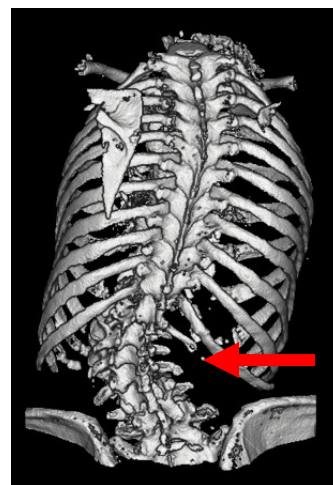
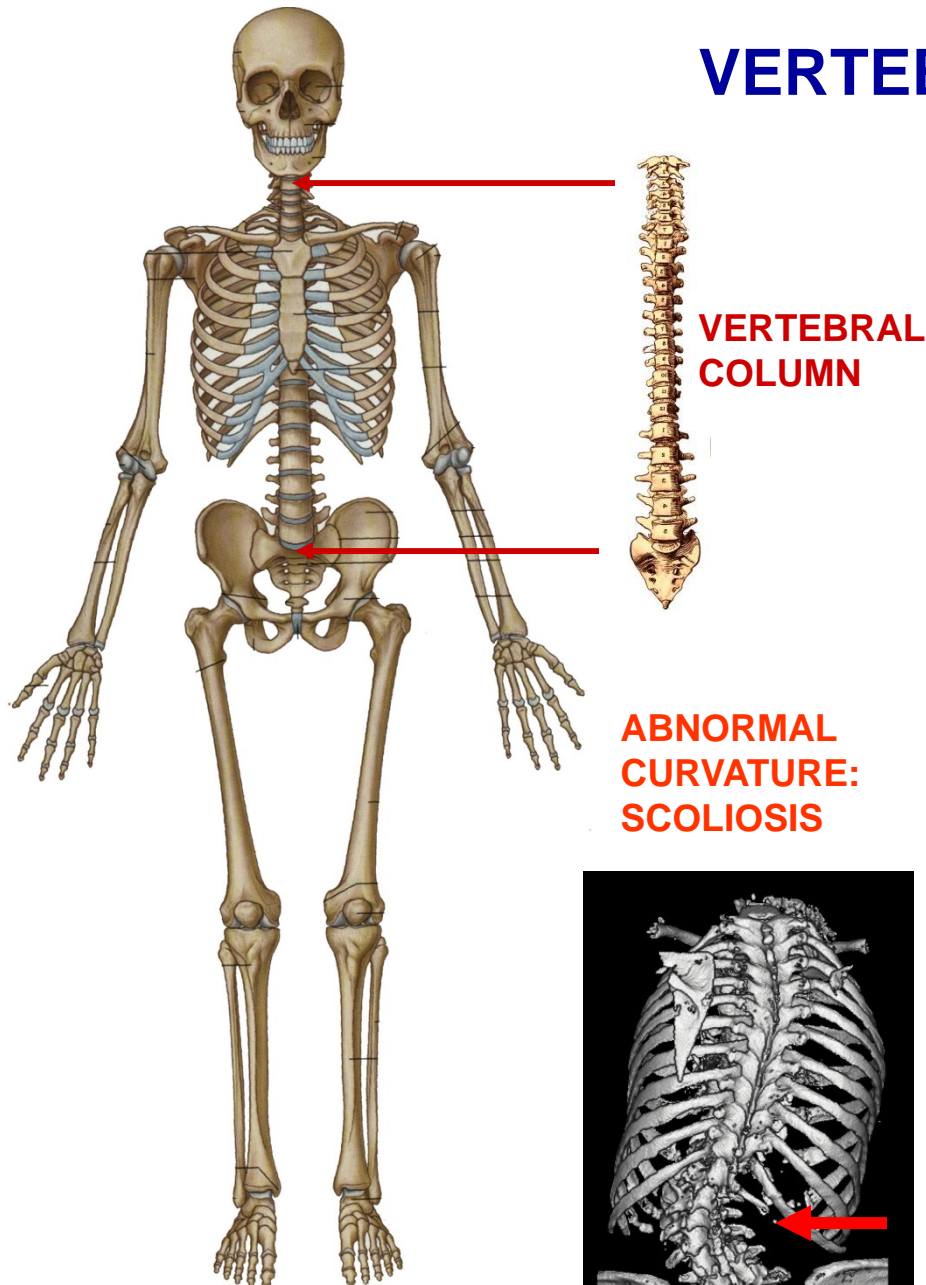


VERTEBRAL COLUMN OVERVIEW



Relevance

1- Nomenclature – the terms used to describe vertebrae (C,T,L,S,Co) form the basis for the description of Spinal nerves

2- Clinical relevance – Back problems second highest cause of disability

1. 'Slipped' disc – herniation of nucleus pulposus

2. Spinal curvature -
Curvatures of spine –
Common

VERTEBRAL COLUMN

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I. VERTEBRAL COLUMN - functions to support weight of body and protect spinal cord while permitting movements of trunk and providing for muscle attachments.

A. Typical vertebra

1. A typical vertebra (by convention thoracic or upper lumbar) consists of a body (anterior) and a vertebral arch (posterior) surrounding the vertebral canal (houses spinal cord).
2. The vertebral arch is composed of pedicles (projecting from the body) and laminae (uniting arch posteriorly).
3. Transverse processes (arising from arch laterally) and spinous processes (arising from arch posteriorly) provide for attachments of muscles and ligaments.
4. Spinal nerves exit the vertebral canal via intervertebral foramina (between pedicles of vertebrae) that are bordered by superior and inferior vertebral notches.
5. Superior and inferior articular processes - provide for joints between adjacent vertebrae; located at junction of pedicles and laminae; orientations of articular processes (also called facets) determine the types of movements that occur between vertebrae.
6. Bodies of adjacent vertebrae are also joined by intervertebral discs (see below).

B. Regional Variations - vertebral column is divided anatomically into regions; in each region, vertebrae are numbered superior to inferior:

2. SUMMARY OF FEATURES OF VERTEBRAE

Vertebra	#	Features	Articular Process Oriented	Movements
Cervical	7	Bodies small, Foramina transversaria (small in C7) C1 = Atlas - no body C2 = Axis - dens C7 = Vertebra prominens	Slanted (Superiorly and Medially)	Considerable freedom of movement: Flex-Extend, Lateral Flex, Rotate
Thoracic	12	Facets for ribs on bodies (heads of ribs), transverse processes (articular tubercles of ribs)	Coronal plane	Little movement: No Flex-Extend, Small Rotate
Lumbar	5	Large bodies	Sagittal plane	Flex-Extend, No Rotate
Sacral	5	Fused		Normally no movement
Coccygeal	3-5	Fused, rudimentary		No movement

ANATOMY HANDOUTS, TABLES

Lecture videos follow handouts (read handout)

Summary tables at end of handout – recap anatomical features, terms

CLINICAL ANATOMY CHARTS - REVIEW FOR STEP 1 EXAM, CLINICAL INTEGRATION

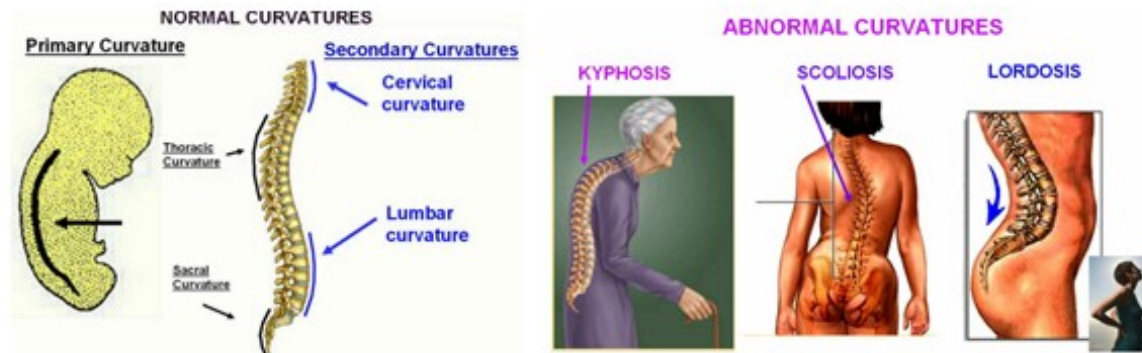
CLINICAL ANATOMY OF VERTEBRAE, SPINAL NERVES, REFLEXES

1) VERTEBRAE - NORMAL SPINAL CURVATURES: Primary = Concave Anterior - (fetal curvature); preserved in adult Thorax, Sacrum

Secondary = Concave Posterior (develop in childhood) - Cervical (support head), Lumbar (support body)

ABNORMAL CURVATURES - all can cause pain from compression of spinal nerves

	Curvature	Location (Most common)	Cause
Kyphosis	Exaggerated Concave Anterior	Often in Thoracic Region (Hump back)	Osteoporosis , etc. - loss of bone in bodies of vertebrae
Scoliosis	Exaggerated Lateral	Thoracic, Lumbar most common	Hemivertebra (half of vertebral body does not form in development), etc.
Lordosis	Exaggerate Concave Posterior	Lumbar (normal in pregnancy)	Obesity, etc.



Summarize anatomical features of clinical conditions, developmental abnormalities; useful for review for exams, including Step 1 Board Exam

VERTEBRAL COLUMN

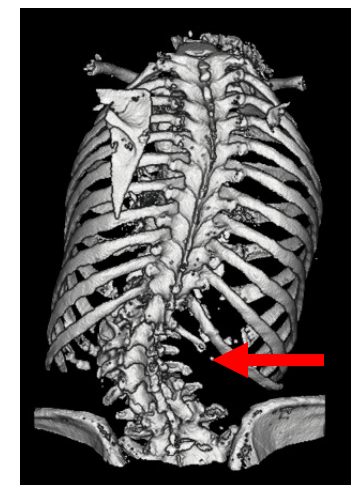
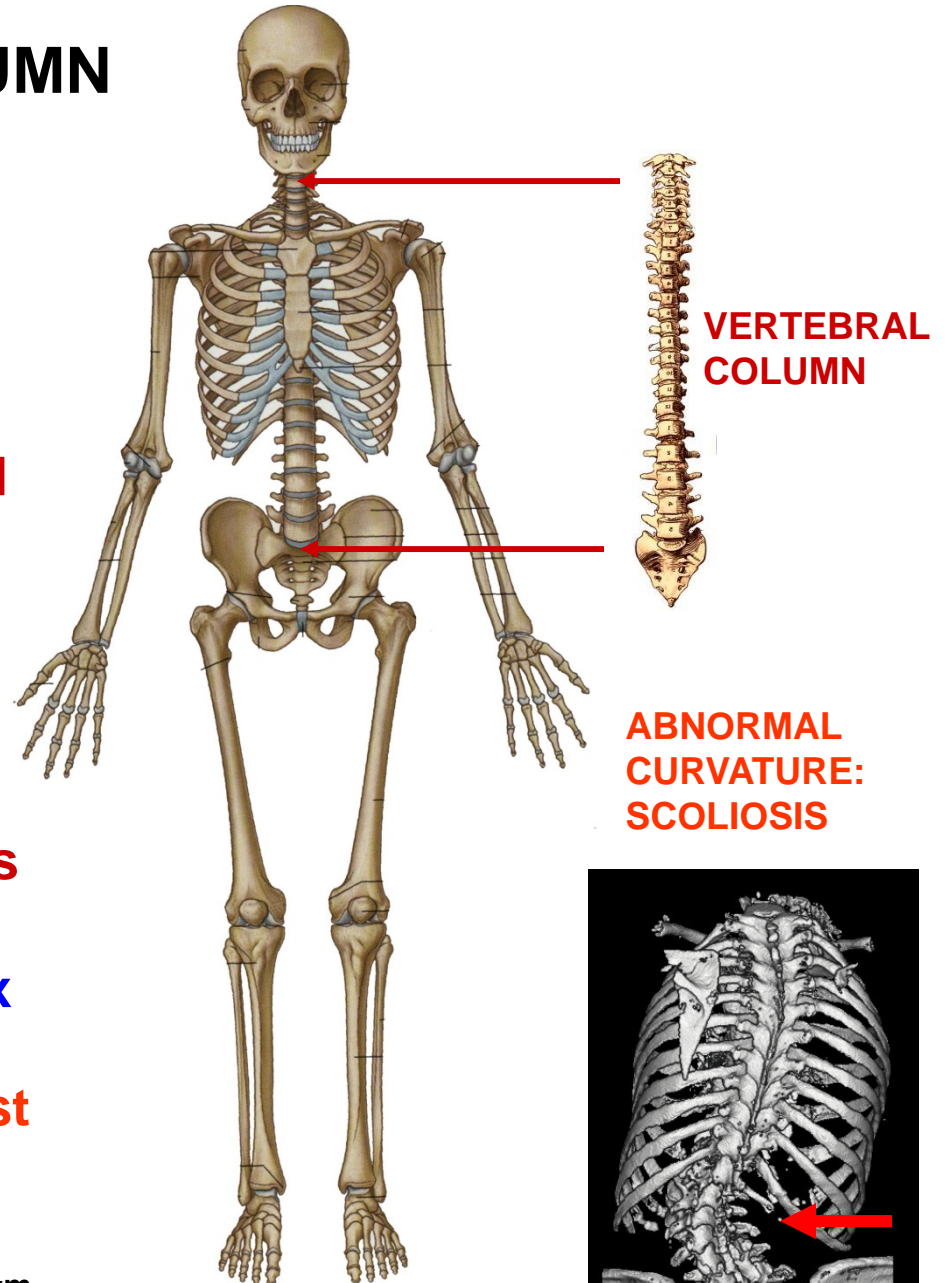
FUNCTIONS:

- 1) **Support weight** - transmits weight to pelvis and lower limbs
- 2) **Houses and protects spinal cord** - spinal nerves leave cord between vertebrae
- 3) **Permits movements** - *clinical problems
- 4) **Provides for muscle attachments** - muscles of back; also muscles of head, neck, upper extremity, thorax

***Back/spine problems** - second most common cause of disability (after arthritis)

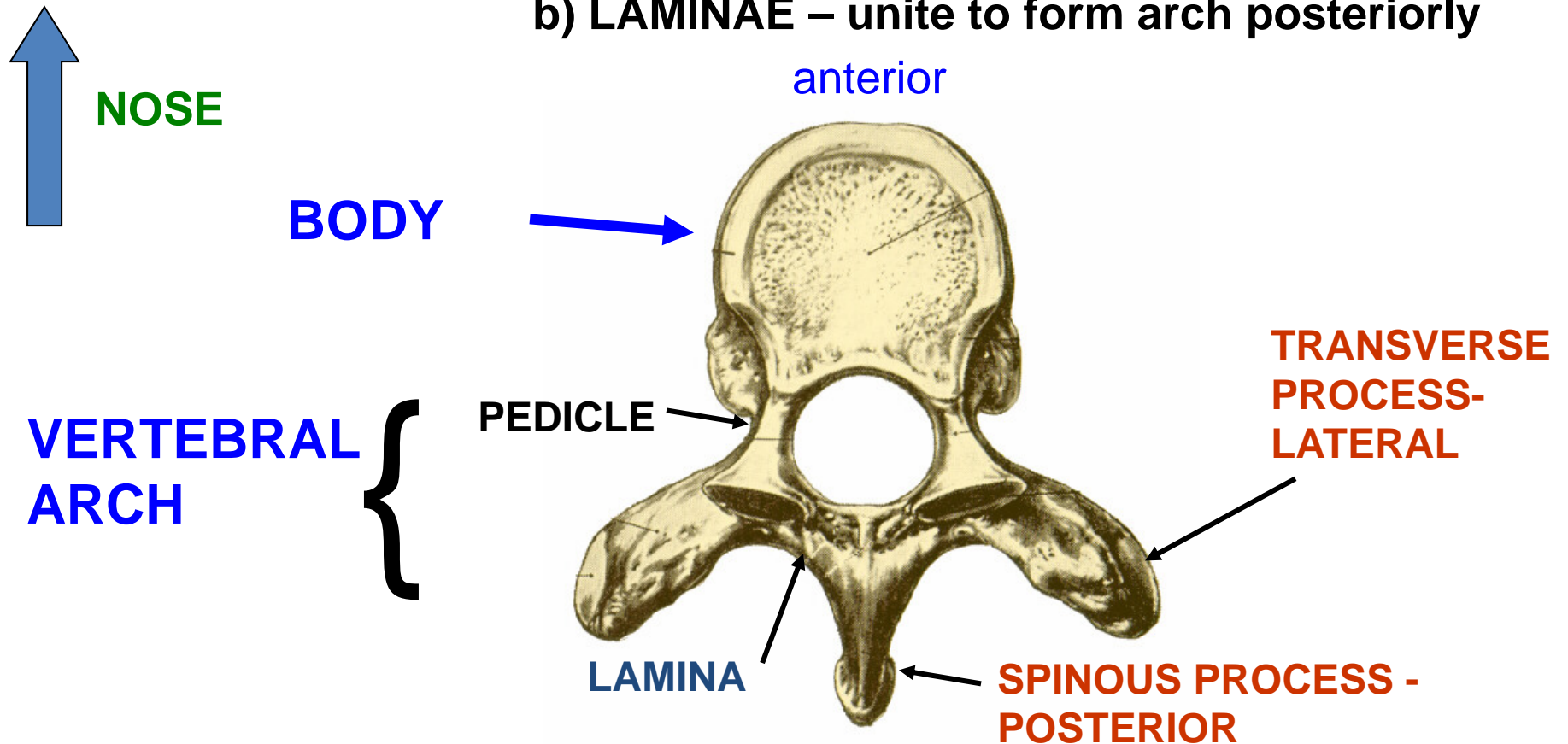
<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5816a2.htm>

CDC web site: <http://www.cdc.gov/>



A. TYPICAL VERTEBRA – by convention thoracic

1. BODY – anterior, solid transmits weight
2. VERTEBRAL ARCH – posterior, surrounds vertebral canal, spinal cord; consists of
 - a) PEDICLES – project from body
 - b) LAMINAE – unite to form arch posteriorly



3. TRANSVERSE AND SPINOUS PROCESSES - projections from arch for muscle, ligament attach

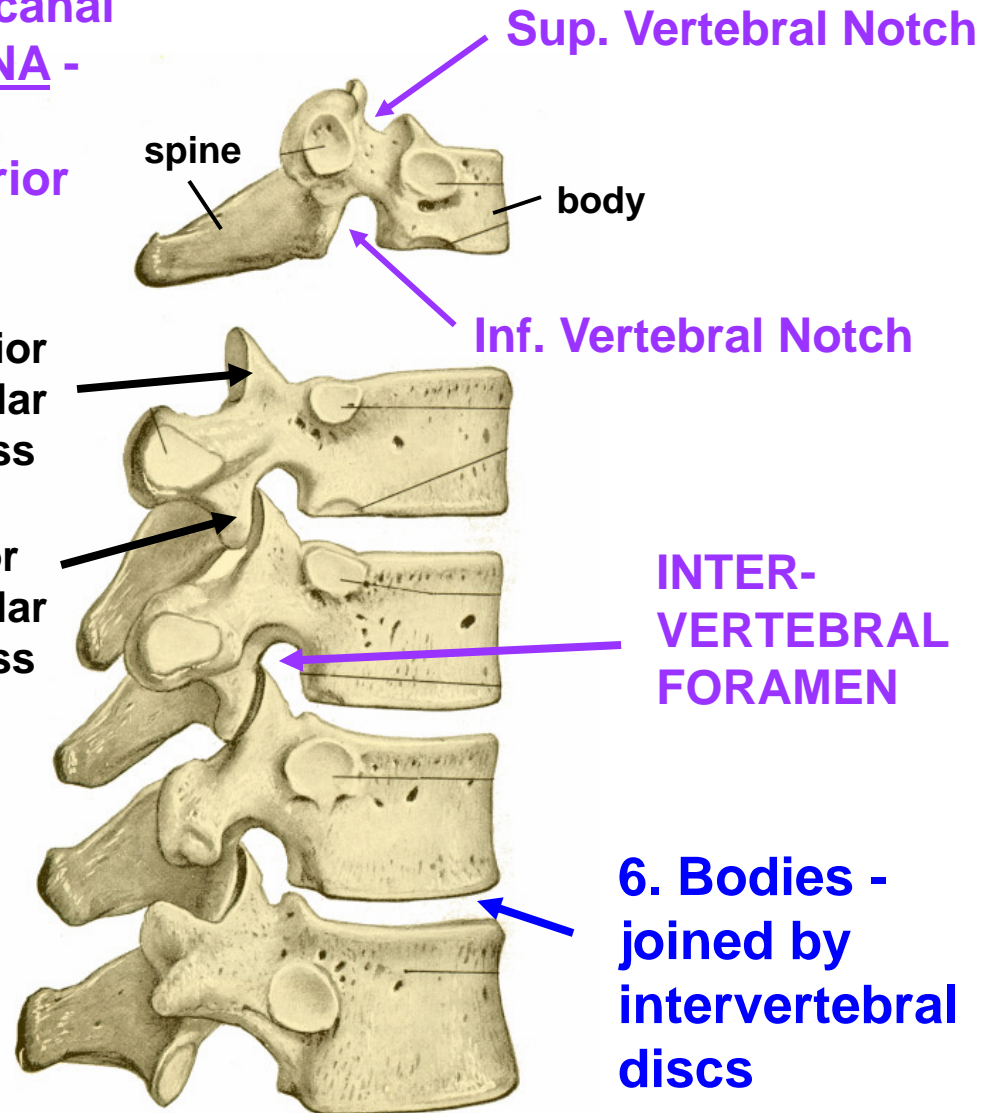
LATERAL VIEW OF VERTEBRAE

NOSE



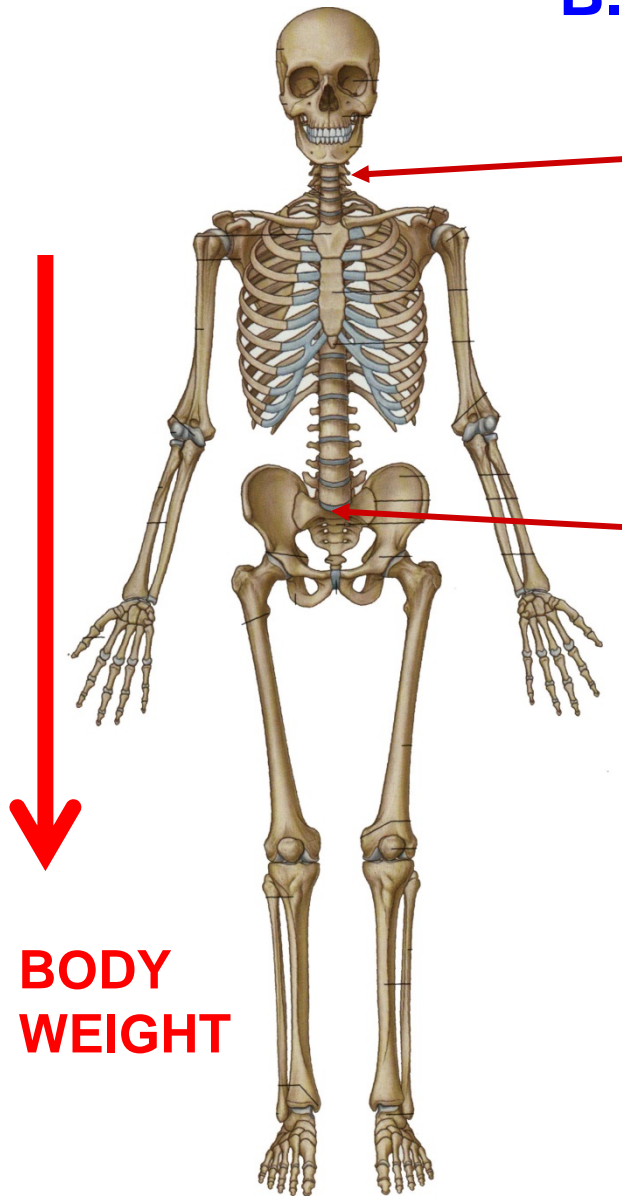
4. Spinal nerves leave vertebral canal via INTERVERTEBRAL FORAMINA - between pedicles of vertebrae; bordered by – Superior and Inferior Vertebral Notches

5. SUPERIOR AND INFERIOR ARTICULAR PROCESSES - Articular processes also called **Facets**; at junction between pedicles and laminae; form joints between adjacent vertebrae; orientation of facets determine types of movements that occur between vertebrae



6. Bodies - joined by intervertebral discs

B. REGIONS OF VERTEBRAL COLUMN



- 
- Cervical (neck) - 7 vertebrae (C1-C7)
 - Thoracic (chest) - 12 vertebrae (T1-T12)
 - Lumbar (lower back) - 5 vertebrae (L1-L5)
 - Sacral (pelvis) - 5 fused vertebrae (S1-S5)
 - Coccygeal (tail) - 3 - 5 vertebrae (Co1-Co3)

- Structure of vertebrae differ in different regions
- Some cervical vertebrae are uniquely identifiable (ex. C1, C2 and C7)

Important Note: Nomenclature short hand: C6 means the sixth cervical vertebra

CERVICAL VERTEBRA



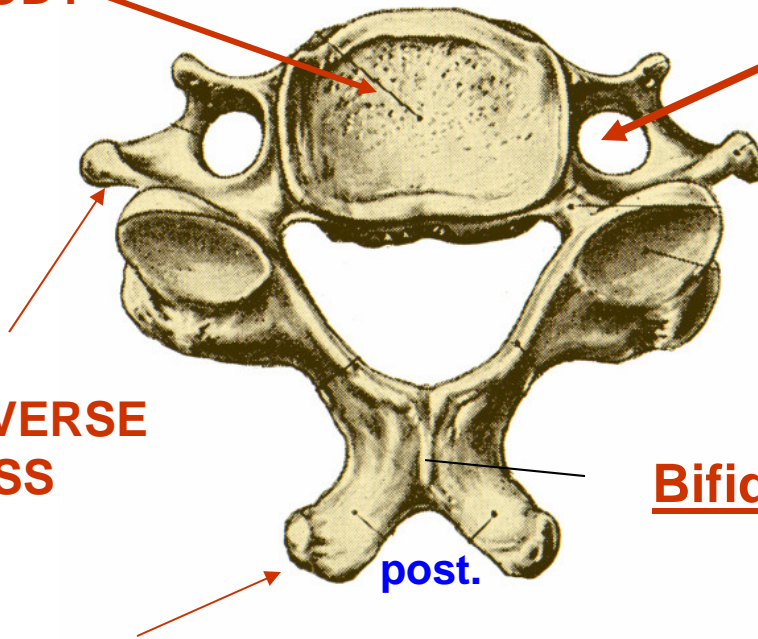
NOSE

BODY

ant.

- body is small

Foramen Transversarium - hole in transverse process (C1-C7) for Vertebral artery and veins



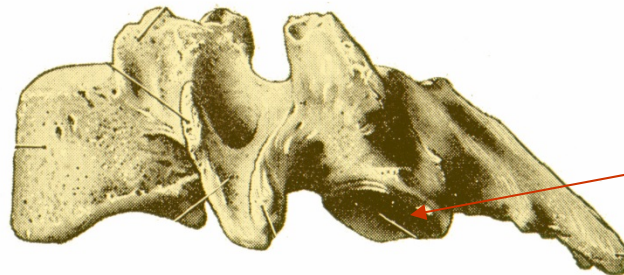
TRANSVERSE PROCESS

Bifid (divided) Spinous Process

post.

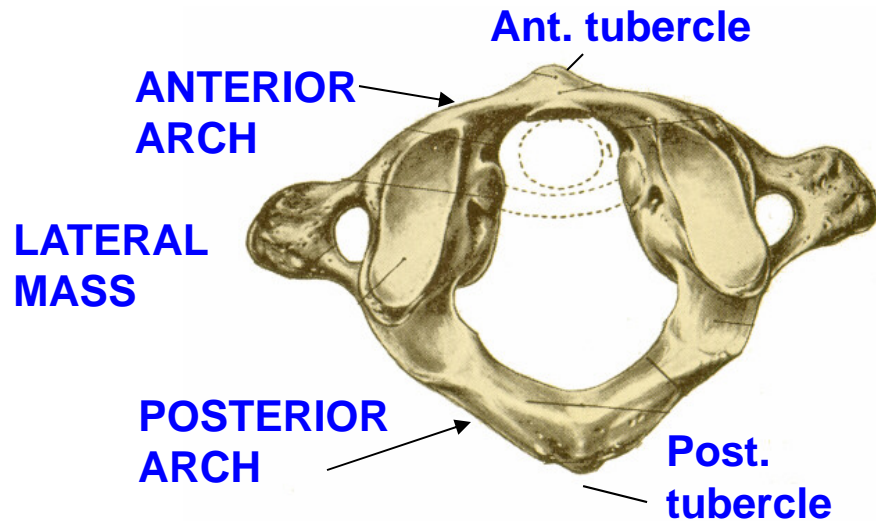
SPINOUS PROCESS – Bifid (divided) for Ligamentum nuchae

lat.
view



ARTICULAR FACETS - angled superiorly and medially
- considerable freedom of movement

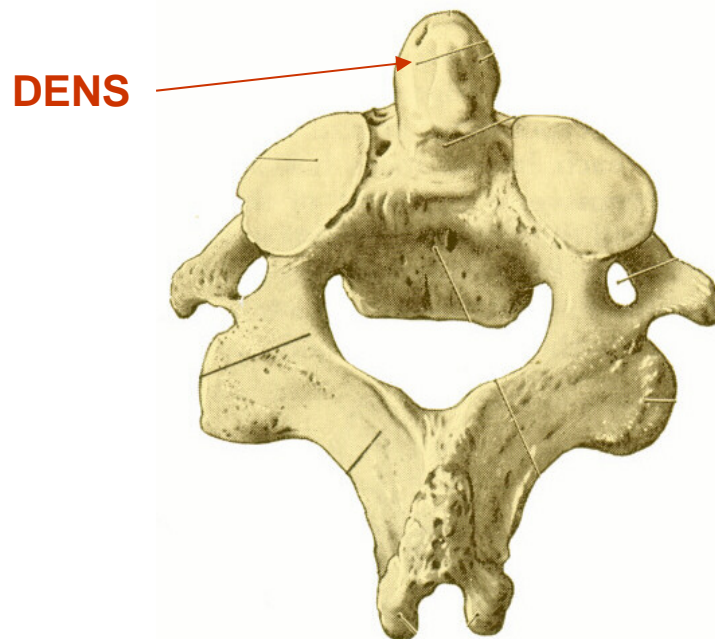
FIRST CERVICAL VERTEBRA = C1 (ATLAS)



- 1) has no body only ring of bone
- 2) Anterior and Posterior Arches and Lateral mass
- 3) bumps on arches - Ant. and Post. Tubercles
- 4) has Foramina Transversaria
- 5) superior articular facets to occipital bone of skull; permits Flex-Ext 'yes' movement of head



SECOND CERVICAL VERTEBRA = C2 (AXIS)

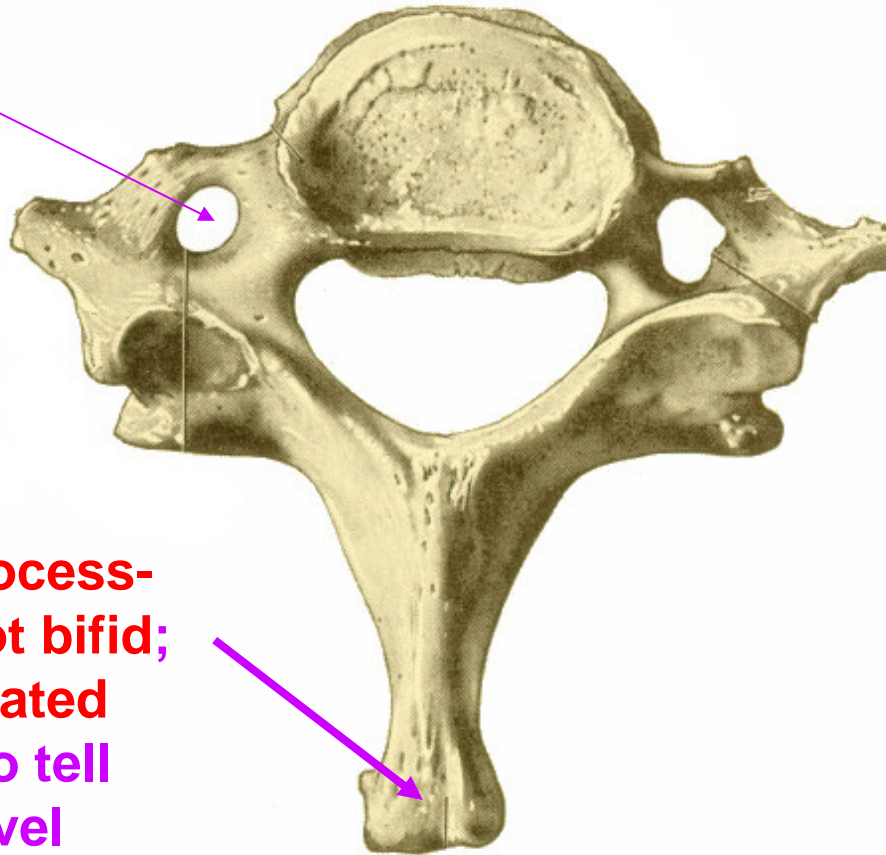


- 1) has peg-like Odontoid process = Dens (may be fused body of C1)
- 2) joint between C1-C2 is pivot joint allowing rotation; Rotation = 'no' movement of head; joint is important in hanging



SEVENTH CERVICAL VERTEBRA = C7 (VERTEBRA PROMINENS)

Small Foramina Transversaria -
transmit only Vertebral Veins
(Vert. Artery passes through C1-
C6)



Spinous process-
long and not bifid;
can be palpated
externally to tell
vertebral level

Clinical Note: The long spinous process of the seventh cervical vertebra (**C7**, Vertebra prominens) is **palpable** can be used to identify the level of injury (ex. physical examination for disc herniation after minor car accidents)

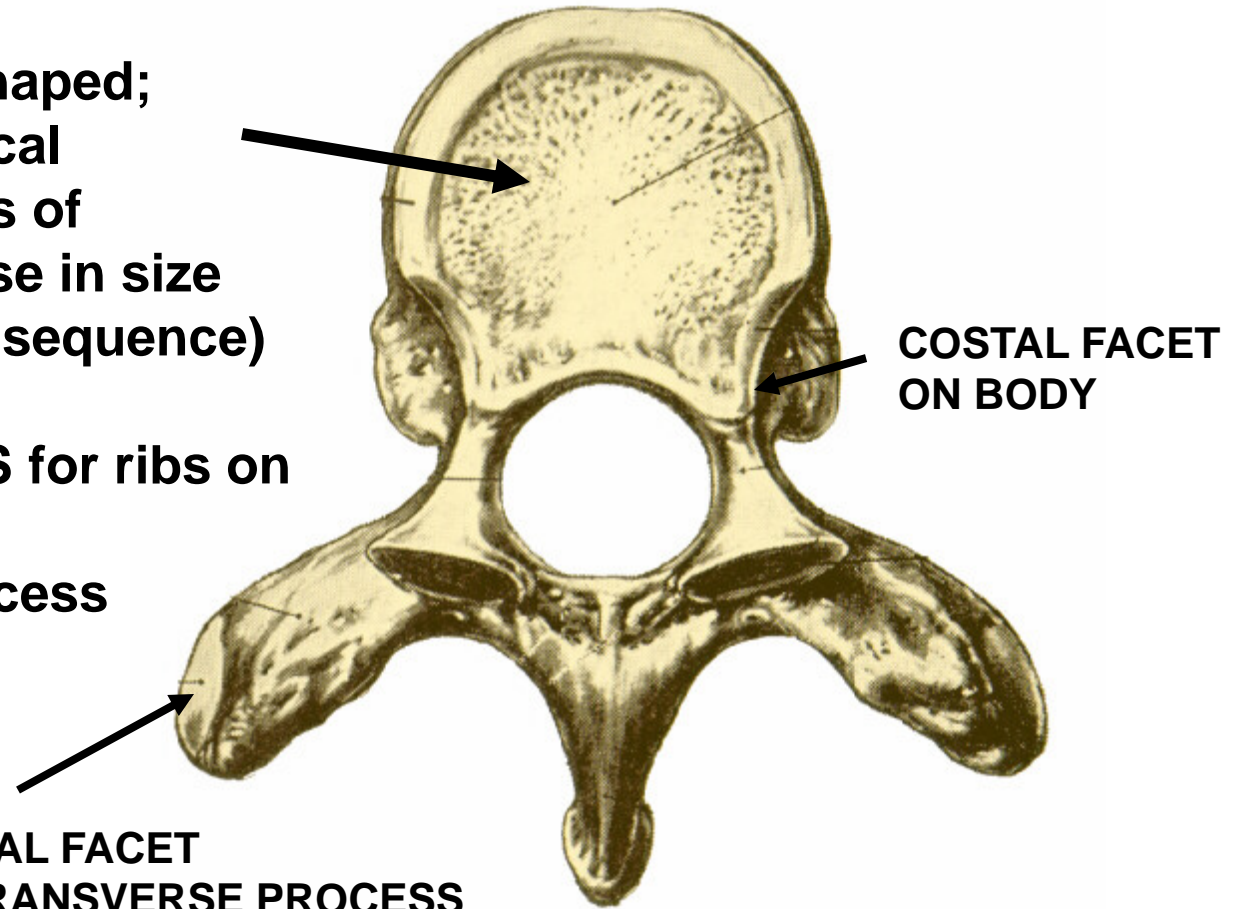
THORACIC VERTEBRA (12)

BODY – heart-shaped;
larger than cervical
vertebrae (bodies of
vertebrae increase in size
in rostral-caudal sequence)

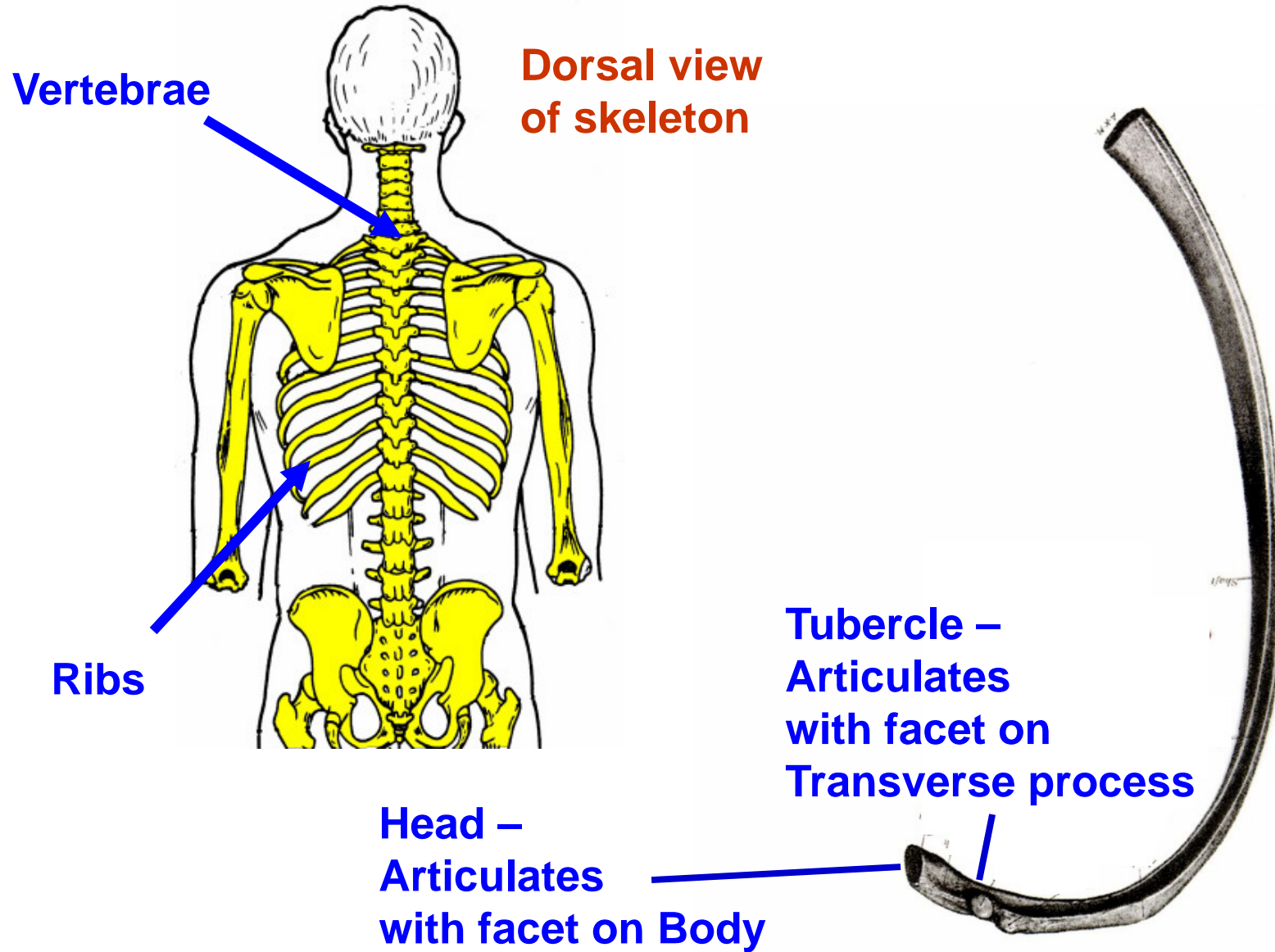
COSTAL FACETS for ribs on

- body
- transverse process

**COSTAL FACET
ON TRANSVERSE PROCESS**

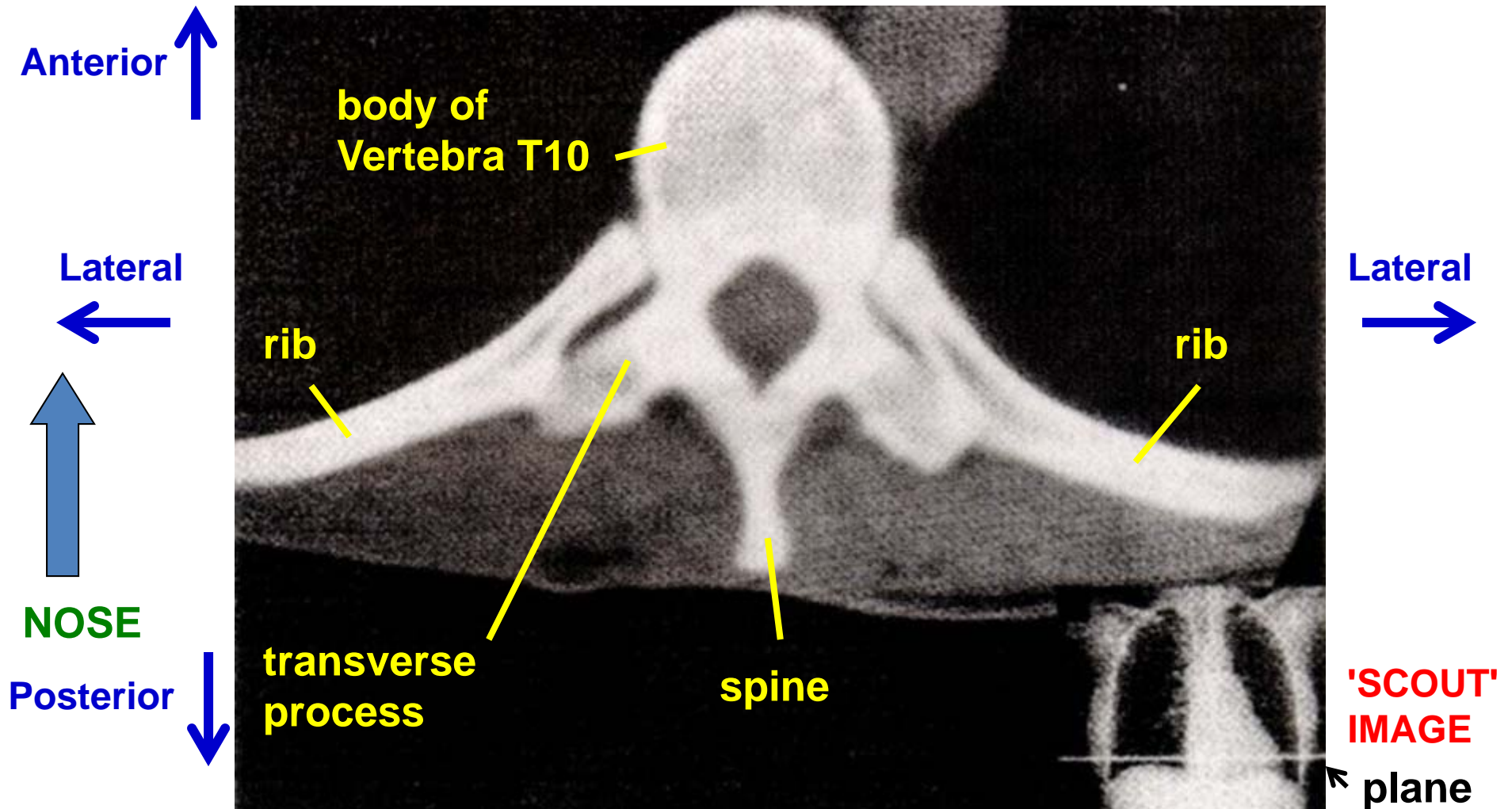


RIBS- have bumps for articulation with vertebra



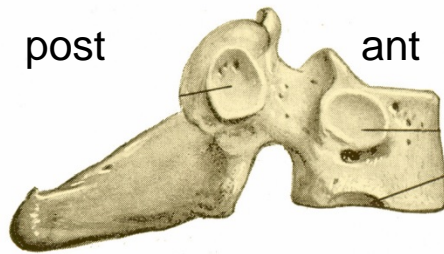
CT OF THORACIC VERTEBRA

Note: CT and X rays: bone and metal white, air black; soft tissues grey



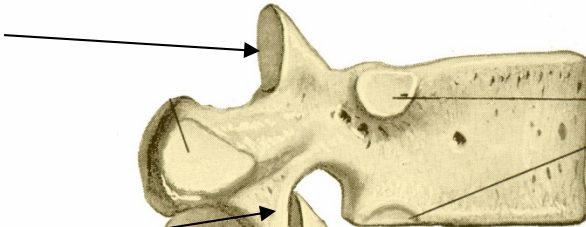
QUESTION: LOOK AT THE ORIENTING ARROWS. GIVEN THE ORIENTATION, IN WHAT ANATOMICAL PLANE WAS THE SECTION TAKEN? **HORIZONTAL**. IN WHICH DIRECTION WOULD THE PATIENT'S NOSE BE POINTING (EX. TOWARD BOTTOM OF IMAGE)? **TOP OF IMAGE**

LATERAL VIEW OF THORACIC VERTEBRA

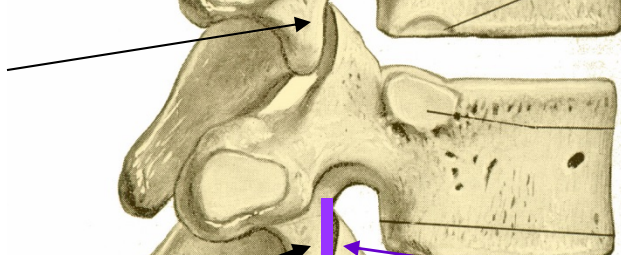


**3. Costal Facets for Ribs -
Body - Facets for Heads of rib
Transverse Process - Facets for
Tubercles of ribs**

**Superior
Articular
process**



**Inferior
Articular
process**



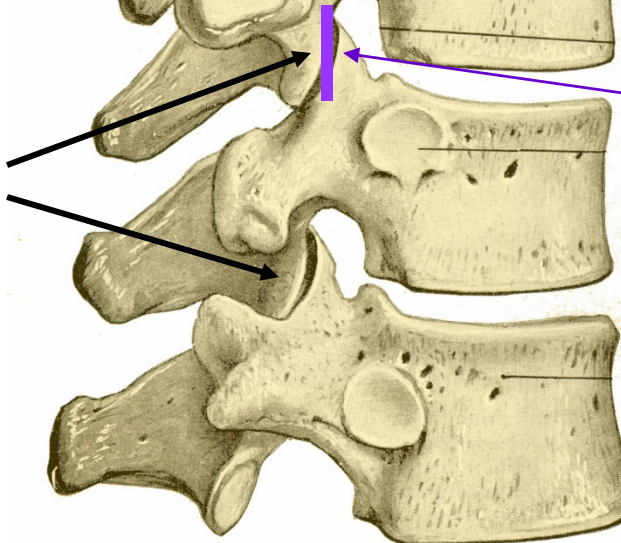
**4. Spines of thoracic vertebrae -
long and inclined posteriorly
and inferiorly**

**5. Articular Processes in
coronal plane**

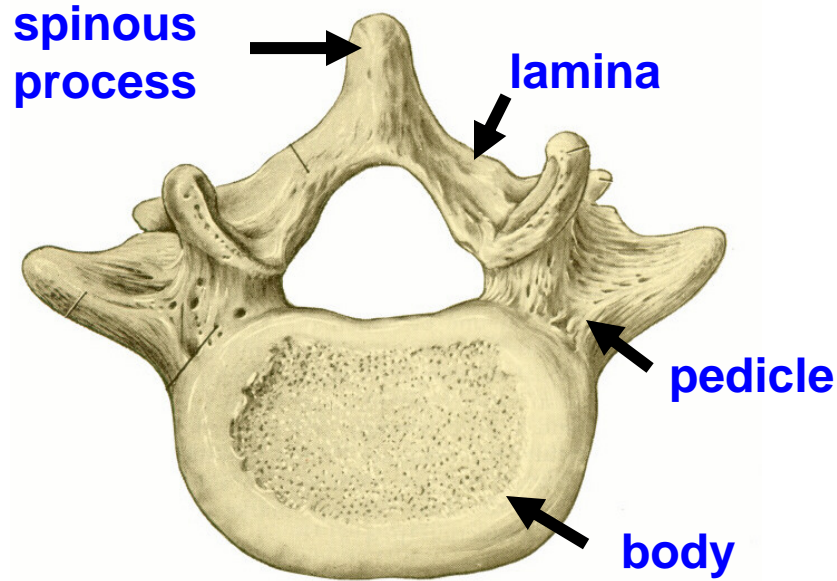
**Note: Bodies increase in
size from rostral to caudal
= superior to inferior**

**Spines
inclined**

Inf.



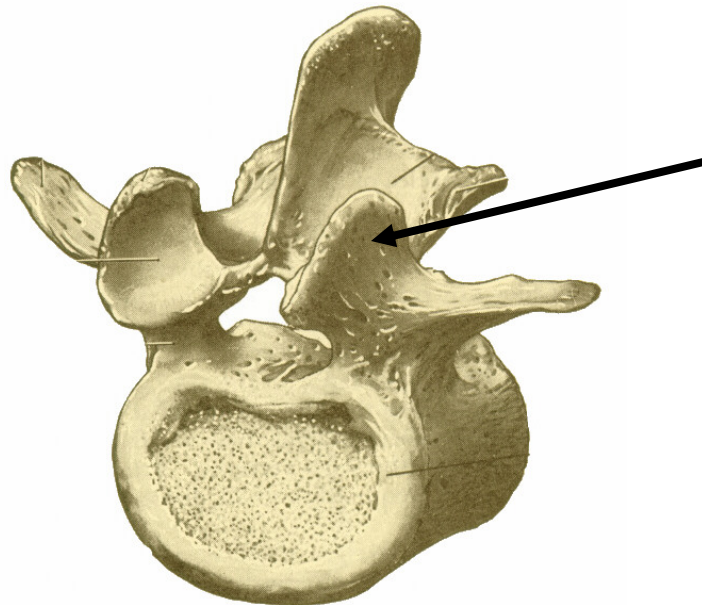
LUMBAR VERTEBRA



Bodies - hefty
Pedicles - stout
Lamina - thick
Spinous Processes - broad



NOSE



Articular processes in sagittal plane*

* - look at skeletons, models in lab