

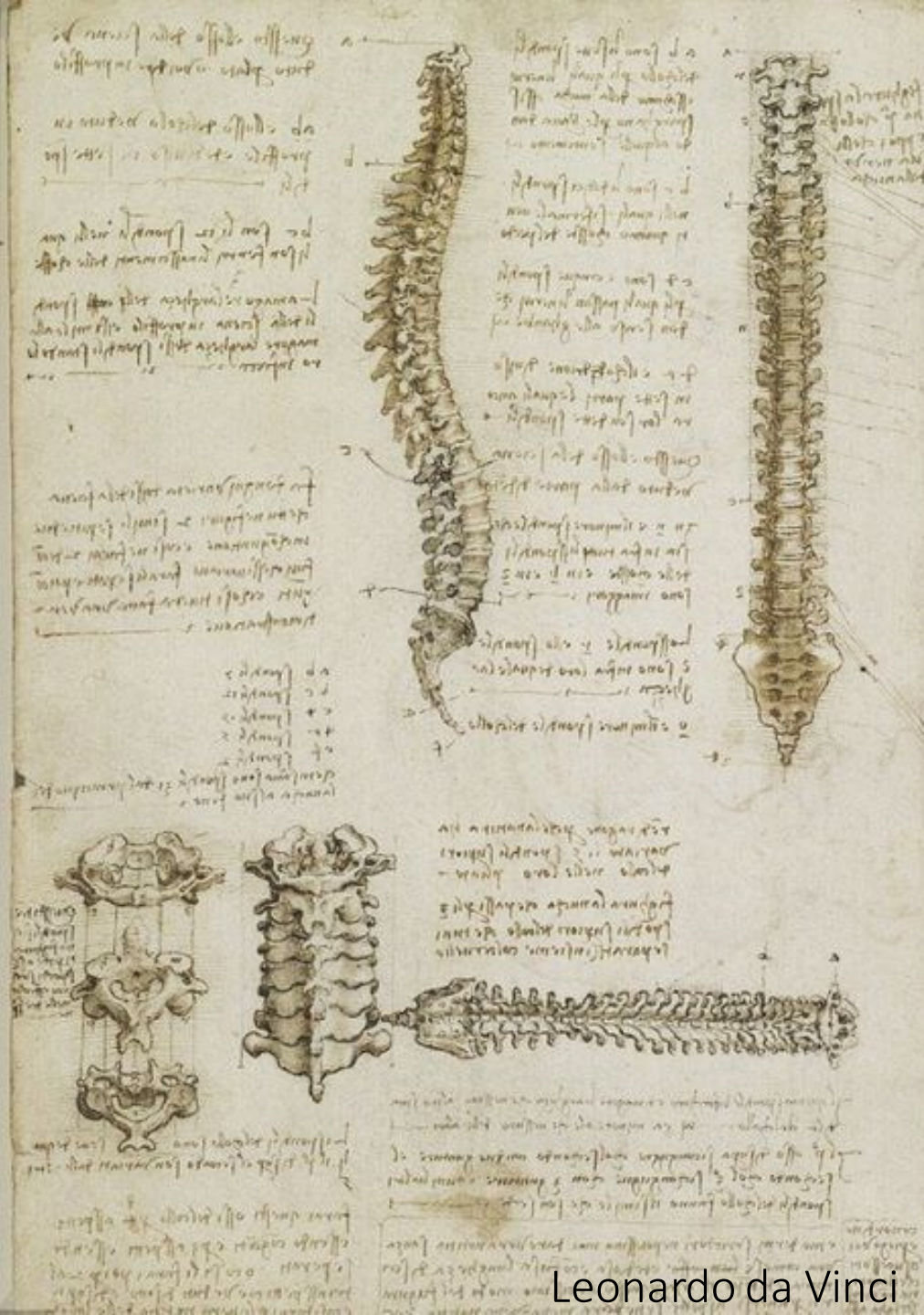
Vertebral column:  
movements and muscles.

Actions and muscles of  
the atlantooccipital and  
atlantoaxial joints.

Emese Pálfi

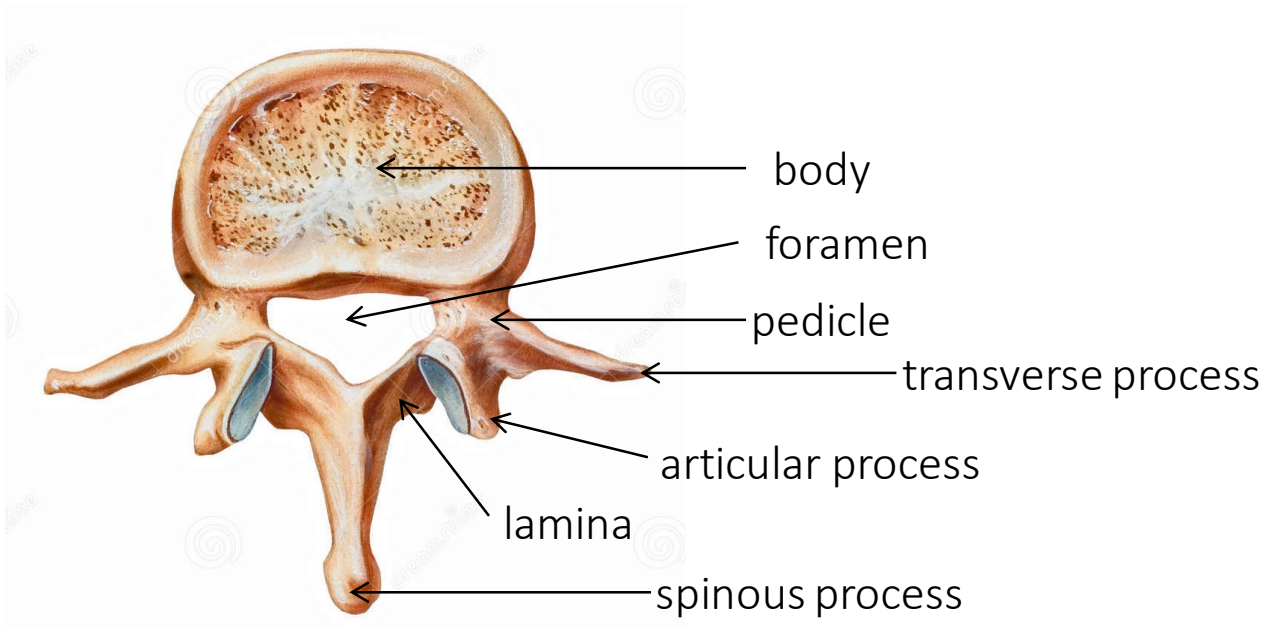
Semmelweis University

Department of Anatomy, Histology  
and Embryology



# Vertebral column

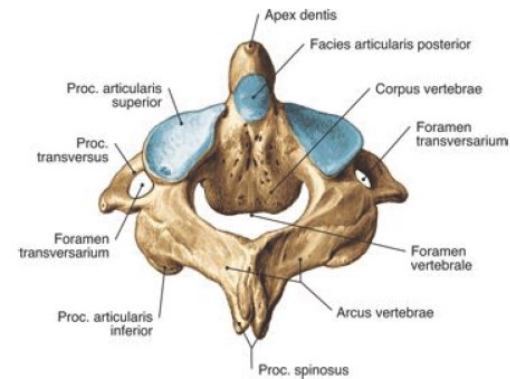
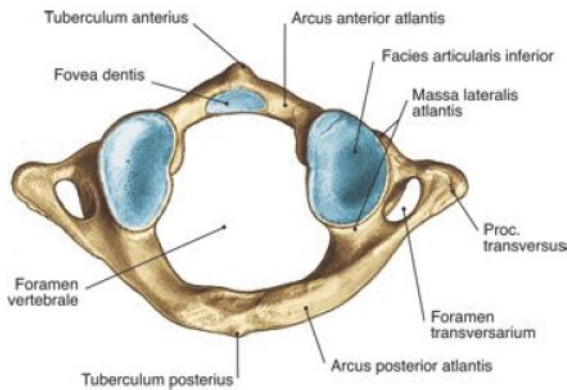
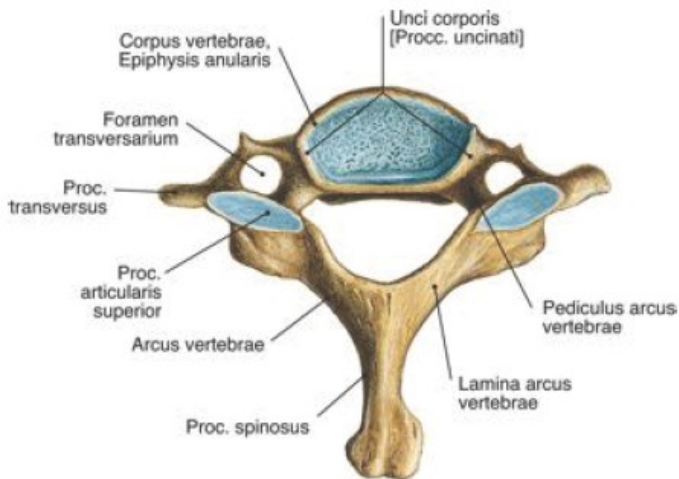
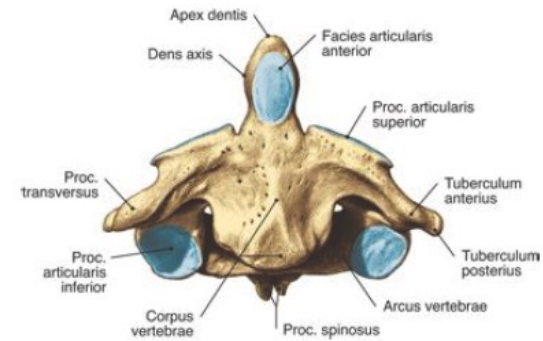
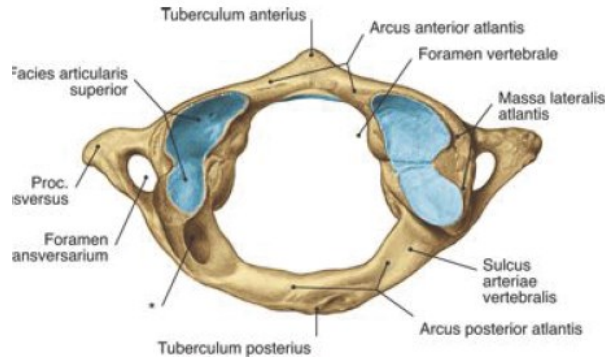
- Bony axis of the body
- In a standing position leads the body weight to the lower limbs
- During walking absorbs the collisions
- Protects the spinal cord
  
- 7 cervical, 12 thoracal, 5 lumbar, 5 sacral and 4-6 coccygeal vertebrae



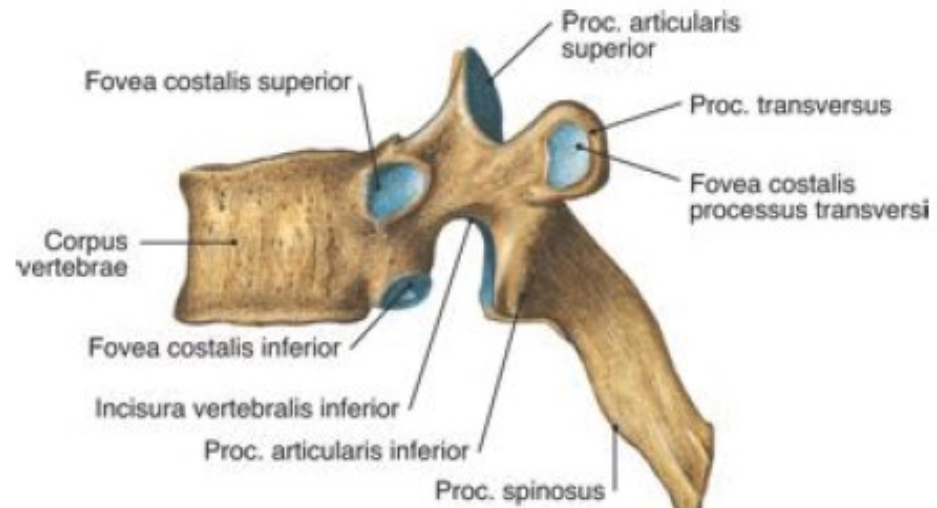
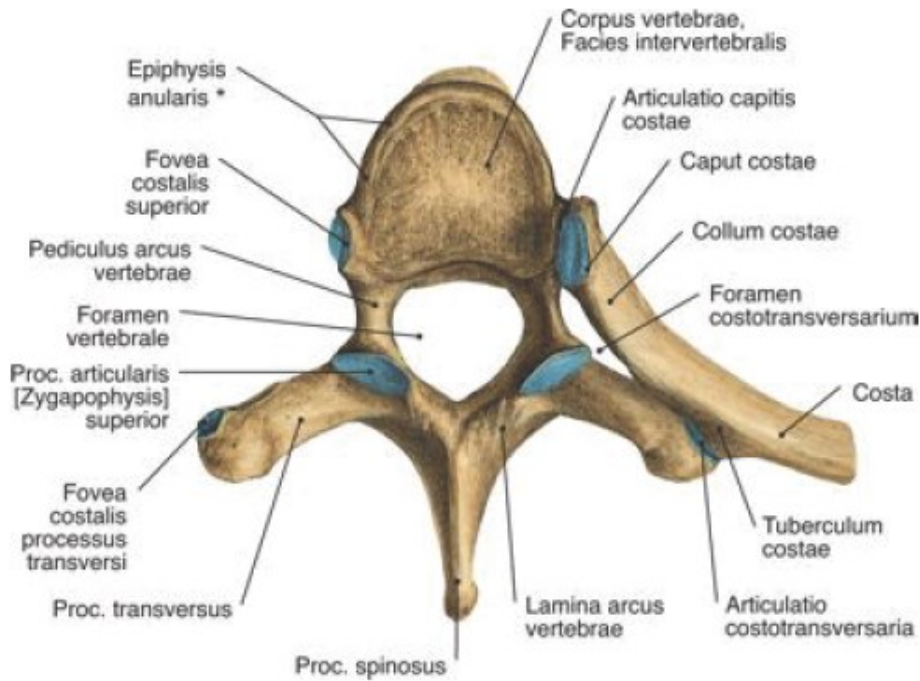
# Cervical vertebrae (7)

## Atlas

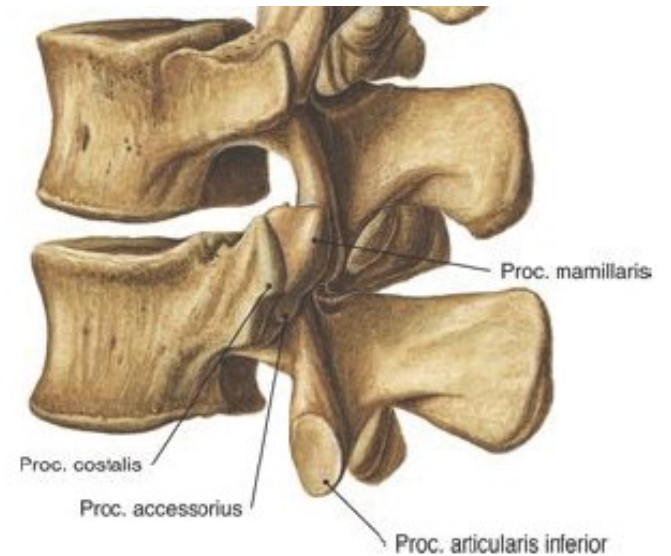
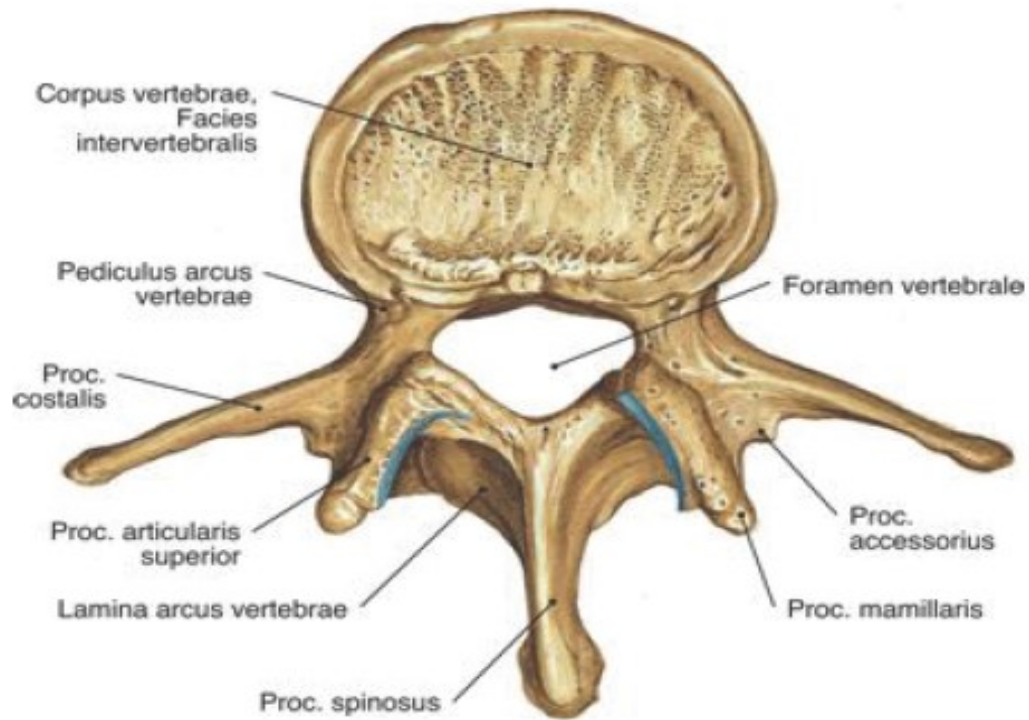
## Axis



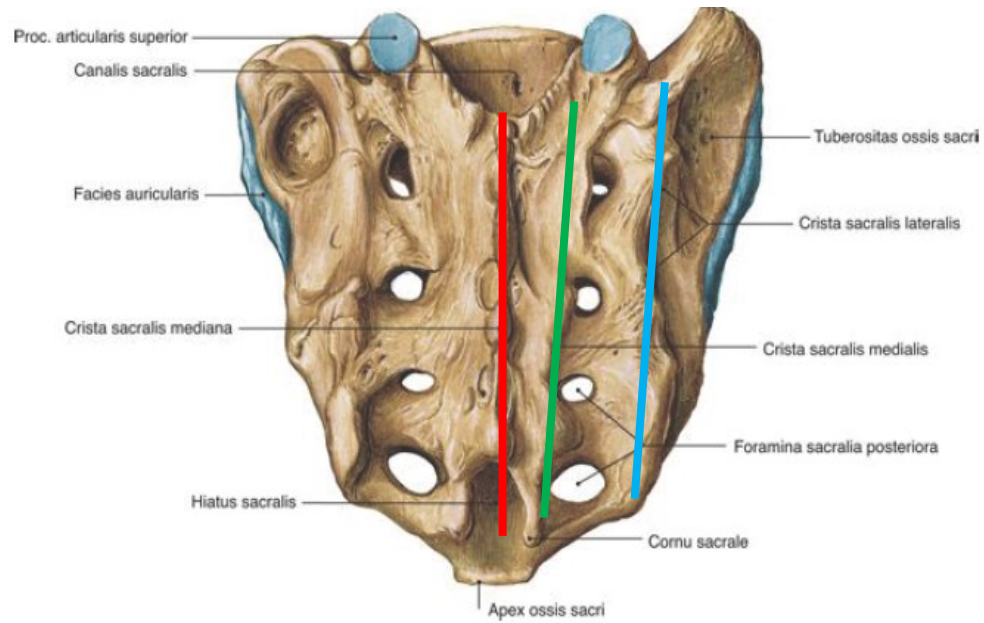
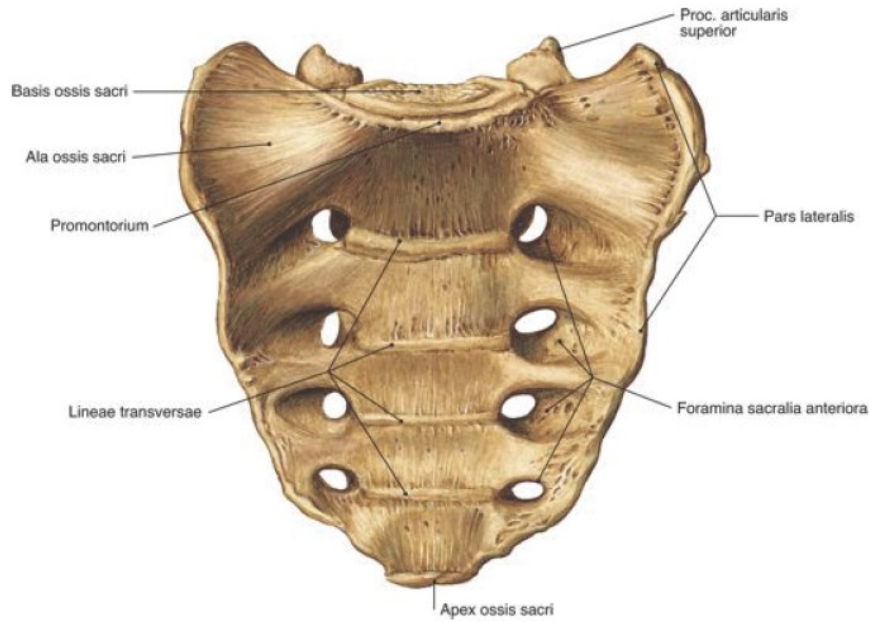
# Thoracal vertebrae (12)



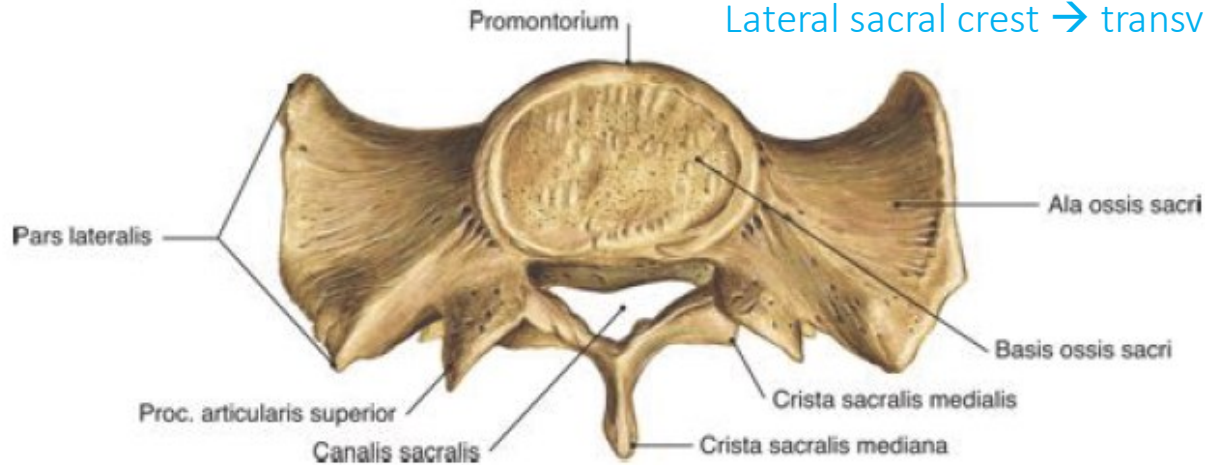
# Lumbal vertebrae (5)



# Sacrum (5)



Median sacral crest → spinous processes  
 Intermediate sacral crest → articular processes  
 Lateral sacral crest → transverse processes

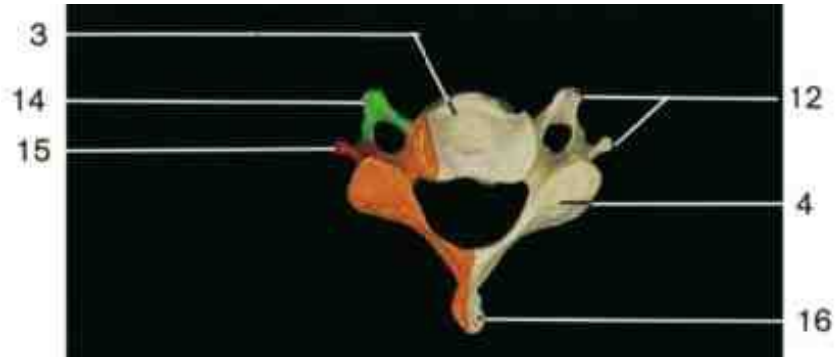


# Coccyx (4-6)

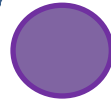


Body  
Vertebral foramen

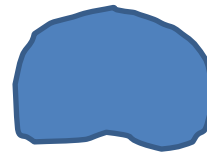
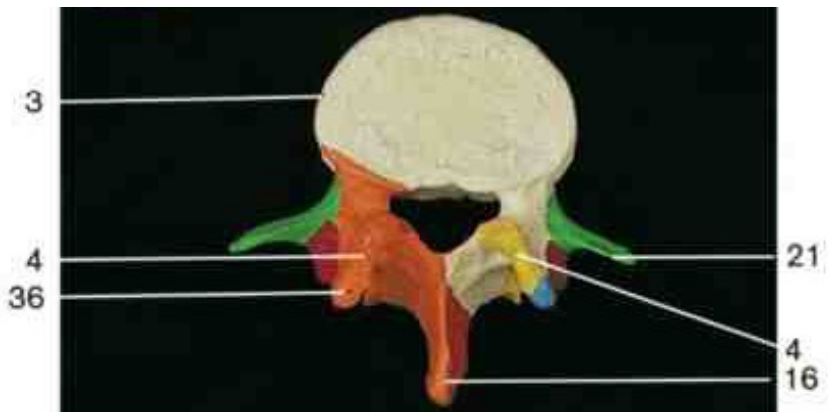
Articular process



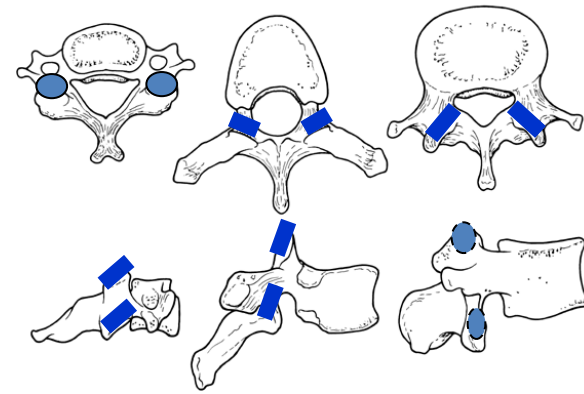
horizontal



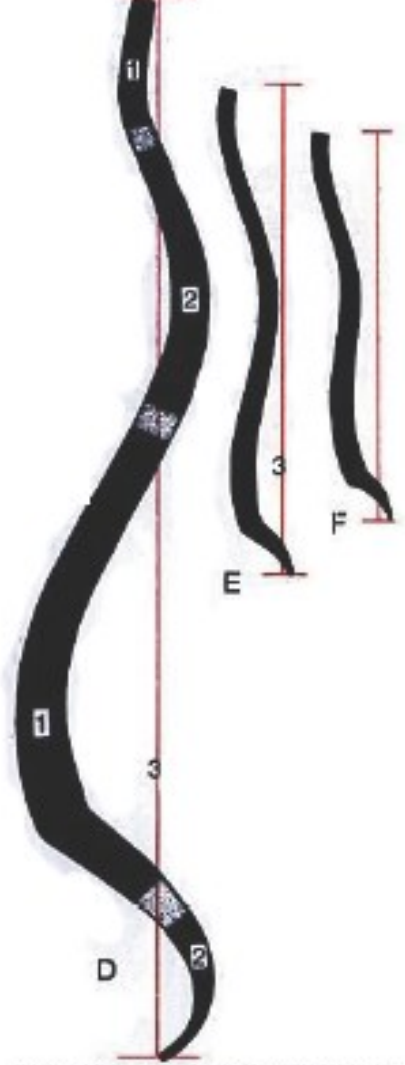
frontal



sagittal







← Cervical lordotic curve  
(C3-4)

→ Thoracic kyphotic curve  
(Th5-6)

← Lumbar lordotic curve  
(L3-4)

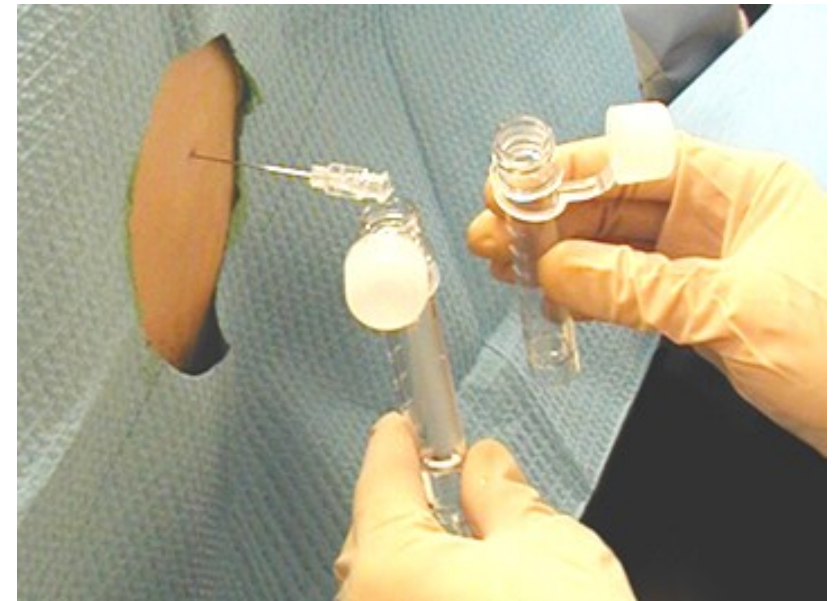
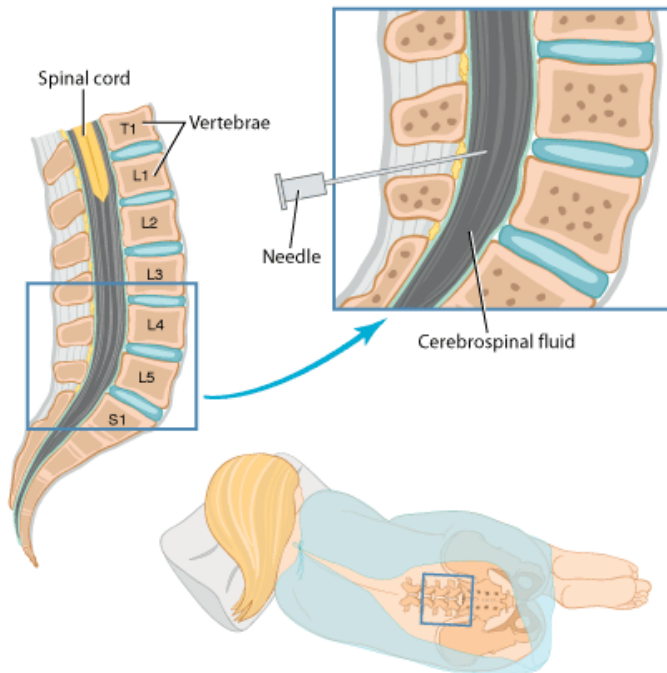
← Promontory

*Scoliosis*



D: 18 yo  
E: 10 month  
F 3 month

# Lumbar puncture



# Connections of the vertebral column

synostosis

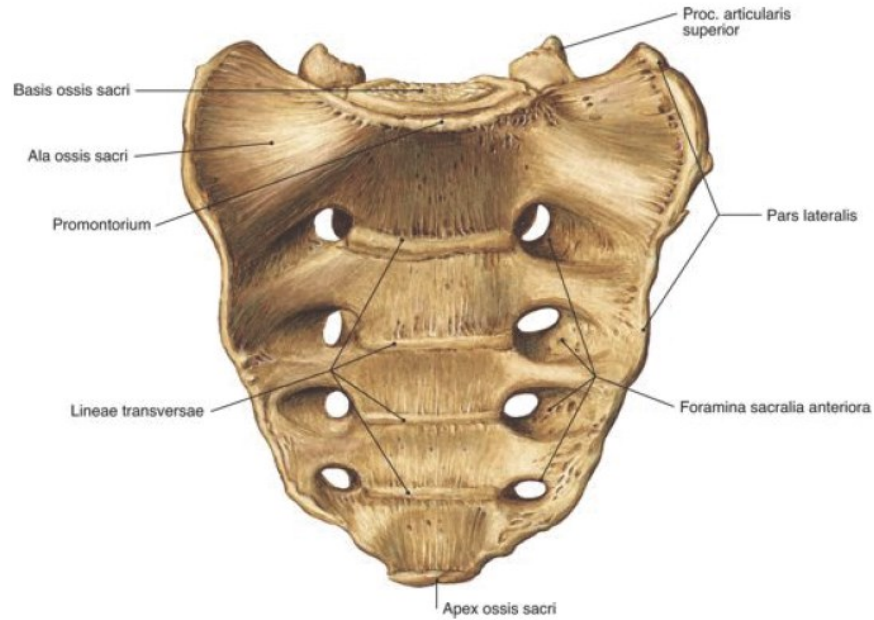
synchondrosis

syndesmosis

joints

# Synostosis

Sacrum



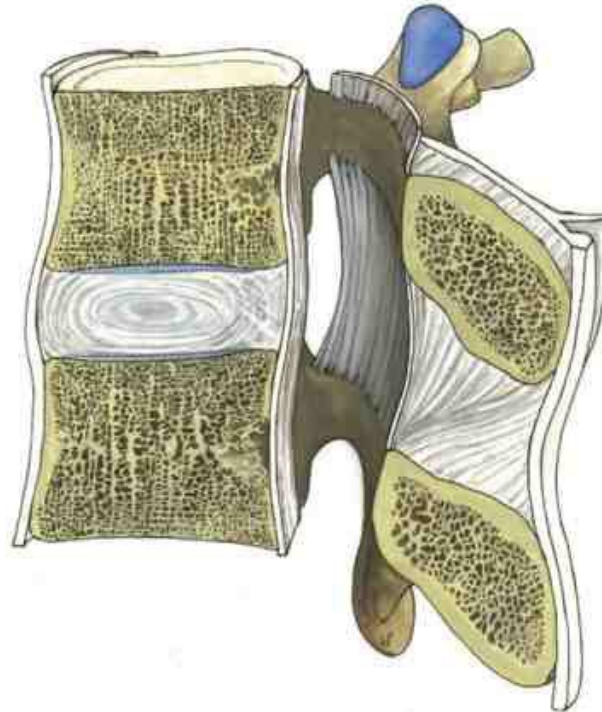
Coccyx



# Synchondrosis

## Intervertebral discs

- 23
- fibrocartilage: anulus fibrosus + nucleus pulposus

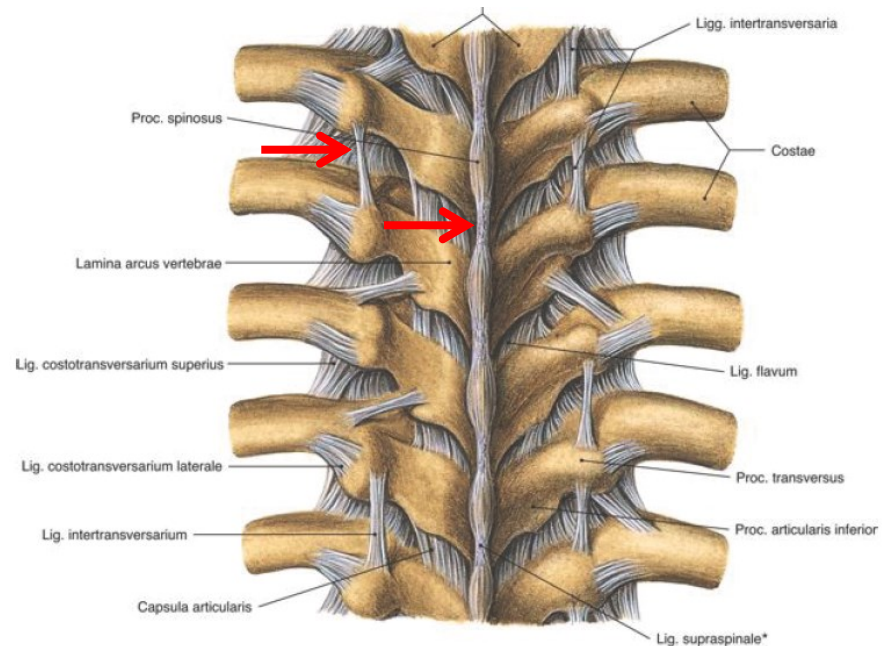
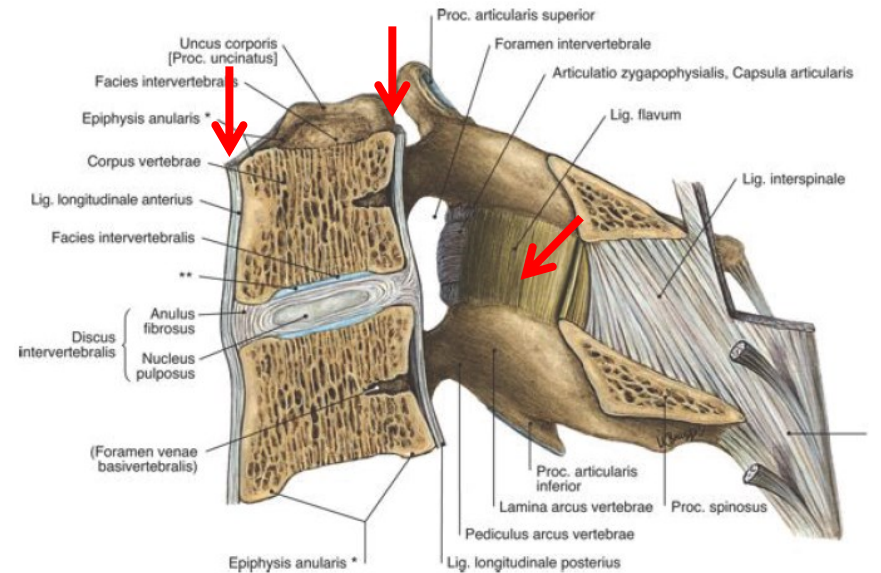


*Spinal disc herniation*



# Syndesmosis

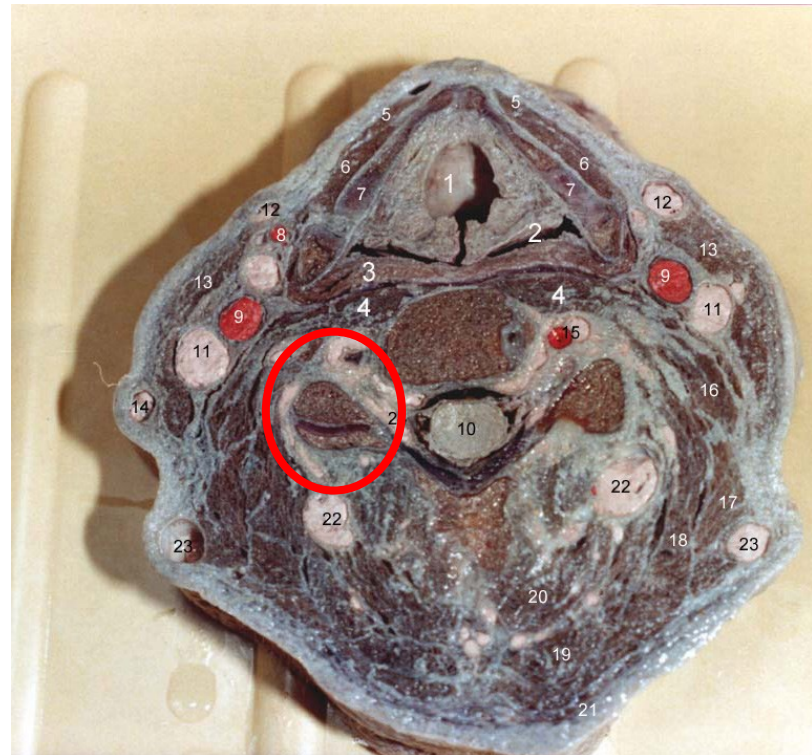
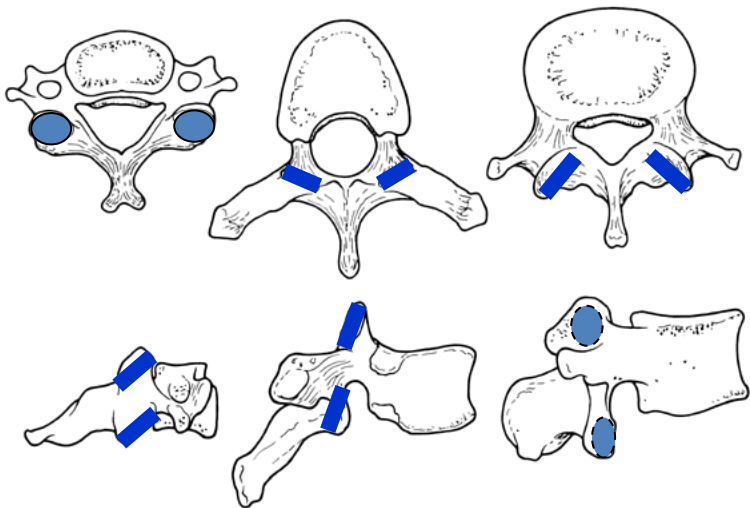
- Anterior longitudinal ligament
- Posterior longitudinal ligament
- Tectorial membrane
- Lig. flavum
- Intertransversal ligament
- Supraspinal ligament
- Nuchal ligament



# Intervertebral joints

## Zygapophysieal joints

- between articular processes
- gliding or plane joints



1. Larynx
2. Pharynx
3. M. constrictor pharyngis inf.
4. M. longus colli
5. M. sternohyoideus
6. M. omohyoideus
7. Cartilago thyroidea
8. A. thyroidea sup.
9. A. carotis comm.
10. Gericvelö
11. V. jugularis int.
12. V. jugularis ant.
13. M. sternocleidomastoideus
14. V. jugularis ext.
15. A. et v. vertebralis
16. M. scalenus medius
17. M. levator scapulae
18. M. splenius cervicis et capitis
19. M. semispinalis capitis
20. M. semispinalis cervicis
21. M. trapezius
22. V. cervicalis profunda
23. V. occipitalis
24. Plexus venosus vert. int.

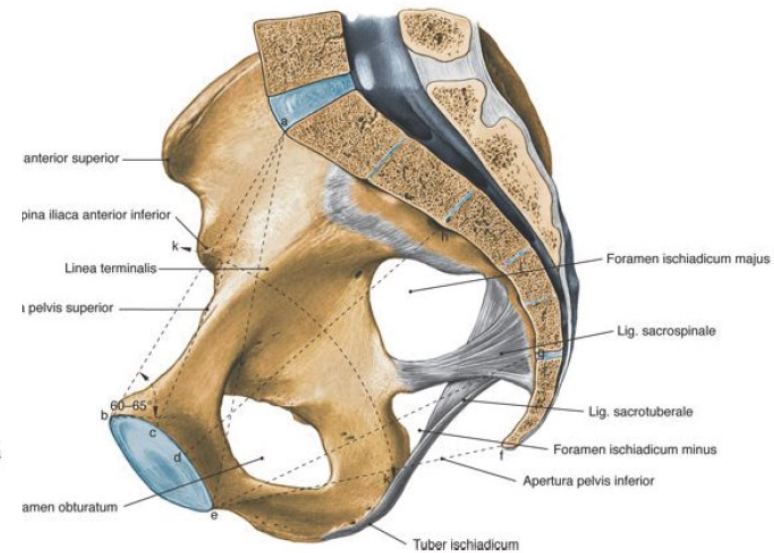
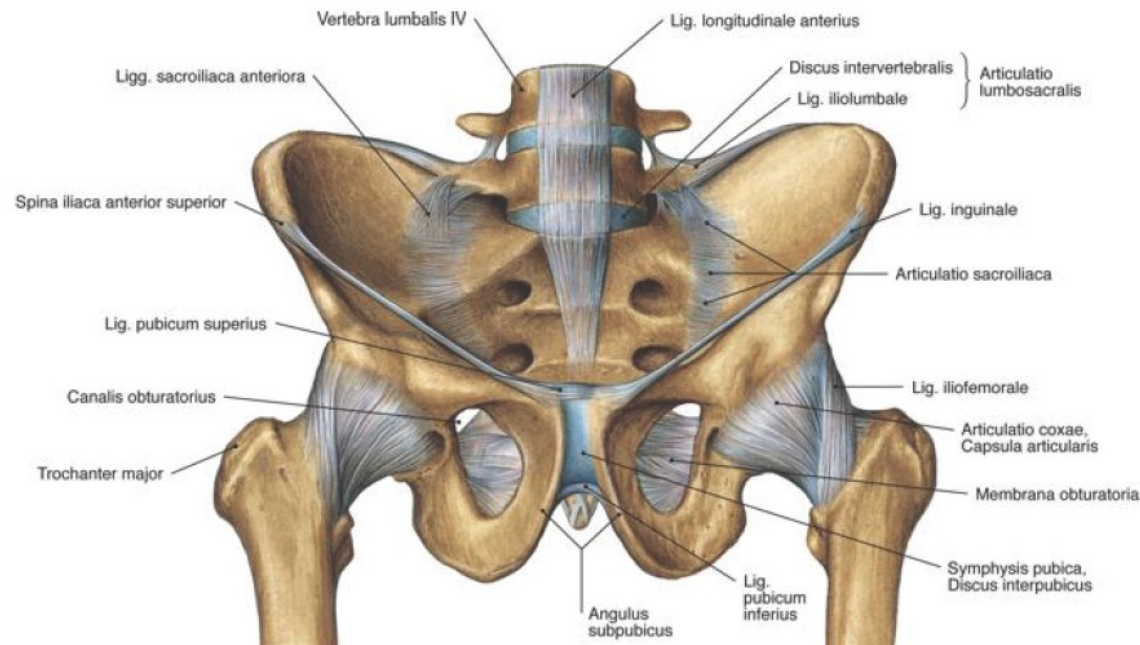
*Stephan Schmidt*  
2005

# Lumbosacral joint

- L5 – sacrum
- Iliolumbar ligament

# Sacrococcygeal joint

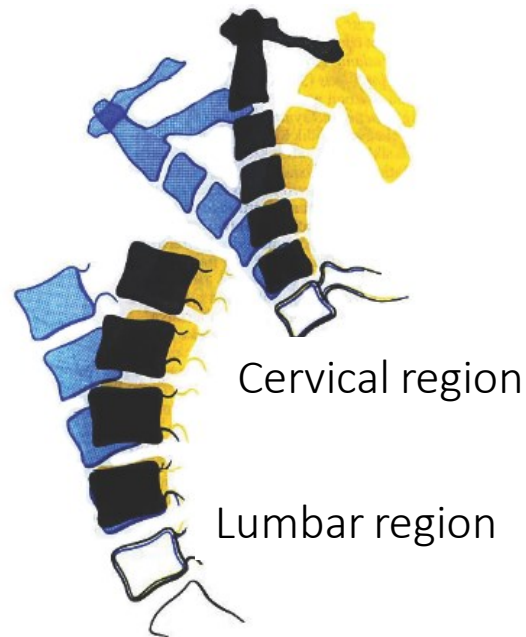
- Sacrum – coccyx





# Movements of the vertebral column

	Ventral and dorsal flexion	Lateral flexion	Torsion
C	+++	++	++
Th	+	+	+
L	++	++	-



# Atlantooccipital joint

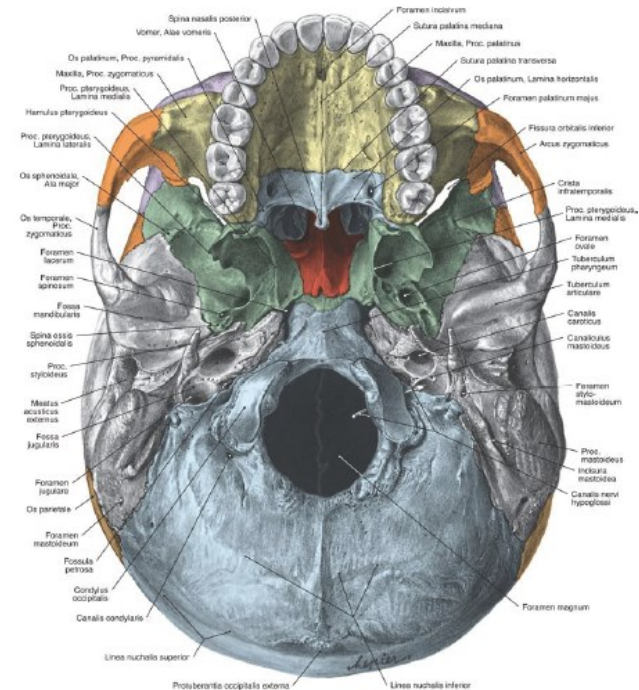
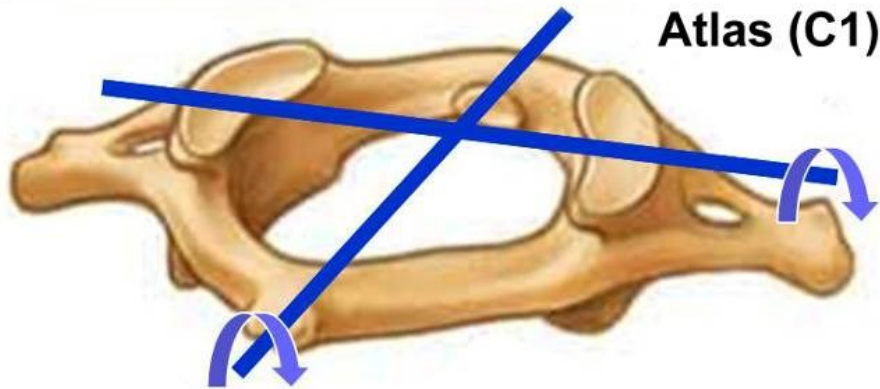
*Occipital condyli*

*Atlas – superior articular facet*

elipsoid joint (biaxial with two perpendicular axes)

transverse axis: flexion - extension („yes-yes”)

sagittal axis: lateral bending („well-well”)

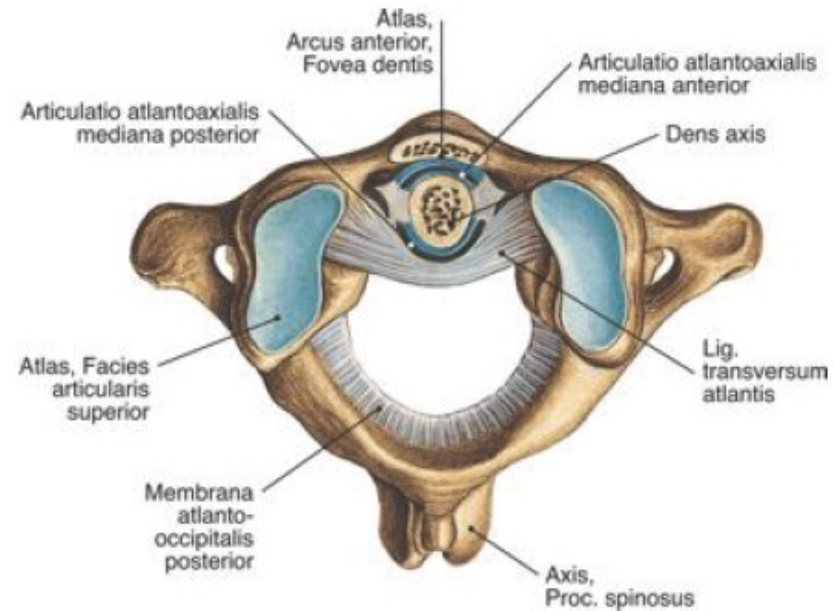
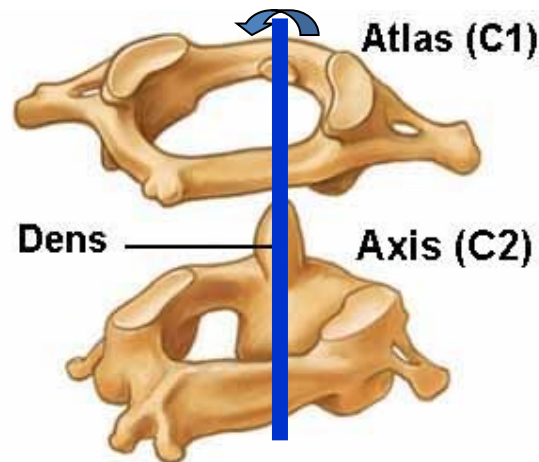
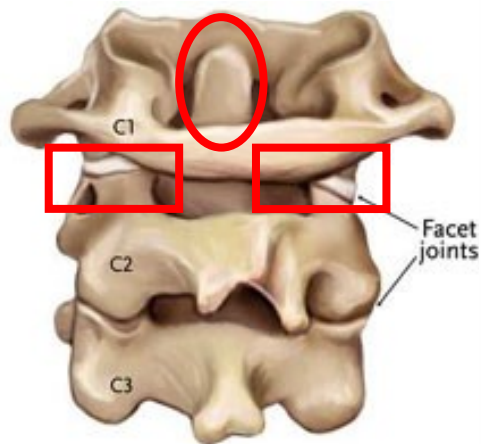


# Atlantoaxial joint

*atlas - fovea dentalis*  
*axis - tooth process*

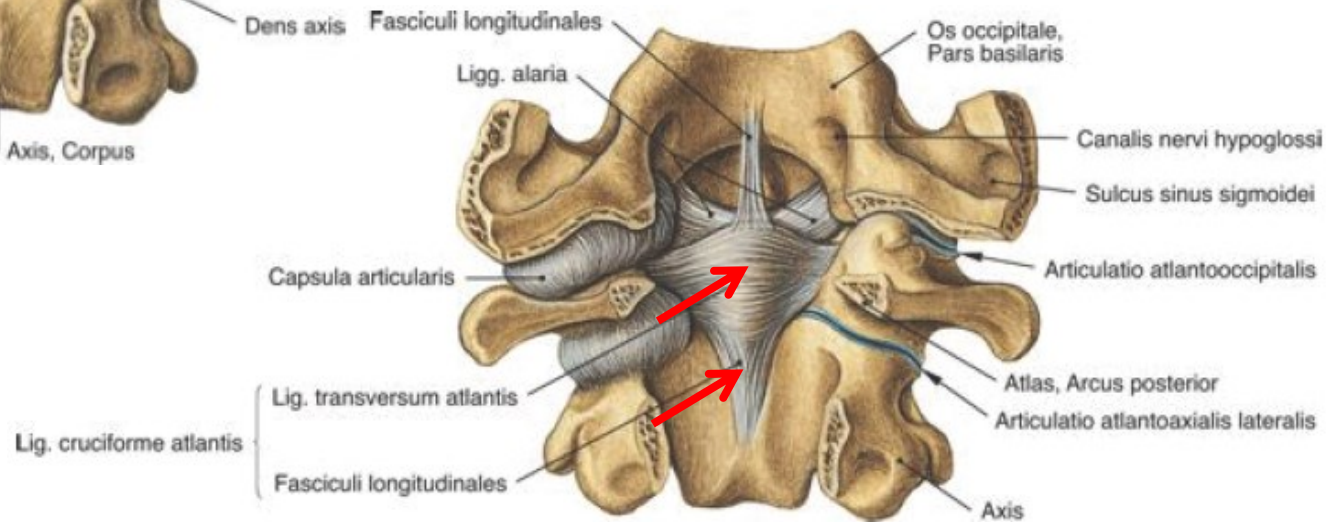
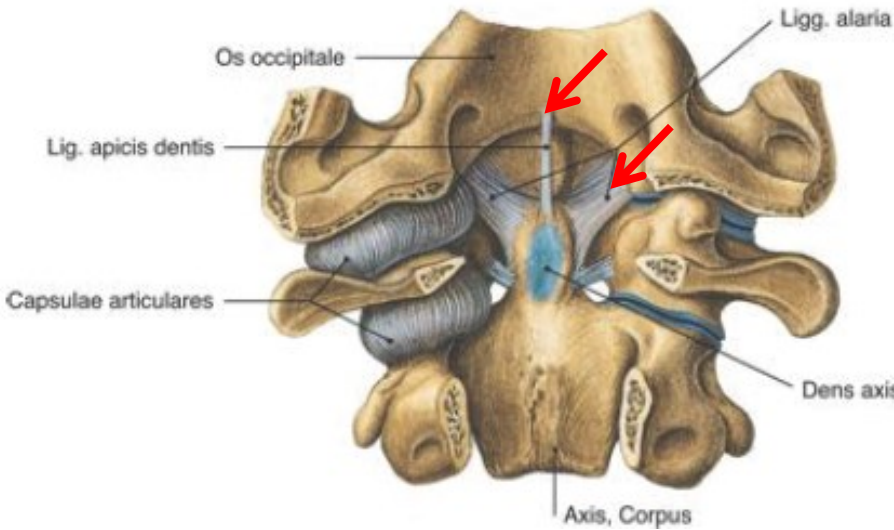
*atlas - inf. art. facet*  
*axis - sup. art. facet*

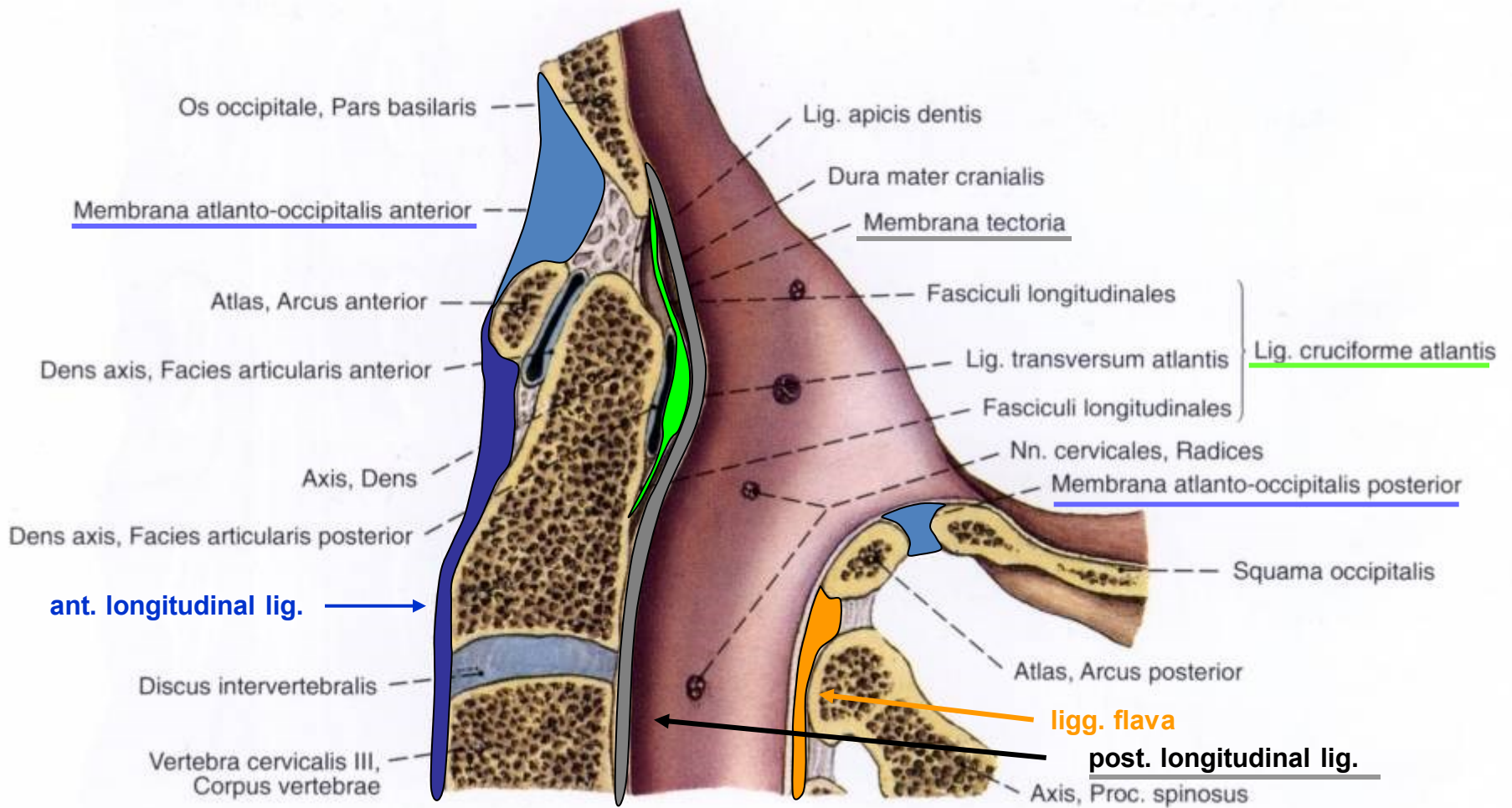
trochoid joint: vertical axis with rotation („no-no”)



# Ligaments

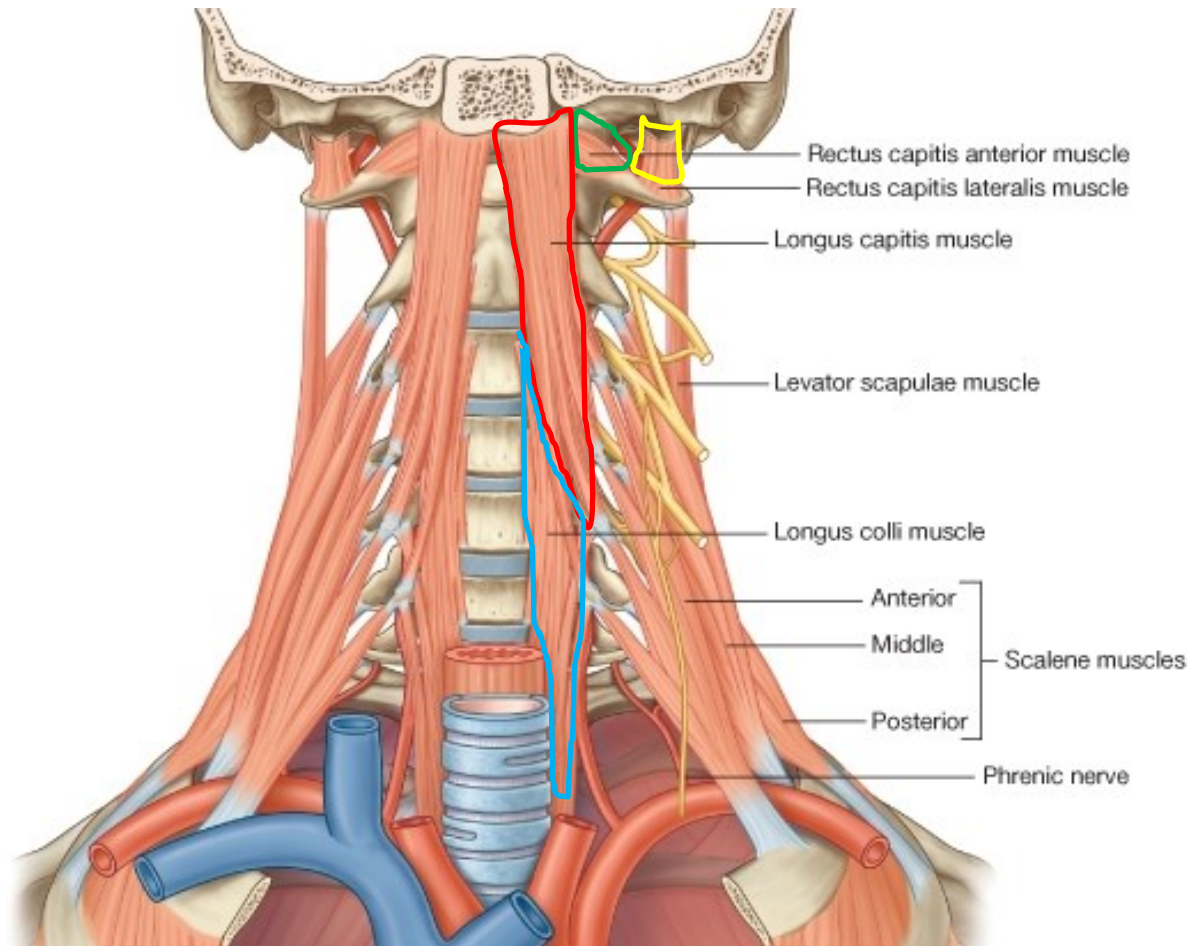
- Alar ligament
  - Lig. apicis dentis
  - Transversal lig. of atlas
  - Fasciculi longitudinales
  - Tectorial membrane
  - Ant. and post. atlantooccipital membranes
- } Cruciform ligament of atlas





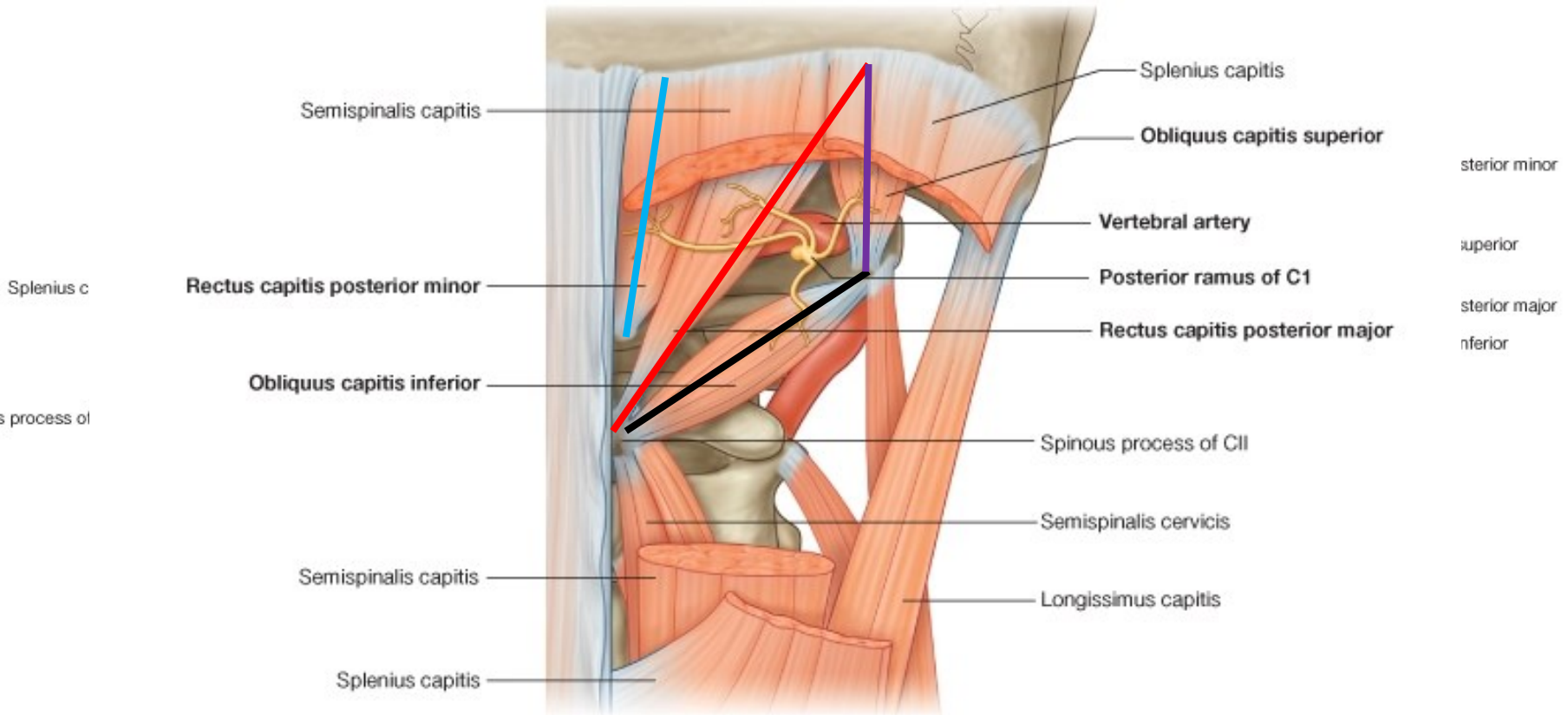
# Muscles of the neck (ventrally)

- Sternocleidomastoid
  - Rectus capitis lateralis
  - Rectus capitis anterior
  - Longus capitis and colli
- } prevertebral muscles



# Muscles of the nape (dorsally)

- Trapezius (found in the nape but a dorsal thoracoappendicular muscle!)
  - Splenius capitis Longissimus capitis
  - Semispinalis capitis
  - Rectus capitis posterior major and minor
  - Obliquus capitis superior and inferior
- } suboccipital muscles

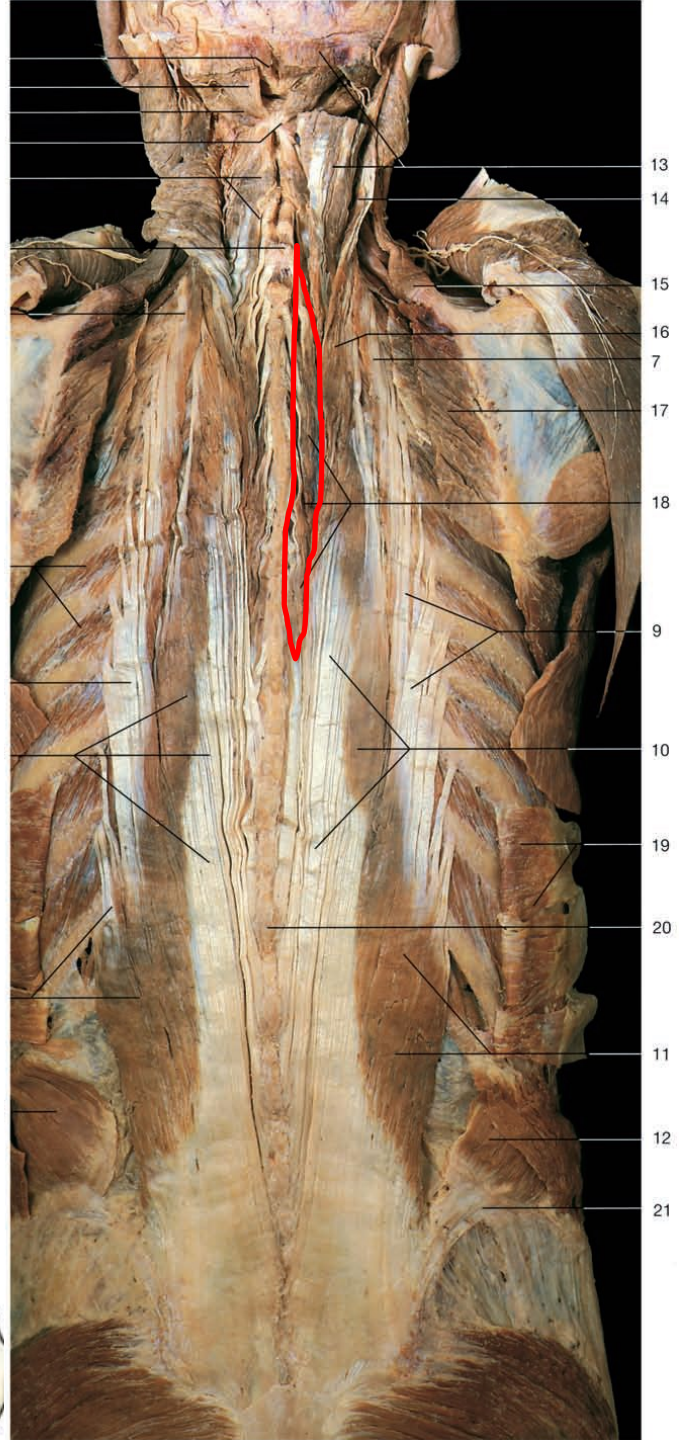
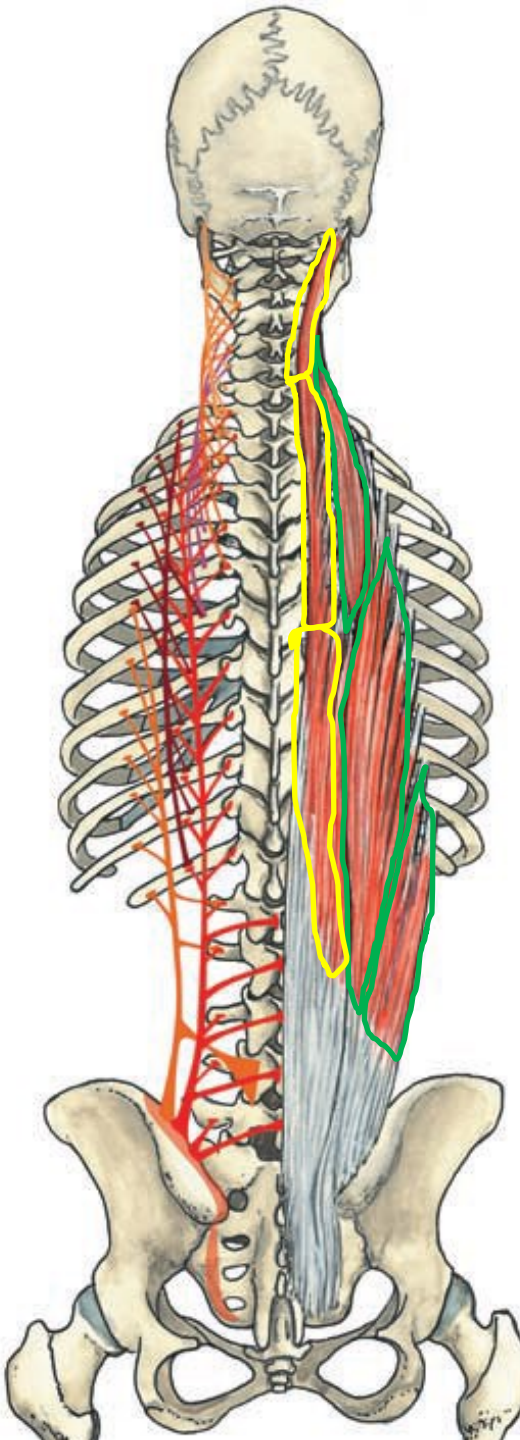


# BACK MUSCLES

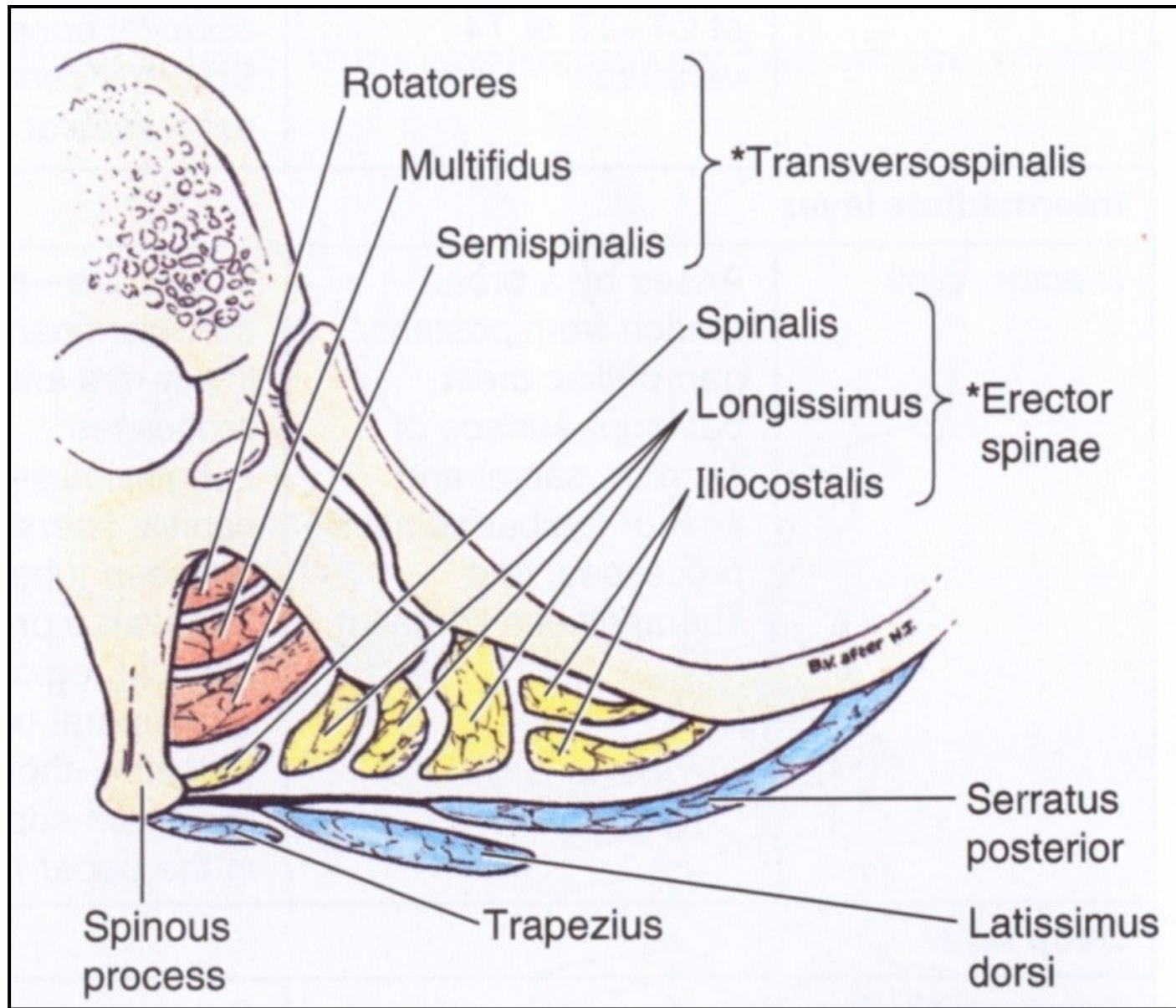
- Superficial back muscles (or dorsal thoracoappendicular muscles): are found on the back, but do not act upon the vertebral column e.g.: Trapezius, Levator scapulae, Rhomboids, Latissimus dorsi.
- Deep or intrinsic back muscles:
  - Erector spinae
    - Longissimus
    - Iliocostalis
    - Spinalis
  - Transversospinal muscles
    - Semispinalis
    - Multifidus
    - Rotatores

# ABDOMINAL MUSCLES

– see elsewhere!







# Sources:

Márk Kozsurek: Spine, headjoints

Szentágothai, Réthelyi: Funkcionális anatómia I. (1994)

Platzer: Taschenatlas der Anatomie – Bewegungsapparat (6. Auflage, 1991)

Rohen, Yokochi: Color atlas of anatomy (7th edition, 2011)

Gray's Anatomy (Elsevier, 41th edition)