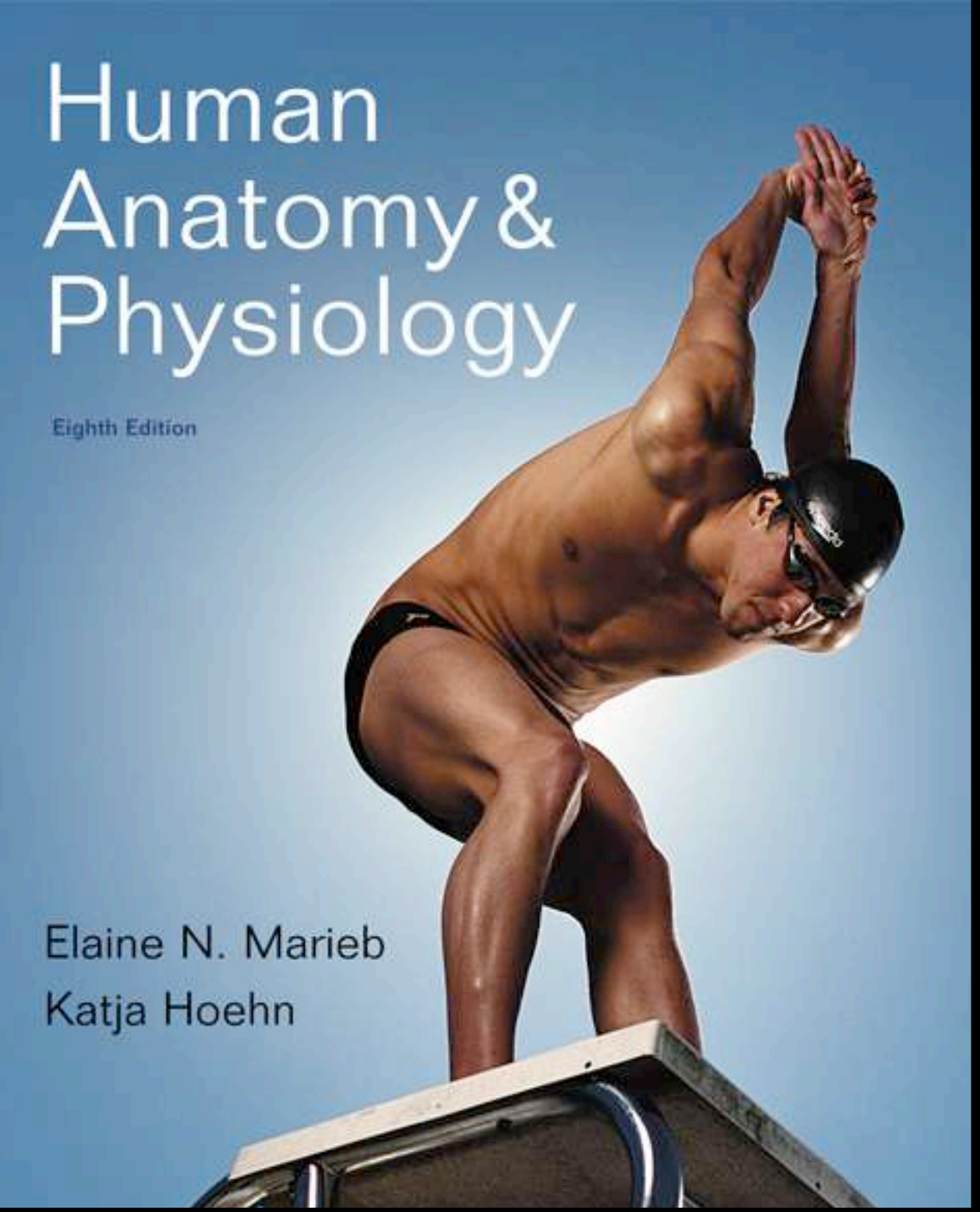


PowerPoint® Lecture Slides
prepared by
Janice Meeking,
Mount Royal College

CHAPTER 7

The Skeleton: Part B

**Vertebral Column

- Transmits weight of trunk to lower limbs
- Surrounds and protects spinal cord
- Flexible curved structure containing 26 irregular bones (vertebrae)
  - Cervical vertebrae (7)—vertebrae of the neck
  - Thoracic vertebrae (12)—vertebrae of the thoracic cage
  - Lumbar vertebrae (5)—vertebra of the lower back
  - Sacrum—bone inferior to the lumbar vertebrae
  - Coccyx—terminus of vertebral column

**Vertebral Column: Curvatures

- Increase the resilience and flexibility of the spine
  - Two posteriorly concave curvatures
    - Cervical and lumbar
  - Two posteriorly convex curvatures
    - Thoracic and sacral
- Abnormal spine curvatures
  - Scoliosis (abnormal lateral curve)
  - Kyphosis (hunchback)
  - Lordosis (swayback)

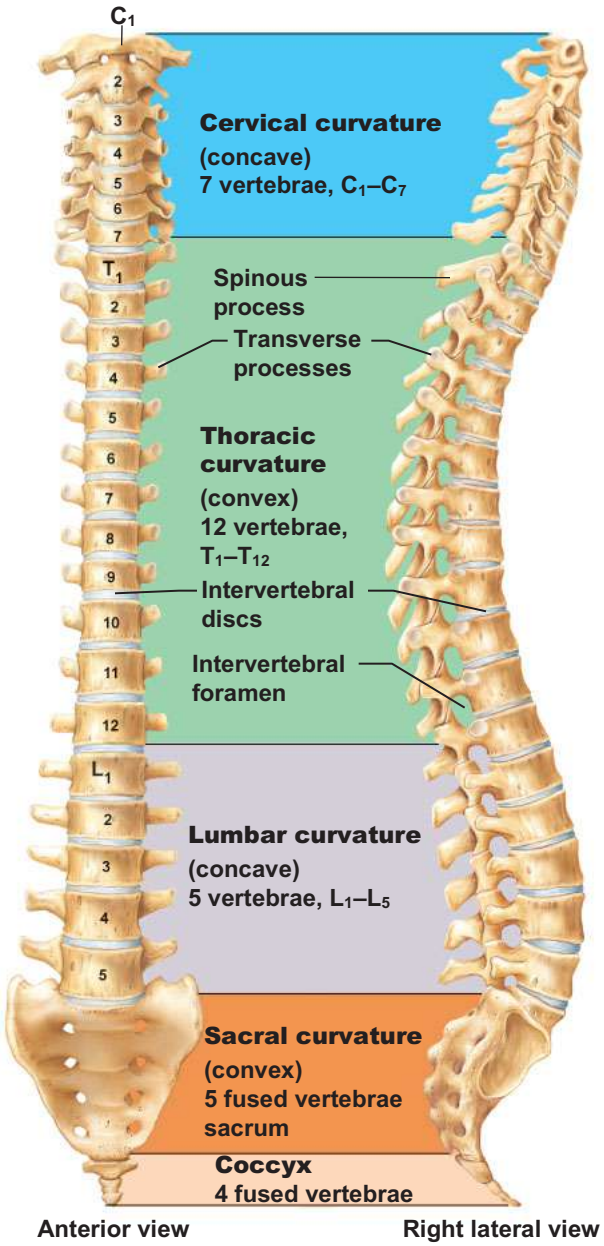


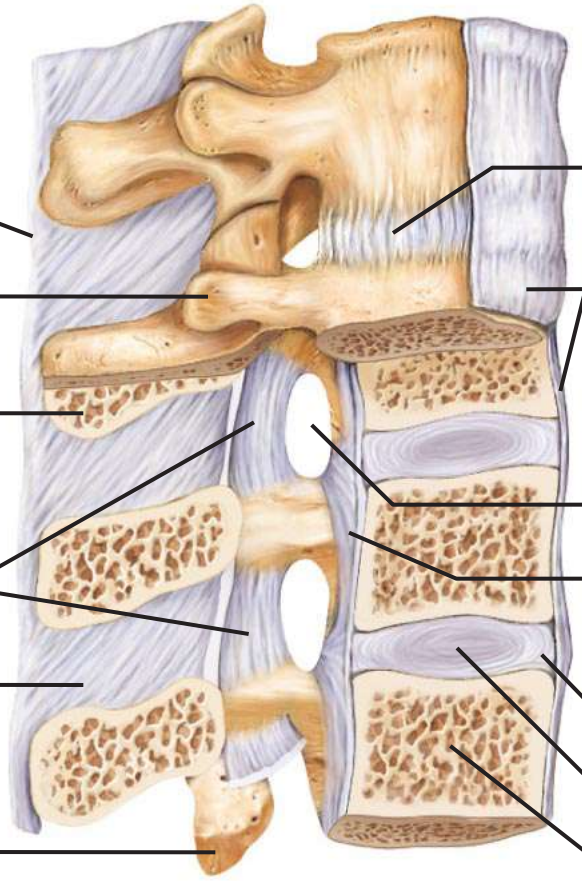
Figure 7.16

**Ligaments

- Anterior and posterior longitudinal ligaments
  - From neck to sacrum
- Ligamentum flavum
  - Connects adjacent vertebrae
- Short ligaments
  - Connect each vertebra to those above and below

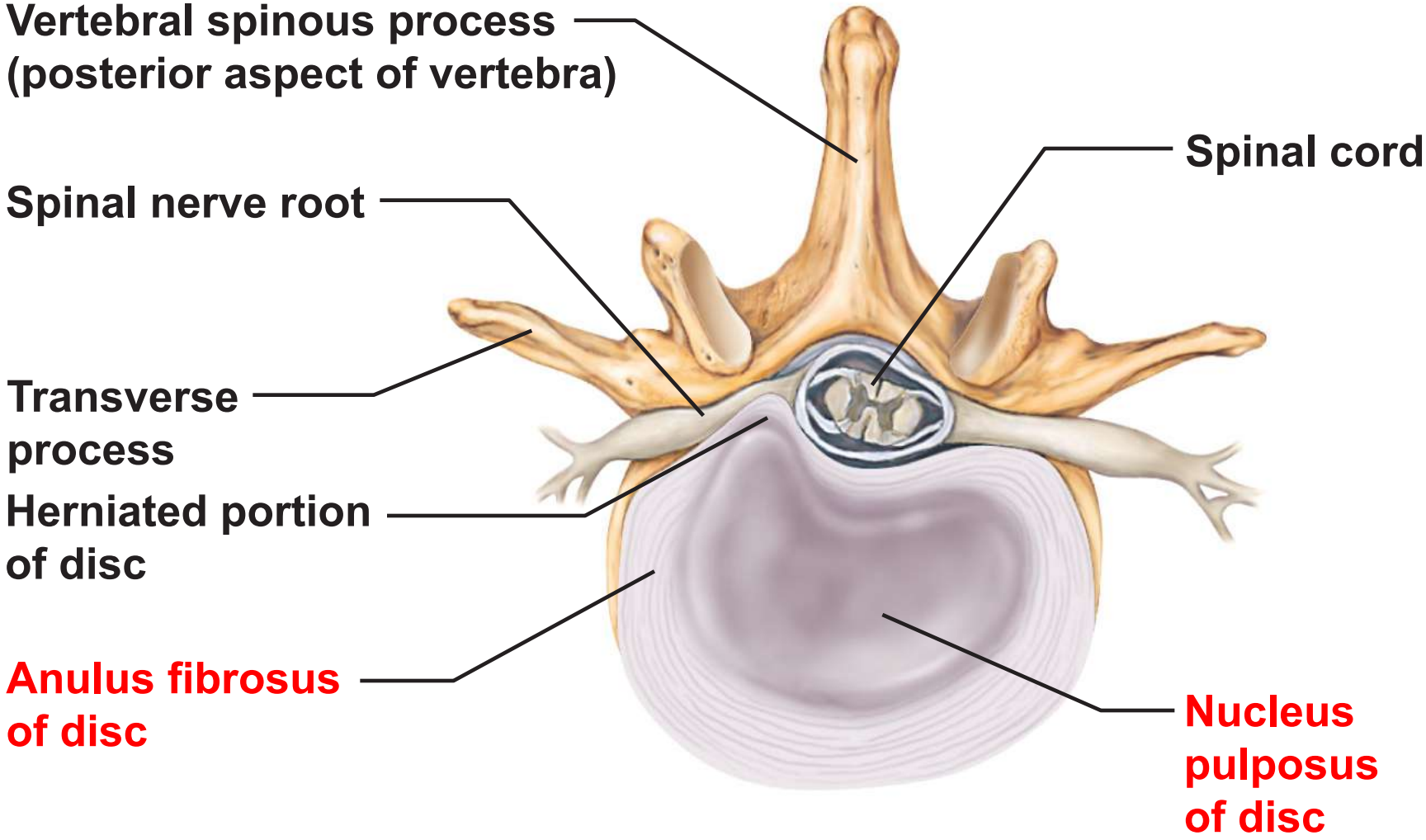
**Intervertebral Discs

- Cushionlike pad composed of two parts
  1. Nucleus pulposus
     - Inner gelatinous nucleus that gives the disc its elasticity and compressibility
  2. Anulus fibrosus
     - Outer collar composed of collagen and fibrocartilage



Median section of three vertebrae, illustrating the composition of the discs and the ligaments

Figure 7.17a



(c) Superior view of a herniated intervertebral disc

Figure 7.17c

**General Structure of Vertebrae

Know these

- Body or centrum
  - Anterior weight-bearing region
- Vertebral arch
  - Composed of pedicles and laminae that, along with centrum, enclose vertebral foramen
- Vertebral foramina
  - Together make up vertebral canal for spinal cord
- Intervertebral foramina
  - Lateral openings between adjacent vertebrae for spinal nerves

**General Structure of Vertebrae

Know these

- Seven processes per vertebra:
  - Spinous process—projects posteriorly
  - Transverse processes (2)—project laterally
  - Superior articular processes (2)—protrude superiorly inferiorly
  - Inferior articular processes (2)—protrude inferiorly

PLAY **Animation: Rotating Spine (horizontal)**

PLAY **Animation: Rotating Spine (vertical)**

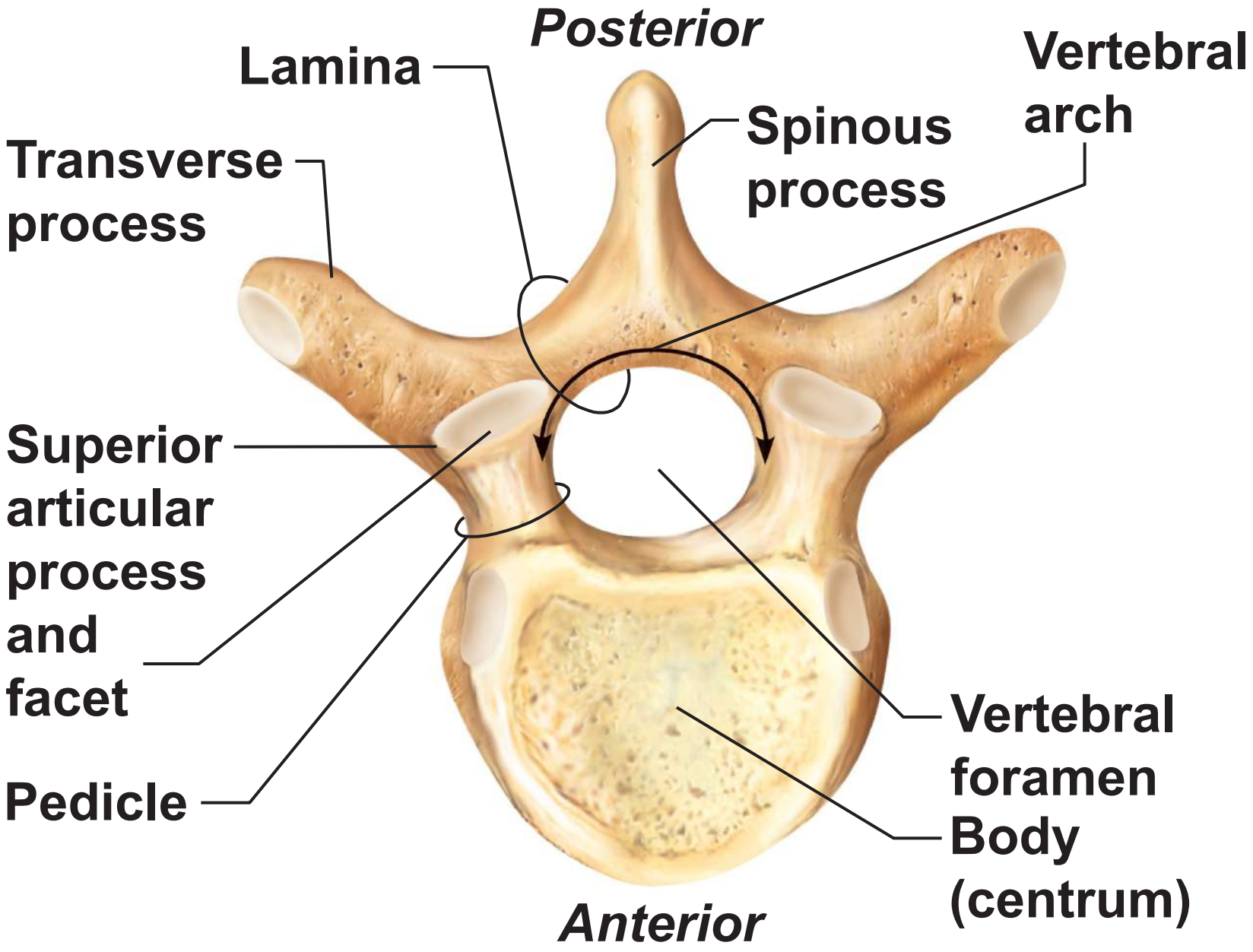


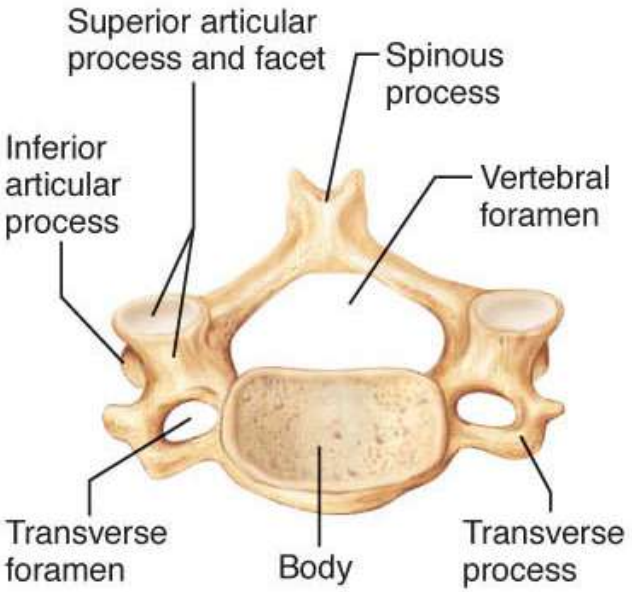
Figure 7.18

**Cervical Vertebrae

identify structure & shape

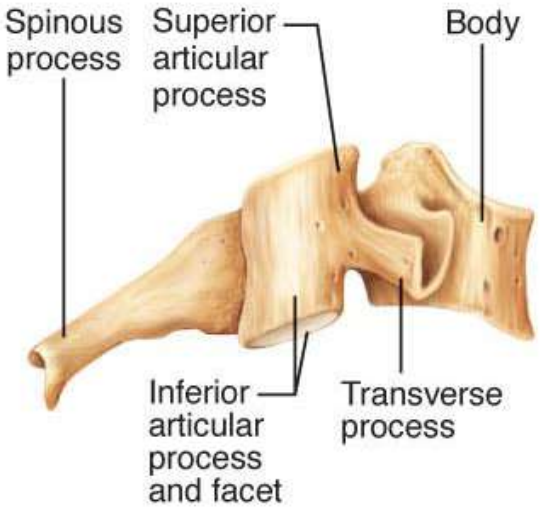
- C_1 to C_7: smallest, lightest vertebrae
- C_3 to C_7 share the following features
  - Oval body
  - Spinous processes are bifid (except C_7)
  - Large, triangular vertebral foramen
  - Transverse foramen in each transverse process

Superior View



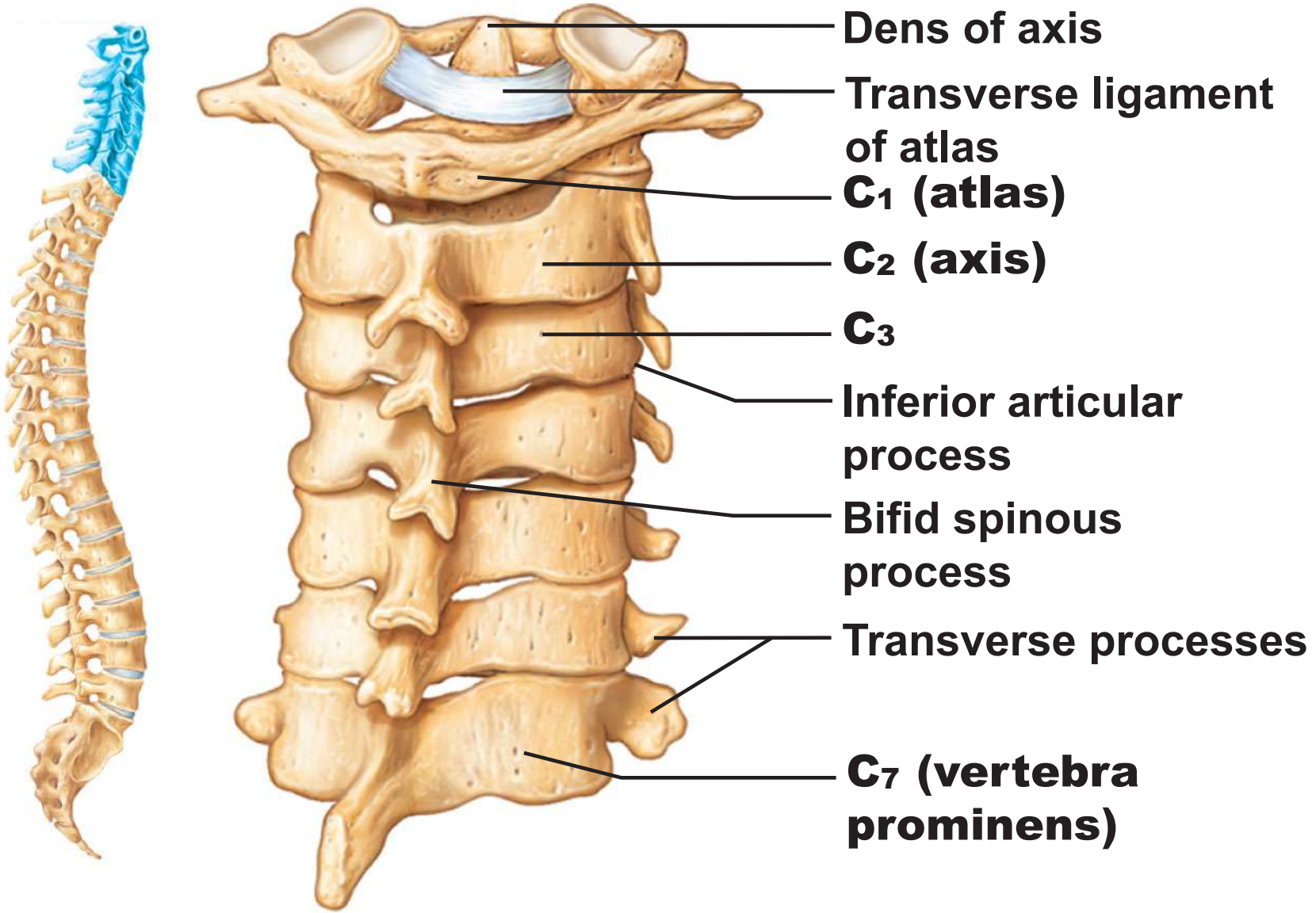
(a) Cervical

Right Lateral View



(a) Cervical

Table 7.2

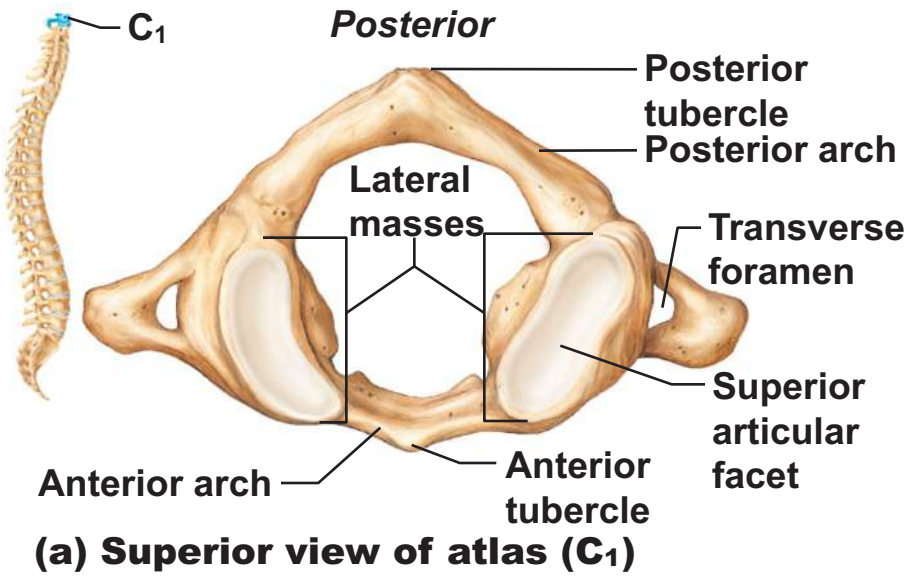


(a) Cervical vertebrae

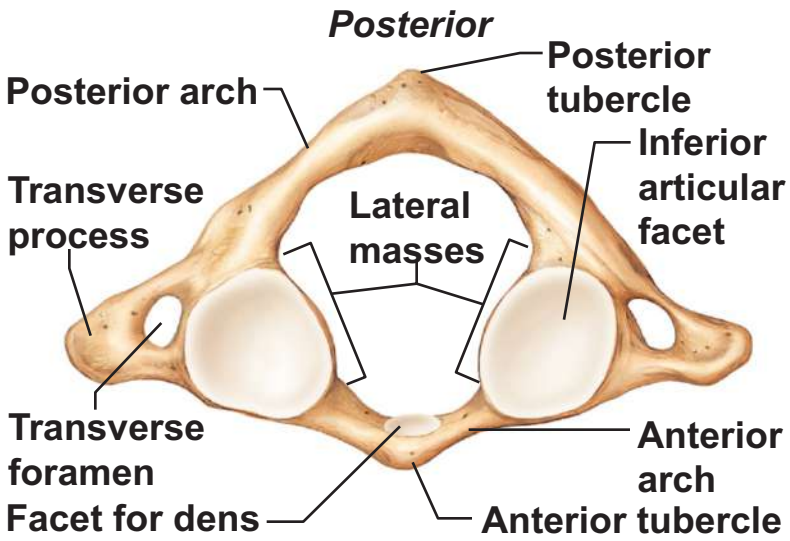
Figure 7.20a

Cervical Vertebrae

- C_1 (atlas) and C_2 (axis) have unique features
- Atlas (C_1)
  - No body or spinous process
  - Consists of anterior and posterior arches, and two lateral masses
  - Superior surfaces of lateral masses articulate with the occipital condyles



(a) Superior view of atlas (C_1)

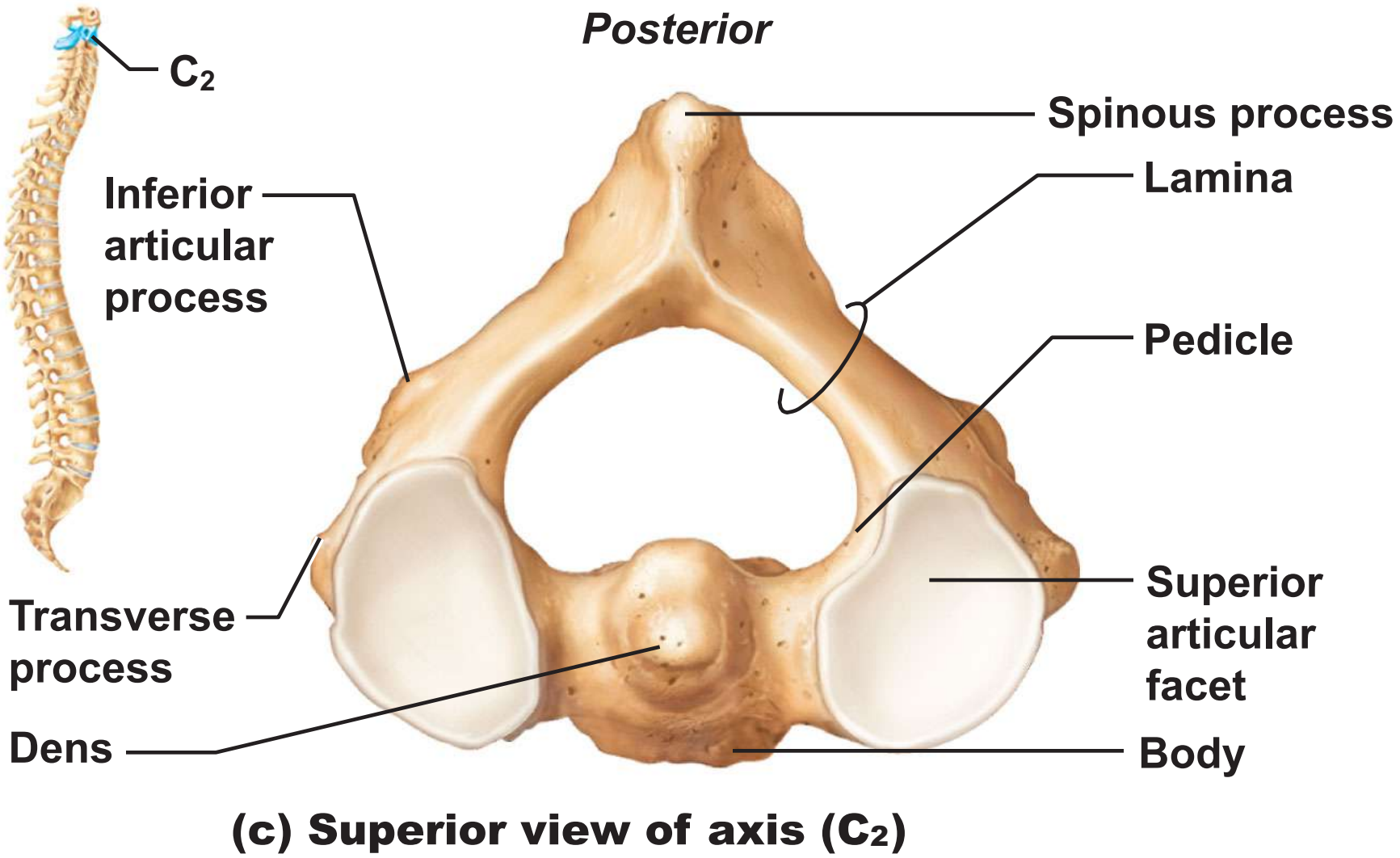


(b) Inferior view of atlas (C_1)

Figure 7.19a-b

Cervical Vertebrae

- Axis (C_2)
  - Dens projects superiorly into the anterior arch of the atlas
  - Dens is a pivot for the rotation of the atlas

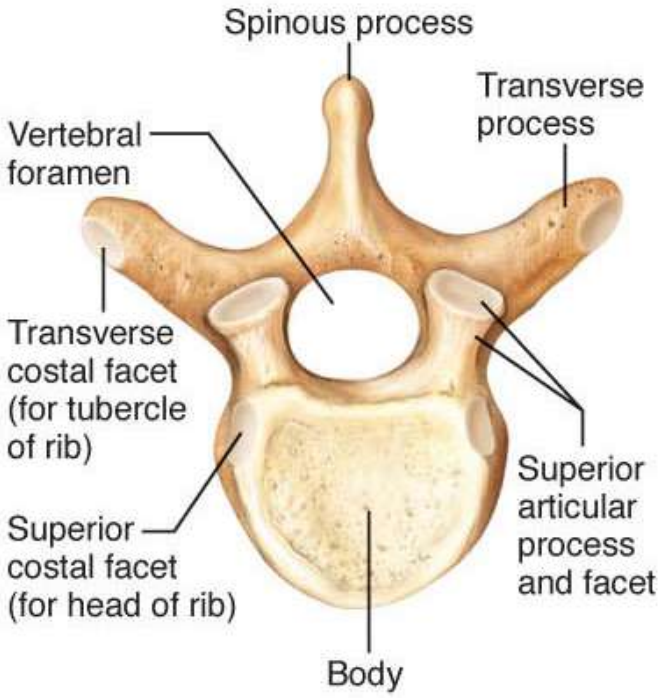


(c) Superior view of axis (C_2)

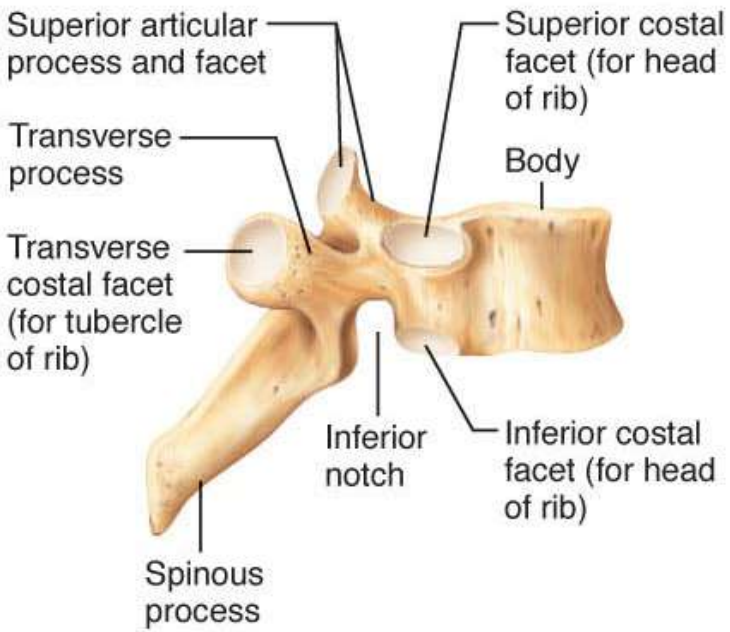
Figure 7.19c

**Thoracic Vertebrae
identify structure & shape

- T_1 to T_{12}
- All articulate with ribs at facets and demifacets
- Long spinous process
- Location of articular facets allows rotation of this area of spine

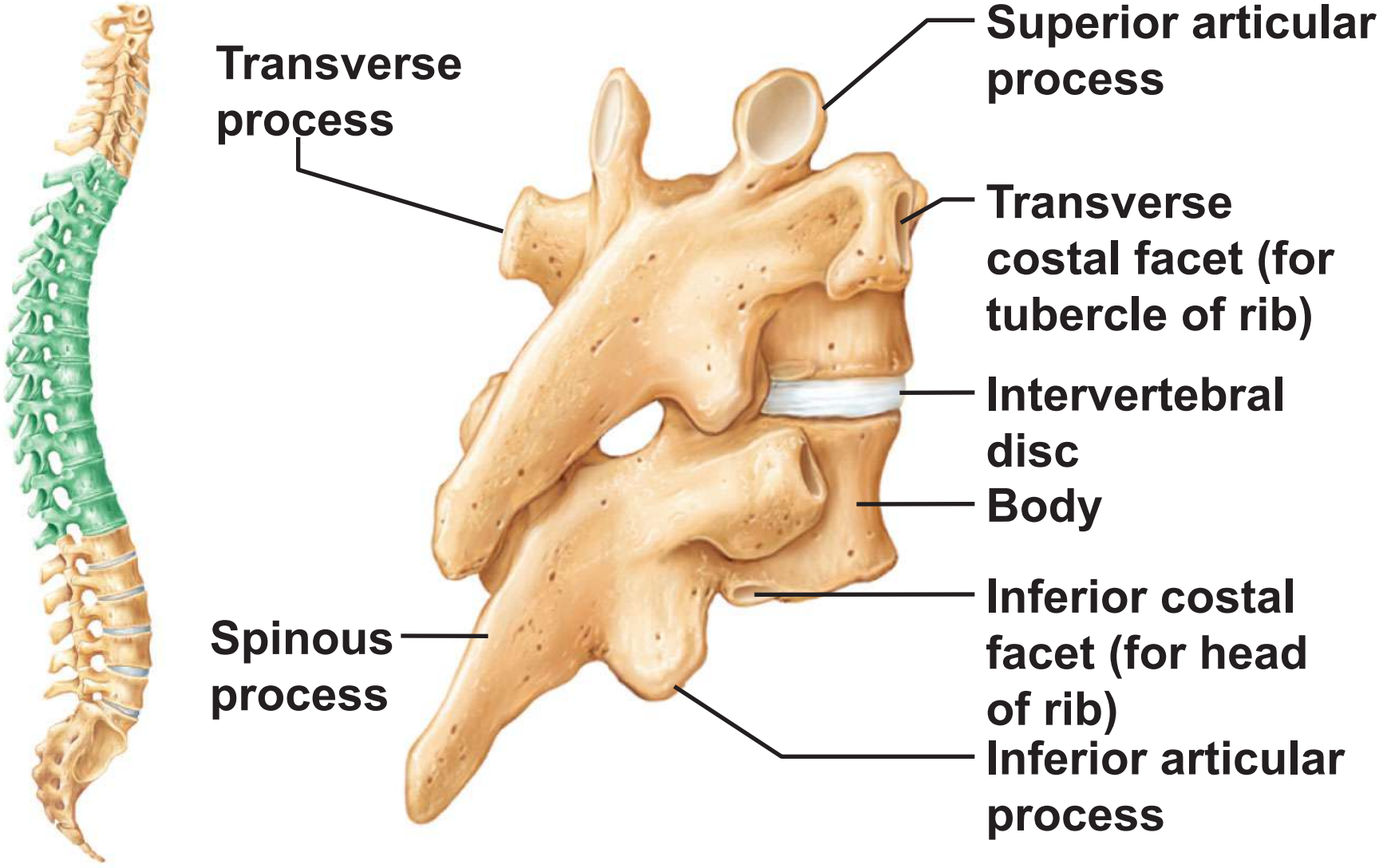


(b) Thoracic



(b) Thoracic

Table 7.2

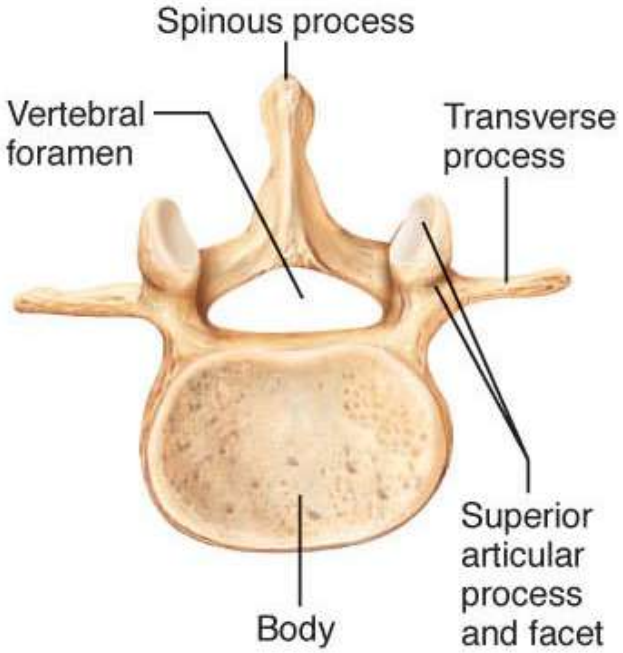


(b) Thoracic vertebrae

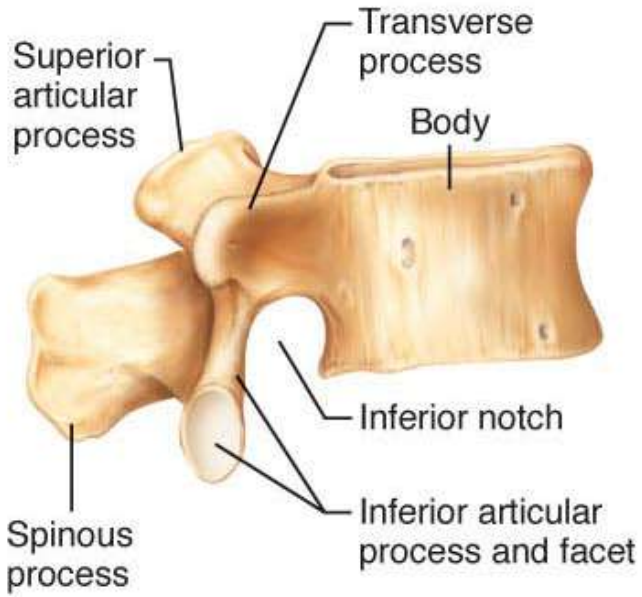
Figure 7.20b

**Lumbar Vertebrae
identify structure & shape

- L_1 to L_5
- Short, thick pedicles and laminae
- Flat hatchet-shaped spinous processes
- Orientation of articular facets locks lumbar vertebrae together so as to prevent rotation

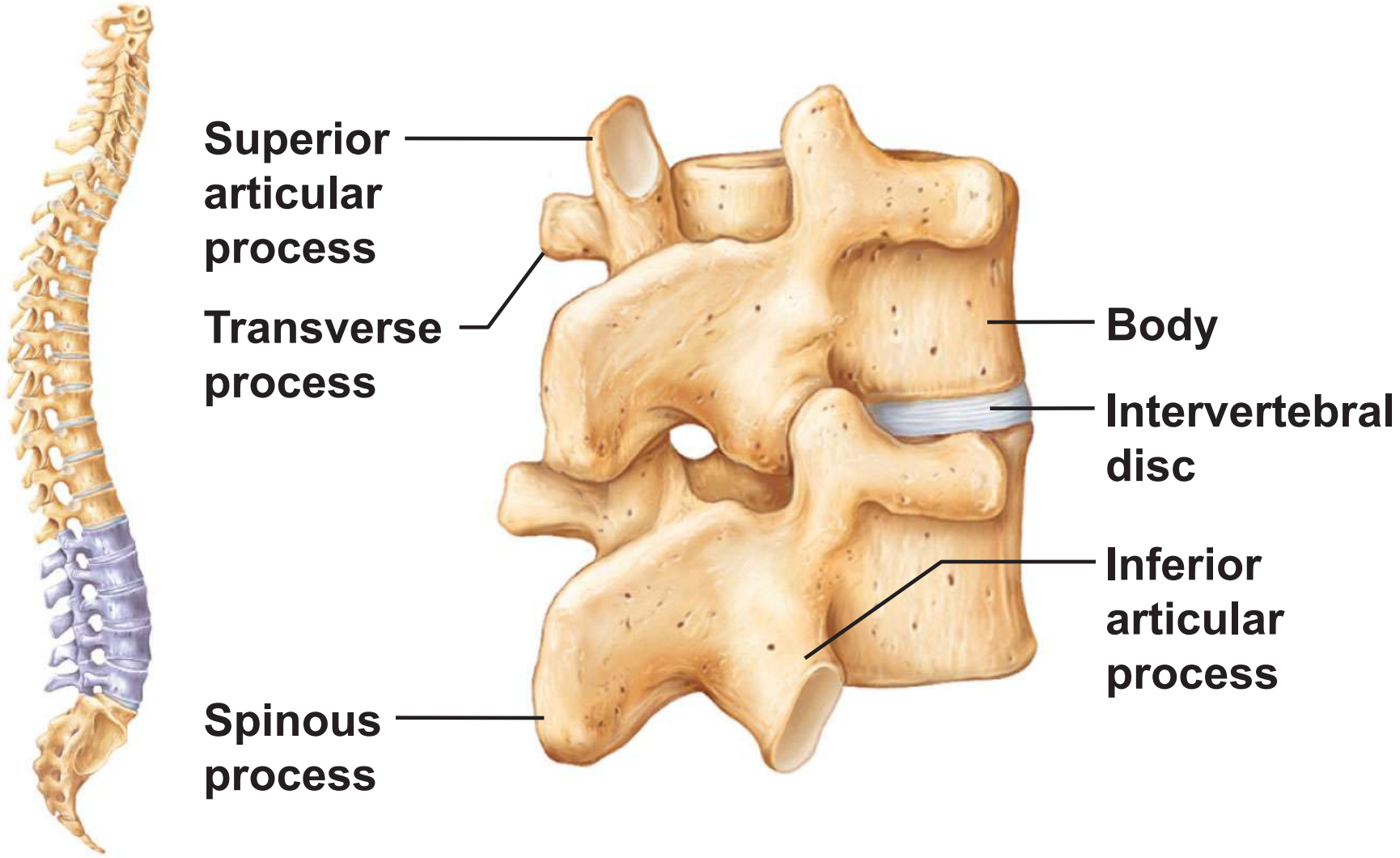


(c) Lumbar



(c) Lumbar

Table 7.2



(c) Lumbar vertebrae

Figure 7.20c

**Sacrum and Coccyx
identify structure & shape

- Sacrum
  - 5 fused vertebrae (S_1–S_5)
  - Forms posterior wall of pelvis
  - Articulates with L_5 superiorly, and with auricular surfaces of the hip bones laterally
- Coccyx
  - Tailbone
  - 3–5 fused vertebrae
  - Articulates superiorly with sacrum

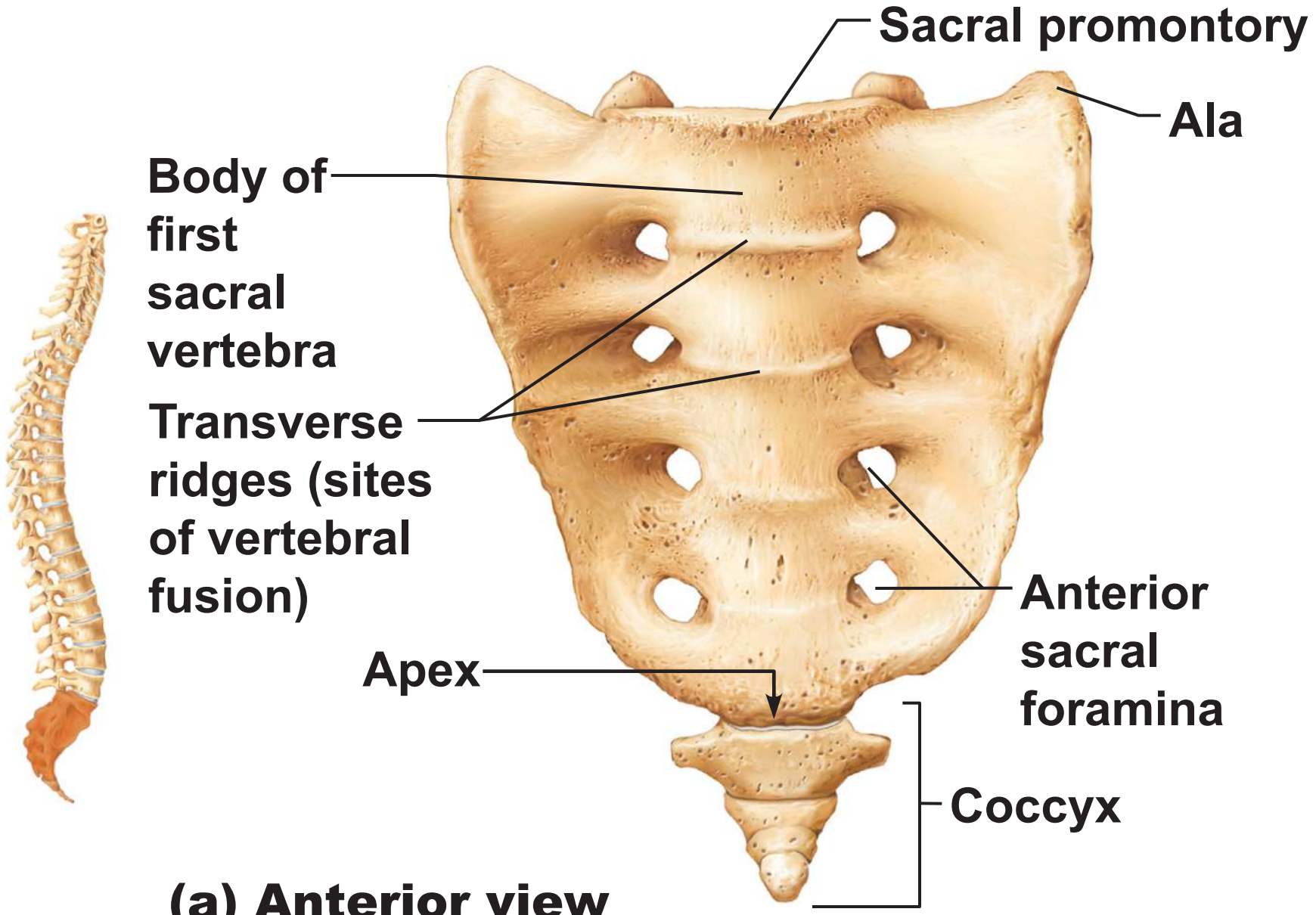


Figure 7.21a

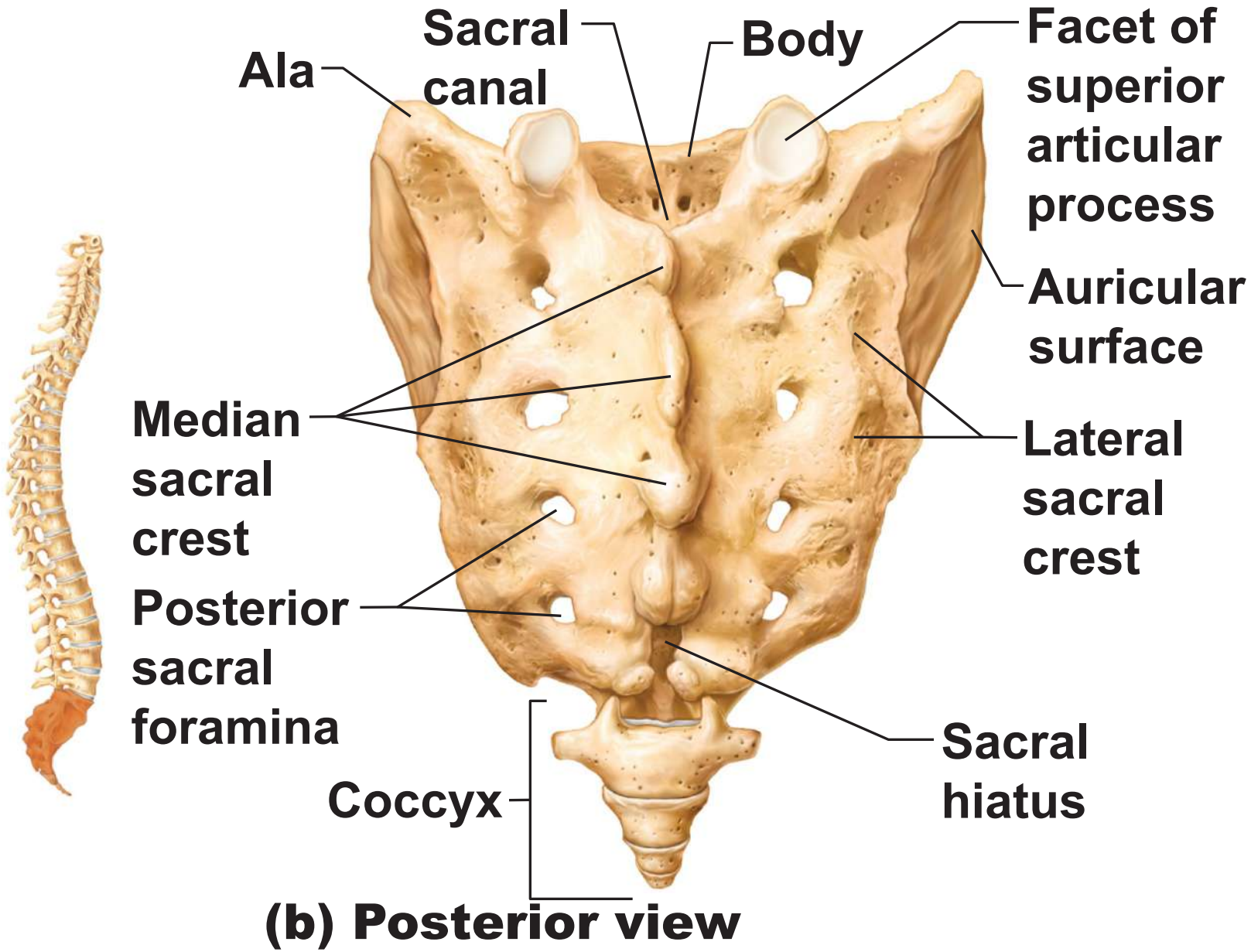


Figure 7.21b

**Thoracic Cage

- Composed of
  - Thoracic vertebrae
  - Sternum
  - Ribs and their costal cartilages
- Functions
  - Protects vital organs of thoracic cavity
  - Supports shoulder girdle and upper limbs
  - Provides attachment sites for many muscles, including intercostal muscles used during breathing

**Sternum (Breastbone)

- Three fused bones
  - Manubrium
    - Articulates with clavicles and ribs 1 and 2
  - Body
    - Articulates with costal cartilages of ribs 2 through 7
  - Xiphoid process
    - Site of muscle attachment
    - Not ossified until ~ age 40

**Ribs and Their Attachments

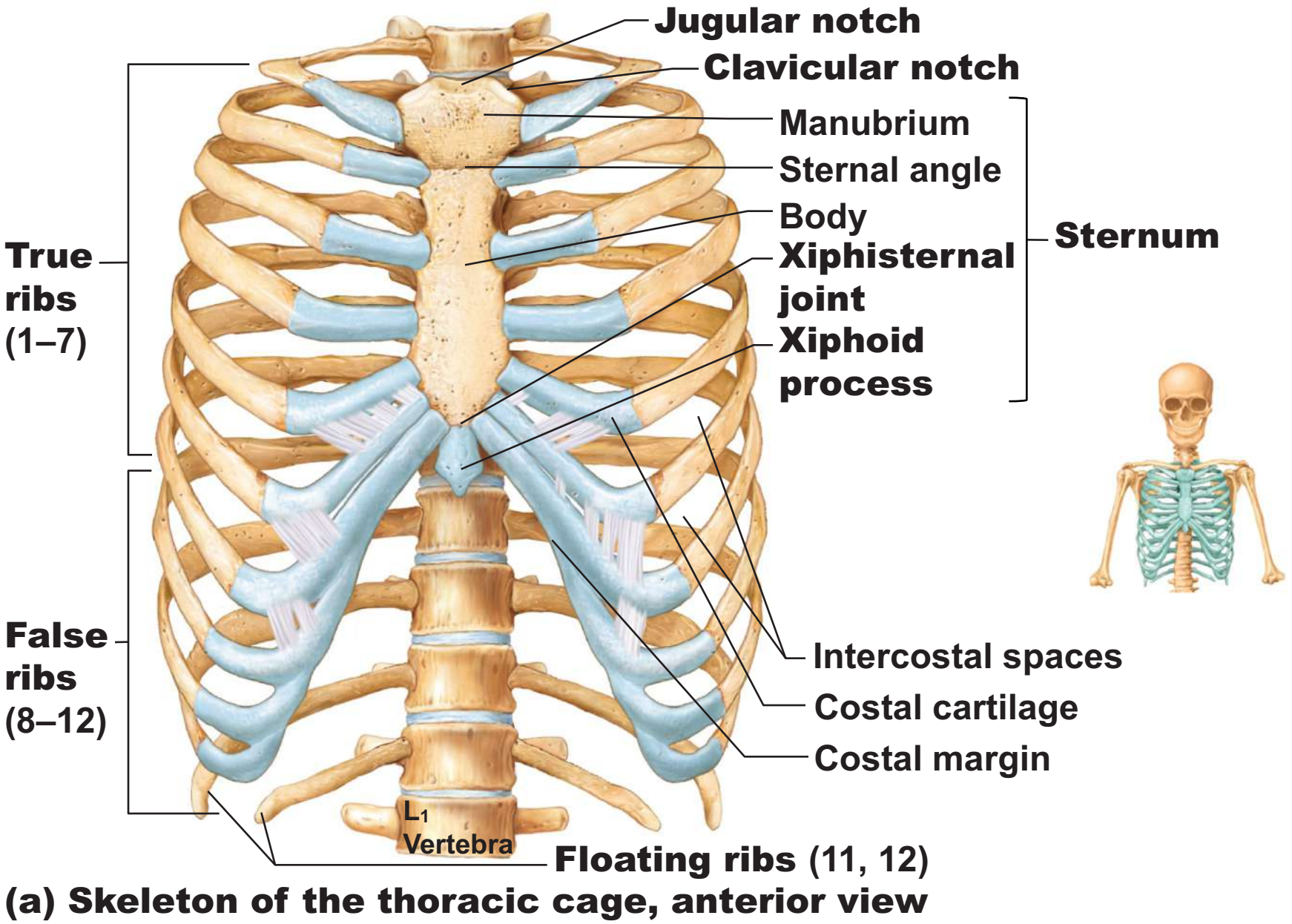
Know these

- 12 pairs
- All attach posteriorly to thoracic vertebrae
- Pairs 1 through 7
  - True (vertebrosternal) ribs
  - Attach directly to the sternum by individual costal cartilages

**Ribs and Their Attachments

know these

- Pairs 8 through12
  - False ribs
  - Pairs 8–10 also called vertebrochondral ribs
    - Attach indirectly to sternum by joining costal cartilage of rib above
  - Pairs 11–12 also called vertebral (floating) ribs
    - No attachment to sternum

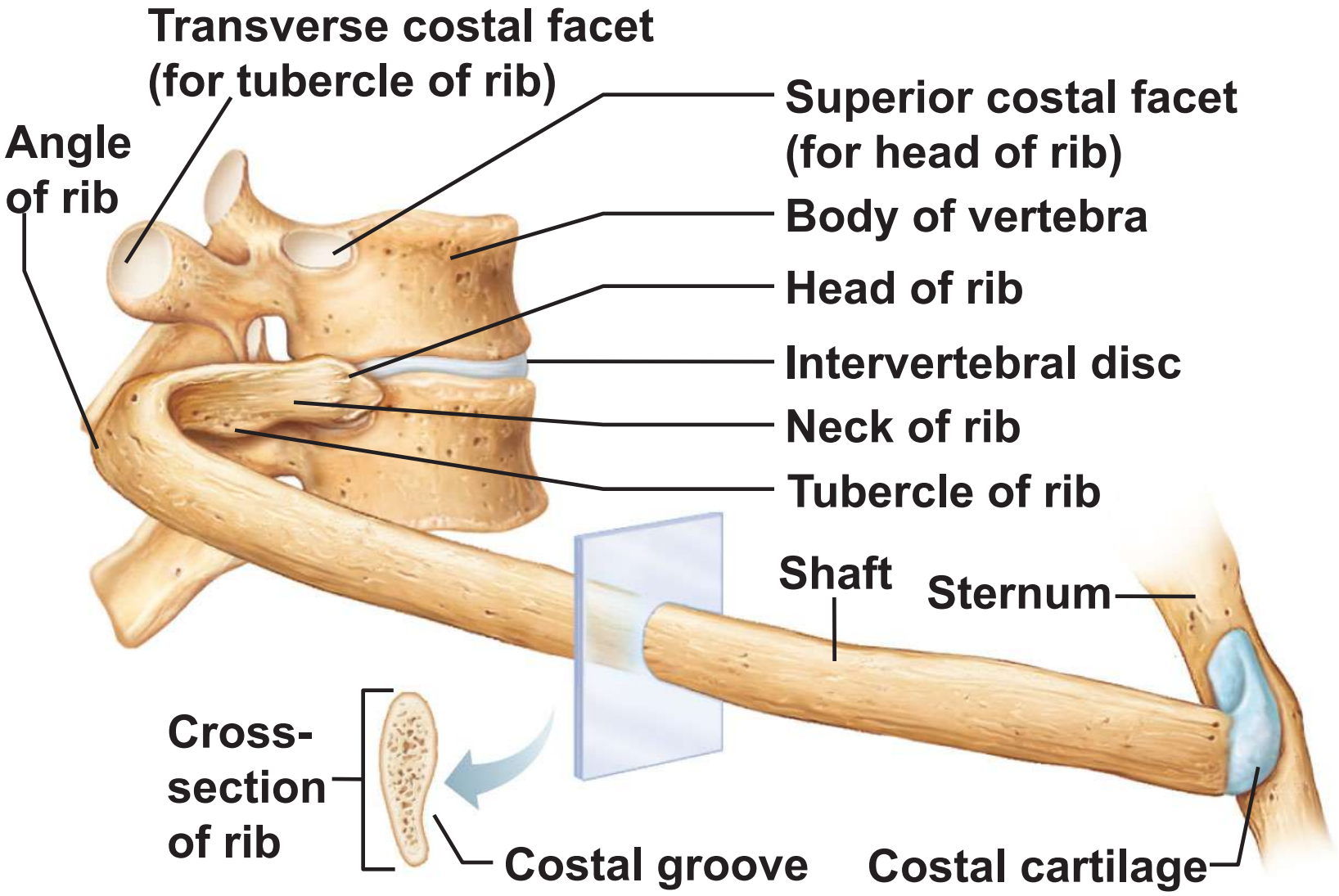


(a) Skeleton of the thoracic cage, anterior view

Figure 7.22a

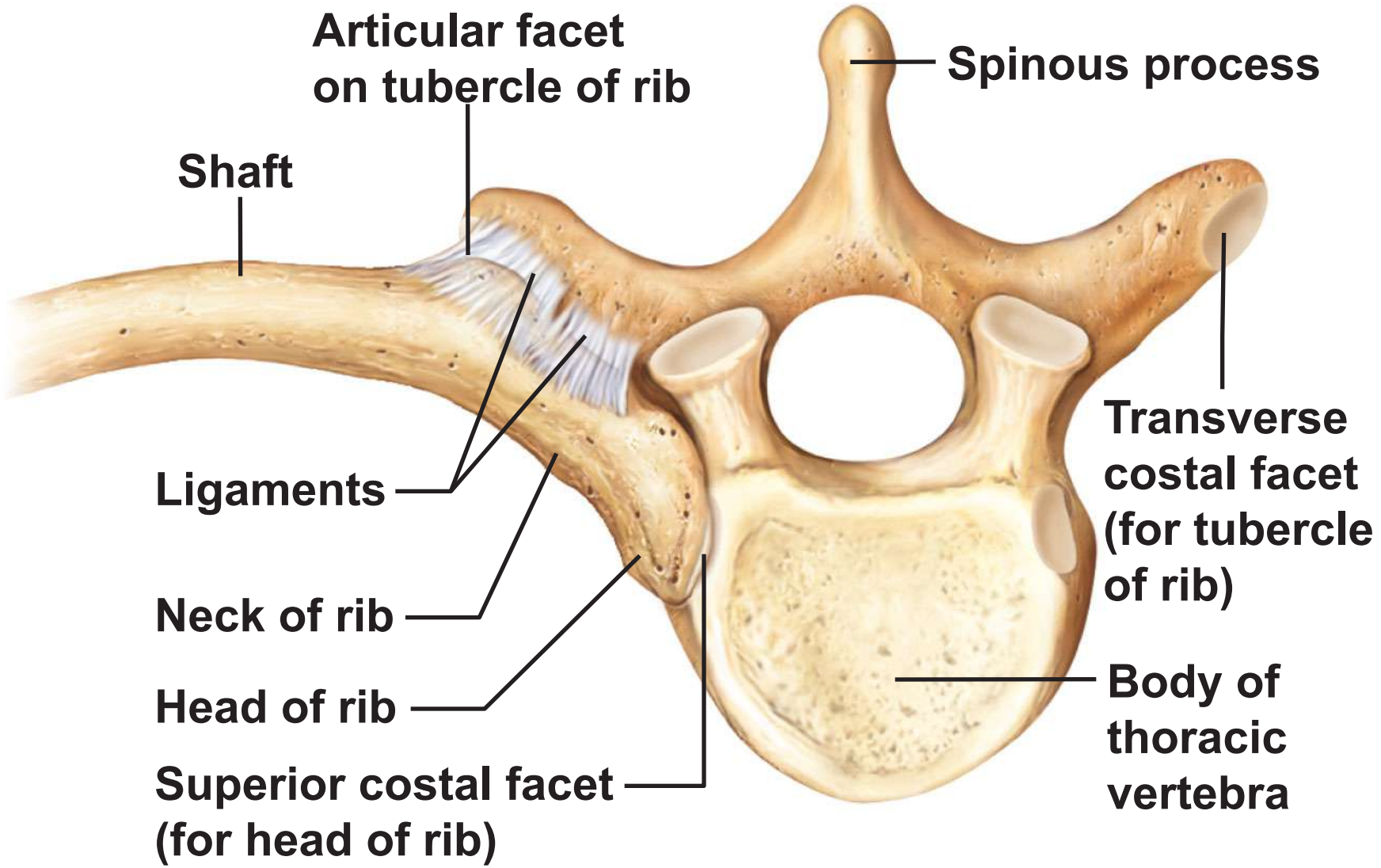
Structure of a Typical Rib

- Main parts:
  - Head
    - Articulates posteriorly with facets (demifacets) on bodies of two adjacent vertebrae
  - Neck
  - Tubercle
    - Articulates posteriorly with transverse costal facet of same-numbered thoracic vertebra
  - Shaft



(a) Vertebral and sternal articulations of a typical true rib

Figure 7.23a



(b) Superior view of the articulation between a rib and a thoracic vertebra

Figure 7.23b