

# MEDULLA SPINALIS

Ústav anatomie 2. LF

R. Druga

A decorative graphic consisting of several sets of concentric circles in a lighter shade of blue, located in the bottom right area of the slide.

# Míšní segmenty

C 8

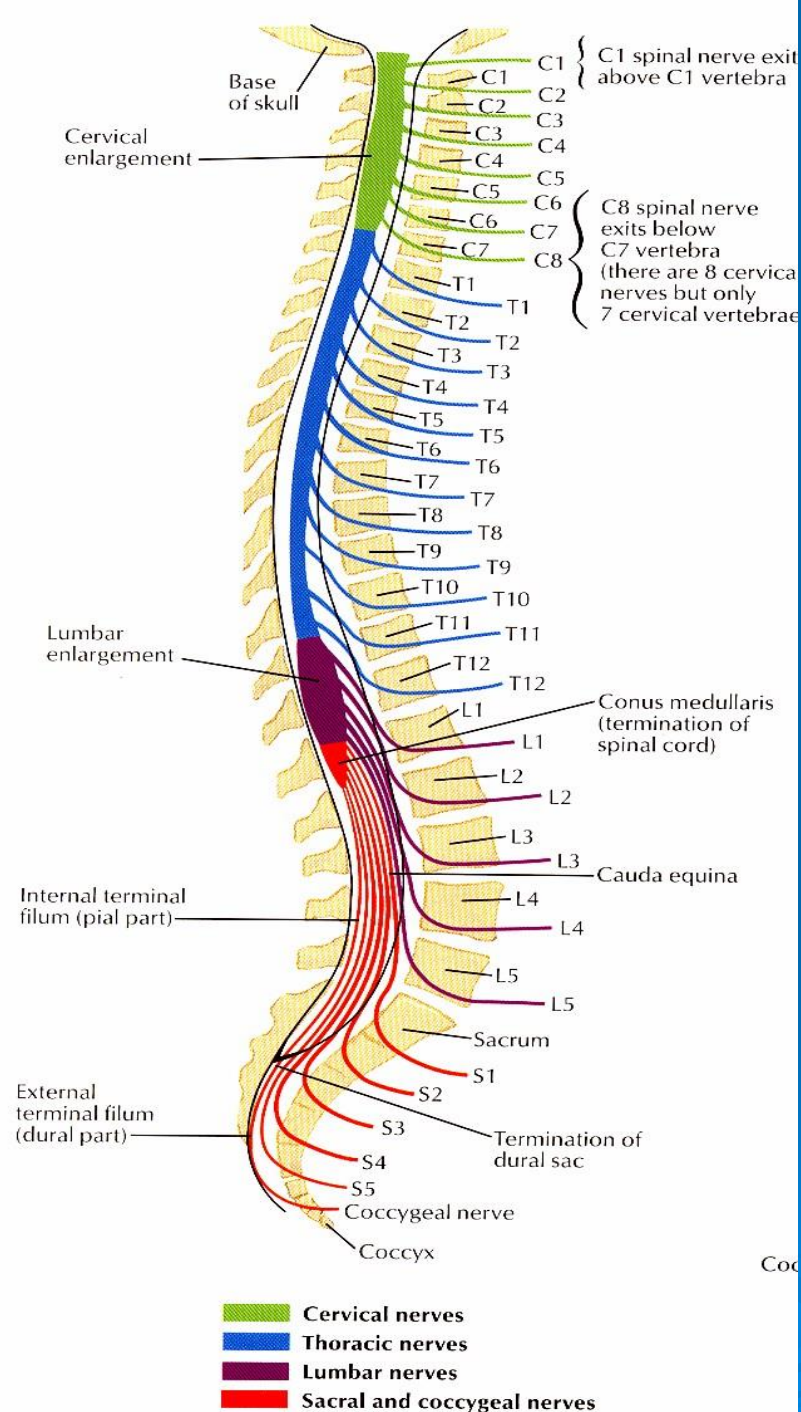
T 12

L 5

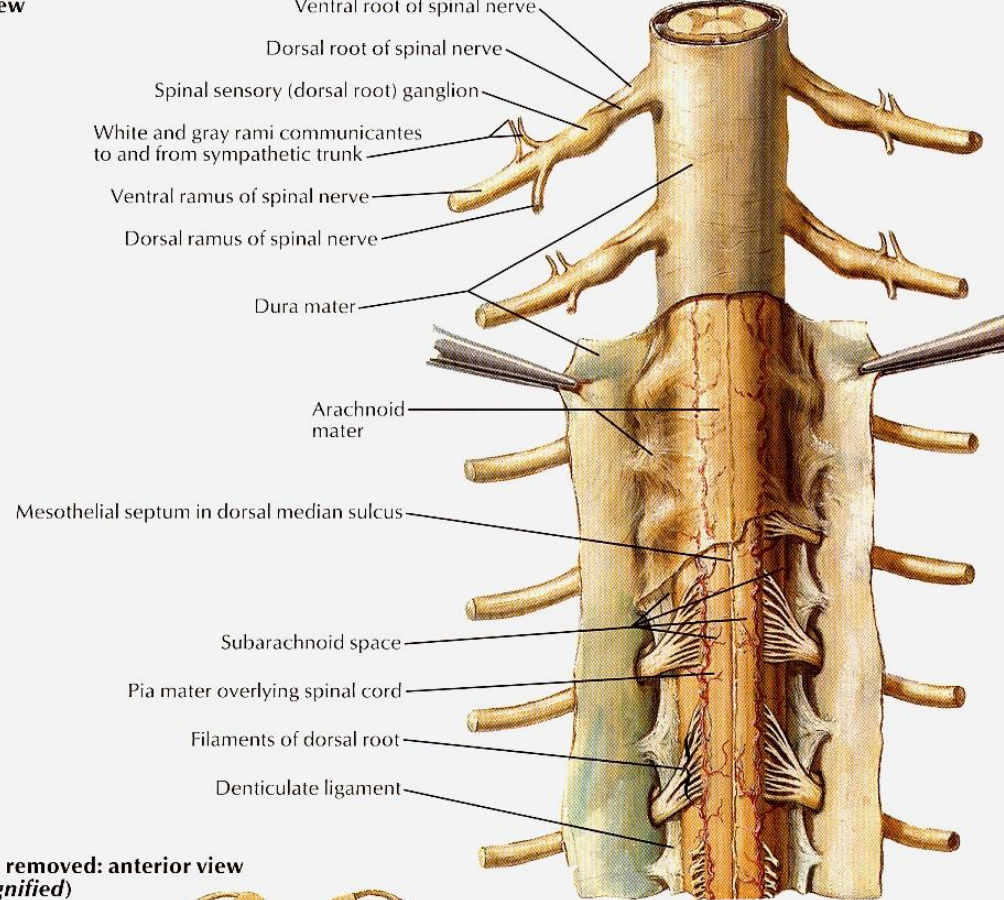
S 5

Co

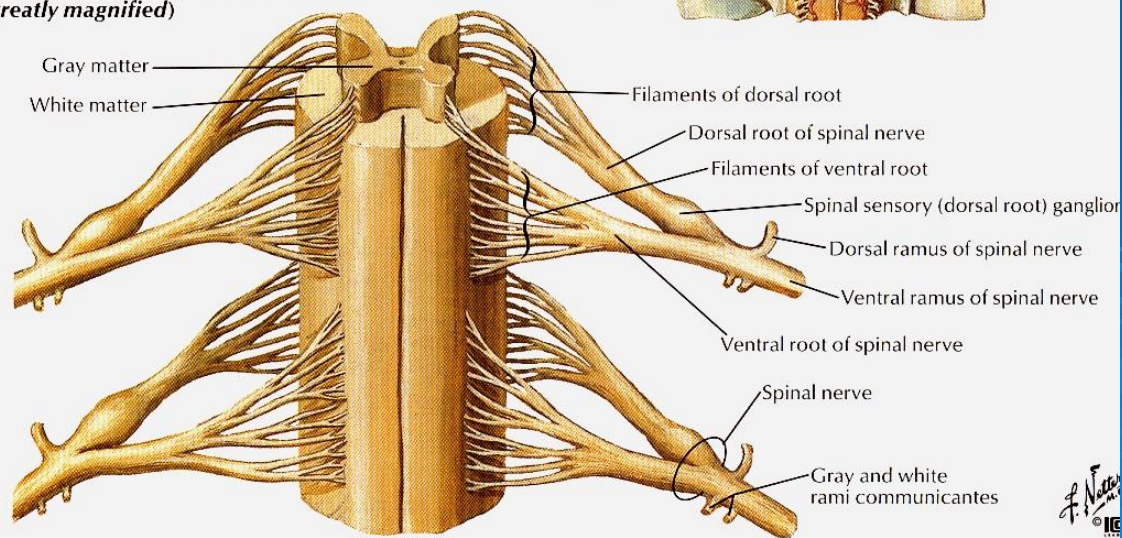
**Kaudální konec  
míchy (L 1/ L 2) !!**



**Posterior view**

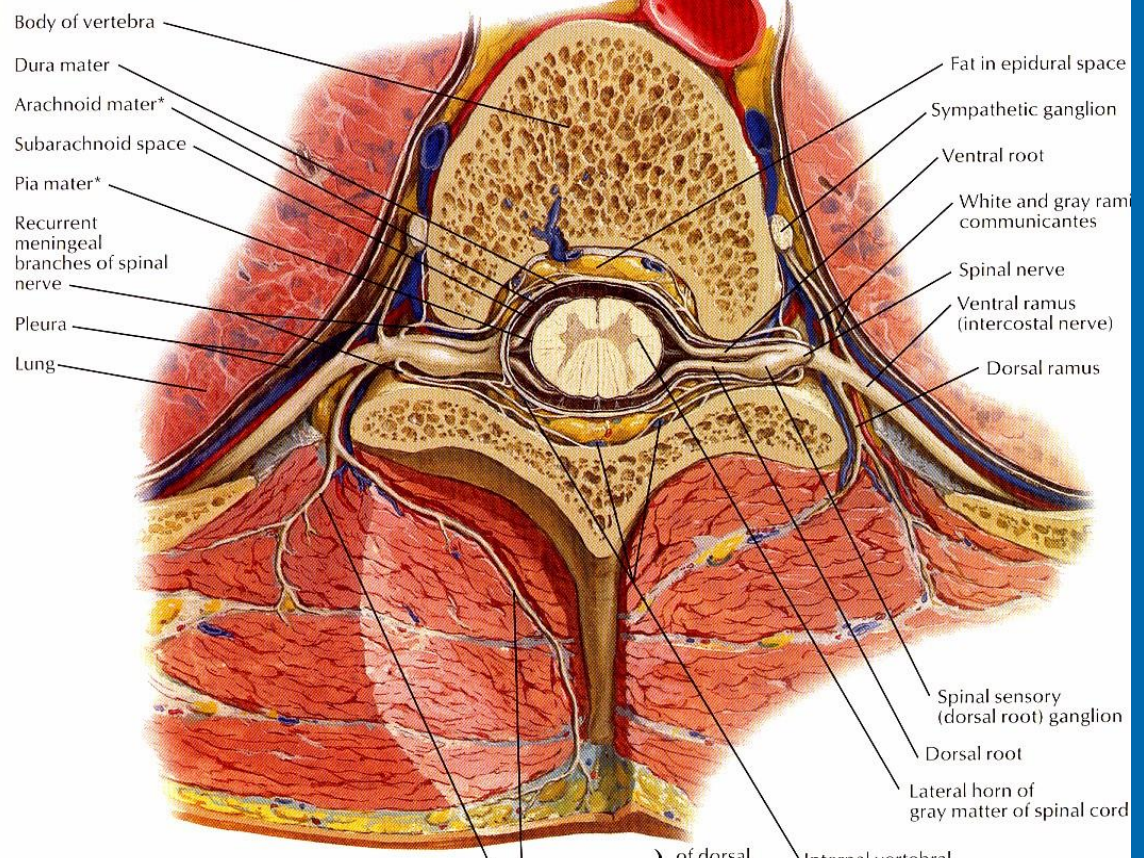


**Membranes removed: anterior view  
(greatly magnified)**

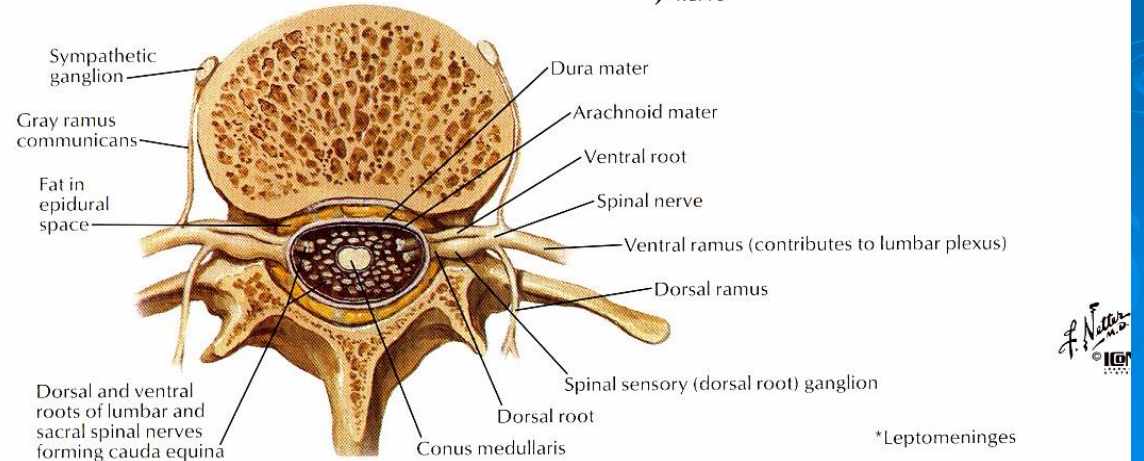


Pleny a prostory

**Section through thoracic vertebra**

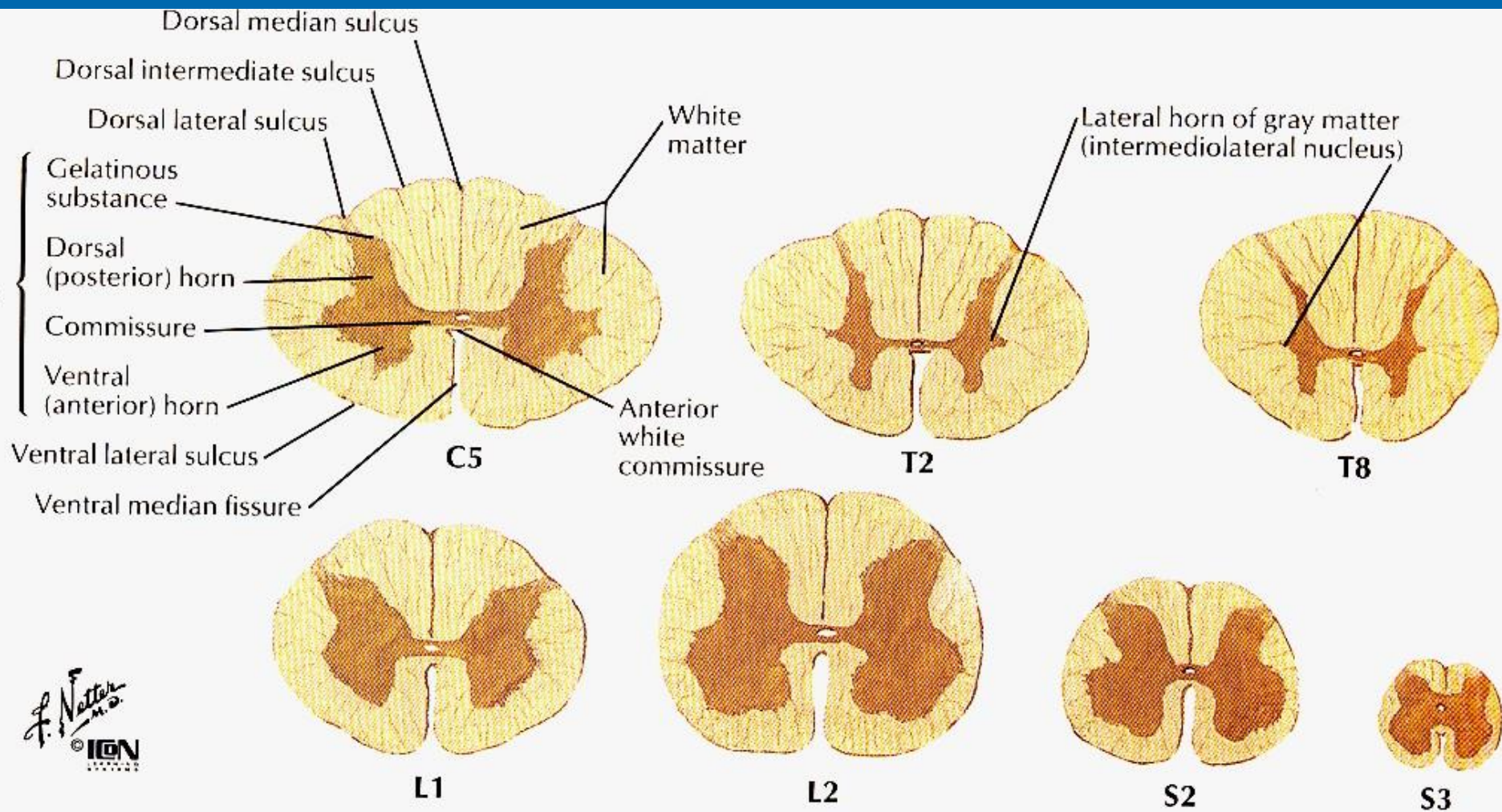


**Section through lumbar vertebra**



F. Netter M.D.

\*Leptomeninges



# Členění šedé míšní hmoty



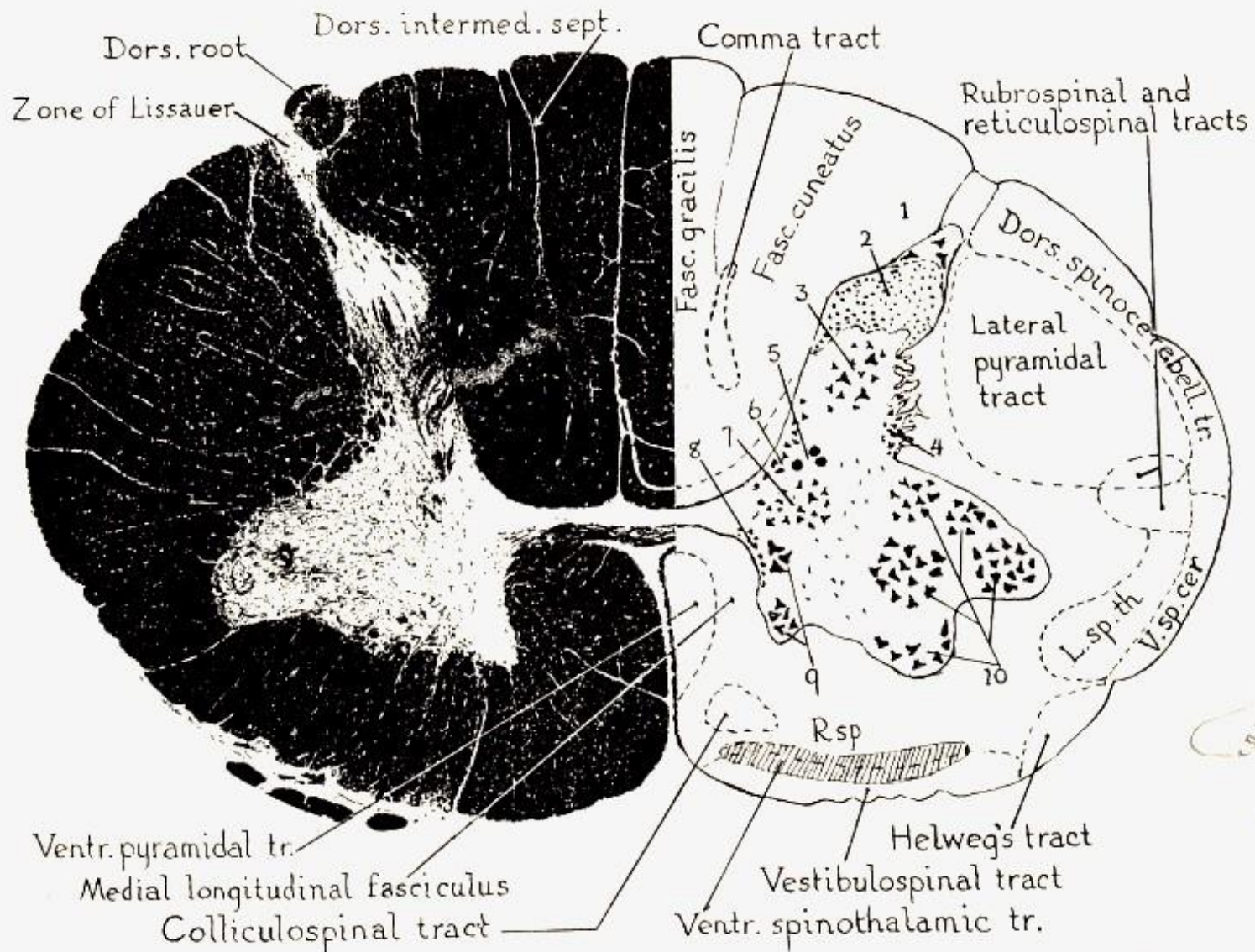


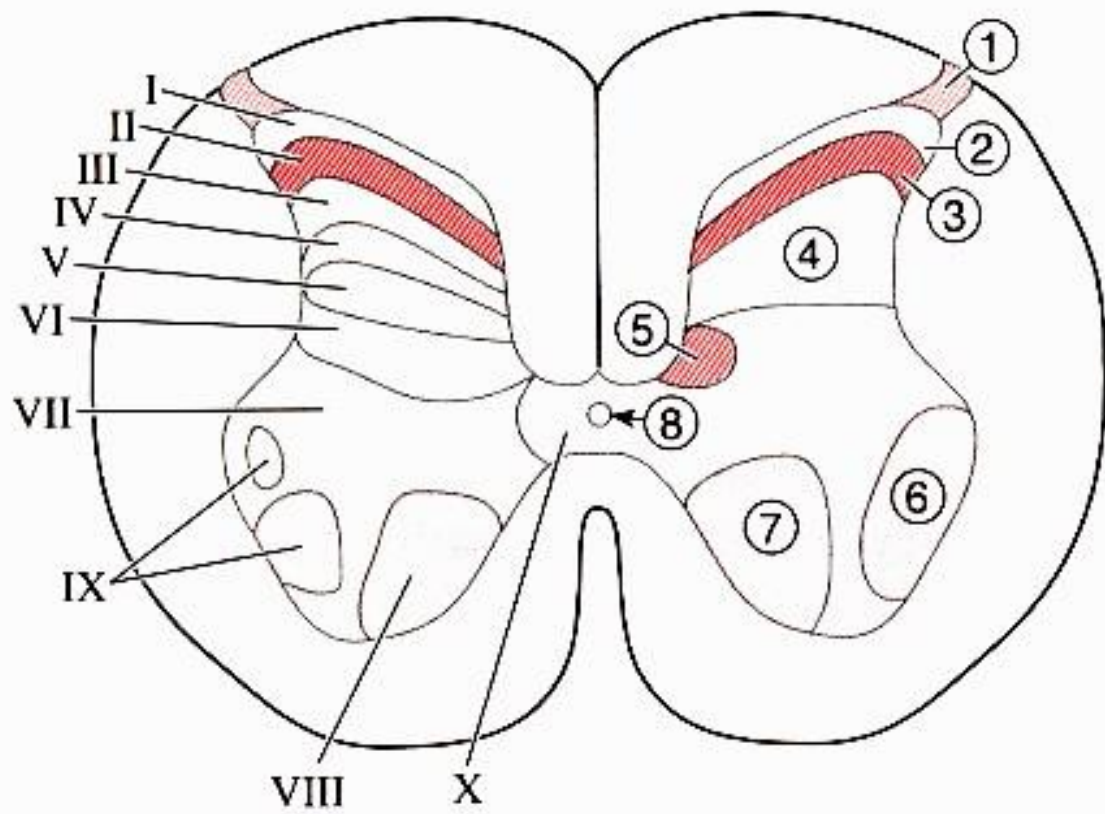
FIG. 112. Section through adult human spinal cord at level of C7-C8. Weigert's myelin stain. Photograph. On the right side the cell groups (1-10) and fiber tracts are diagrammatically indicated. 1, cellulae posteromarginales; 2, substantia gelatinosa; 3, nucleus proprius cornu dorsalis; 4, nucleus reticularis; 5, Clarke's column; 6, nucleus cornucommissuralis posterior; 7, nucleus intermedio-medialis; 8, nucleus cornucommissuralis anterior; 9, nuclei motorii mediales; 10, nuclei motorii laterales; *L.sp.th.*, lateral spinothalamic tract; *R.sp.*, reticulospinal fibers; *V.sp.cer.*, ventral spinocerebellar tract.

Nc. proprius – (lamina IV.-V.) tr. spinothalamicus, tr. spinotectalis, tr. spinoreticularis

Nc. Thoracicus posterior (Stillingovo–Clarkeovo jádro) –(lamina V. – VI.)

Tr. spinocerebellaris posterior (T 1 – L 3)

Tr. spinocerebellaris anterior (L 1 -S 5)

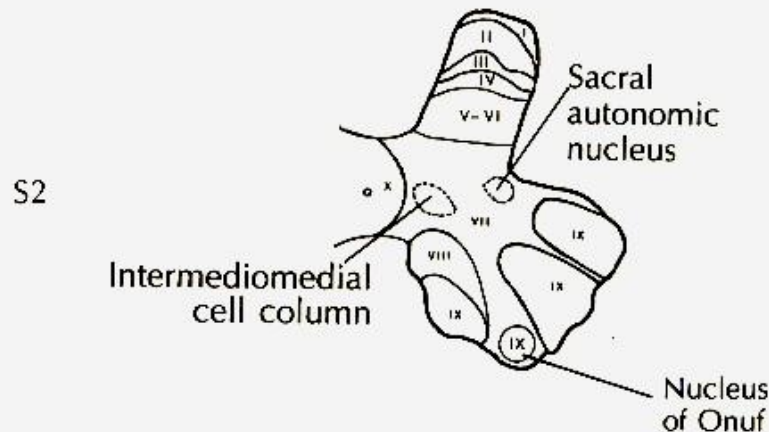
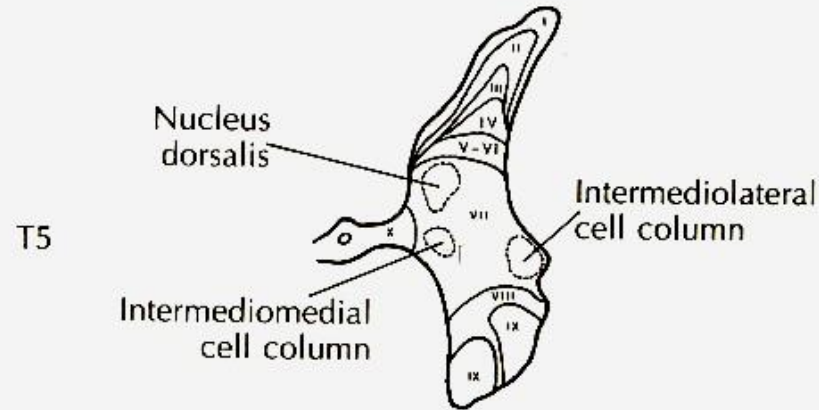
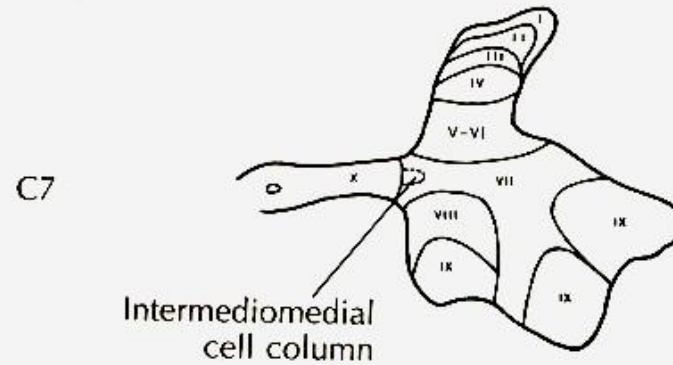


**Abb. 3-19** Einteilung der Grauen Substanz des Rückenmarks, Querschnitt.  
links: REXED-Schichten (römische Zahlen)  
rechts: Kerngebiete  
rot: wichtige Schichten bzw. Kerngebiete  
1 Tractus posterolateralis (LISSAUER)  
2 Zona marginalis  
3 Substantia gelatinosa  
4 Nc. proprius  
5 Nc. thoracicus  
6 Lateraler motorischer Kern  
7 Medialer motorischer Kern  
8 Canalis centralis mit Substantia gelatinosa centralis



Nc. Phrenicus

C3 – C5



Nc. intermediolateralis  
Sympatikus (C8 – L2)

Nc. intermediolateralis  
Parasympatikus (S2 – S4)

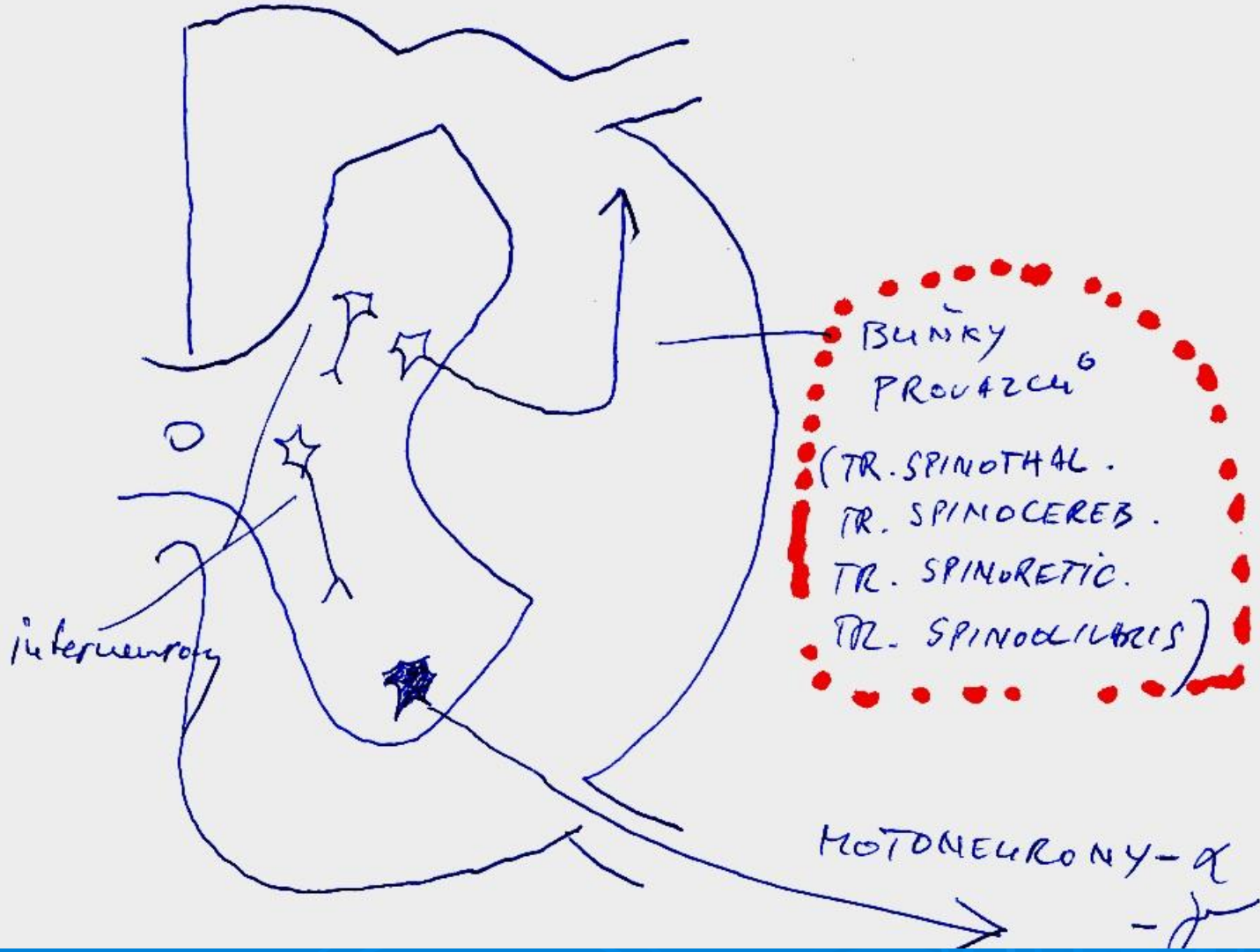
Onufovo jádro

Svěrače (m-  
sphincter ani ext.,  
urethrae ext.)

m. ischiocavernosus

m. bulbospongiosus

# Základní typy neuronů v míšni šedi

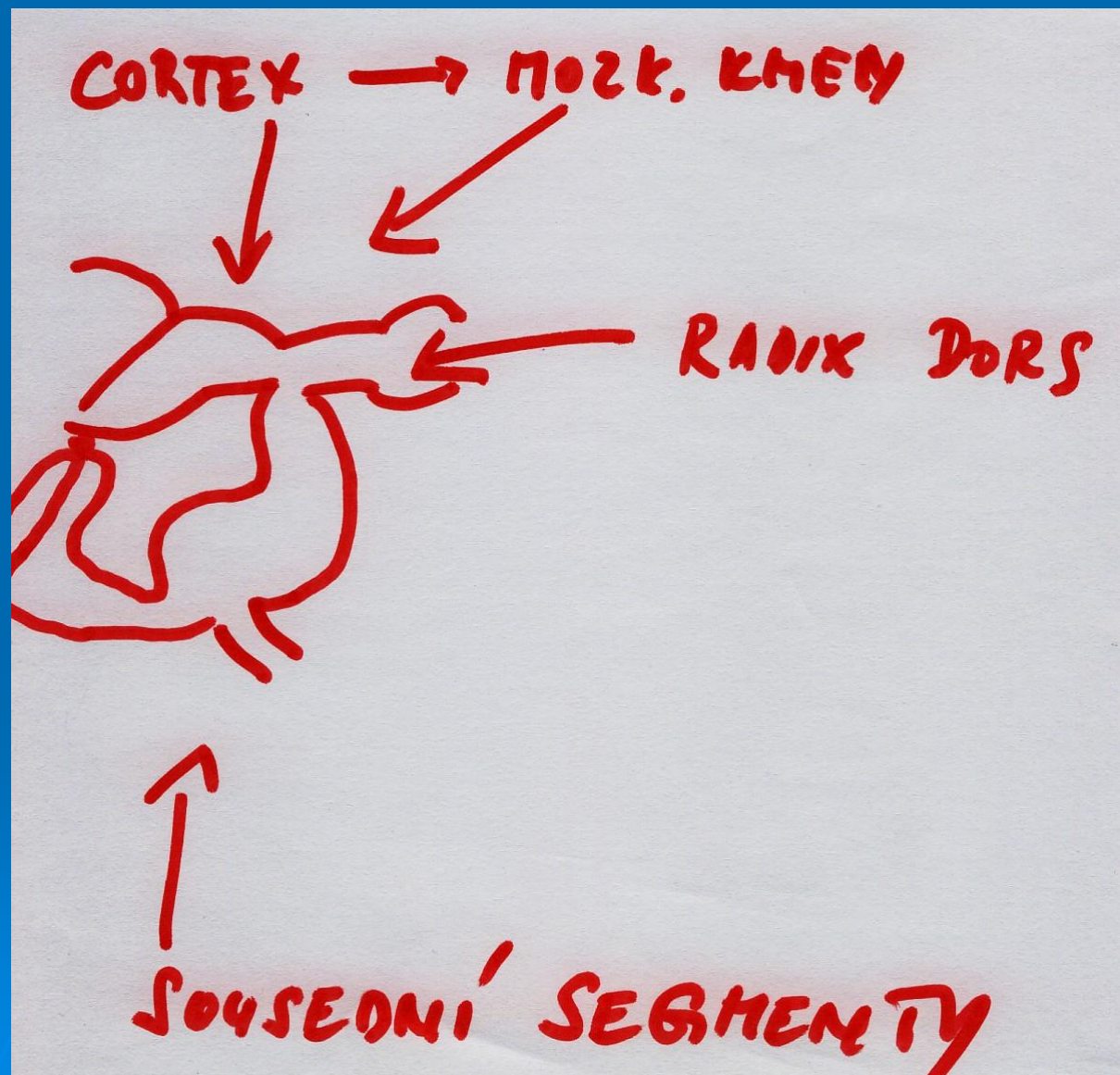


Pregangliové neurony sympatiku a parasympatiku

# Členění bílé míšníhohmoty - míšní dráhy

ascendentní – sensitivní  
descendentní – motorické  
intersegmentové (fasc. proprii)

## Inervace míšního segmentu

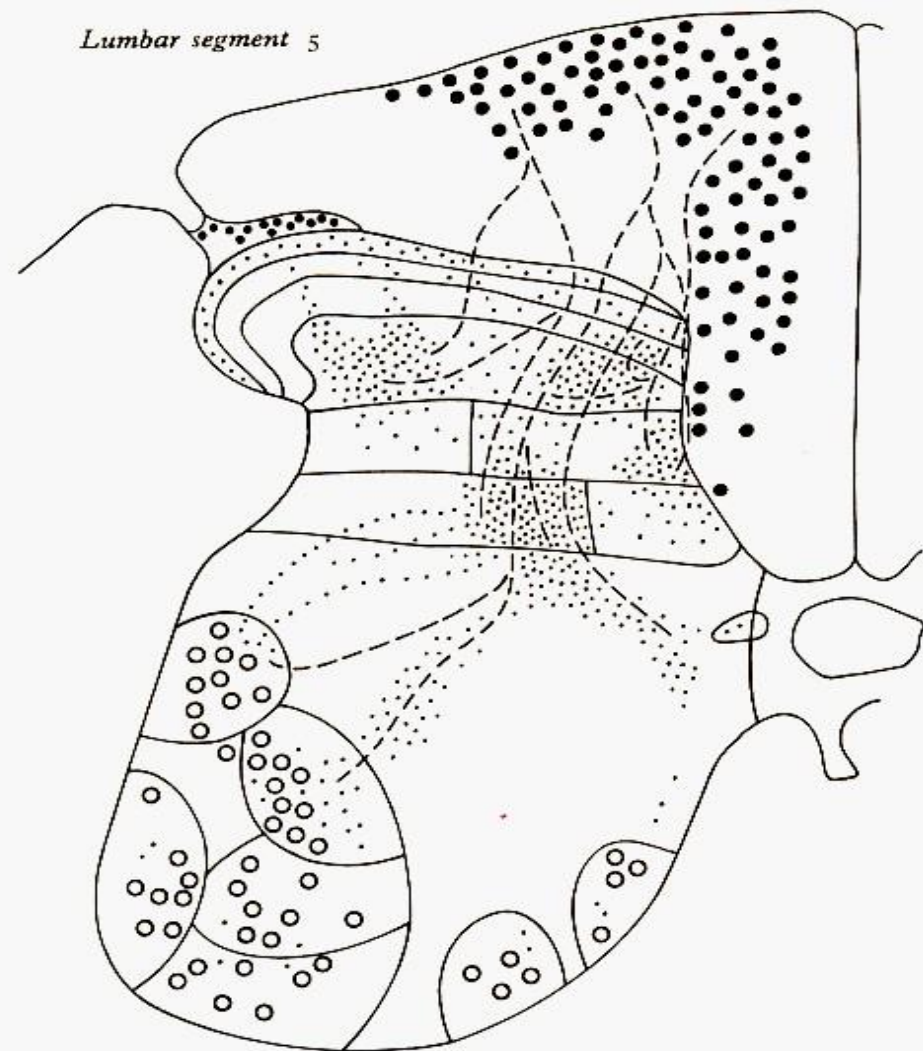


# Radix posterior

vlákna z radix posterior se  
rozdělí do dvou směrů :

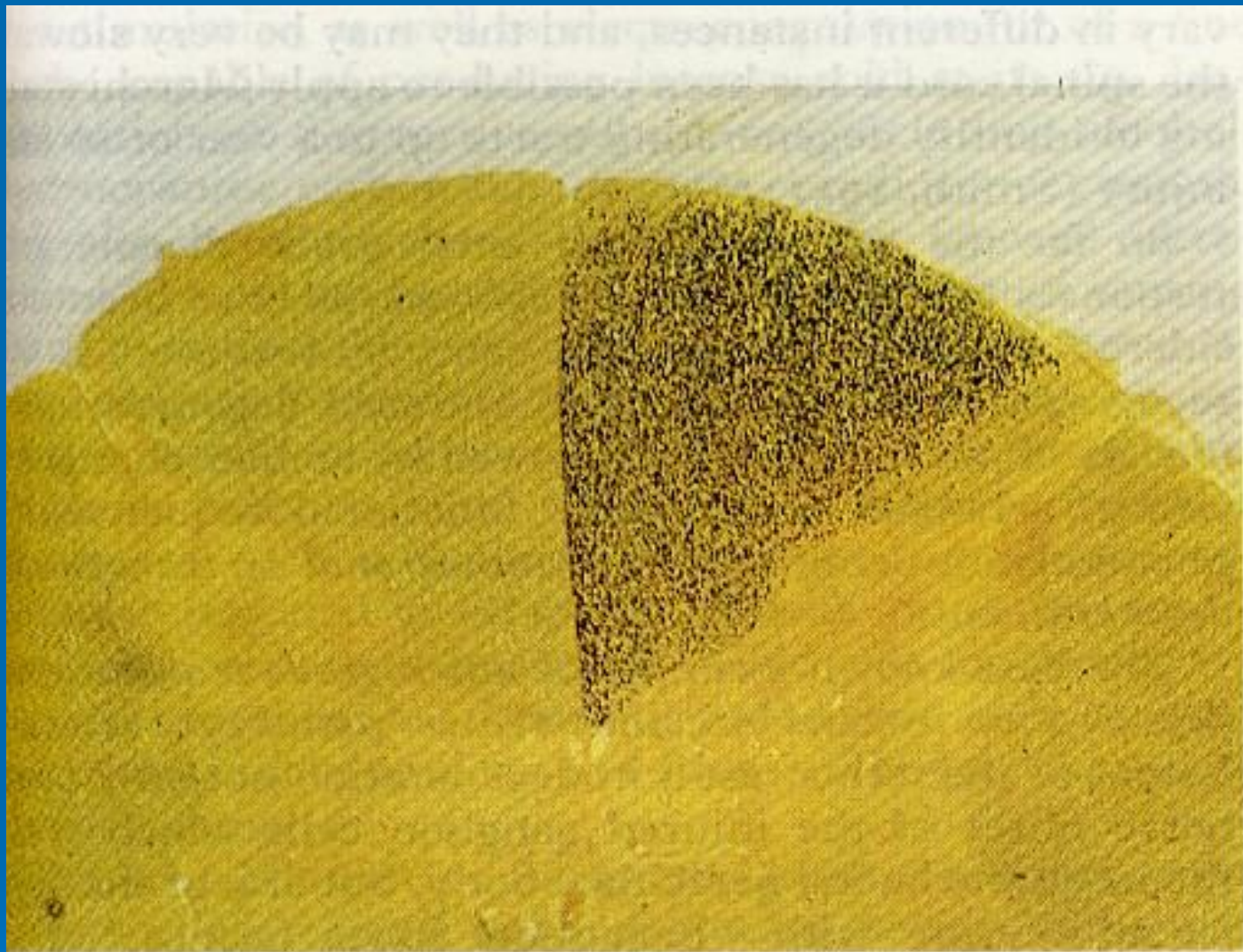
a) Zadní míšň  
provazce

b) Míšň šed'



A

7.50 A-C The pattern of degeneration of nerve fibres and their terminals, demonstrated with the Nauta-Laidlaw technique in the ipsilateral half of the spinal cord at various segmental levels, five days after surgical division of the *sixth* lumbar dorsal spinal nerve root of the cat. A the fifth

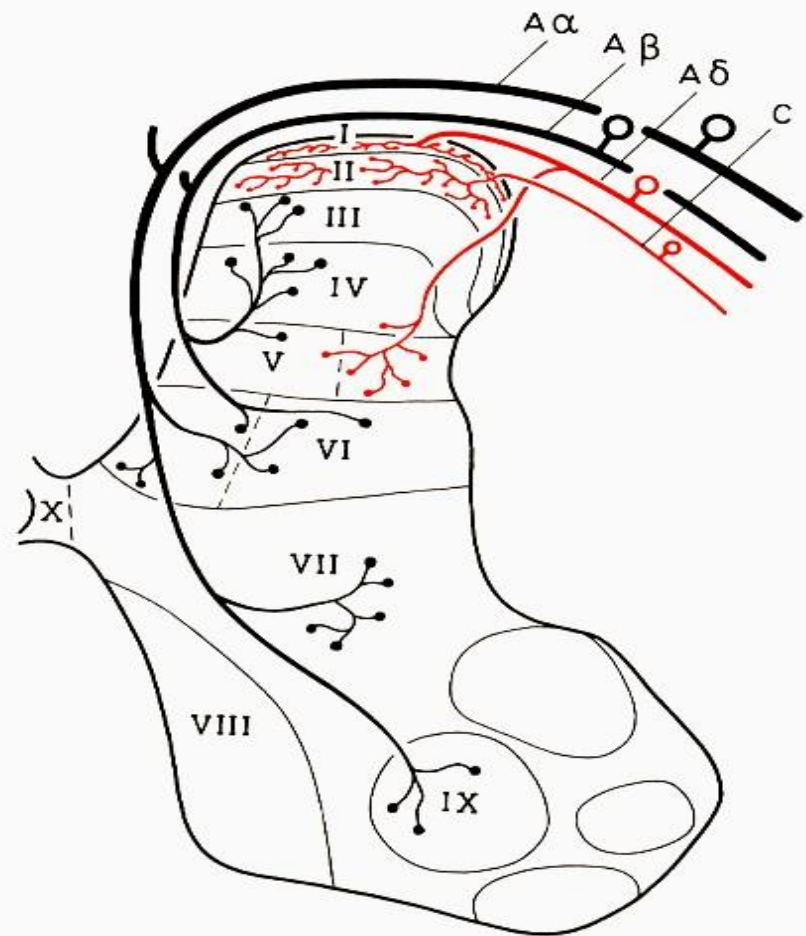


Transverse section through dorsal funiculi of feline cervical spinal cord, after unilateral dorsal column section at a more caudal level. Note anterograde Wallerian degeneration of ascending nerve fibres: degenerating myelin sheaths are stained black by Marchi technique. (Provided by Dr. E. W. Baxter, Dept. of Biology, Guy's Hospital Medical School.)

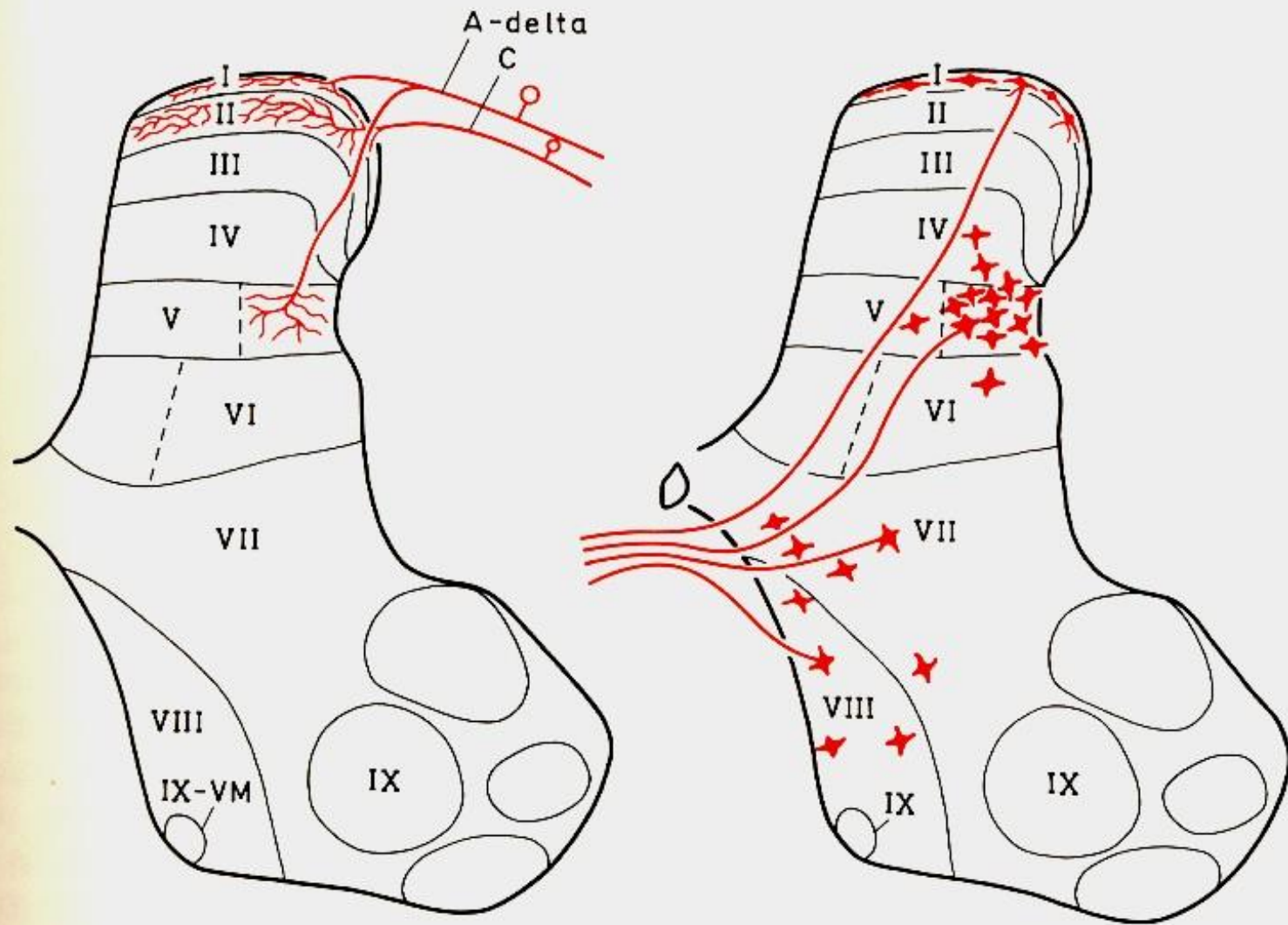
$A\alpha$  - svalová vřeténka,  
šlachová vřeténka

$A\beta$  - kožní  
mechanoreceptory

$A\delta$  a C - nociceptory



**Fig. 4.10.** *The terminal regions of the dorsal root fibers in the cord. The thickest myelinated fibers ( $A\alpha$ , from muscle spindles and tendon organs) end in the deep parts of the dorsal horn and partly also in the ventral horn. Thick, myelinated fibers from cutaneous mechanoreceptors ( $A\beta$ ) end in laminae III–VI. The thinnest myelinated and unmyelinated dorsal root fibers ( $A\delta$  and C)—many of them leading from nociceptors—end in laminae I, II, and parts of V. Based on experiments with axonal transport of tracer substances.*

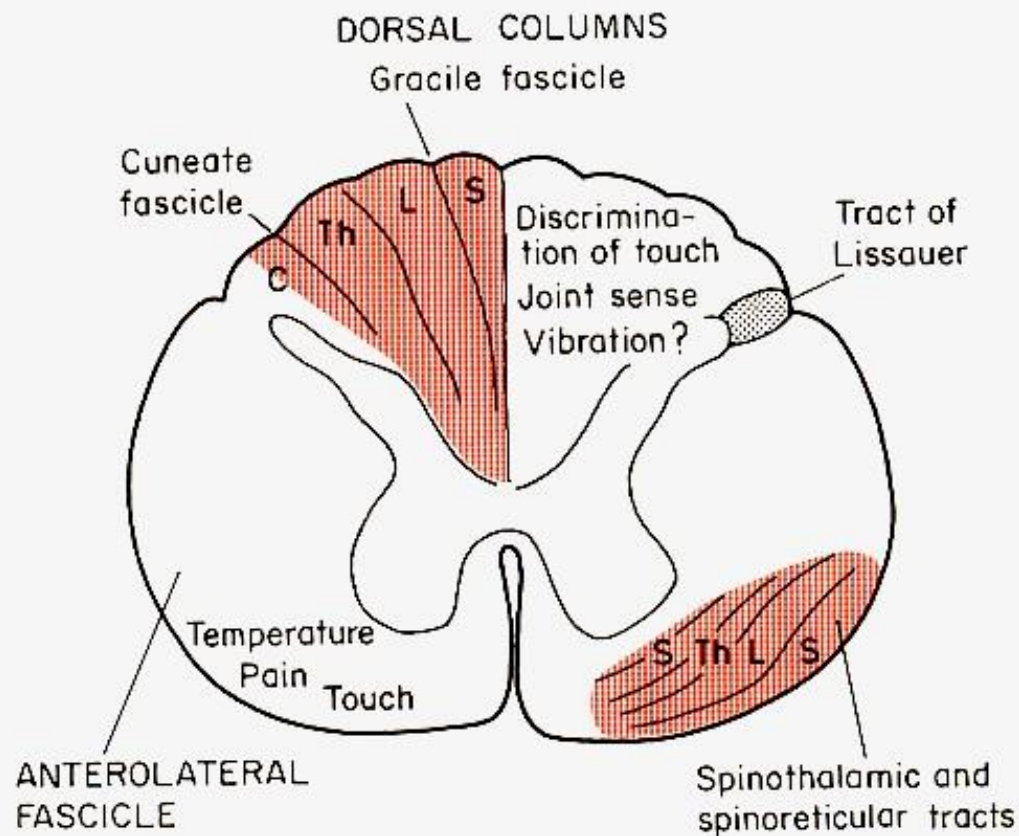


**Fig. 4.17.** *Signal transmission from nociceptors in the spinal cord.* The terminal region of thin dorsal root fibers leading from nociceptors, and the position of cells sending their axons to

the opposite thalamus (spinothalamic neurons). Note that lamina II (the substantia gelatinosa) receives many C fibers, but the neurons of this lamina do not send their axons to the thalamus.



# Dráha zadních míšních provazců uspořádaná podle: Kahlerova pravidla

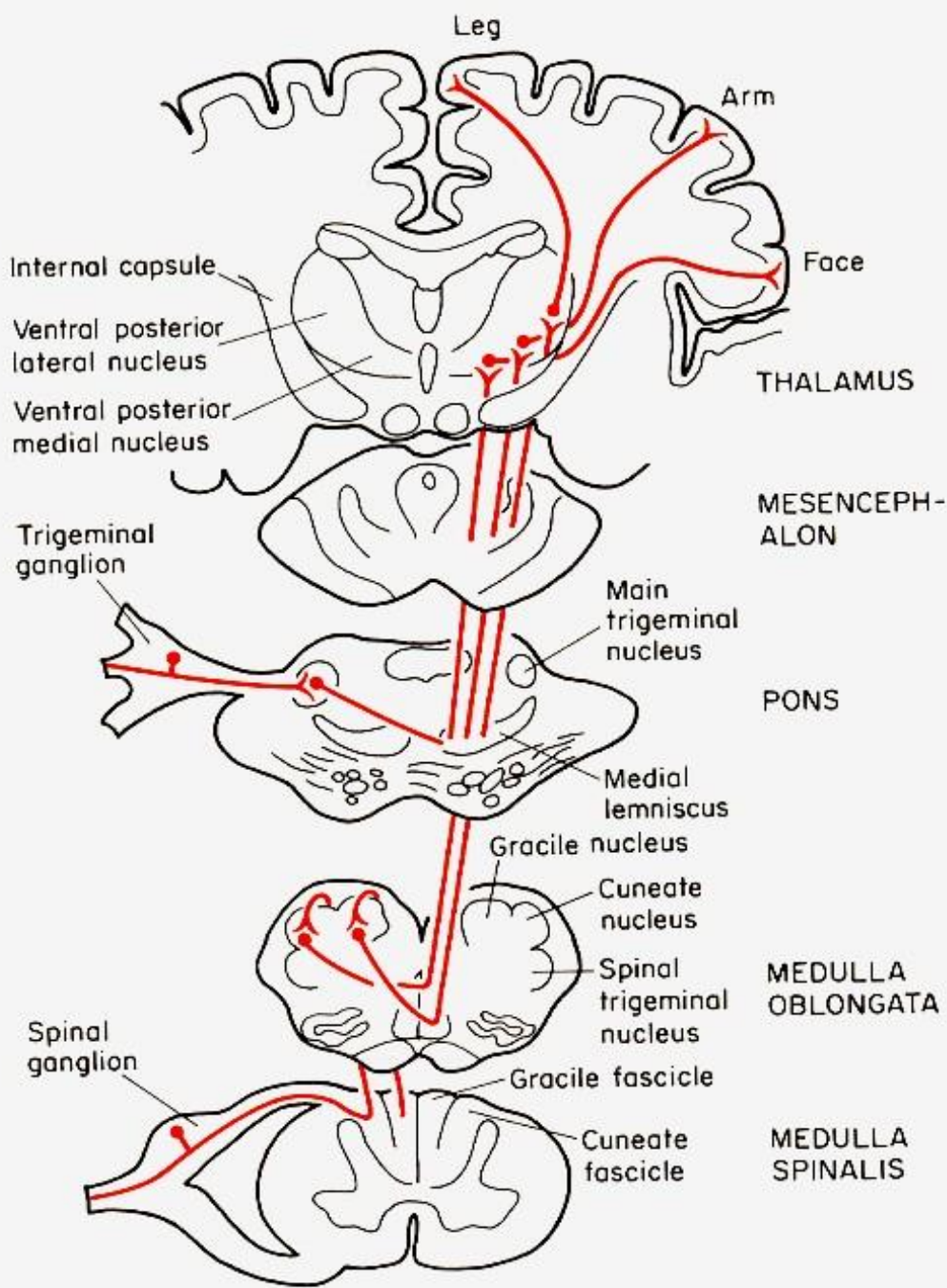


Tr. spinothalamicus

Fig. 4.15. Somatosensory pathways. Position and segmental arrangement in the spinal cord white matter.

Somatotopické uspořádání drah,

Funkční uspořádání drah

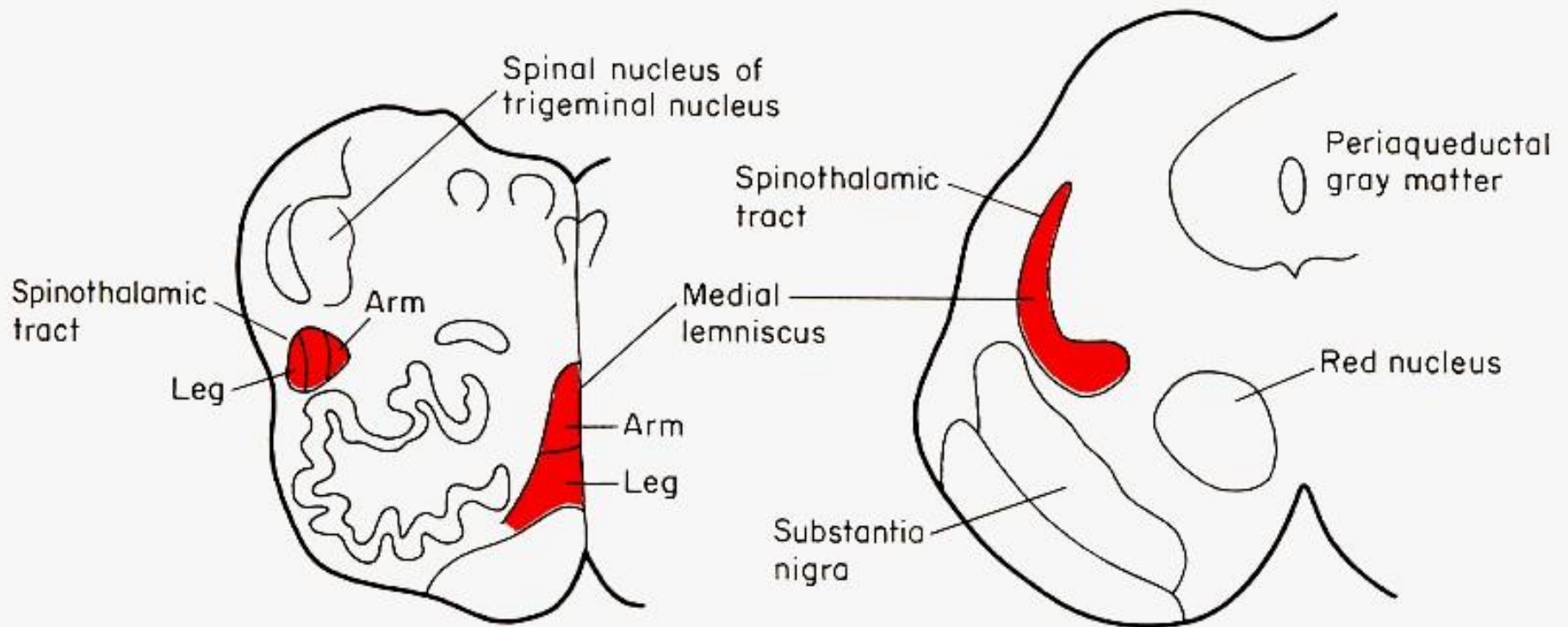


## Dráha zadních míšních provazců

### Tr. Spino – bulbo – thalamo-corticalis

**Fig. 4.13.** *The dorsal column–medial lemniscus pathway.* This is the main pathway for transmission of signals from low-threshold mechanoreceptors. Fibers leading impulses from mechanoreceptors in the face join the medial lemniscus in the brain stem.

## Lemniscus medialis a tr. spinothalamicus



**Fig. 4.16.** *Somatosensory pathways.* Position and somatotopic arrangement in the medulla and the mesencephalon.

# Sensitivní míšňí dráhy (vzestupné)

## ➤ **Lemniskový systém**

- Tr. Spinobulbaris – tractus bulbothalamicus x (lemniscus medialis (nc. VPL) – tractus thalamocorticalis (area 3,1,2)
- Dráha – diskriminačního, vibračního a dotykového čítí

## ➤ **Anterolaterální systém**

- **Tractus spinothalamicus** – spinální ganglia – lamina I, II, IV . X - tr. Spinothalamicus – nc. VPL, ncc. Intralaminare, ncc. Posteriores – tr. Thalamocorticalis
- Dráha bolesti, tepla a chladu (**ostrá, řezavá, pronikavá bolest**)
- **Tractus spinoreticularis** – spinální ganglia – lamina V. a VII.- zkříž. i nezkříž. – RF prodloužené míchy a mostu (mediální jádra) – Tr. thalamocorticalis. Zkřížená složka vede **bolest, tupou, pomalou, špatně lokalizovanou. Nezkřížená složka - AASRF**
- **Tractus spinotectalis** – vede do tekta signály dotykového čítí

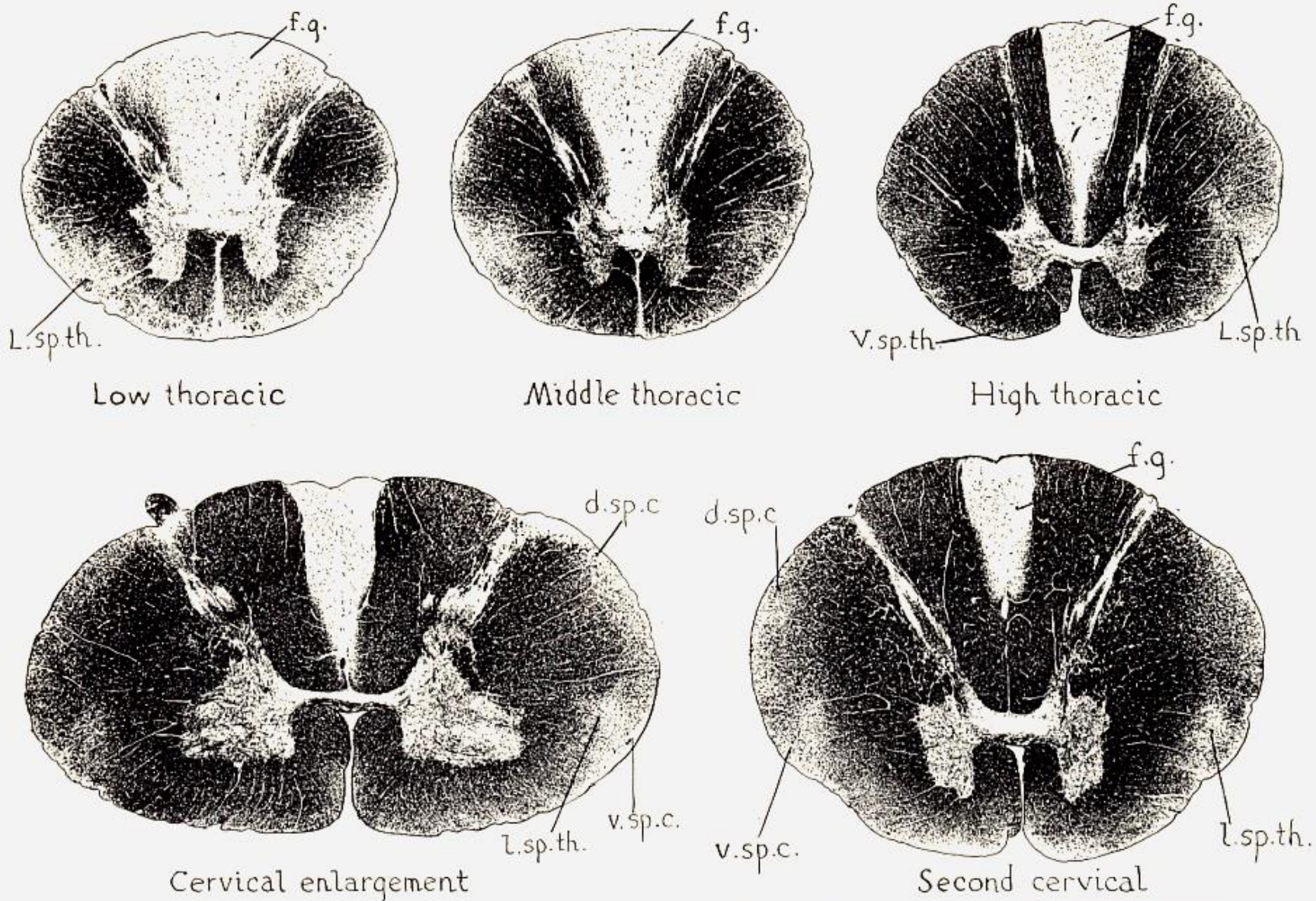
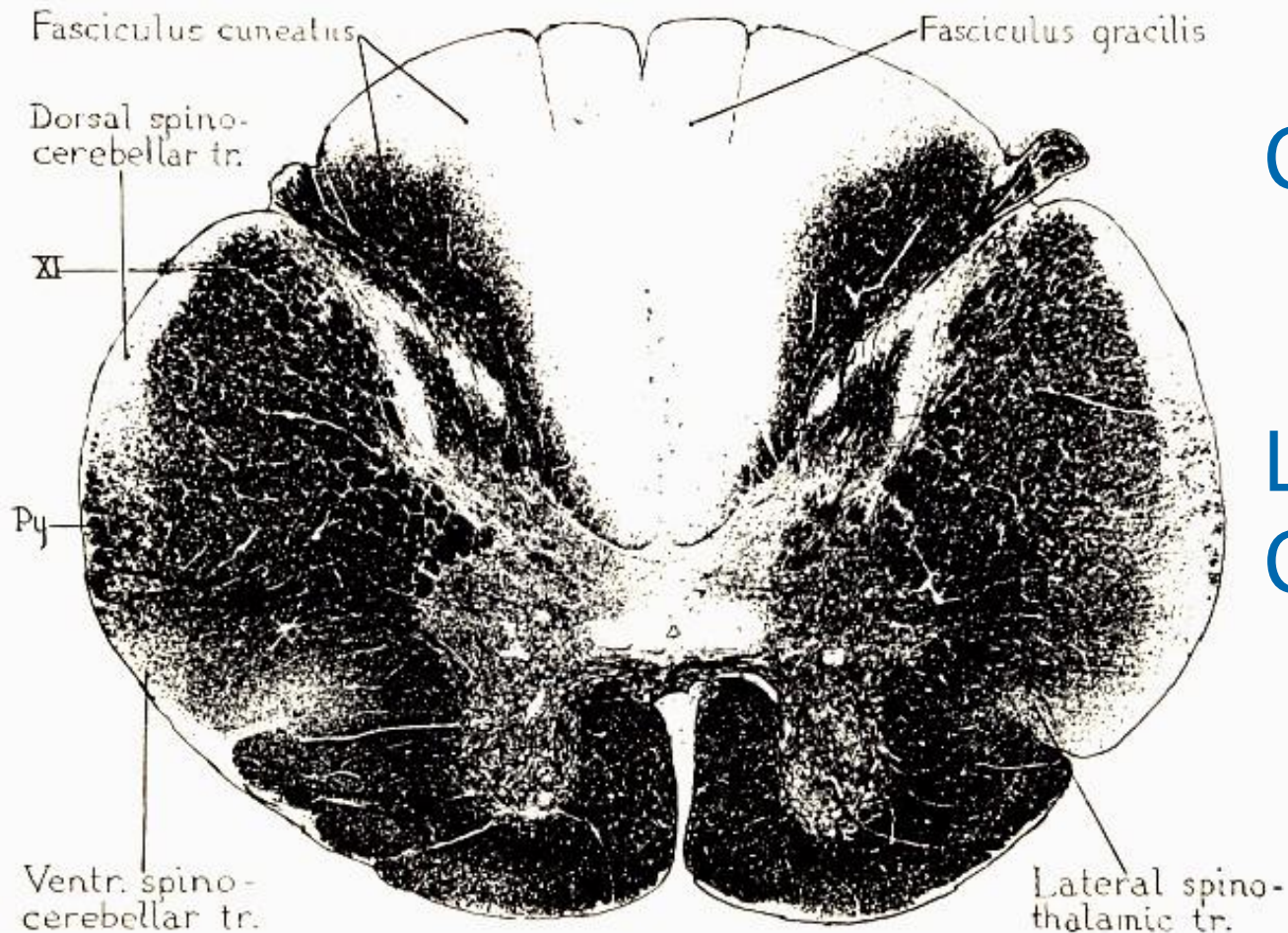


FIG. 138. Transverse sections of a human spinal cord which had been crushed some time previously in the lumbo-sacral region. Weigert's myelin stain. Photographs. *d.sp.c.*, dorsal spinocerebellar tract; *f.g.*, fasciculus gracilis; *l.sp.th.*, lateral spinothalamic tract; *v.sp.c.*, ventral spinocerebellar tract. In the dorsal column the progressive diminution of the degenerated area is due to the passing into the gray of the short and medium ascending arms of the lumbo-sacral dorsal root fibers. Also the progressive increase of normal fibers, next to the dorsal horn, is due to the addition of ascending arms of dorsal root fibers entering the cord above the injury.



C 2

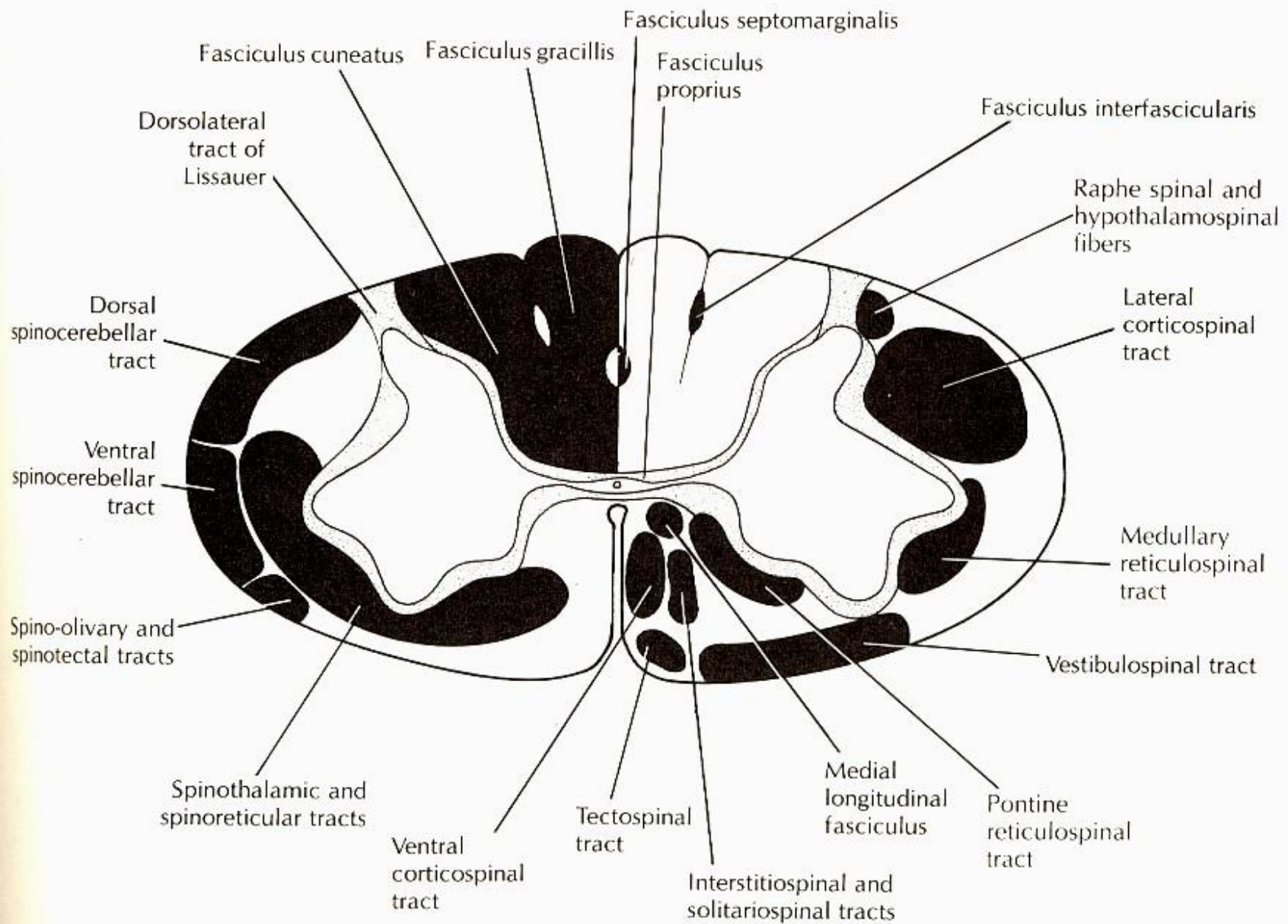
Léze

C 7

FIG. 142. Section through second cervical segment of a human spinal cord which had been crushed some time previously in the lower cervical region. Weigert's myelin stain. Photograph. Owing to the high level of the injury, practically all the fibers of the spino-cerebellar and spinothalamic tracts have undergone degeneration; also all ascending root fibers in dorsal column except those of dorsal root fibers which have entered above the upper level of the lesion (about C6). *Py*, aberrant pyramidal fibers; *XI*, root fibers of spinal accessory nerve.

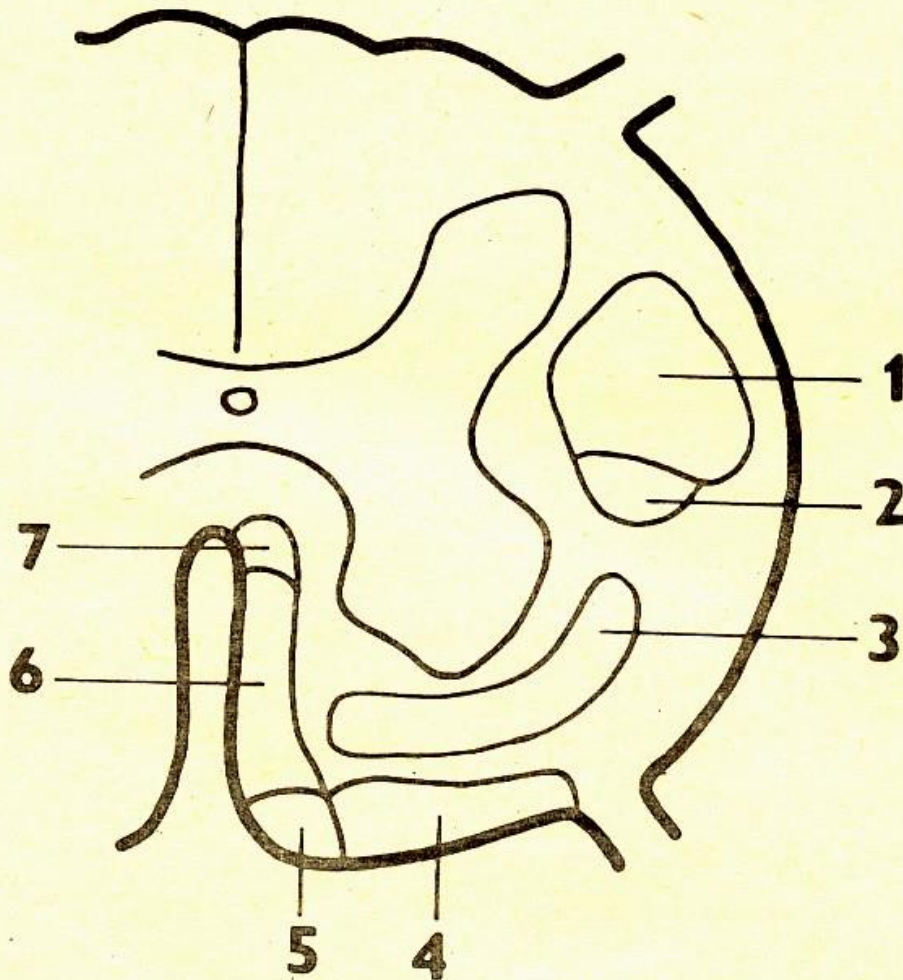
# Motorické míšní dráhy (sestupné)

- **Korové** – tr. corticospinalis
  - **Kmenové** – tr. reticulospinalis, tr. Vestibulospinalis, dále tr. tectospinalis, tr. interstitiospinalis, (tr. rubrospinalis)
- Mediální a laterální systém**

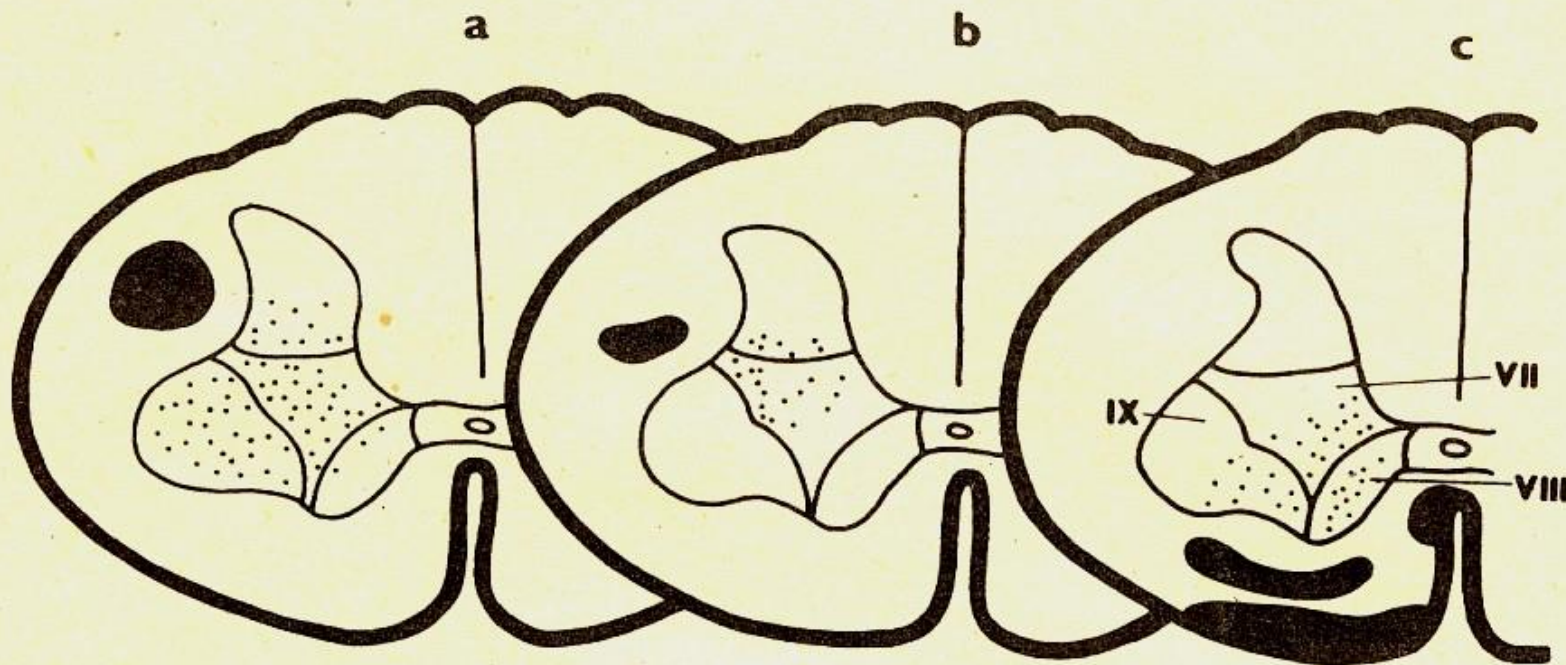


**Figure 5-9.** Major tracts of the spinal white matter at midcervical level. Ascending tracts are on the left; descending tracts are on the right.

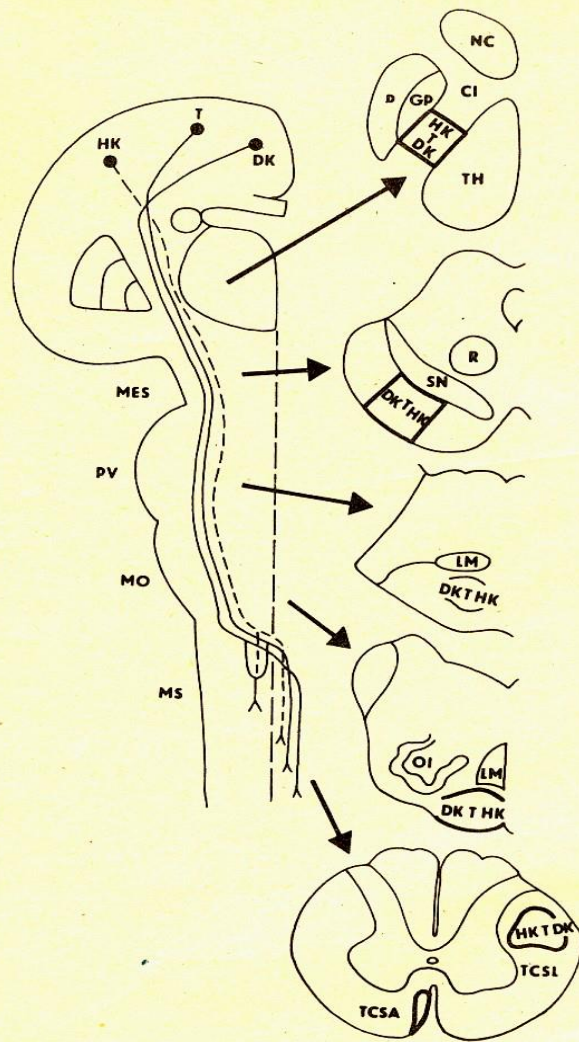




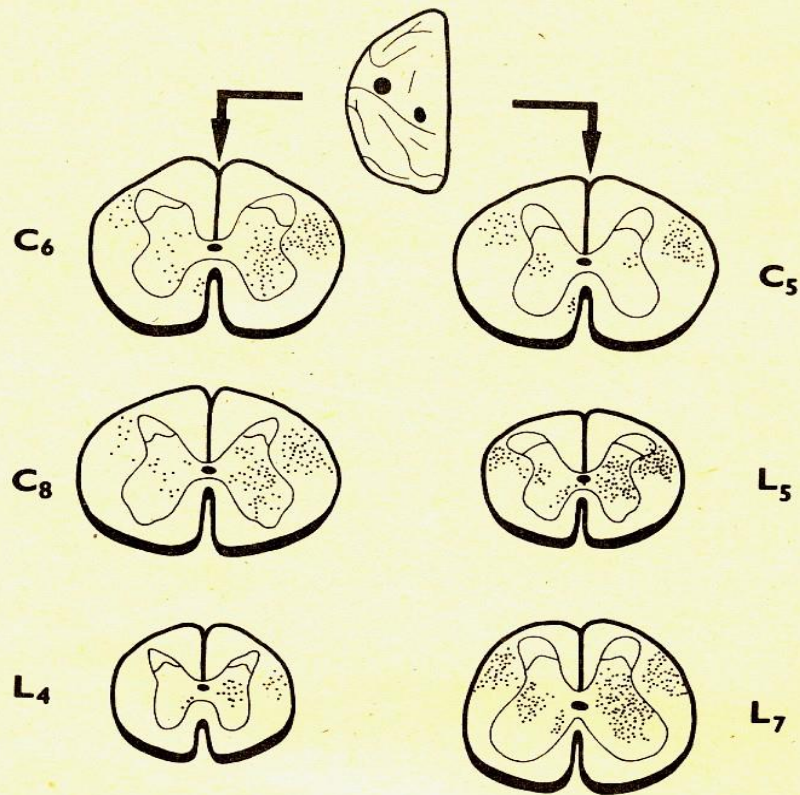
**Příčný řez míchou s vyznačením uložení sestupných míšních drah (schematicky).**  
 1 - tr.corticospinalis lateralis (zkřížený),  
 2 - tr.rubrospinalis, 3 - tr.reticulospinalis,  
 4 - tr.vestibulospinalis, 5 - tr.tectospinalis,  
 6 - tr.corticospinalis ventralis (anterior - nezkrížený), 7 - tr.interstitiospinalis



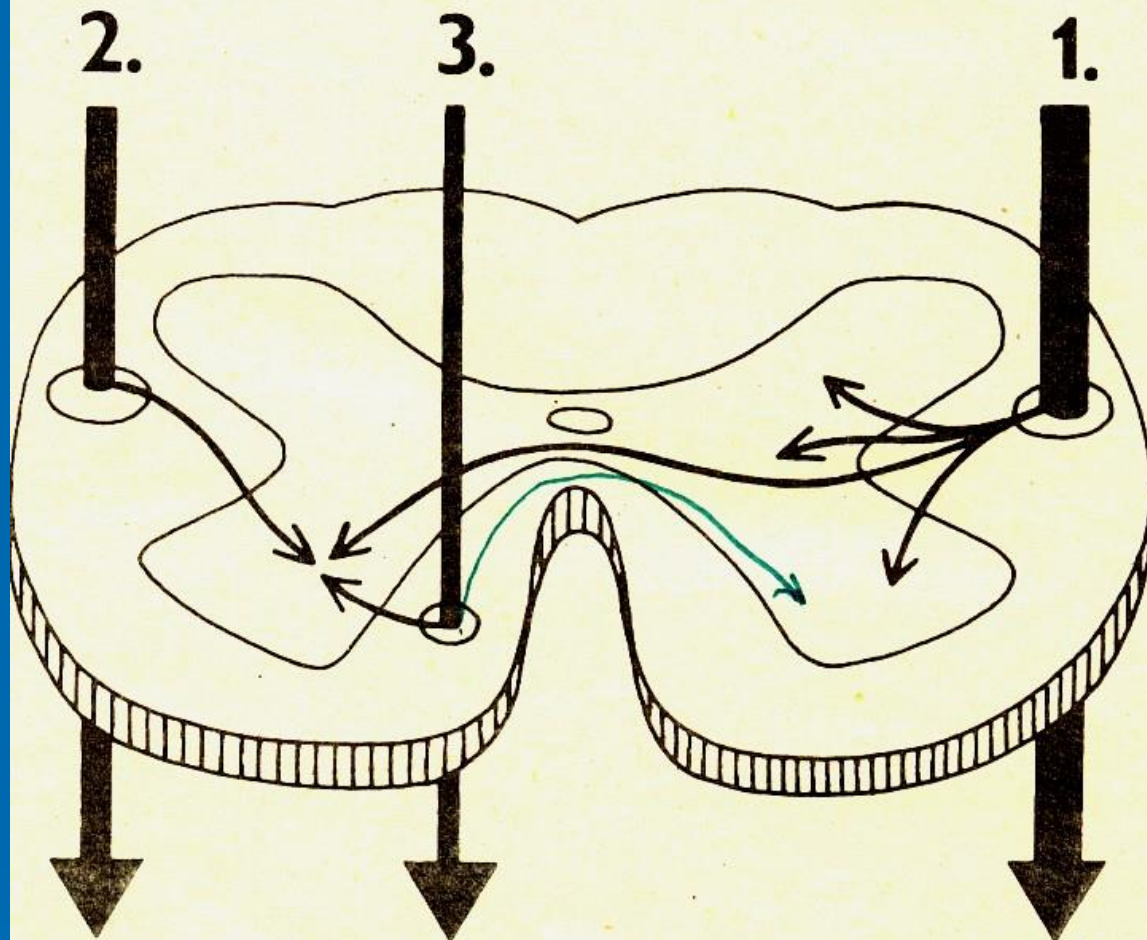
**Obr. 78.:** Zakončení vláken laterálního (a,b) a ventromediálního (c) systému sestupných míšních drah. a - tr.corticospinalis lateralis (zkřížený) a jeho terminace v míšni šedi, b - tr.rubrospinalis, c - ventromediální systém sestupných míšních drah a jejich zakončení v míšni šedi (srovnej s obr. 75). Schematicky podle Lawrence a Kuypere



**Průběh vláken tr.corticospinalis (pyramidové dráhy) hemisférou (capsula interna), mezkovým kmenem a míchou. DK, T, HK - vlákna vystupující z motorických kerových okresek pro dolní končetinu, trup a horní končetinu, CI - capsula interna, GP - globus pallidus, LM - lemniscus medialis, MES - mesencephalon, MO - medulla oblongata, MS - medulla spinalis, NC - nc.caudatus, OI - oliva inferior (caudalis), P - putamen, PV - pons Varoli, R - nc.ruber, SN - subst.nigra, TCSA - tractus corticospinalis anterior (nezkřížený), TCSL - tractus corticospinalis lateralis (zkřížený), TH - thalamus**



1.: Průběh a zakončení vláken pyramidové dráhy  
 v míše opice (makakus).  
 Levý sloupec - po koagulaci motorického korového  
 okrsku pro horní končetinu, většina vláken pyra-  
 midové dráhy končí v cervikálních segmentech.  
 Pravý sloupec - po koagulaci korového okrsku pro  
 dolní končetinu končí většina vláken v lumbál-  
 ních a sakrálních segmentech

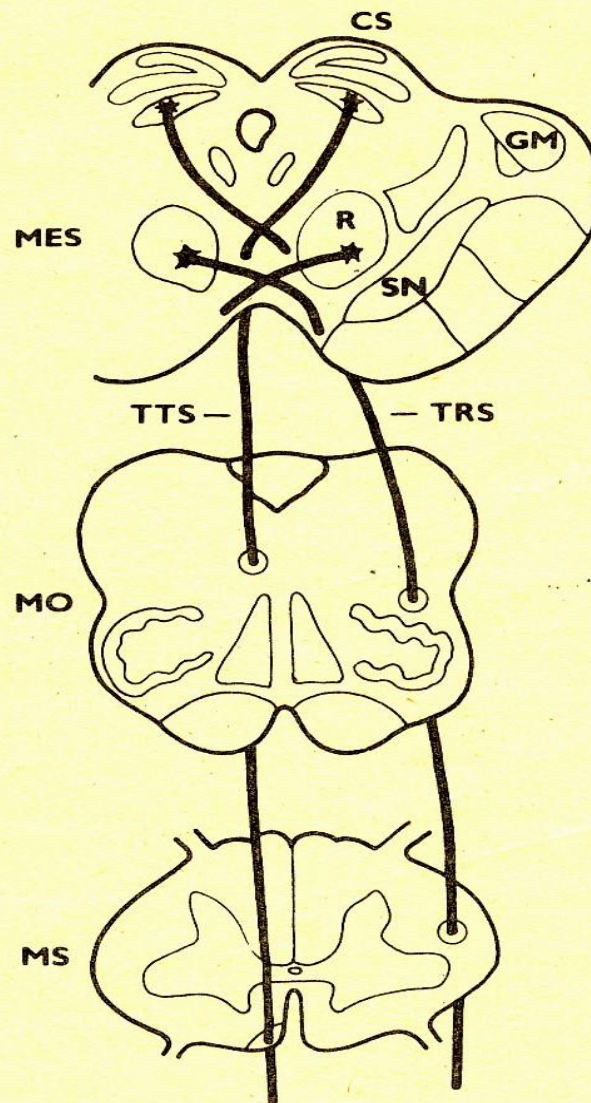


: Schema průběhu a zakončení jednotlivých složek pyramidové dráhy. 1 - zkřížená složka pyramidové dráhy (tr. corticospinalis lateralis), 2. a 3. - nezkřížené složky pyramidové dráhy. Vlákná zkřížené složky končí v předních míšních rozích, v zona intermedia míšní šedi a při bazi zadních míšních rohů. Vlákná nezkřížené složky končí v mediální části předních míšních rohů.

Kmenové motorické dráhy:

Tractus tectospinalis

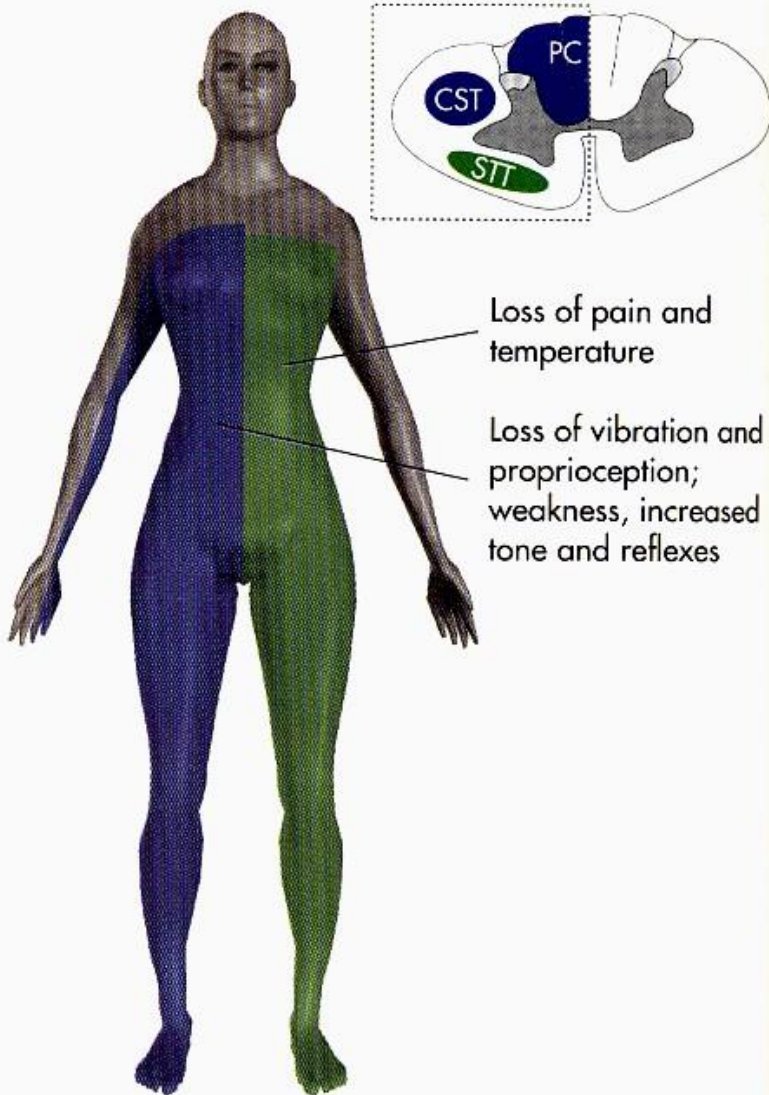
(Tractus rubrospinalis)



Schema počátku a průběhu tr.rubrospinalis (TRS) a tr.tectospinalis (TTS) mozkovým kmenem a míchou.

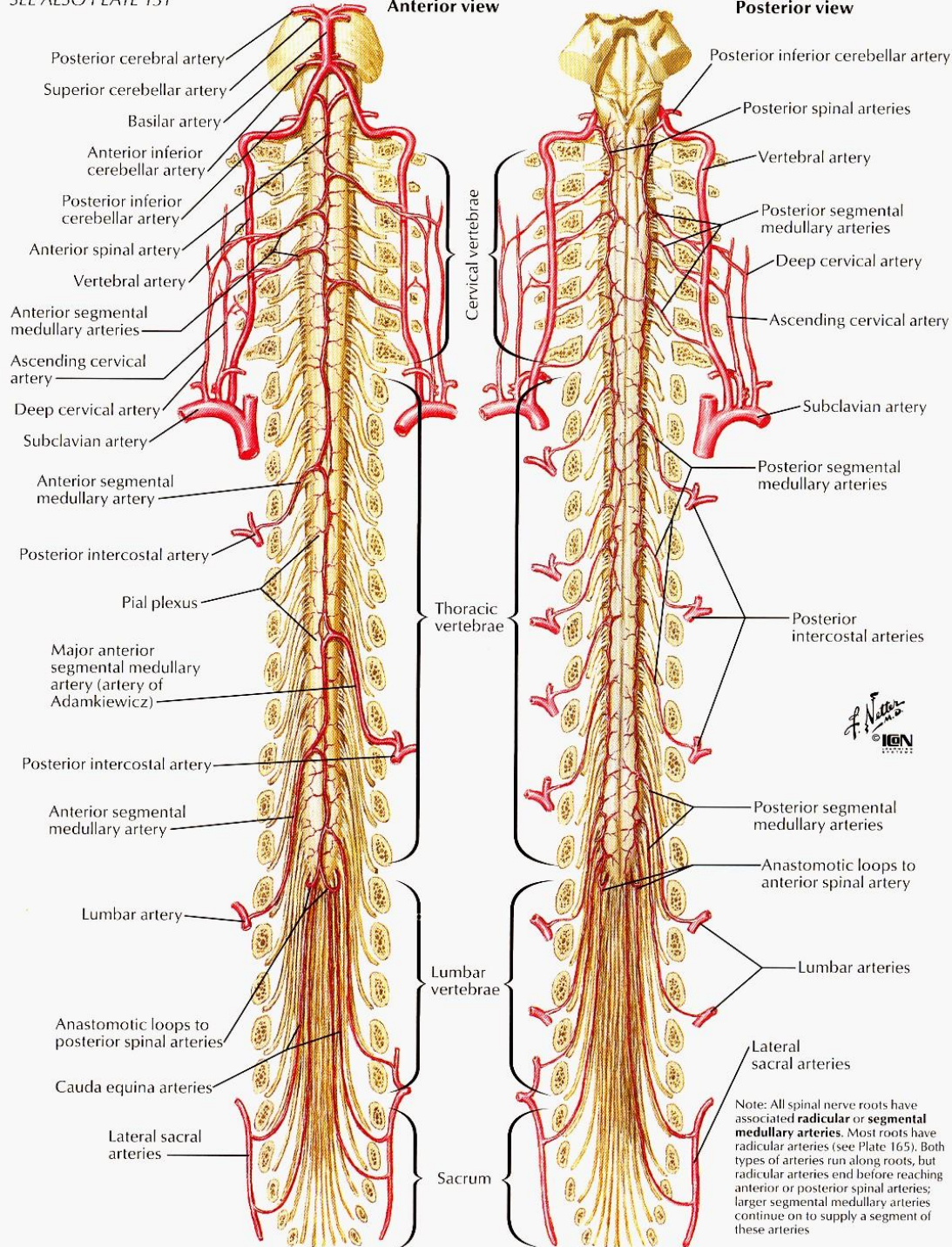
CS - colliculus superior (cranialis), GM - corpus geniculatum mediale, MES - mesencephalon, MO - medulla oblongata, MS - medulla spinalis, R - nc.ruber, SN - substantia nigra

# Míšní léze - C 8



**FIGURE 10-29**  
Brown-Séquard syndrome. Damage to the outlined area of the spinal cord (in this example at C8) would affect the indicated tracts, causing ipsilateral spastic paralysis and loss of fine touch and proprioception, and contralateral loss of pain and temperature beginning one or more segments below the level of damage.

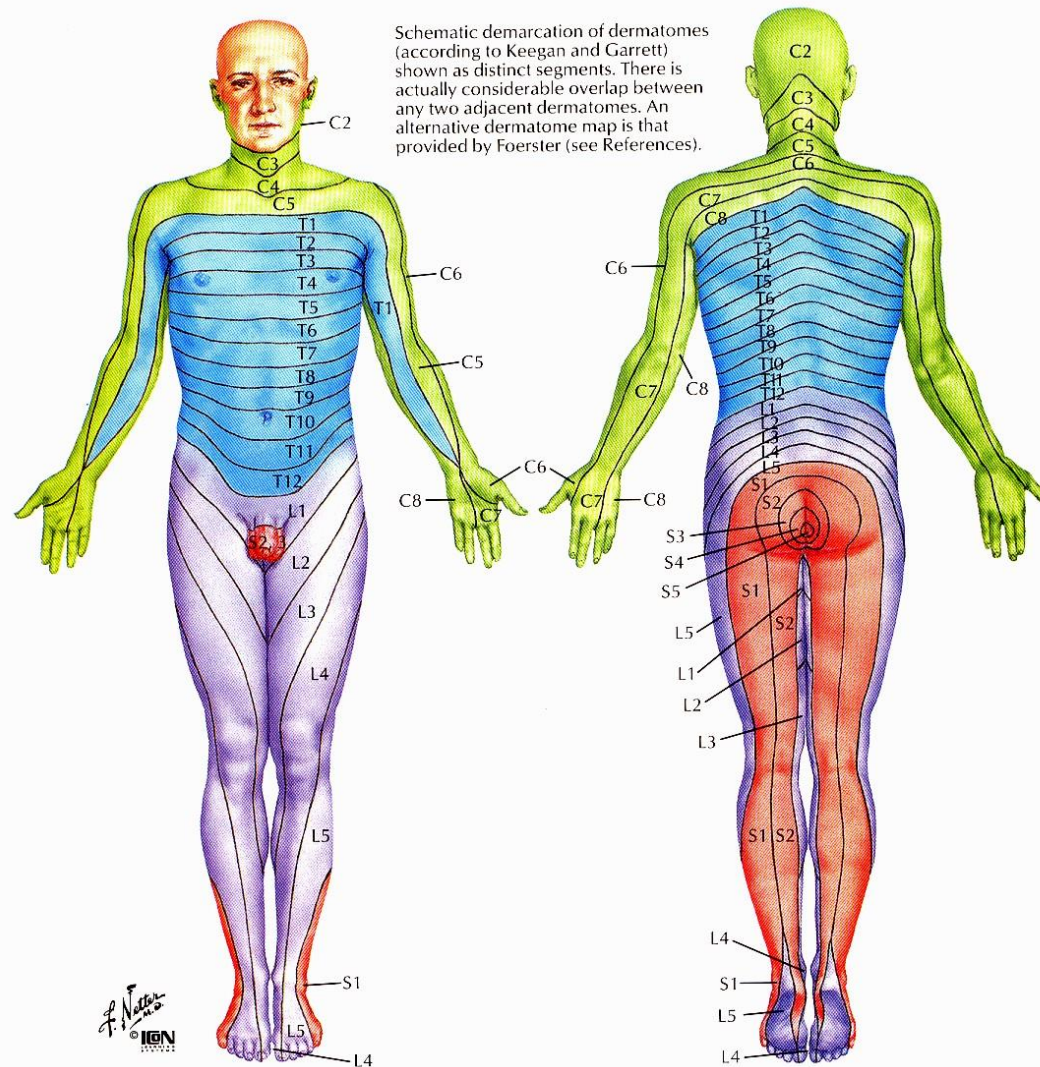
# Arteriae spinales





SEE ALSO PLATES 465, 525; FOR MAPS OF CUTANEOUS NERVES SEE PLATES 20, 455, 457-459, 461, 464, 520-524

## Dermatomová mapa



### Levels of principal dermatomes

- C5 Clavicles
- C5, 6, 7 Lateral parts of upper limbs
- C8, T1 Medial sides of upper limbs
- C6 Thumb
- C6, 7, 8 Hand
- C8 Ring and little fingers
- T4 Level of nipples

- T10 Level of umbilicus
- T12 Inguinal or groin regions
- L1, 2, 3, 4 Anterior and inner surfaces of lower limbs
- L4, 5, S1 Foot
- L4 Medial side of great toe
- S1, 2, L5 Posterior and outer surfaces of lower limbs
- S1 Lateral margin of foot and little toe
- S2, 3, 4 Perineum