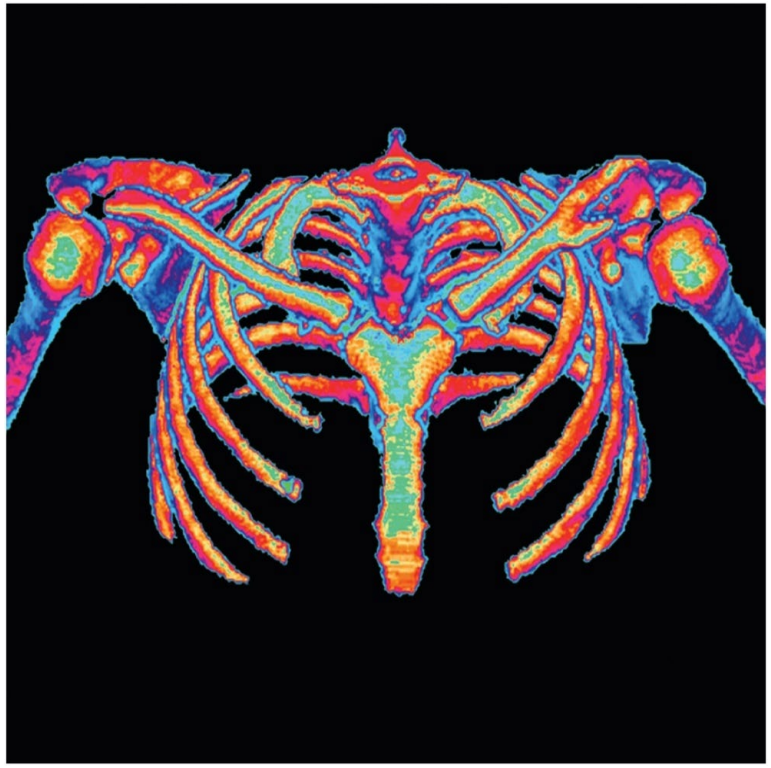
Chapter 8.1

# An Introduction to the Skeleton System



# Overview of the Skeleton

- The two regions of the skeleton

–axial skeleton

•forms the central axis of the body

•skull, auditory ossicles, hyoid bone, vertebral column, and thoracic cage (ribs and sternum)

–appendicular skeleton

•pectoral girdle and the bones of the upper limbs

•pelvic girdle and bones of the lower limbs

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# Overview of the Skeleton

Number of bones changes throughout life (270 bones at birth, decreases because some bones fuse)

206 in typical adult skeleton (How many bones fused?)

- bone number varies because of sesamoid bones (e.g. patella) // bones that form within tendons in response to stress
- bone count number also varies because of the presence of sutural (wormian) bones in skull
- these are extra bones that develop in skull suture lines

## TABLE 8.1 Bones of the Adult Skeletal System

### Axial Skeleton

*Skull (22 bones)*
Cranial bones
- Frontal bone (1)
- Parietal bone (2)
- Occipital bone (1)
- Temporal bone (2)
- Sphenoid bone (1)
- Ethmoid bone (1)

Facial bones
- Maxilla (2)
- Palatine bone (2)
- Zygomatic bone (2)
- Lacrimal bone (2)
- Nasal bone (2)
- Vomer (1)
- Inferior nasal concha (2)
- Mandible (1)

*Auditory ossicles (6 bones)*
Malleus (2)
Incus (2)
Stapes (2)

*Hyoid bone (1 bone)*

*Vertebral column (26 bones)*
Cervical vertebrae (7)
Thoracic vertebrae (12)
Lumbar vertebrae (5)
Sacrum (1)
Coccyx (1)

*Thoracic cage (25 bones plus thoracic vertebrae)*
Ribs (24)
Sternum (1)

### Appendicular Skeleton

*Pectoral girdle (4 bones)*
Scapula (2)
Clavicle (2)

*Upper limb (60 bones)*
Humerus (2)
Radius (2)
Ulna (2)
Carpals (16)
Metacarpals (10)
Phalanges (28)

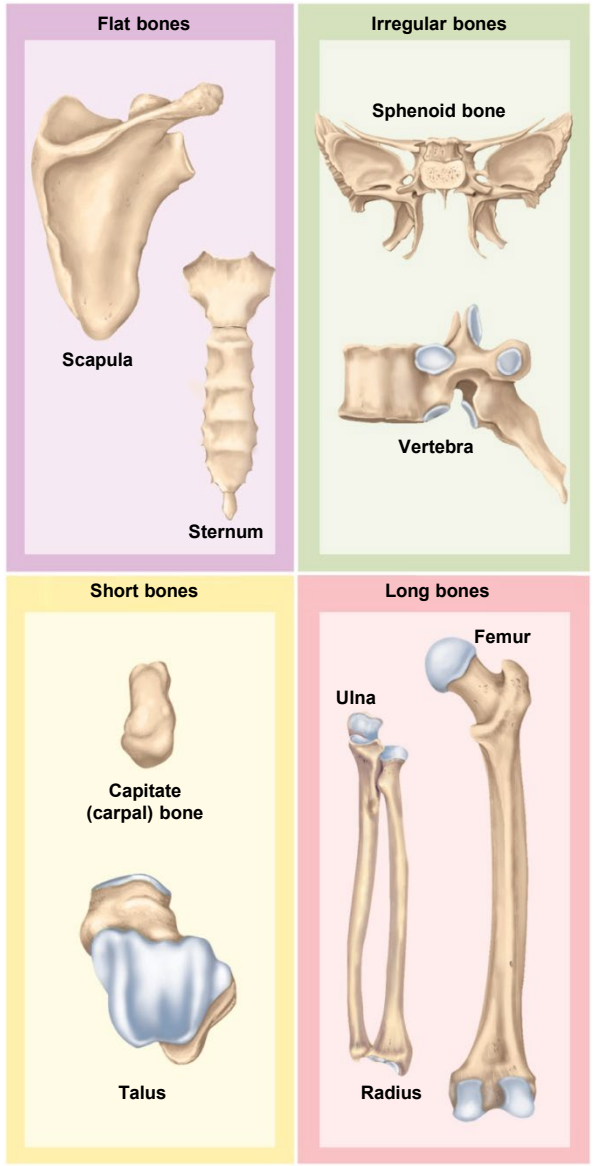
*Hip bones (2)*

*Lower limb (60 bones)*
Femur (2)
Patella (2)
Tibia (2)
Fibula (2)
Tarsals (14)
Metatarsals (10)
Phalanges (28)

**Grand Total: 206 Bones**

# Shapes of Bones






- long bones

–longer than wide

–rigid levers acted upon by muscles

- short bones

–equal in length and width

–glide across one another in multiple directions

- flat bones

–protect soft organs

–curved but wide & thin

- irregular bones

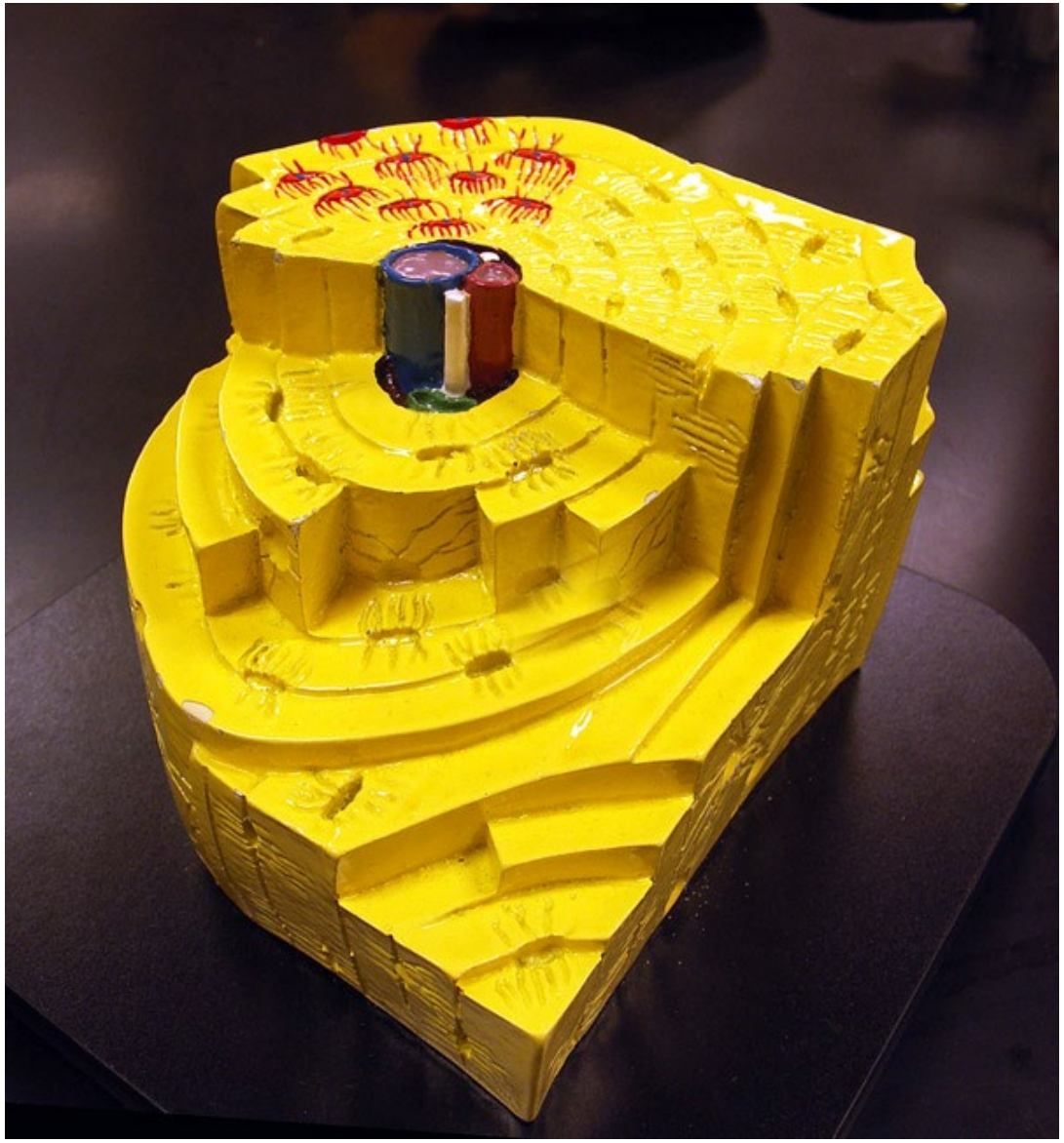
–elaborate shapes that don't fit into the other categories

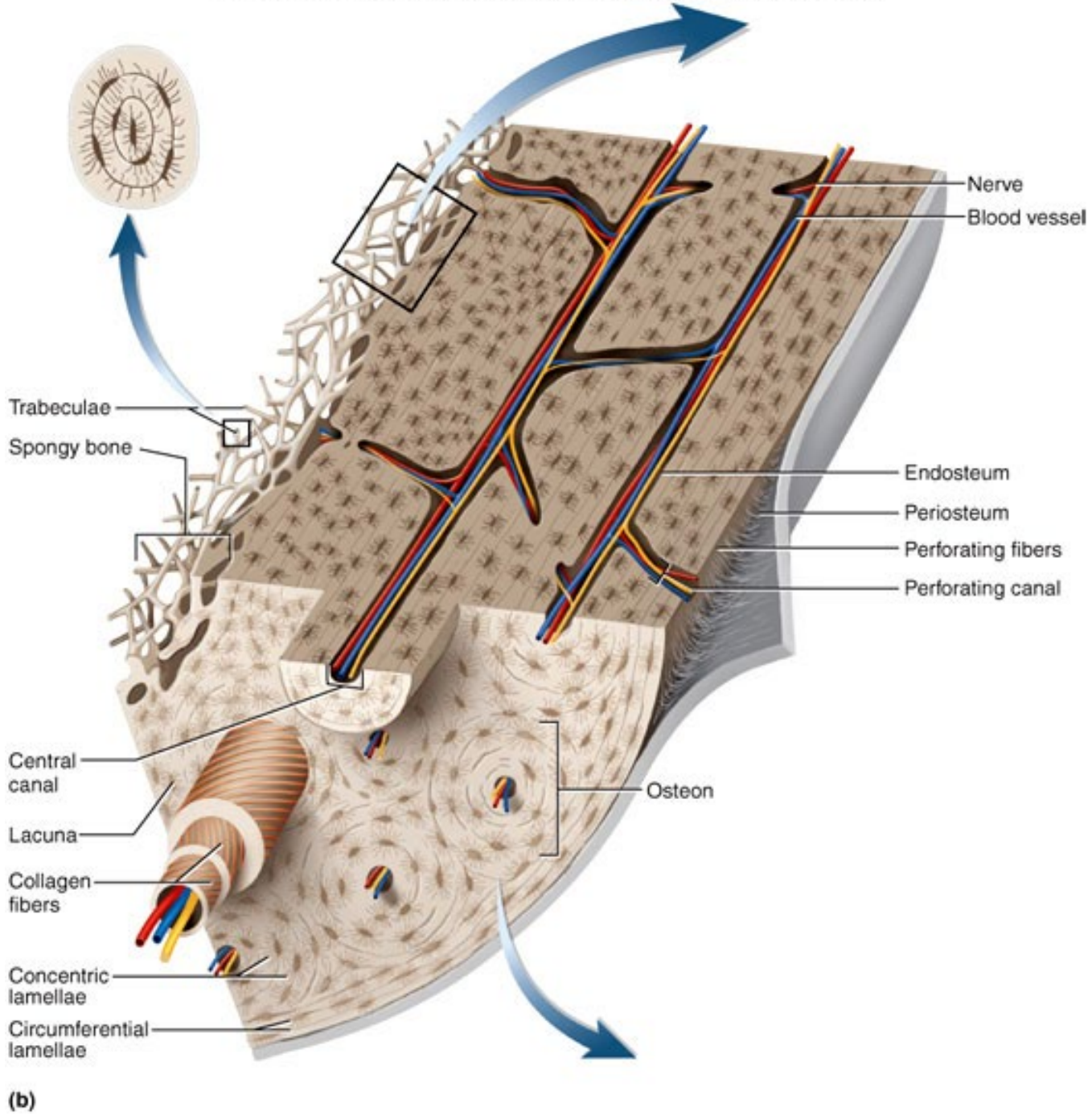
**TABLE 8.2** Anatomical Features (Markings) of Bones

| Term | Description and Example |
|---|---|
| *Articulations* | |
| Condyle | A rounded knob that articulates with another bone (occipital condyles of the skull) |
| Facet | A smooth, flat, slightly concave or convex articular surface (articular facets of the vertebrae) |
| Head | The prominent expanded end of a bone, sometimes rounded (head of the femur) |
| *Extensions and projections* | |
| Crest | A narrow ridge (iliac crest of the pelvis) |
| Epicondyle | An expanded region superior to a condyle (medial epicondyle of the femur) |
| Line | A slightly raised, elongated ridge (nuchal lines of the skull) |
| Process | Any bony prominence (mastoid process of the skull) |
| Protuberance | A bony outgrowth or protruding part (mental protuberance of the chin) |
| Spine | A sharp, slender, or narrow process (mental spines of the mandible) |
| Trochanter | Two massive processes unique to the femur |
| Tubercle | A small, rounded process (greater tubercle of the humerus) |
| Tuberosity | A rough elevated surface (tibial tuberosity) |
| *Depressions* | |
| Alveolus | A pit or socket (tooth socket) |
| Fossa | A shallow, broad, or elongated basin (mandibular fossa) |
| Fovea | A small pit (fovea capitis of the femur) |
| Sulcus | A groove for a tendon, nerve, or blood vessel (intertubercular sulcus of the humerus) |
| *Passages and cavities* | |
| Canal | A tubular passage or tunnel in a bone (auditory canal of the skull) |
| Fissure | A slit through a bone (orbital fissures behind the eye) |
| Foramen | A hole through a bone, usually round (foramen magnum of the skull) |
| Meatus | An opening into a canal (external acoustic meatus of the ear) |
| Sinus | An air-filled space in a bone (frontal sinus of the forehead) |

# Anatomical Features (Markings) of Bones

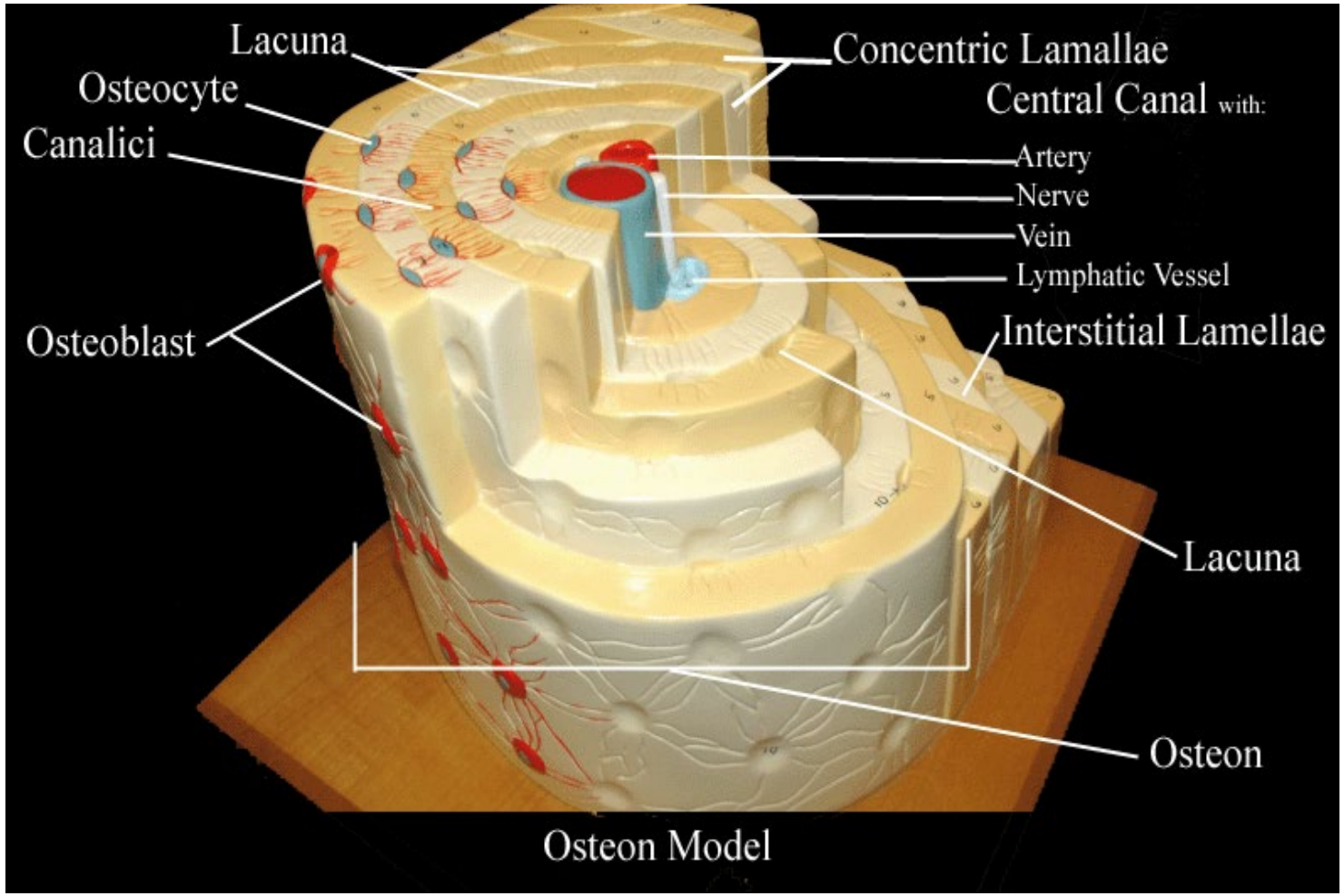
# The Osteon

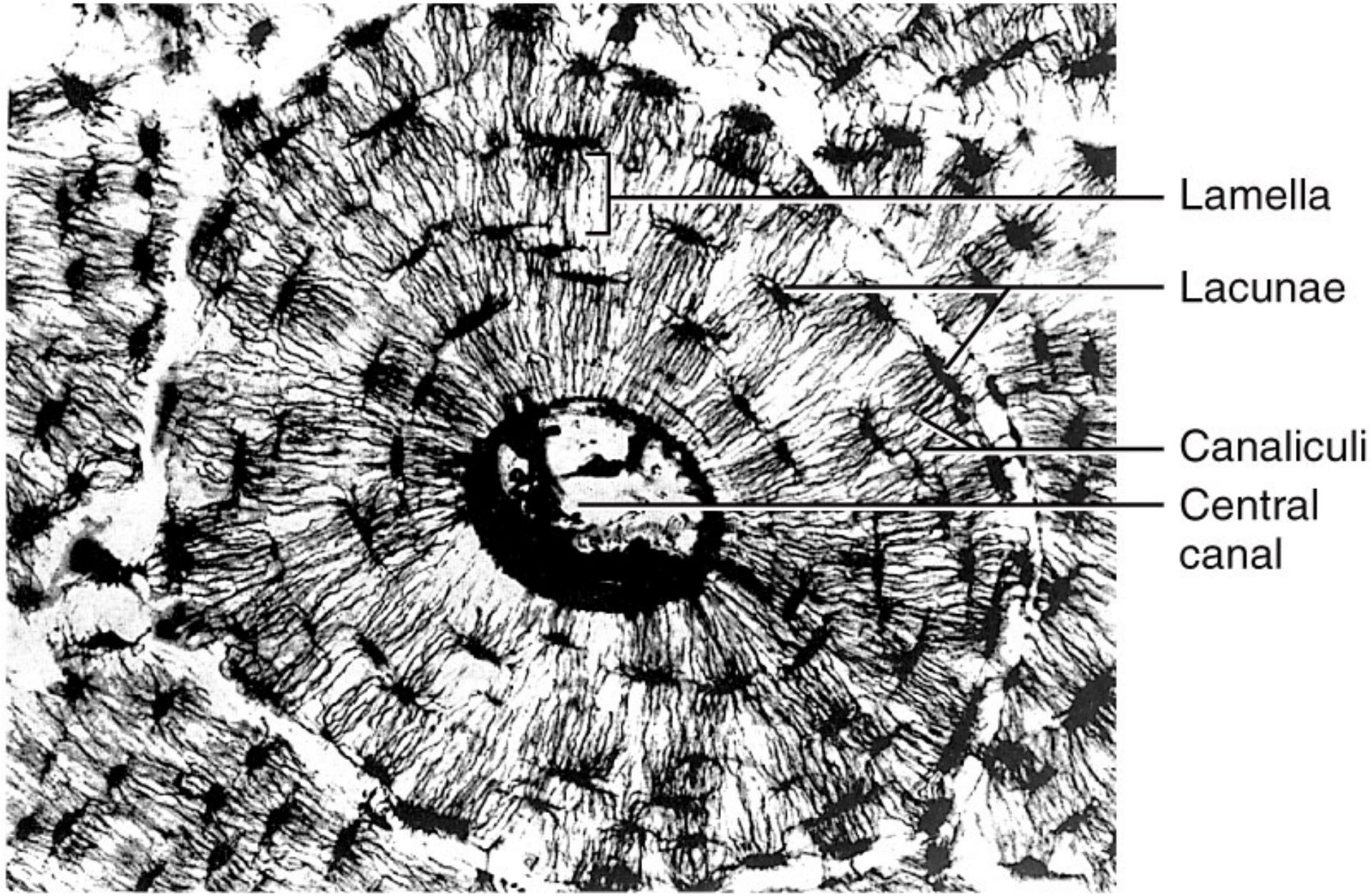





Blood
Vessels of Bone

- circumferential lamellae
  - interstitial lamellae


Lacuna
Osteocyte
Canalici
Osteoblast
Concentric Lamallae
Central Canal with:
Artery
Nerve
Vein
Lymphatic Vessel
Interstitial Lamellae
Lacuna
Osteon
Osteon Model



# Cranium (Braincase)

–protects the brain and associated sense organs

–swelling of the brain inside the rigid cranium may force tissue through foramen magnum resulting in death

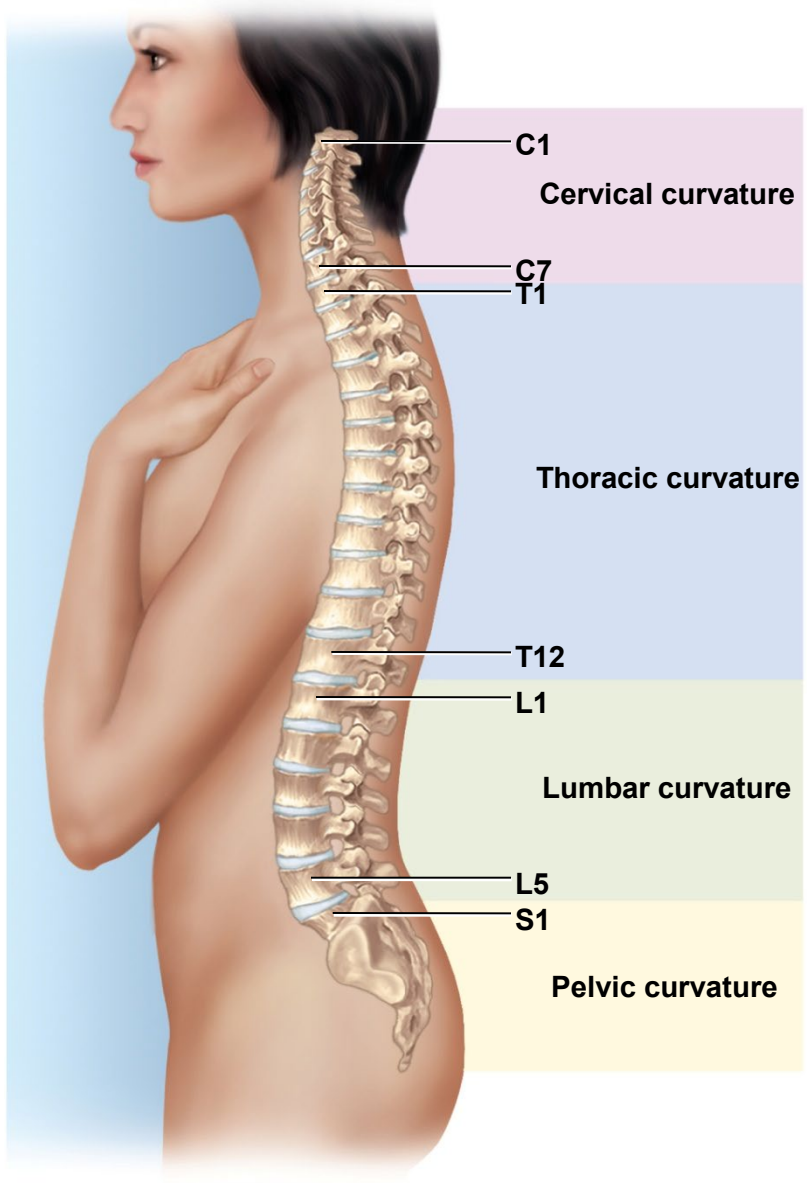
–consists of two parts:

- the **calvaria** (skullcap)
- and the cranial **base**

# Newborn Spinal Curvature


- Newborn's spine exhibits one continuous C-shaped curve at birth
- known as primary curvature

# Adult Spinal Curvatures

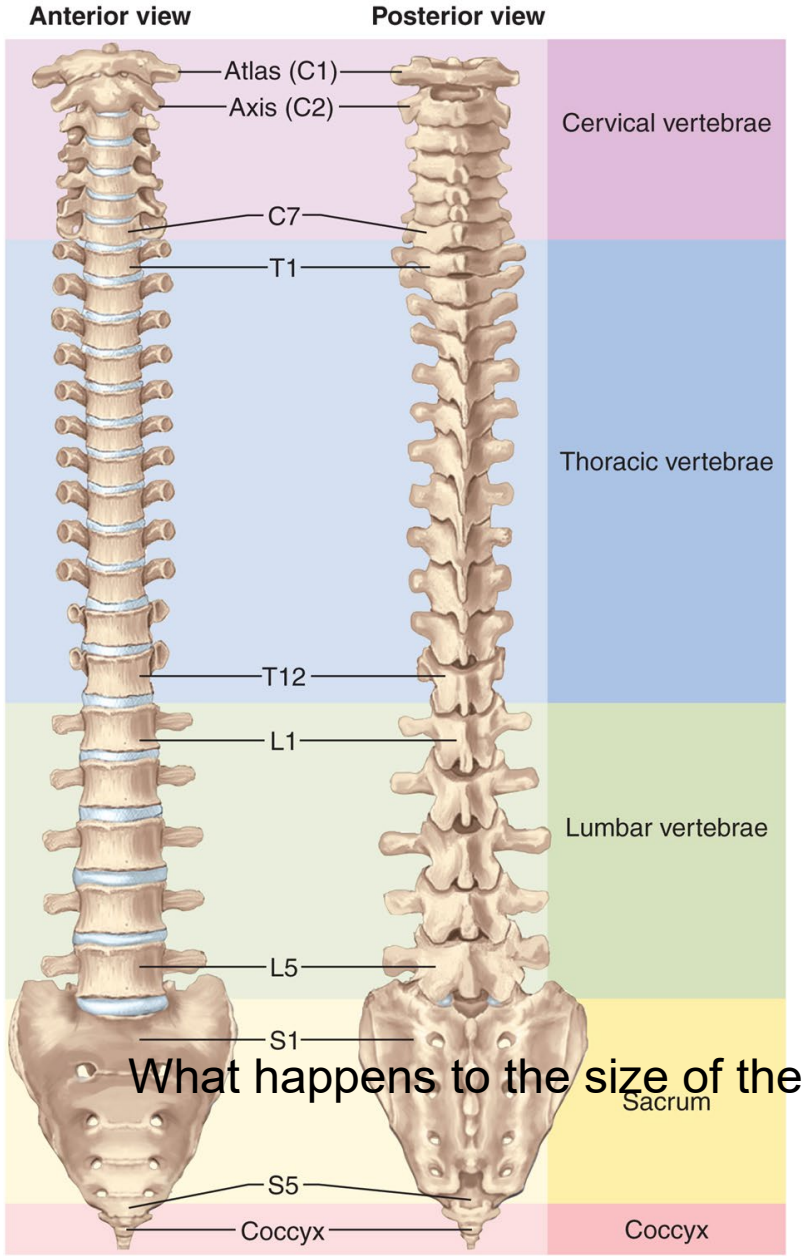



- s-shaped vertebral column with four curvatures

–cervical
–thoracic
–lumbar
–pelvic (sacral)

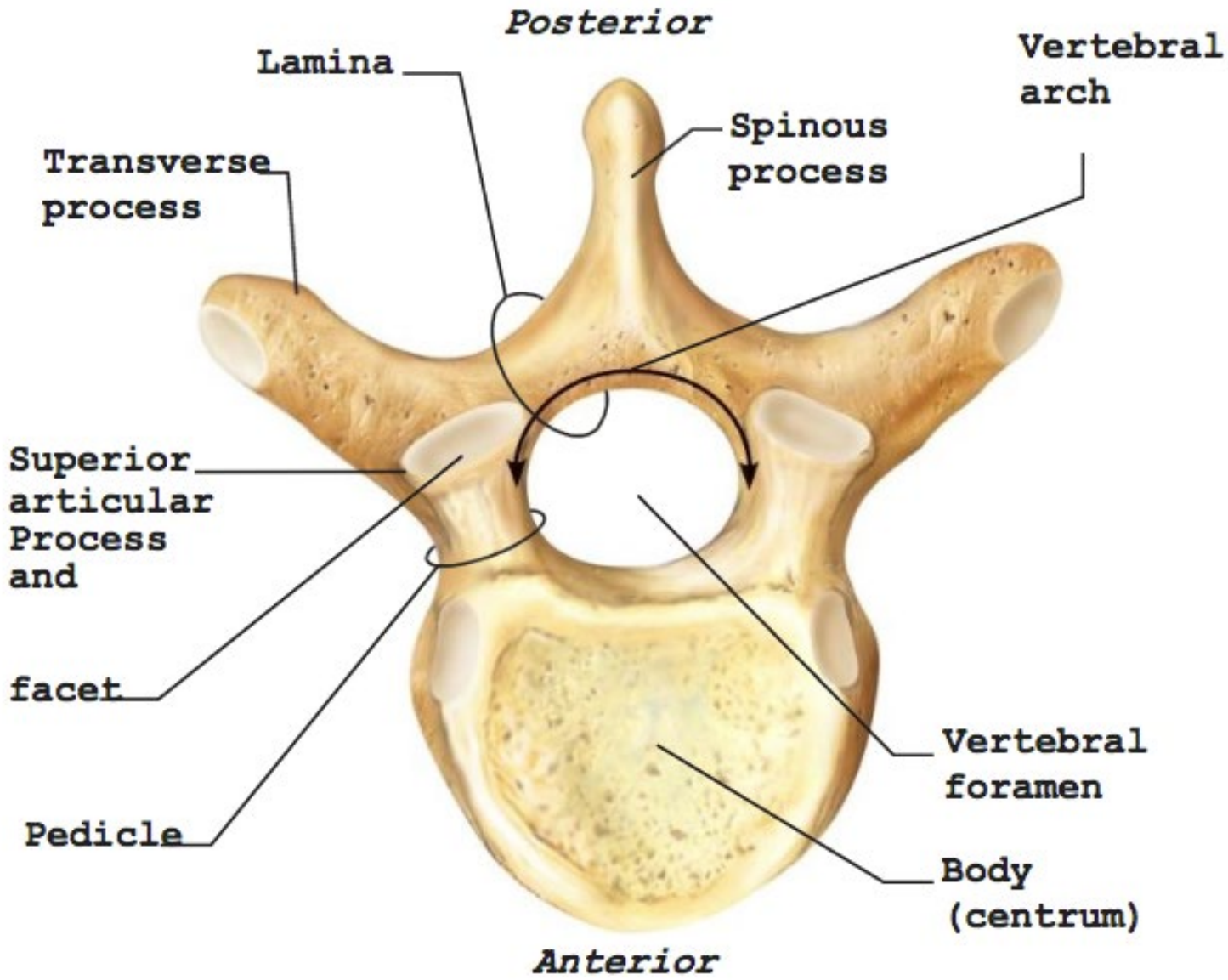
- primary curvatures // present at birth = thoracic and pelvic
- secondary curvatures // develop later = cervical and lumbar

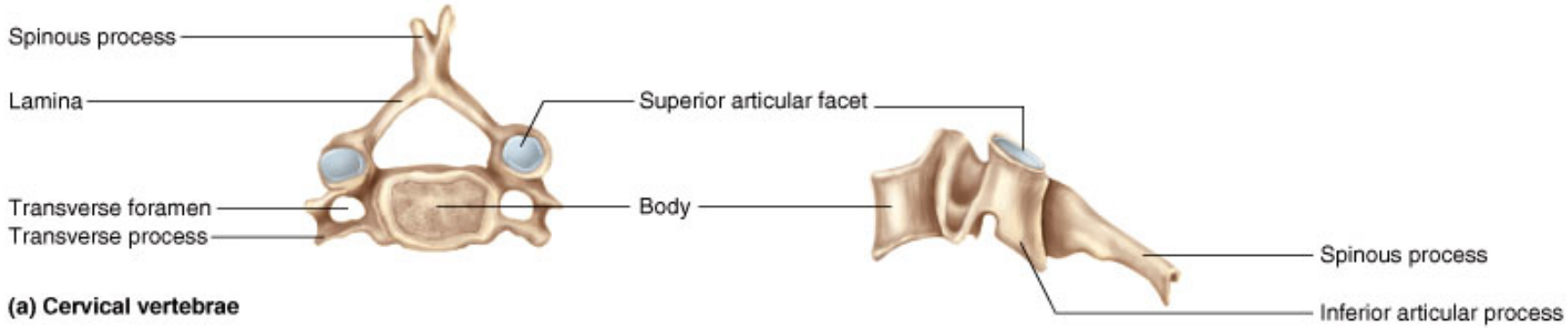
–lifting head as it begins to crawl develops cervical curvature
–push up with arms before walking start to develop lumbar
–walking upright develops lumbar curvature



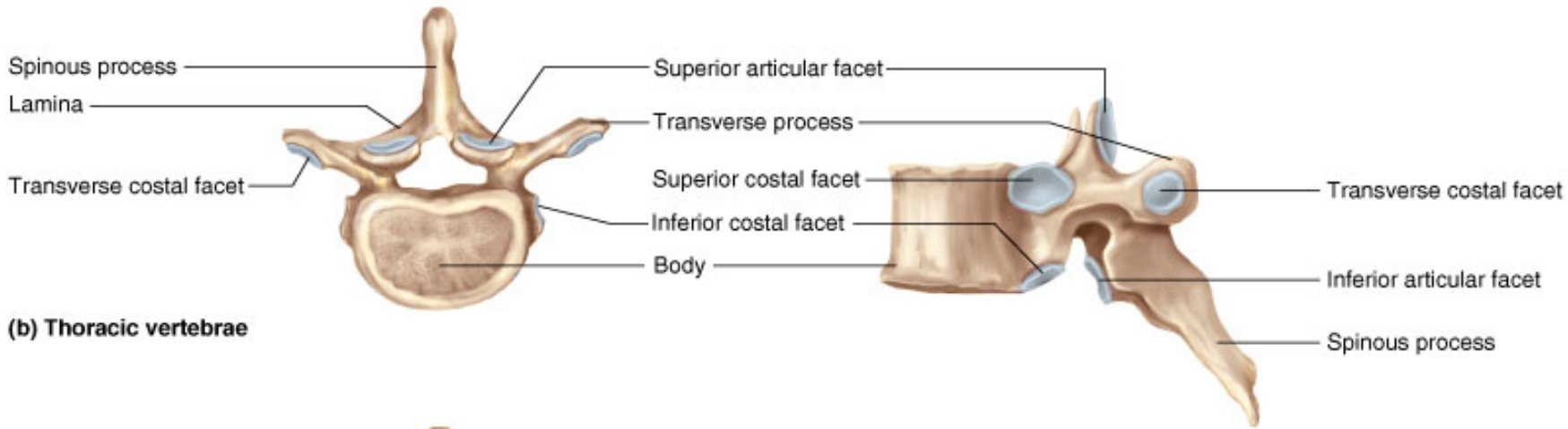

# Five Type of Vertebrae

What happens to the size of the Vertebrae as you go from the cervical to the lumbar? Why? Wha

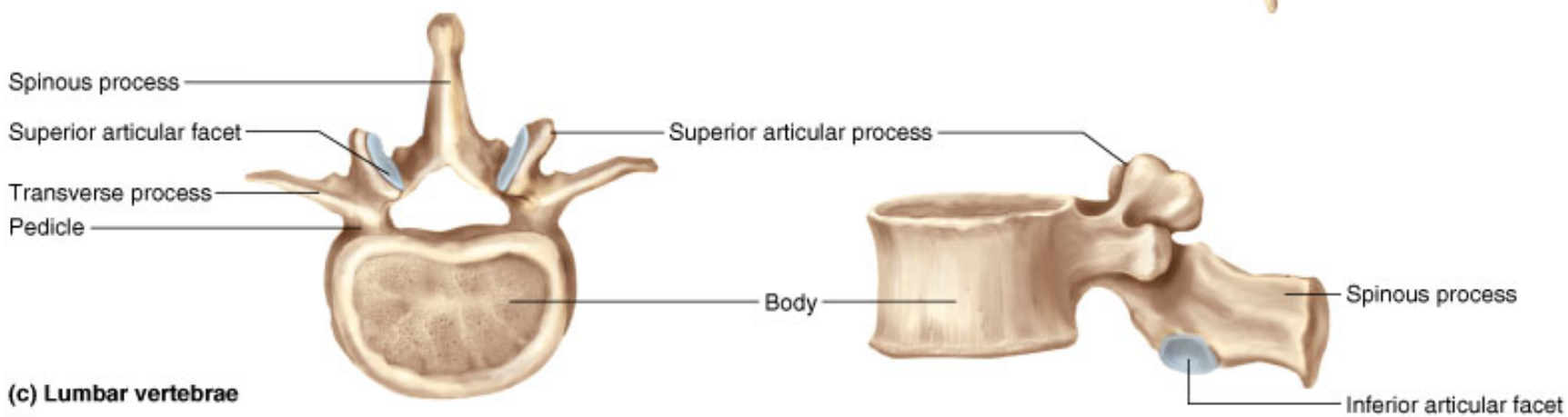




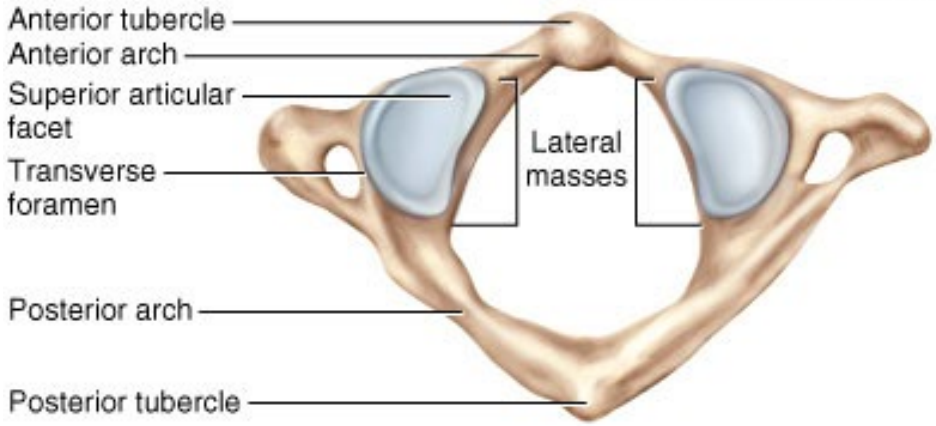

**(a) Cervical vertebrae**



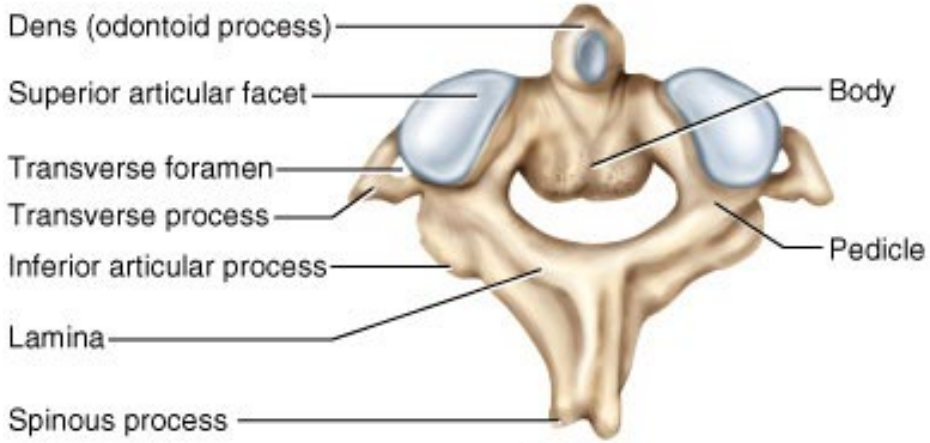

**(b) Thoracic vertebrae**



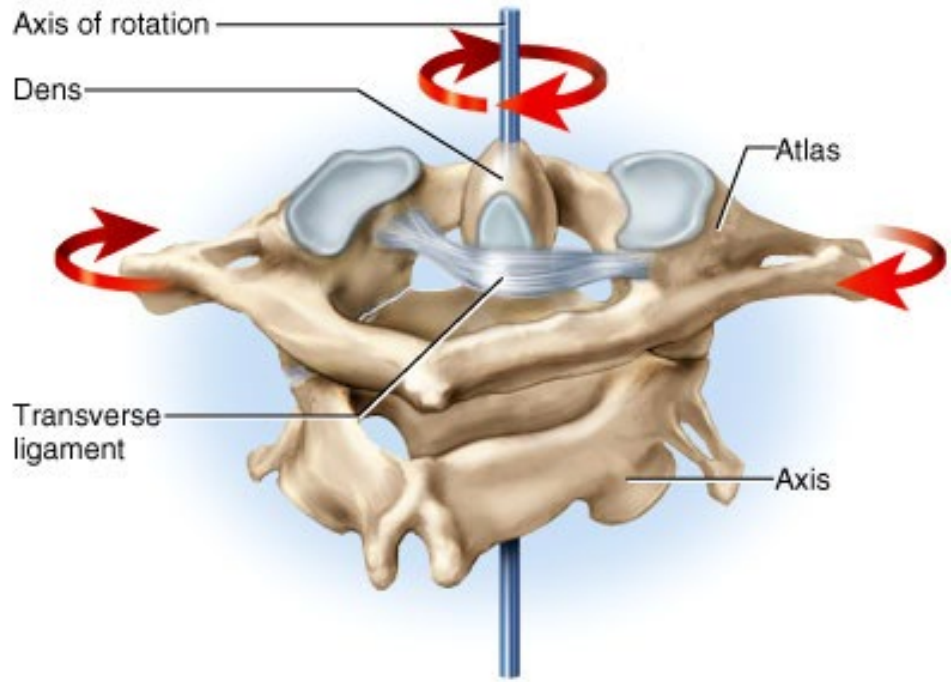

**(c) Lumbar vertebrae**



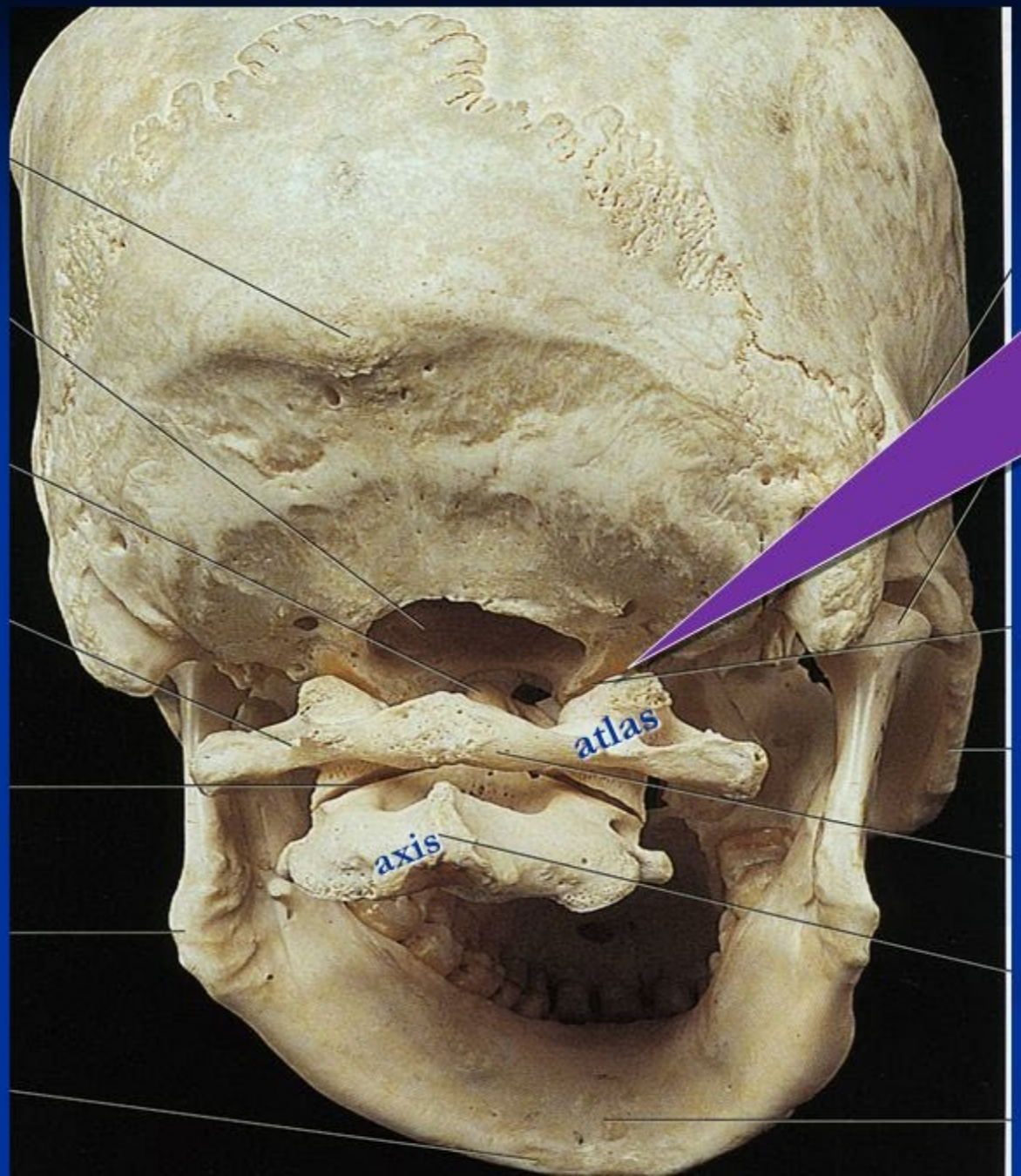

**(a) Atlas**



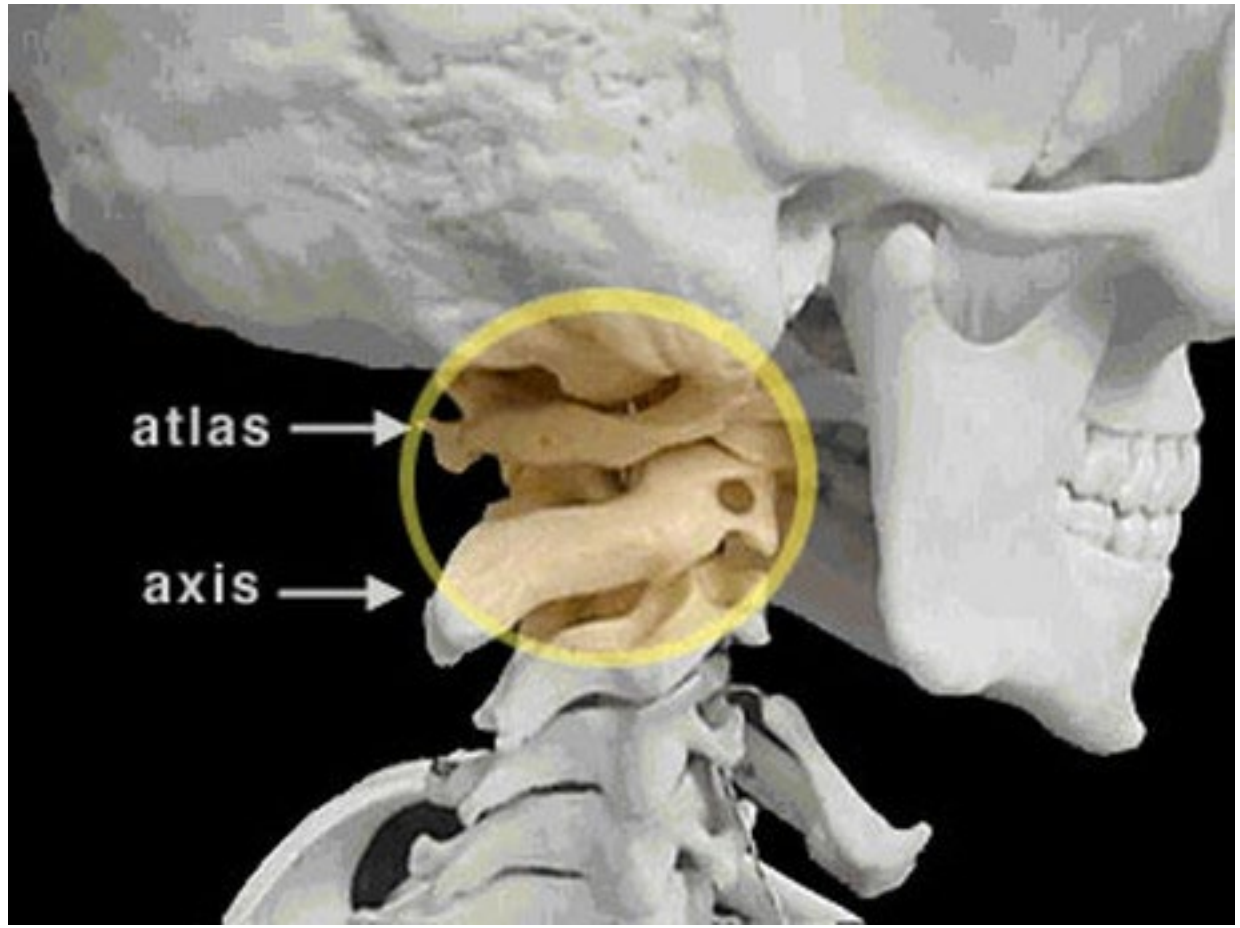

**(b) Axis**



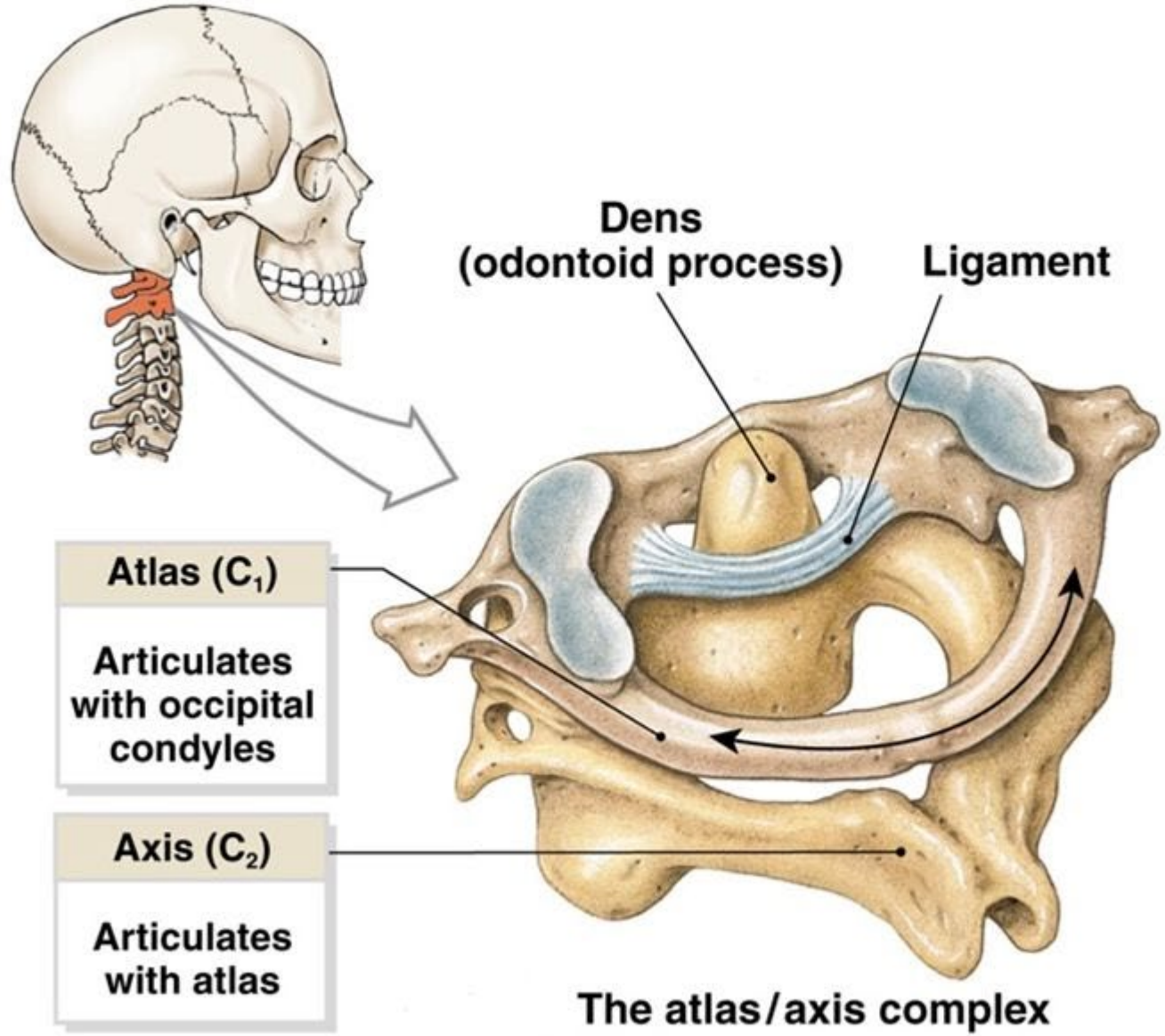

**(c) Atlantoaxial joint**




The **Atlanto-occipital joints** are synovial joints between the occipital condyles, and the facets on the superior surfaces of the lateral masses of the atlas below.


atlas
axis

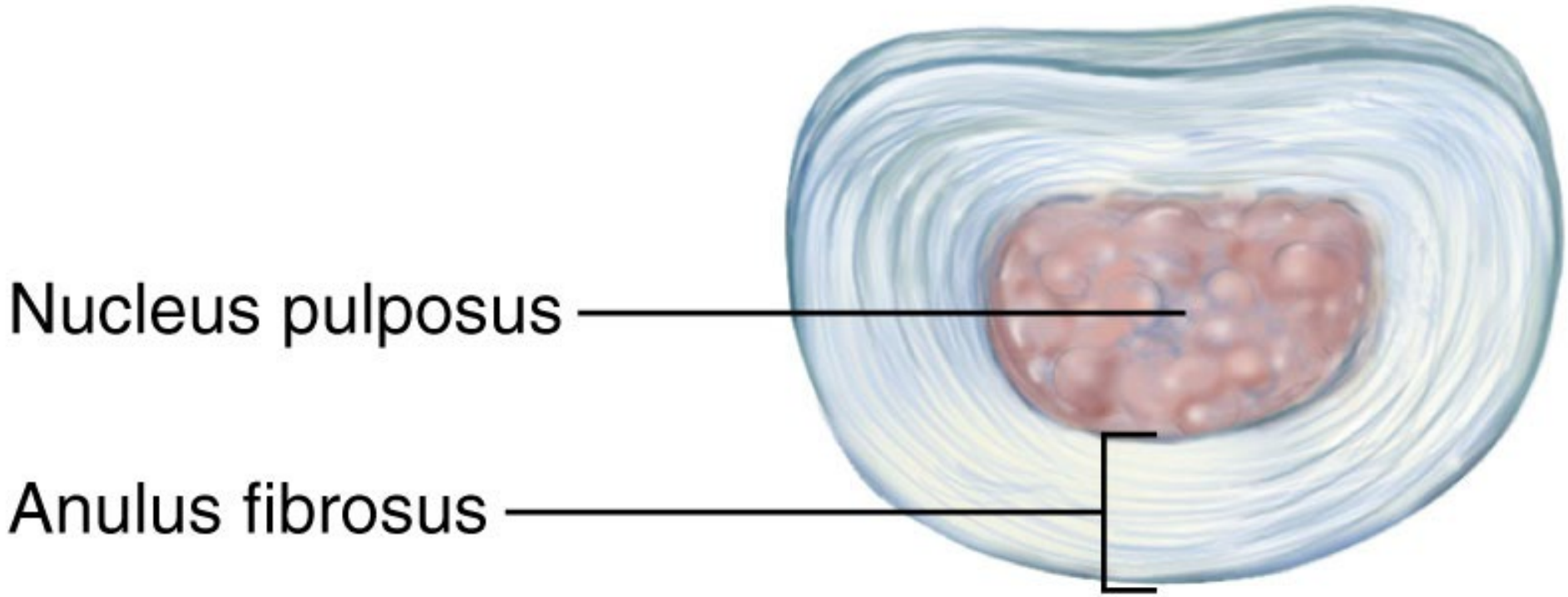
# VERTEBRAL COLUMN (continued)




**Shake Head**

**No**

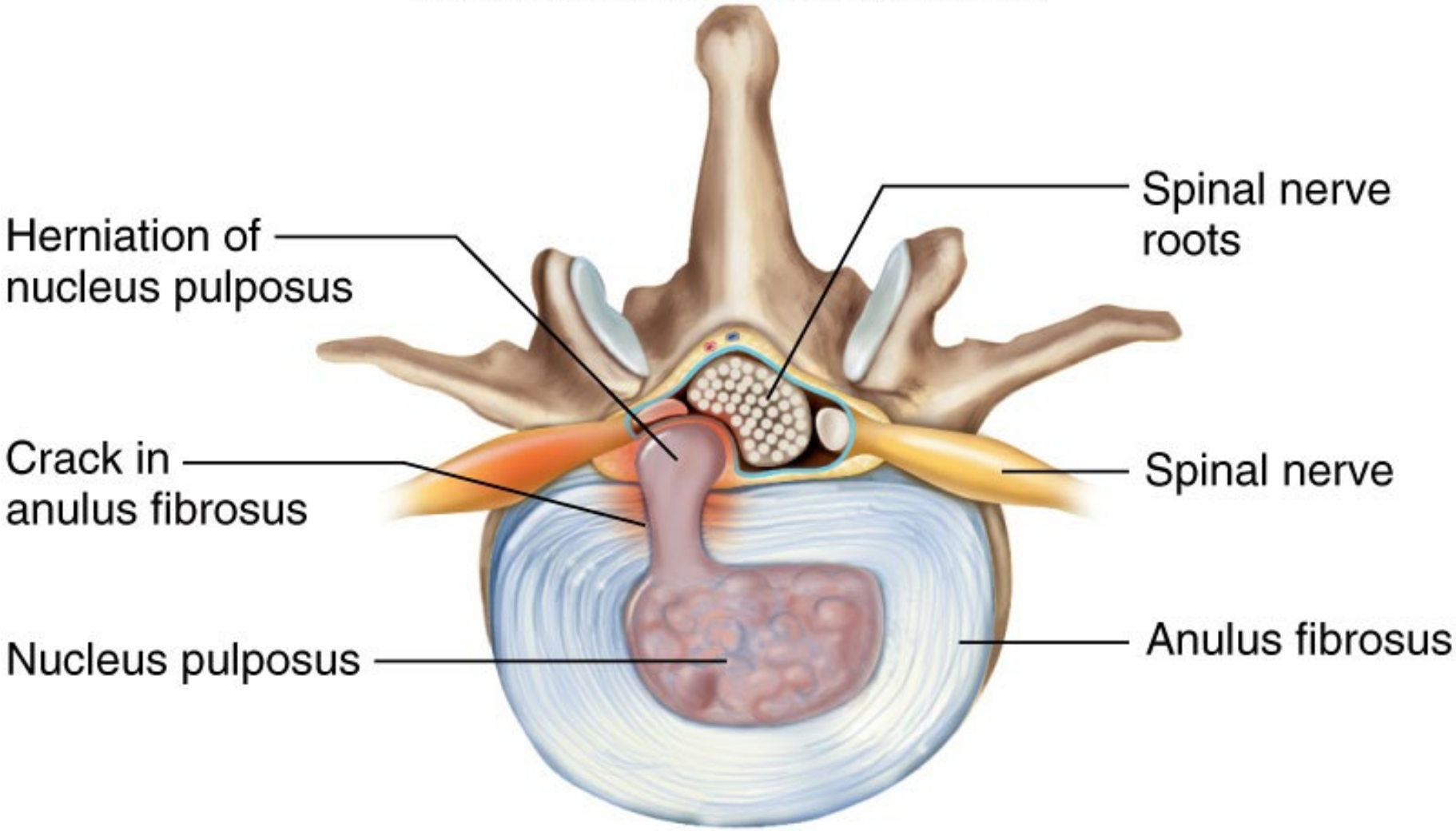
**Yes**




**(b) Intervertebral disc**

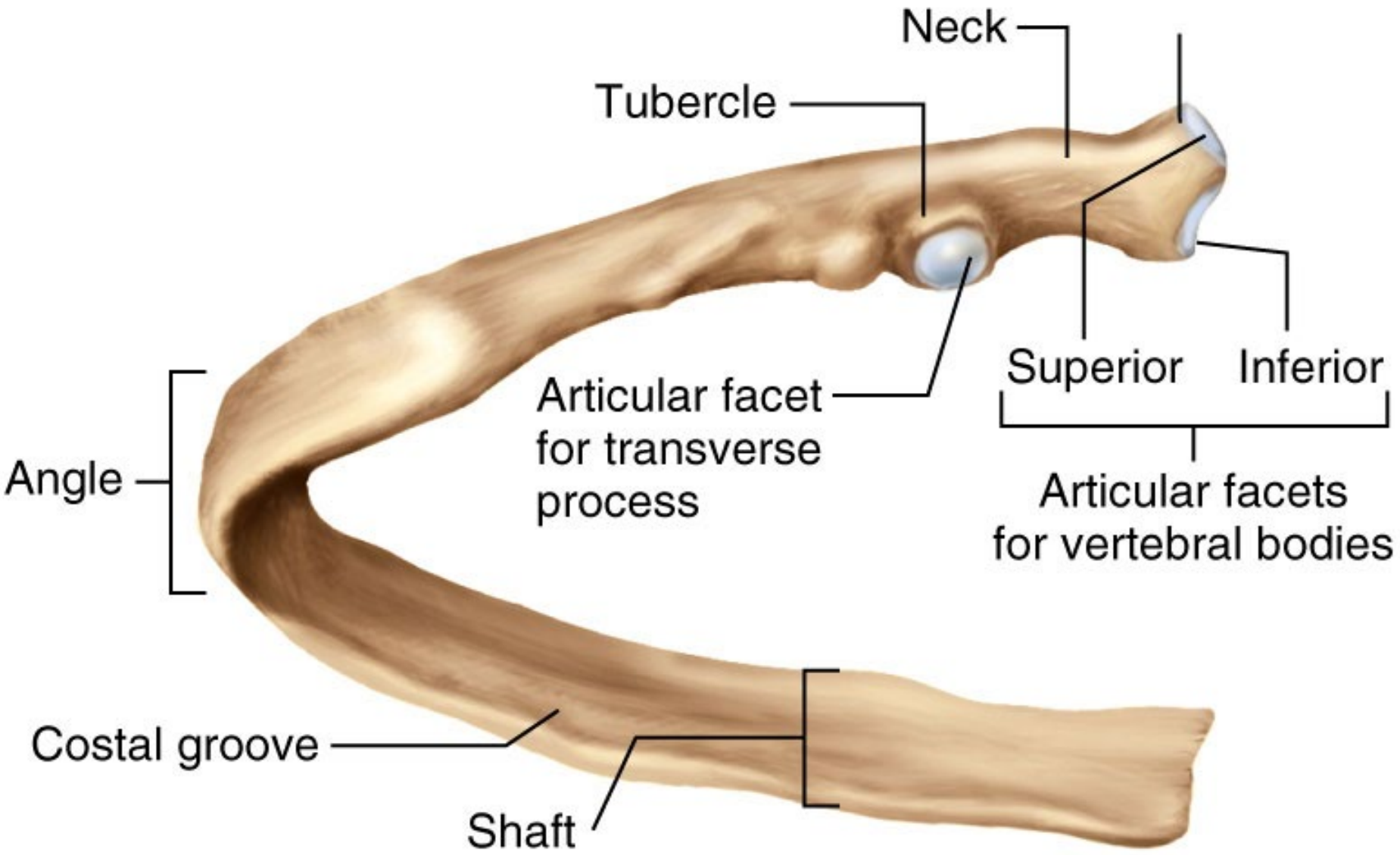
# Figu



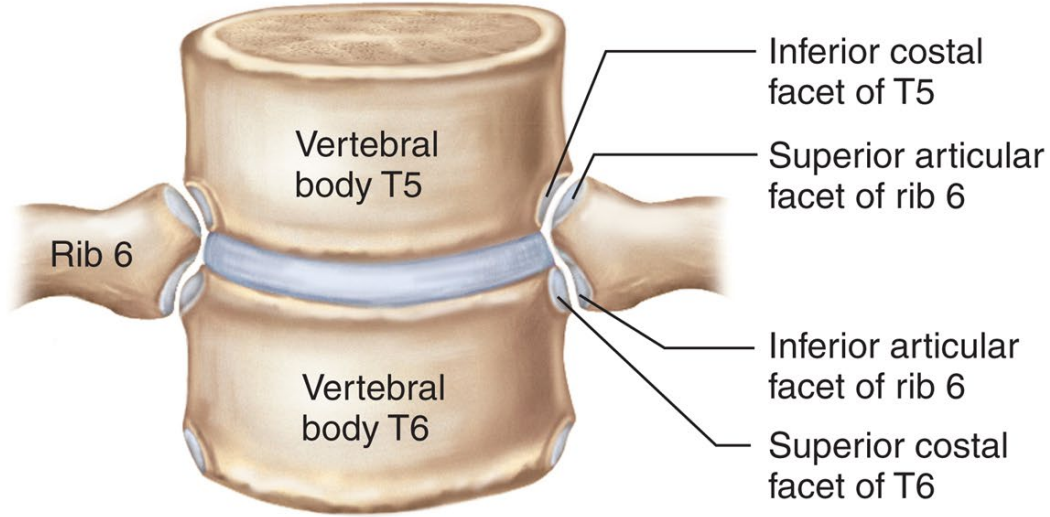



**(c) Herniated disc**

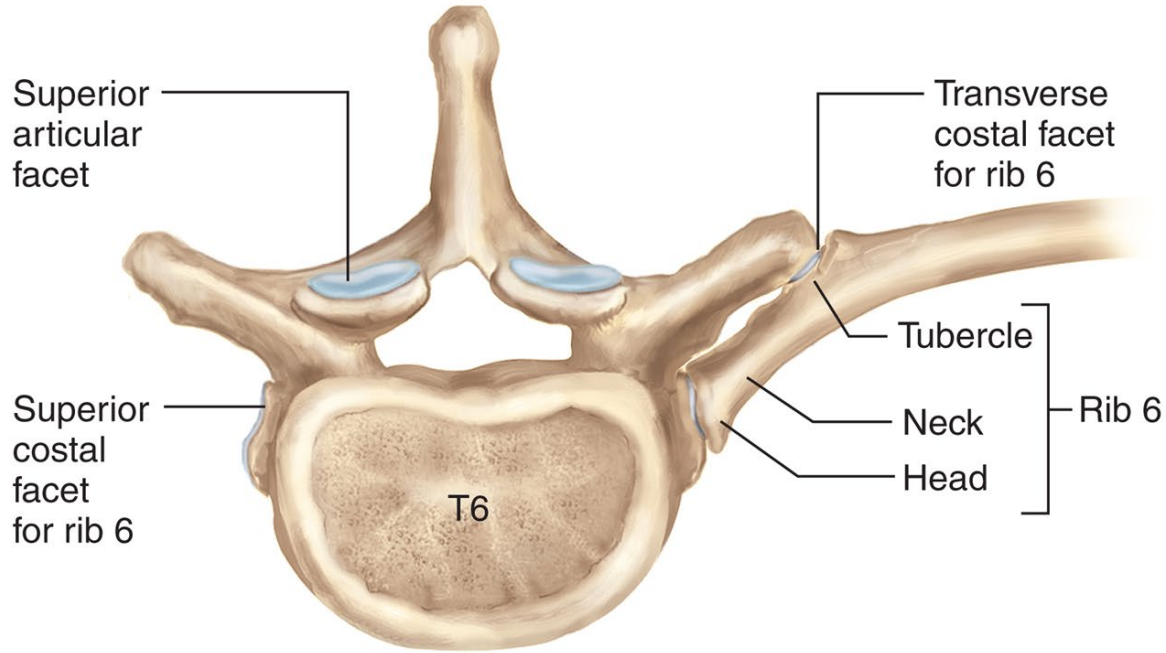
Fig




**(b) Ribs 2–10**

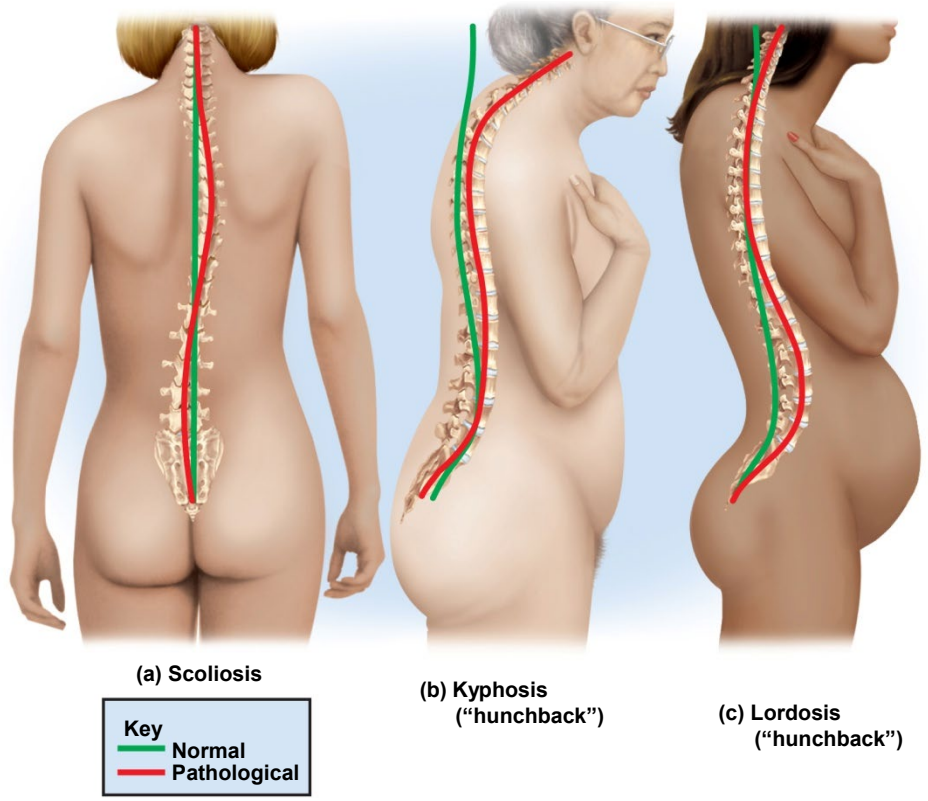



**(a) Anterior view**




**(b) Superior view**

# Abnormal Spinal Curvatures




- from disease, paralysis of trunk muscles, poor posture, pregnancy, or congenital defect

- scoliosis – abnormal lateral curvature

–most common

–usually in thoracic region

–particularly of adolescent girls

–developmental abnormality in which the body and arch fail to develop on one side of the vertebrae

- kyphosis (hunchback) – exaggerated thoracic curvature

–usually from osteoporosis, also osteomalacia or spinal tuberculosis, or wrestling or weightlifting in young boys

- lordosis (swayback) – exaggerated lumbar curvature

– is from pregnancy or obesity

# CO 7



# Spinal Osteoporosis



(a)

(b)