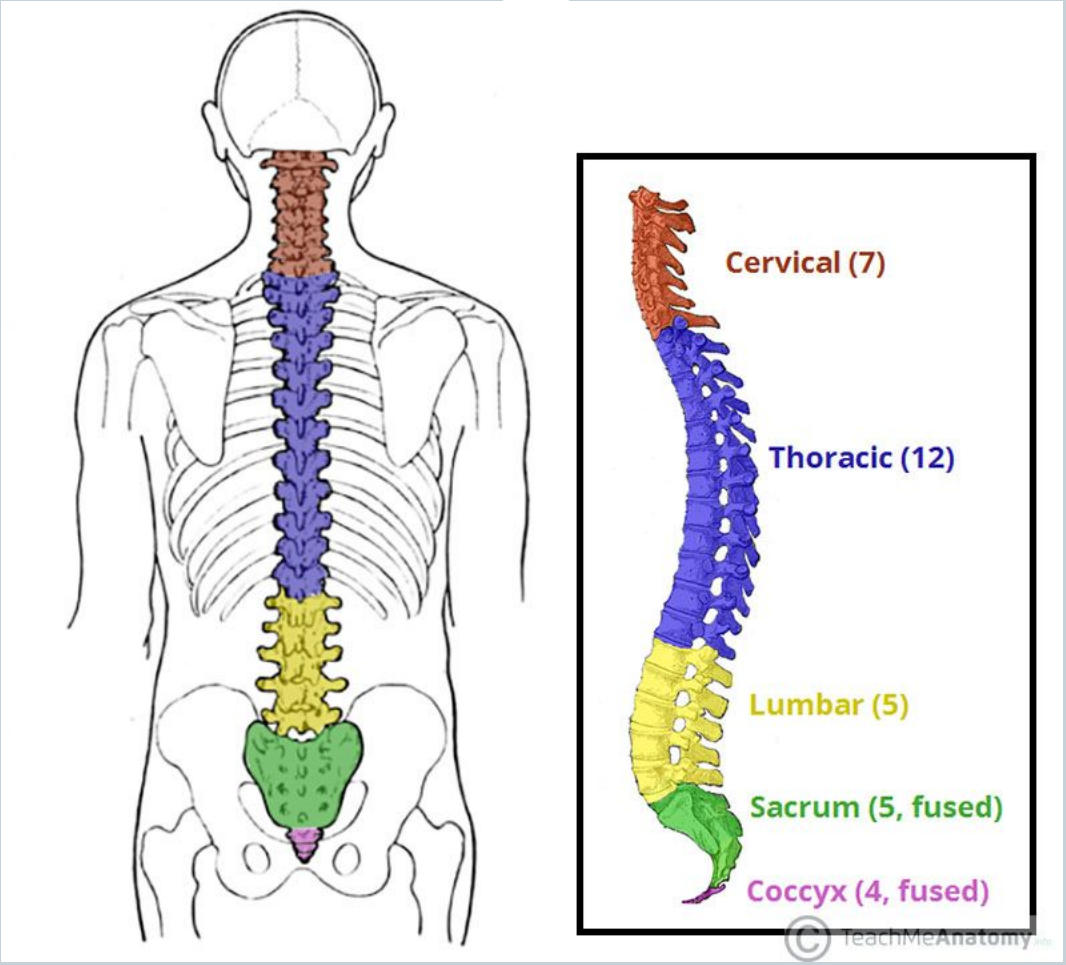
The Vertebral Column

The Vertebral Column

- The vertebral column is made up of approximately **33** bones called vertebrae which are separated by intervertebral discs.

- The column can be divided into **five** different regions, each region is characterised by a different a vertebral structure
  - Cervical (7), Thoracic (12), Lumbar (5), Sacrum (5, fused), Coccyx (4, fused)

Regional Anatomy

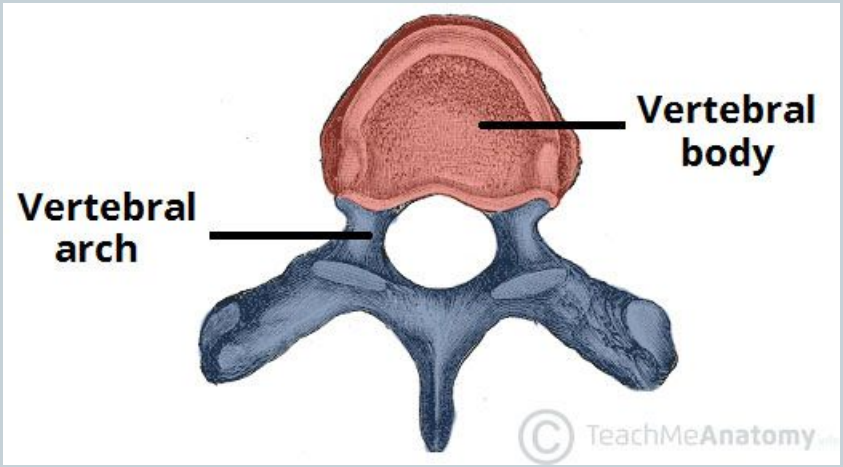


Functions of the Vertebral Column

- Protection
  - encloses and protects the spinal cord within the spinal canal.
- Support
  - carries the weight of the body above the pelvis.
- Axis
  - forms the central axis of the body.
- Movement
  - has roles in both posture and movement.

Structure of a Vertebrae

- All vertebrae share a basic common structure
- They each consist of an anterior vertebral body, and a posterior vertebral arch
  - C1 of the cervical vertebrae lacks a vertebral body

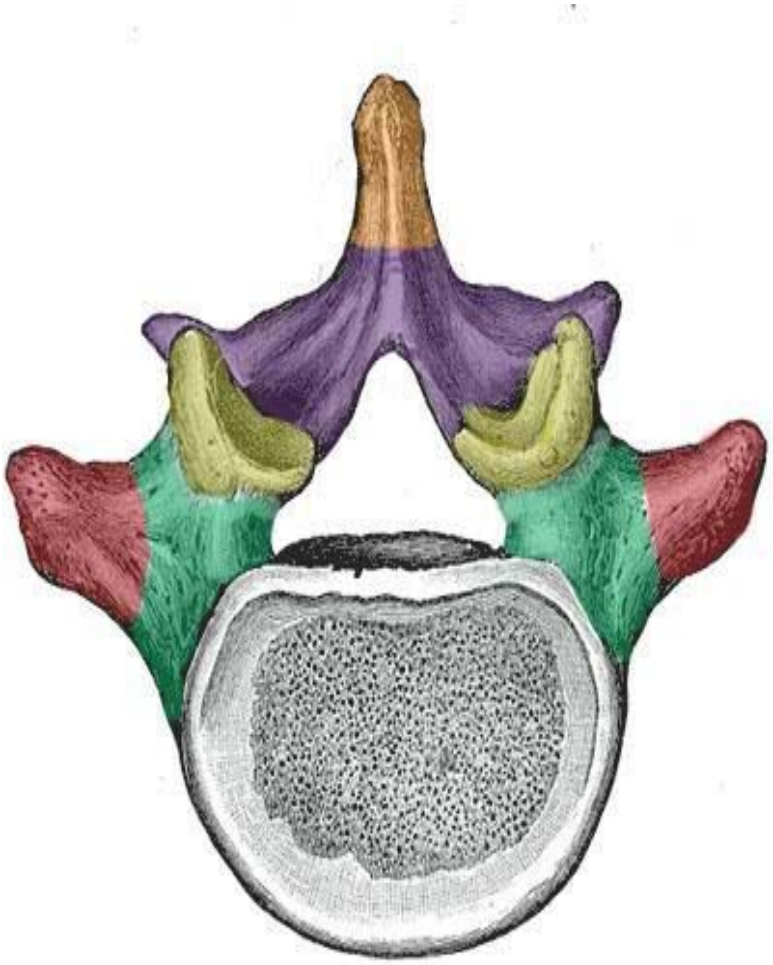


Vertebral Arch

- The vertebral arch forms the lateral and posterior aspect of each vertebrae
- Together, the vertebral body & the vertebral arch creates an enclosed hole called the vertebral foramen
- The vertebral foramen of all vertebrae line up to form the vertebral canal which encloses the spinal cord

Vertebral Arch ct'd

- The vertebral arches have several bony prominences which function as attachment sites for muscles and ligaments:
  - Spinous processes
    - single spinous process, centered posteriorly at the point of the arch.
  - Transverse processes
    - each vertebra has two transverse processes, which extend laterally and posteriorly from the vertebral body
  - Pedicles
    - connect the vertebral body to the transverse processes.
  - Lamina
    - connect the transverse and spinous processes.
  - Articular processes (facets)
    - form joints between one vertebrae and its superior and inferior counterparts
    - the articular processes are located at the intersection of the laminae and pedicles.



Spinous process

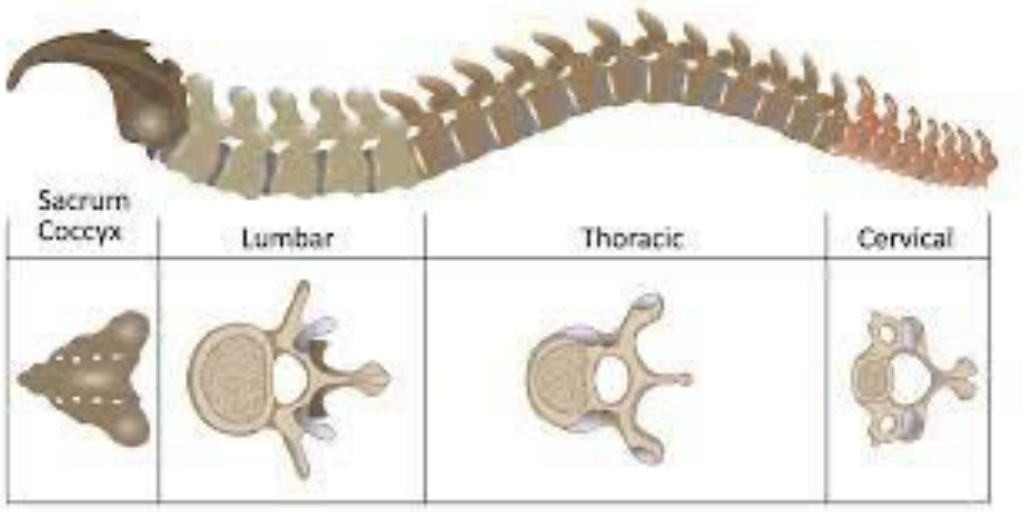
Lamina

Superior articular processes

Pedicles

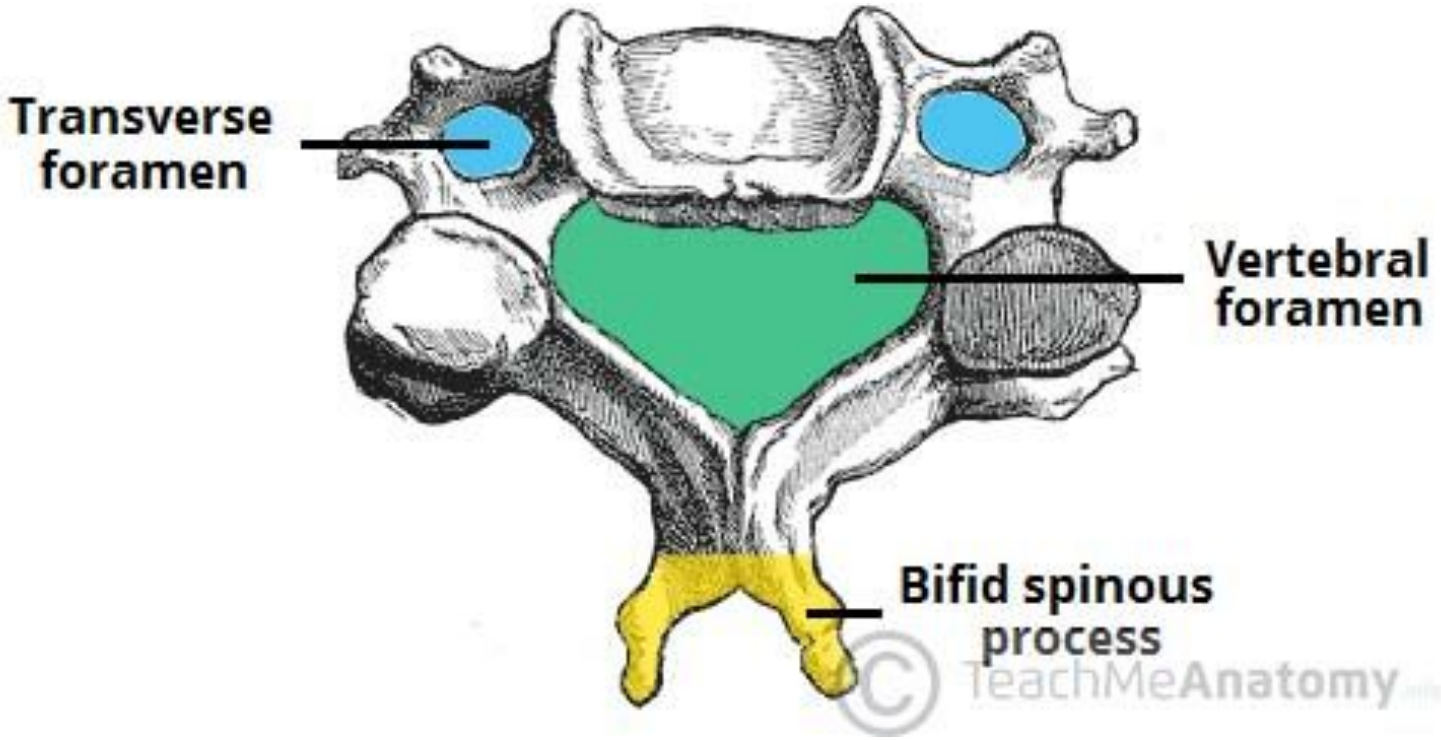
Transverse processes

Classification of Vertebrae



Cervical Vertebrae

- There are 7 **cervical** vertebrae in the human body
- Distinguishing features:
  - bifid spinous process – the spinous process bifurcates at its distal end
    - exceptions to this are C1 (no spinous process) and C7
  - triangular vertebral foramen
  - transverse foramina – an opening in each transverse process
    - the vertebral arteries travel to the brain (C1 – C6)
- C1 & C2 (called the atlas and axis respectively) are specialised to allow for the movement of the head.


Transverse foramen
Vertebral foramen
Bifid spinous process
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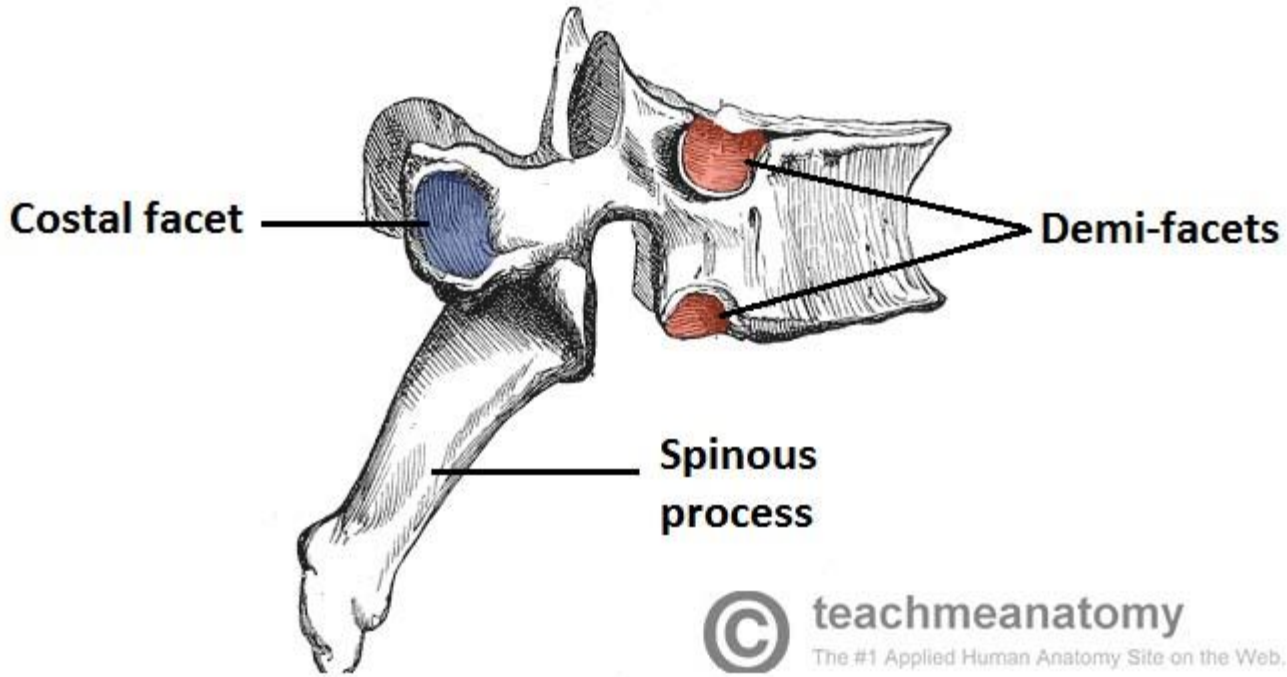
Thoracic Vertebrae

- There are **12 thoracic** vertebrae in the human body
- Their specialized function of the thoracic vertebrae is to articulate with the ribs
- Distinguishing features:
  - demi facets - 2 sets located superiorly and inferiorly on either side of the vertebral body
    - articulate with **the heads** of **two different ribs**
  - costal facet - located on the transverse processes of the vertebrae
    - articulate with **the shaft** of a **single rib**

Example:

- the head of rib 2 articulates with the inferior demi facet of thoracic vertebra 1 (T1) and the superior demi facet of T2
- the shaft of rib 2 articulates with the costal facets of T2

- the spinous processes of thoracic vertebrae are oriented obliquely, inferiorly and posteriorly
- the vertebral foramen of thoracic vertebrae is circular


Costal facet
Demi-facets
Spinous process
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The #1 Applied Human Anatomy Site on the Web.

Lumbar Vertebrae

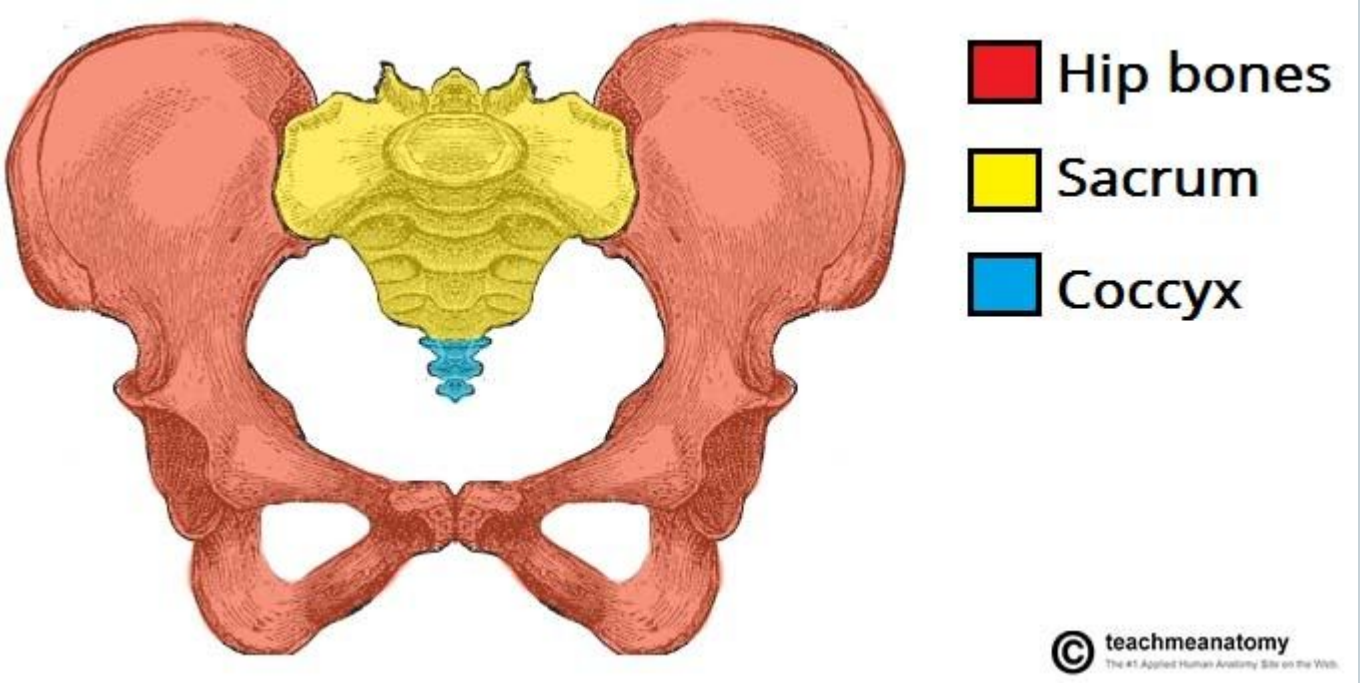
- There are **5 lumbar** vertebrae in the human body
  - the largest in the vertebral column
- Their specialized function is to support the weight of the torso
- Distinguishing features:
  - lumbar vertebrae have very large vertebral bodies which are kidney-shaped
  - no transverse foramina, costal facets, or bifid spinous processes
  - triangular-shaped vertebral foramen
  - spinous processes are shorter than those of thoracic vertebrae and do not extend inferiorly below the level of the vertebral body
  - their size and orientation allows for clinical access to the spinal canal

Sacrum & Coccyx

- The sacrum
  - a collection of five fused vertebrae
  - described as an inverted triangle, with the apex pointing inferiorly
  - On the lateral walls of the sacrum are facets for articulation with the pelvis at the sacro-iliac joints.

- The coccyx
  - is a small bone which articulates with the apex of the sacrum
  - it is recognised by its lack of vertebral arches and vertebral canal

Sacrum & Coccyx



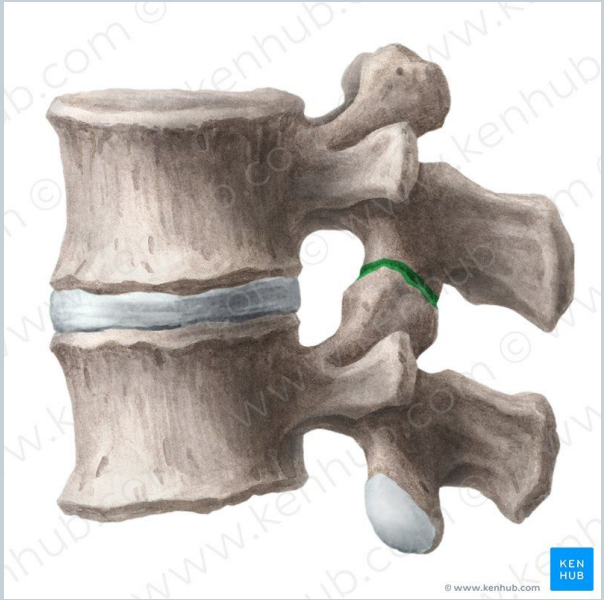
Joints & Ligaments

Joints

- vertebrae are mobile and articulate with each other via joints between their bodies and articular facets:
  - left and right superior articular facets articulate with the vertebra above
  - left and right inferior articular facets articulate with the vertebra below
  - vertebral bodies indirectly articulate with each other via the intervertebral discs
- The joints between the vertebral bodies are called cartilaginous joints
  - function: designed for weight-bearing
  - structure: the articular surfaces of the vertebral bodies are covered by hyaline cartilage and connect indirectly by the intervertebral disc

Joints ct'd

- Facet joints
  - functionally: diarthrotic
  - structurally synovial plane joints

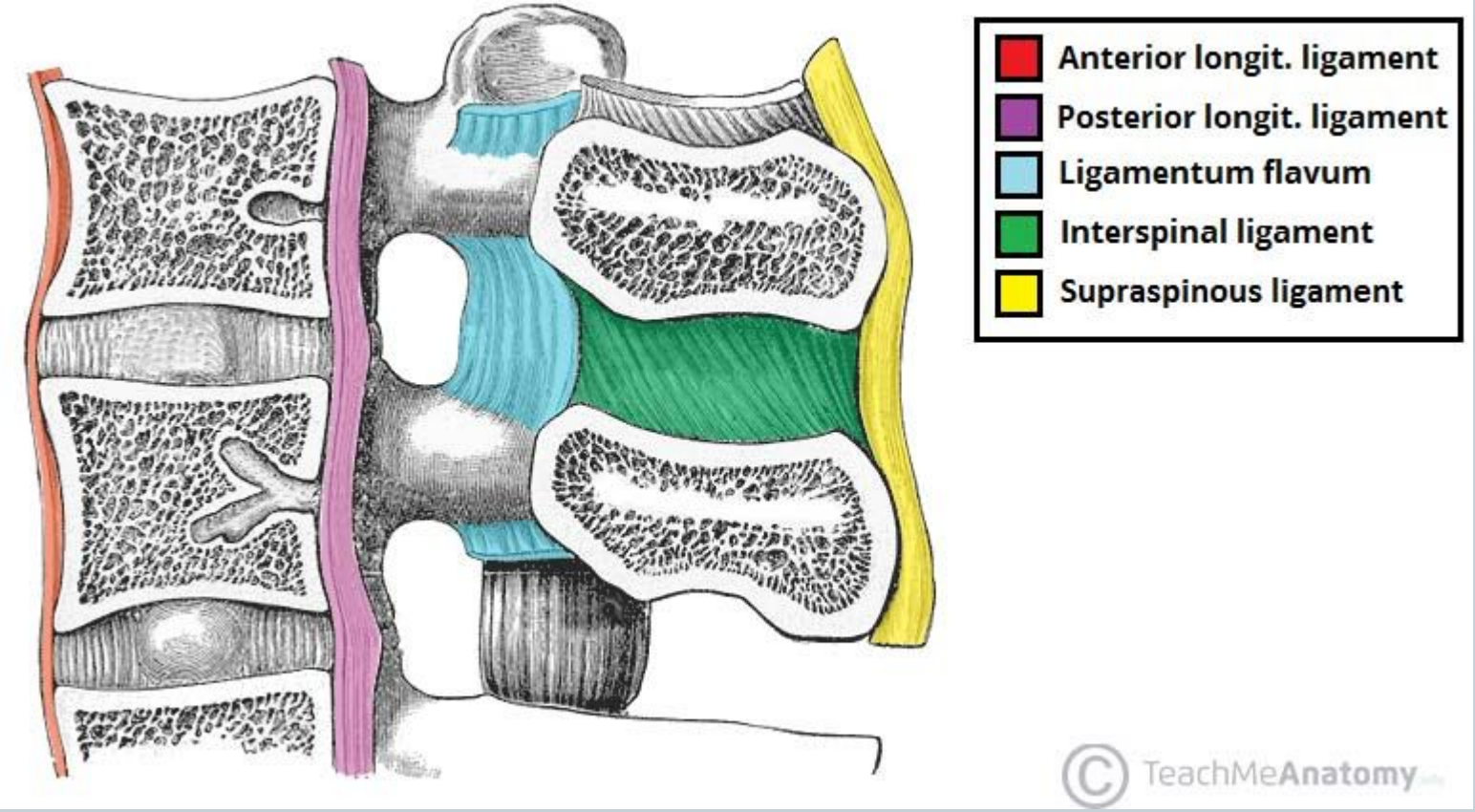


Ligaments

- There are **2** ligaments that strengthen the vertebral body joints:
  - the anterior and posterior longitudinal ligaments
    - run the full length of the vertebral column.
    - the **anterior longitudinal ligament** is thick and **prevents hyperextension** of the vertebral column
    - the **posterior longitudinal ligament** is weaker, and **prevents hyperflexion**

- facet joints
  - allow for some gliding motion between the vertebrae
  - strengthened by several ligaments:
    - ligamentum flavum
      - extends between lamina of adjacent vertebrae
    - interspinous and supraspinous
      - join the spinous processes of adjacent vertebrae
      - the interspinous ligaments attach between the spinous processes
      - the supraspinous ligaments attach to the tips of the spinous processes
    - intertransverse ligaments
      - extends between transverse processes

Ligaments


Anterior longit. ligament
Posterior longit. ligament
Ligamentum flavum
Interspinal ligament
Supraspinous ligament
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