

LUMBOSACRAL SPINE: ANATOMY, RADIOLOGY AND BIOMECHANICS

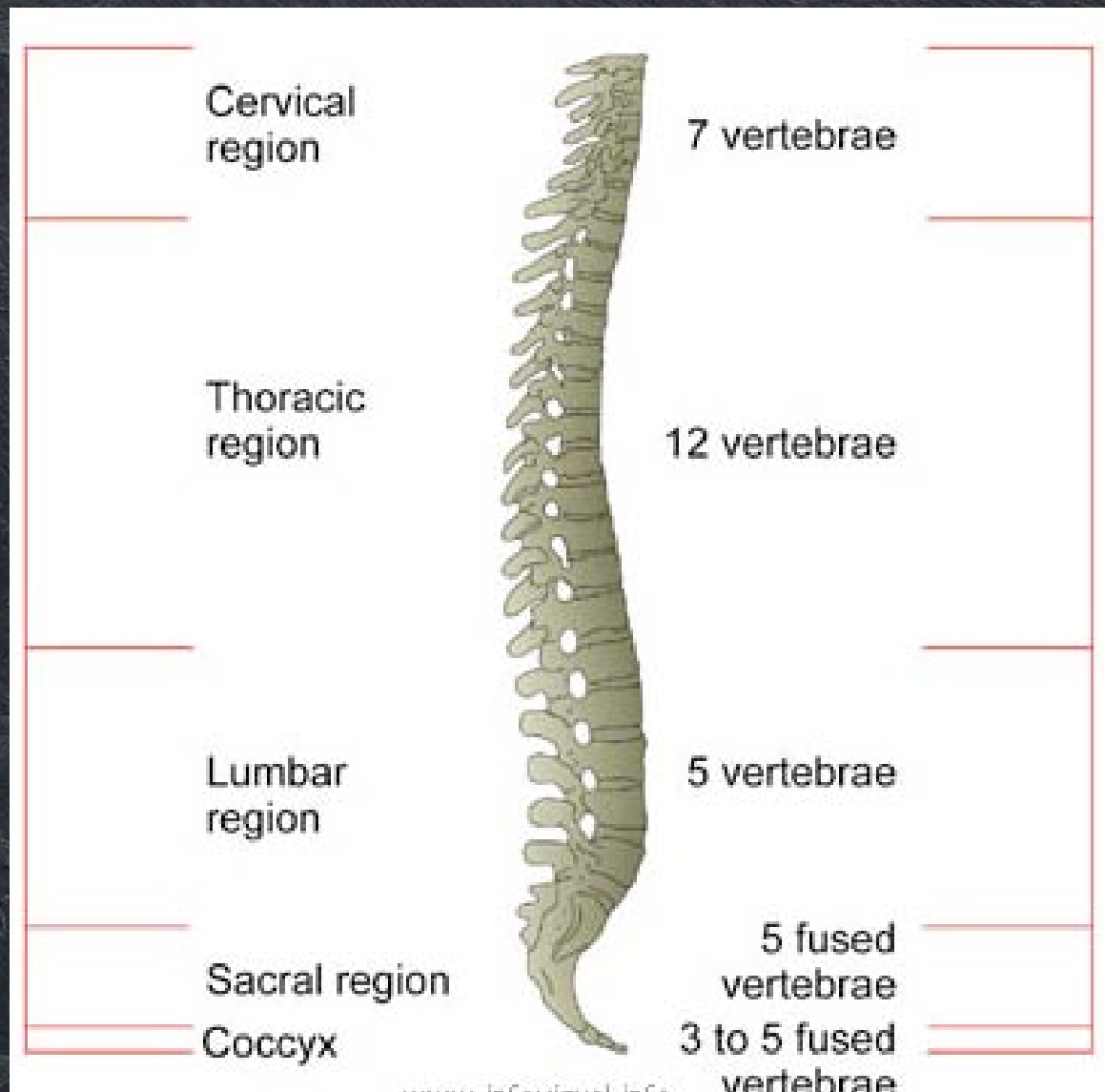
PERRY DHALIWAL, PGY-1

UNIVERSITY OF CALGARY

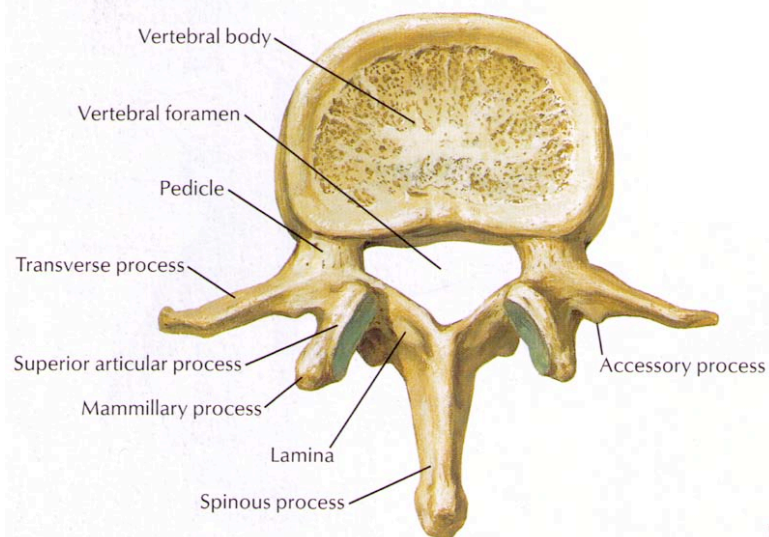
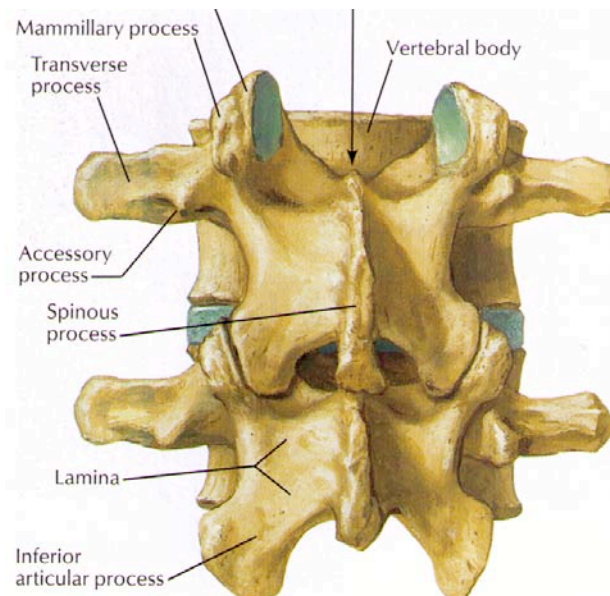
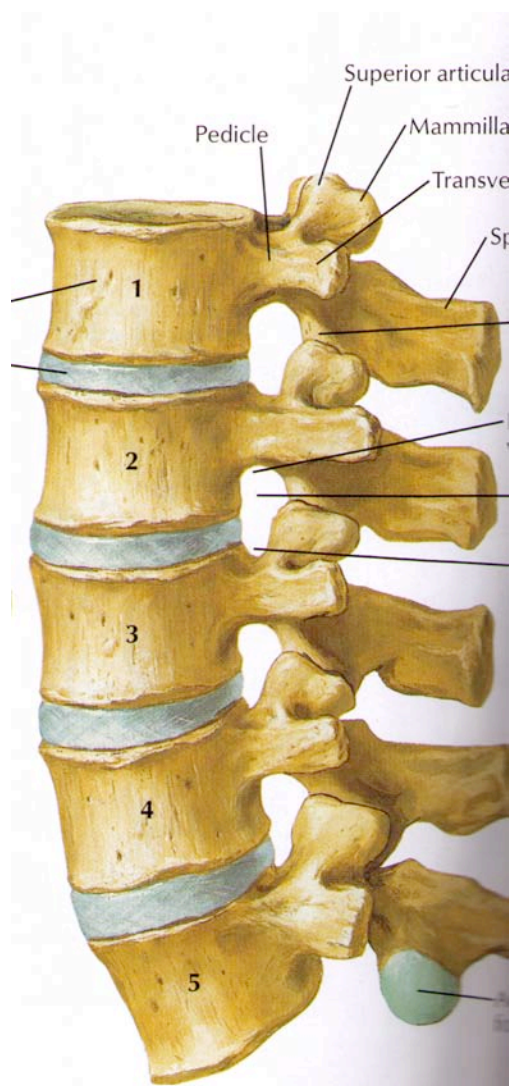
OVERVIEW

- ▶ OSTEOLOGY
- ▶ MUSCLES OF THE LOWER BACK
- ▶ LIGAMENTS OF THE LUMBAR SPINE
- ▶ VASCULAR SUPPLY
- ▶ NERVES AND LUMBOSACRAL PLEXUS
- ▶ RADIOLOGY CORRELATES
- ▶ BIOMECHANICS OF THE LUMBOSACRAL SPINE

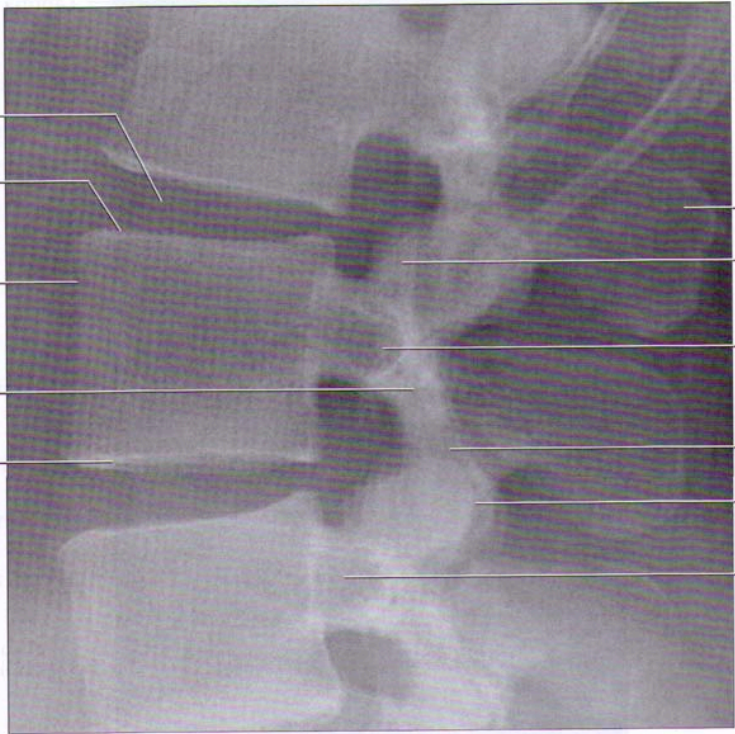
VERTEBRAL COLUMN



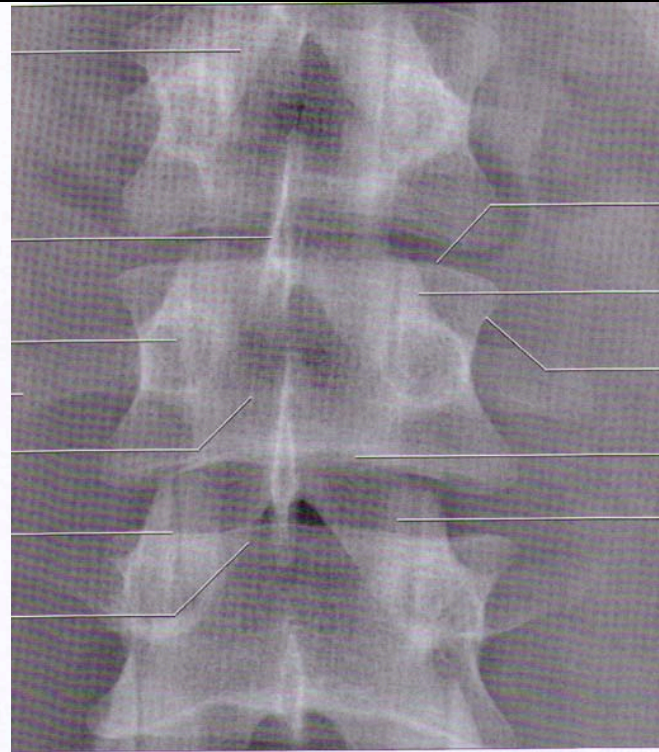
OSTEOLOGY: LUMBAR SPINE



X-RAY OF LUMBAR SPINE



- Spinous process
- Superior articular process
- Transverse process
- Inferior articular process
- Facet joint
- Pedicle

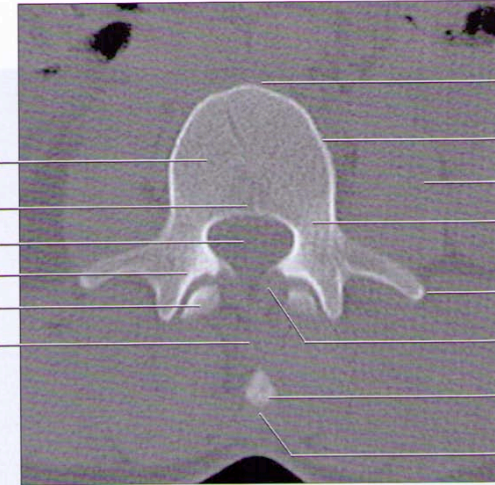


- Superior cortical margin
- Superior articular process
- Lateral cortical margin
- Inferior cortical margin
- Inferior articular process

AXIAL CT

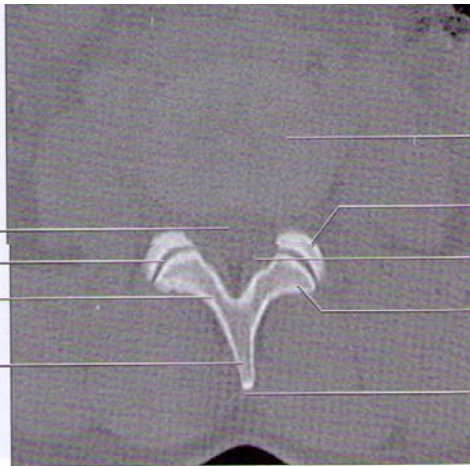
AXIAL NECT

Vertebral body medullary bone
 Basivertebral vein
 Spinal canal
 Superior articular facet
 Inferior articular facet
 Interspinous ligament



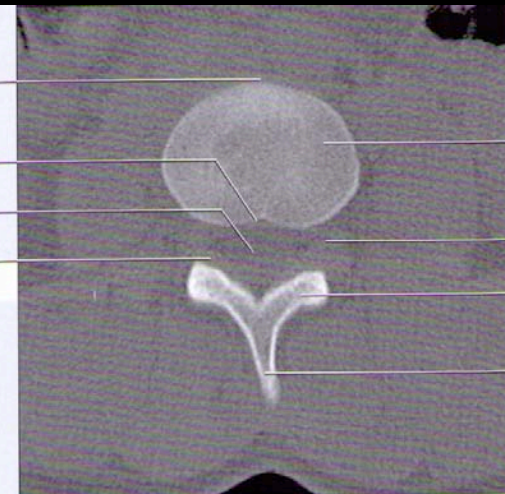
Anterior longitu
 Vertebral body c
 Psoas muscle
 Pedicle
 Transverse proc
 Ligamentum fla
 Spinous process
 Supraspinous li

Spinal canal with thecal sac
 Facet joint
 Lamina
 Spinous process



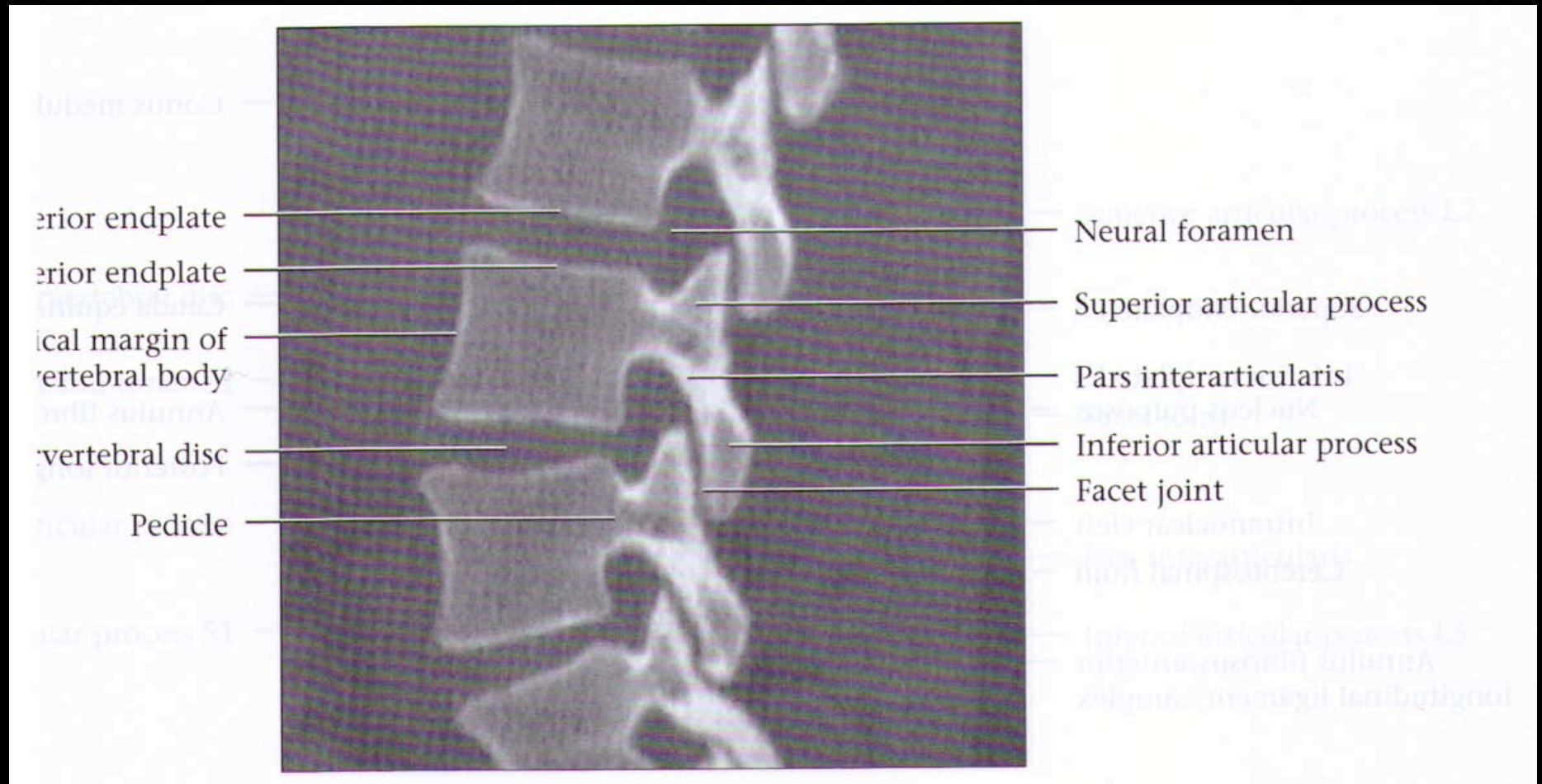
Intervertebral c
 Superior articular
 Ligamentum fl
 Inferior articular
 Supraspinous l

Anterior longitudinal ligament
 Posterior longitudinal ligament
 Spinal canal with thecal sac
 Ligamentum flavum

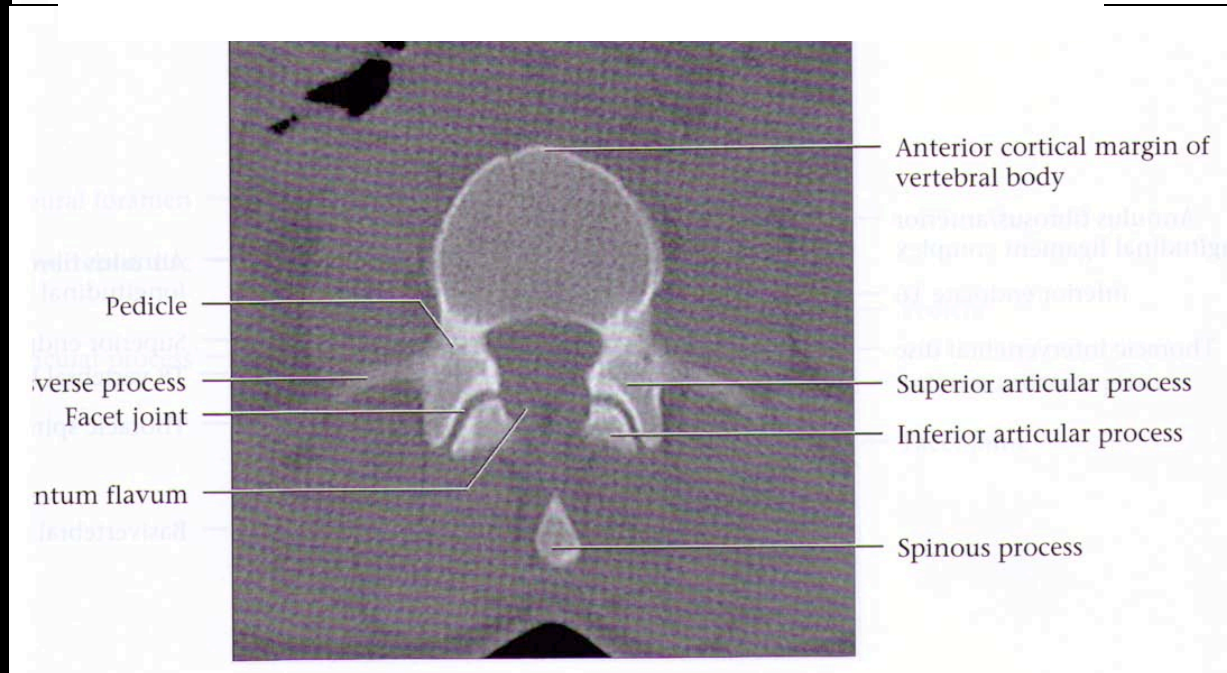
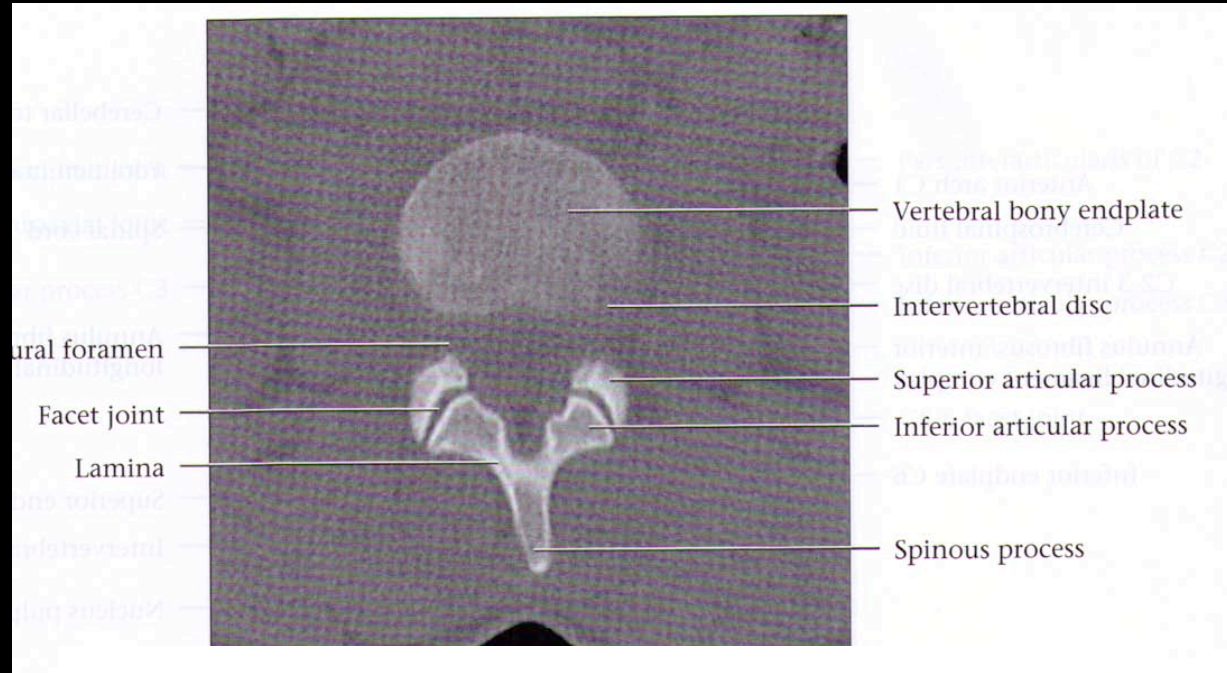


Vertebral body
 Neural foramen
 Lamina
 Spinous proces

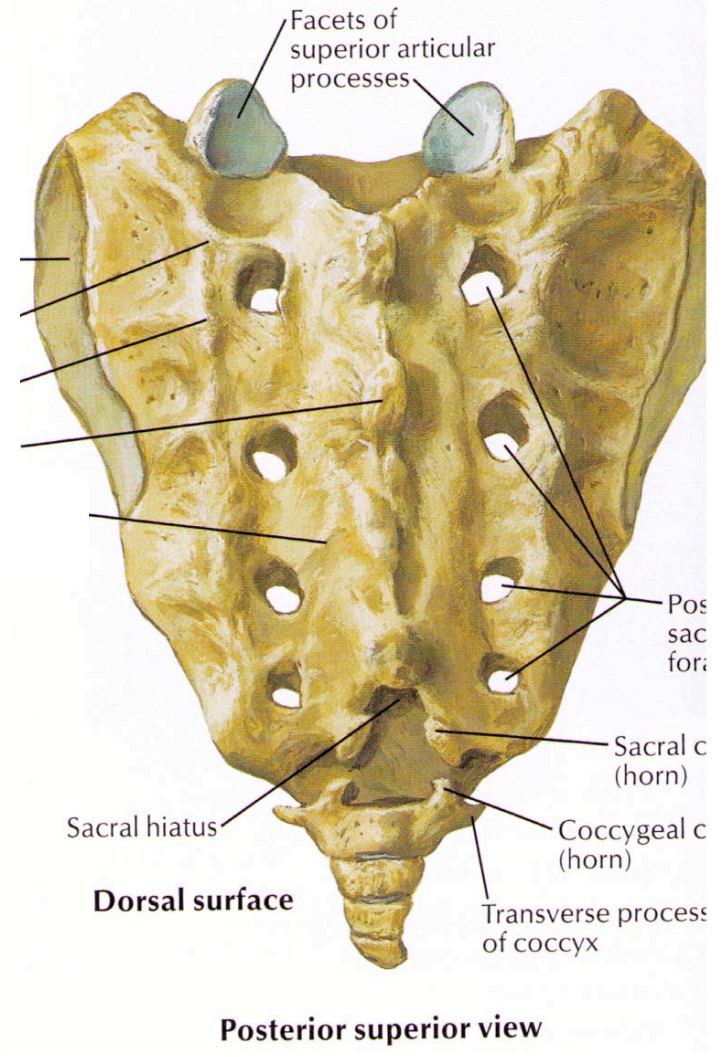
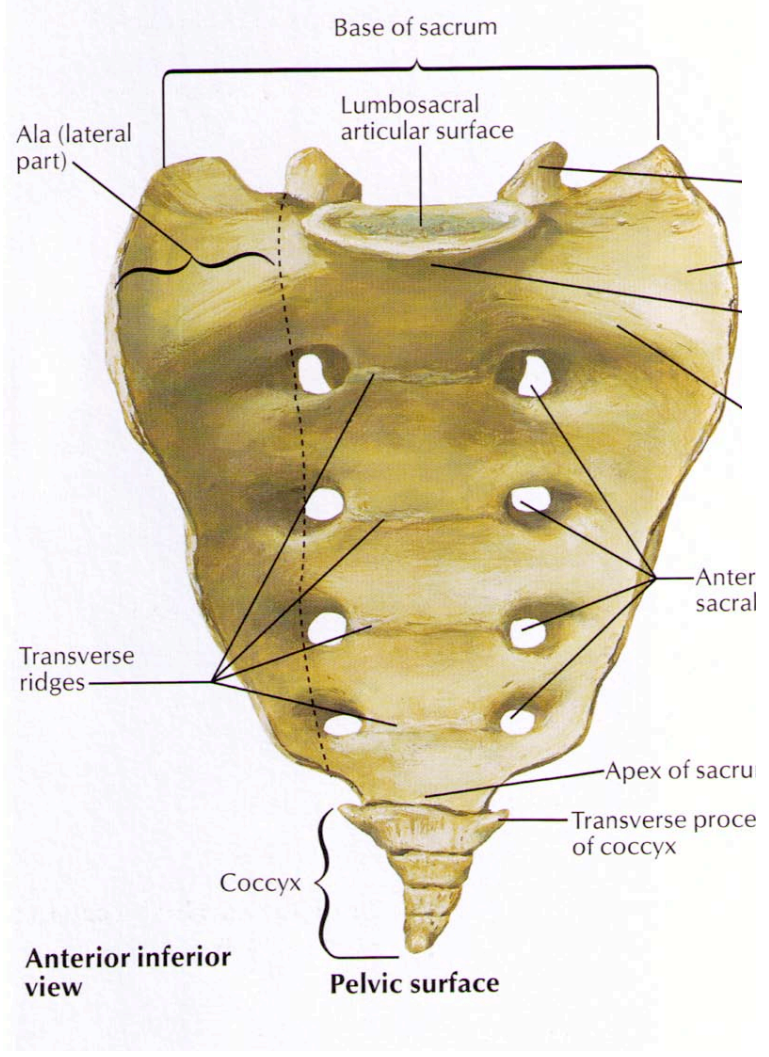
INTERVERTEBRAL DISC AND FACET JOINTS



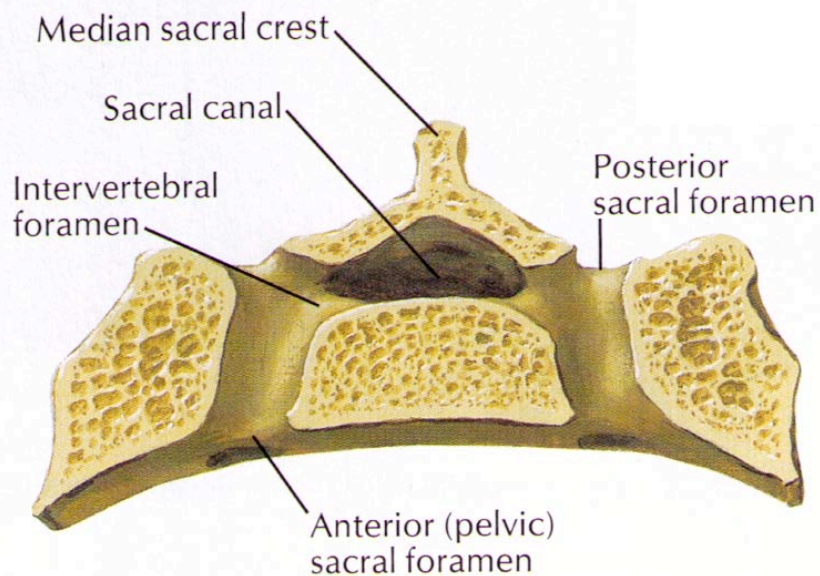
INTERVERTEBRAL DISC AND FACET JOINTS



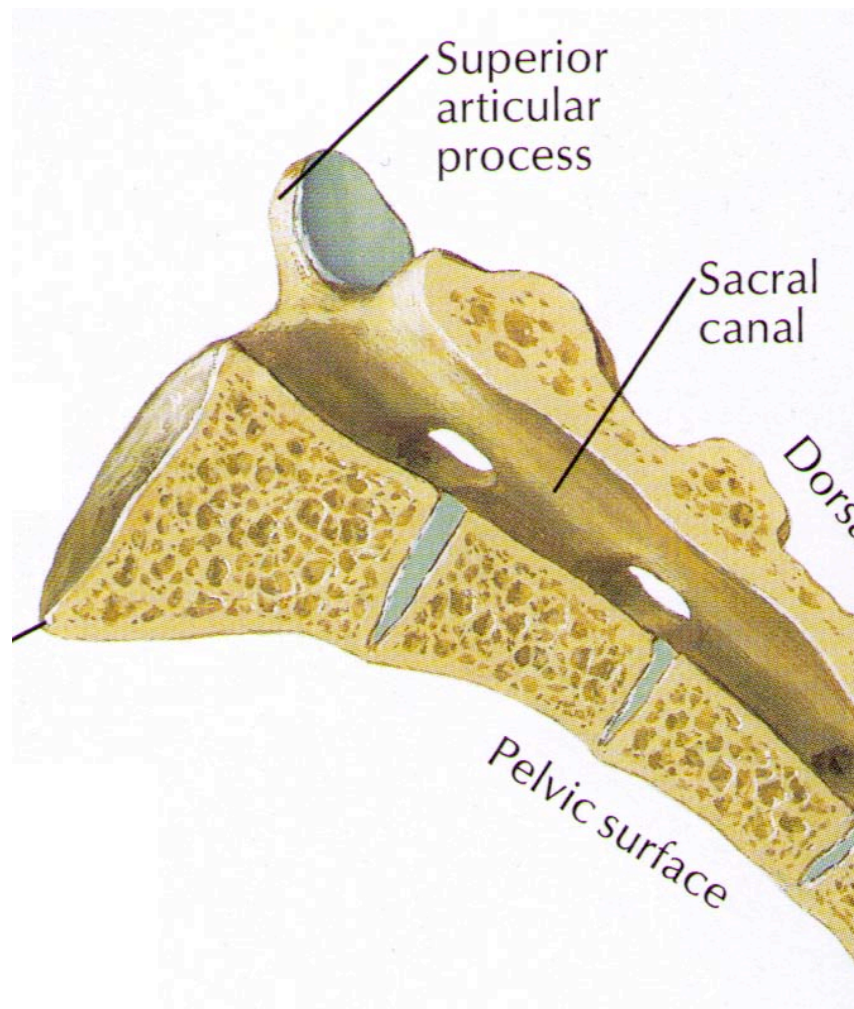
OSTEOLOGY: SACRUM



OSTEOLOGY: SACRUM

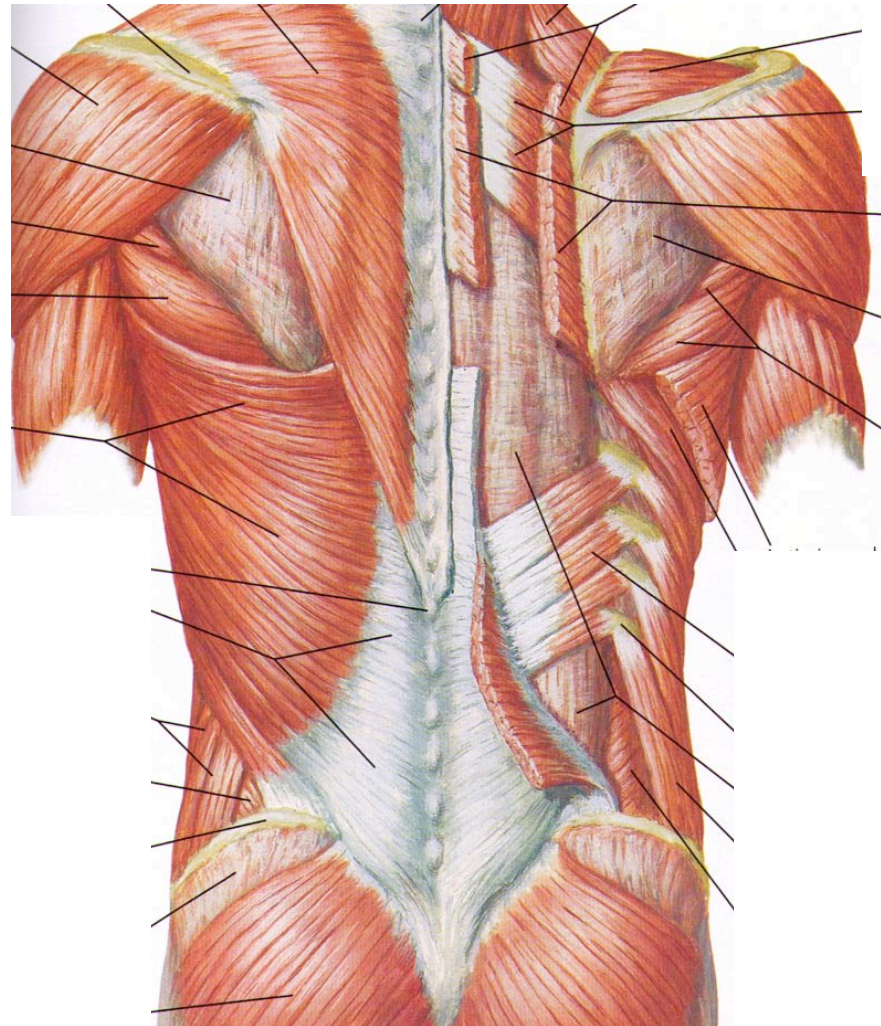


**Coronal section
through S2 foramina**



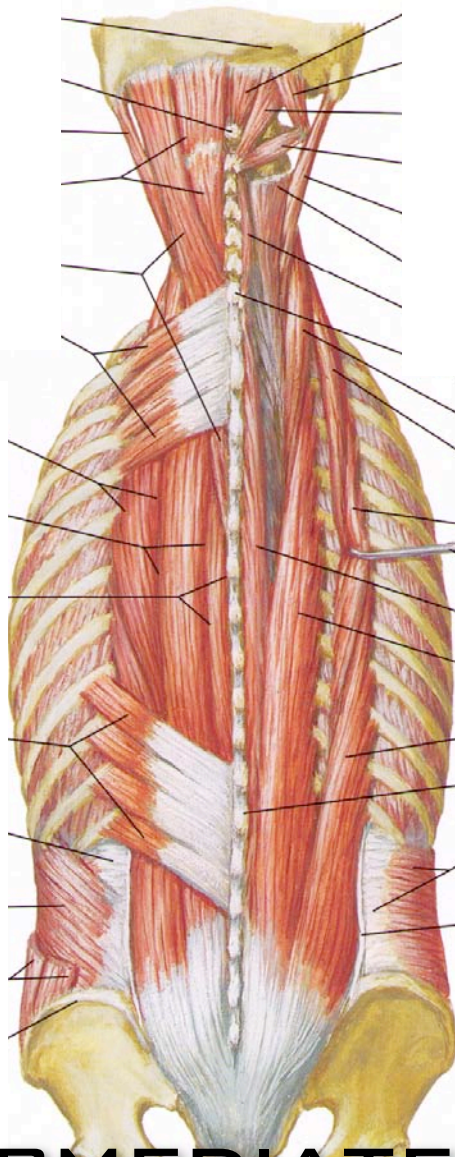
MUSCLES OF THE LOWER BACK

MUSCLES OF THE BACK

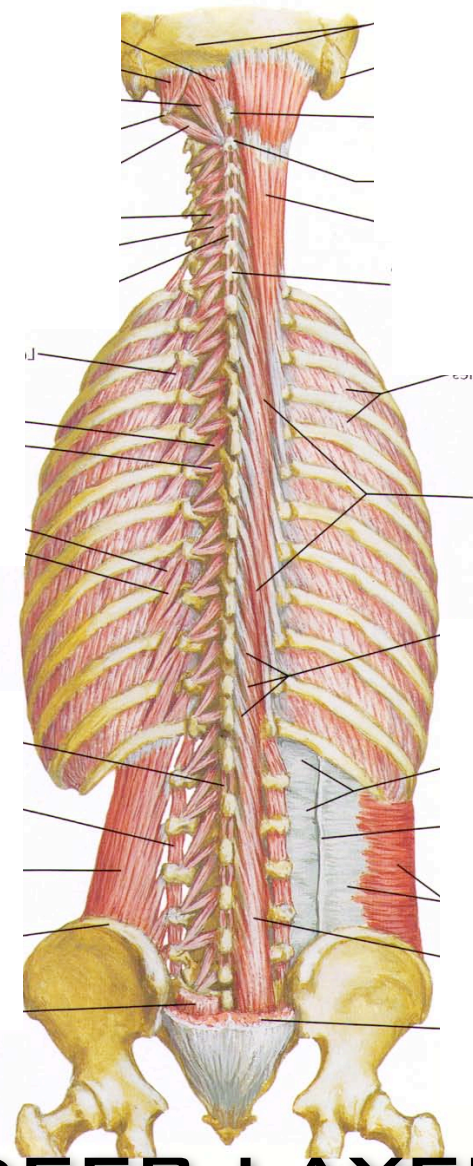


SUPERFICIAL LAYER

MUSCLES OF THE BACK



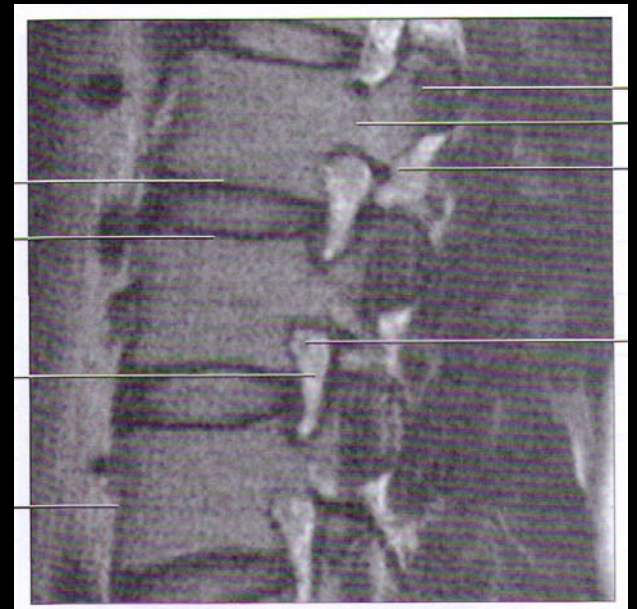
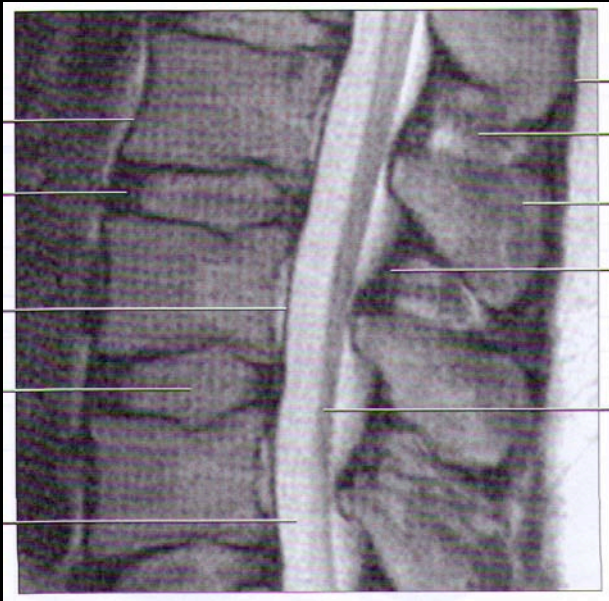
INTERMEDIATE LAYER



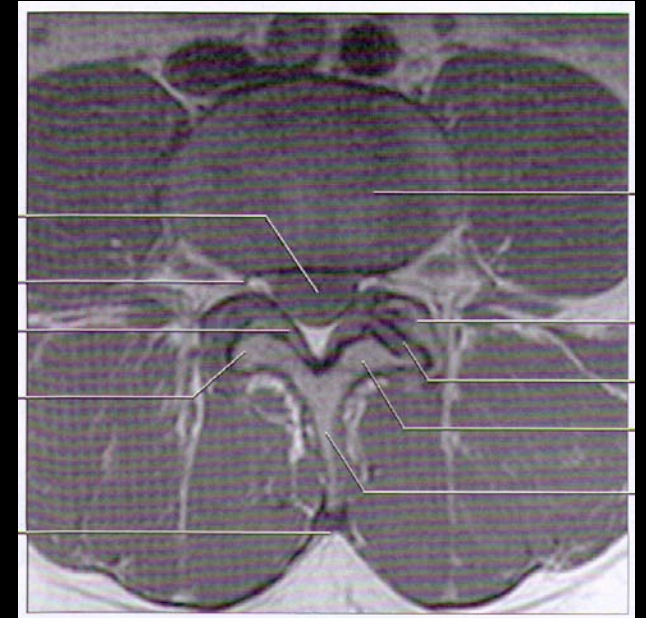
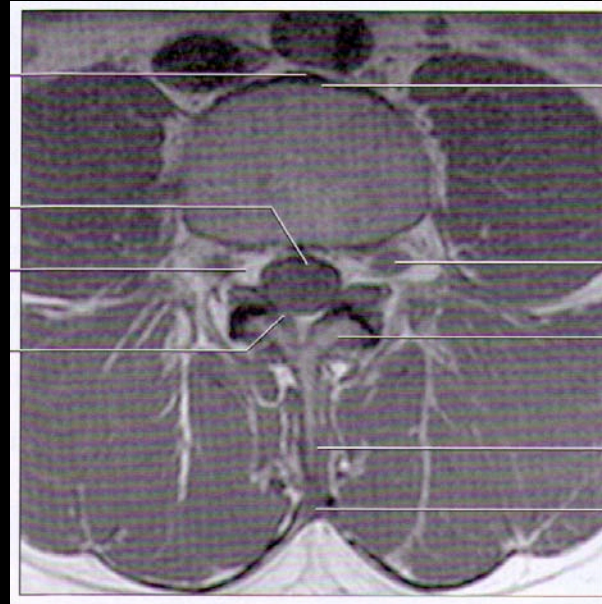
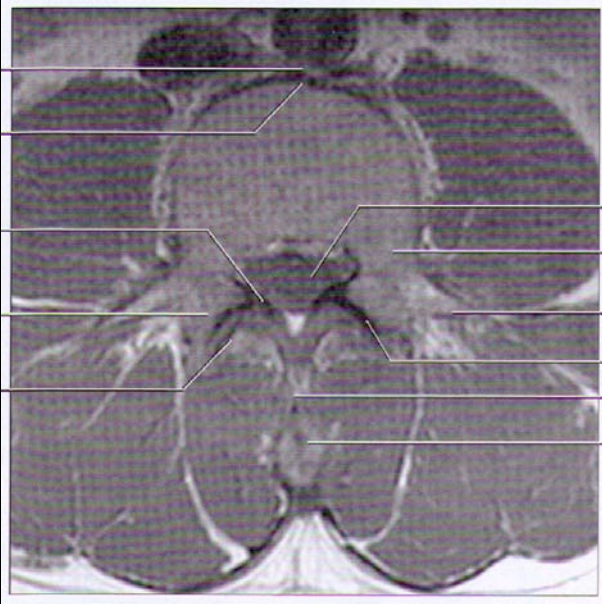
DEEP LAYER

LIGAMENTS OF THE LUMBAR SPINE

T2 SAGITTAL

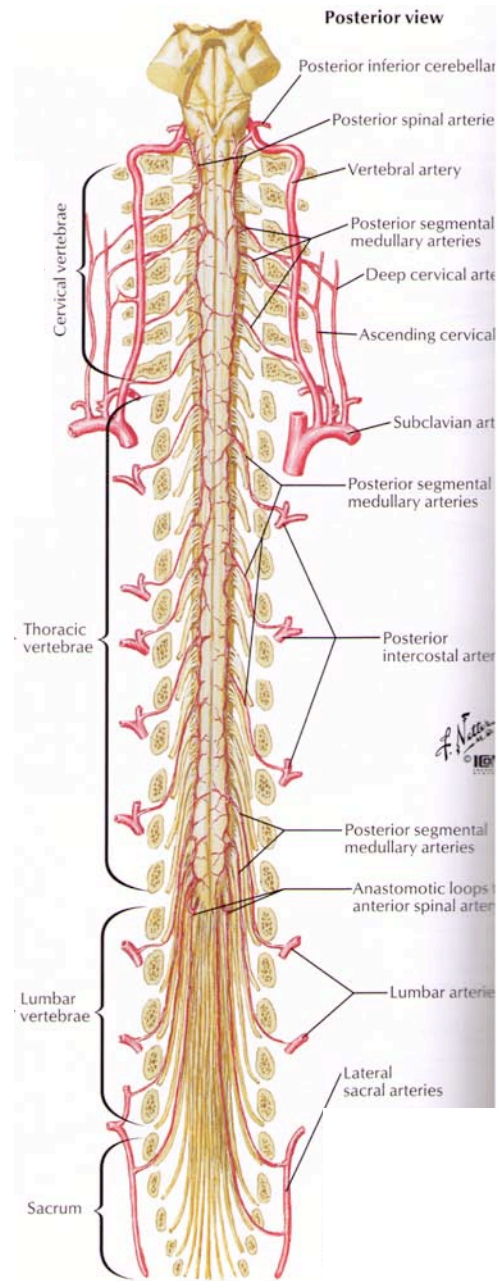
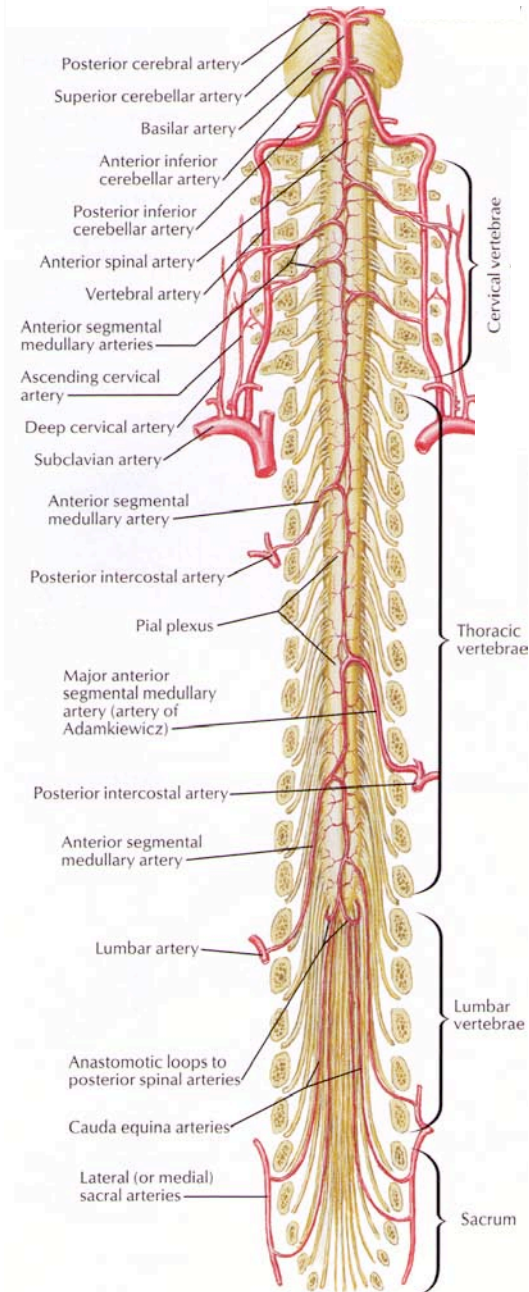


T2 AXIAL

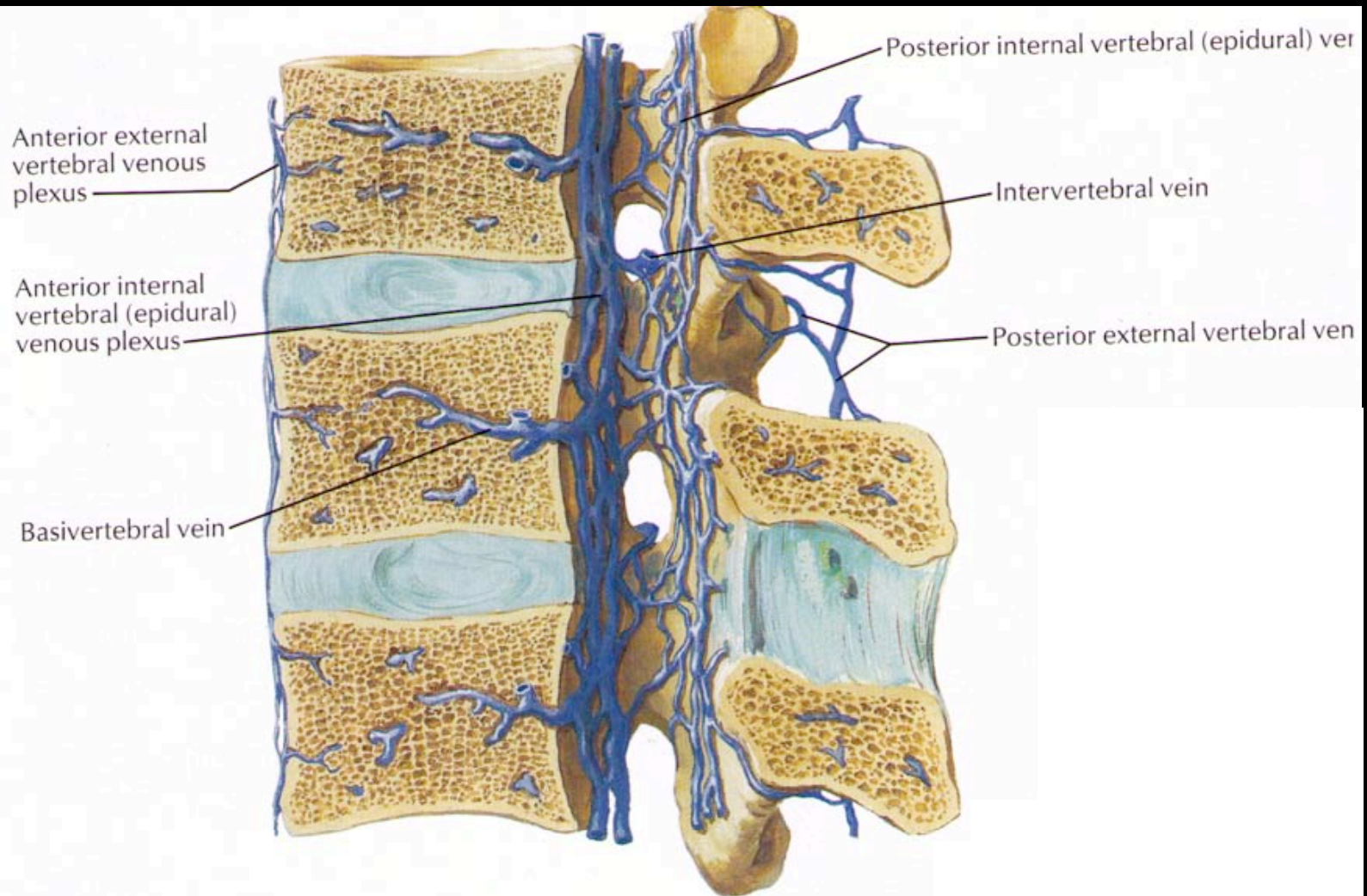


VASCULAR SUPPLY

ARTERIAL SUPPLY

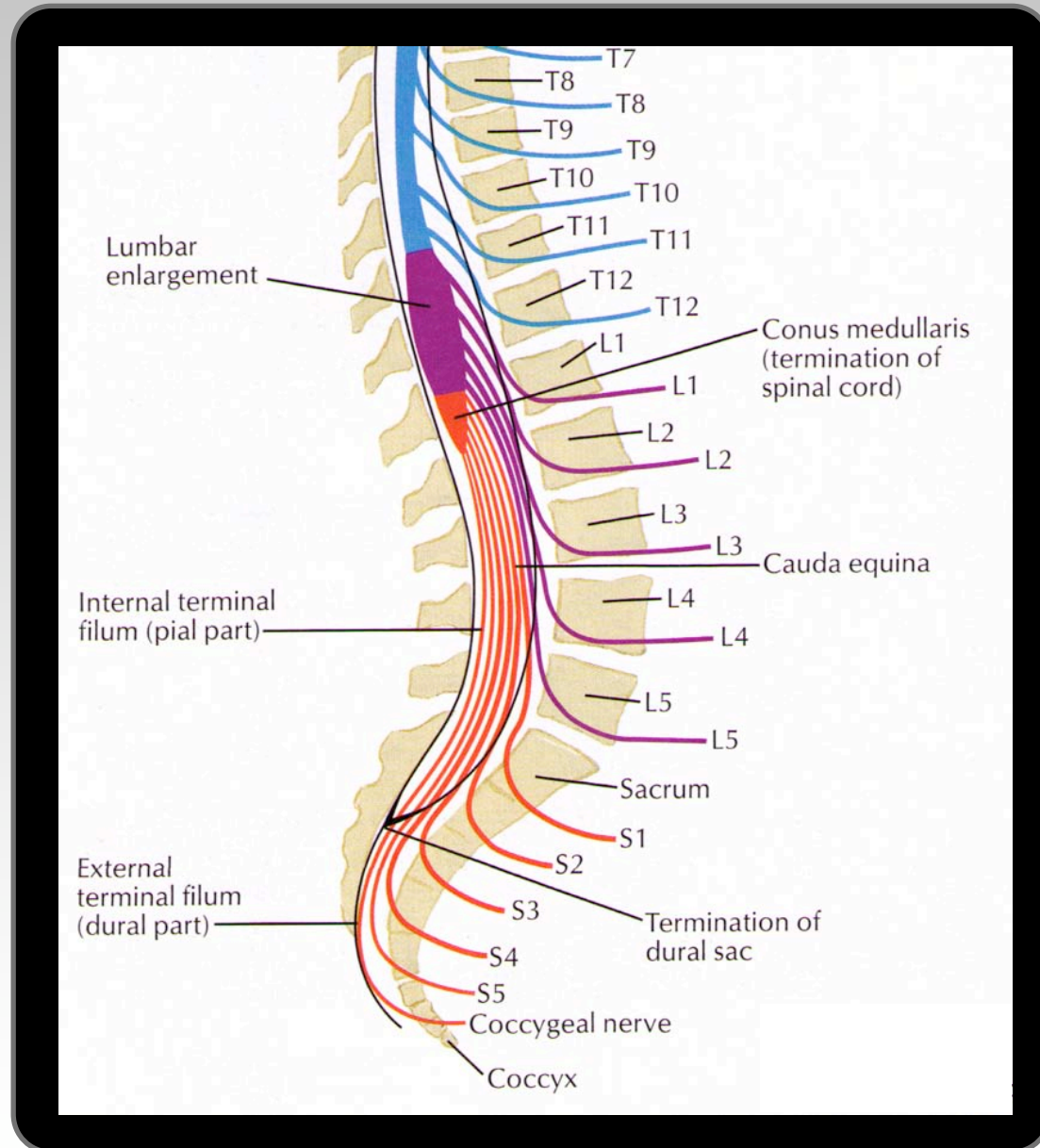


VENOUS DRAINAGE

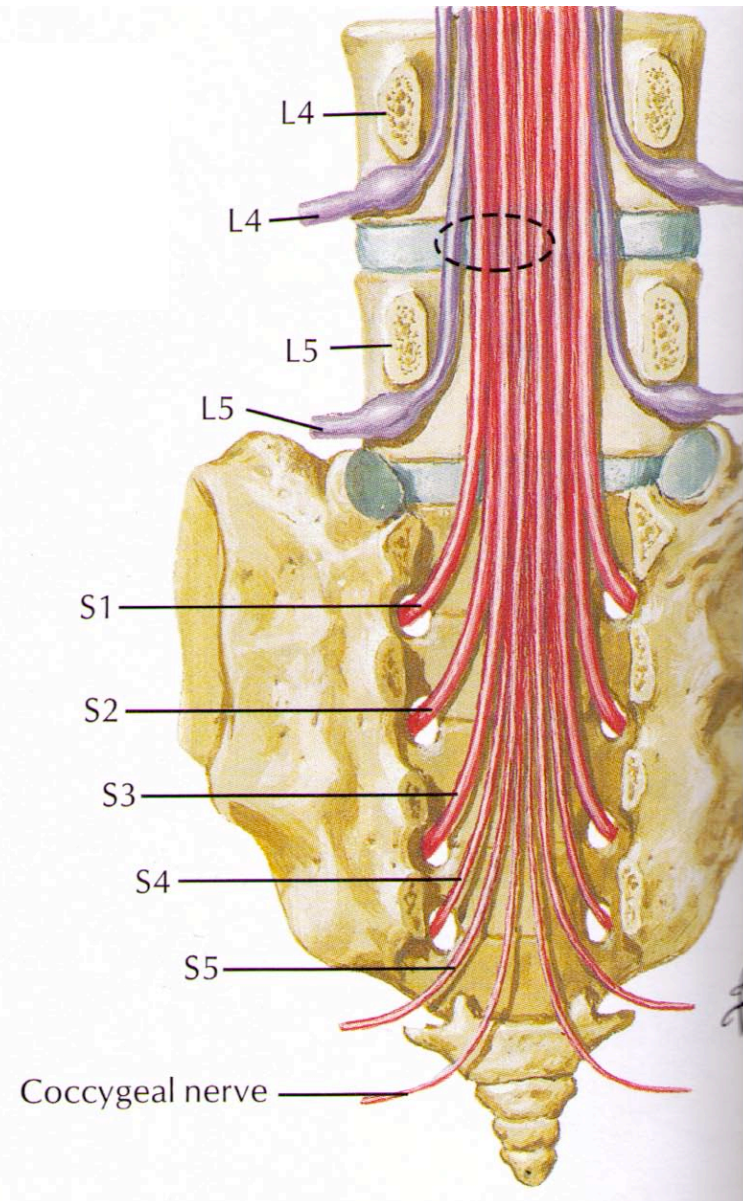
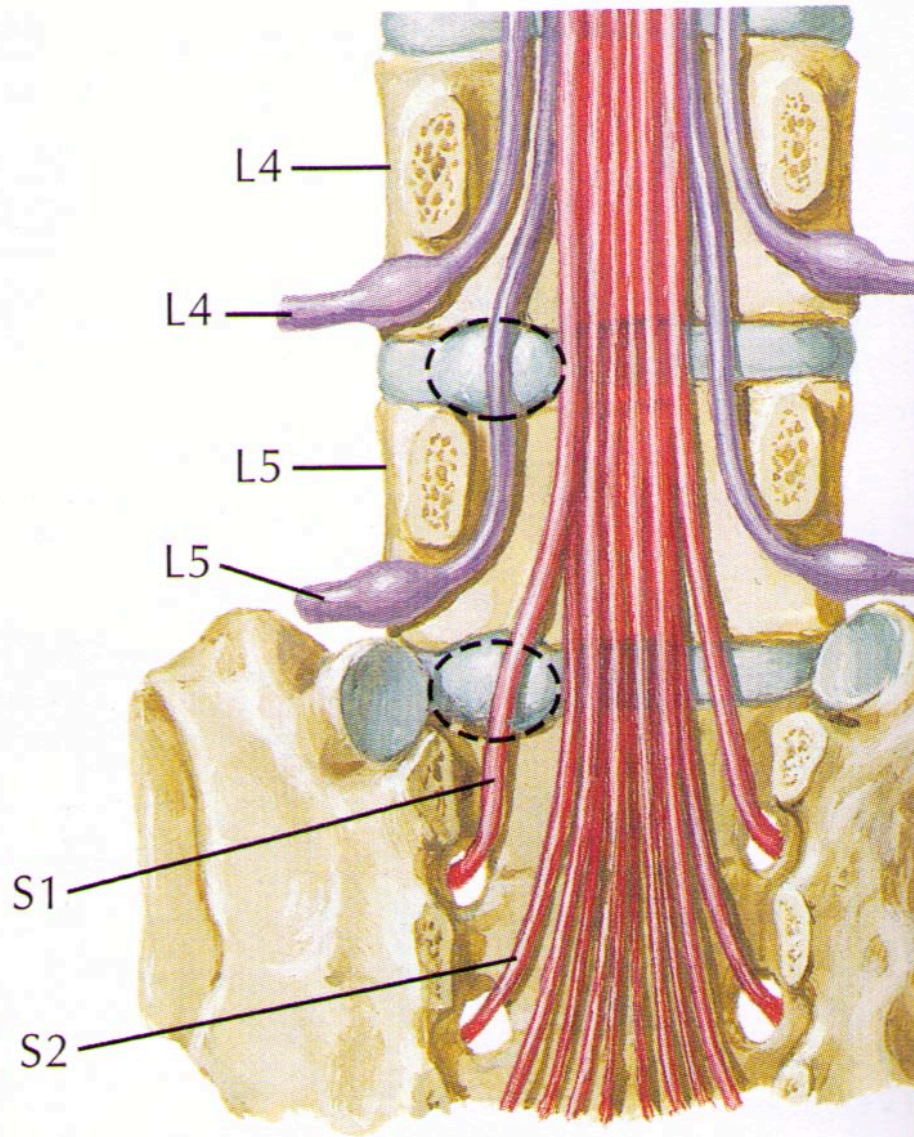


NERVES AND LUMBOSACRAL PLEXUS

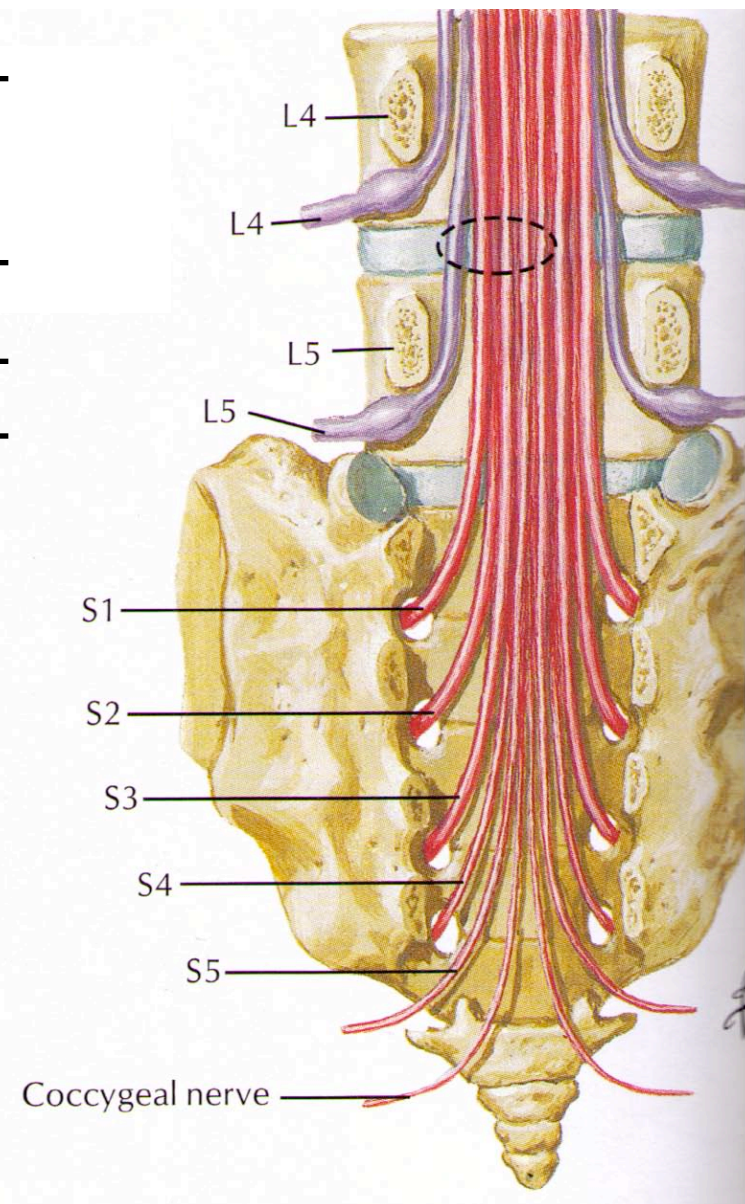
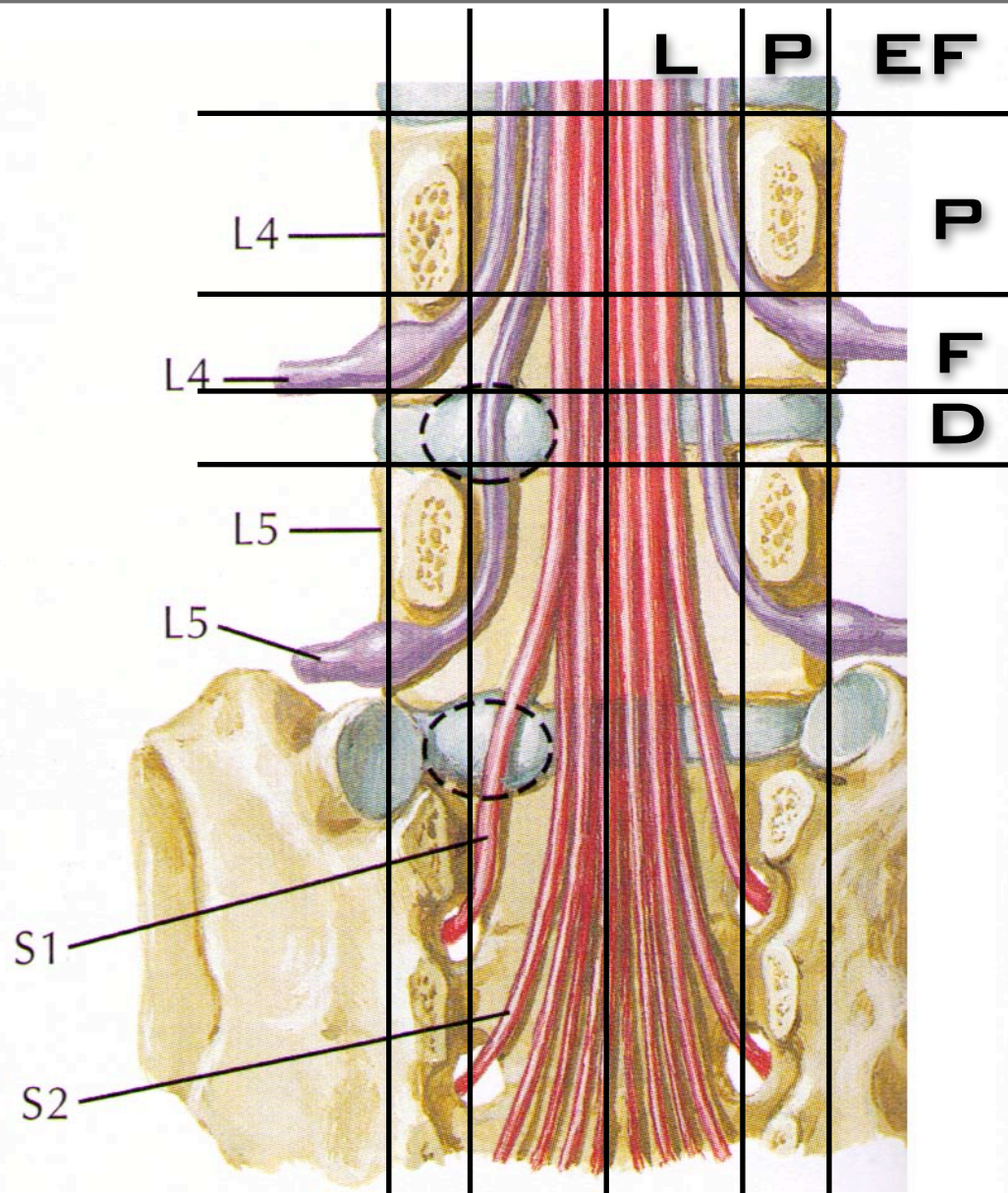
SPINAL NERVE ROOTS



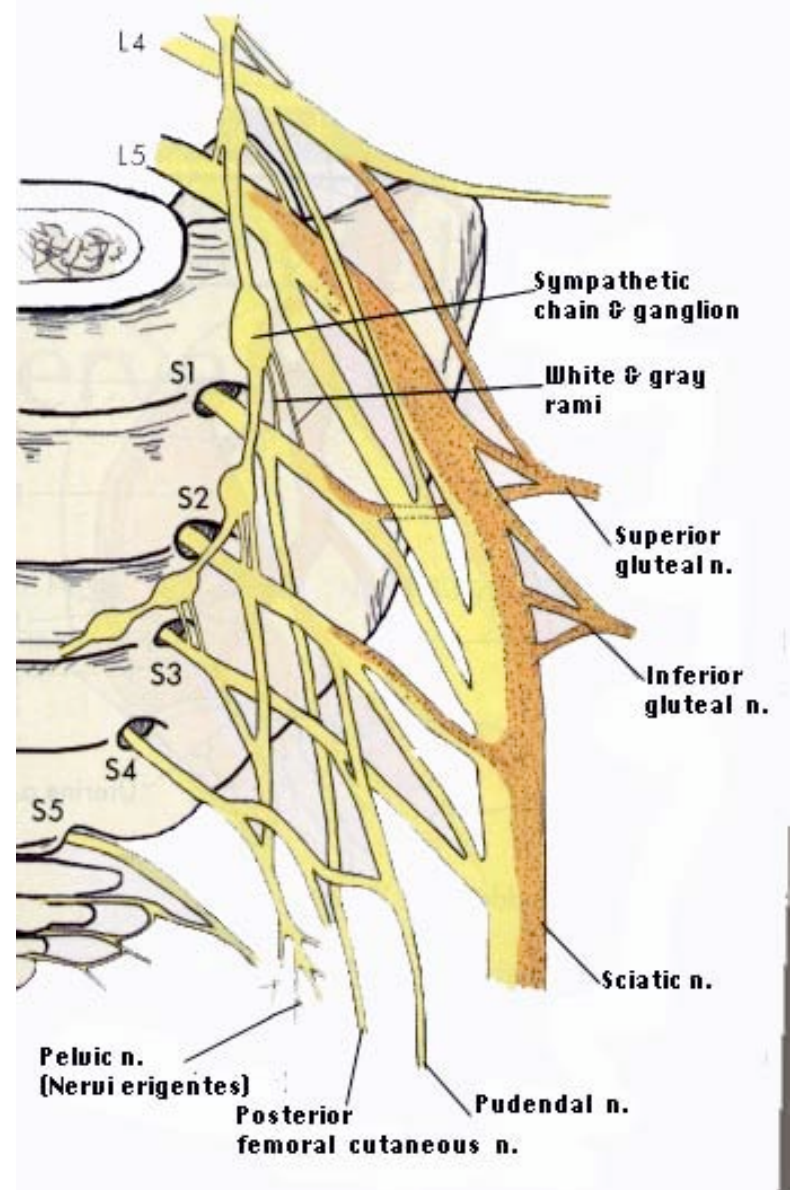
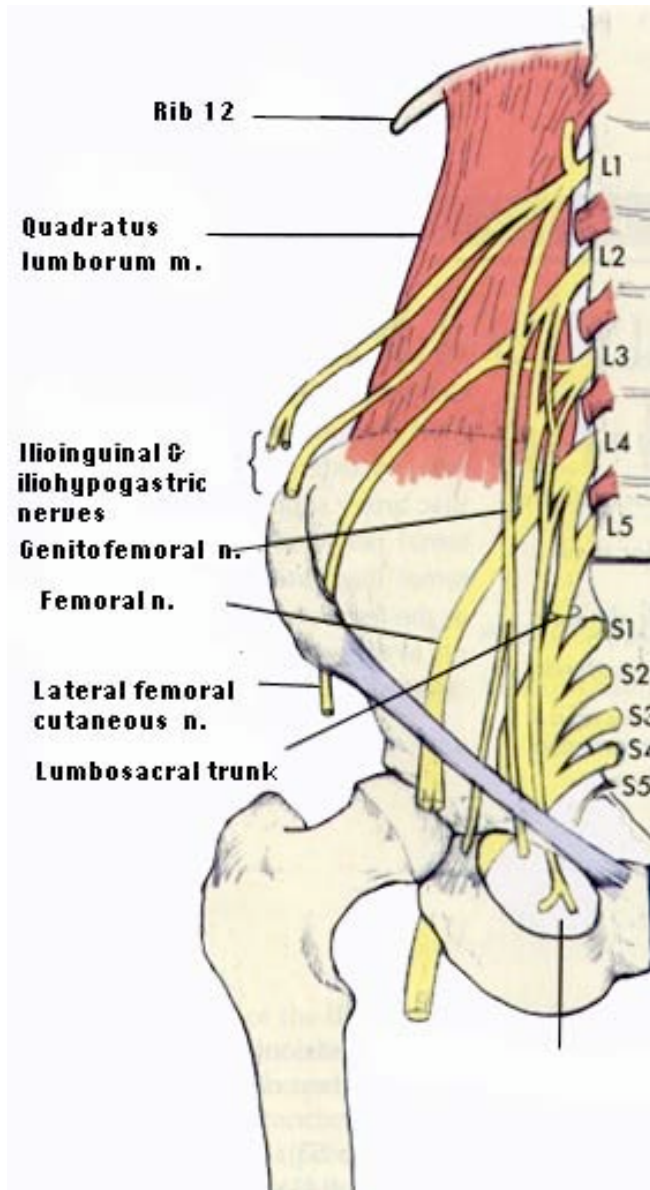
SPINAL NERVE ROOTS



SPINAL NERVE ROOTS



LUMBOSACRAL PLEXUS



BIOMECHANICS OF THE LUMBAR SPINE

PHYSICAL PROPERTIES OF THE SPINE

▶ INTERVERTEBRAL DISC

- ▶ SUBJECT TO COMPRESSIVE, TENSILE AND TORSIONAL LOADS
- ▶ RESPONSIBLE FOR CARRYING ALL THE COMPRESSIVE LOADING (ALONG WITH FACET JOINTS)
- ▶ BIOMECHANICS OF THE DISC ARE DEPENDENT ON ITS STATE OF DEGENERATION
 - ▶ MOST DEGENERATED DISCS: L3-L4, L4-L5, L5-S1
 - ▶ COMPOSED OF NUCLEUS PULPOSUS, ANNULUS FIBROSUS AND CARTILAGINOUS END-PLATE

PHYSICAL PROPERTIES OF THE SPINE

▶ SPINAL LIGAMENTS

▶ MOST EFFECTIVE IN CARRYING LOADS IN THE DIRECTION OF FIBERS - RESIST TENSILE FORCES

▶ FUNCTIONS INCLUDE:

▶ ALLOW ADEQUATE PHYSIOLOGIC MOVEMENT AND FIXED RELATIVE POSITIONS OF VERTEBRAL BODIES

▶ MUST RESTRICT MOVEMENTS WITHIN WELL-DEFINED LIMITS

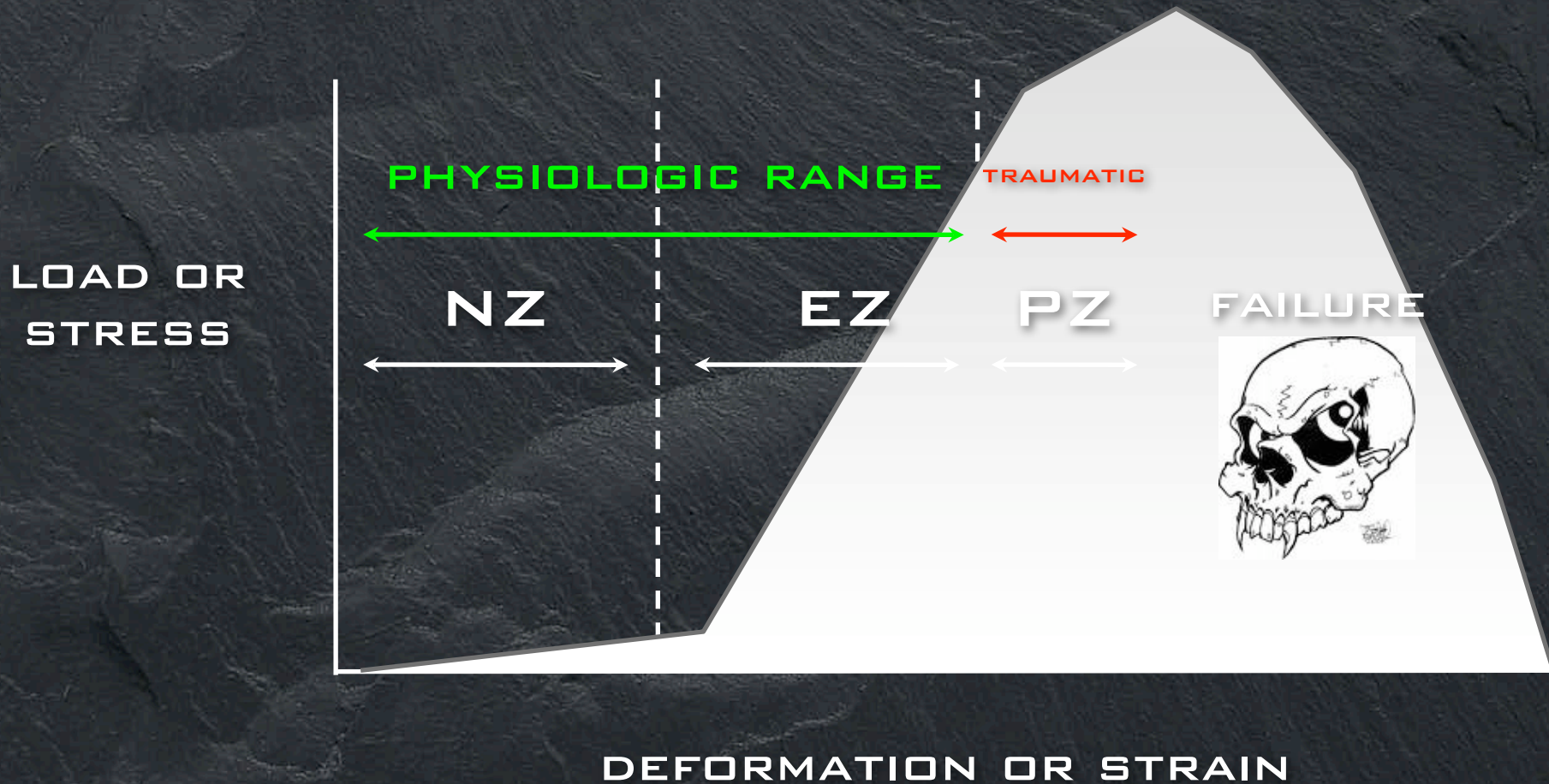
▶ SPINE STABILITY

PHYSICAL PROPERTIES OF THE SPINE



NZ = NEUTRAL ZONE EZ = ELASTIC ZONE PZ = PLASTIC ZONE

PHYSICAL PROPERTIES OF THE SPINE

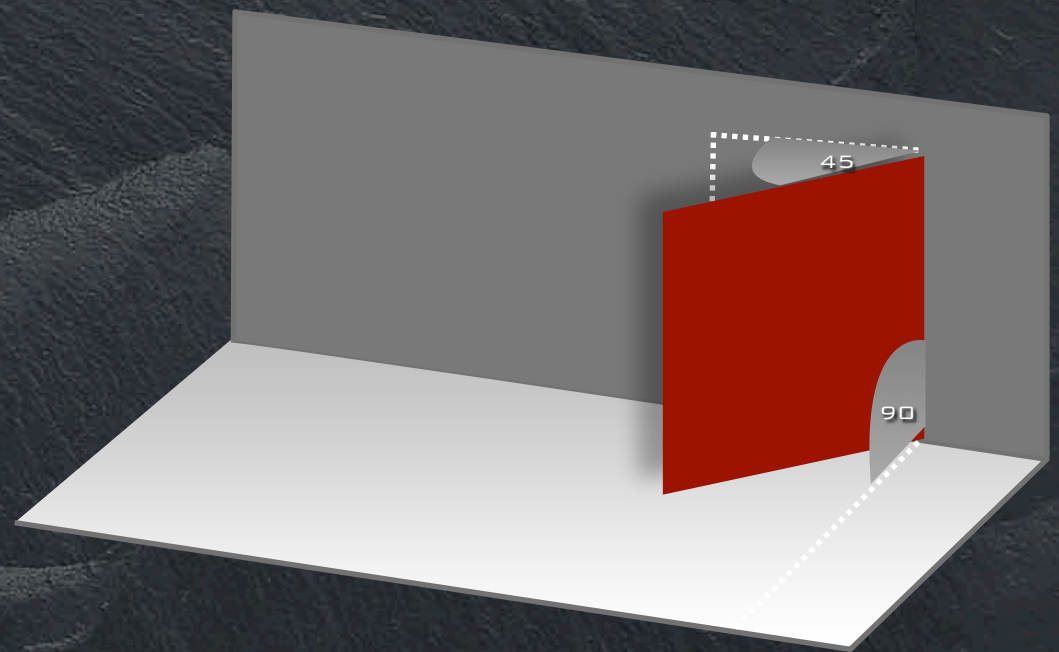


NZ = NEUTRAL ZONE EZ = ELASTIC ZONE PZ = PLASTIC ZONE

PHYSICAL PROPERTIES OF THE SPINE

▶ VERTEBRAL BODIES

- ▶ ORIENTATION OF THE FACETS DIFFERS IN THE LUMBAR SPINE
- ▶ ORIENTATION OF PEDICLES VARIES AMONGST VERTEBRAL BODIES OF THE LUMBAR SPINE
- ▶ ORIENTATION IMPORTANT TO UNDERSTAND FOR PEDICLE SCREWS
- ▶ CORTICAL SHELL AND CANCELLOUS CORE PLAY ROLE IN WEIGHT BEARING
- ▶ LUMBOSACRAL JOINT HAS THE MOST MOTION IN SAGITTAL PLANE



INSTABILITY OF THE LUMBAR SPINE

▶ ANTERIOR ELEMENTS

- ▶ ANTERIOR LONGITUDINAL LIGAMENT AND ANNULUS FIBROSUS CONSTITUTE MAJOR STRENGTH

▶ POSTERIOR ELEMENTS

- ▶ FACET JOINTS IMPORTANT FOR STABILITY OF LUMBAR SPINE

- ▶ IF THERE IS A FRACTURE WITH AXIAL ROTATION, FACET JOINT COMPROMISE MUST BE CONSIDERED

- ▶ SUPRASPINOUS LIGAMENTS ALSO IMPORTANT IN THE MAINTENANCE OF THE STABILITY

- ▶ INTERSPINOUS LIGAMENTS AND LIGAMENTUM FLAVUM ADD LITTLE TO THE STABILITY OF THE SPINE

QUESTIONS???

