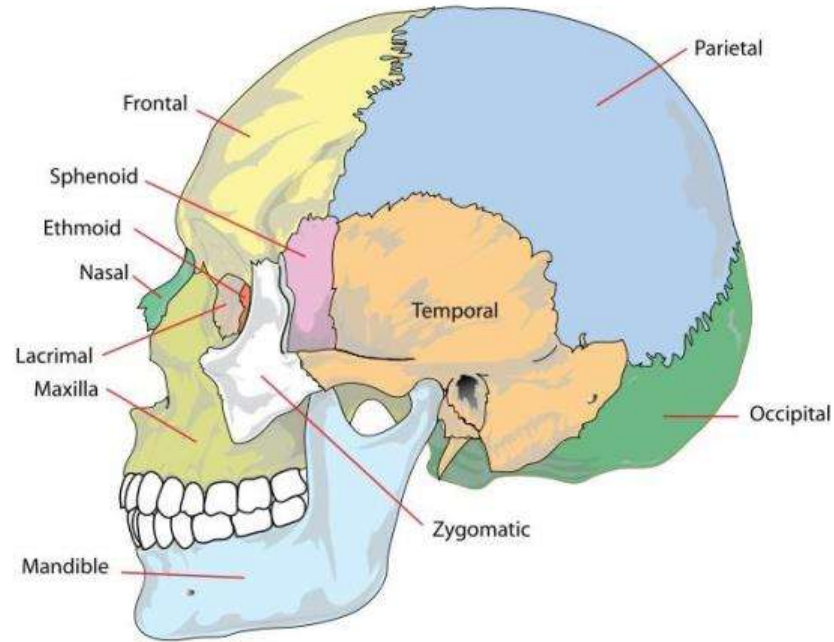


The Vertebral Column

Head, Neck and Spine



Bones of the head

Some consider the bones of the head in terms of the vault bones and the facial bones 'hanging off' the front of them

The vault bones

- Frontal
- Parietals
- Occiput
- Temporals
- Sphenoid
- Ethmoid

The Facial Bones

- Maxillae
- Palatines
- Vomer
- Zygomae
- Nasals
- Chonchae (turbinators)
- Mandible

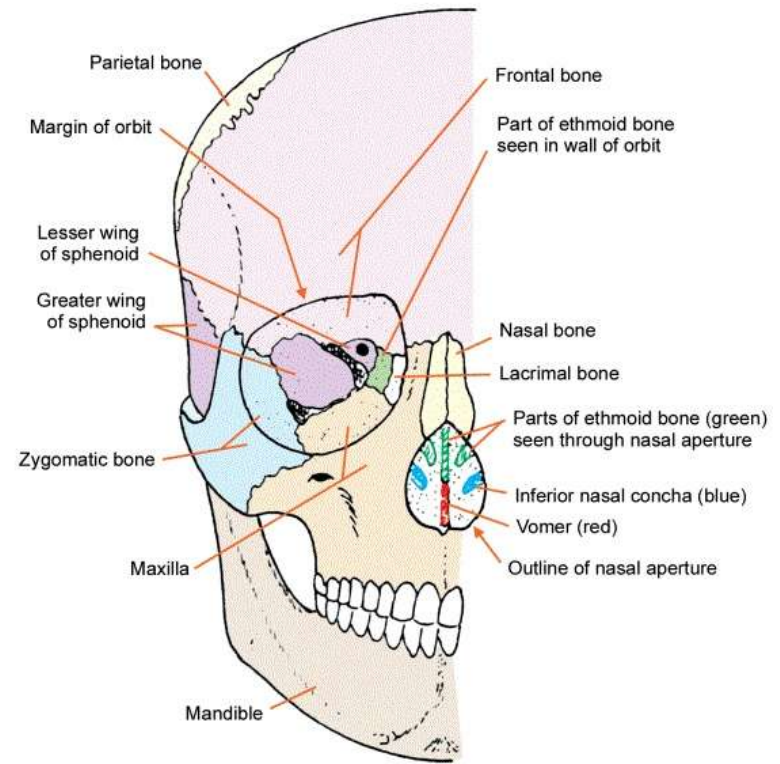


Figure 1 - Bones of the Head

Bones of the vertebral column

- 7 cervical vertebrae
- 12 thoracic vertebrae
- 5 lumbar vertebrae
- 5 (fused) sacral vertebrae
- 3 coccygeal vertebrae

Bones of the spine

The bones of the spine are numbered from the top down, as per the region of the spine, e.g. the second bone down in the cervical spine = C2

Ligaments of the Spine

- **Anterior longitudinal ligament**
 - Runs the whole length of the spine on the anterior aspect of the vertebrae and discs; it stabilises the front of the spine
- **Posterior longitudinal ligament**
 - Runs the whole length of the spine on the posterior aspect of the vertebrae and discs; it stabilises the back of the spine.
- **Interspinous ligaments**
 - Between the TPs of the vertebrae; it stabilises the spine in flexion
- **Supraspinous ligament**
 - This joins all the tips of the TPs and runs the entire length of the spine; it stabilises the spine in flexion
- **Ligamentum nuchae**
 - This is a strong fibrous structure between the occiput and C7, joining all the TPs.
- **Thoracolumbar fascia**
 - This is a fibrous envelope wrapping around the lumbar erector spinae, extending from the sacrum up to the level of T8; it is not a ligament, per se, but acts as one

Lateral (Side) Spinal Column



Posterior (Back) Spinal Column

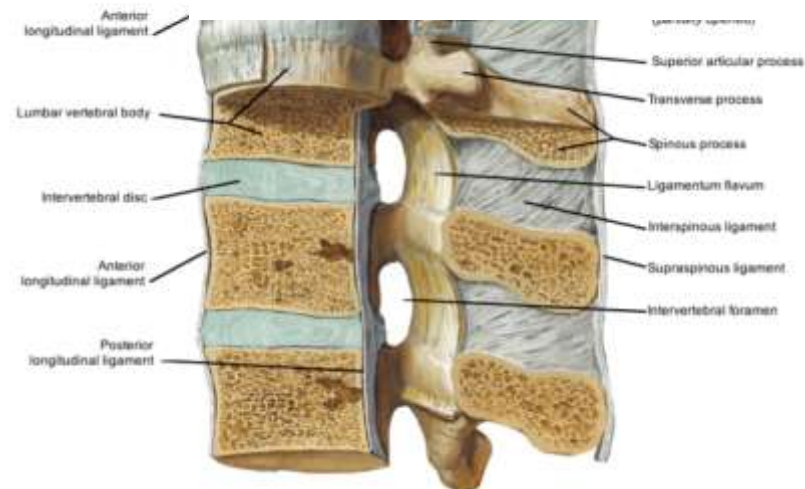
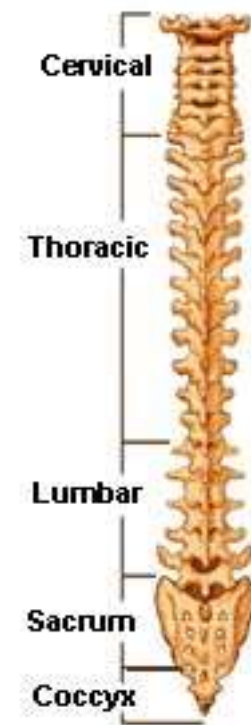
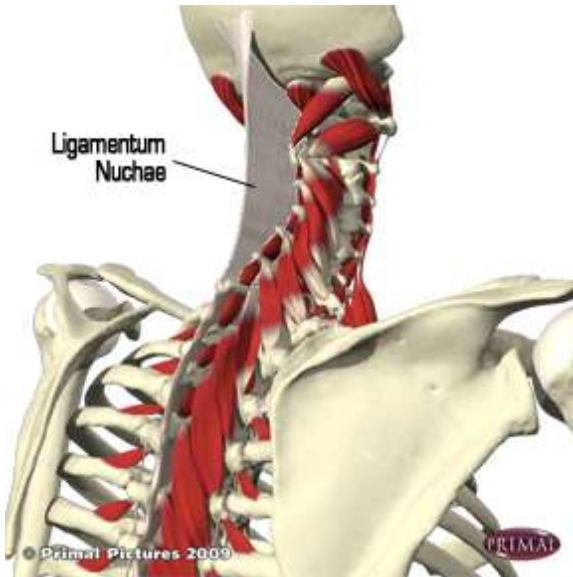
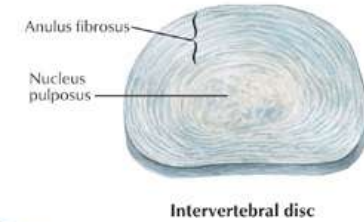
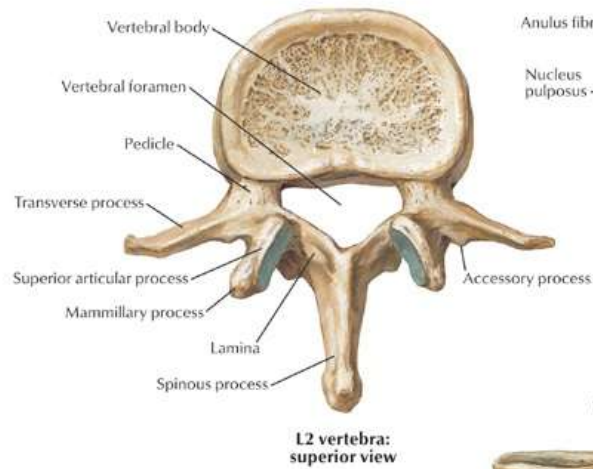


Figure 2 - Ligaments of the Spine



Ligaments of the neck and low back

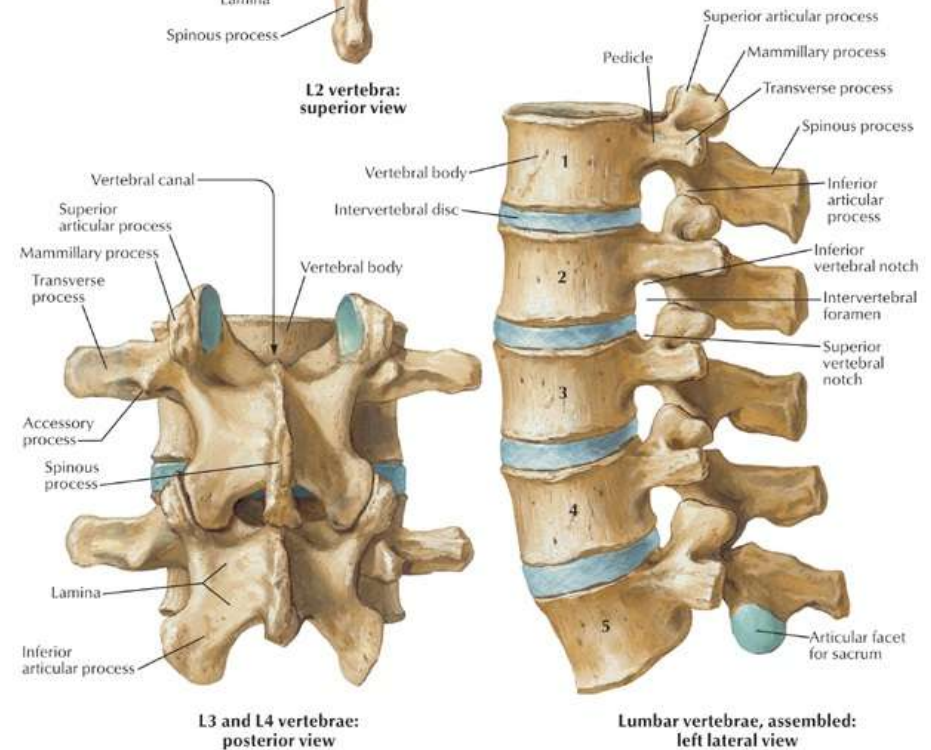
- Ligamentum Nuchae
- Thoracolumbar fascia



Vertebrae

The common factors all vertebrae share are:

- Vertebral body
- Pedicles
- Laminae
- Transverse processes
- Superior and inferior articular processes and facets
- Spinous processes



Joints of the Spine

The primary weight-bearing joint in the spine is the intervertebral disc. It is a cartilaginous joint, allowing limited movement between each bone, but summing up along the length of the spine. Legend would believe that these structures are discrete and can move out of place. This is not true. They are bound to the adjacent vertebrae and to the longitudinal ligaments. Their structure consists of concentric rings of fibrous tissue (annulus fibrosus) with a gelatinous, almost liquid, centre (nucleus pulposus). This arrangement allows the structure to bear weight and allow movement (like a ball between two boards). However, the disc is not the only joint in the spine.

Behind the disc are two facet joints, these define what type of movement occurs at that level, dependent upon the plane of the joints, e.g. in the neck, the plane of the facet joints are relatively horizontal, allowing lots of rotation, whereas in the lumbar spine, they are in the vertical plane, aligned front to back (sagittal plane), allowing more flexion/extension, but less rotation.

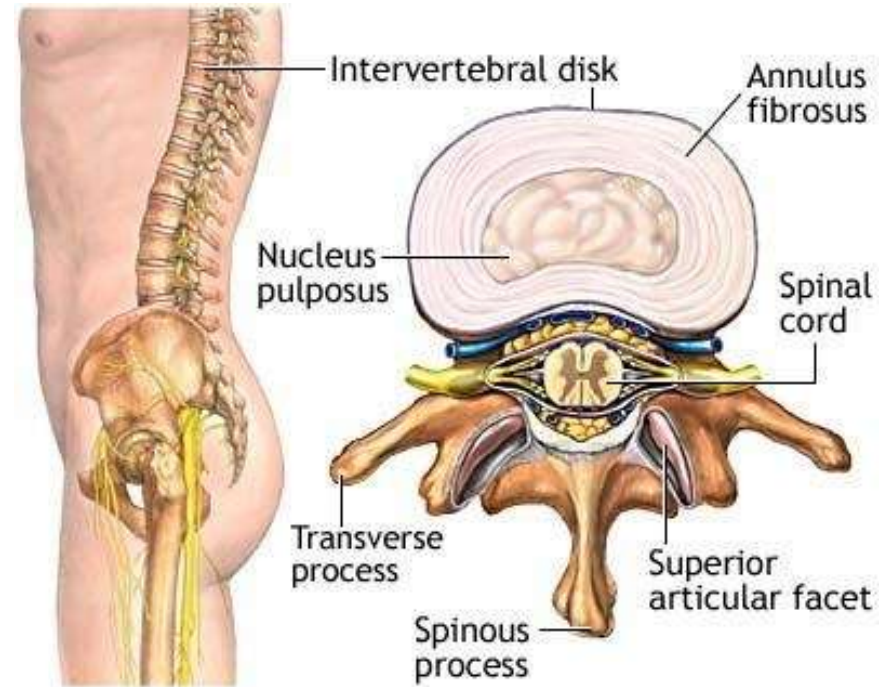
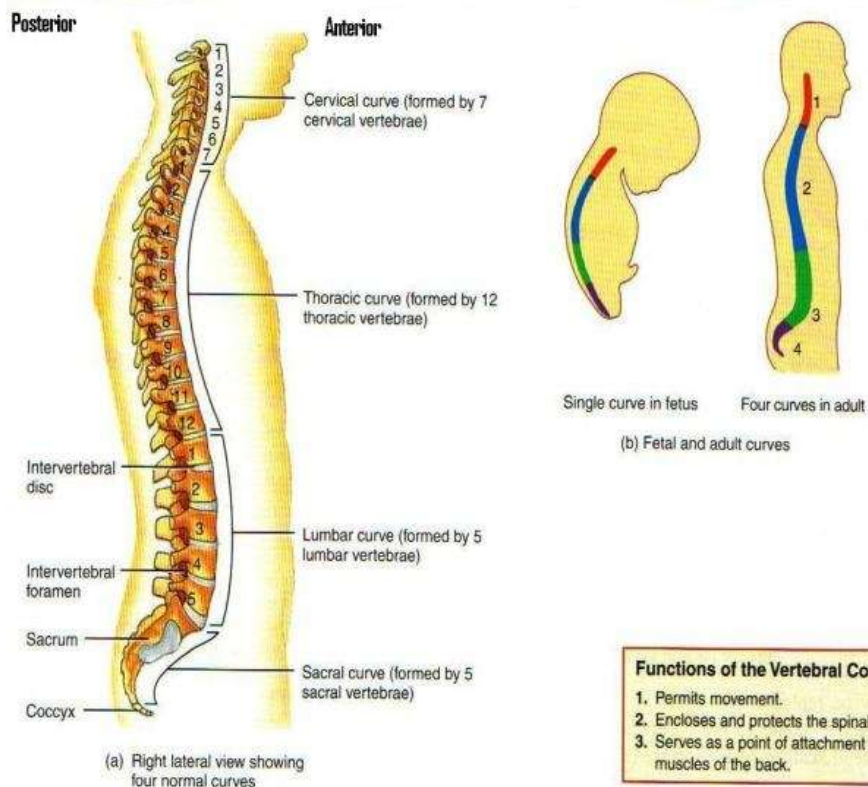


Figure 3 - Cross Section Of Spine Showing Disc and Spinal Cord



Functions of the Vertebral Column

1. Permits movement.
2. Encloses and protects the spinal cord.
3. Serves as a point of attachment for the ribs and muscles of the back.

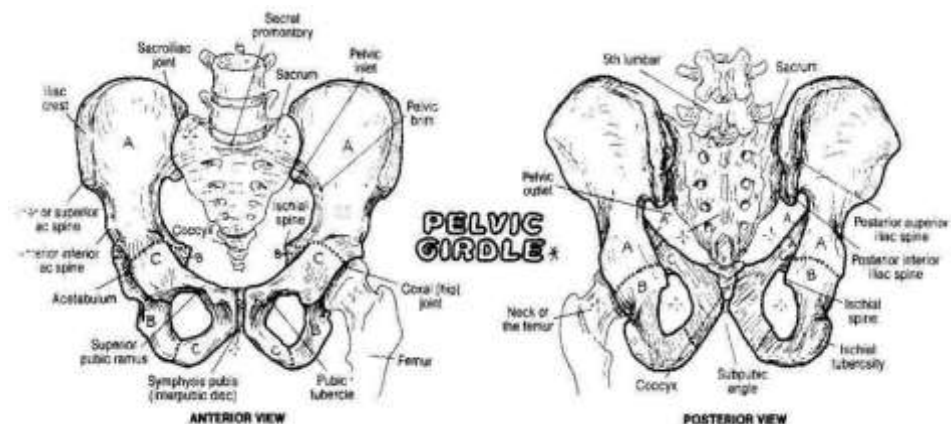
There are natural curves in the spine.

A curve that is concave forwards is called a **kyphosis**, as in the thoracic spine and sacrum; whereas a curve that is concave backwards is called a **lordosis**, as in the cervical and lumbar spine.

Figure 4 - Normal Curves of the Spine

At the base of the spine is the pelvic girdle. It consists of 3 bones and 3 joints. The bones are the sacrum, and two innominate bones (bone without a name). Together they form a most robust structure that is capable of transferring forces up into the spine from the legs, and vice versa.

For more, see the section on Hip and Pelvis



Any curvature to the side is known as a **scoliosis**.



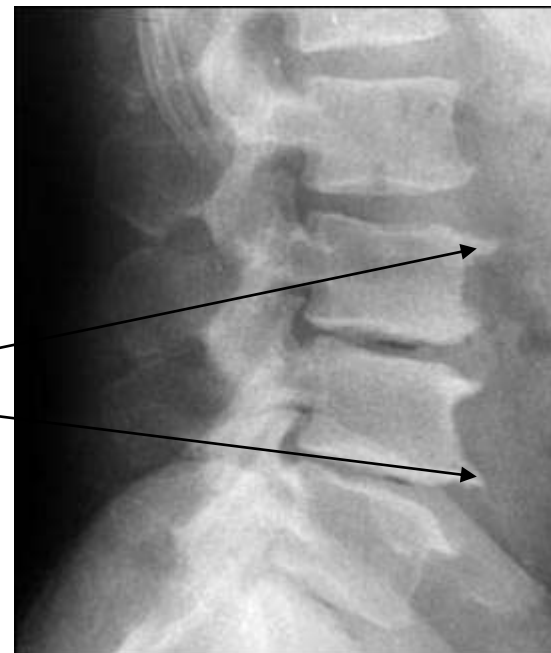
Figure 5 - Organic Scoliosis

There are two types:

- **Organic**—this occurs during the person's growth years, when the spine grew like it. This type is irreversible.
- **Functional**- This type is the result of an adaptation to an external situation. This type is reversible

Degenerative changes (wear and tear)

This manifests as narrowing of the disc space and bony outgrowths at the periphery (osteophytes)



Prolapsed intervertebral disc (slipped disc)

This is a frequently used diagnosis with a lot of people with a bad back, however it is rarely the cause of most back problems.

This shows a schematic and an MRI of disc lesions. The nucleus pulposus of the disc breaks through the annular rings and begins to press on the annulus fibrosus (the outermost layer). The annulus is the first pain sensitive structure it encounters, so it is only then that the person suffers pain. If it pushes out further than this, it can press on other structures, like nerve roots, precipitating neurological symptoms along the course of the nerve; where the symptoms depend upon where the level of the prolapse.

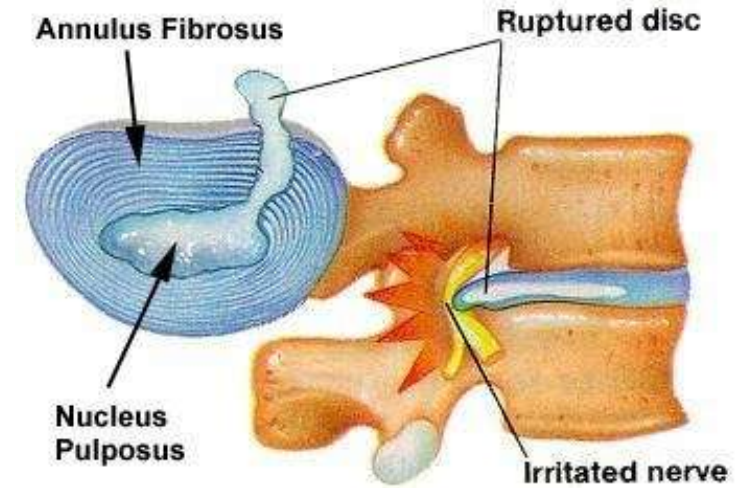
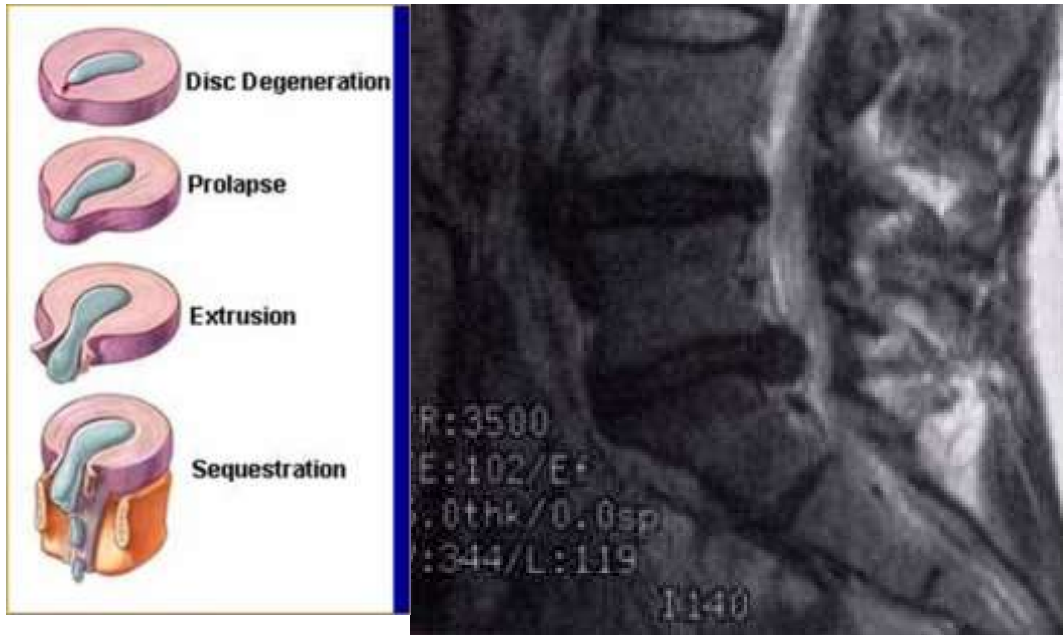
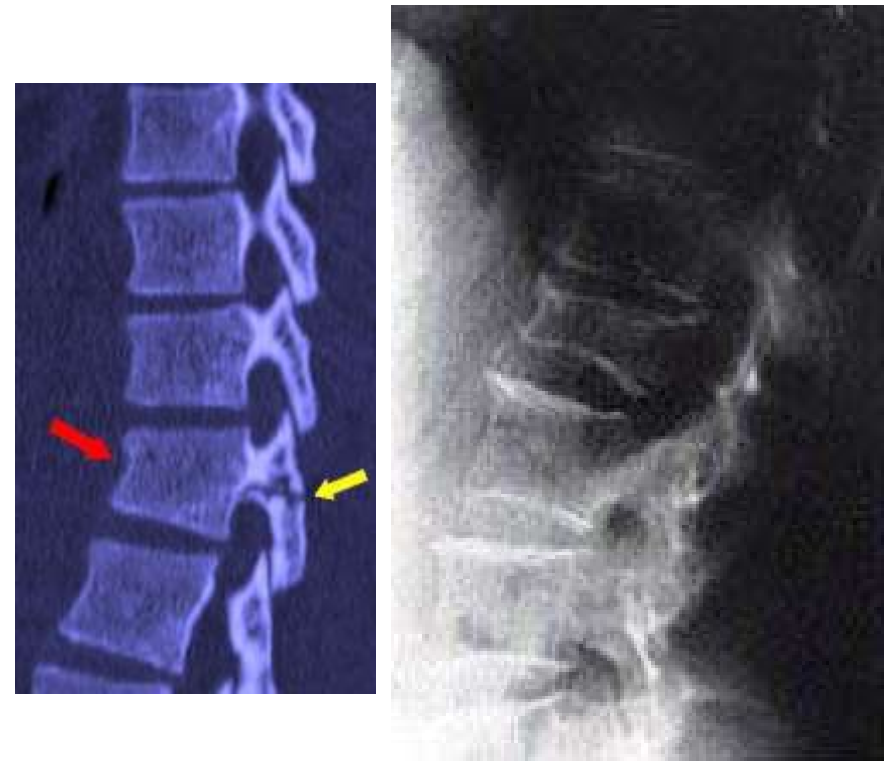


Figure 6 - Diagrams Showing Prolapsed Intervertebral Disc

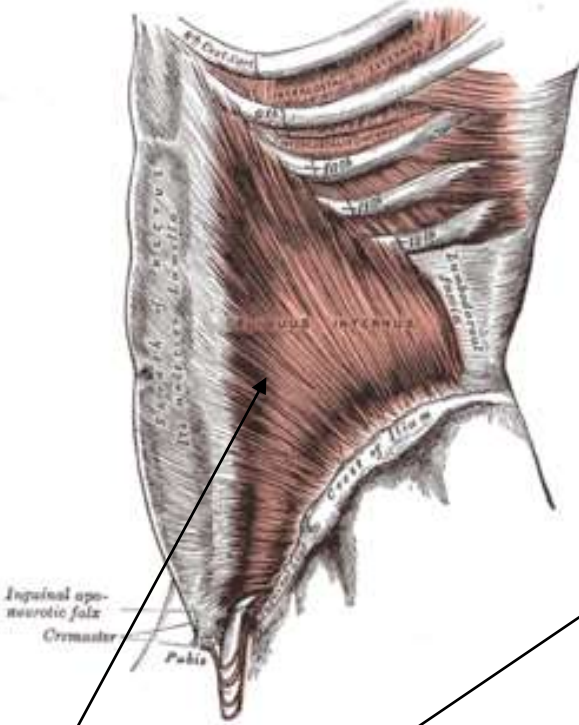
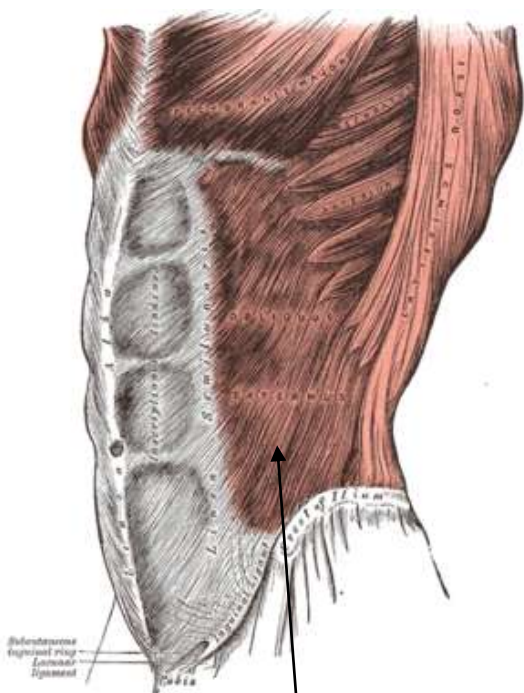
Crush fracture in the thoracic spine, creating a wedge shape (and a flexion deformity)

Figure 7 - Crush Fractures in Spine



Abdominal muscles

Figure 8 - Abdominal Muscles

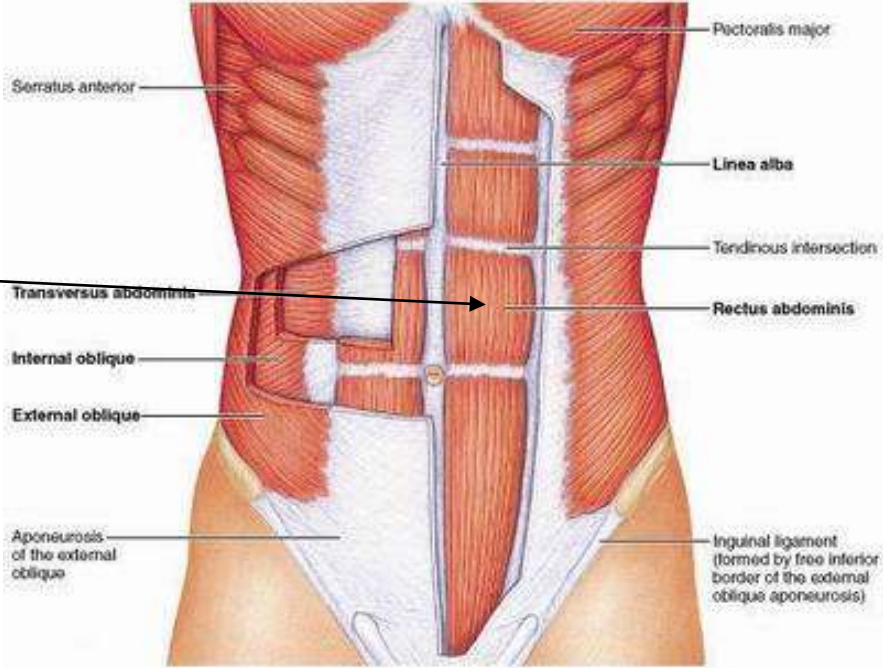


External oblique

Internal oblique

Transversus abdominis

Rectus Abdominis



Muscles of the Spine

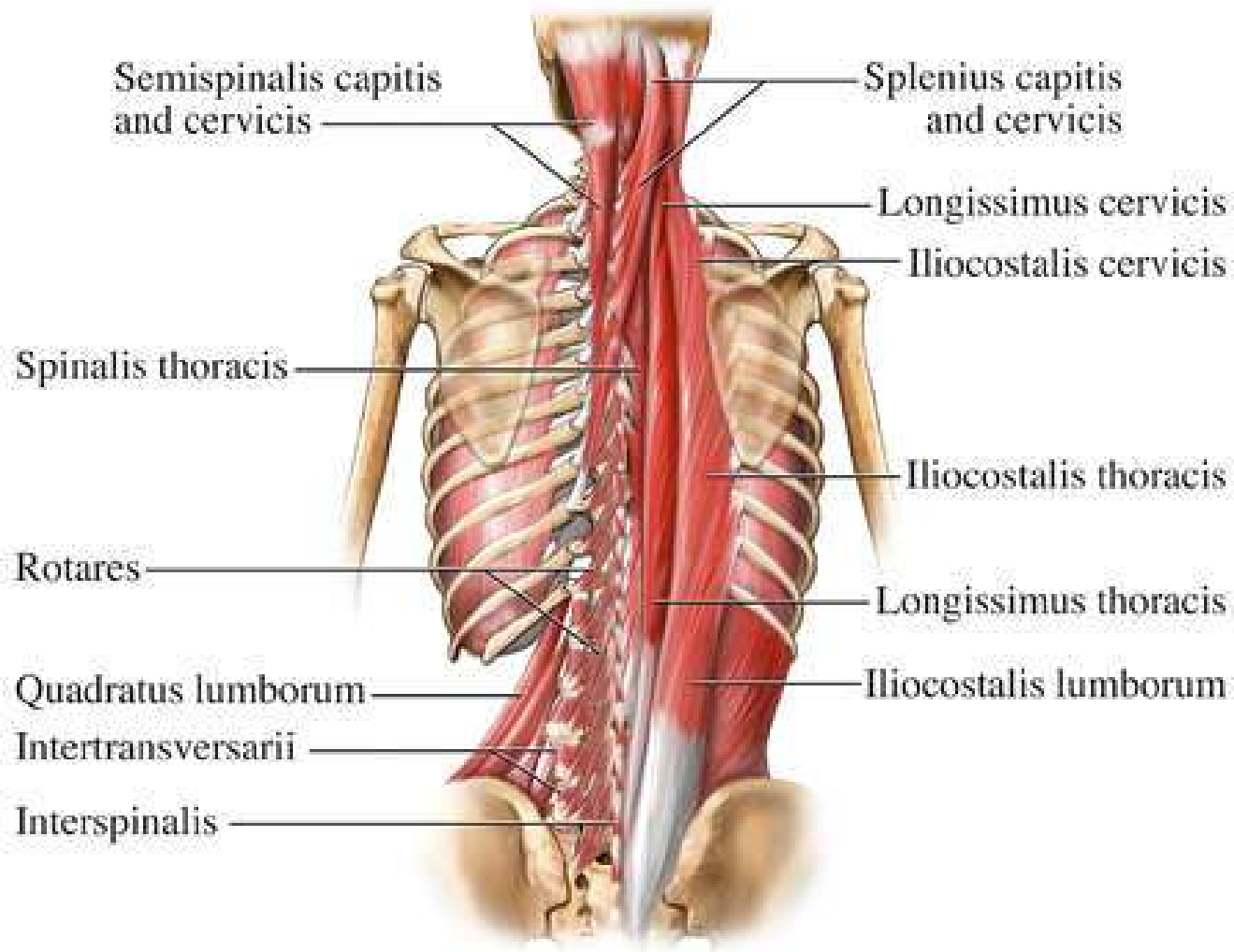


Figure 9 Muscles of the spine

The muscles of the spine are arranged on three groups:

Vertical muscles

- Longissimus
- Iliocostalis
- Spinalis

Oblique muscles

- Semispinalis
- Multifidus
- Rotatores

Deepest muscles

- Interspinales
- Intertransversarii
- Suboccipital muscles

The Thoracic Cage

This consists of 12 thoracic vertebrae and 12 pairs of ribs

Each rib has at least two joints with the spine

- The top 7 ribs articulate directly with the sternum
- Ribs 8 - 10 join on to the band of costal cartilage (passing up and joining onto the sternum)
- Ribs 11 and 12 are 'floating' (they have no joint at the front end at all)

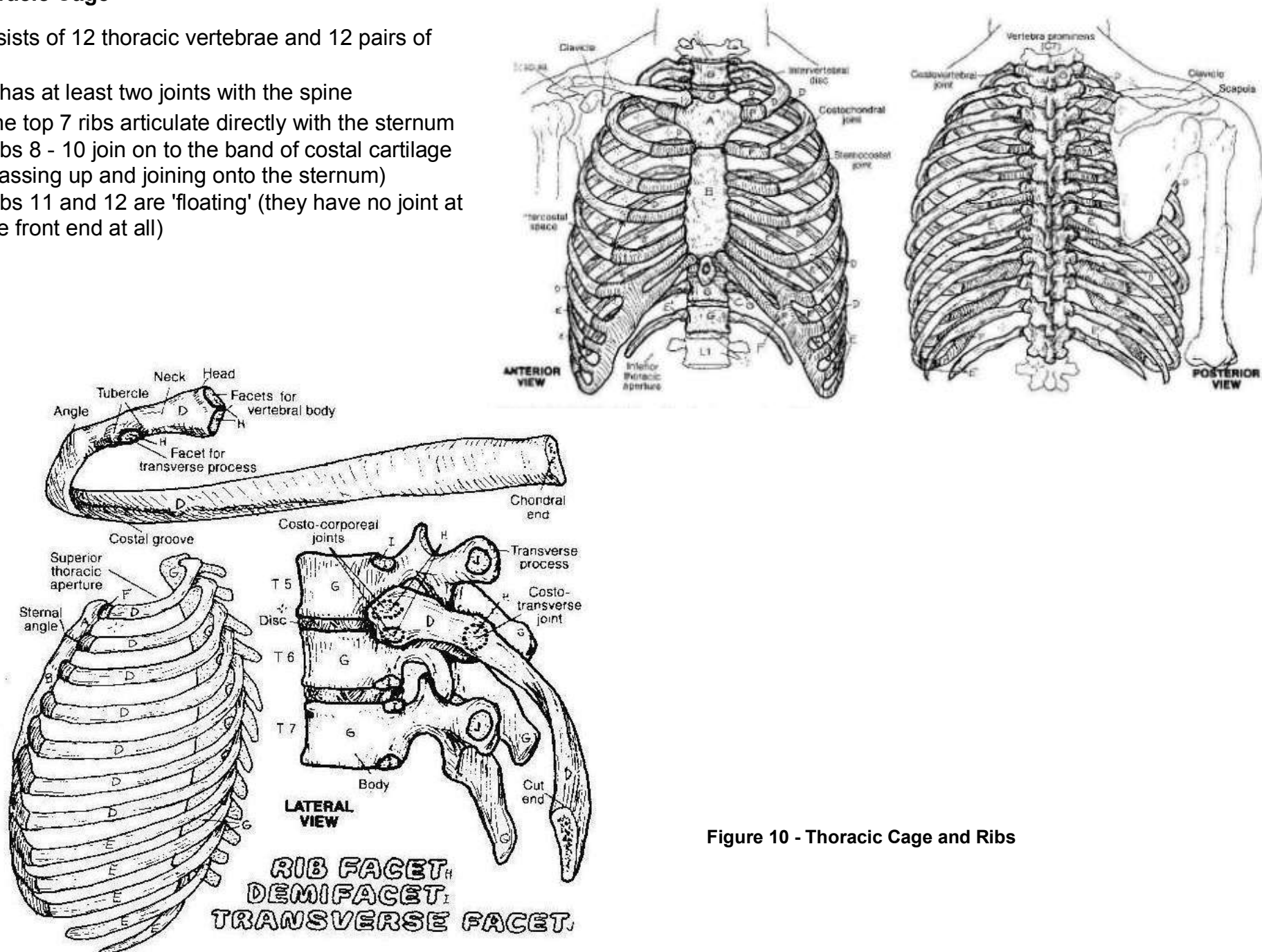


Figure 10 - Thoracic Cage and Ribs

Muscles of Respiration

Figure 11 - Muscles of Respiration

- Respiratory Diaphragm
- Intercostals

For details of these, see The Respiratory System

