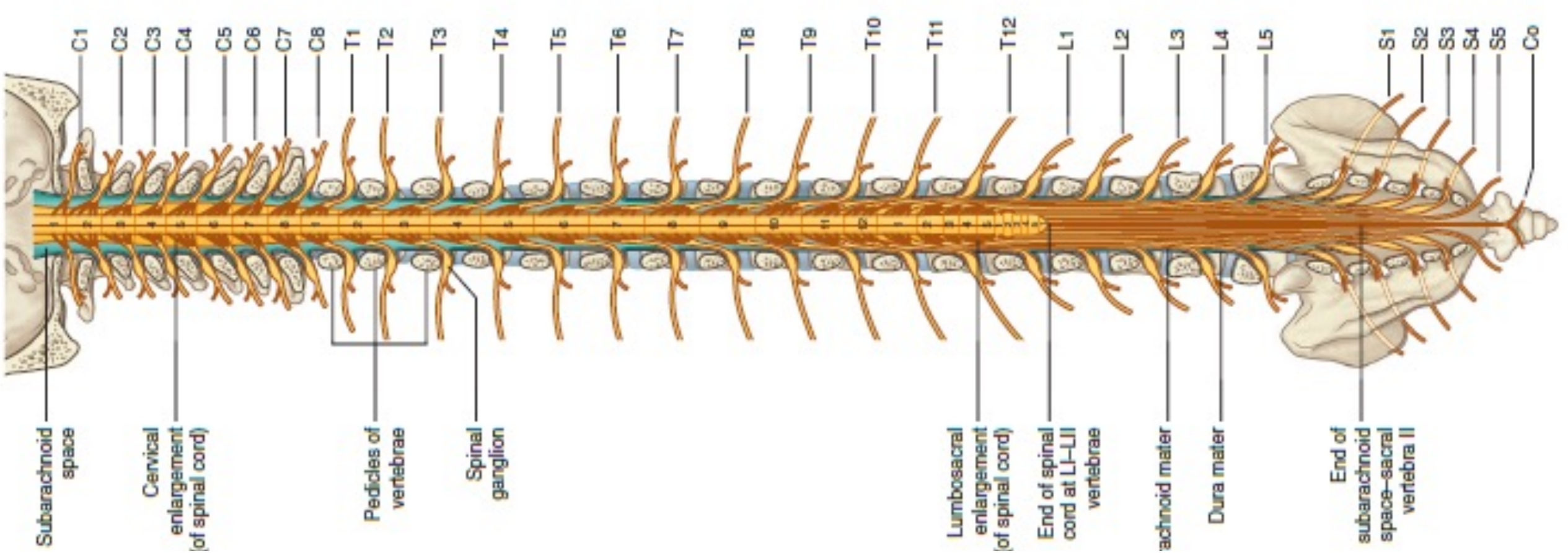
MEDULLA SPINALIS

MEDULLA SPINALIS



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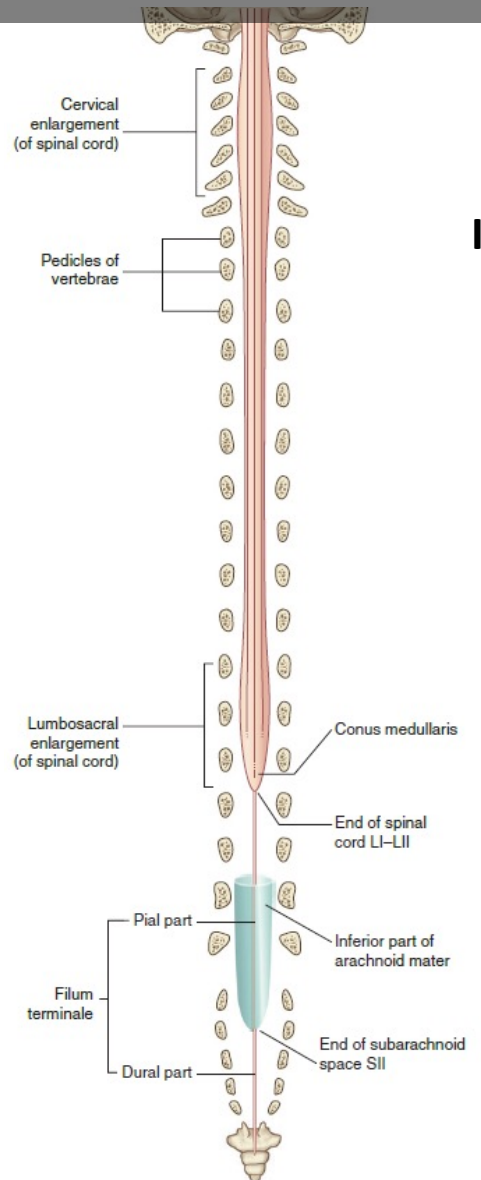
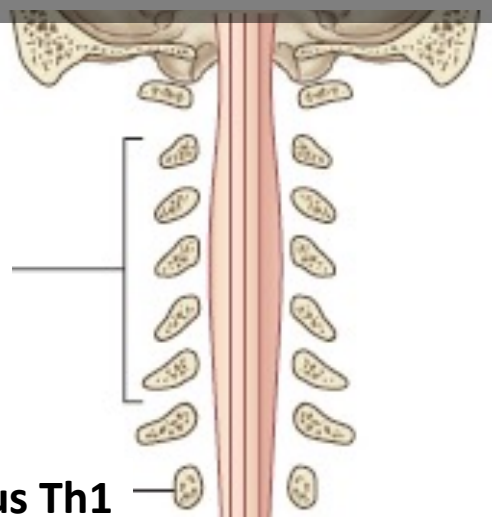
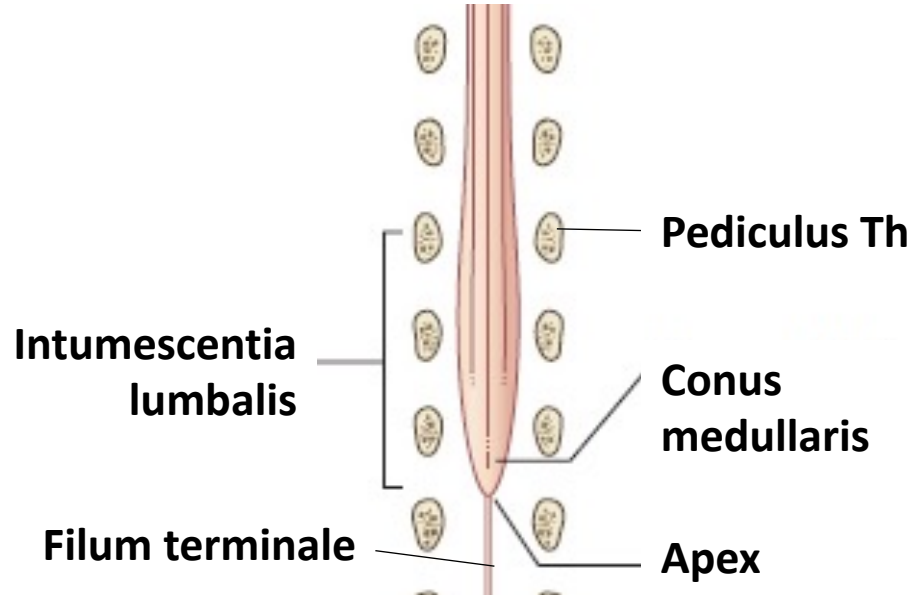
MEDULLA SPINALIS

- Rozsah
  - Foramen magnum - L1/2
  - diferent grwth velocity cord/channel
  - Cave! - newborn L3
- Variation of the transection area
- Intumescentia cervicalis
  - Segments C5 - Th1
  - vertebrae C2- C7
- Intumescentia lumbalis
  - Segments L1 - S3
  - vertebrae Th12 - L2
- Conus medullaris
- Filum terminale

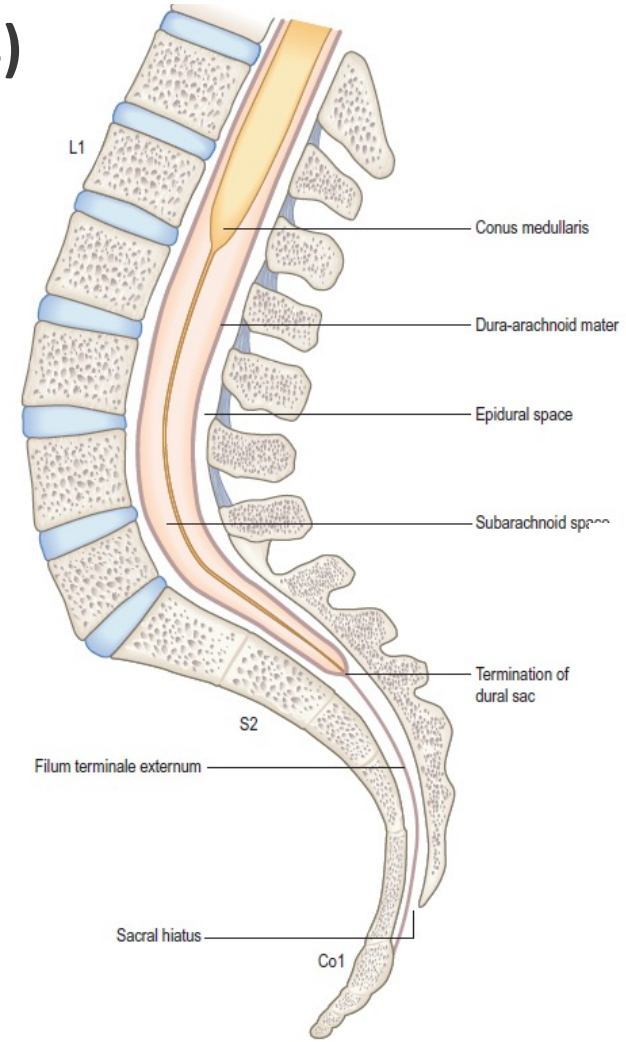


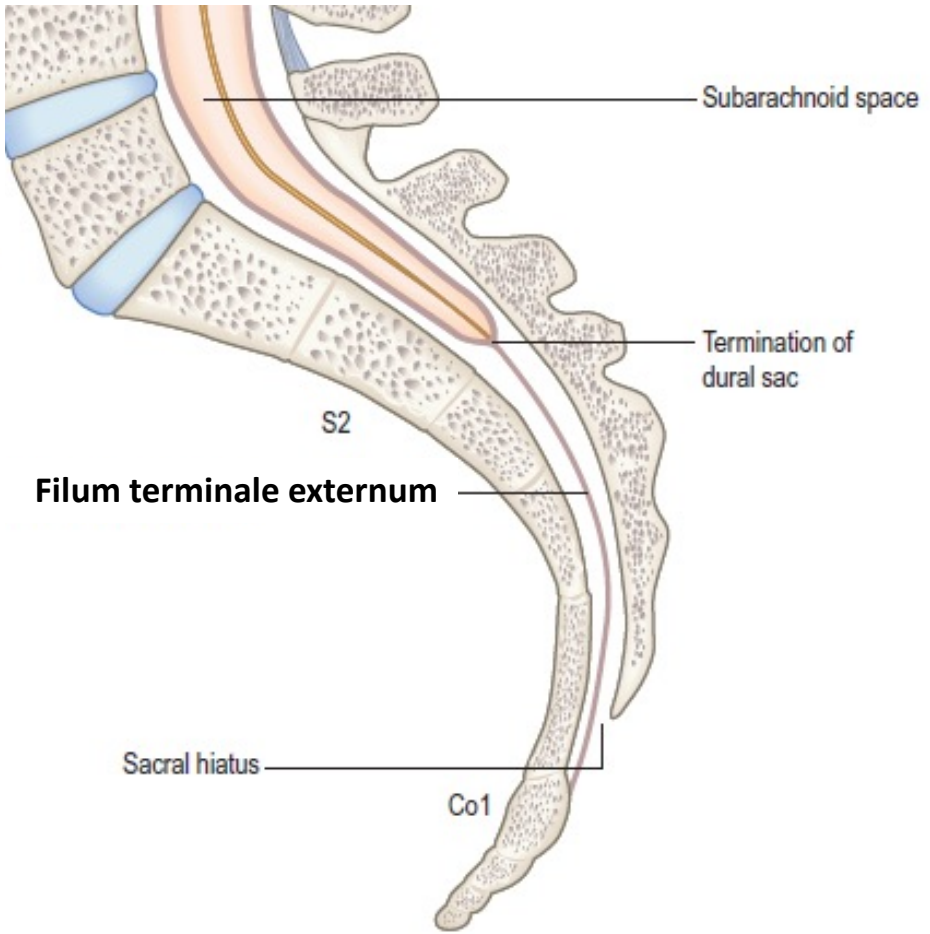




FILUM TERMINALE

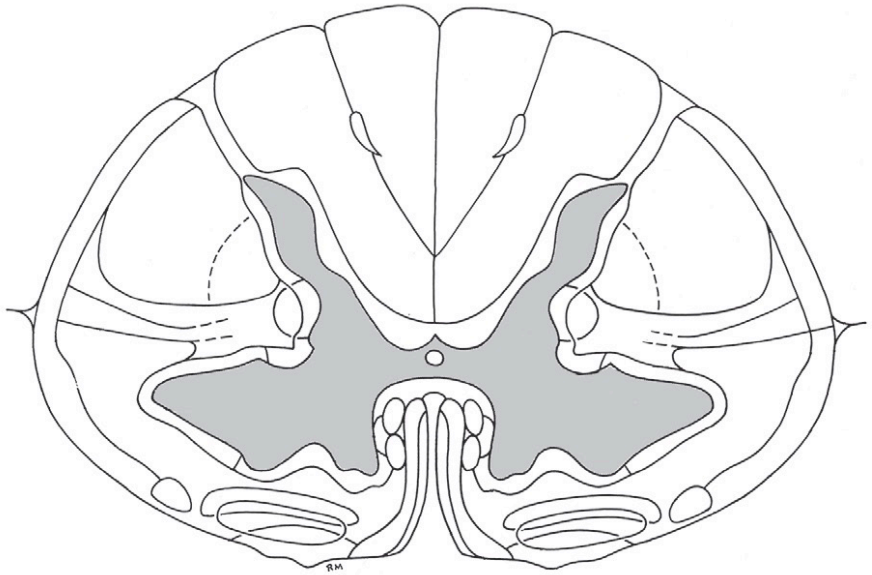
- Cord end (apex coni medularis)
- Os coccygeum
- Pial part
  - L2 - S2
  - Subarachnoideal space ends
- Dural part
- Filum terminale externum
  - S2 - Coccyx

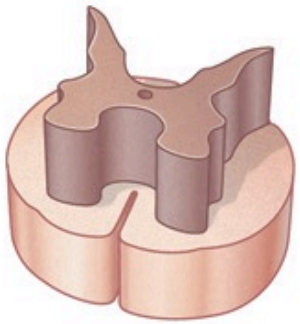


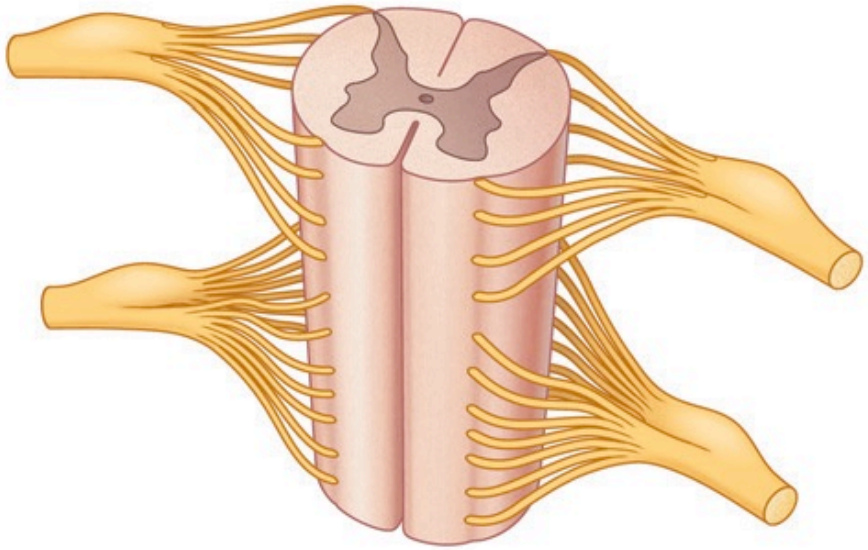


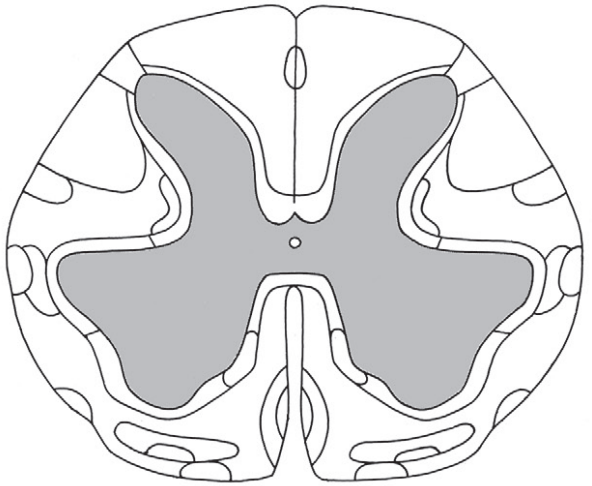
FISSURA, SULCI, ET CANALIS CENTR.

- **Fissura mediana anterior**
- **Sulcus medianus posterior**
- **Sulcus posterolateralis**
- **Canalis centralis**
  - *Follows canalis centr. m. oblongatae*
  - *Liquor cerebrospinalis*
  - *Ependyma*

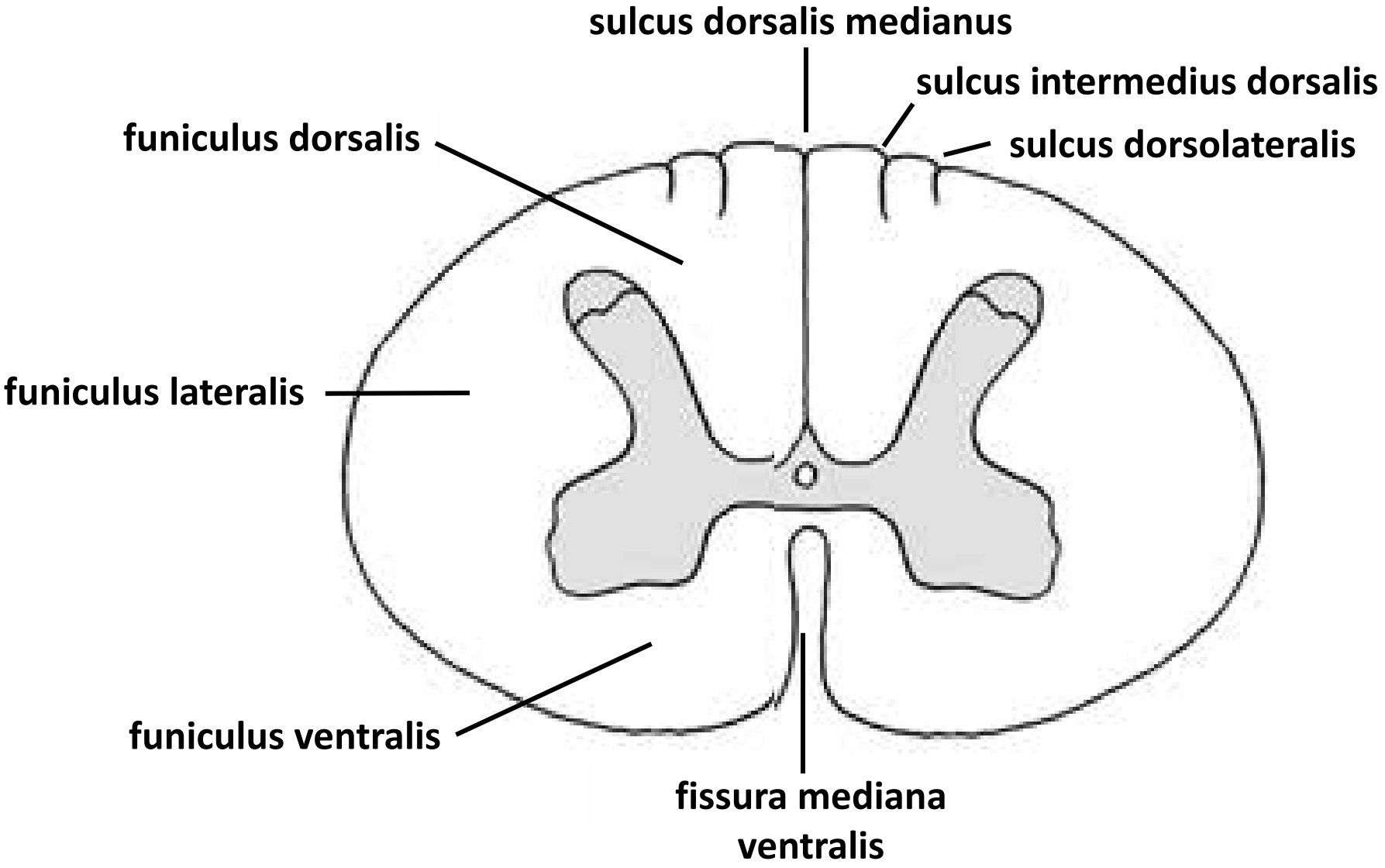




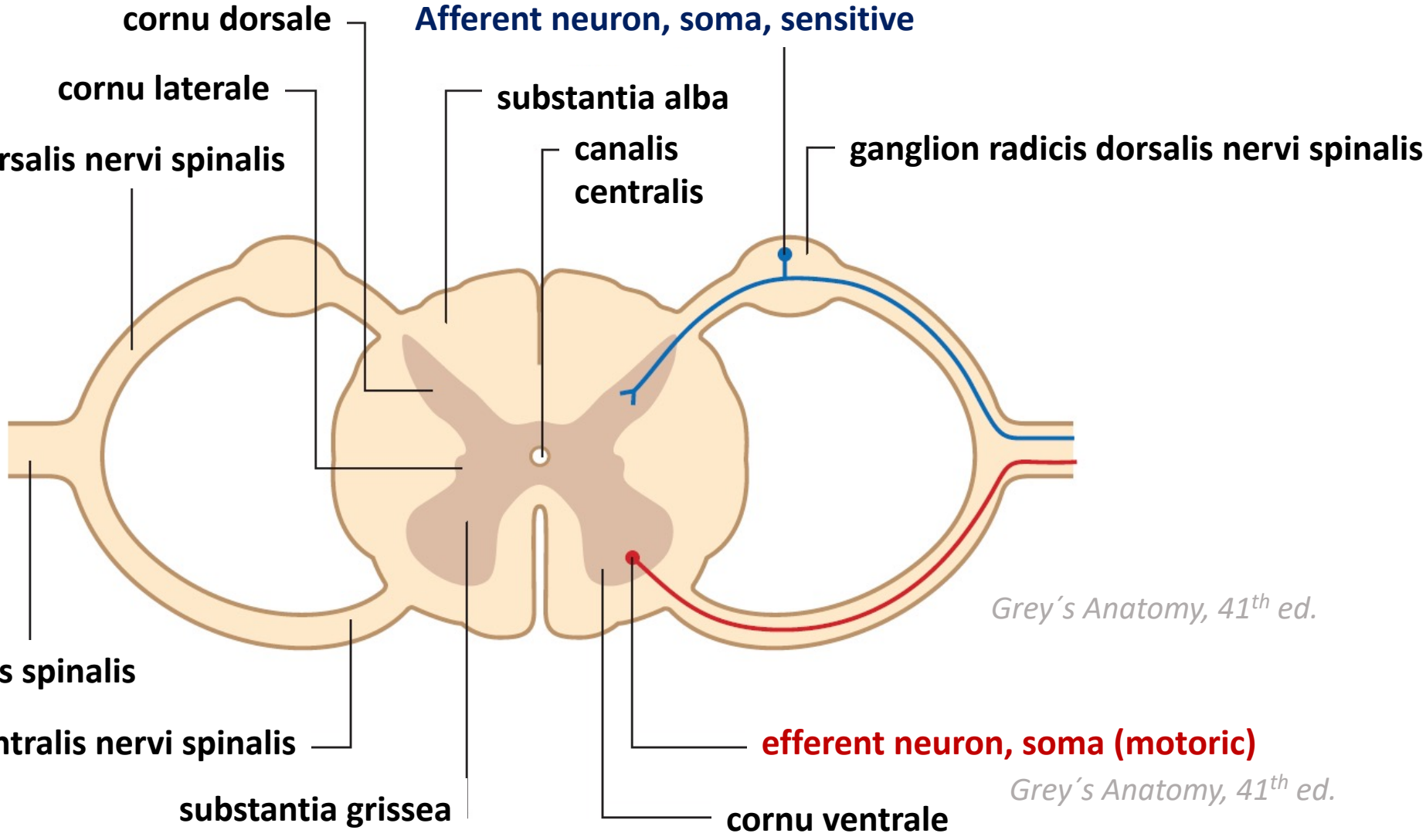




MEDULLA SPINALIS



MEDULLA SPINALIS



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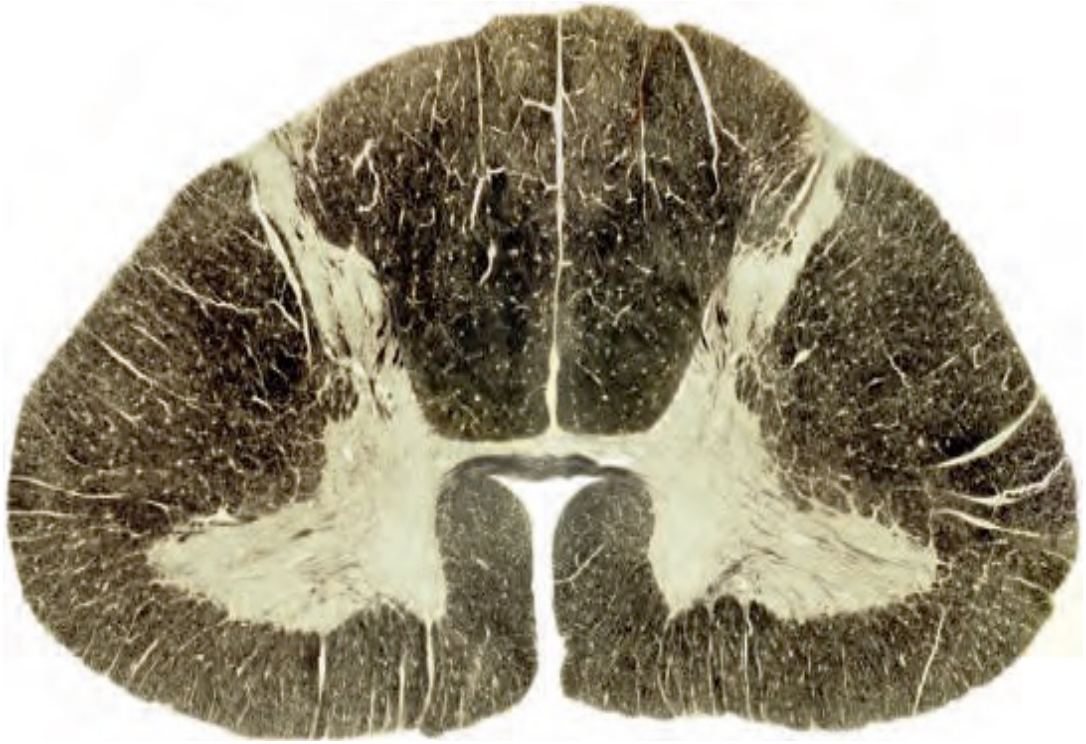
MEDULLA SPINALIS

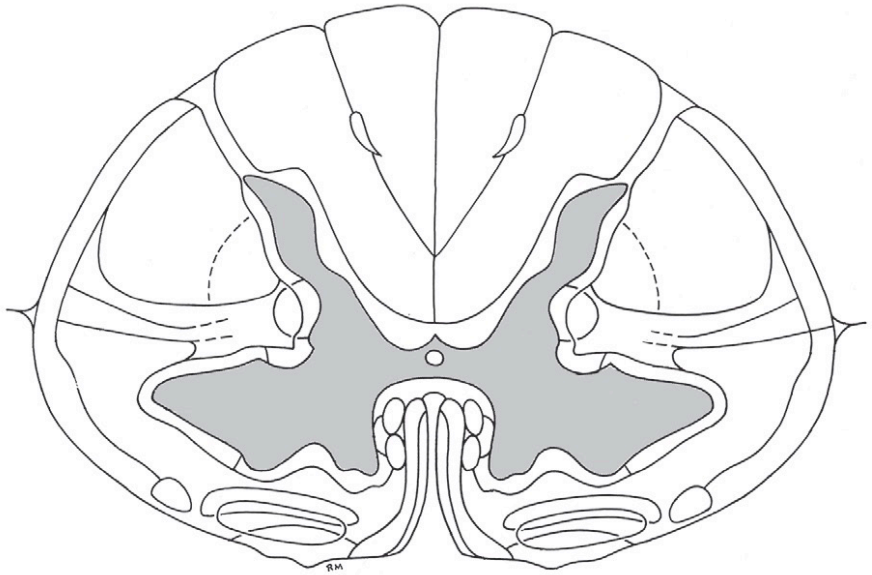
- Substantia alba – nerve fibers
- Substantia grissea – neurons
- **Distinguish!**
- Columna (cornu) = sloupec (roh) = column (horn)
  - *Columna in space, cornu in plane*
- Funiculus (fasciculus) = provazec = funicle (fascicle)
- Radix = kořen = root
- Ramus = větev = branch

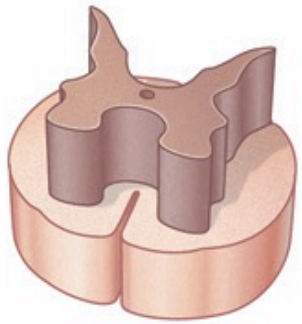


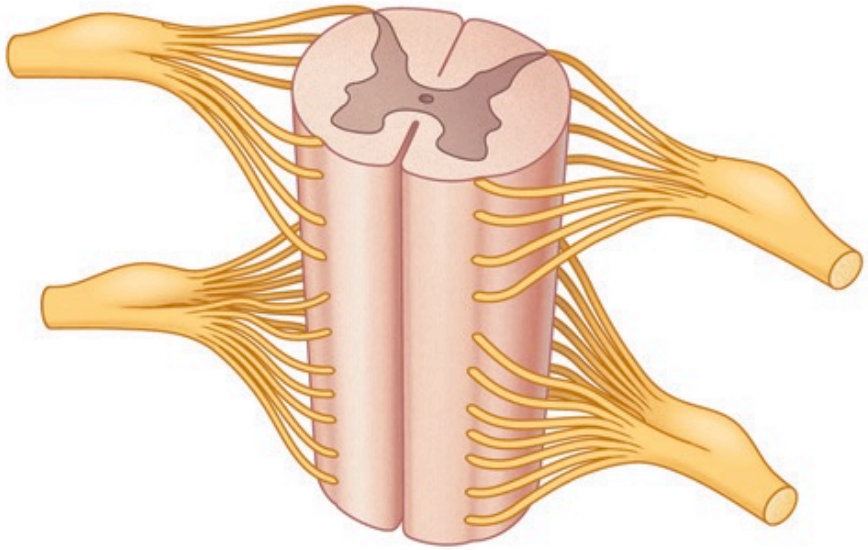
- Dorsal columns– columnae dorsales – sensitive neurons
- Anterior columns – columnae ventrales – motoric neurons
- Lateral columns– columnae laterales – autonomous neurons
  - (C8-L3 – sympaticus, S1-S2 – parasympatikus)

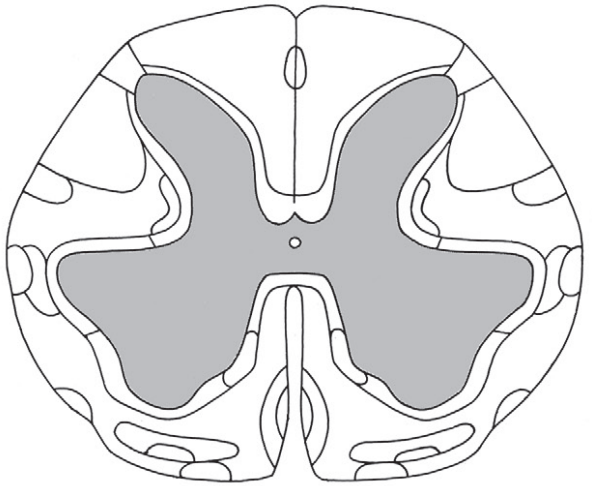
SUBTANTIA GRISSEA

- Substantia grissea (grey matter)
  - centrally
  - Butterfly, H-shaped
  - Rich of neuronal bodies
  - columnae (cornua)
  - anterior, lateralis, posterior



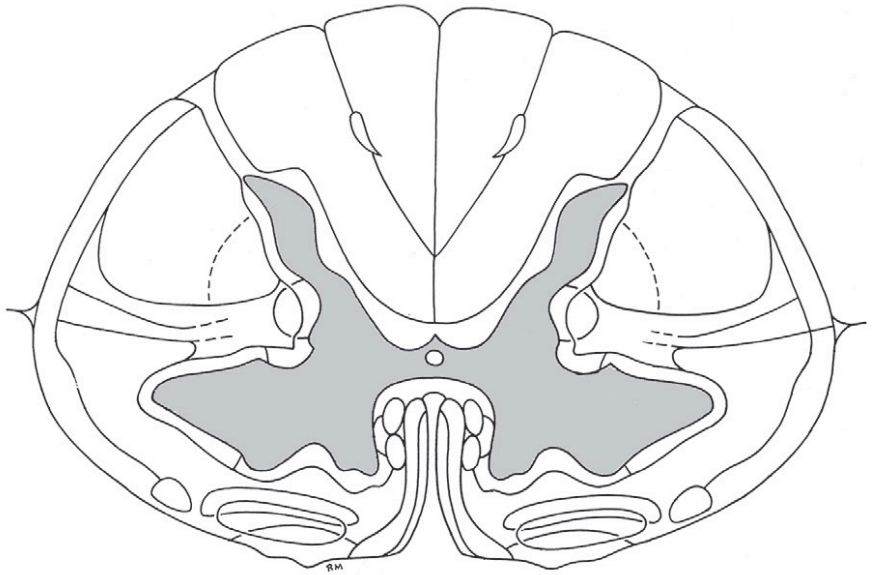


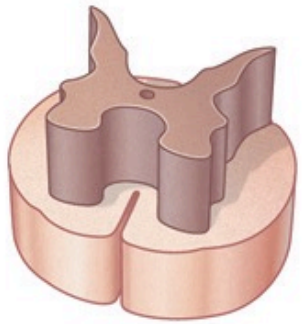


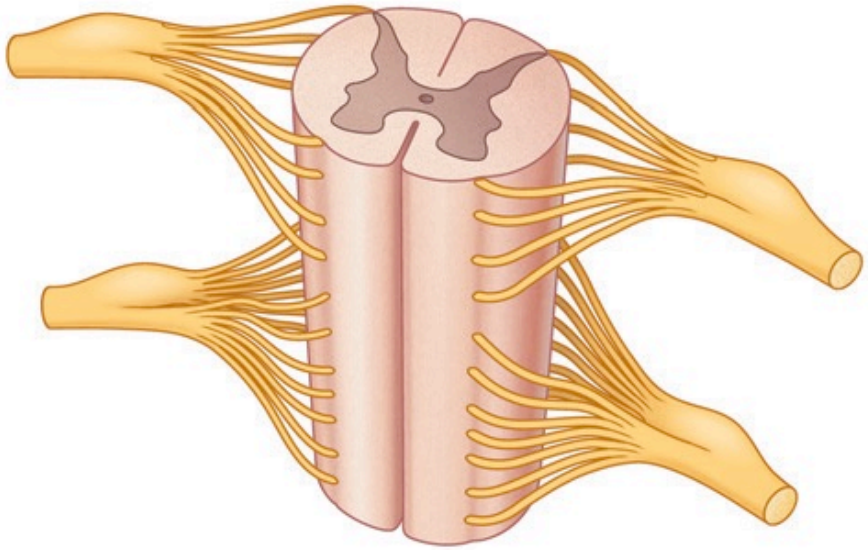


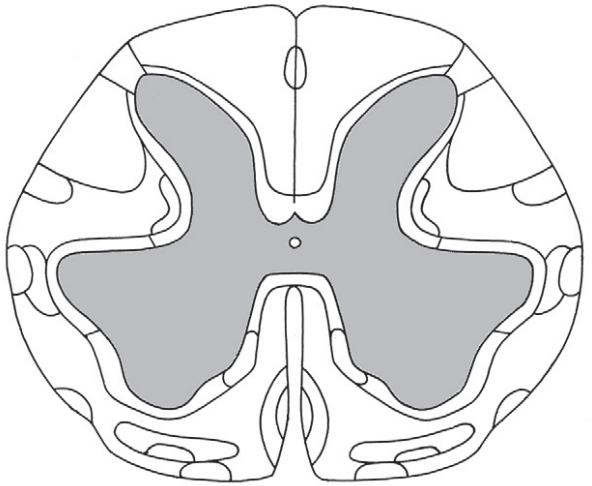
SUBTANTIA ALBA

- Substantia alba (white matter)
  - peripherally
  - Surrounding grey matter
  - Thinnest by dorsal horns
  - Reach of neronal filaments (axons)
  - Fasciculi=funiculi (bundles)
  - Tractus (pathways)









COLUMNAE - COLUMNS

- **columnae dorsales**
- **columnae ventrales**
- **columnae laterales (C8-L3 – sympaticus, S1-S2 – parasympatikus)**

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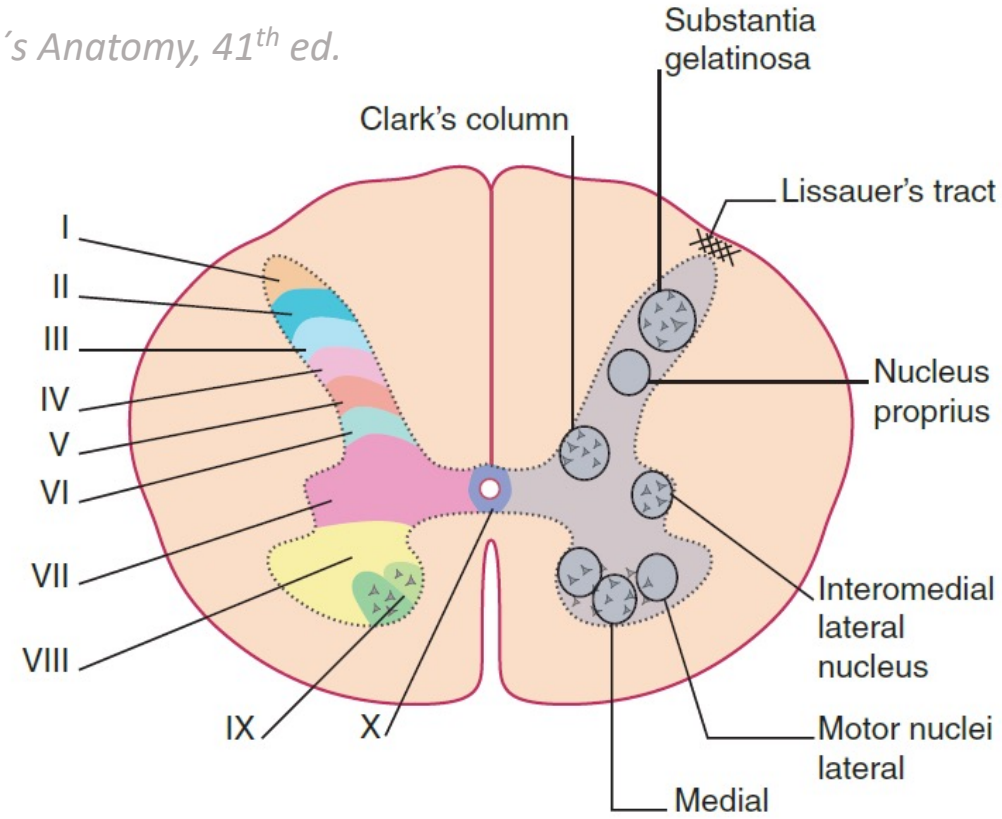
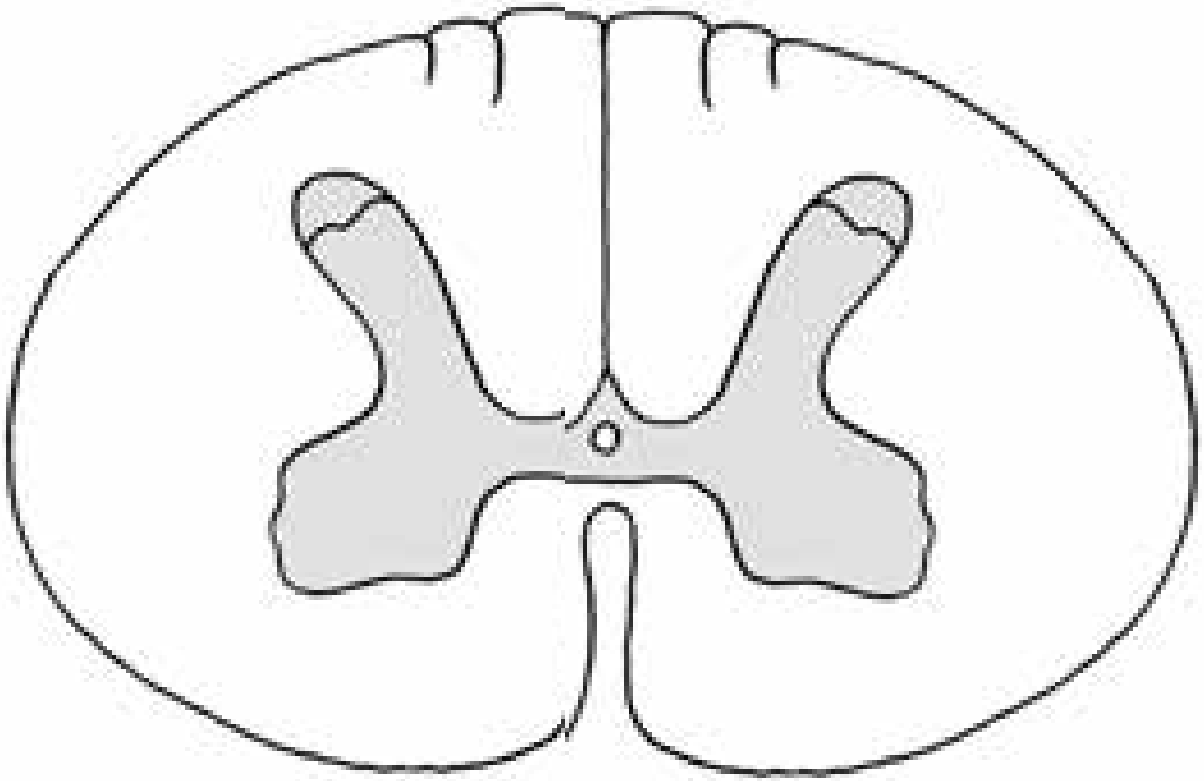
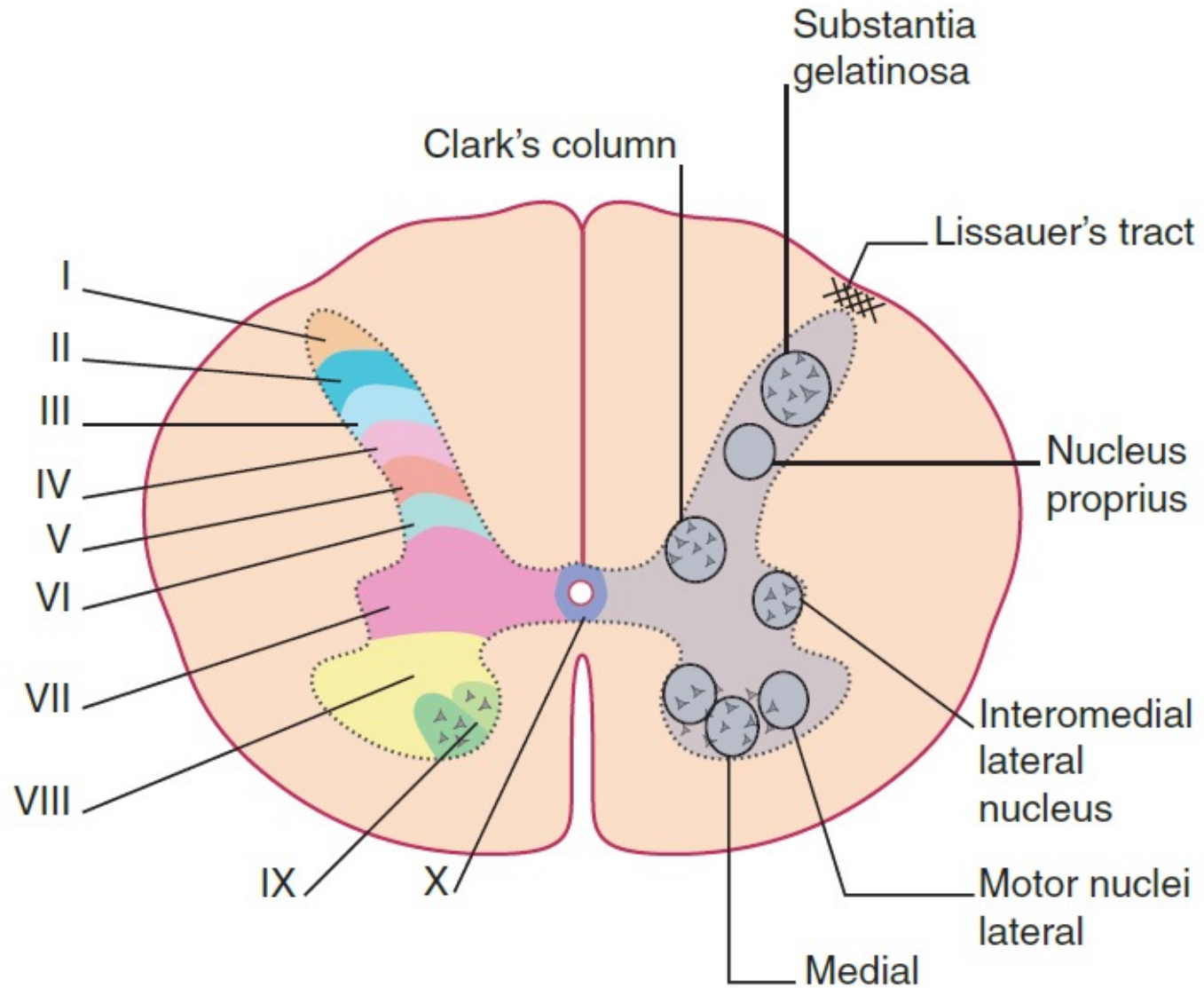


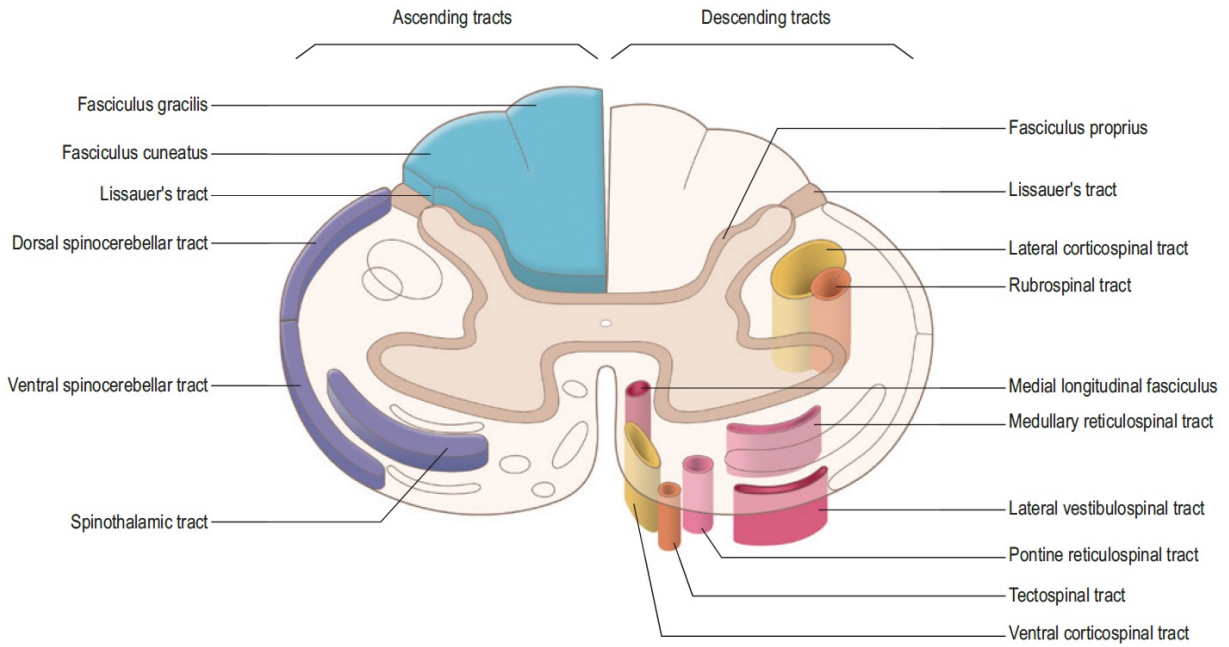


NUCLEI


Substantia gelatinosa
Clark's column
Lissauer's tract
I
II
III
IV
V
VI
VII
VIII
IX
X
Nucleus proprius
Interomedial lateral nucleus
Motor nuclei lateral
Medial

FUNICULI - FASCICULI

- **Funiculus, fasciculus**
- **White matter**
- **Nervous tract**



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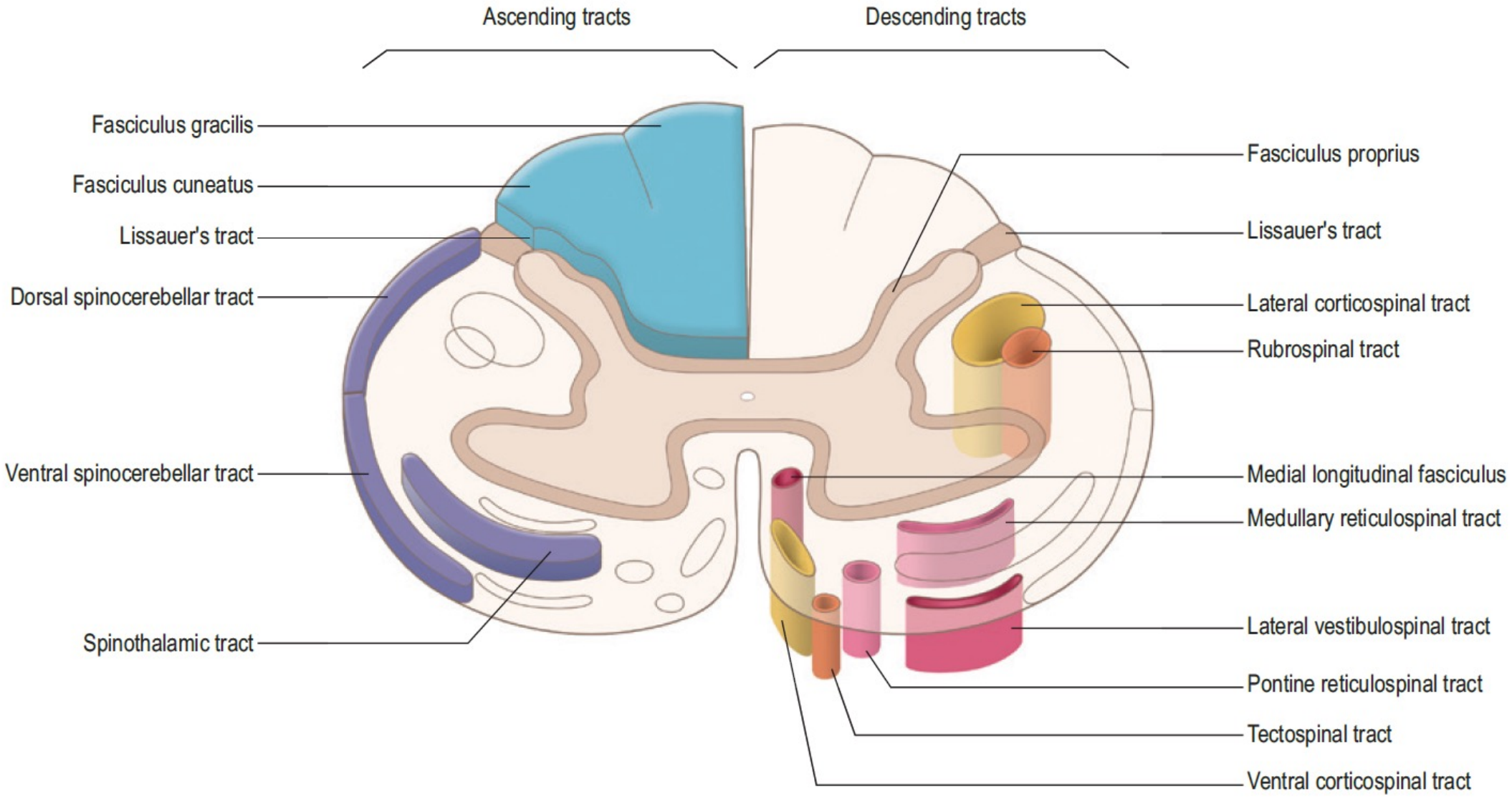
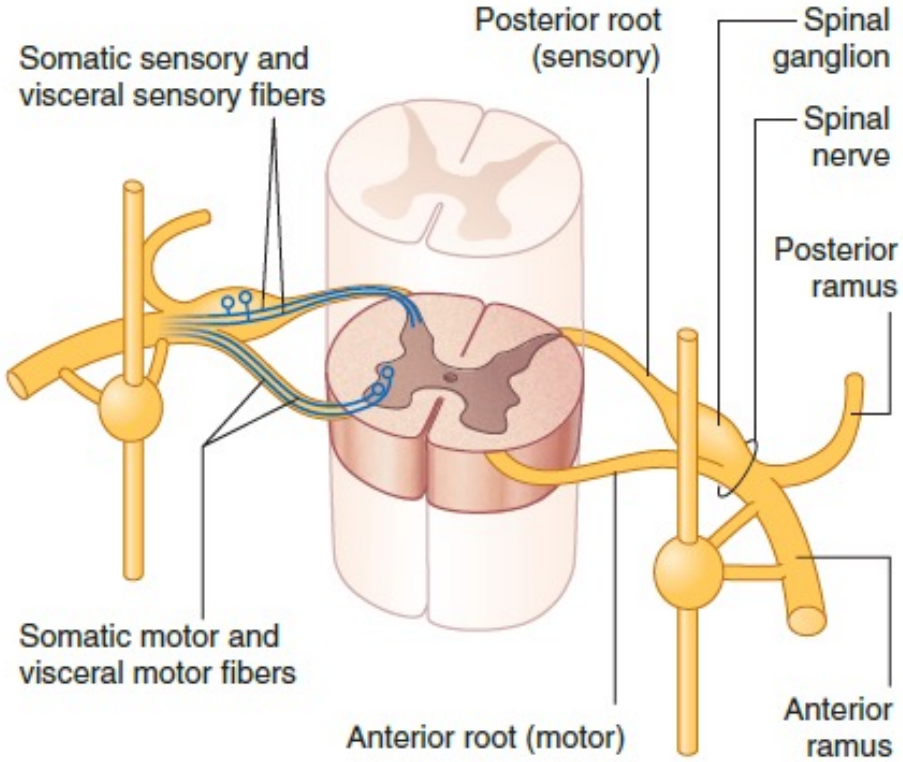
- **Dorsal fasciculi – funiculi dorsales – ascendent tracts– senzitivní**
- **Anterior fasciculi– funiculi ventrales –descendent tracts – motoric**
- **Lateral fasciculi – funiculi laterales – ascendent and descendent tracts- senzitive + motoric**

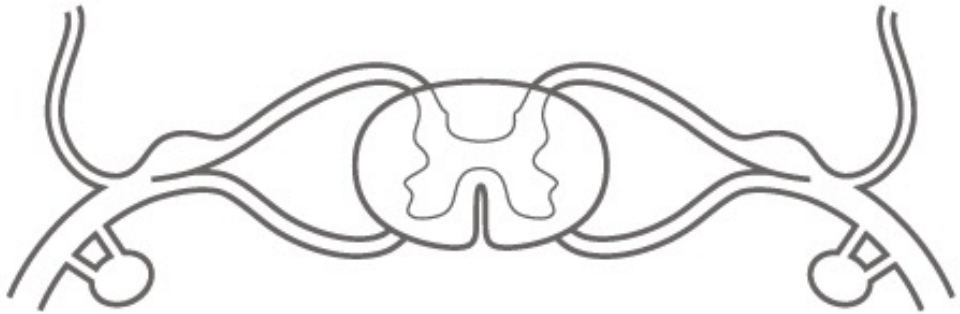
FUNICULI - FASCICULI



RADICES - ROOTS

- Neural filamens arising from spinal cord
- radices ventrales
  - motoric and autonomous
- radices dorsales
  - Sensitive filaments -soma– ganglion spinale
- Nervi spinales
- Junctio of dorsal and ventral roots
  - one spinal cord segment - one spinal nerve (pair)
- foramen intervertebrale
  - Four rami





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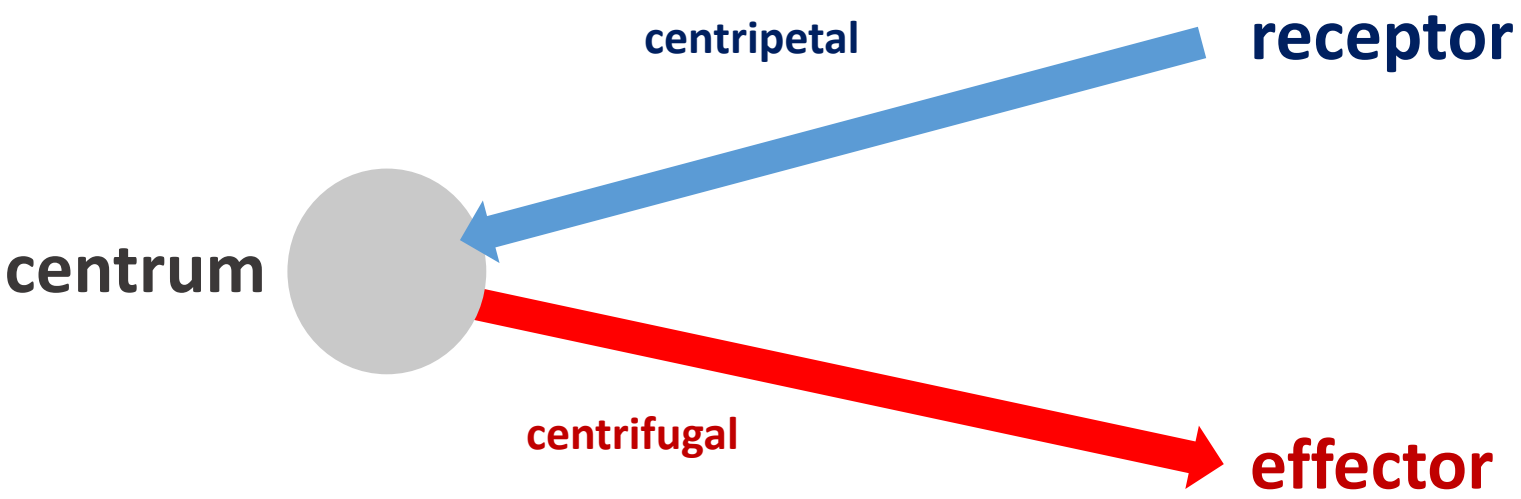
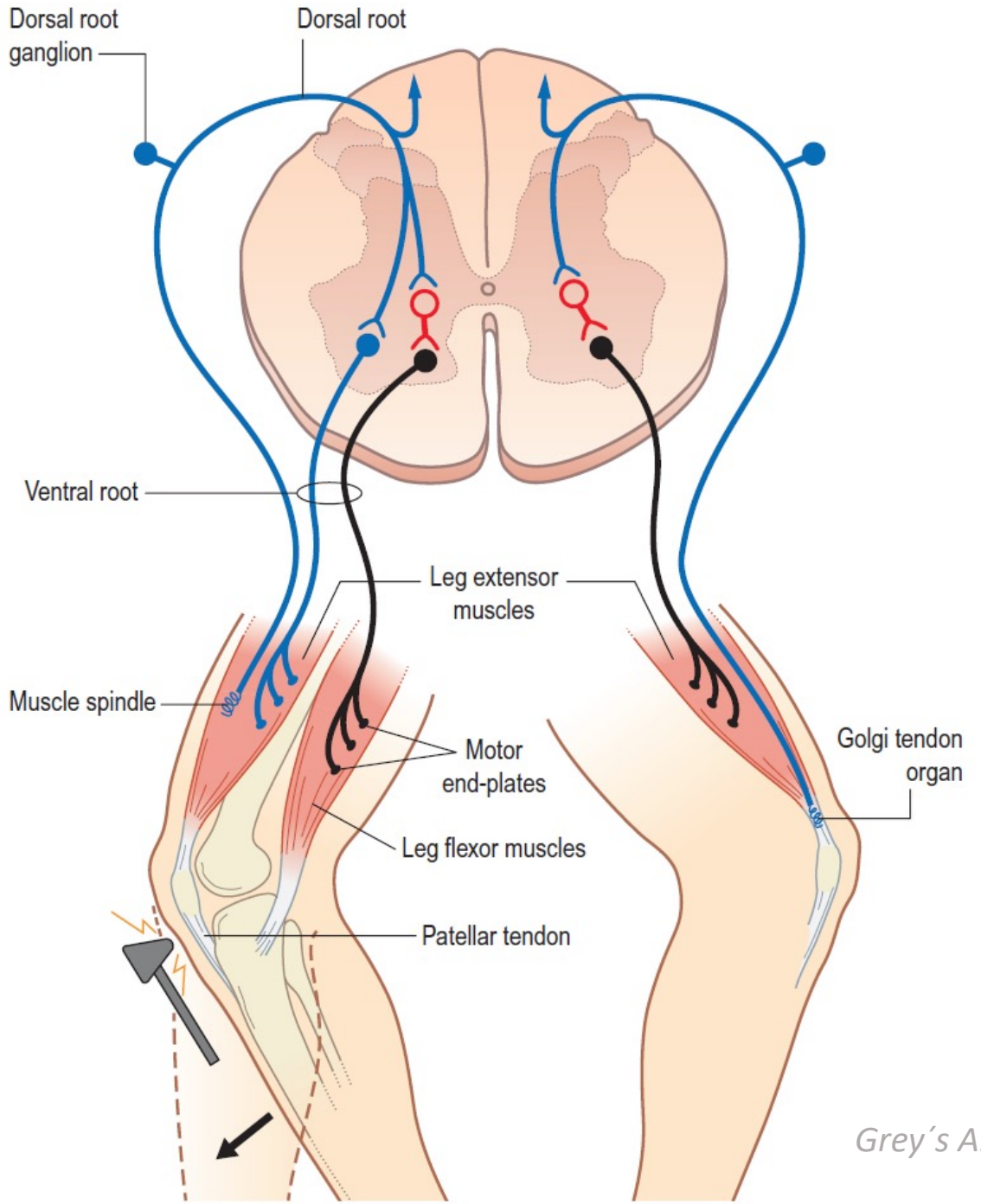
REFLEX ARCH

- Basement of the neural system work
- Centripetal - afferent – senzitive or sensoric
- Centrifuga. - effernet motoric





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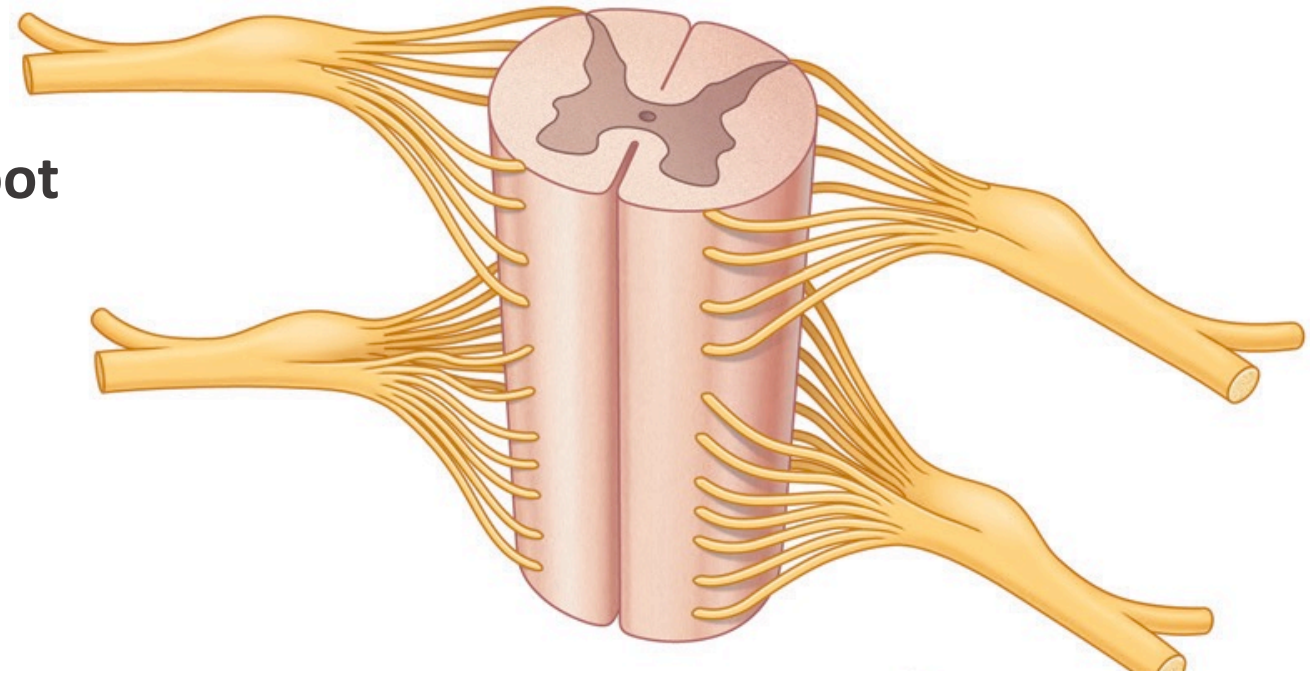
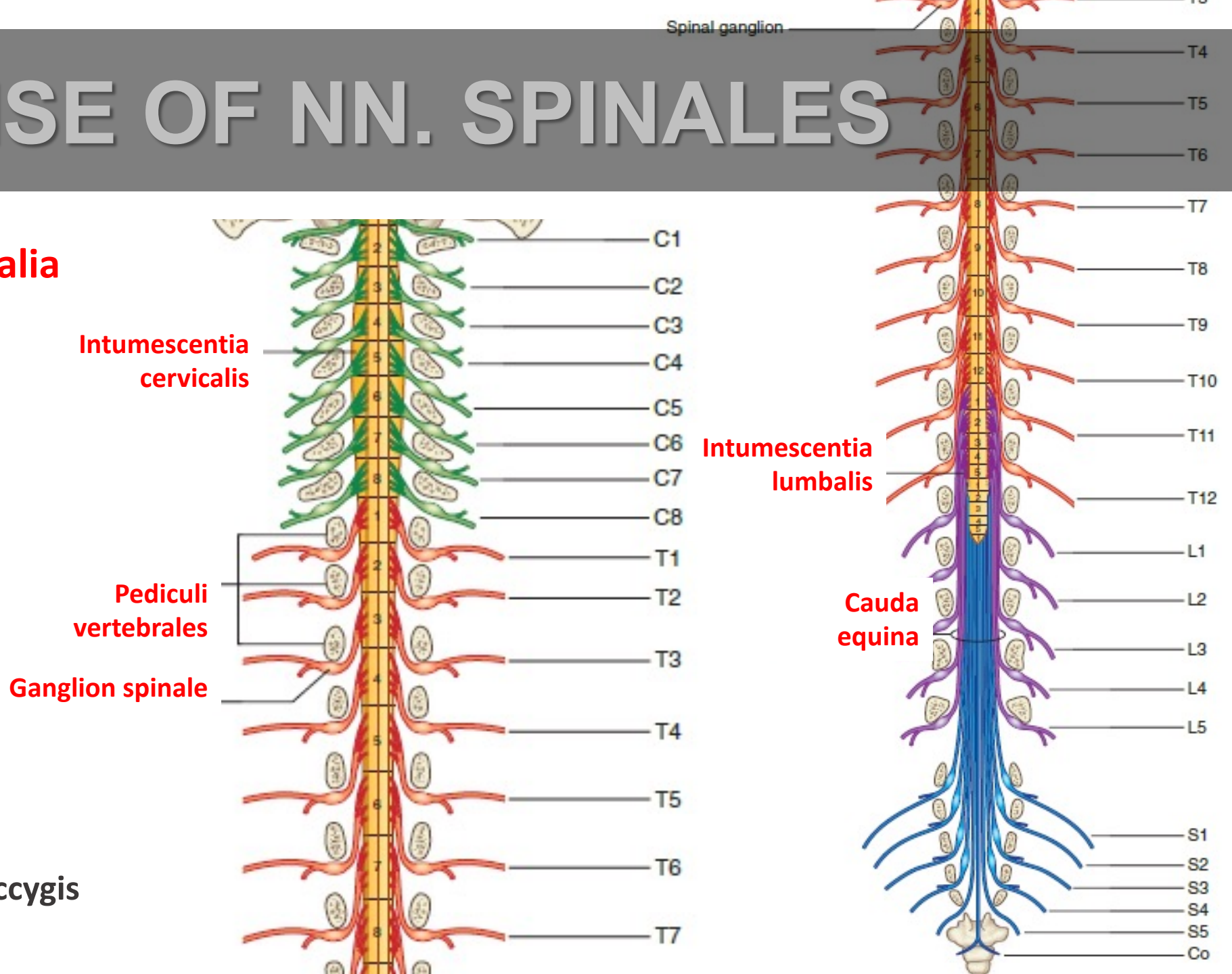
NERVI SPINALES

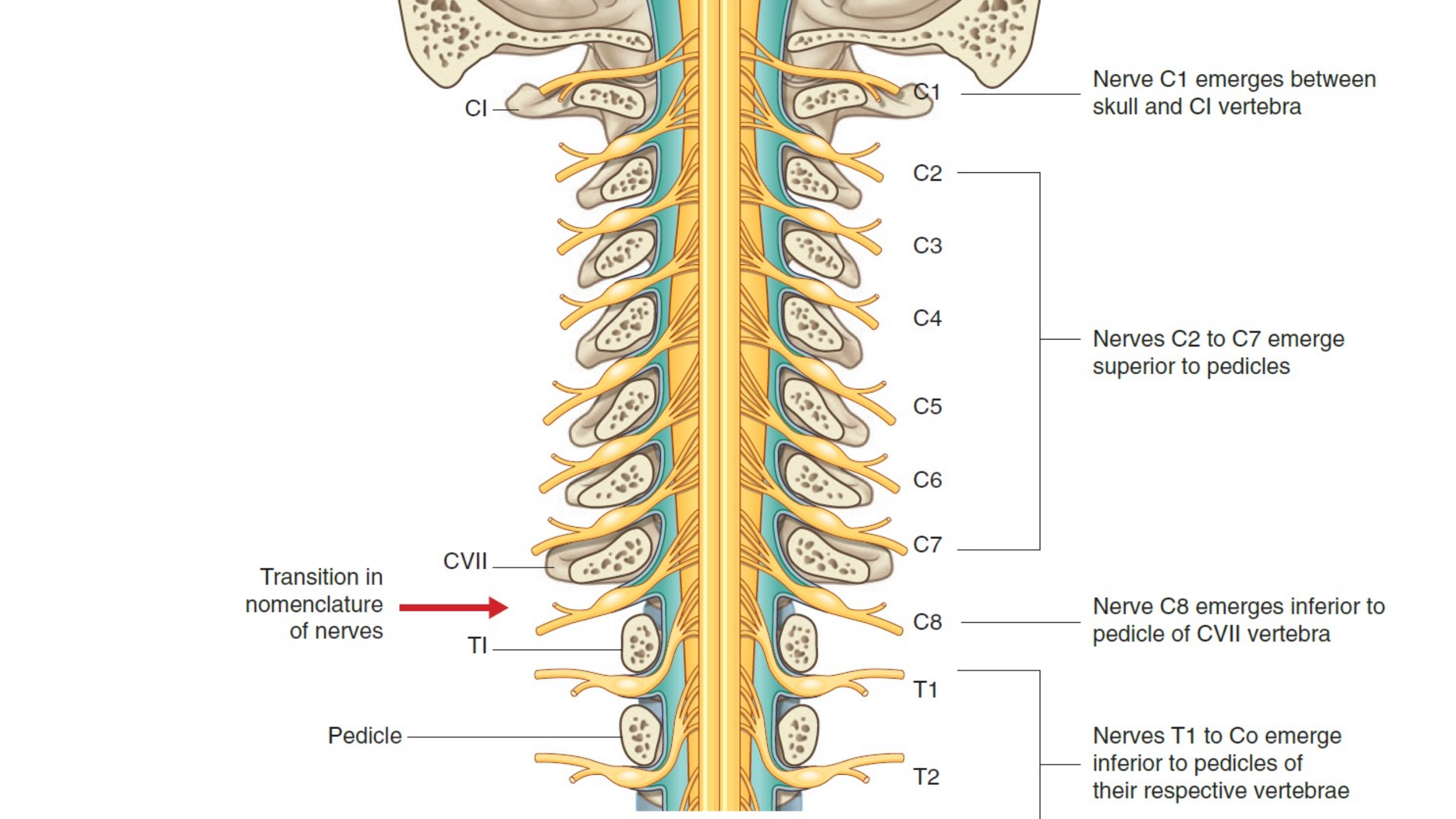
- Zadní kořen - radix posterior - posterior root
  - Soma in ganglion spinale (neural crest cell)
  - Senzitive filaments
  - centripetal
- Přední kořen - radix anterior - anterior root
  - Soma in anterior horn
  - Motoric filaments
  - centifugal
- segmentum spinalis - spinal segment
  - rootlets - roots - forming one spinal nerve
- Rami nervi spinalis
  - Ramus posterior - intrinsic mm, et cutis
  - Ramus anterior other mm, and skin
  - Rami meningeales - recurrent small branches



ARISE OF NN. SPINALES

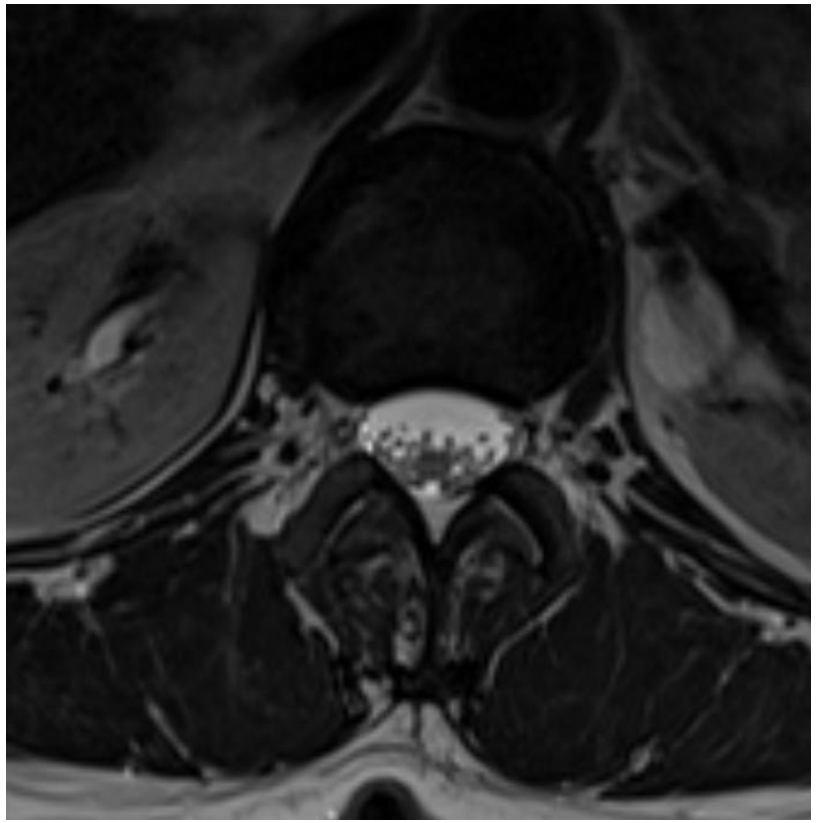
- **Foramina intervertebralia**
- Cervicales (C1-8)
  - Up to pedicle C1 - C7
- Thoracici (TH1-12)
- Lumbales (L1-5)
  - Below pedicle
- Sacrales (S1-4)
  - Foramina sacralia
- S4
  - below os sacrum
- N. coccygeus
  - below cornua ossis coccygis

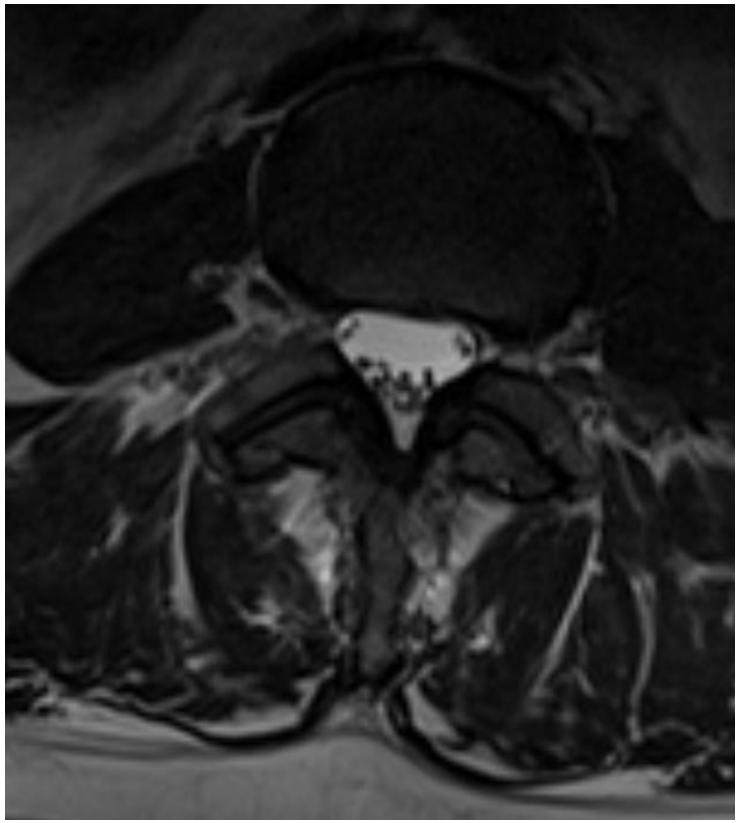


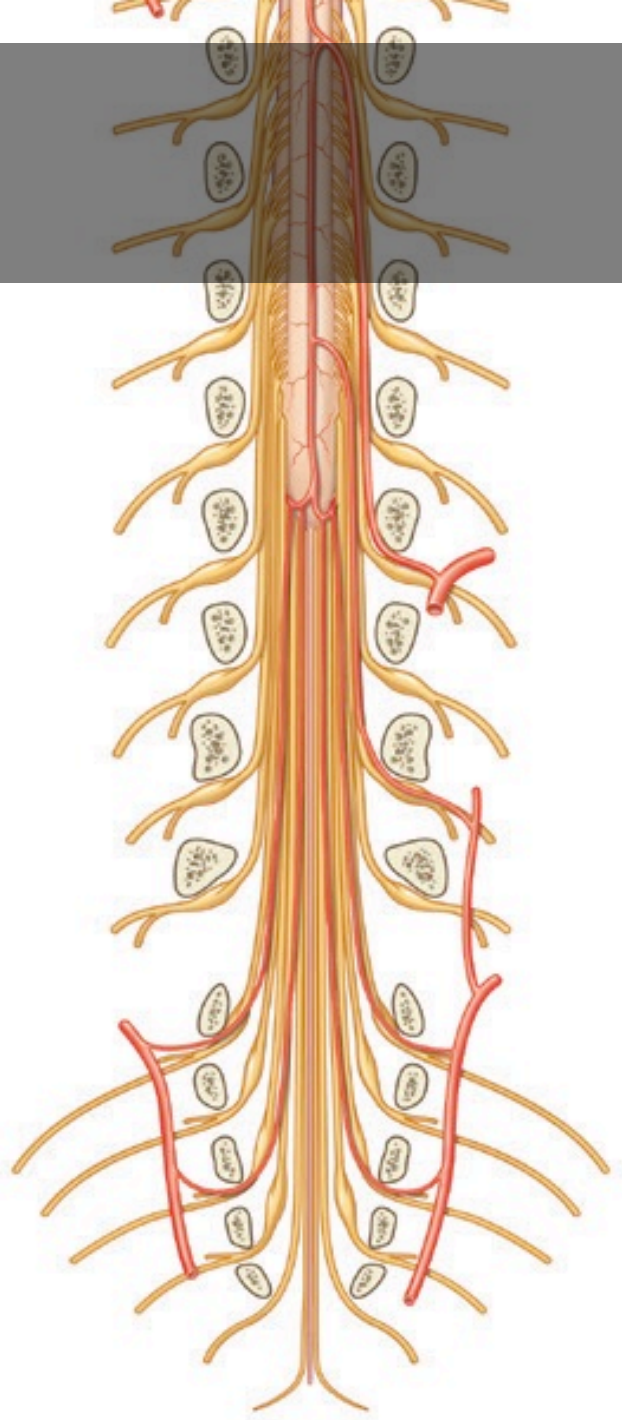

CI
C1
Nerve C1 emerges between skull and CI vertebra
C2
C3
C4
C5
C6
C7
Nerves C2 to C7 emerge superior to pedicles
CVII
Transition in nomenclature of nerves
C8
Nerve C8 emerges inferior to pedicle of CVII vertebra
TI
T1
Pedicle
T2
Nerves T1 to Co emerge inferior to pedicles of their respective vertebrae

CAUDA EQUINA

- Distally form apex coni medullaris
- Bundle of roots localized inside subarachnoideal space

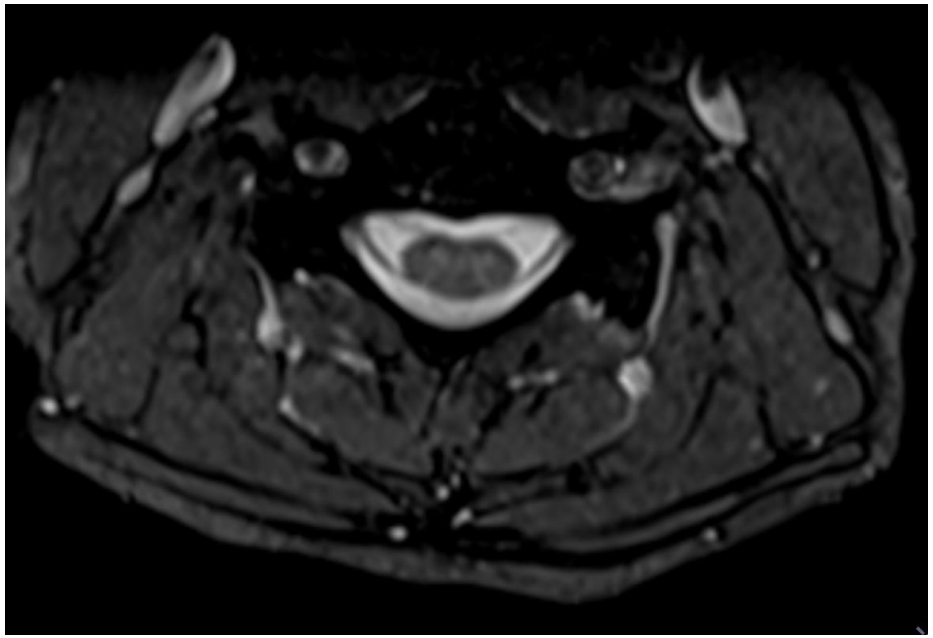






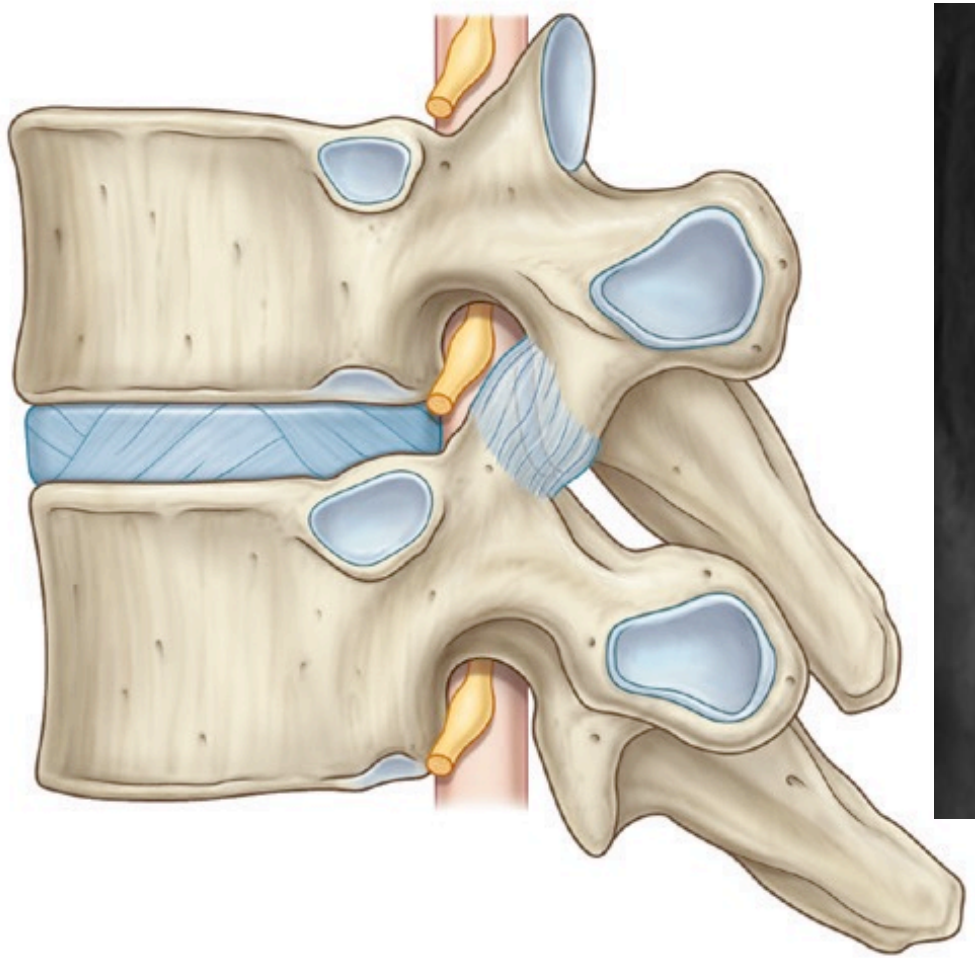
NERVI SPINALES

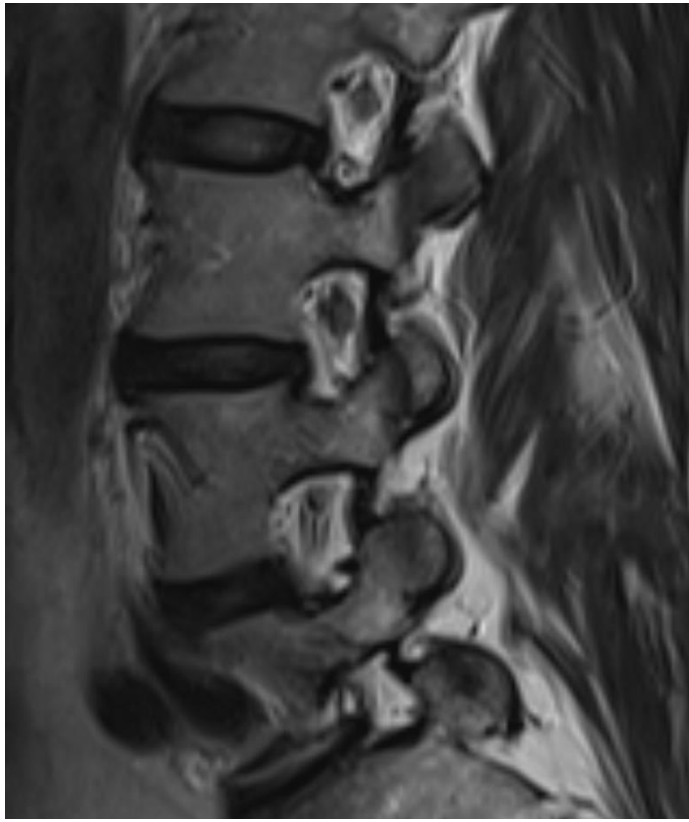
- 31 pairs
  - Cervicales 8x
  - Thoracici 12x
  - Lumbales 5x
  - Sacrales 5x
  - Coccygeus 1x
- One segment of spinal cord - one pair nervi spinales
- Intumescentia cervicalis et lumbalis
- Cord ends - L1-2 (variation TH12 - L3)
- filum terminale
- Cauda equina
- Subarachnoideal ends S2



FORAMINA INTERVERTEBRALIA

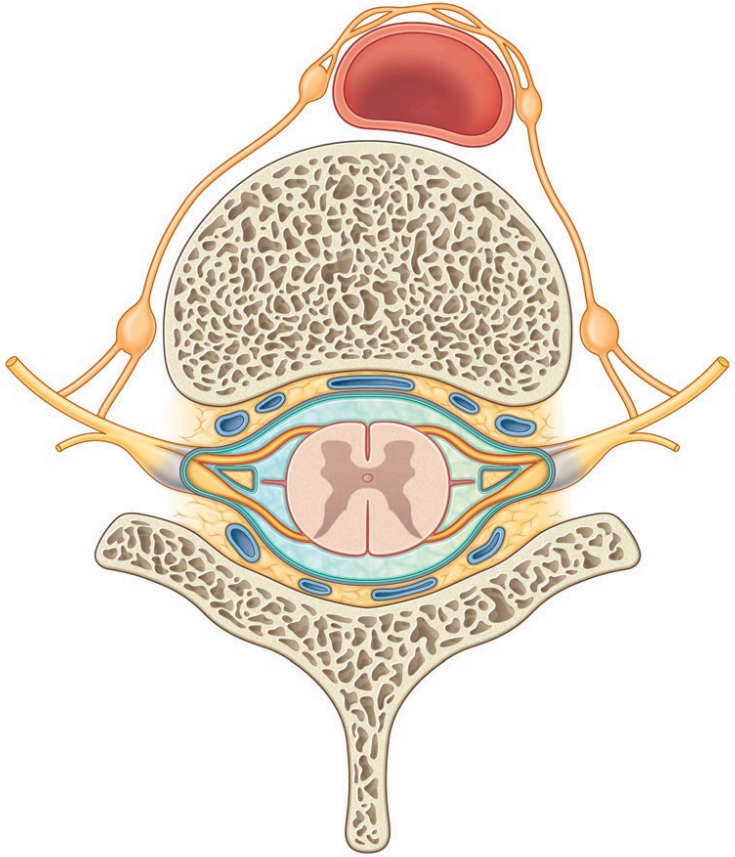
- Spinal nerv emerging from foramen intervertebrale
- Foramen intervertebrale
  - Upper and lower margin
    - arcus
  - Dorsal margin
    - Intervertebral joint
  - anterior margin
    - body
    - intervertebral disc

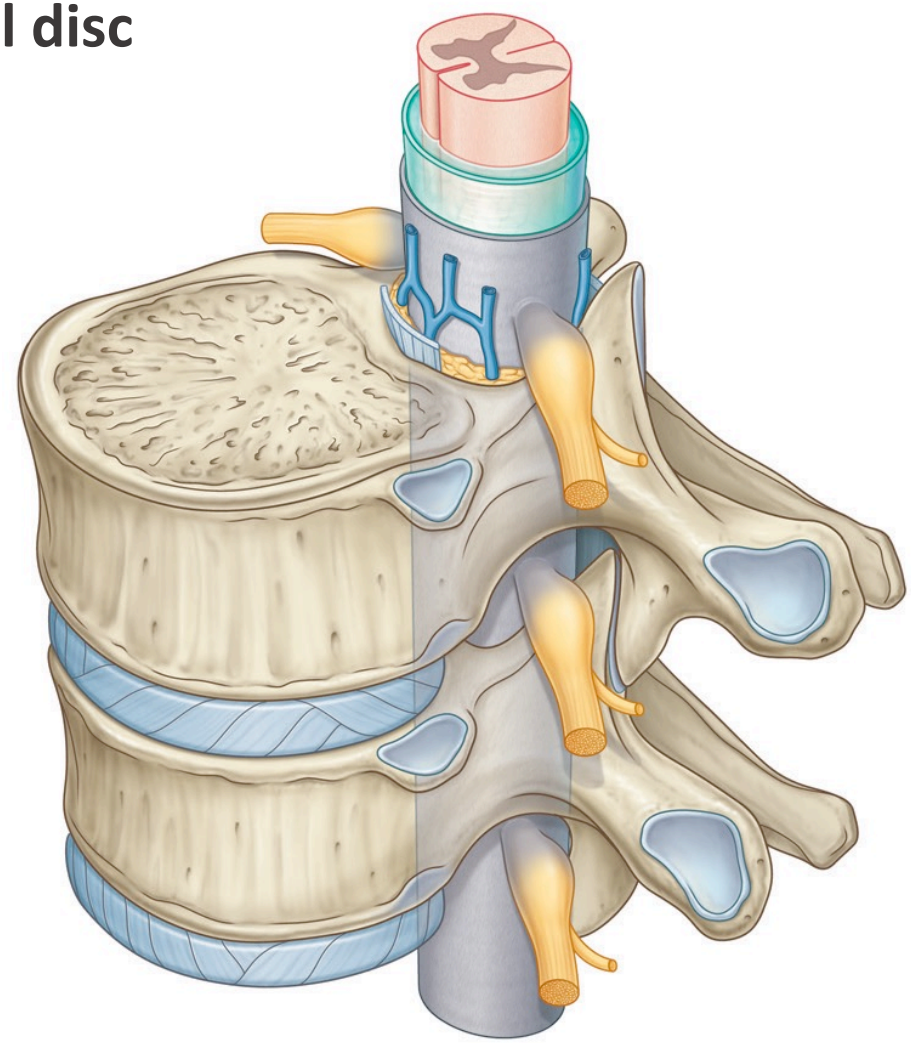




CANALIS VERTEBRALIS

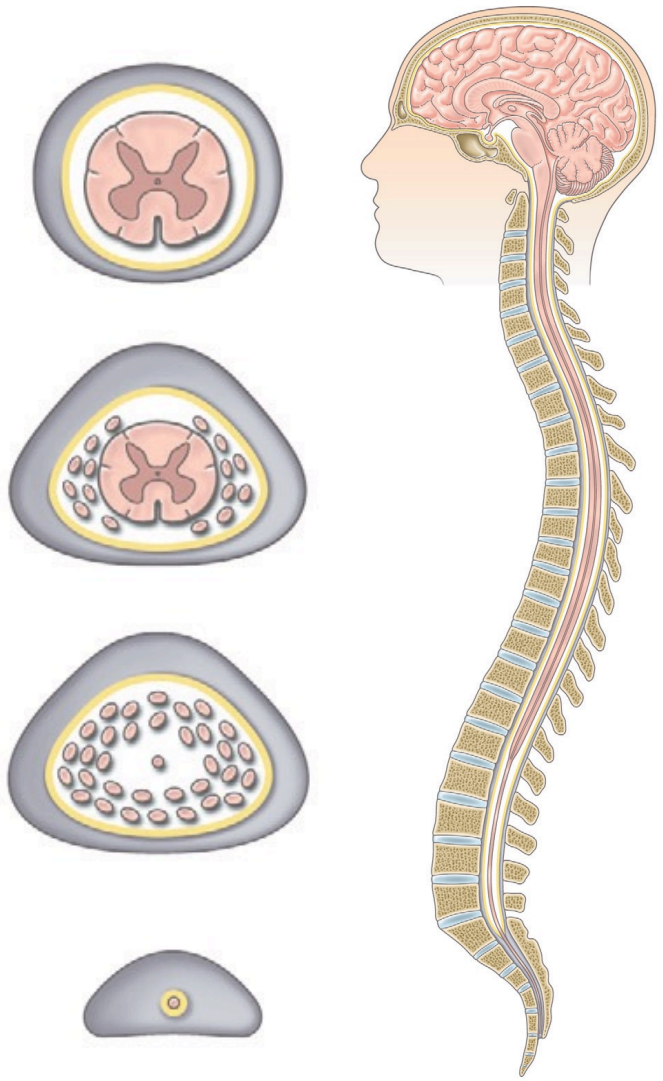
- Anterior borderline - corpus vertebrae and intervertebral disc
- Dorsal borderline arcus, ligamenta
- „osseous channel“
- Medulla spinalis
- Meninges
  - Pia mater
  - Arachnoidea
  - Dura mater
- Epidural space
  - Loose connective tissue
  - fatty tissue
  - Venous plexus

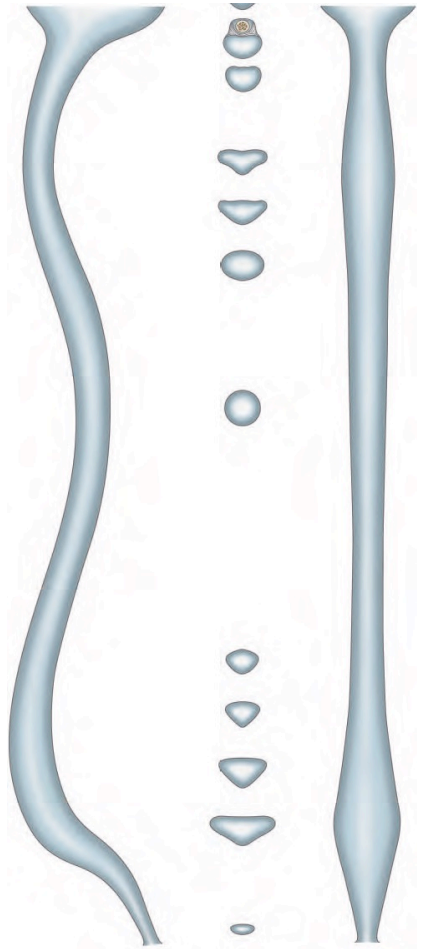




CANALIS SPINALIS

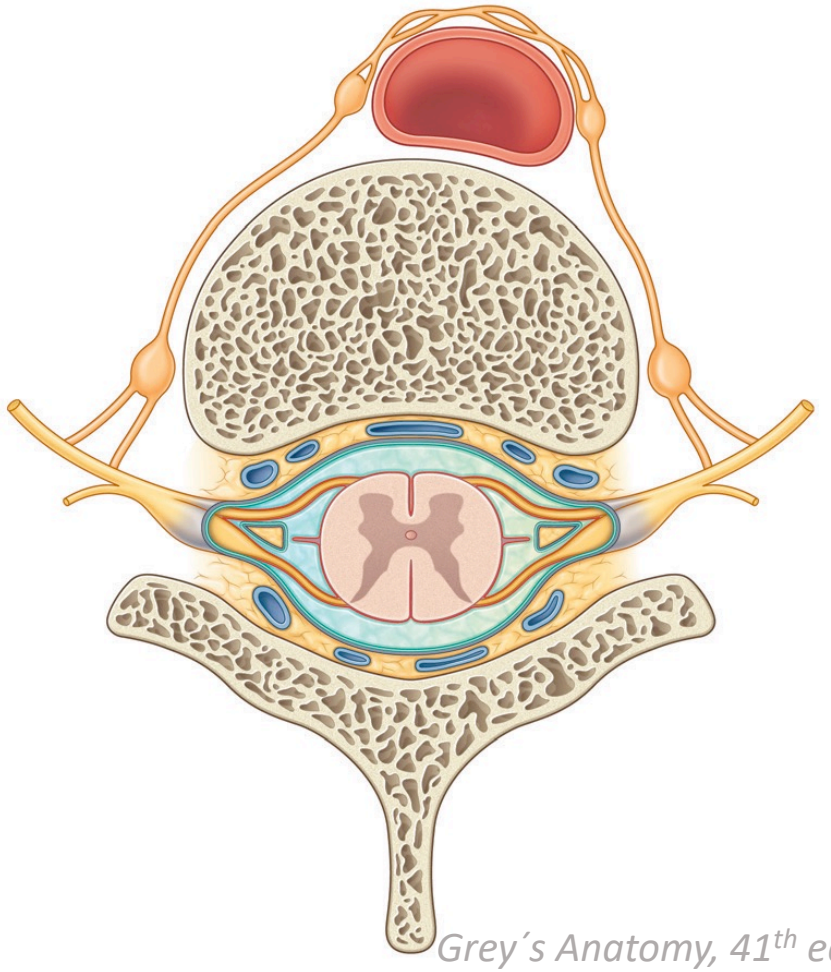
- Osseous channel
- Soft tissue chanenl
- Epidural space
- Dural sac
- Subdural space
- Spinal cord
- Roots
- Filum terminale

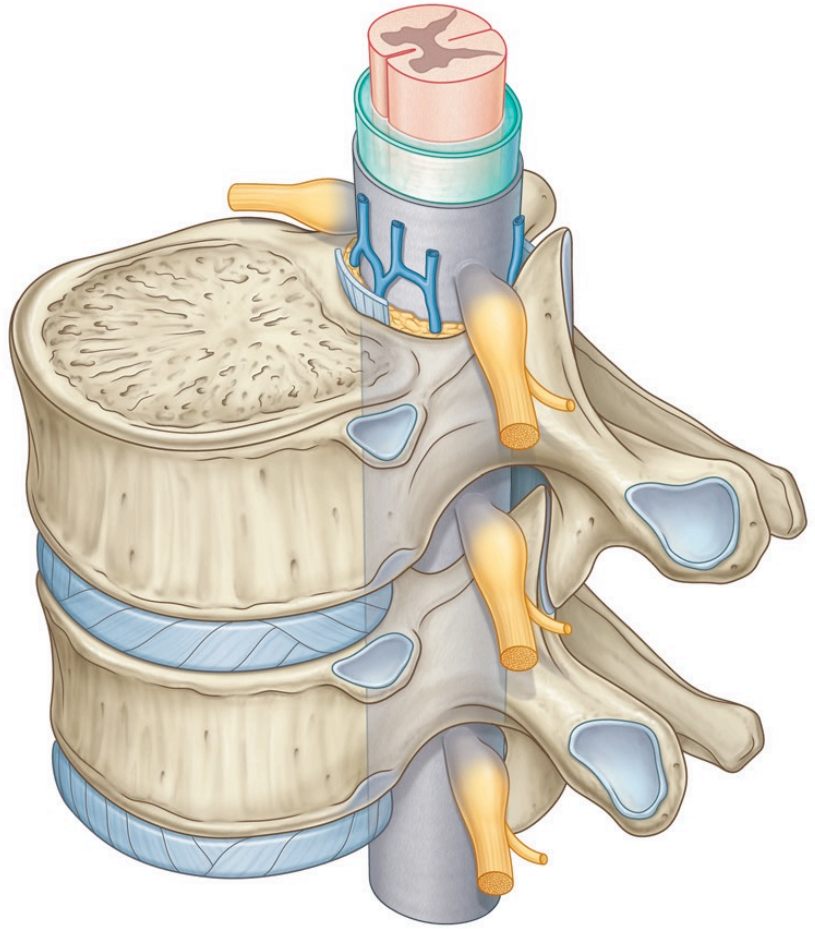




MENINGES MEDULLAE SPINALIS

- Dura mater
- Arachnoidea
- Pia mater





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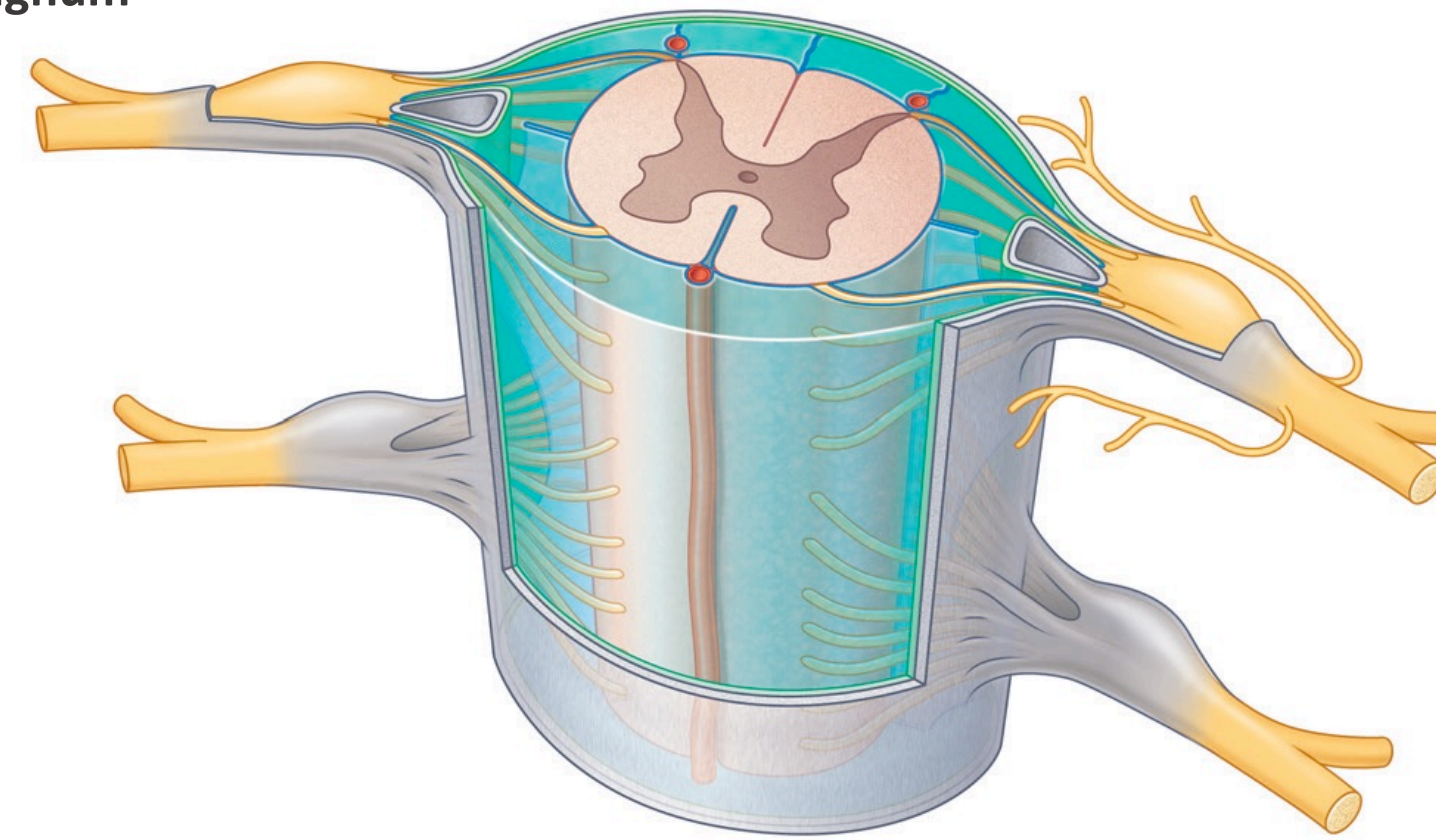
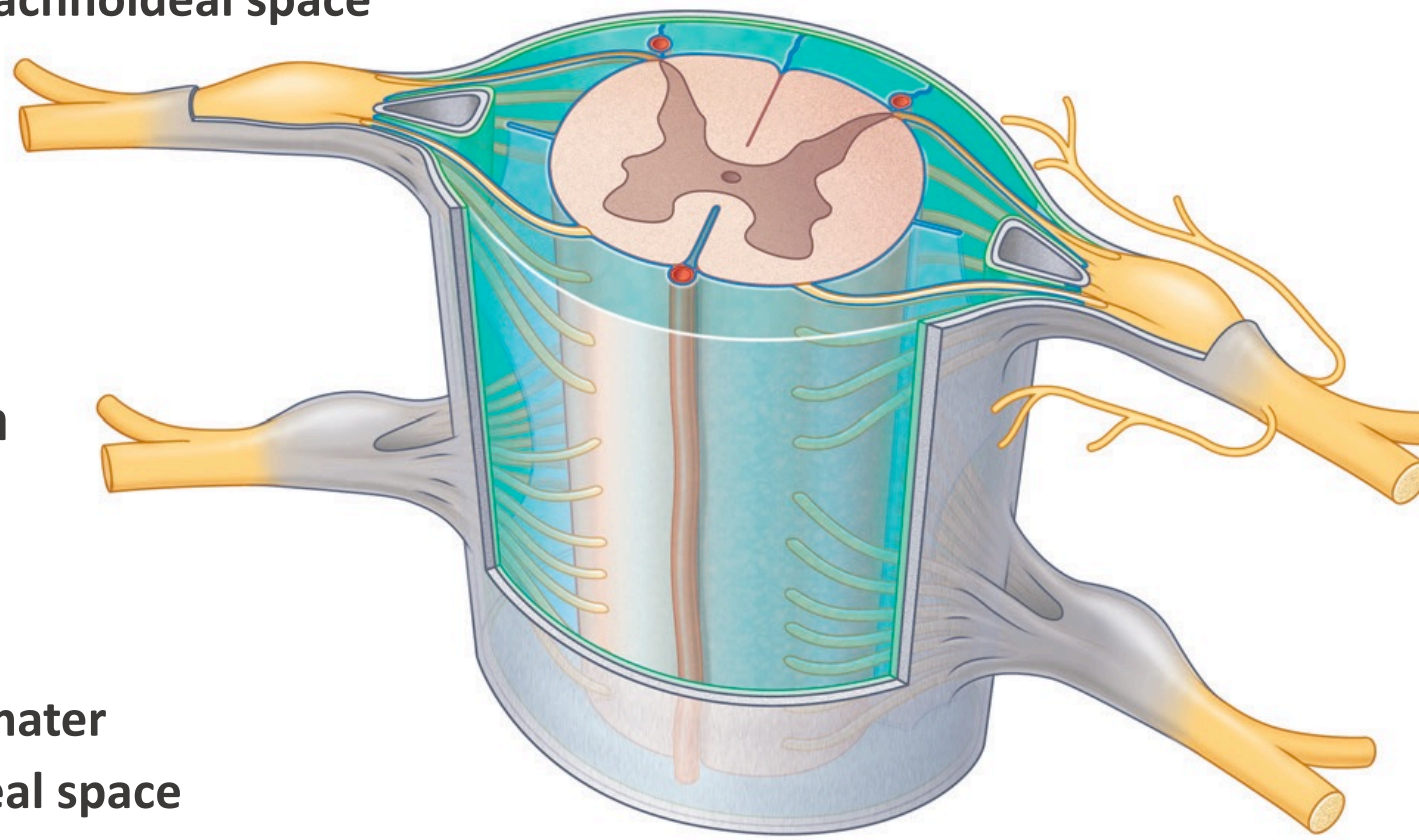
MENINGES M. SPINALIS

- Dura mater
  - Epidural space
  - Following the dura mater in foramen magnum
  - S2 covering fillum terminale
  - Inseriton - os coccygis
  - Spinal nerves sleeves
    - Vaginae radiculares
  - followin in epineurium of spinal nerve



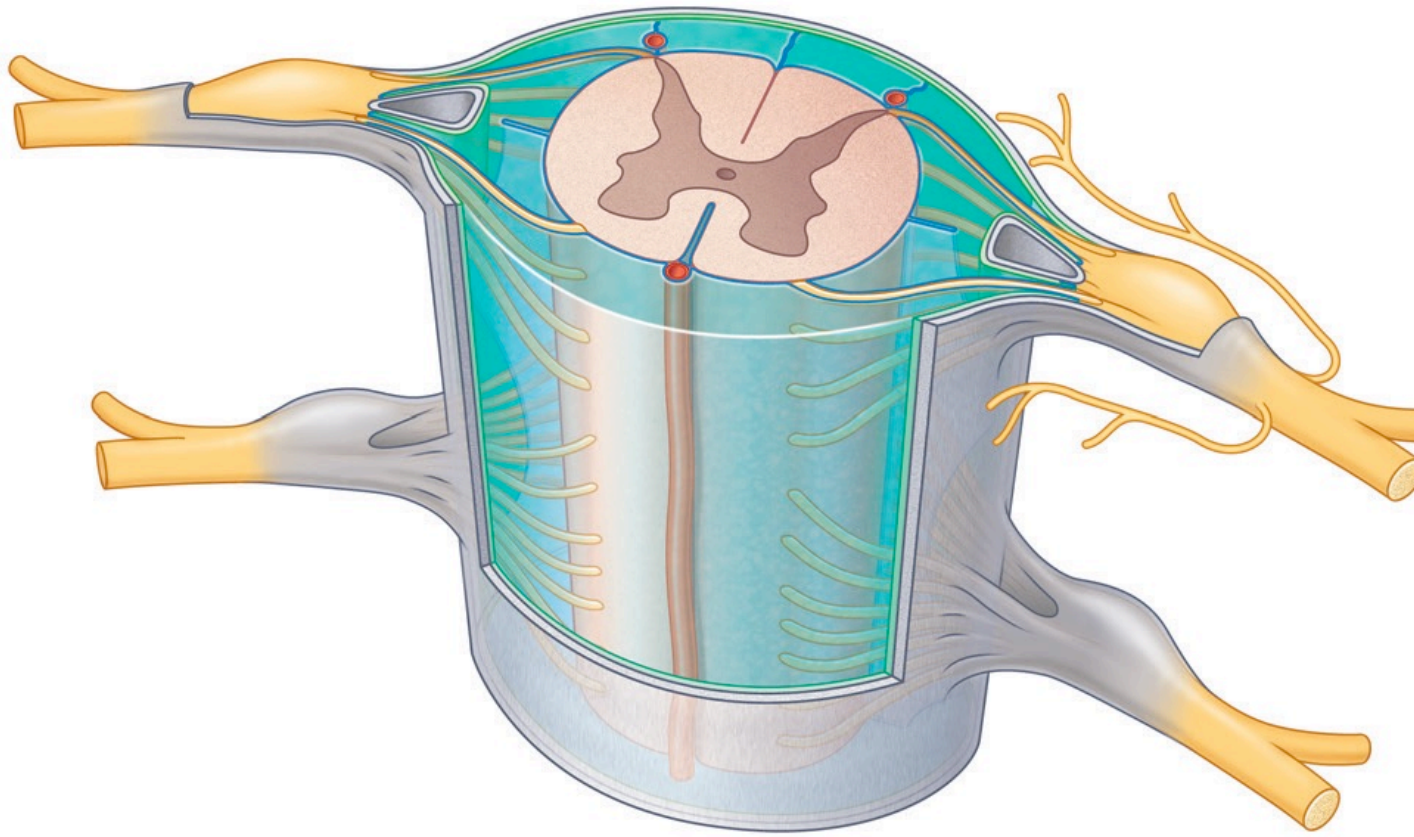
MENINGES M. SPINALIS

- Arachnoidea - spider web
  - No fusing with dura mater
    - From pia amter sepqarated by subarachnoideal space
  - arachnoidea ends by S2
- Subarachnoideal space
  -
  - Obsahuje liquor cerebrospinalis
  - Largest space aroundcauda equina
    - lumbal puncture
  - Trabeculae arachnoideales
    - Bridgign subarachnoideal space
    - Conenction of arachnoidea and pia mater
    - Suspending vessels in subarachnoideal space
    - Coating vessels



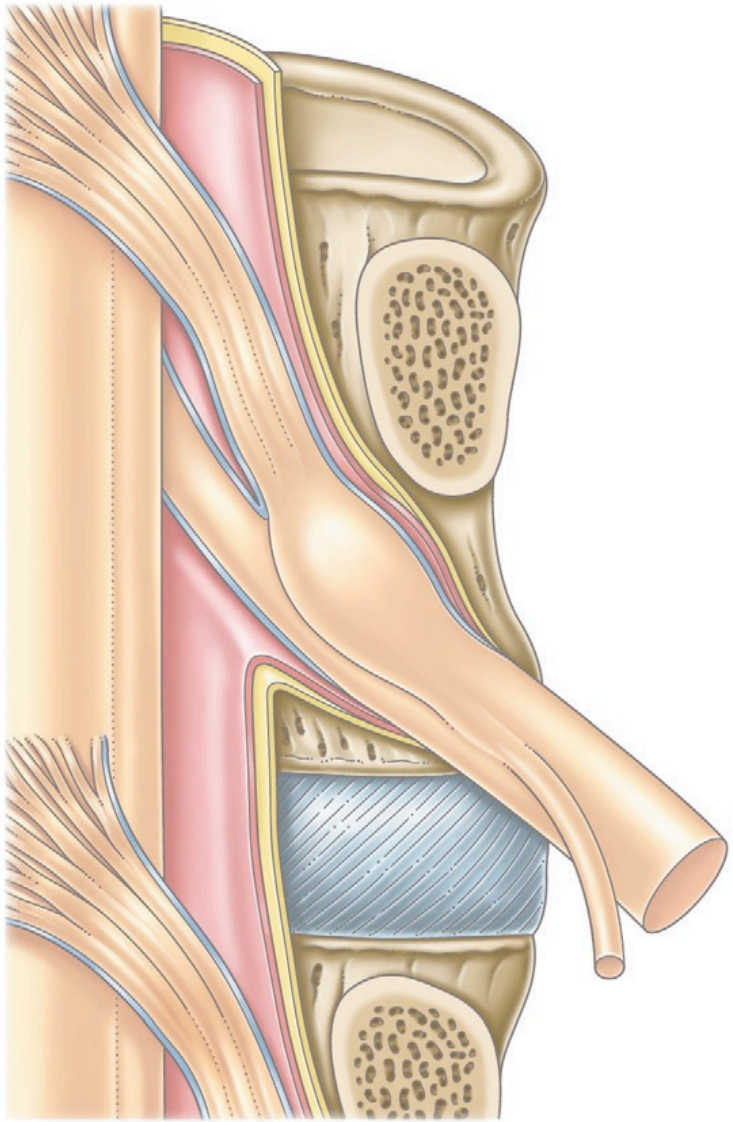
MENINGES M. SPINALIS

- Pia mater
  - Vascular membrane adherent to spinal cor surface
  - Insisde fissura mediana anterior
  - covering radiculi et radices
    - sleeves
  - Blends with arachnoidea
  - Ligamentum denticulatum
    - In the middle of alteral aspect
  - To dura mater
  - Anchoring the spinal cord
    - Triangular anchors to dura mater
    - Between segmental roots

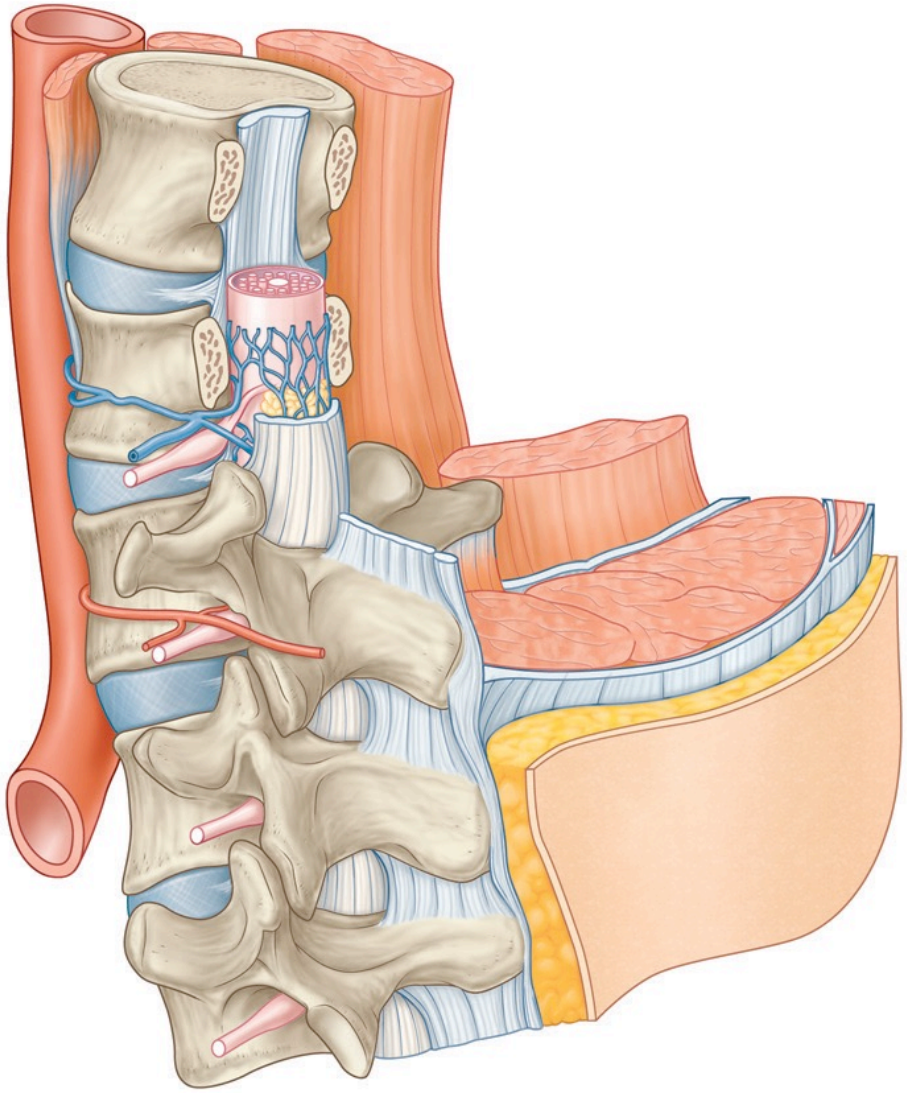


MENINGES M. SPINALIS

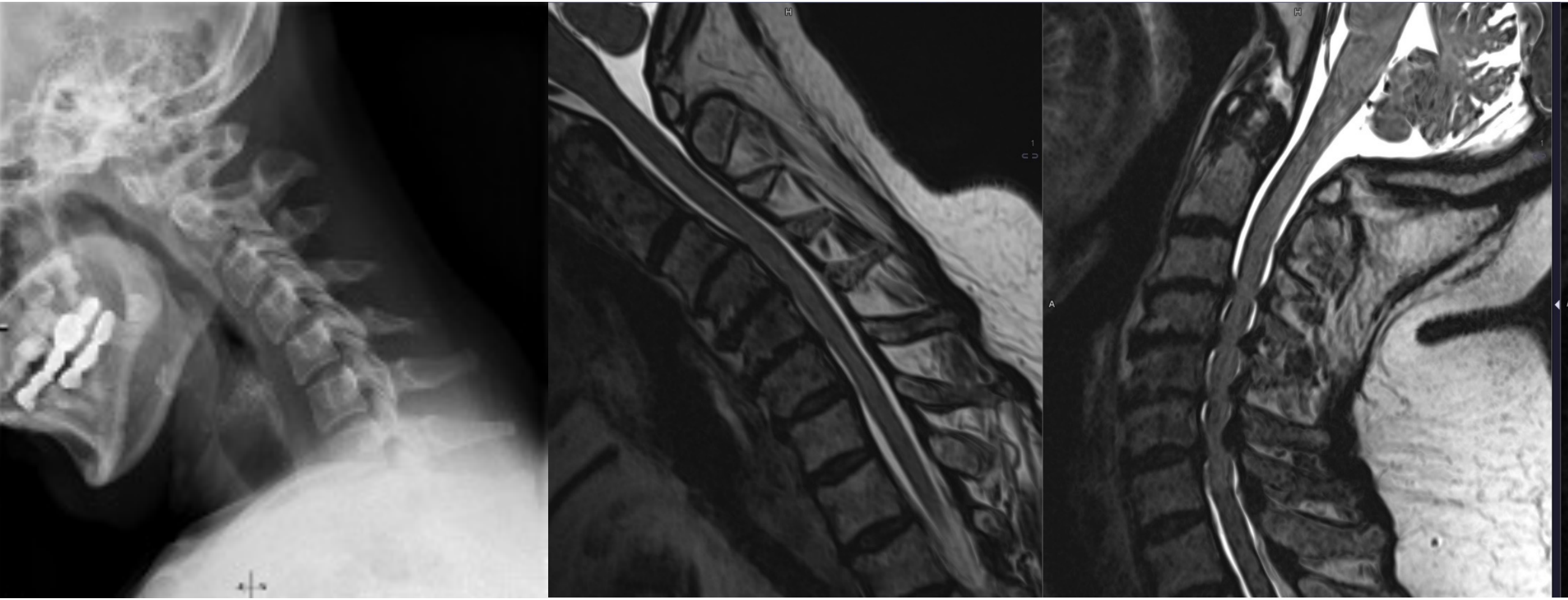
- Periradicula sleeves
  - Radiculi et radices
    - pia mater
  - Nn. spinales
    - arachnoidea
  - Perineurium
    - Follower of dura mater



CANALIS VERTEBRALIS

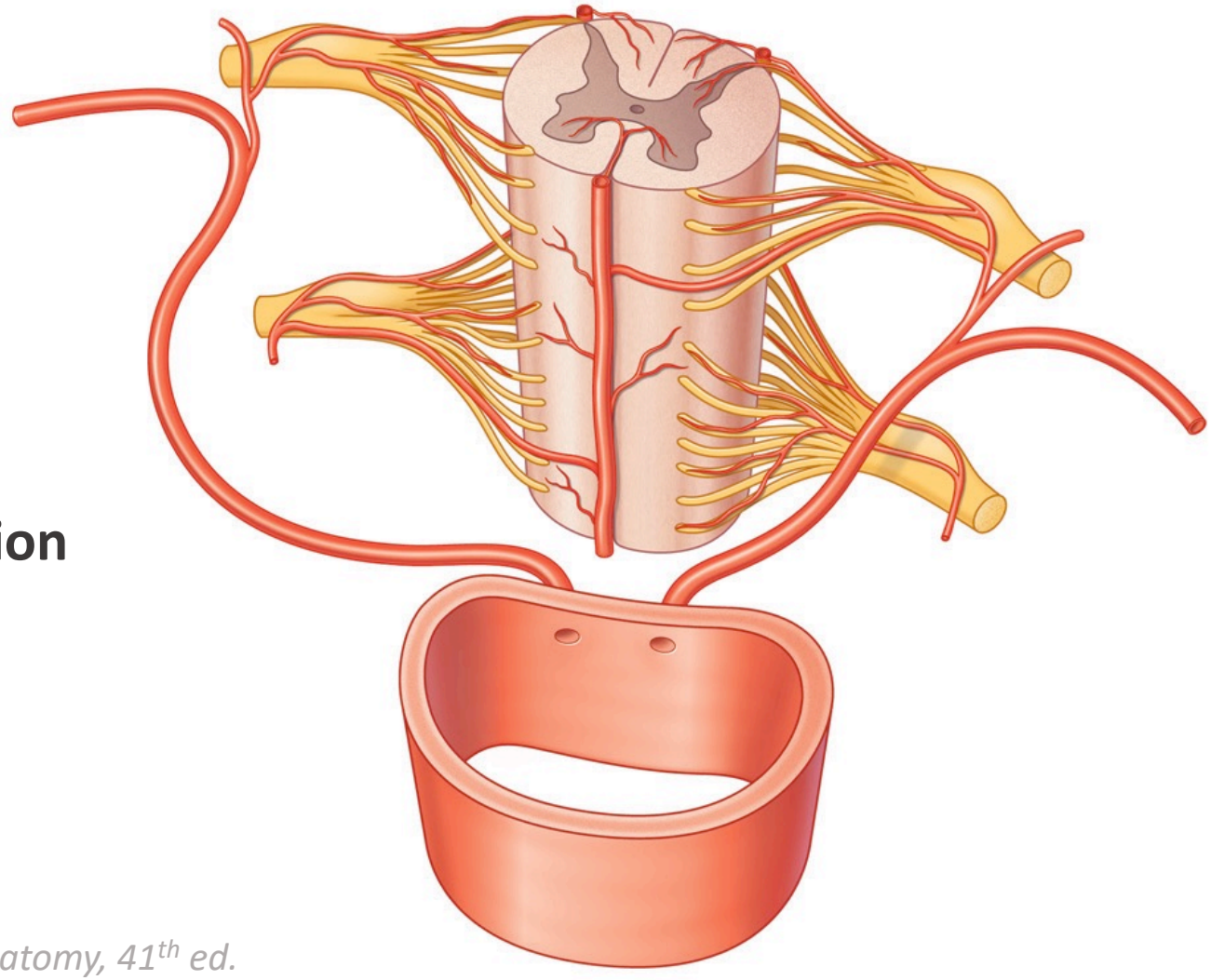


EXTENSION AND FLEXION



ARTERIAE MEDULLAE SPINALIS

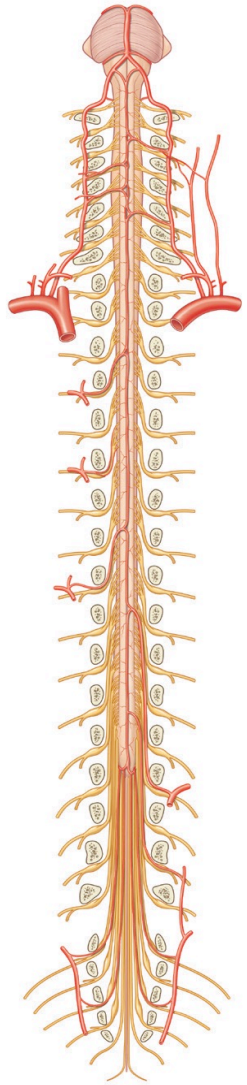
- **Arteria spinalis anterior**
  - **Aa. Vertebrales**
- **Arteriae spinales dorsales**
- **Supplied arteries**
- **in cervical, thoracic and lumbar section**
- *A. radicularis magna Adamkiewicz*
  - *Clinically most important supplier*

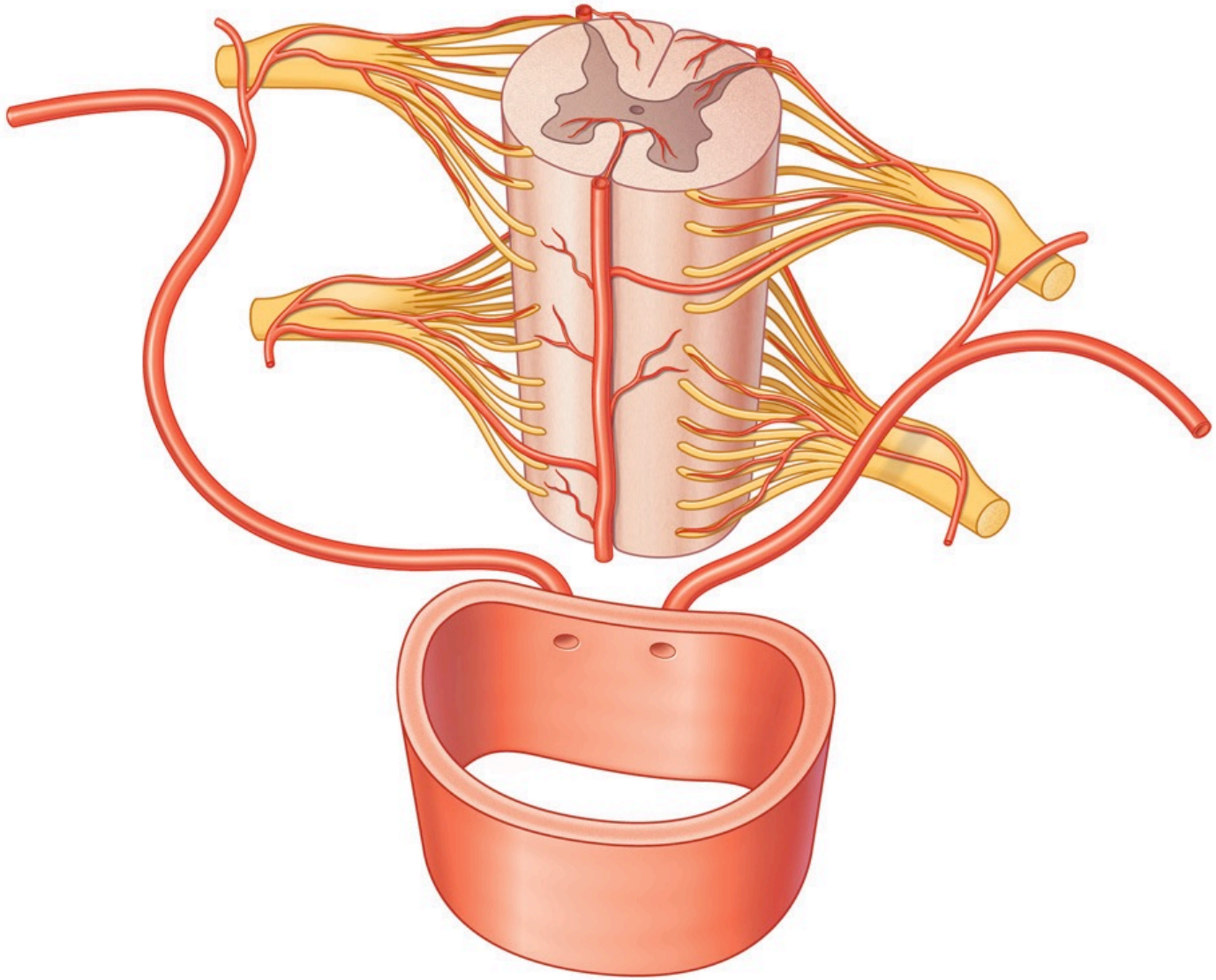


Grey´s Anatomy, 41th ed.

ARTERIAE M.S.

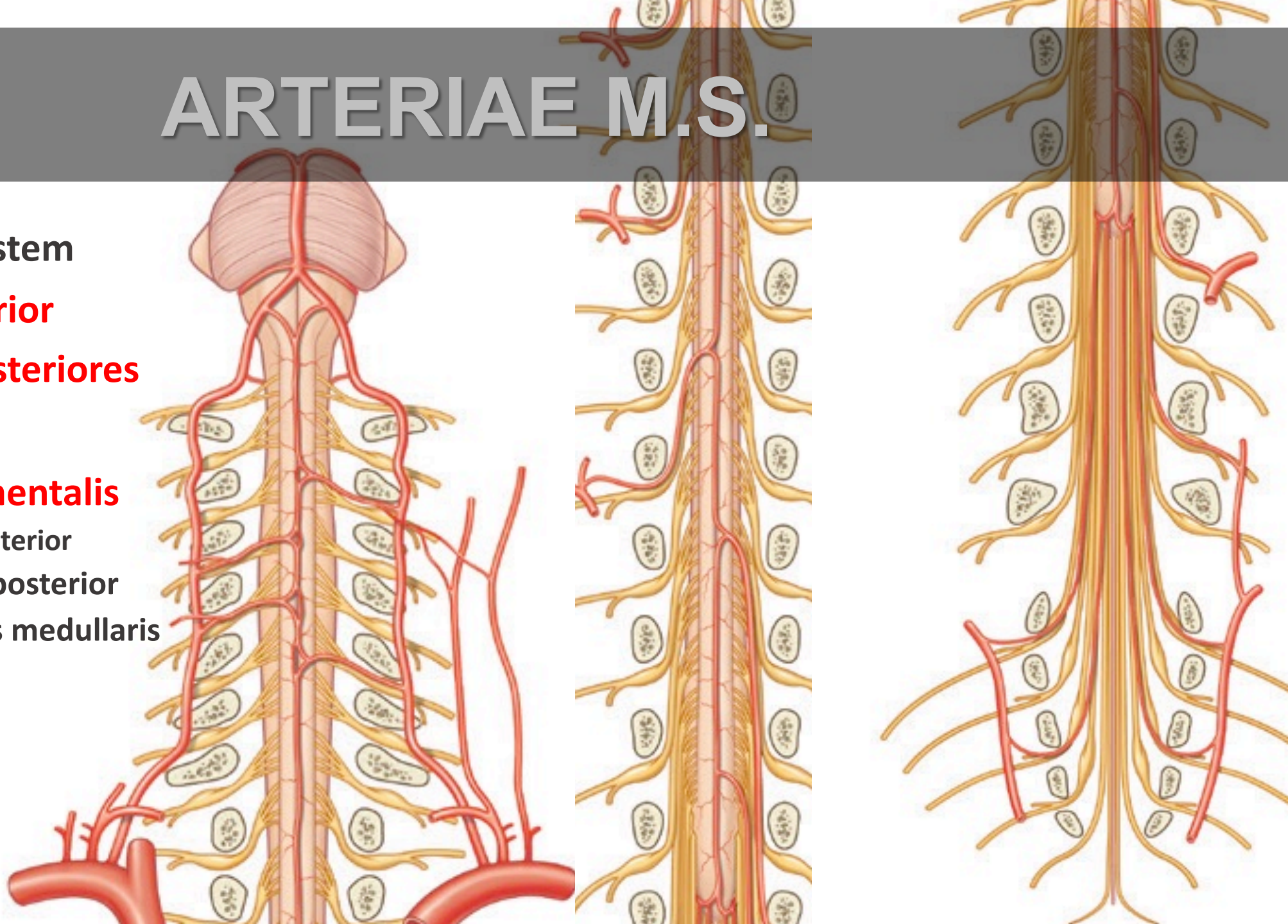
- Longitudinal system
- A. spinalis anterior
- Aa. spinales posteriores
- Feeder system
- A. spinalis segmentalis
  - A. radicularis anterior
  - A. radicularis posterior
  - A. segmentalis medullaris

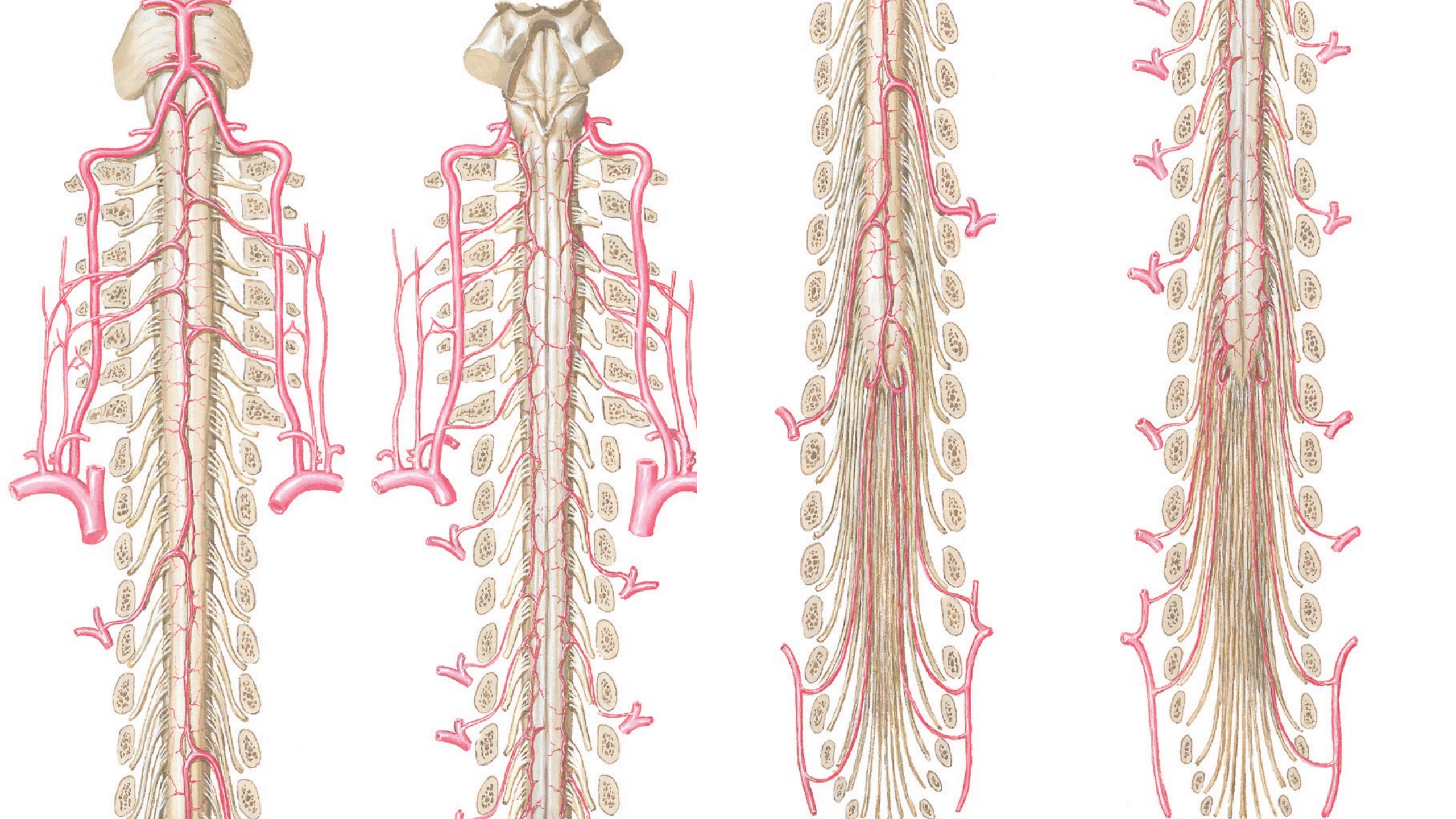




ARTERIAE M.S.

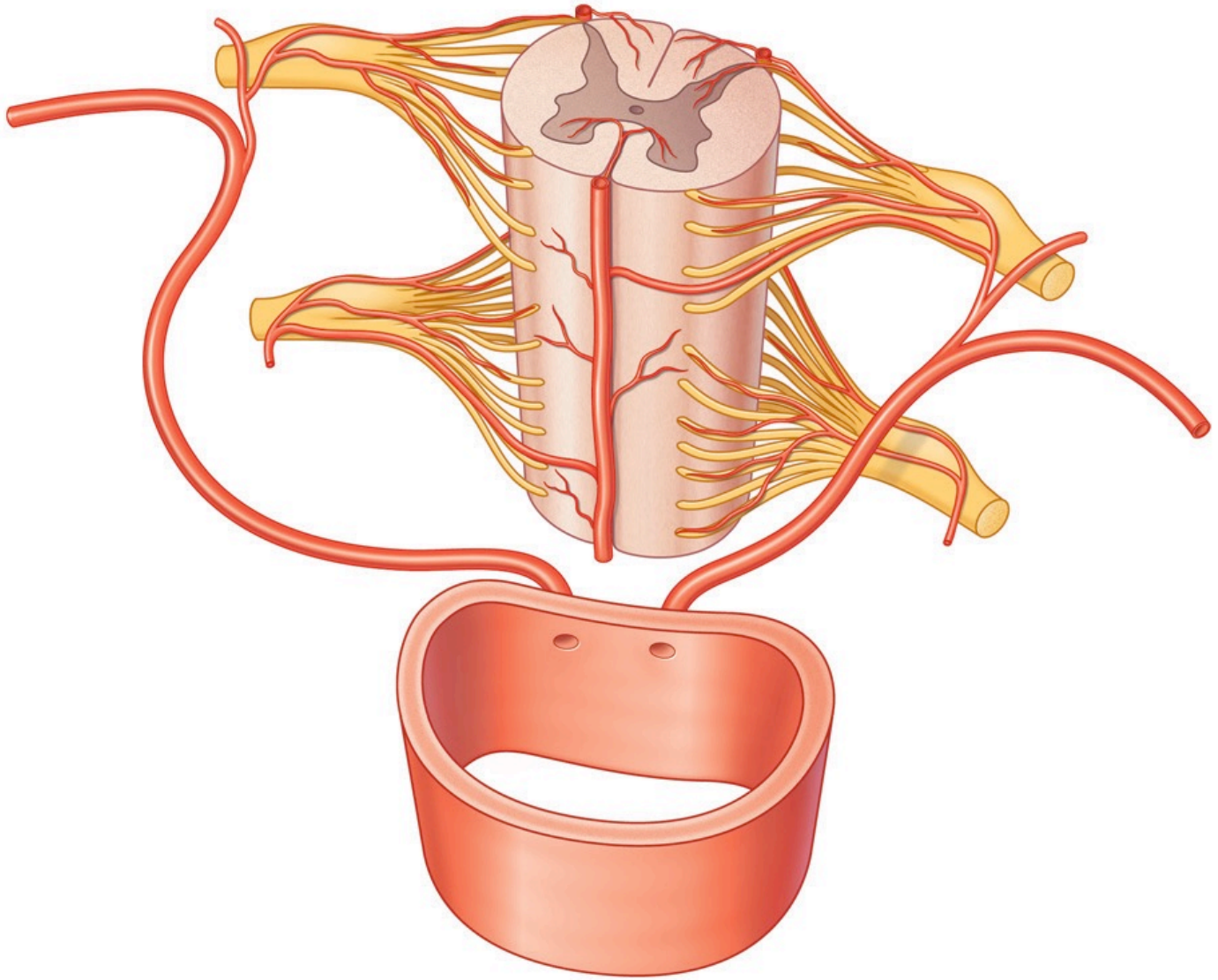
- Longitudinal system
- A. spinalis anterior
- Aa. spinales posteriores
- Feeder system
- A. spinalis segmentalis
  - A. radicularis anterior
  - A. radicularis posterior
  - A. segmentalis medullaris





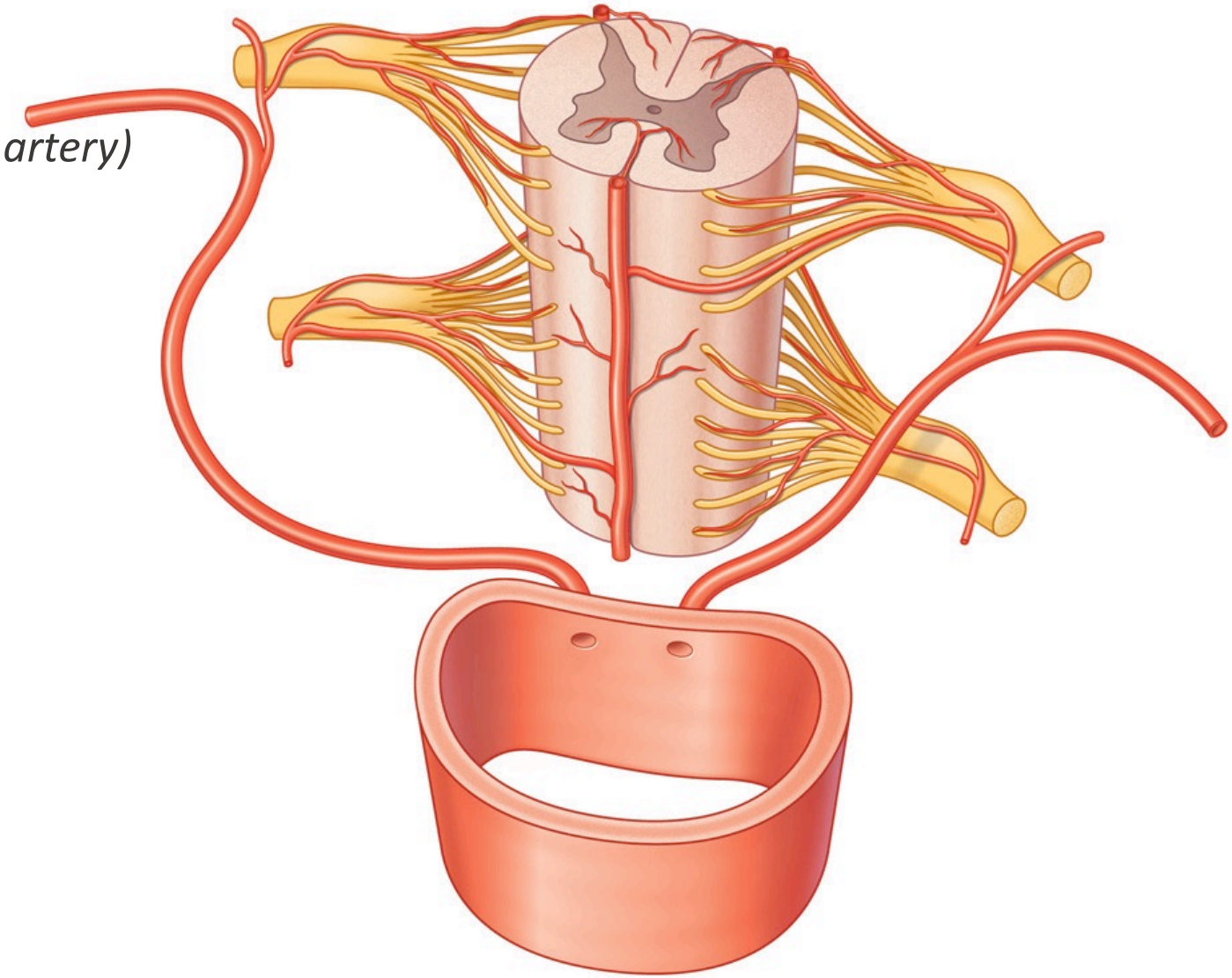
ARTERIAE M.S.

- Longitudinal system
  - A. spinalis anterior
  - Junction of aa. vertebrales branches
  - Descending in fissura mediana anterior
  - supplies columnae anteriores
  - Aa. spinales posteriores
  - Branches of terminal a. vertebralis branch
  - a. cerebeli posterior inferior
  - PICA - posterior inferior cerebellar artery
  - Descending in sulcus posterolateralis
  - Feeds columnae posteriores

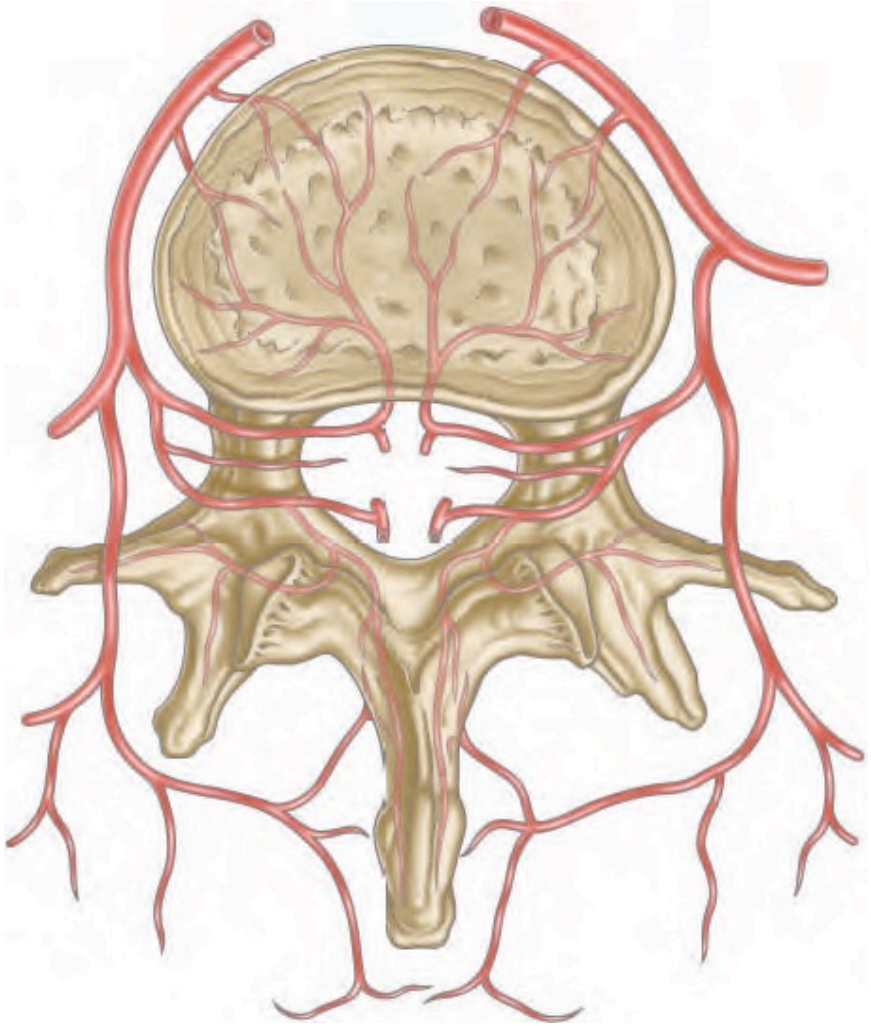


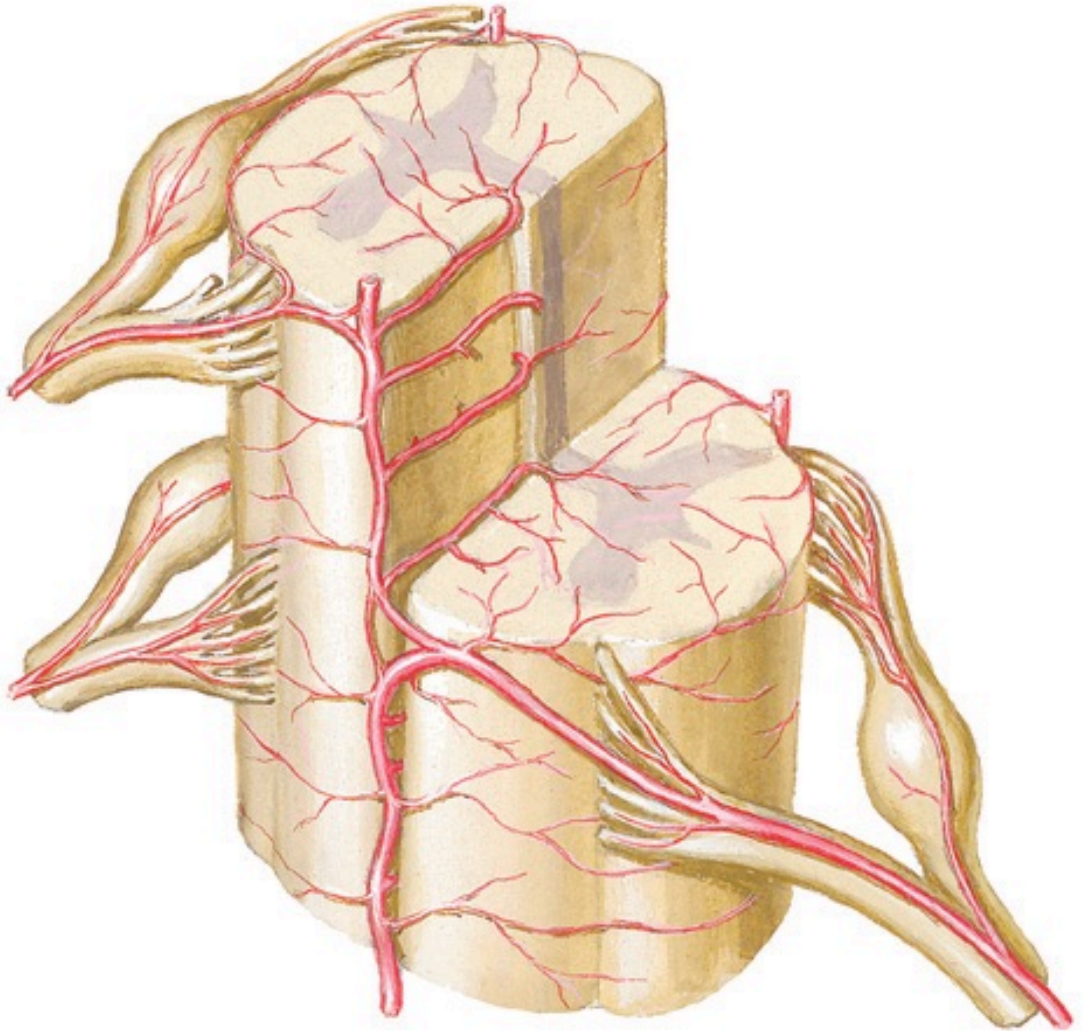
ARTERIAE M.S.

- **Feeder arteries**
- **A. spinalis segmentalis** *(segmental spinal artery)*
  - Every vertebral level
  - (aa. intercostales post, aa. lumbales)
  - Following and supplies n. spinalis
  - **branches**
  - **A. radicularis anterior**
    - **radix anterior**
  - **A. radicularis posterior**
    - **Zradix posterior**
    - **aa. spinales posteriores**
  - **A. segmentalis medullaris**
    - **Not at all levels**
    - **Enhancing a. spinalis anterior**



ARTERIAE M.S.

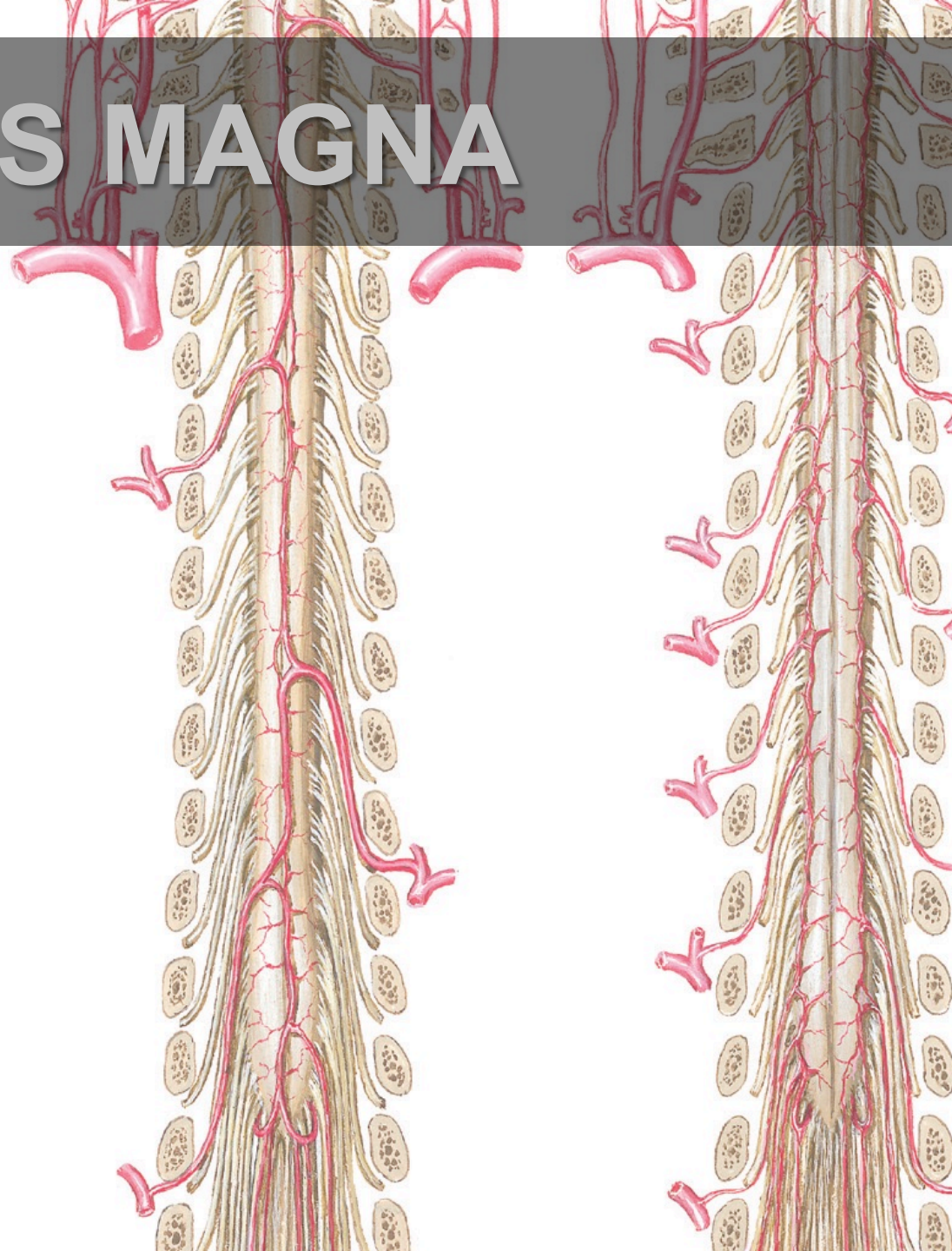




A. RADICULARIS MAGNA

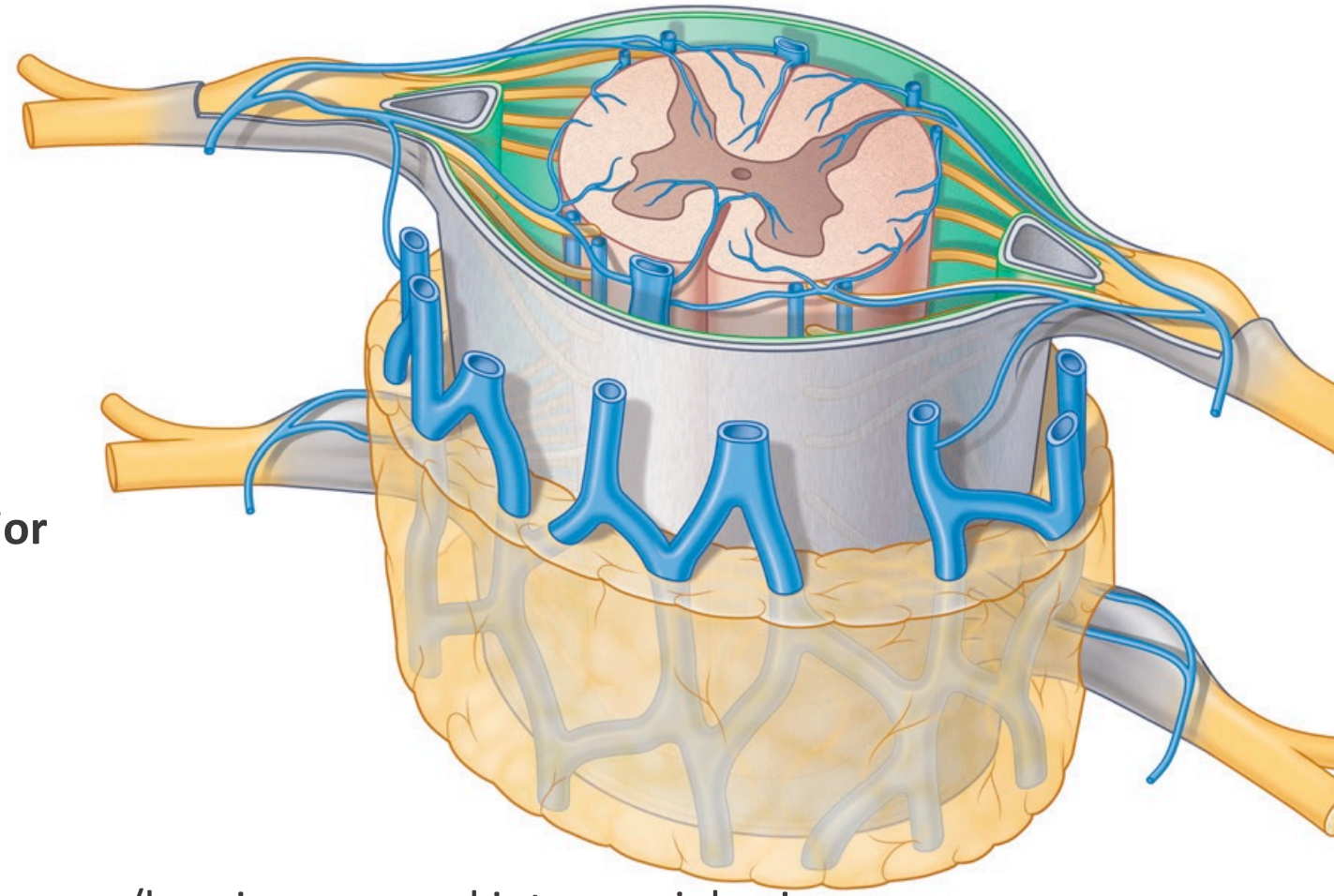
- A. radicularis magna Adamkiewicz
- Clinical term
- Strong left-sided inflow of a. spinalis anterior
- Thoracic or upper lumbar
- Enhancing the flow to intumescentia lumb.
- Vainant - arises from a. bronchialis
- Occlusion - ischemia - paraplegia

A. RADICULARIS MAGNA

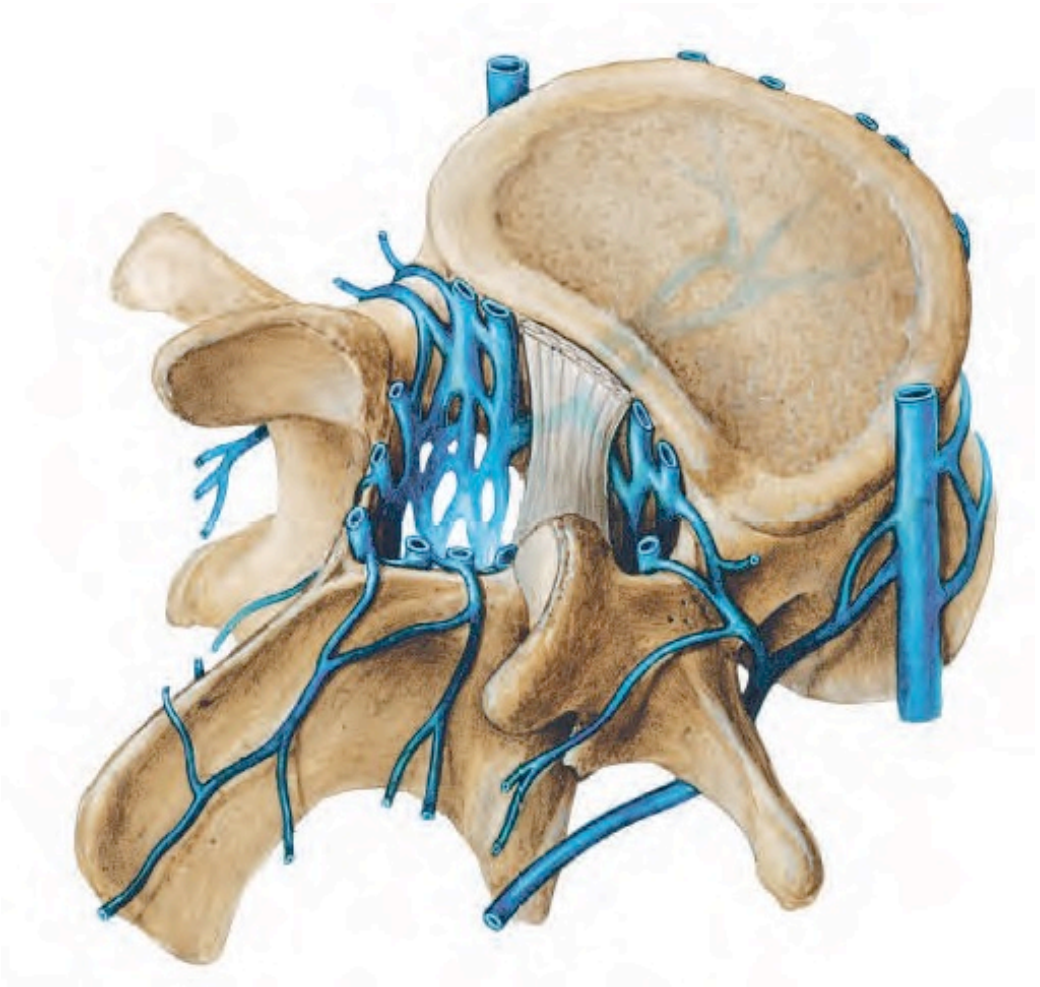


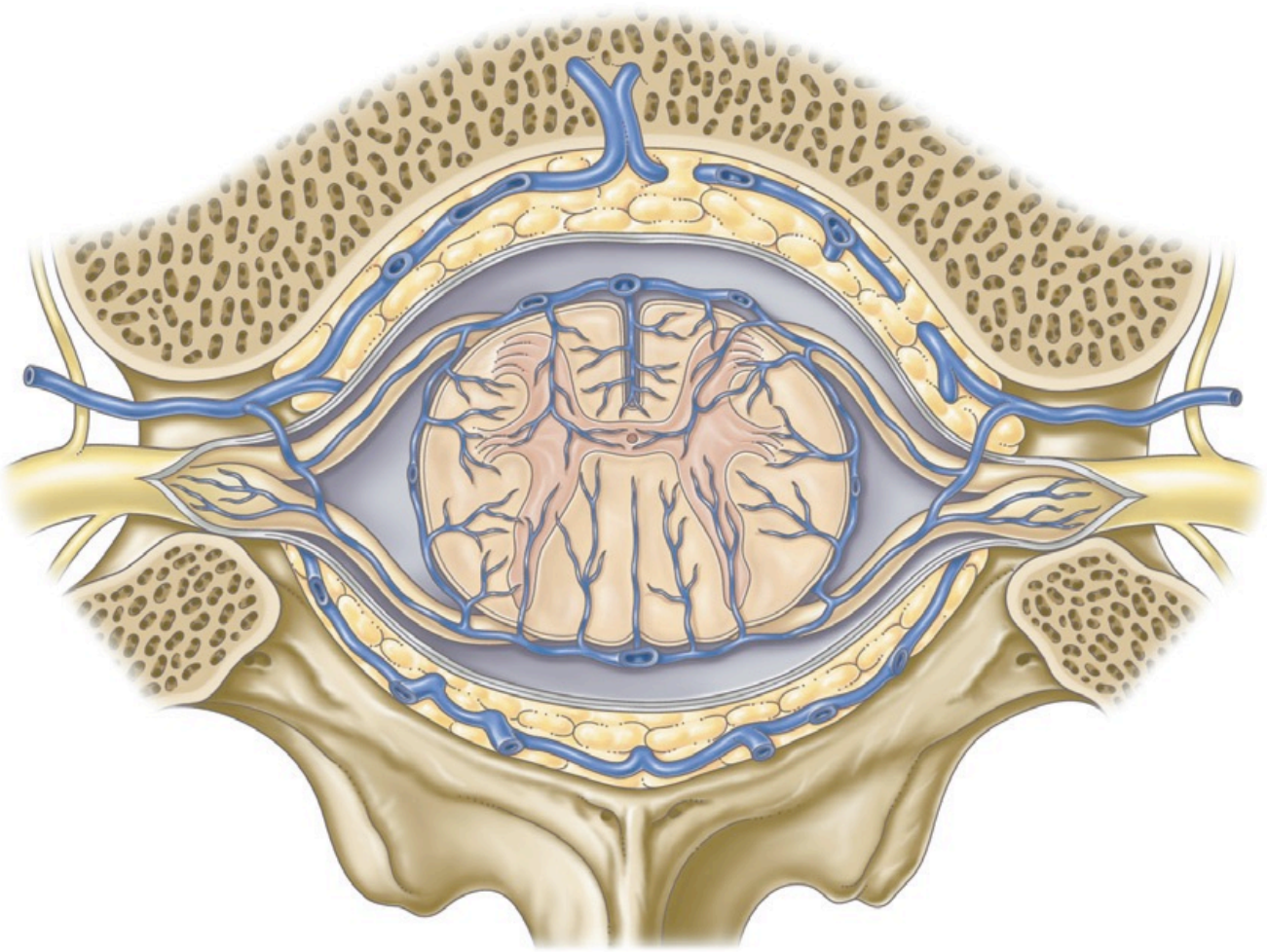
VENAE M. SPINALIS

- Several longitudinal systems
  - Horizontal connections
- Two pairs of veins
  - Ad radices
  - Total four couples of veins
- V. spinalis anterior
  - Fissura mediana right of a. spinalis anterior
- V. spinalis posterior
  - In sulcus medianus posterior
- Plexus vertebralis internus
  - Epidural space
  - Connected with v. lumbalis ascendens, v. azygos/hemiazygos and intracranial veins



VENAE M. SPINALIS





IMAGING OF THE SPINAL CORD

- In vivo only magnetic resonance imaging