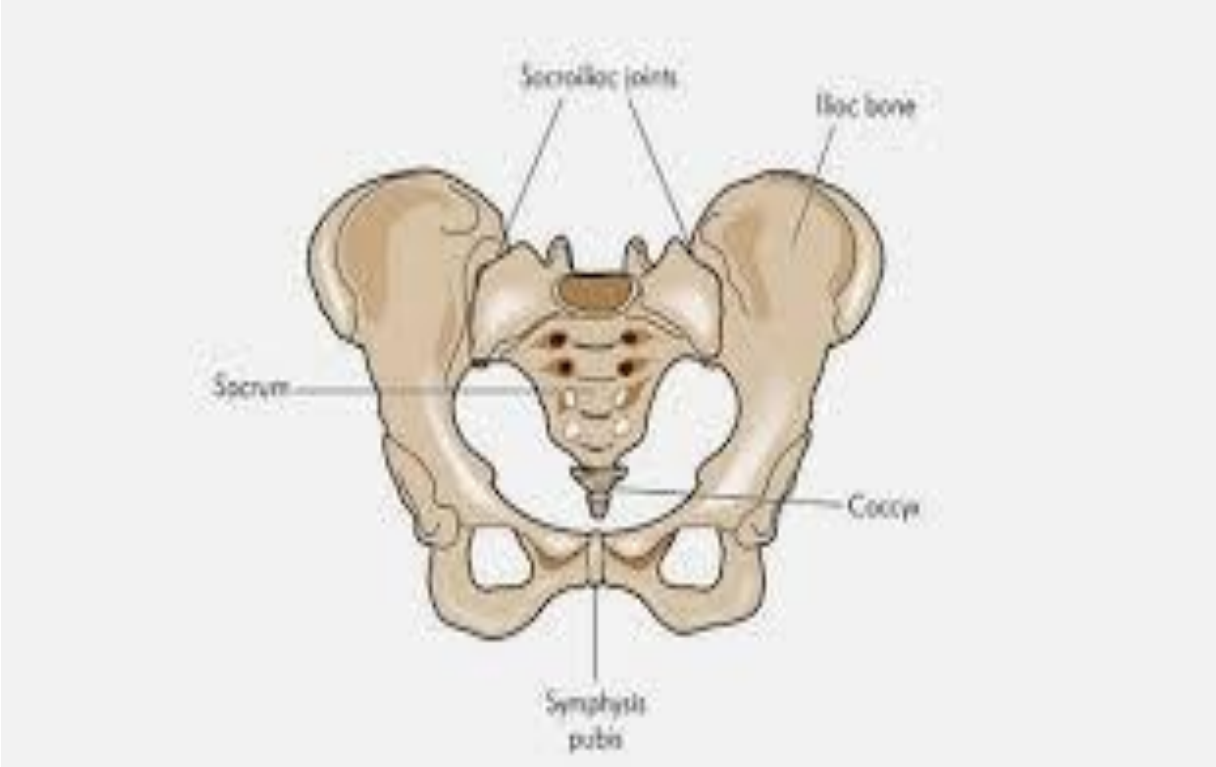
Renal Module

Second Year MBBS (SGD)

Sacrum & Pelvis

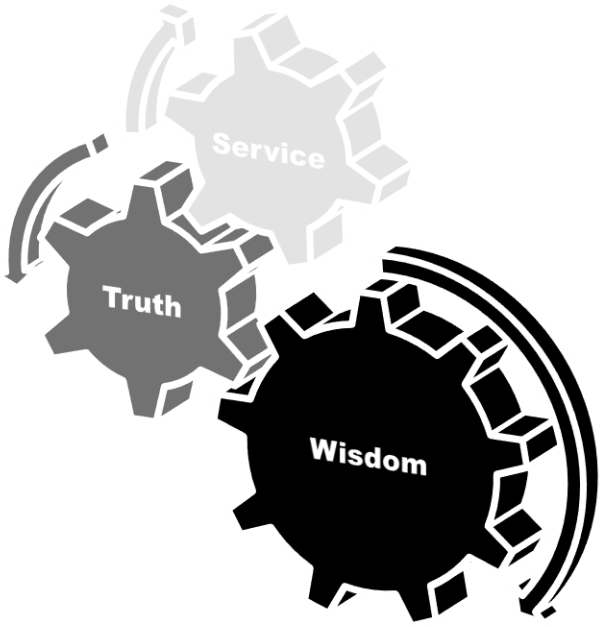


Dr.Sara Bano

Assistant Professor Anatomy

Date:-17-04-2025

Motto



Vision ;The Dream/Tomorrow

- To impart evidence based research oriented medical education
- To provide best possible patient care
- To inculcate the values of mutual respect and ethical practice of medicine

Prof. Umar's Model of Teaching Strategy

Self Directed Learning Assessment Program

Objectives :To cultivate critical thinking, analytical reasoning, and problem-solving competencies.

To instill a culture of self-directed learning, fostering lifelong learning habits and autonomy.

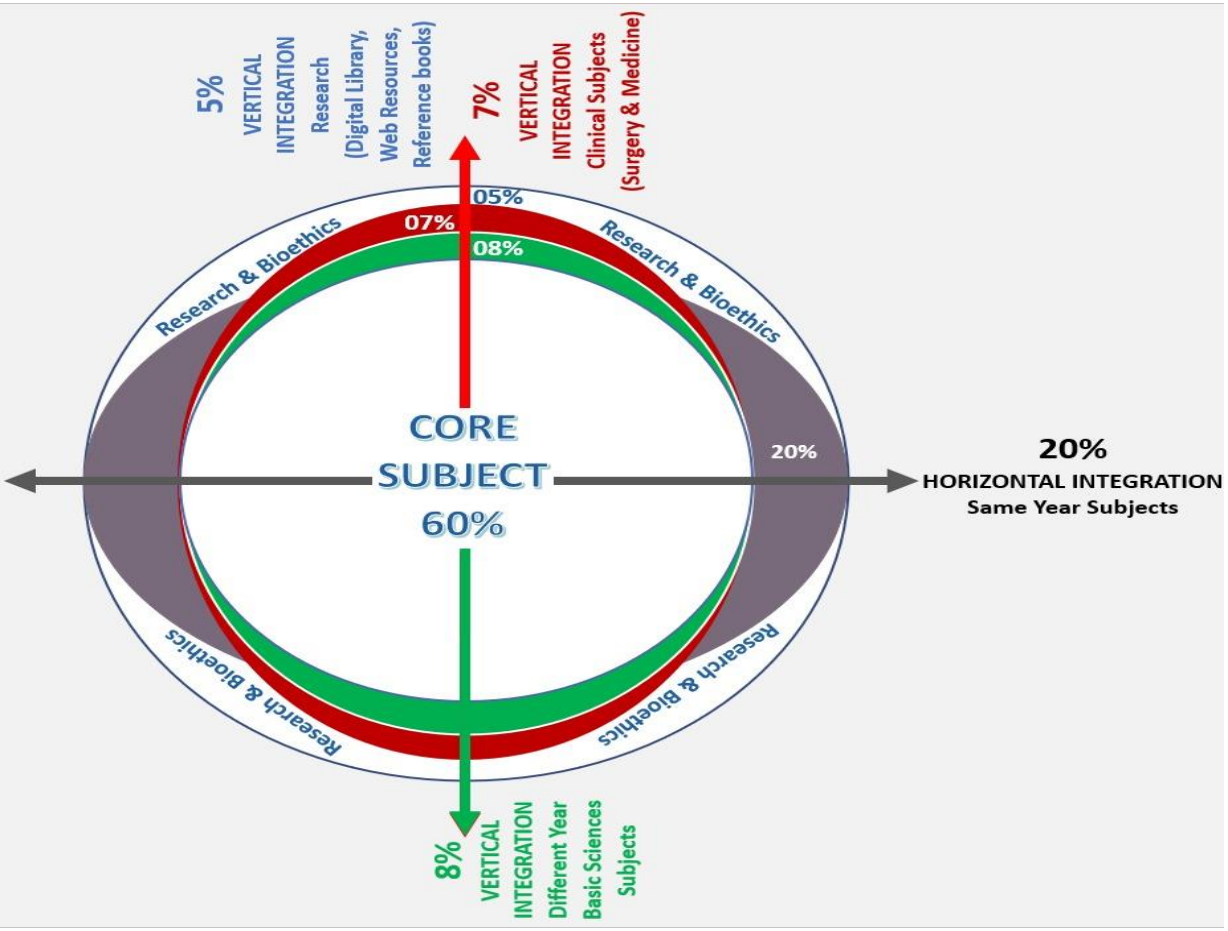
How to Assess?

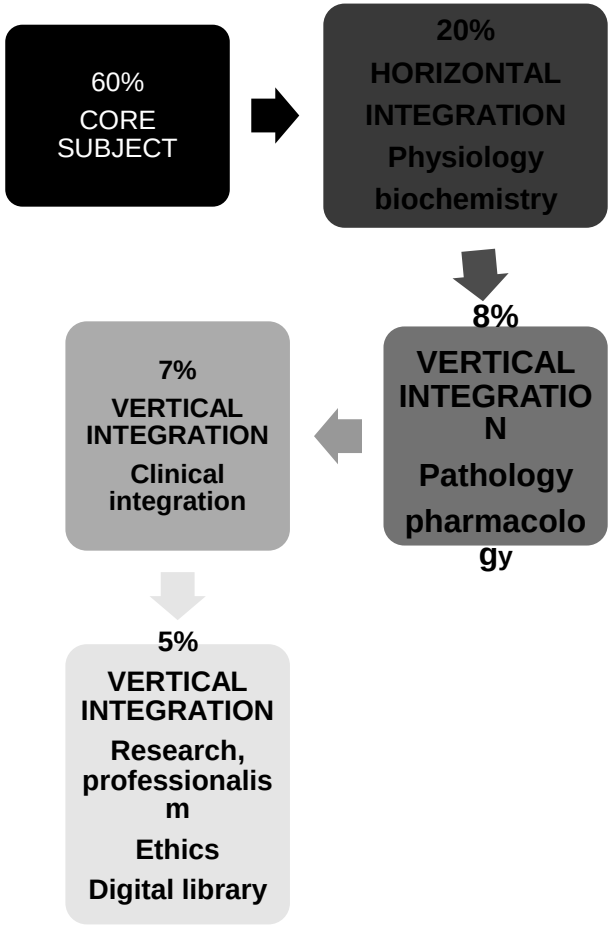
➢Ten randomly selected students will be evaluated within the first 10 minutes of the lecture through 10 multiple-choice questions (MCQs) based on the PowerPoint presentation shared on Students Official WhatsApp group, one day before the teaching session.

➢The number of MCQs from the components of the lecture will follow the guidelines outlined in the Prof. Umar model of Integrated Lecture.

Component of LGIS	Core Knowledge	Horizontal Integration	Vertical Integration	Spiral Integration
No. of MCQs	6-7	1-2	1	1

Professor Umar Model of Integrated Lecture

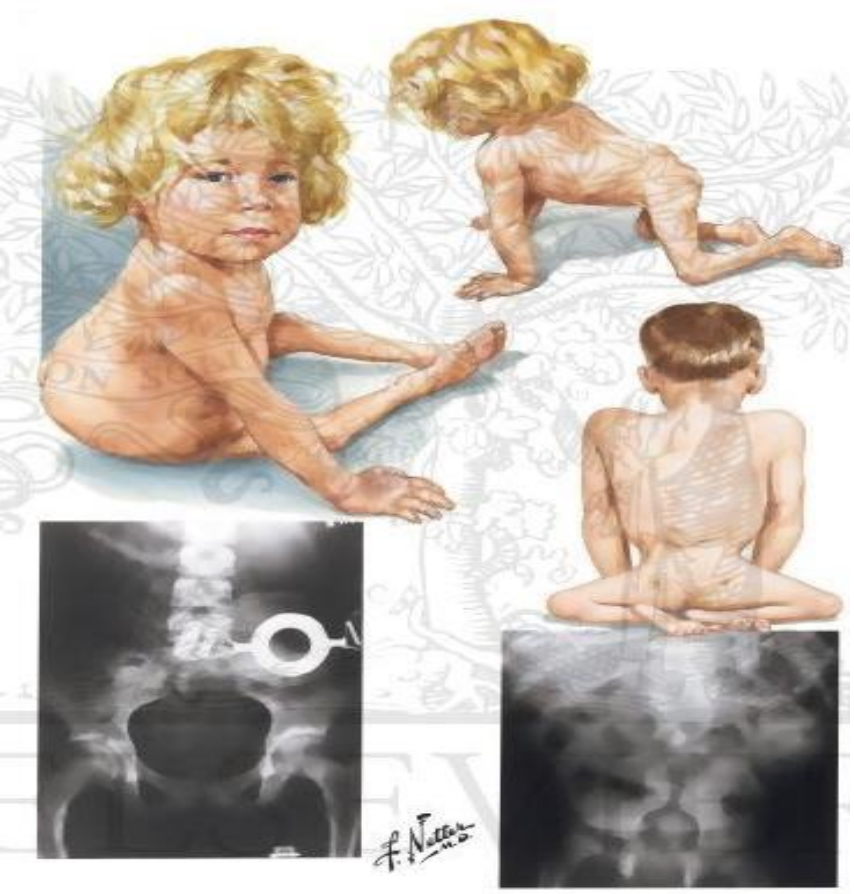


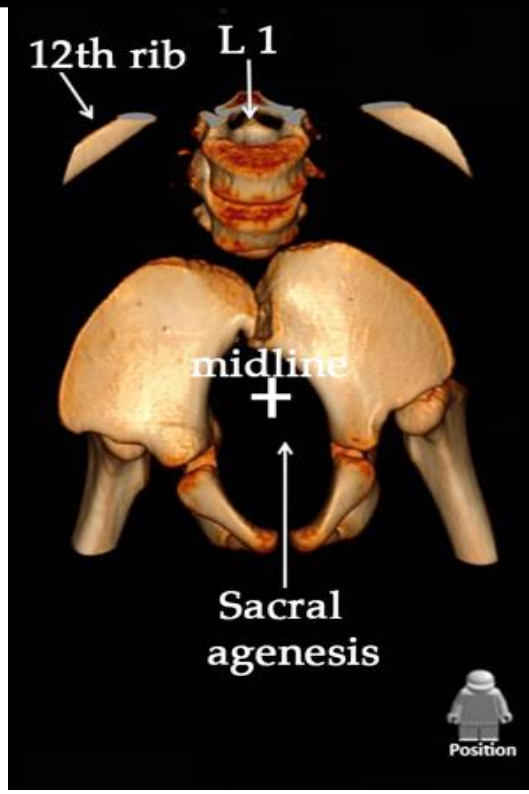


Learning objectives

- Identify the bone and place it in anatomical position
- Demonstrate it’s anatomical features and attachments with relations
- Discuss the related clinicals
- Identify different parts, types & diameters of pelvis
- Discuss the pelvic joints
- Describe the pelvic peritoneal disposition
- Discuss the clinical significance of pelvic diameters
- Correlate Physiology and Biochemistry (Horizontal Integration)
- Correlate clinical aspects / clinical conditions (Vertical integration)
- Able to focus on provision of curative and preventive health care measures
- Practice principles of Bioethics with professionalism/ communication skills
- Apply strategic use of AI in health care
- Able to read relevant research article
- Know how to use HEC Digital Library

INTERACTIVE SESSION





Caudal regression syndrome (CRS) / Sacral agenesis is a condition that affects how the fetus develops in the uterus. In it the sacrum, the lowest part of the spine, doesn't form normally or at all. It can affect a child's:

Lower back.
Legs.
Urinary tract.
Gastrointestinal tract.
Genitals.

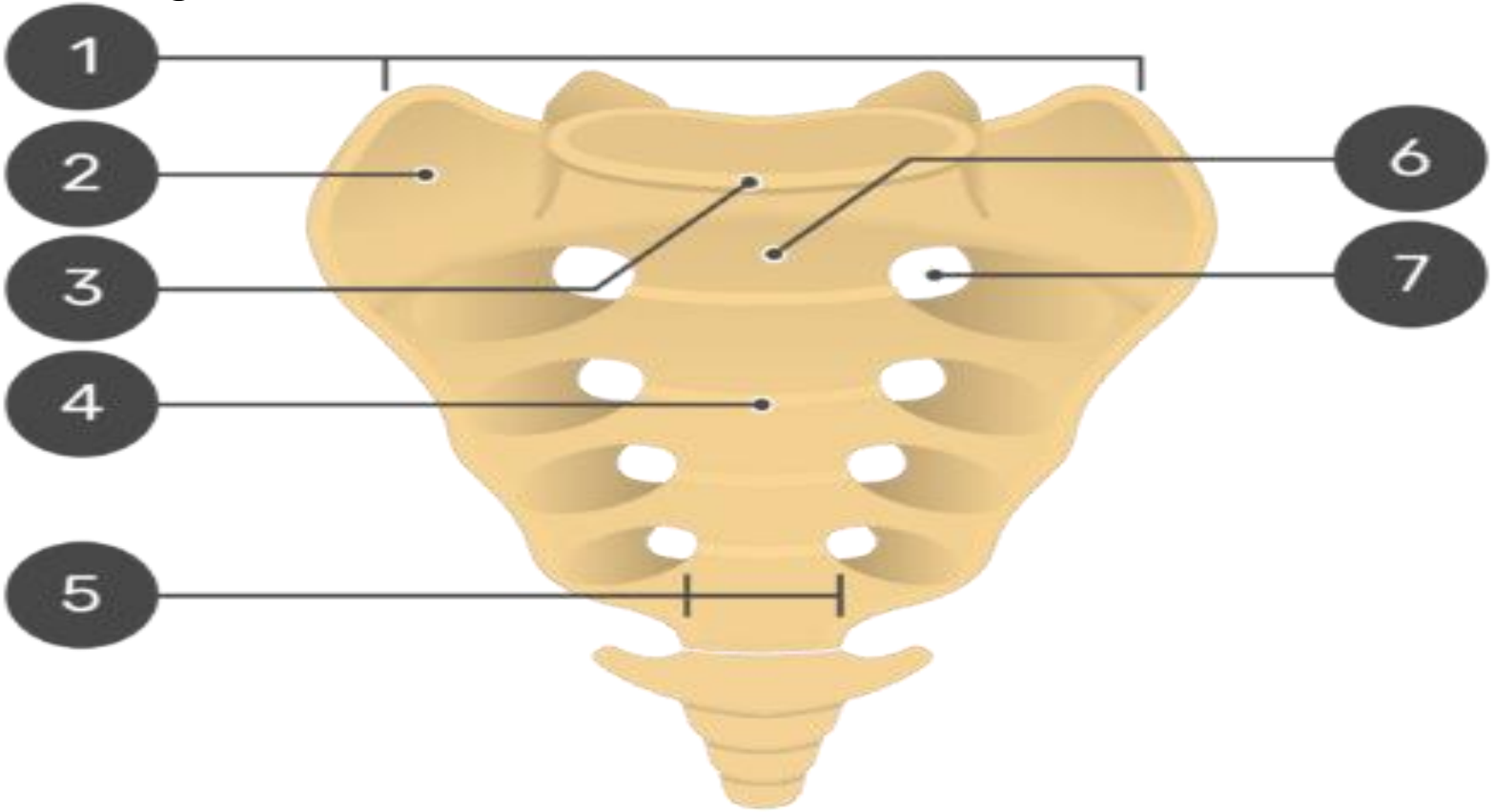
Sacrum

- Triangular bone
- Formed by the union of 5 sacral vertebrae
- Indicated as a S1-S5.
- The fusion of the sacral vertebrae begins ages 16-18 and its usually completed by age 30.
- The sacrum serves as a strong foundation for the pelvic girdle.
- It is positioned at the posterior portion of the pelvic cavity medial to the hip bone.

Cont….

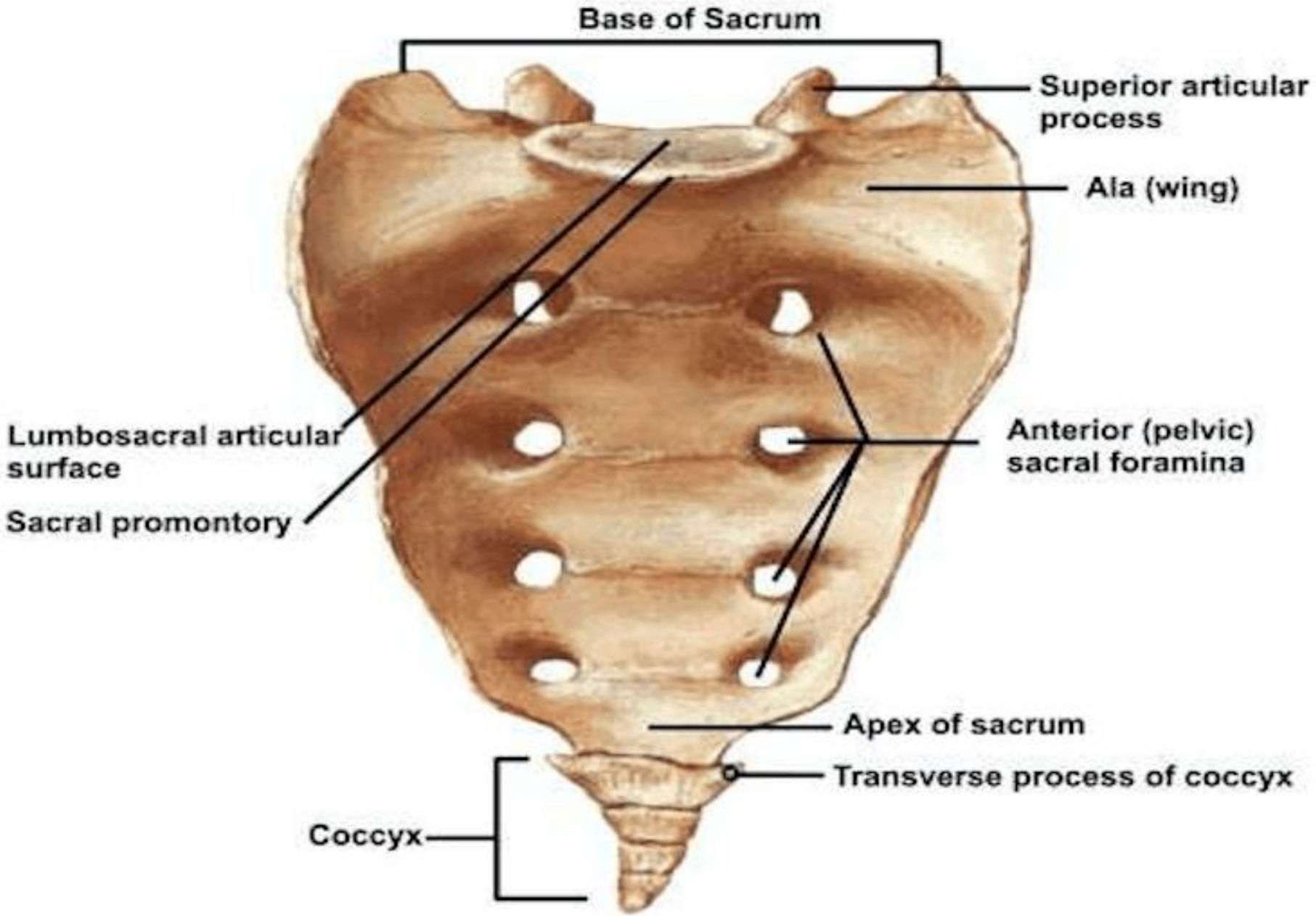
- Female sacrum are shorter, wider and more curved between S2 and S3 than a male sacrum.
- The concave anterior side of the sacrum faces the pelvic cavity.
- Its smooth and contains four transverse lines (ridges) that mark the joining of the sacral vertebral bodies.
- At the end of these lines are four pairs of anterior sacral foramina.

Core Knowledge



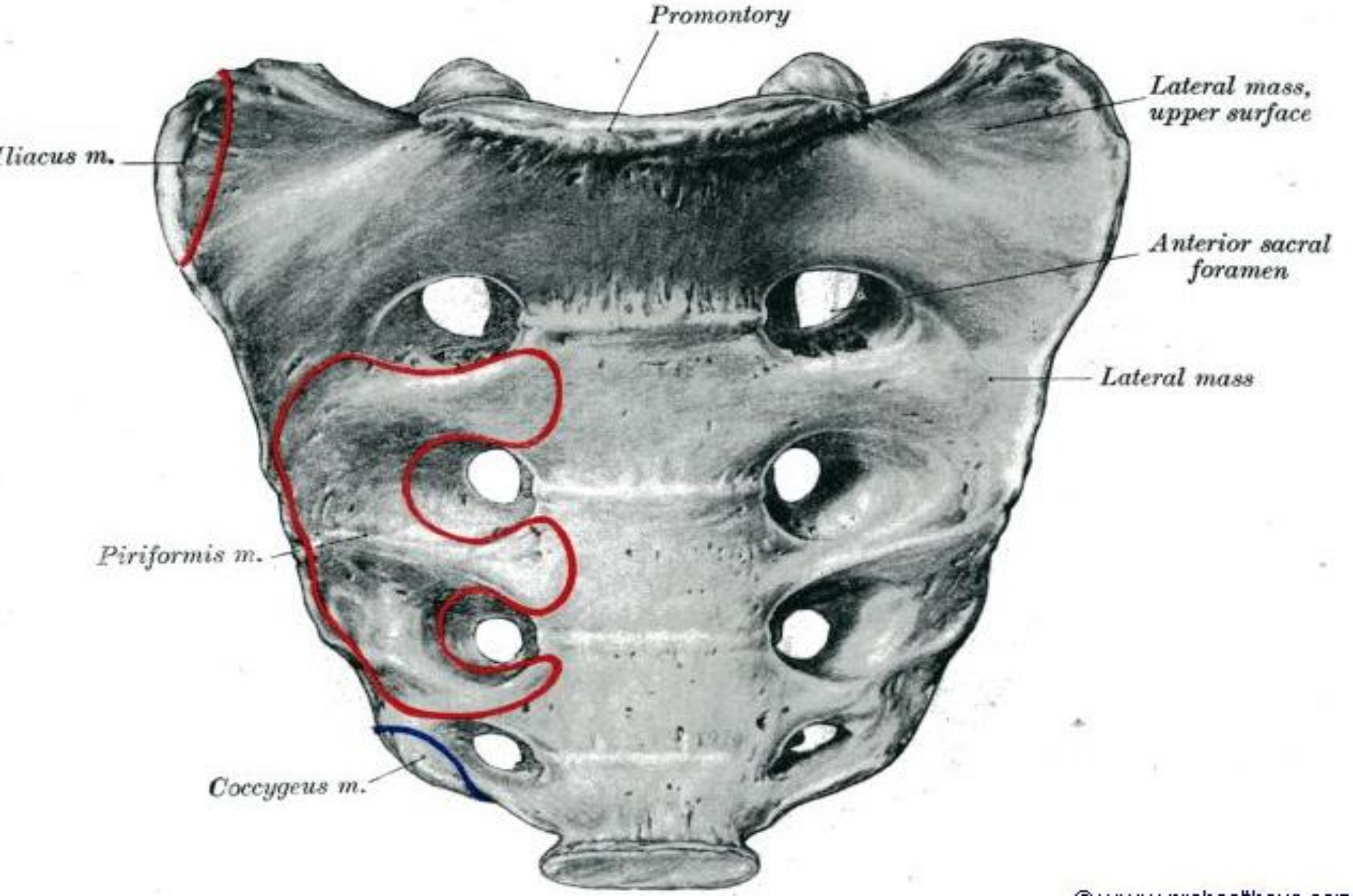
1. Base
2. Sacral ala
3. Sacral promontory
4. Transverse line
5. Apex
6. Body of vertebra
7. Anterior sacral foramen

Core Knowledge

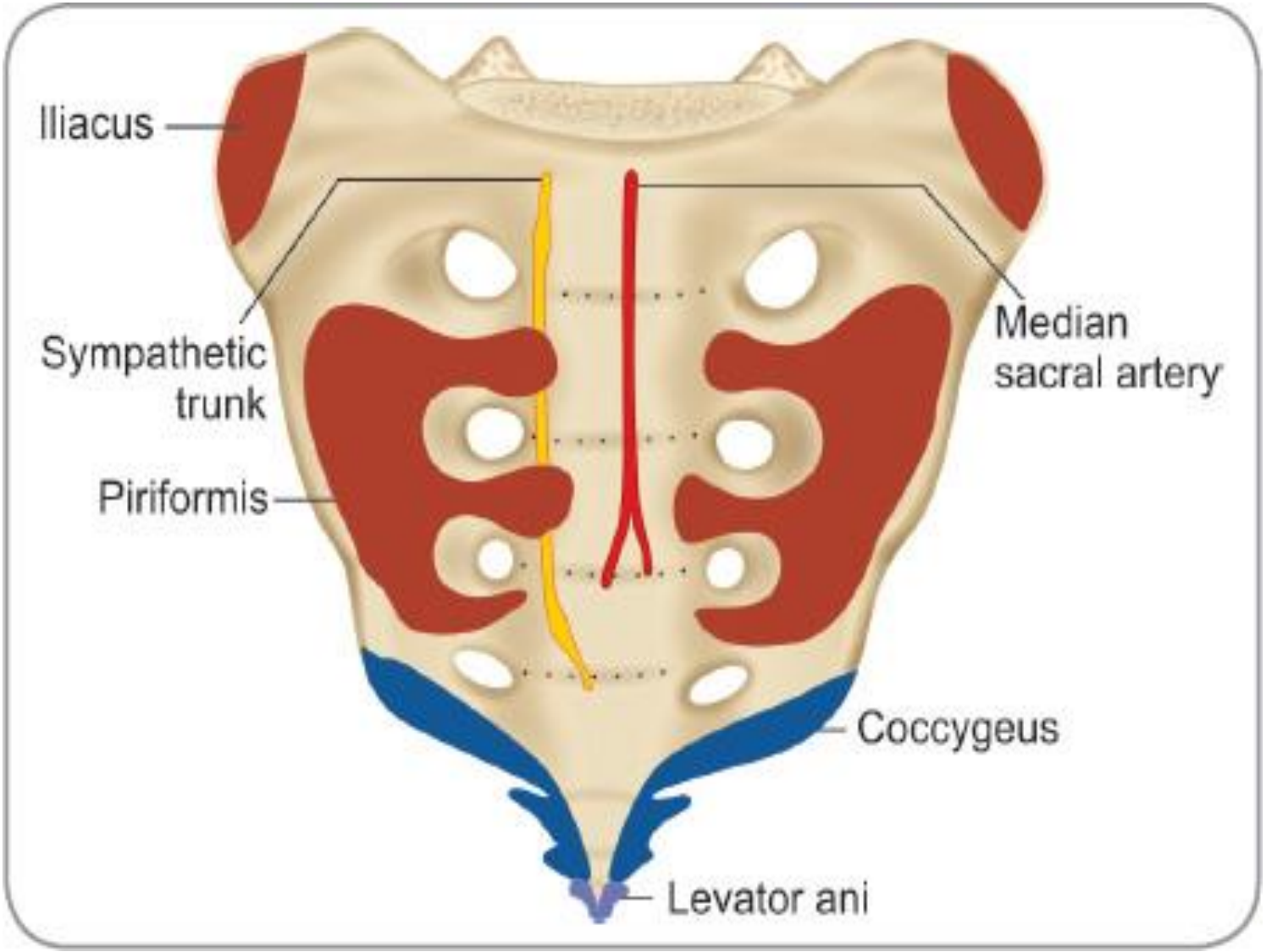


Core Knowledge

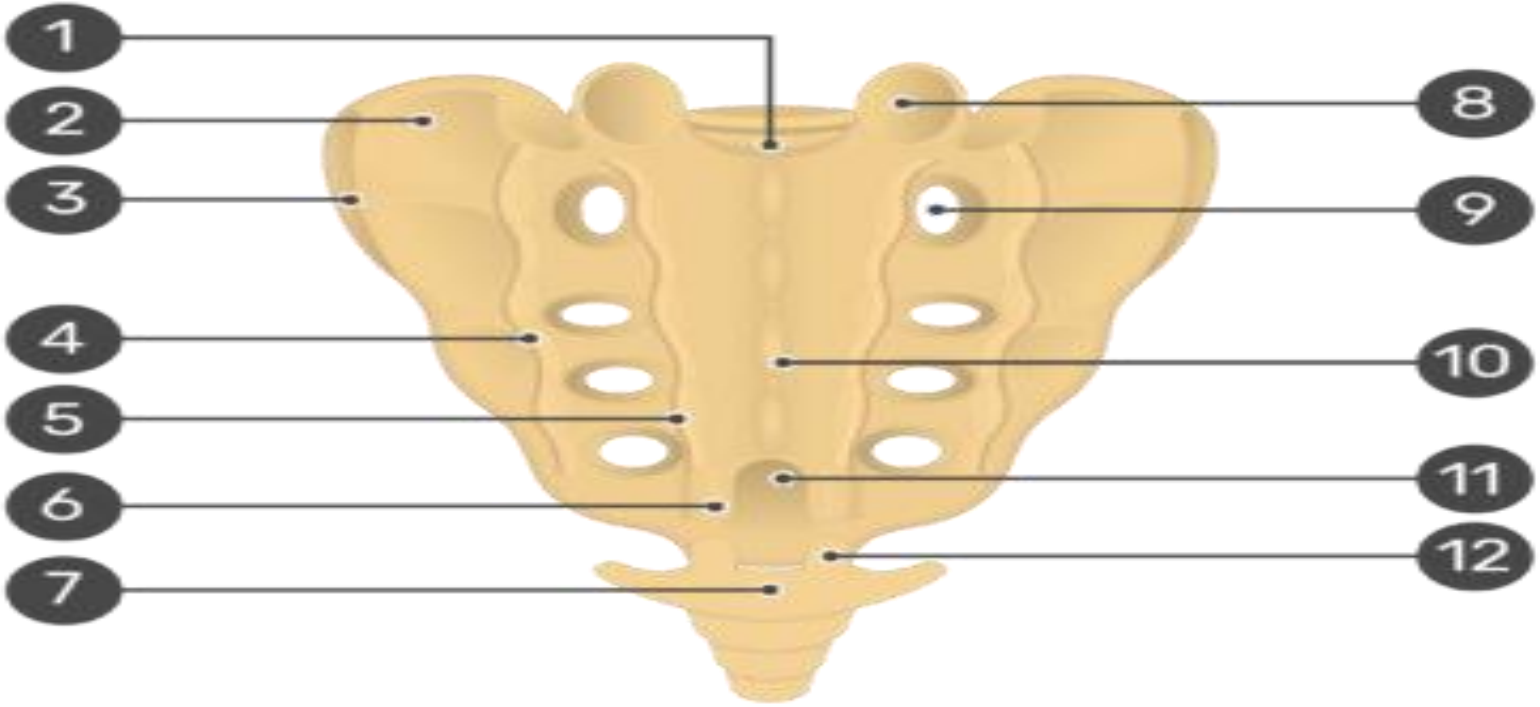
FIG. 279.—The sacrum. Pelvic surface.



Core Knowledge

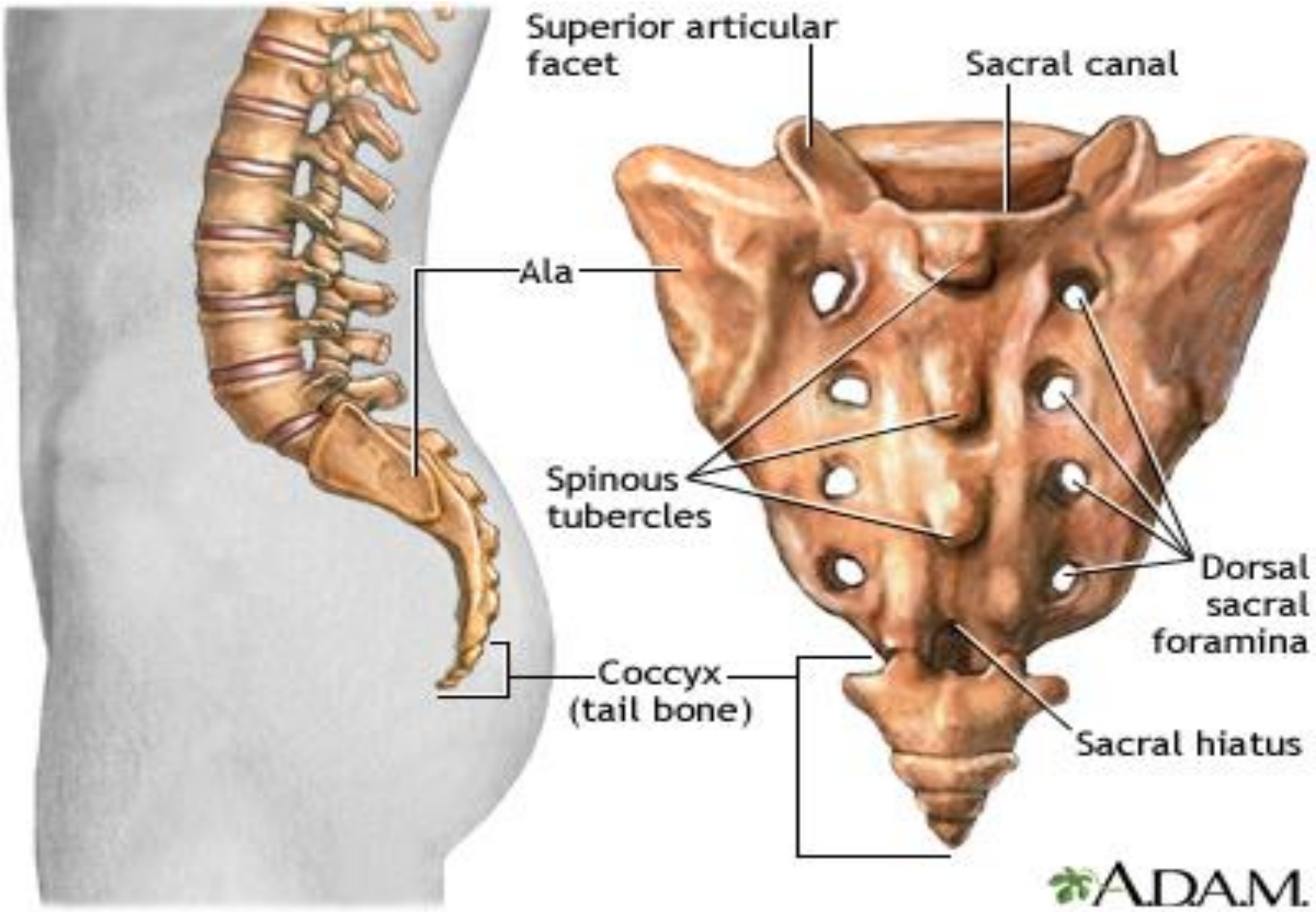


Core Knowledge

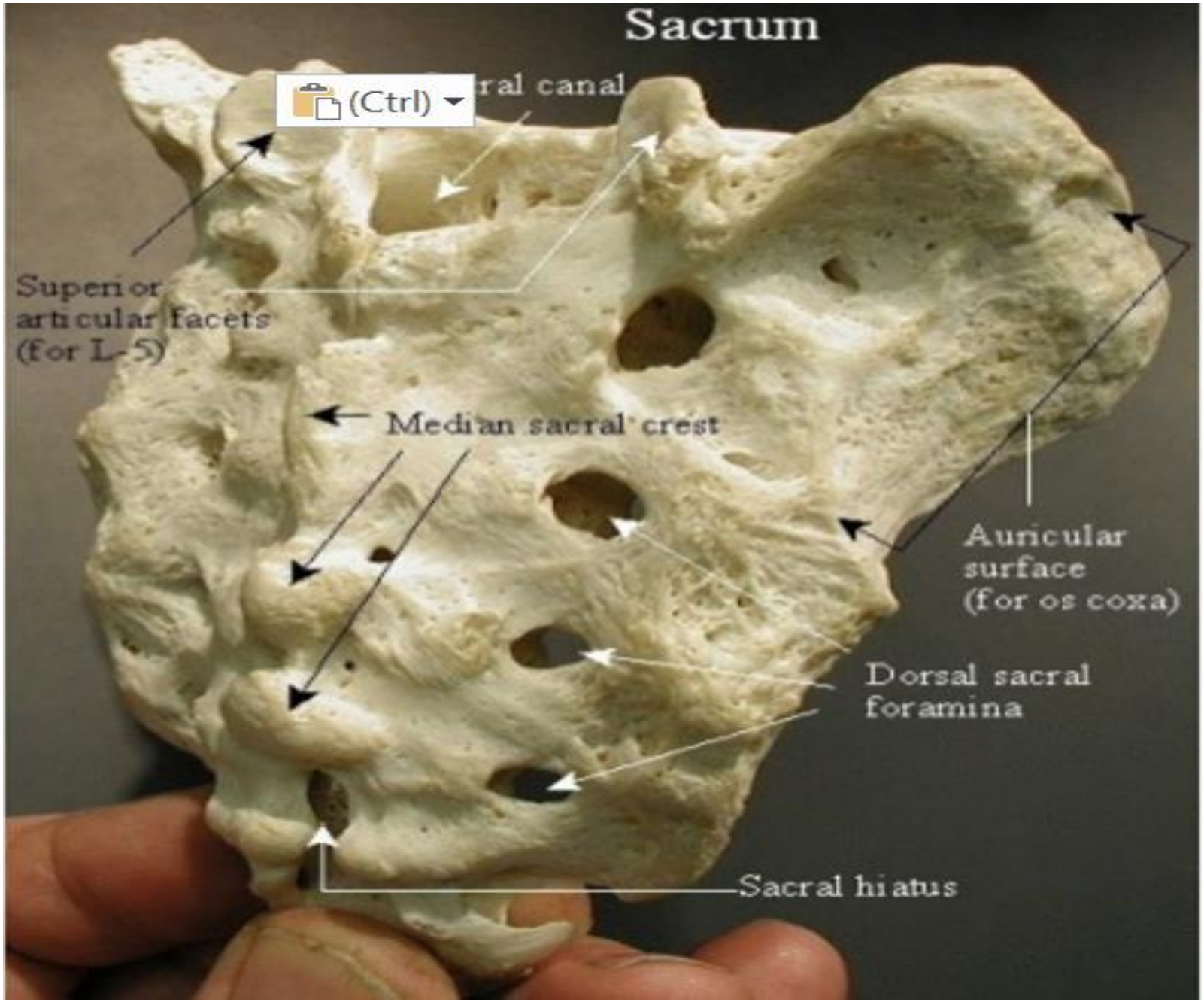


1. Sacral canal
2. Sacral tuberosity
3. Auricular surface
4. Lateral sacral crest
5. Intermediate sacral crest
6. Sacral cornu
7. First coccygeal vertebra
8. Superior articular process
9. Posterior sacral foramen
10. Median sacral crest
11. Sacral hiatus
12. Coccygeal cornu

Core Knowledge

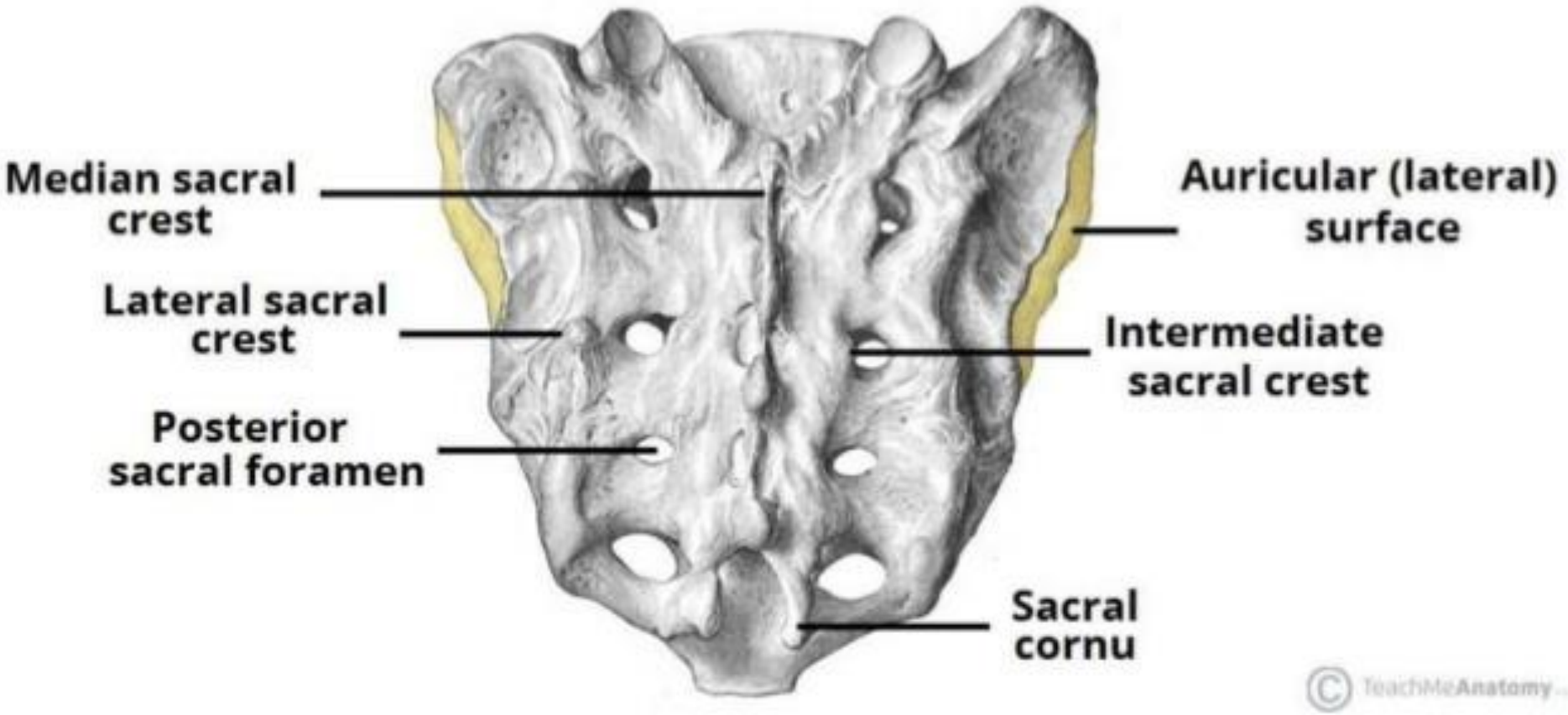


Core Knowledge



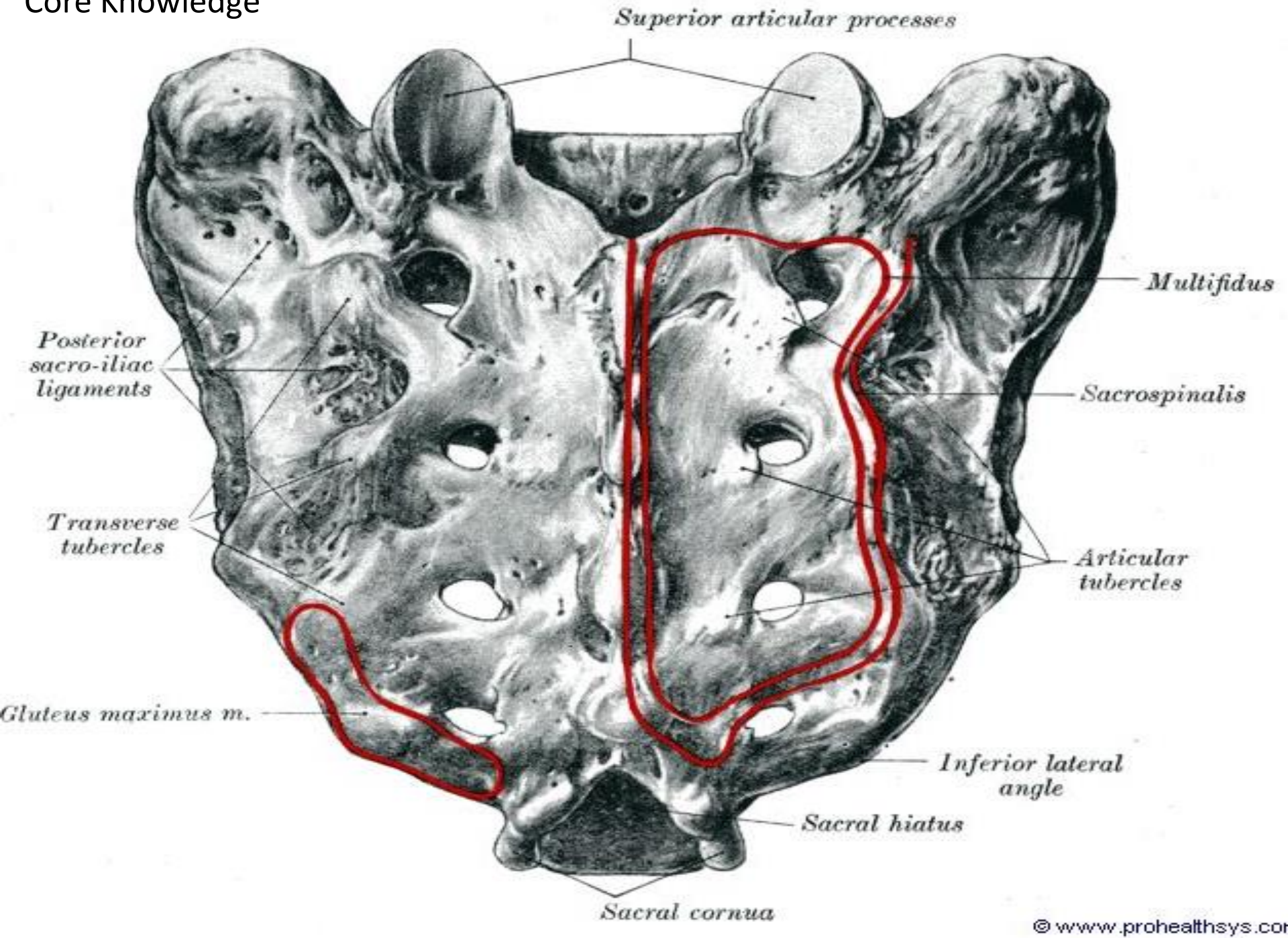
Core Knowledge

Dorsal Surface

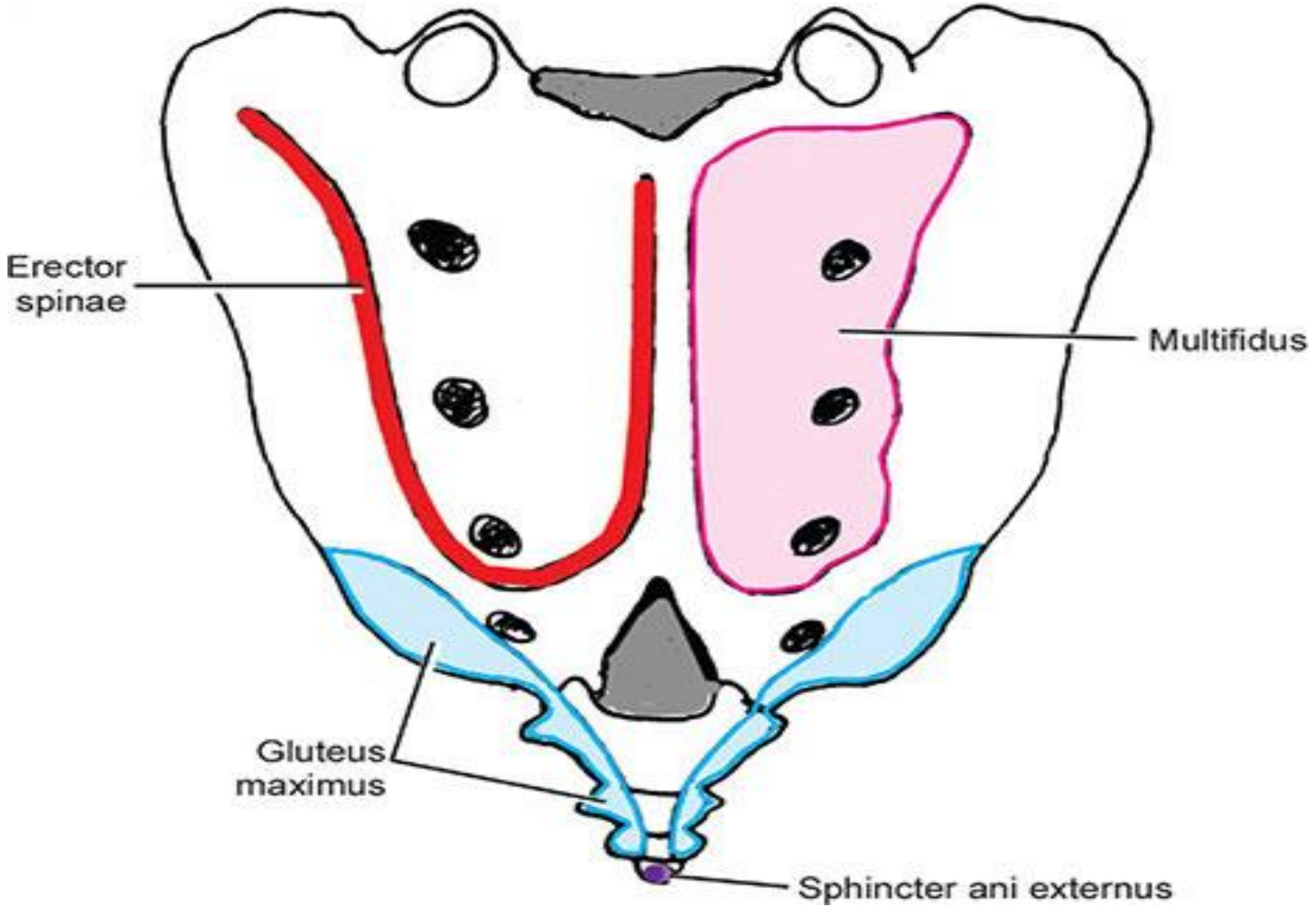


Core Knowledge

FIG. 280.—The sacrum. Dorsal surface.

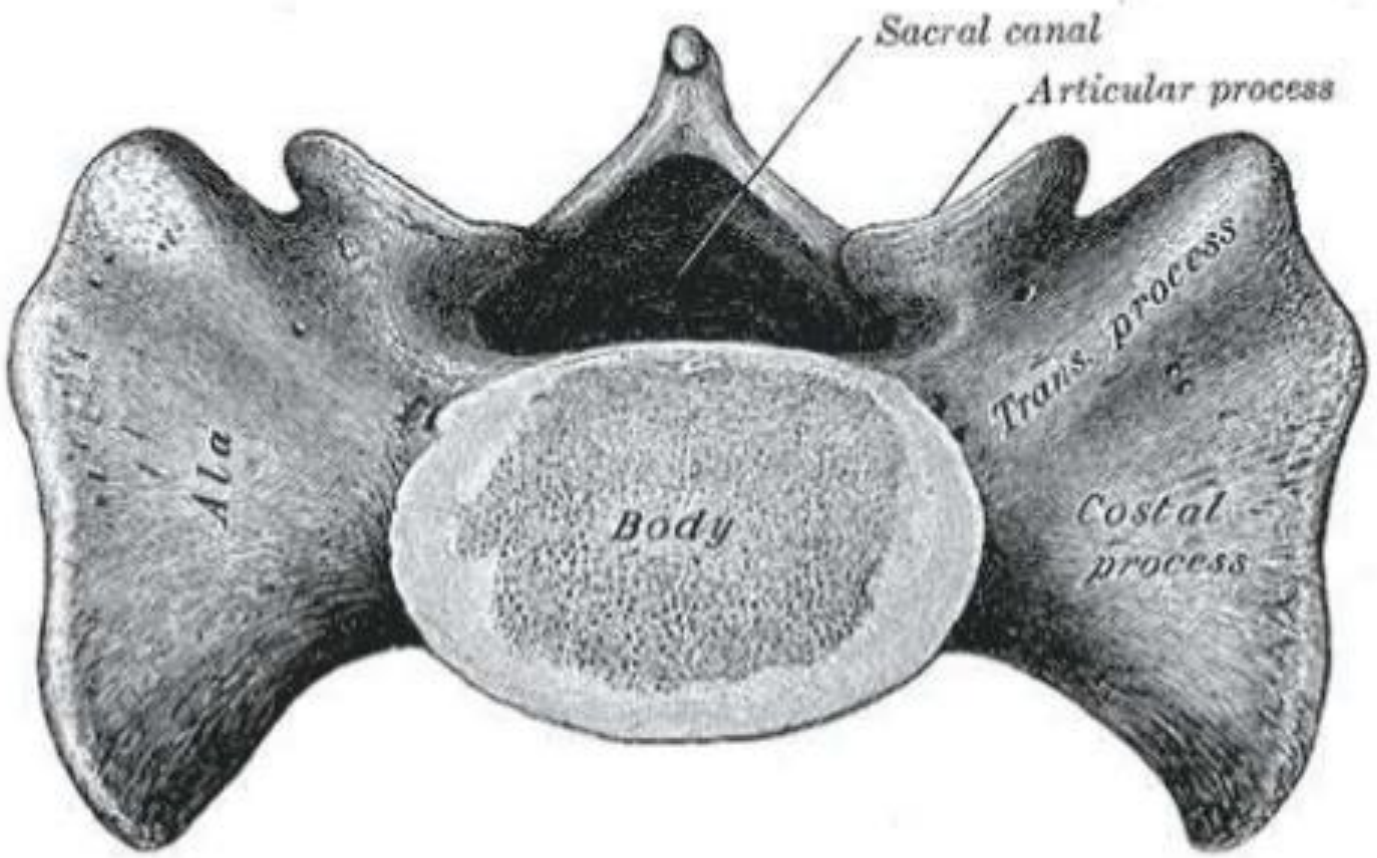


Core Knowledge



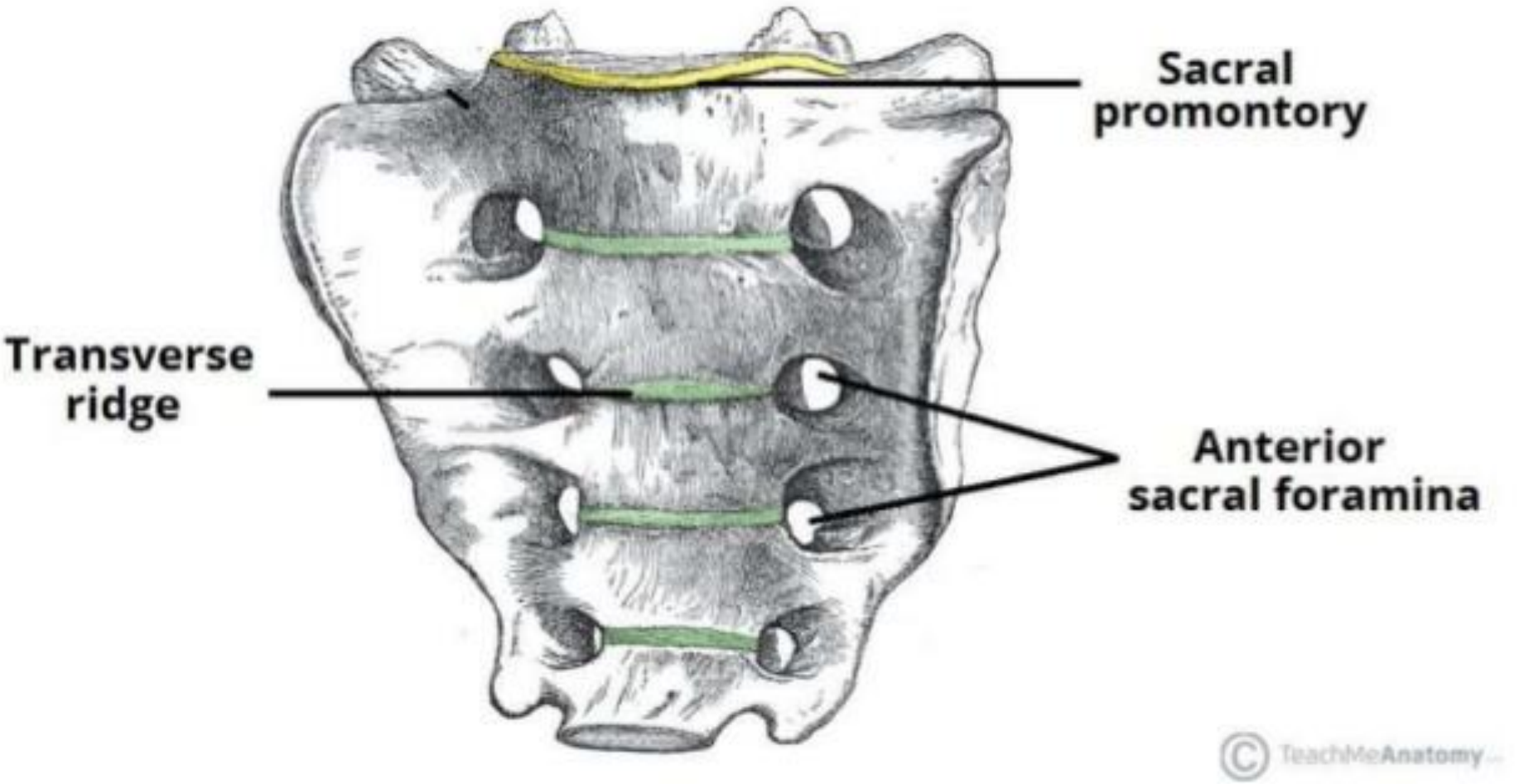
Core Knowledge

Base

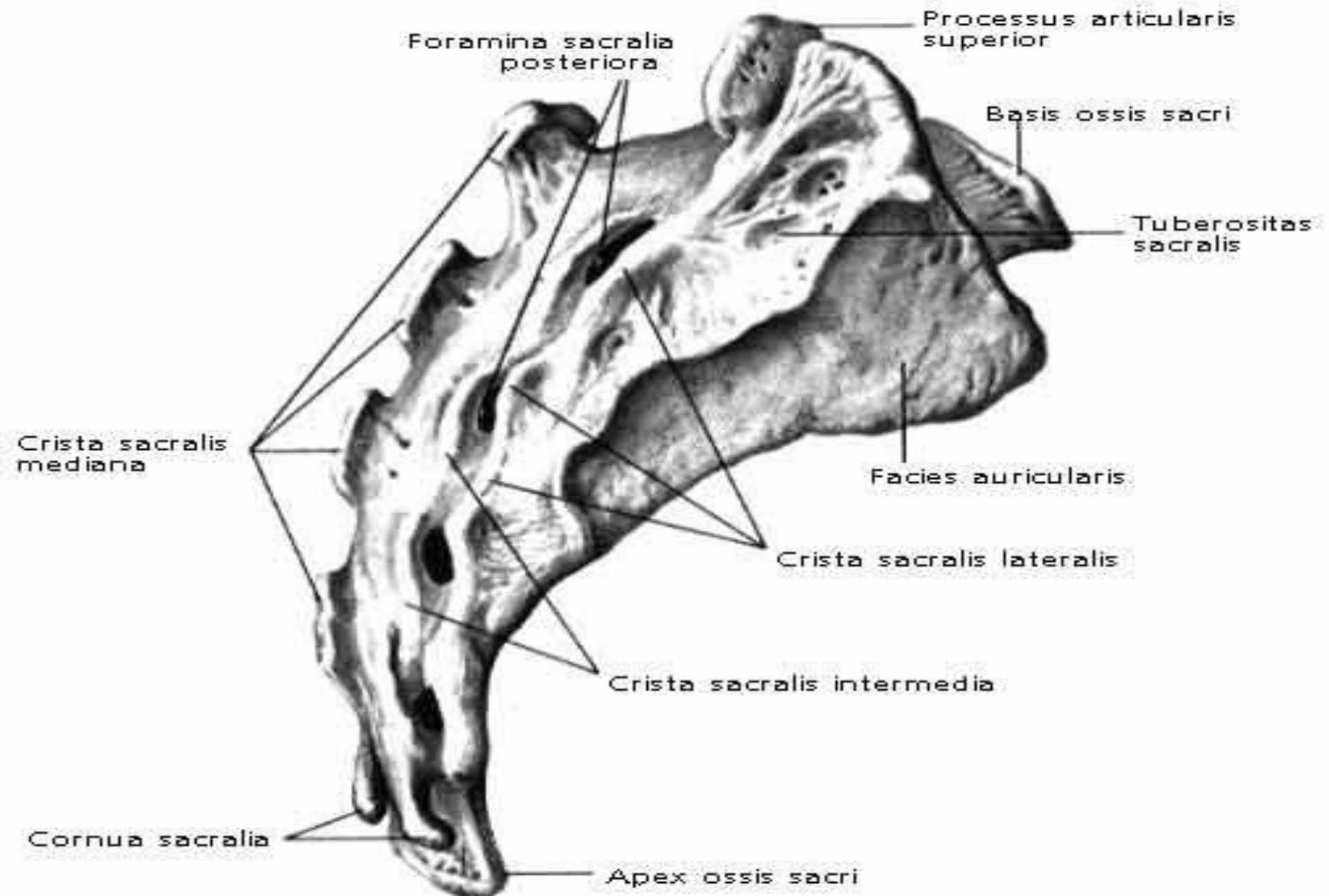


Core Knowledge

Pelvic Surface



Core Knowledge



Sacral Canal

Contents of Sacral Canal

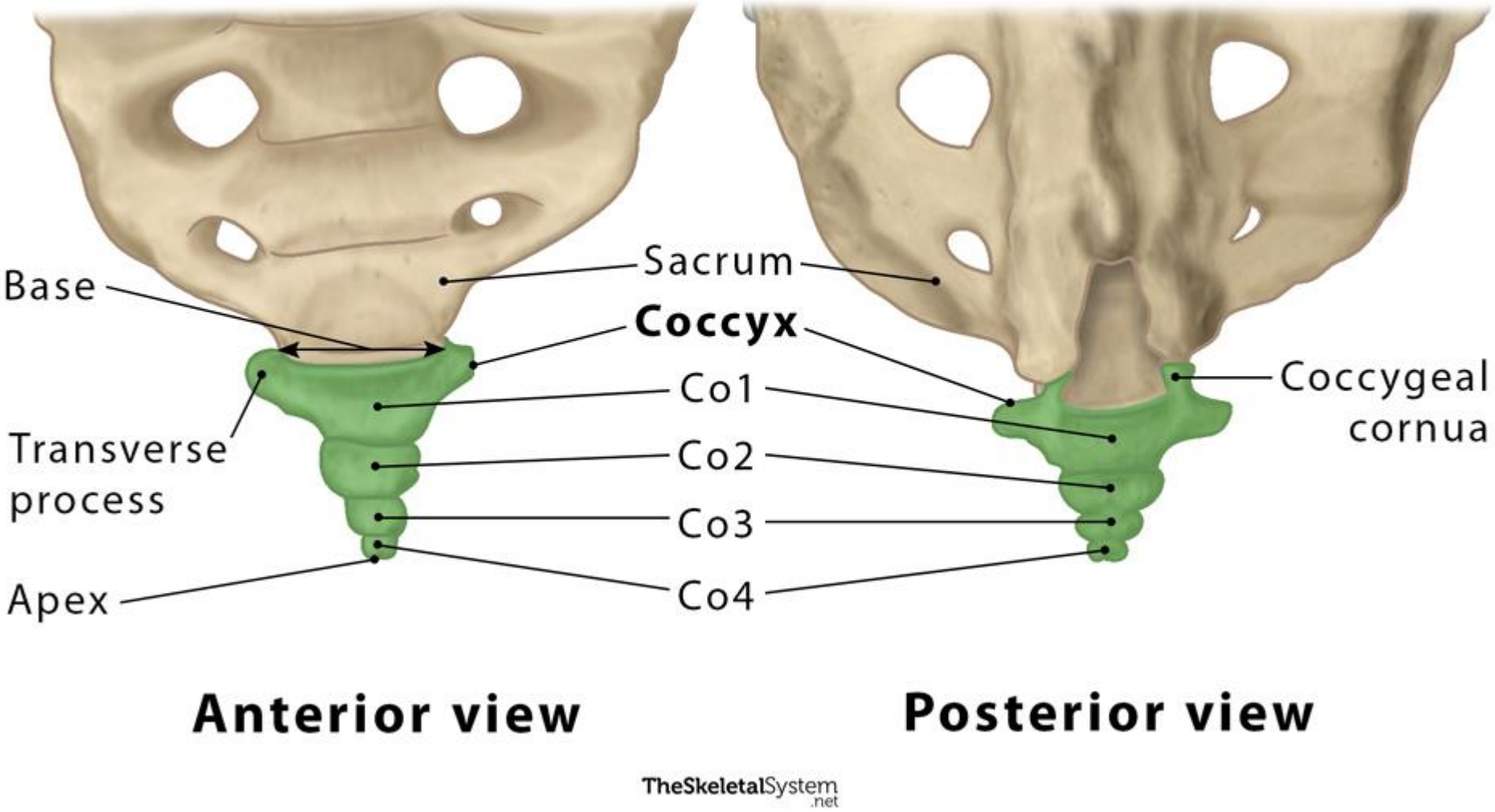
- Cauda Equina (Lower End)
- Filum Terminale
- Meninges (Dural Sac)
- Epidural Fat and Venous Plexus
- Anterior and posterior longitudinal ligaments

Sexual Dimorphism in Sacrum

Features	Male sacrum	Female sacrum
1. Length	More	Less
2. Ratio between the transverse width of body of 1st sacral vertebra and the entire width of sacral base.	More than 1/3rd.	Less thn 1/3rd.
3. Auricular surface	Relatively longer, upper three segments.	Smaller, occupies only upper two segments of sacrum.
4. Anterior surface of sacrum	Shallower	Deeper
5. Sacral Index $\frac{[\text{Breadth of the base X 100}]}{\text{Length}}$	Lesser	Greater
6. Width	Relatively narrower	Wider
7. Curvature	Uniformly curved	Flattened in the upper part but sharply curved in the lower part.

Core Knowledge

Coccyx



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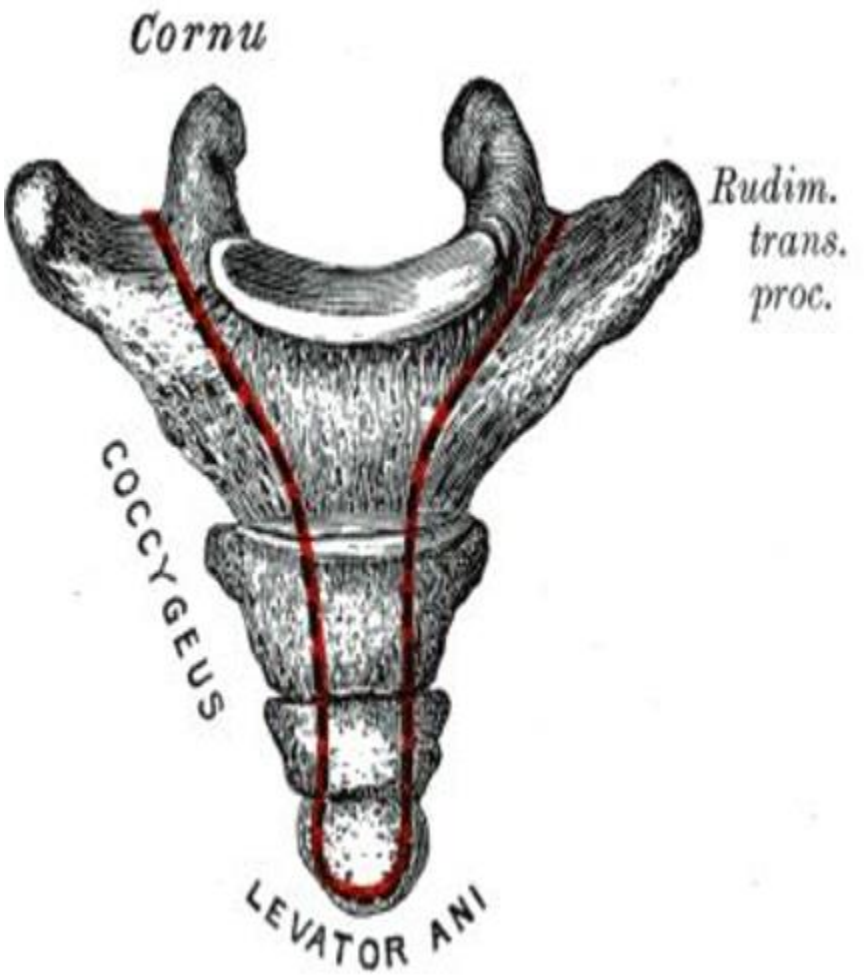
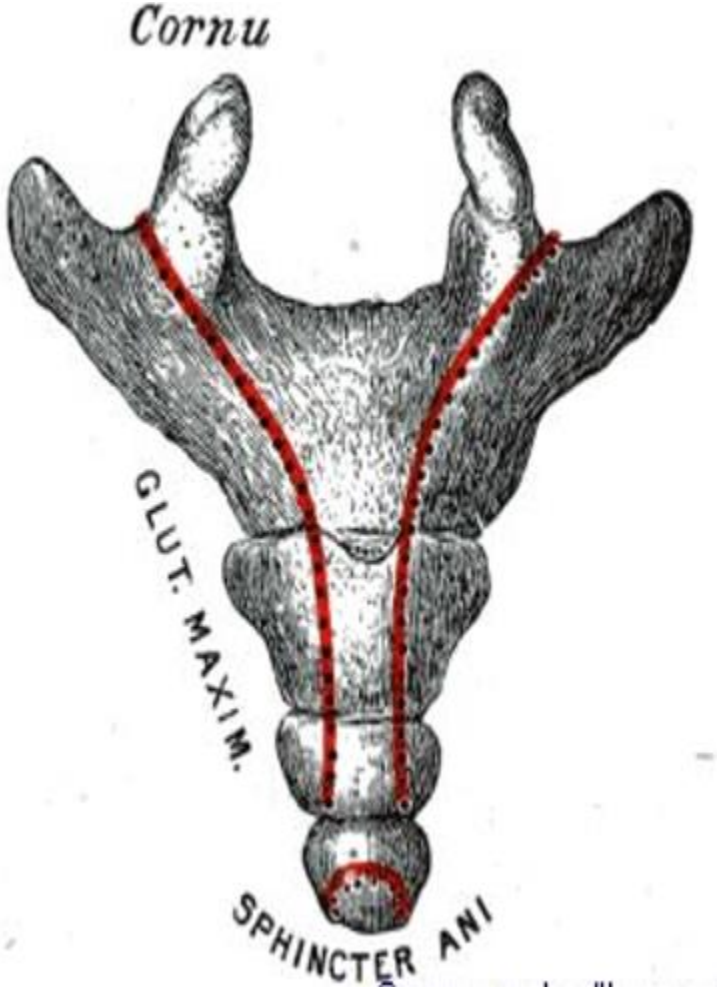


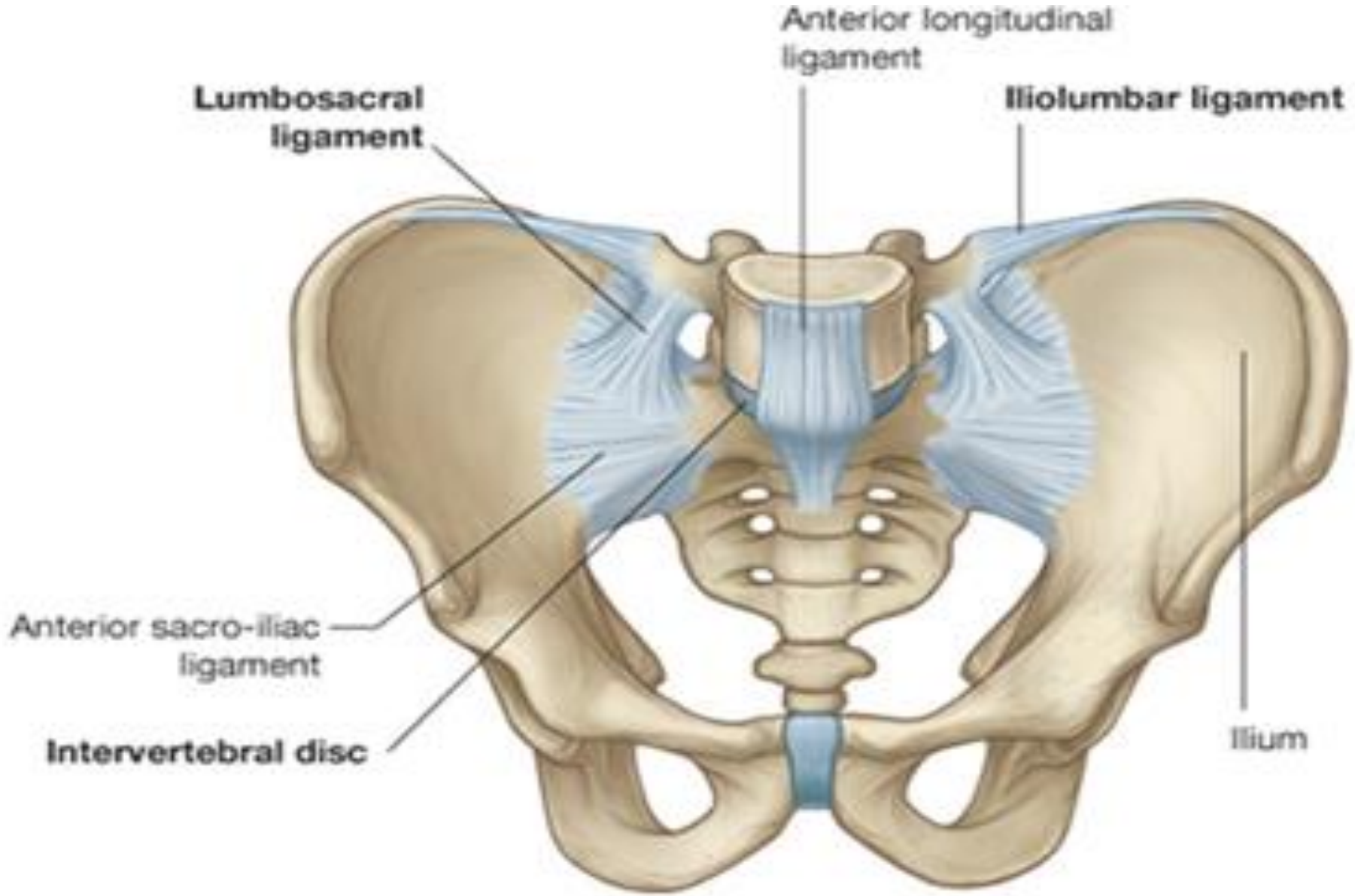


Anterior aspect

Posterior aspect

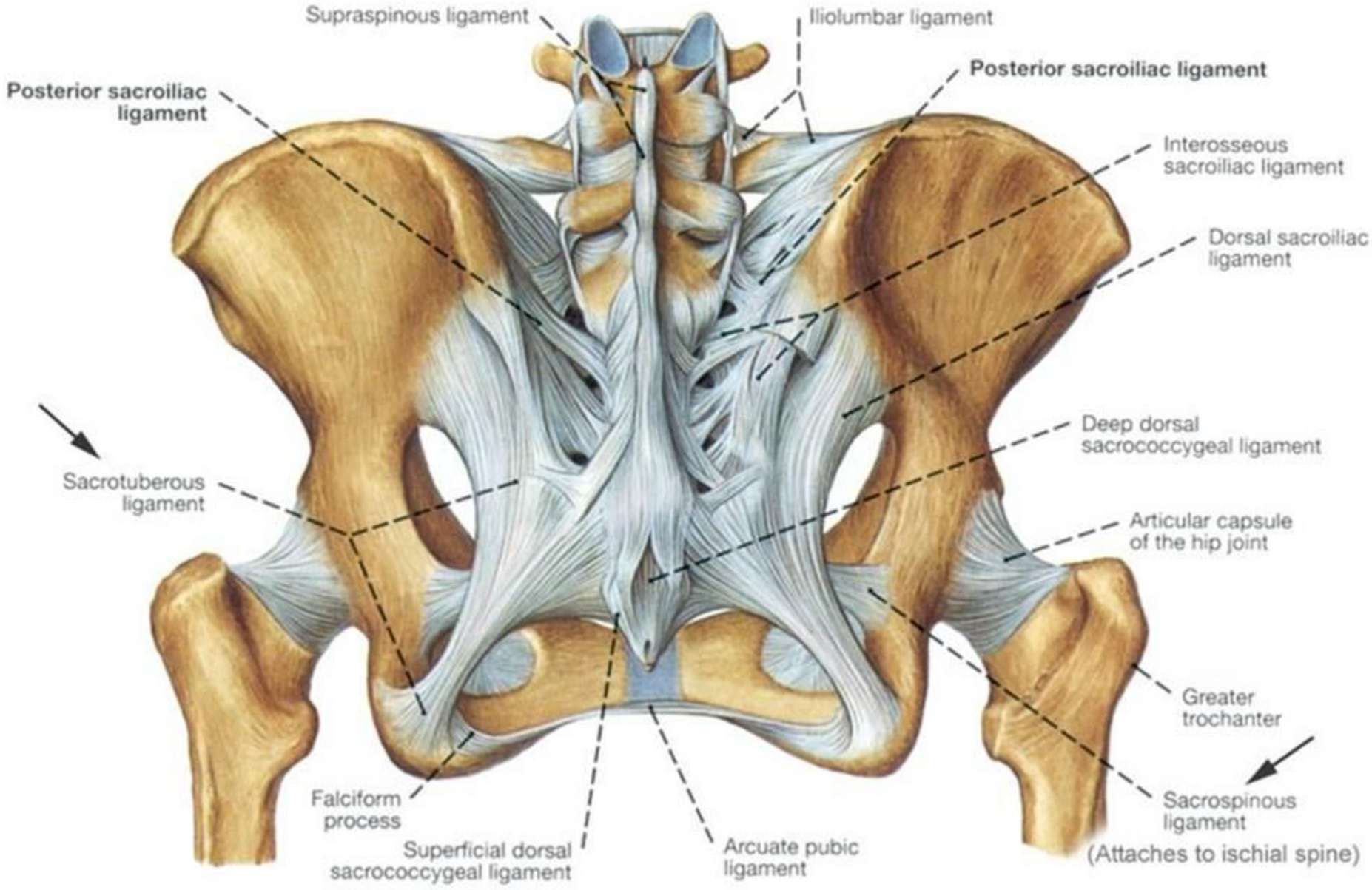
Core Knowledge

Ligaments



Core Knowledge

Ligaments



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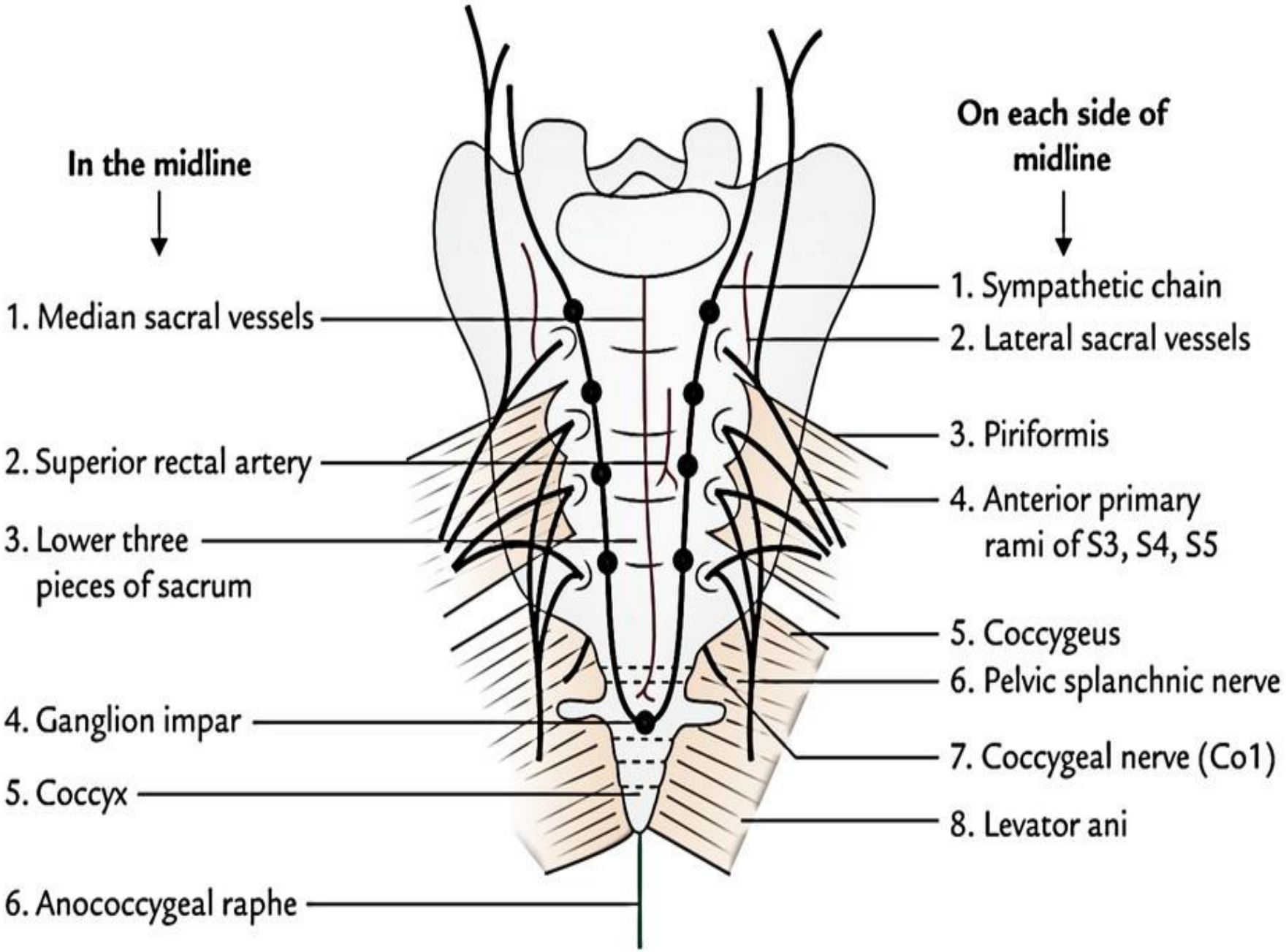
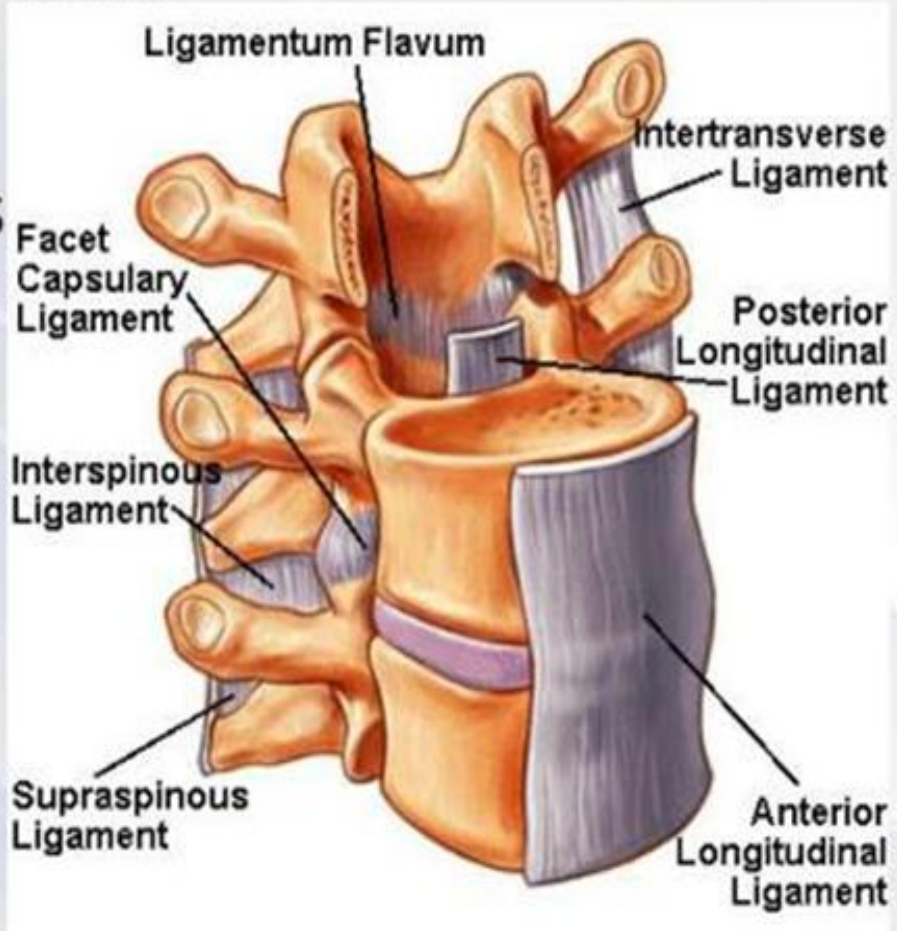


Joints of pelvis

- Lumbosacral joint
- Sacroiliac joint
- Pubic symphysis
- Sacrococcygeal joint
- Intercoccygeal joint

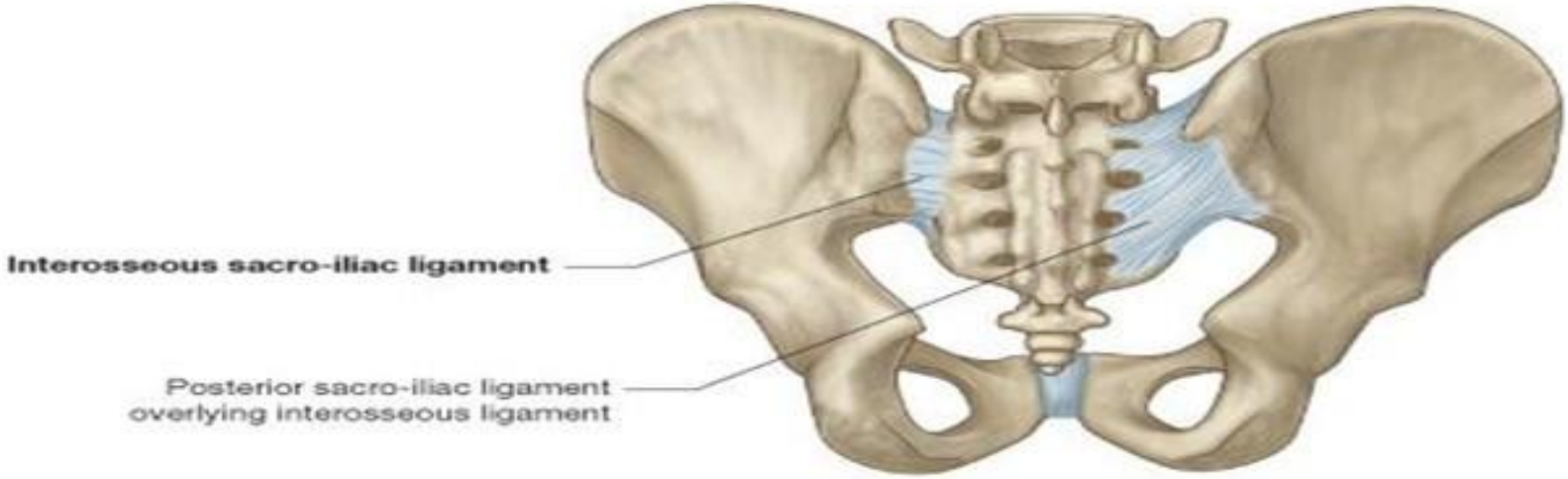
Lumbosacral joint & its Ligaments

1. Anterior longitudinal ligament
2. Posterior longitudinal ligament
3. Ligamentum flavum
4. Facet capsulary ligaments
5. Interspinous ligaments
6. Supraspinous ligaments



Core Knowledge

Sacroiliac joint



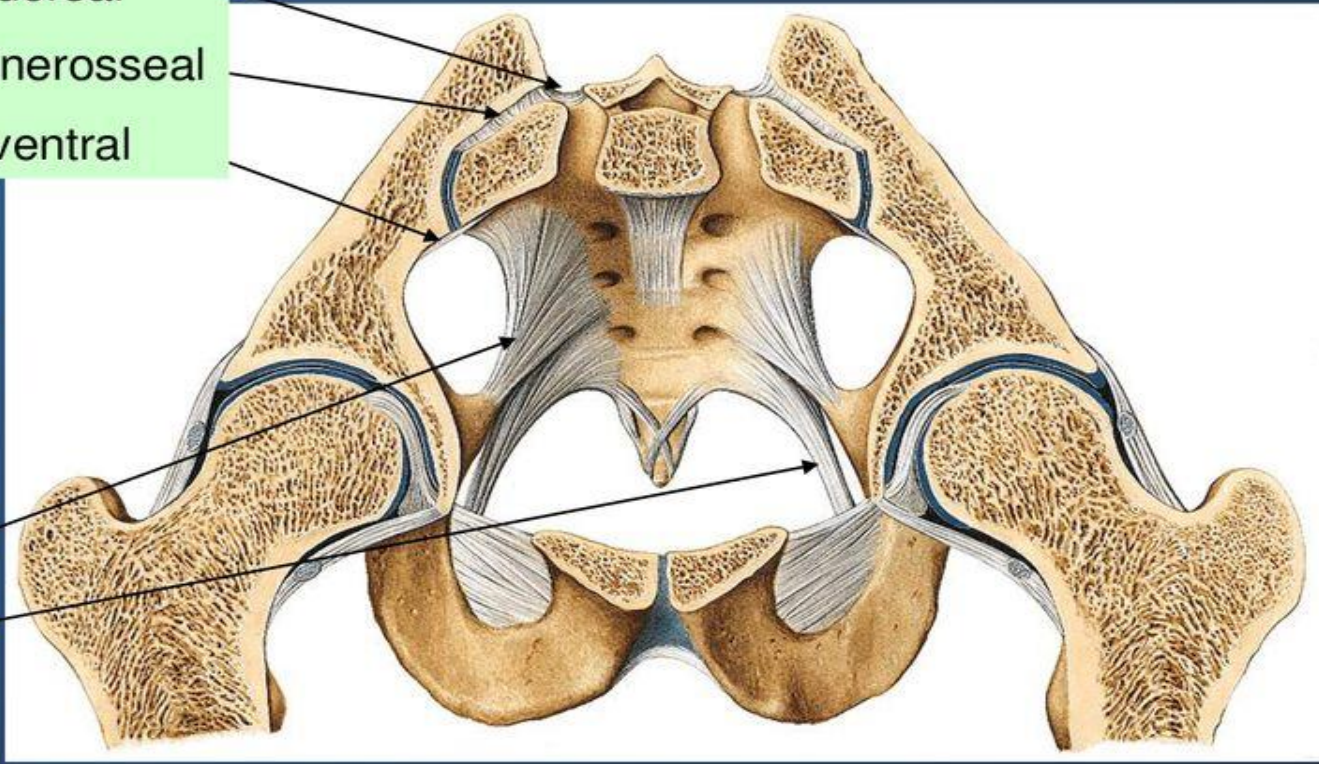
Sacro-iliac joints and associated ligaments.

Ligaments of Sacroiliac joint

Sacro-iliac ligaments dorsal

inerosseal

ventral



Functionally belong to here:

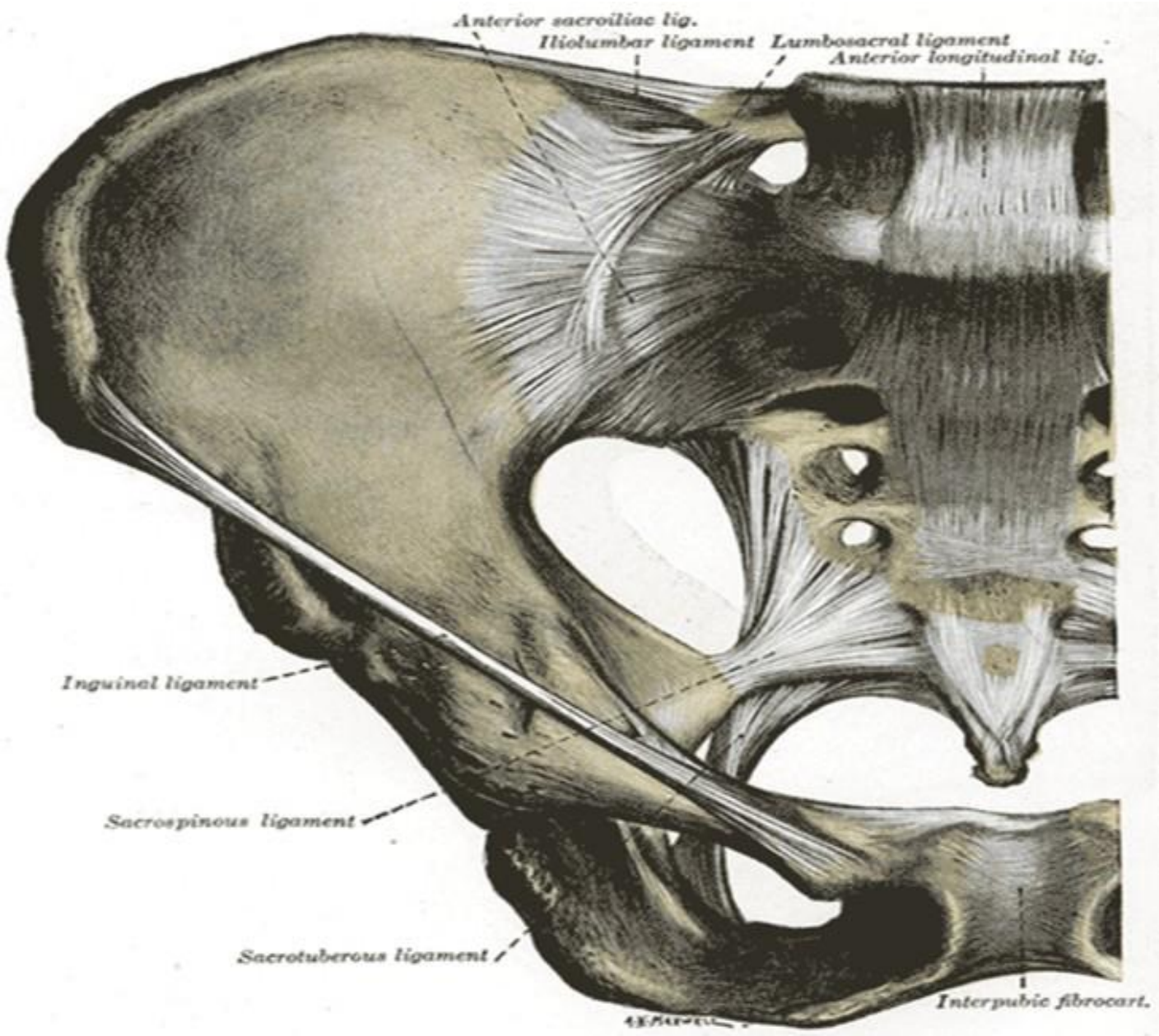
Ileolumbal lig. ,

Sacrospinous lig.

Sacrotuberous lig.

(two-armed lever)

Core Knowledge



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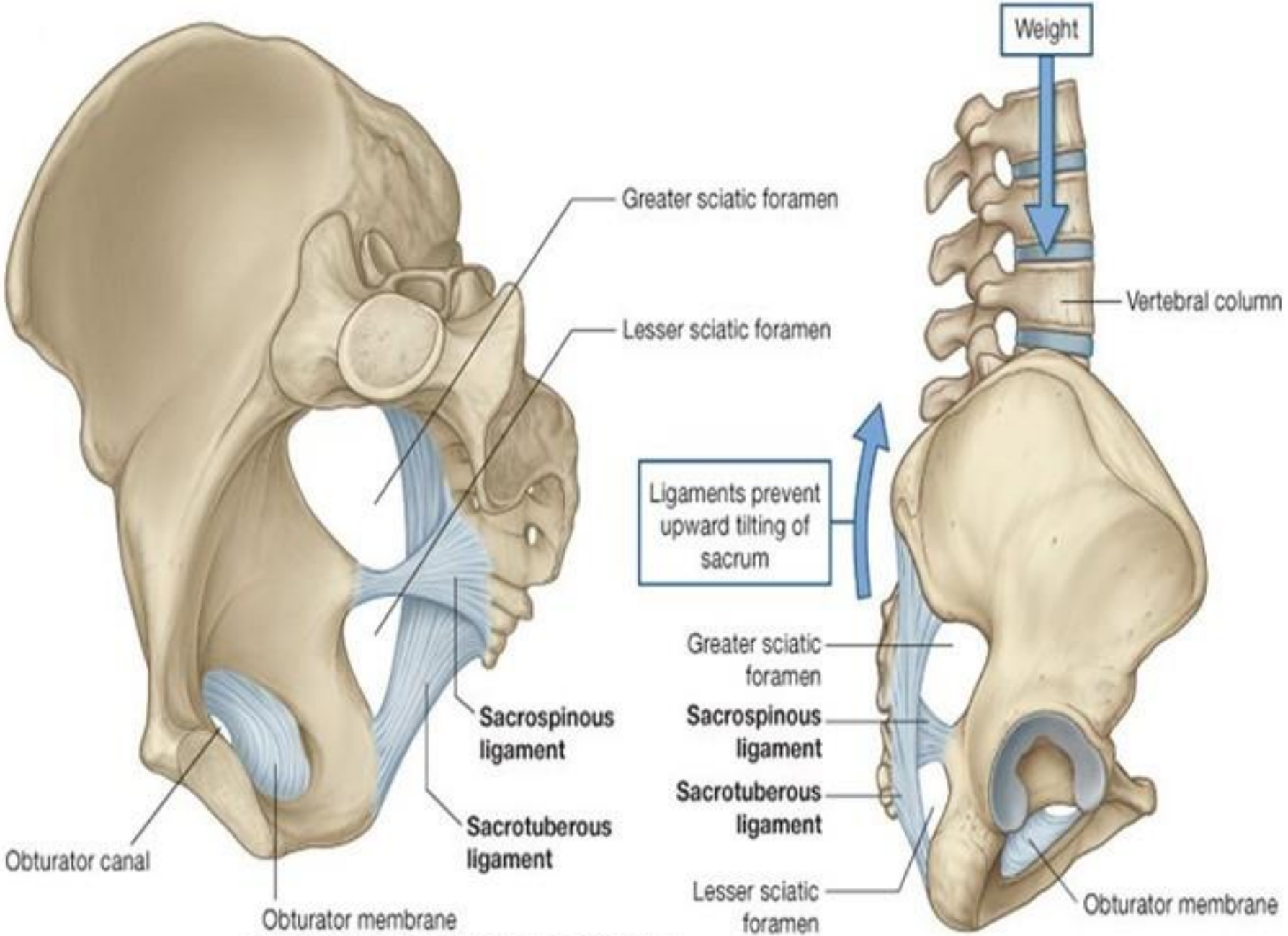
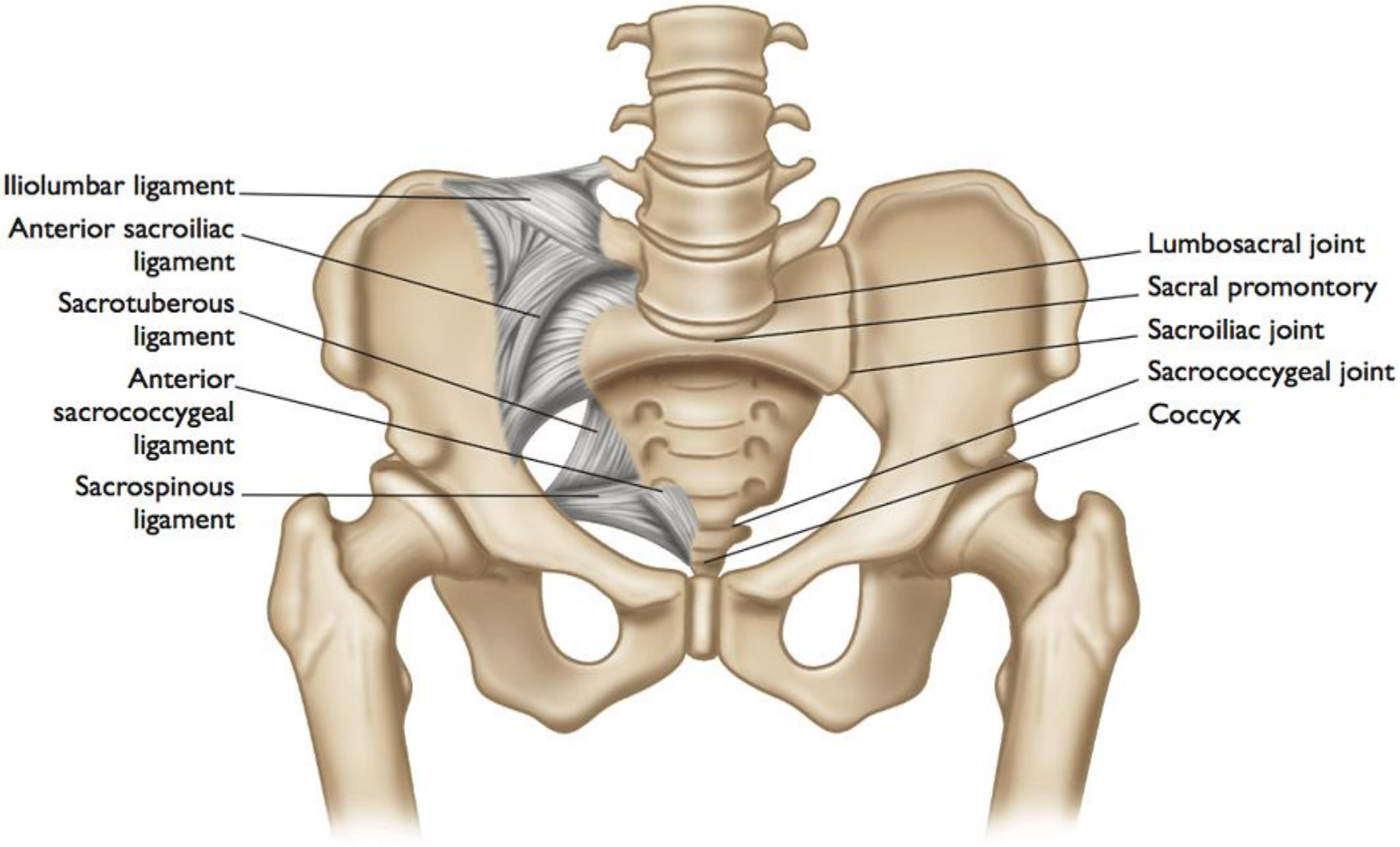


Drake: Gray's Anatomy for Students, 2nd Edition.

Sacrococcygeal joint



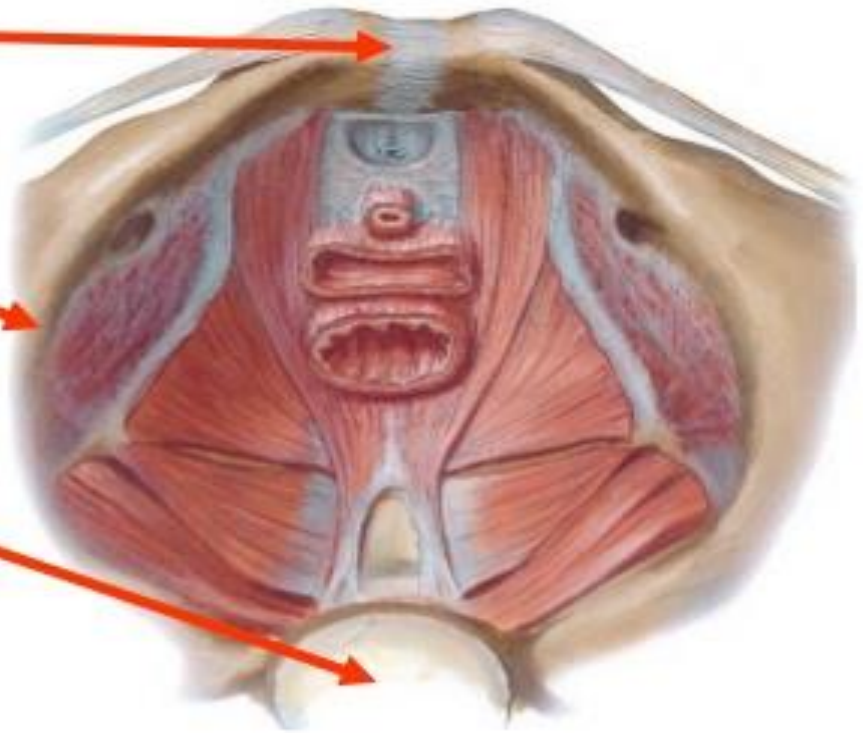
WALL OF PELVIC CAVITY

1) Anterior pelvic wall

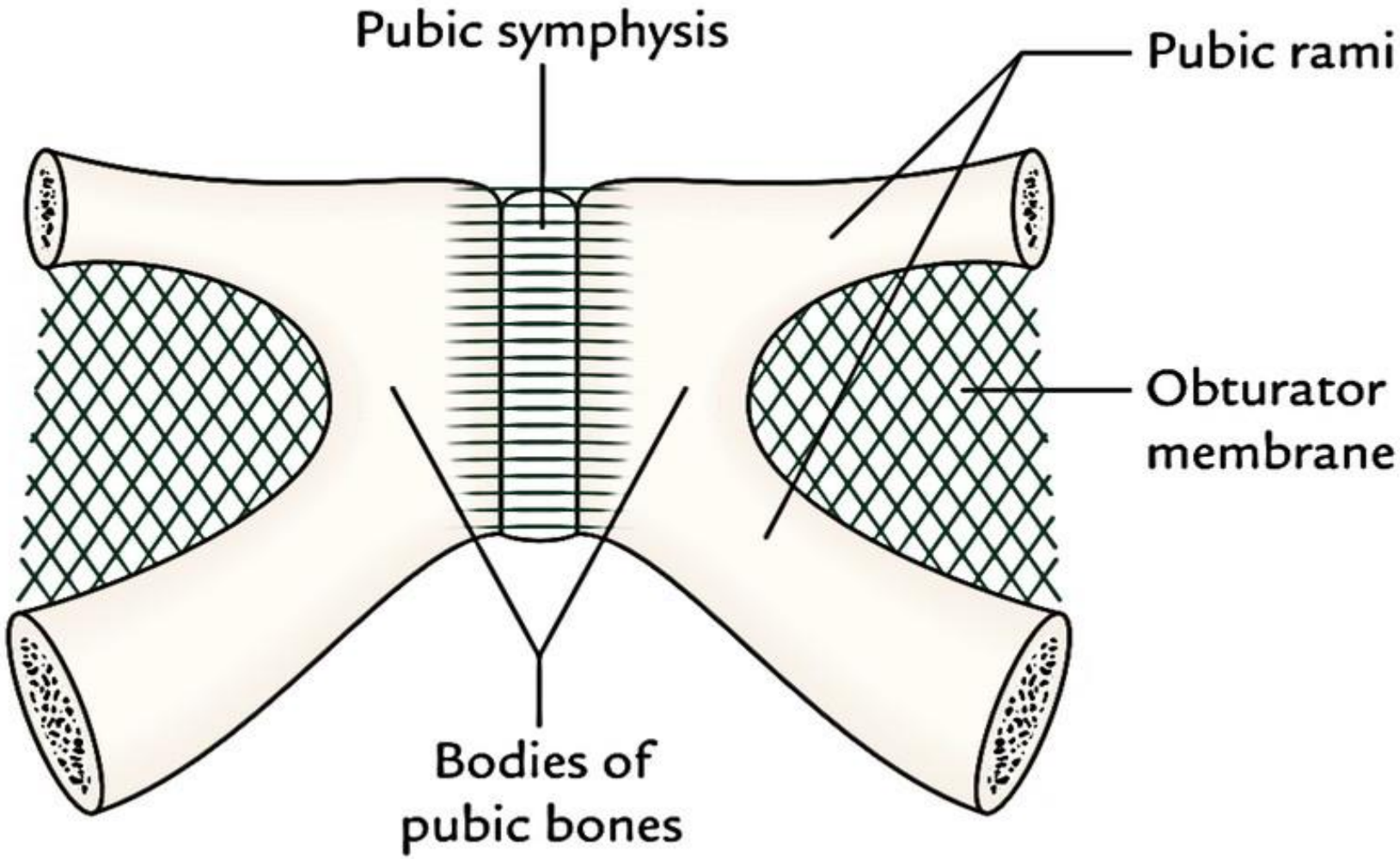
2) Lateral pelvic wall

3) Posterior wall

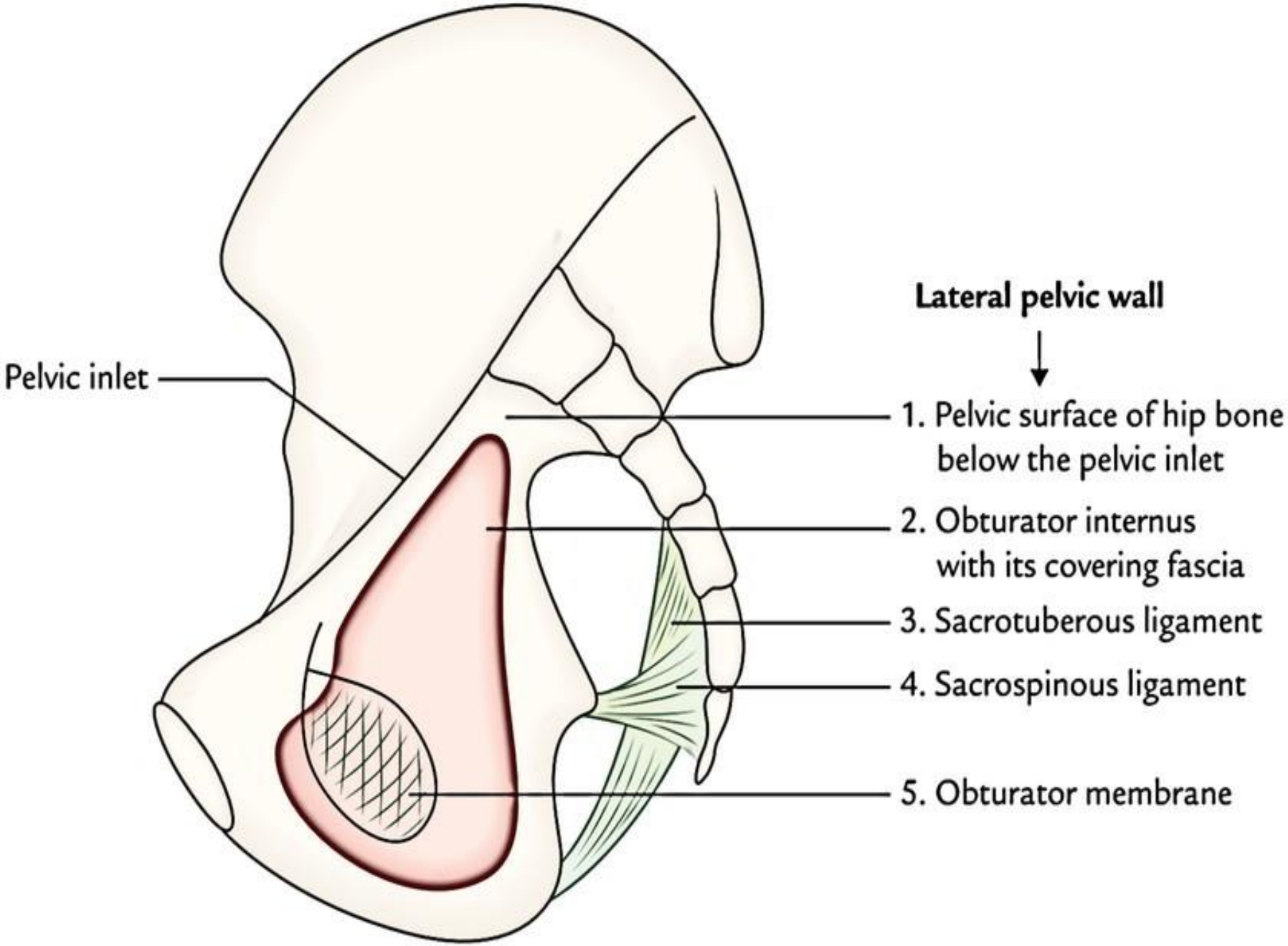
4) Pelvic floor



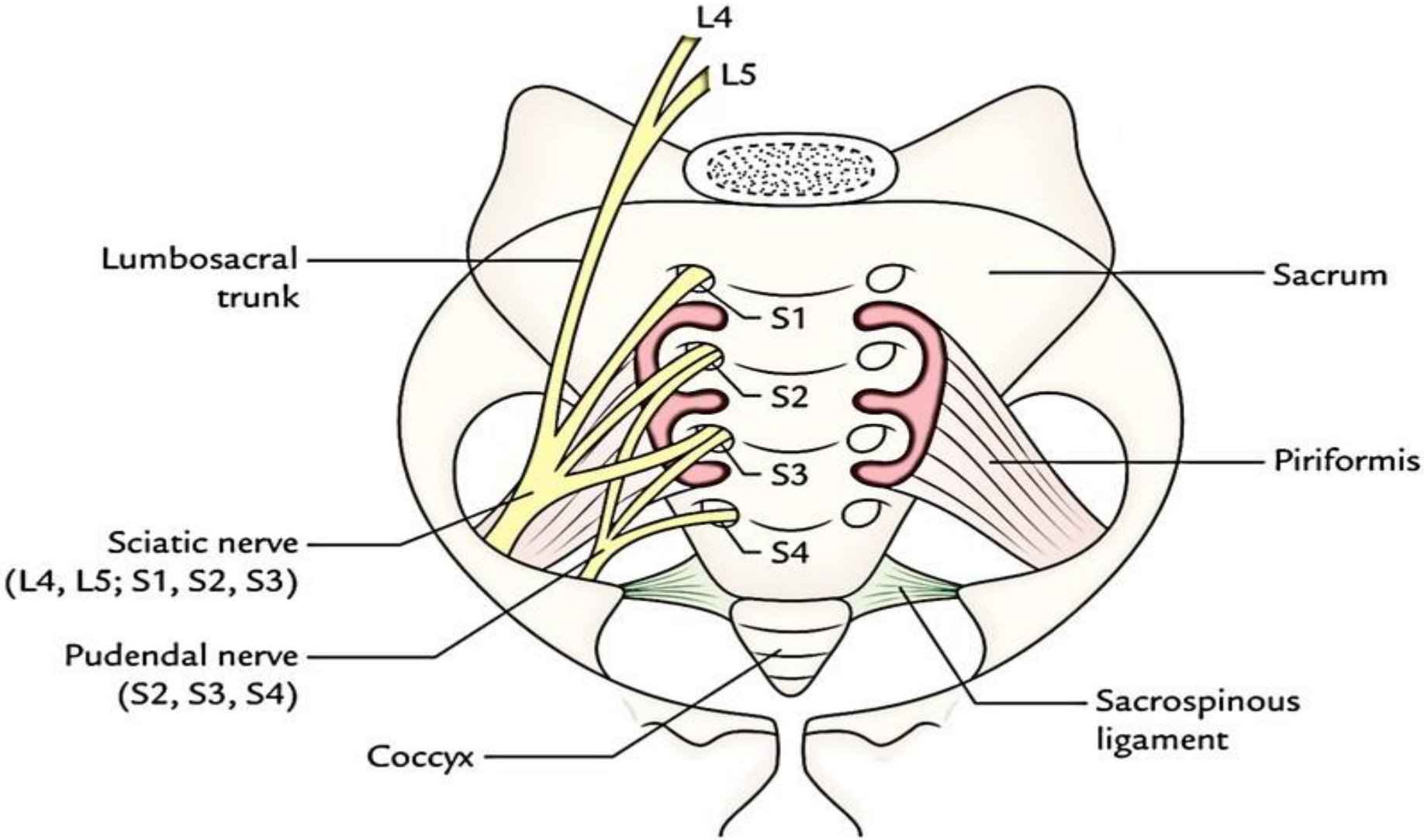
Anterior pelvic wall



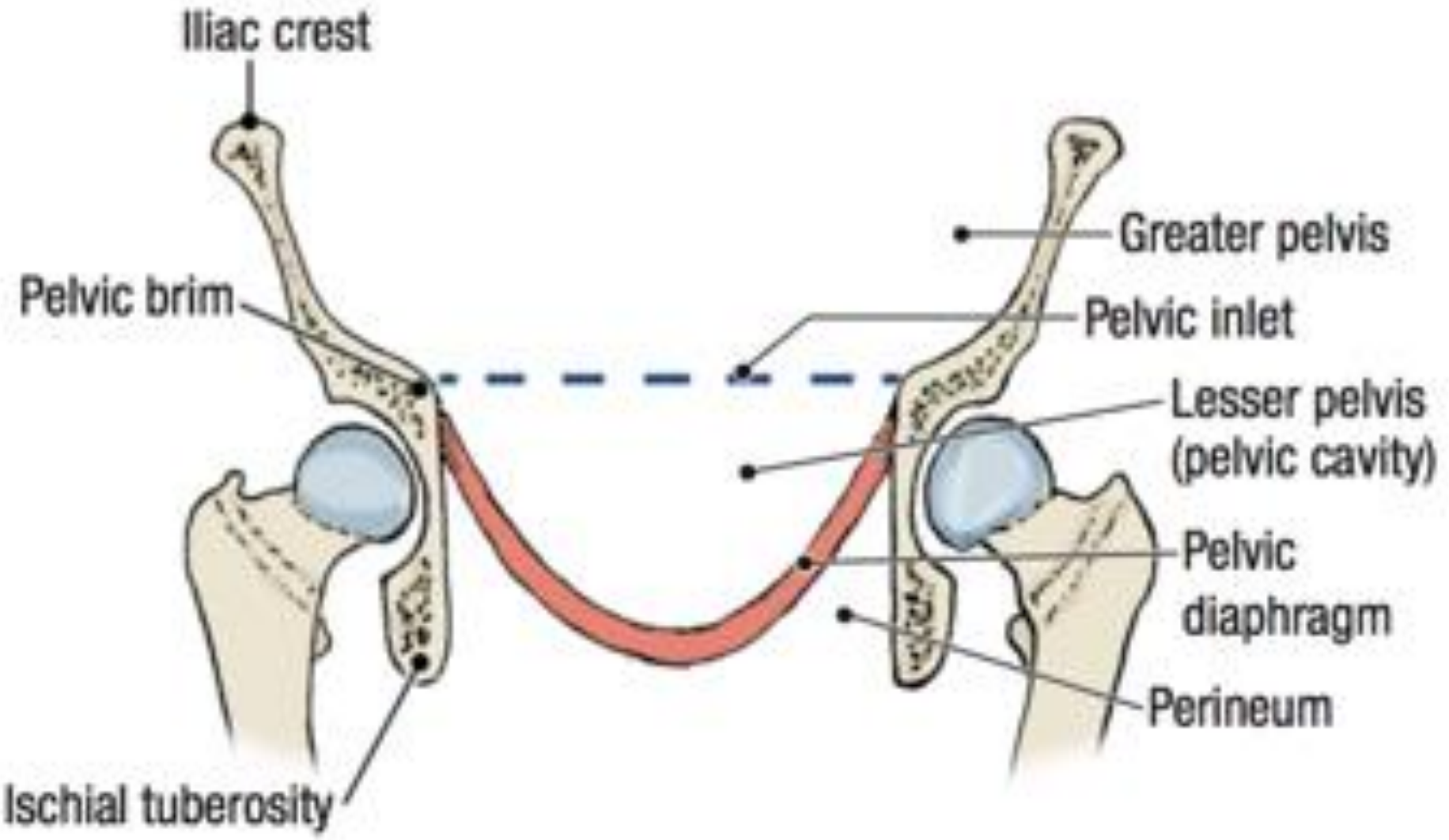
Core Knowledge



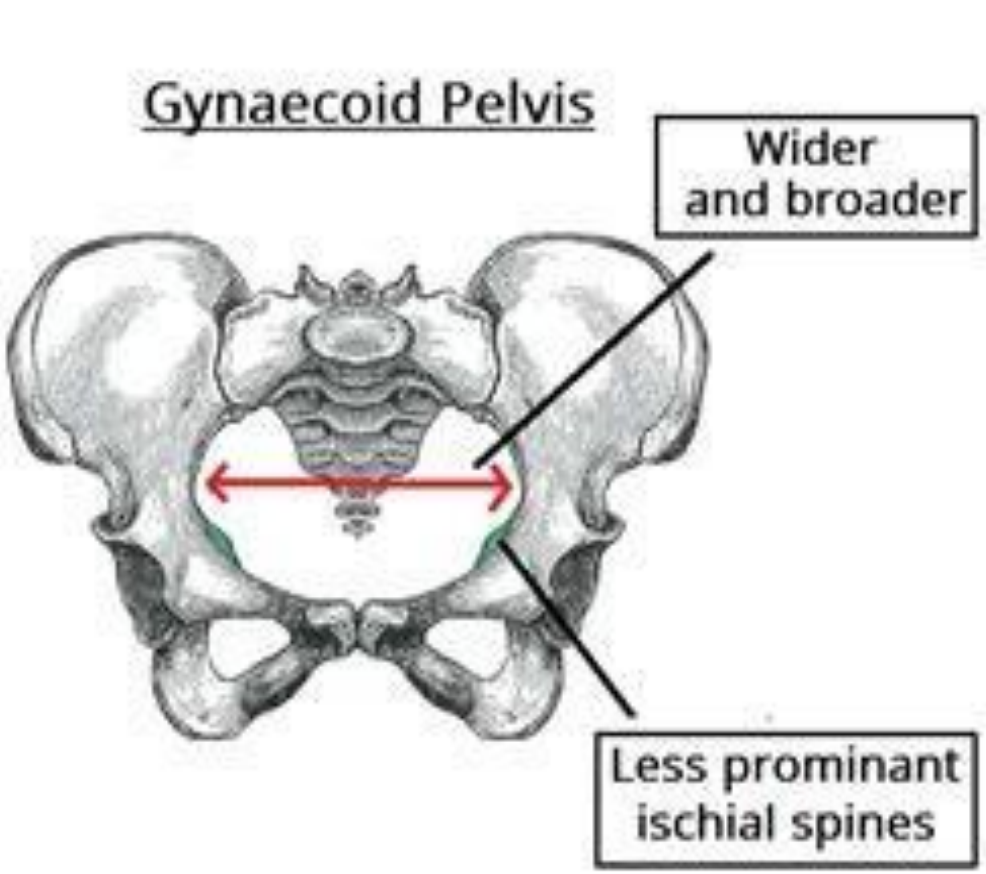
Posterior pelvic wall

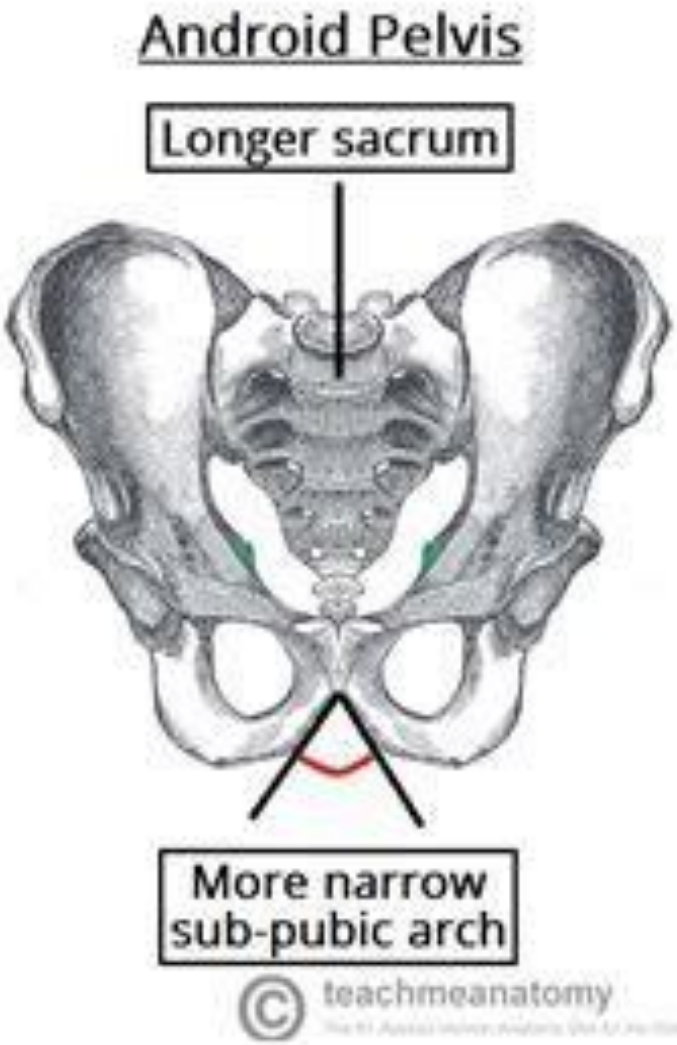


Inferior pelvic wall



Female & Male Pelvic Differences





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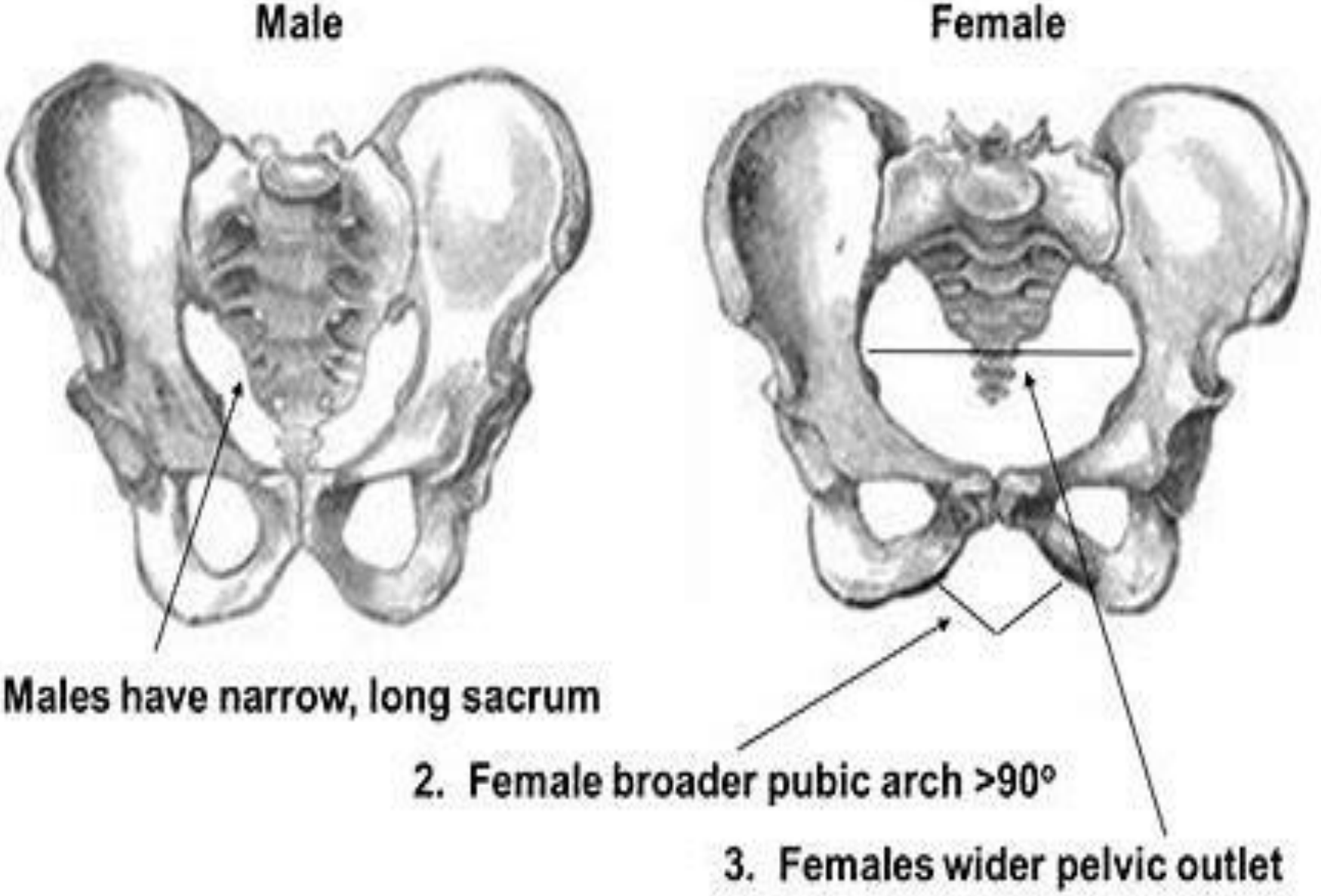
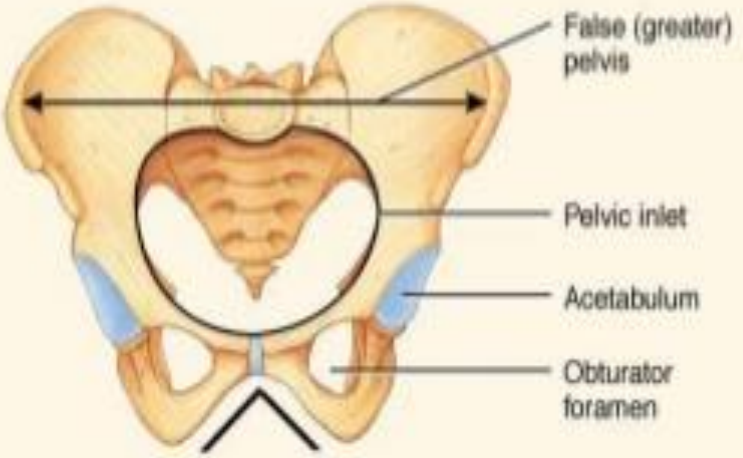


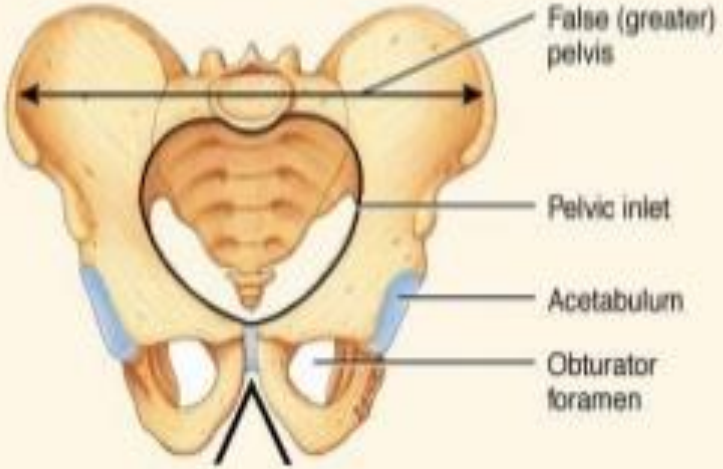
Female & Male Pelvic Differences

Table 6.4 Comparison of the Pelvis in Females and Males

Point of Comparison	Female	Male
General structure	Light and thin.	Heavy and thick.
False (greater) pelvis	Shallow.	Deep.
Pelvic inlet	Larger and more oval.	Smaller and heart-shaped.
Acetabulum	Small and faces anteriorly.	Large and faces laterally.
Obturator foramen	Oval.	Round.
Pubic arch	Greater than 90° angle.	Less than 90° angle.



Pubic arch (wider)

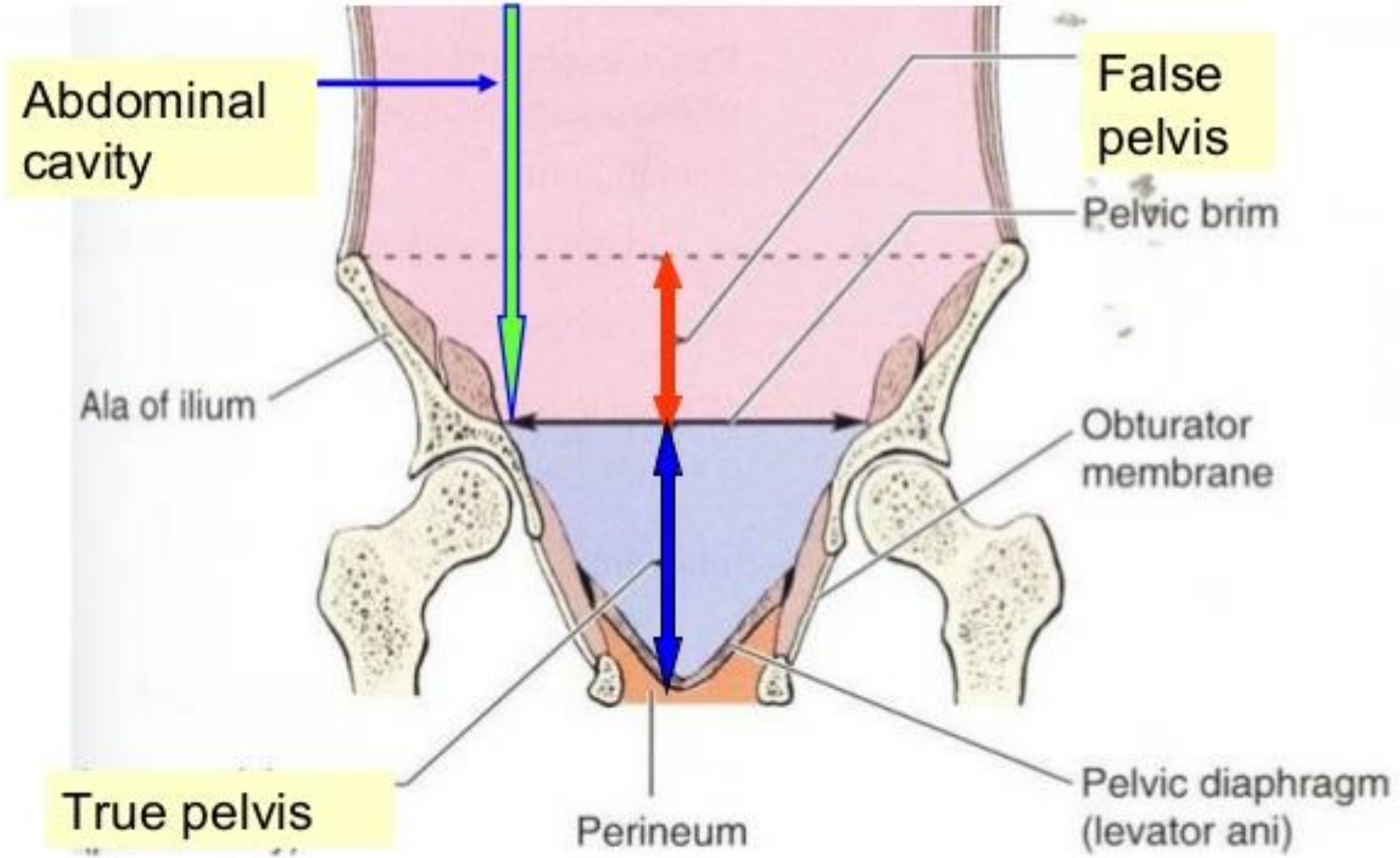


Pubic arch (narrower)

Anterior views

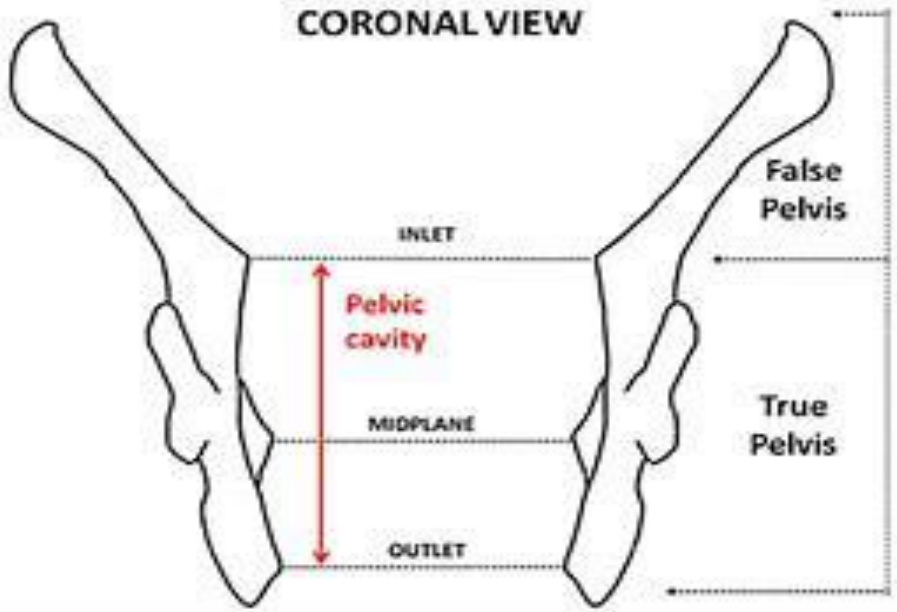
Core Knowledge

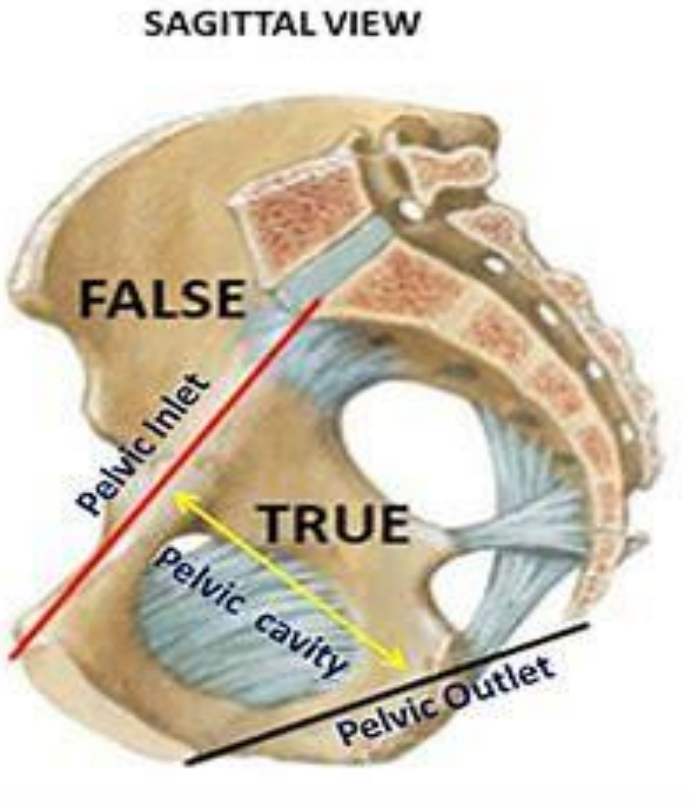
TRUE & FALSE PELVIS



Core Knowledge

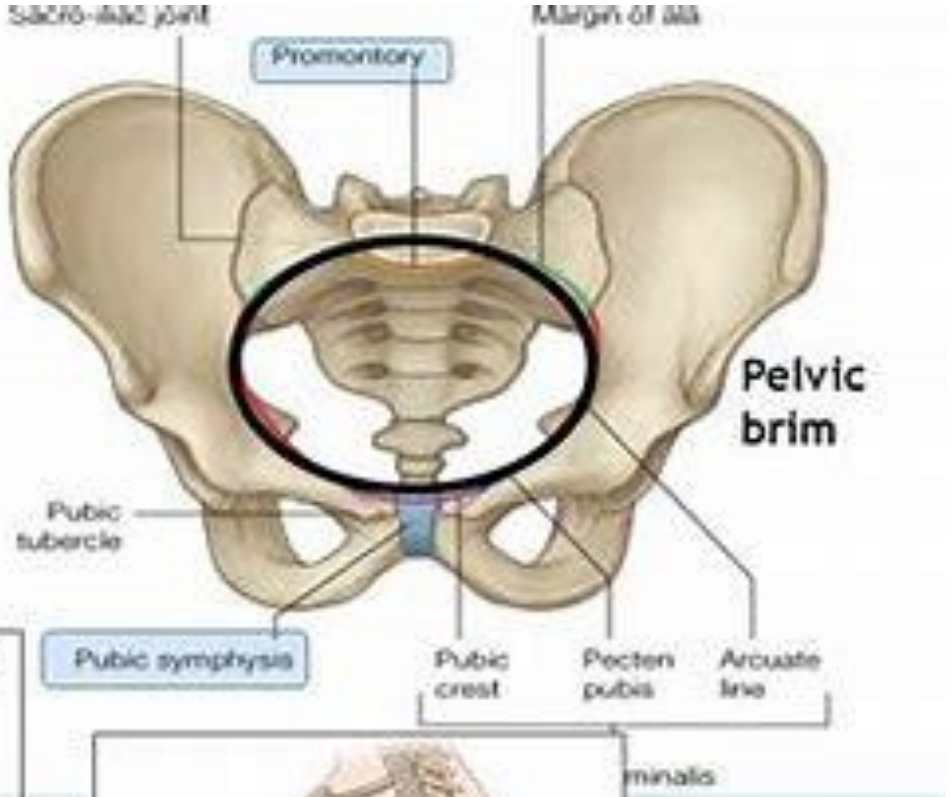
Boundaries Of Pelvic Inlet ,Outlet & Pelvic Cavity





Core Knowledge

The pelvis is divided into two parts by the pelvic brim. Above the brim is the False or greater pelvis, which is part of the abdominal cavity. Below the brim is the True or lesser pelvis.



The False pelvis is **bounded** by:

Posteriorly:
Lumbar vertebrae.

Laterally:
Iliac fossae and the iliacus muscle.

Anteriorly:
Lower part of the anterior abdominal wall.

It supports the abdominal contents.

PELVIMETRY

Pelvic Diameters (Conjugates)

To
determine the capacity of the female pelvis for childbearing,
the diameters of the lesser pelvis are noted radiographically
or manually during a pelvic examination.

FUNCTIONS OF BONY PELVIS

1) To protect pelvic viscera

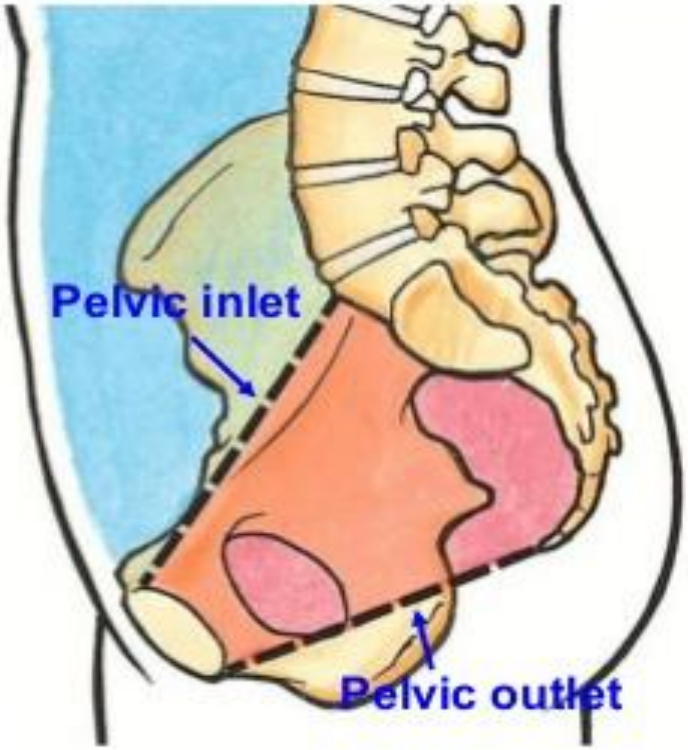
2) To support the weight of the body - transfer the weight of the upper body from the axial to the lower appendicular skeleton

3) Provides attachment for muscles

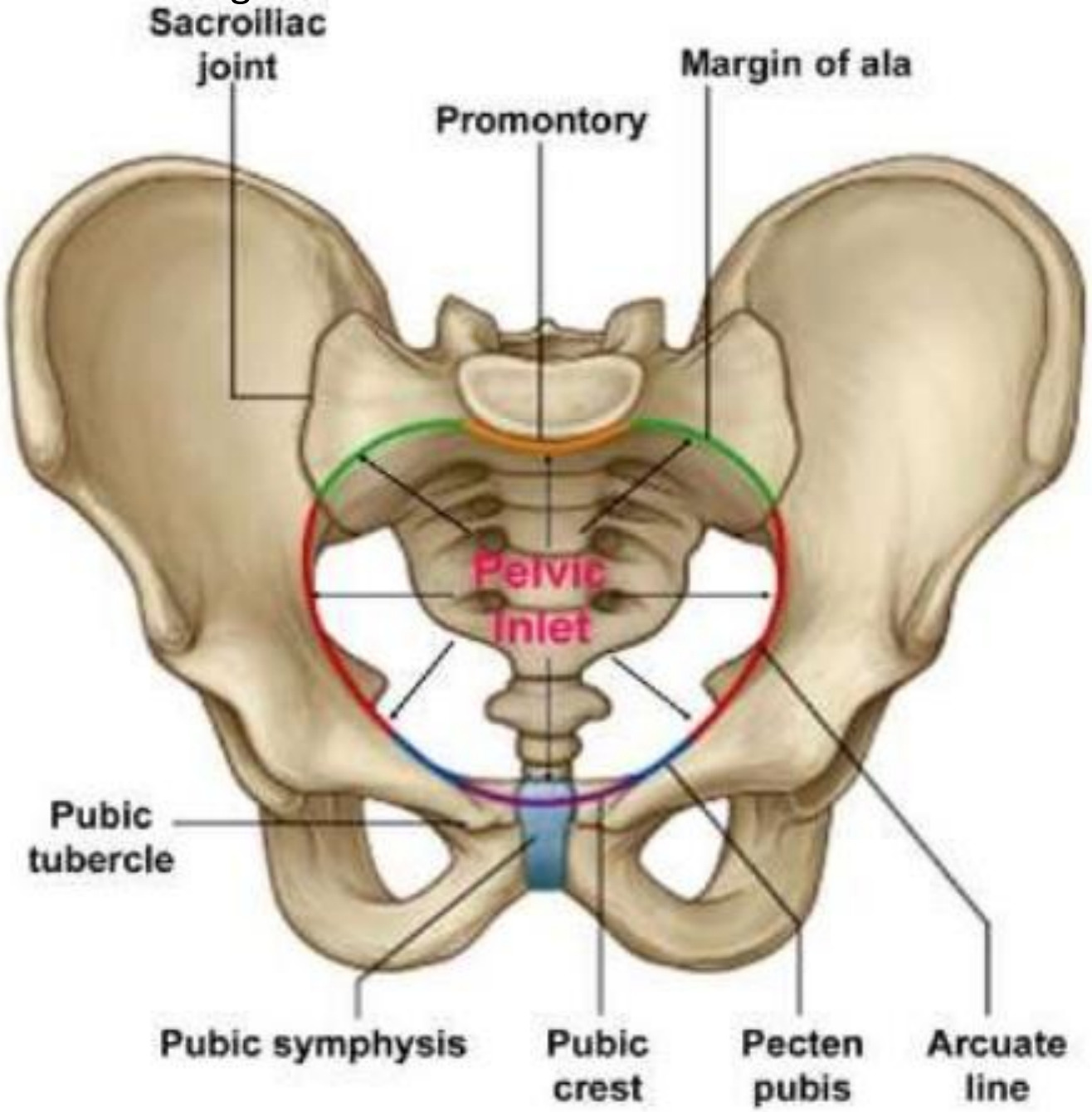
4) In females, it provide bony support for the birth canal

APERTURES OF TRUE PELVIS

- Pelvic inlet (= pelvic brim)
  - also called superior pelvic aperture
- Pelvic outlet
  - also called inferior pelvic aperture
  - closed by the pelvic diaphragm



Core Knowledge



(terminal line)
Linea terminalis

Pubic crest
Pecten pubis
Arcuate line
Margin of ala
Promontory

Gray 5.28

DIAMETER OF PELVIC INLET

Measurement	Extension	Diameter
Anterior-posterior (True conjugate)	From the sacral promontory → superior margin of pubic symphysis	**11.5 cm**
Diagonal conjugate	Sacral promontory → inferior margin of the pubic symphysis	**12.0 cm**
Obstetric conjugate	Sacral promontary → nearest point on posterior surface of pubic symphysis	**10.5 cm**
Transverse diameter	The widest distance across pelvic brim	**13.5 cm**

The largest diameter of pelvic inlet = Transverse diameter

DIAMETER OF PELVIC OUTLET

Measurement	Extension	Diameter
Anteroposterior diameter	From lower margin of pubic symphysis → sacrococcygeal joint	12.5 cm
Transverse diameter (intertuberous)	Between the ischial tuberosities (Diameter > 8 cm – normal)	11 cm

The largest diameter of pelvic outlet = AP diameter

MEASUREMENTS OF PELVIC OUTLET

- Three diameters of pelvic outlet are usually described:
  1) Anteroposterior
  2) Transverse (intertuberous)
  - can be estimated
  3) Posterior sagittal

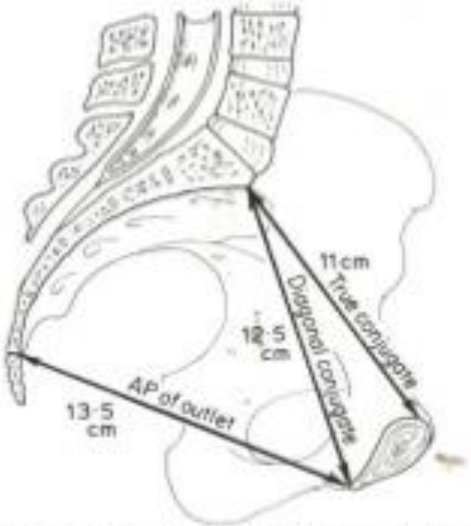
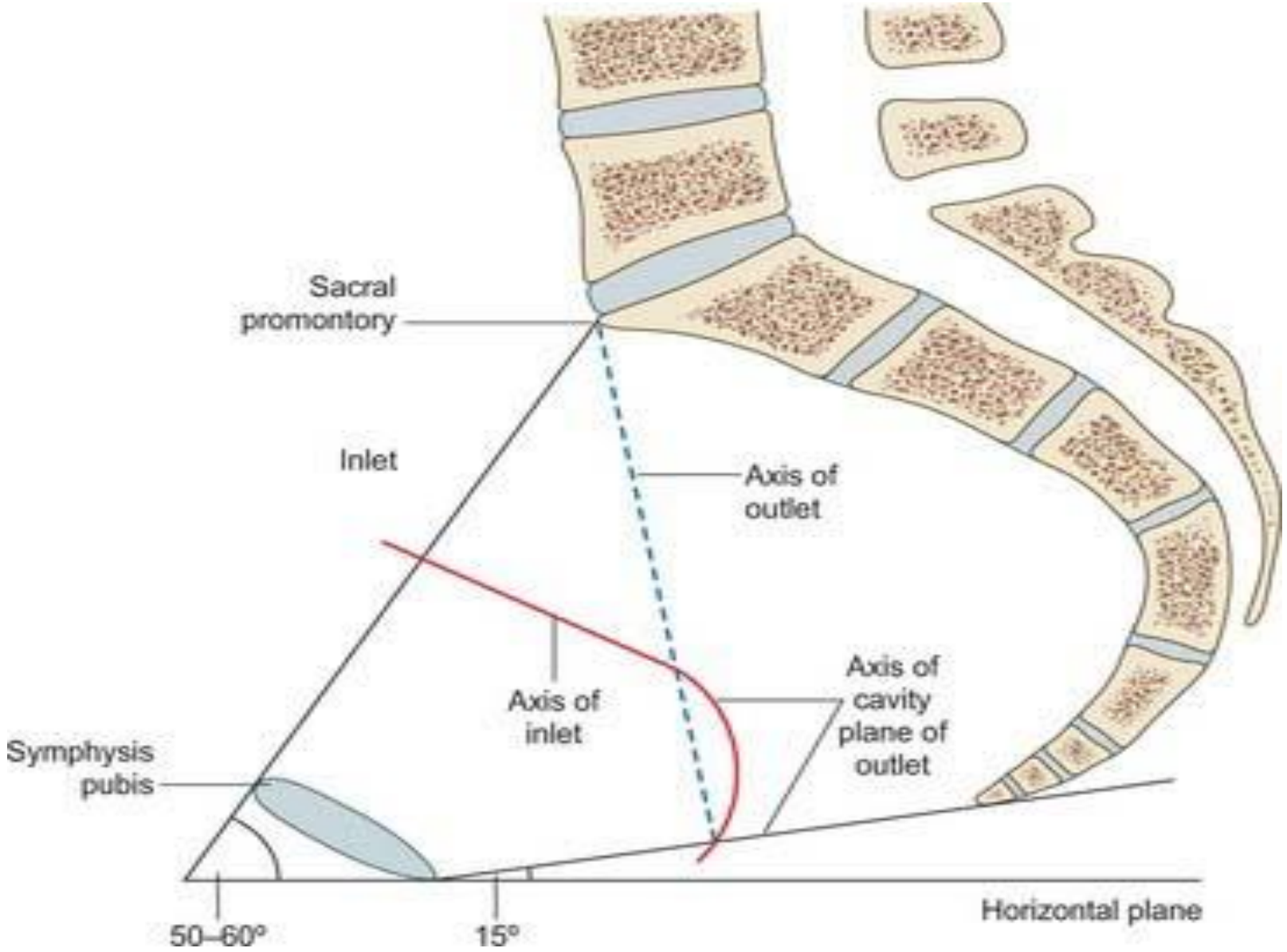


Fig. 1.13 Sagittal section of pelvis. The true and diagonal conjugate diameters are shown as it is the anteroposterior diameter of the outlet

Pelvic outlet viewed from below

Core Knowledge

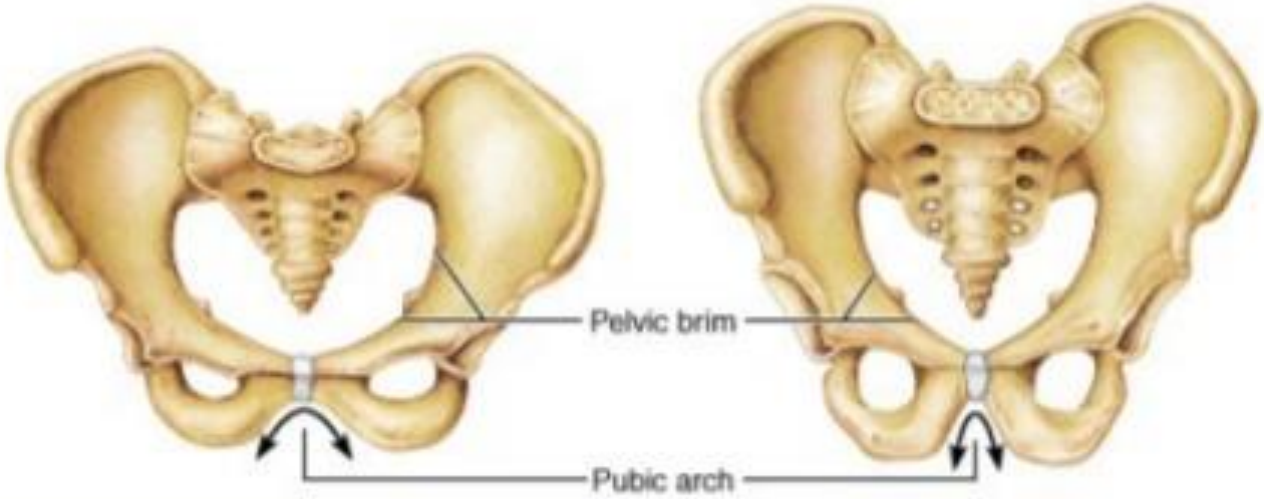
Pelvic axis



Core Knowledge

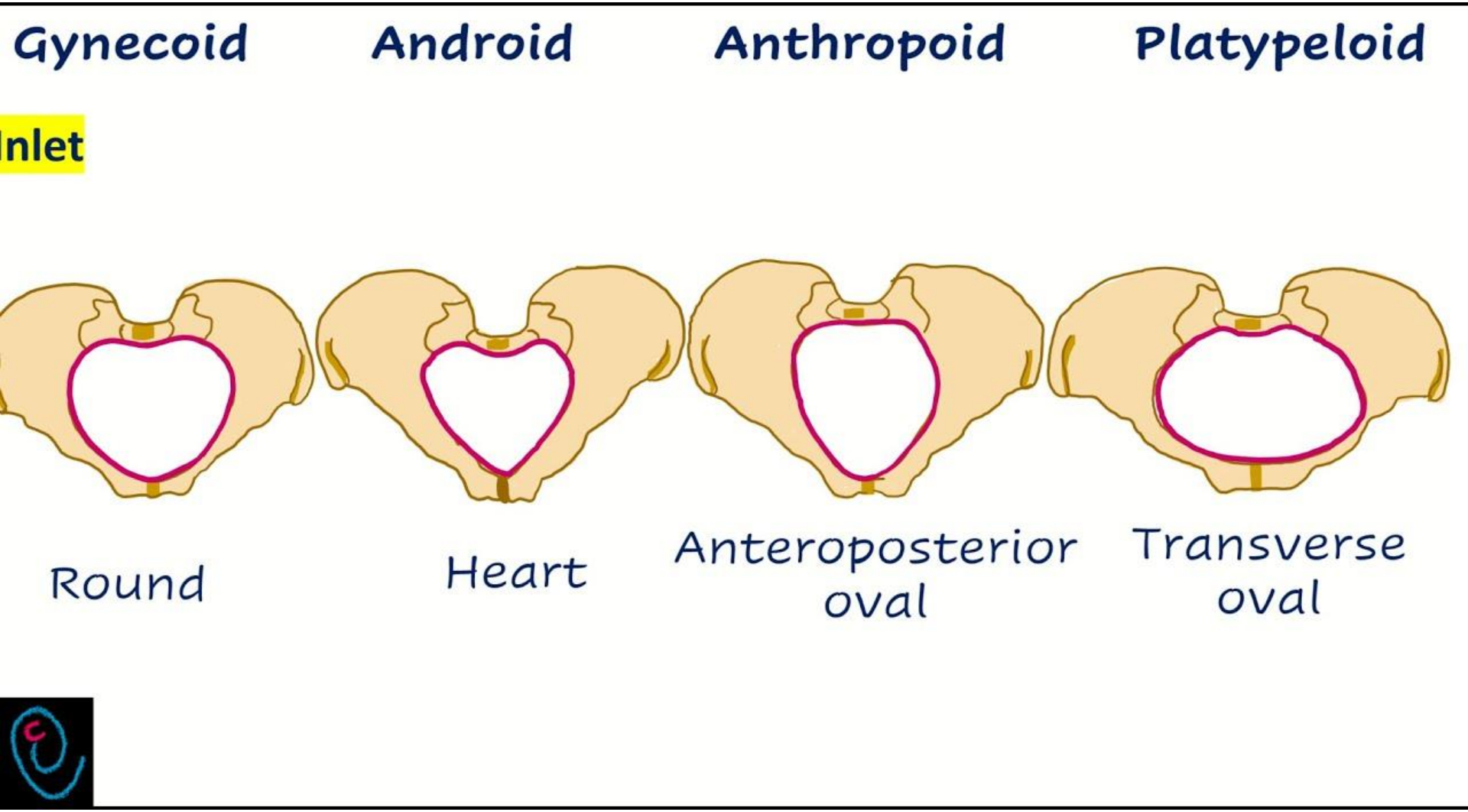
FEMALE

MALE



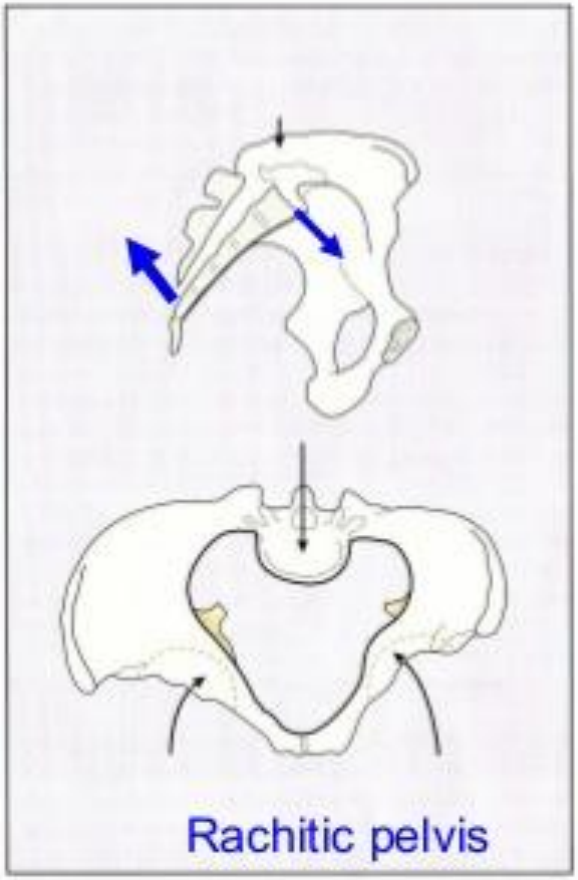
- Bones are lighter, thinner
- False pelvis is shallow
- Pelvic cavity is wide & shallow
- Pelvic inlet round/oval
- Pelvic outlet comparatively large
- Subpubic angle large
- Coccyx more flexible, straighter
- Ischial tuberosities more everted

- Bones heavier, thicker
- False pelvis is deep
- Pelvic cavity is narrow & deep
- Pelvic inlet heart-shaped + smaller
- Pelvic outlet comparatively small
- Subpubic angle more acute
- Coccyx less flexible, more curved
- Ischial tuberosities longer, face more medially


Gynecoid
Android
Anthropoid
Platypeloid
Inlet
Round
Heart
Anteroposterior oval
Transverse oval

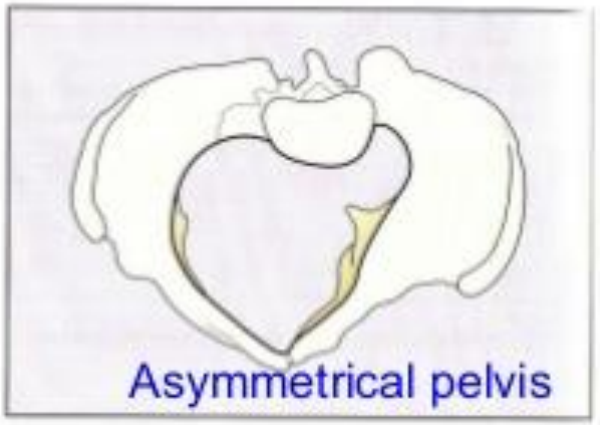
3. Rachitic pelvis

- This deformity is caused by rickets (due to Vit D deficiency)
- Sacrum is rotated so that the sacral promontory projects forward and coccyx tips backward
- AP diameter of inlet is therefore narrowed but the outlet is increased



4. Asymmetrical pelvis

- Asymmetry pelvis can be due to variety of causes such as scoliosis, poliomyelitis, pelvic fracture, congenital abnormality due to thalidomide etc



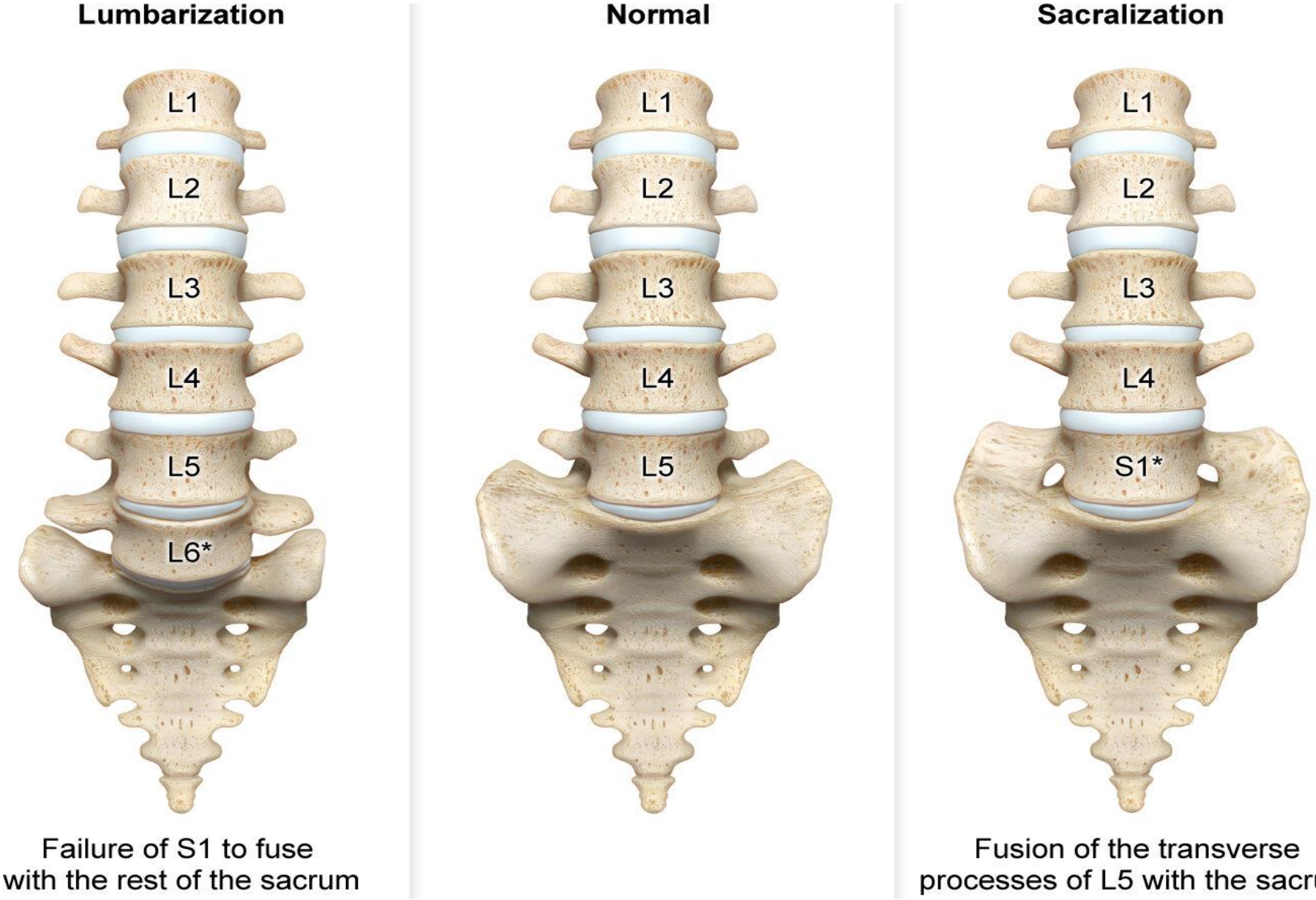
Core Knowledge

NORMAL PELVIC VARIANTS

	Gynaecoid	Android	Anthropoid	Platypelloid
Shape of inlet	Round	Heart-shaped / triangular	Long oval	Flat
Sacrosciatic notch	Wide	Narrow	Wide	Narrow
Side walls	Straight	Convergent	Straight	Straight
Ischial spine	Not prominent	Prominent	Not prominent	Not prominent
Subpubic angle	Wide	Narrow	Medium	Wide
Incidence in Asian women	80 %	0.6 %	15 %	6 %

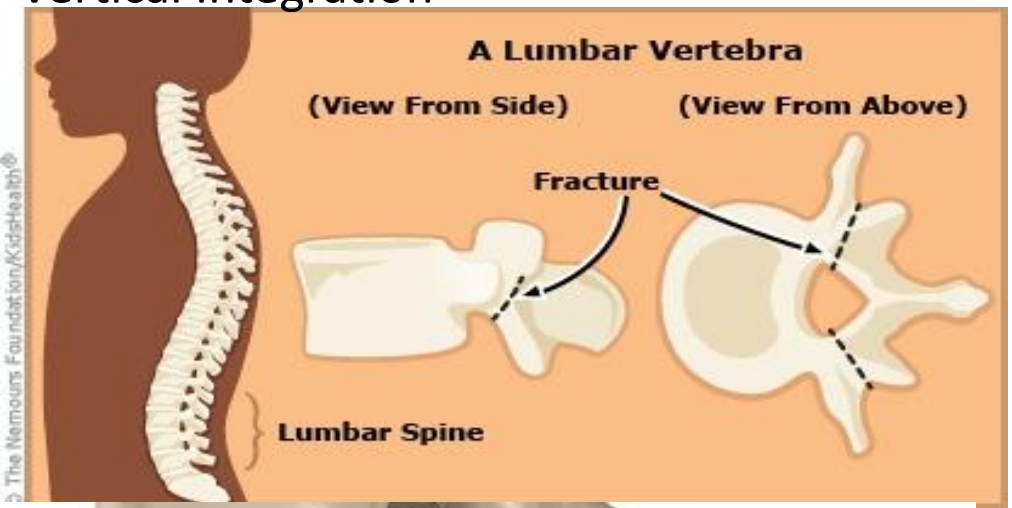
Vertical Integration

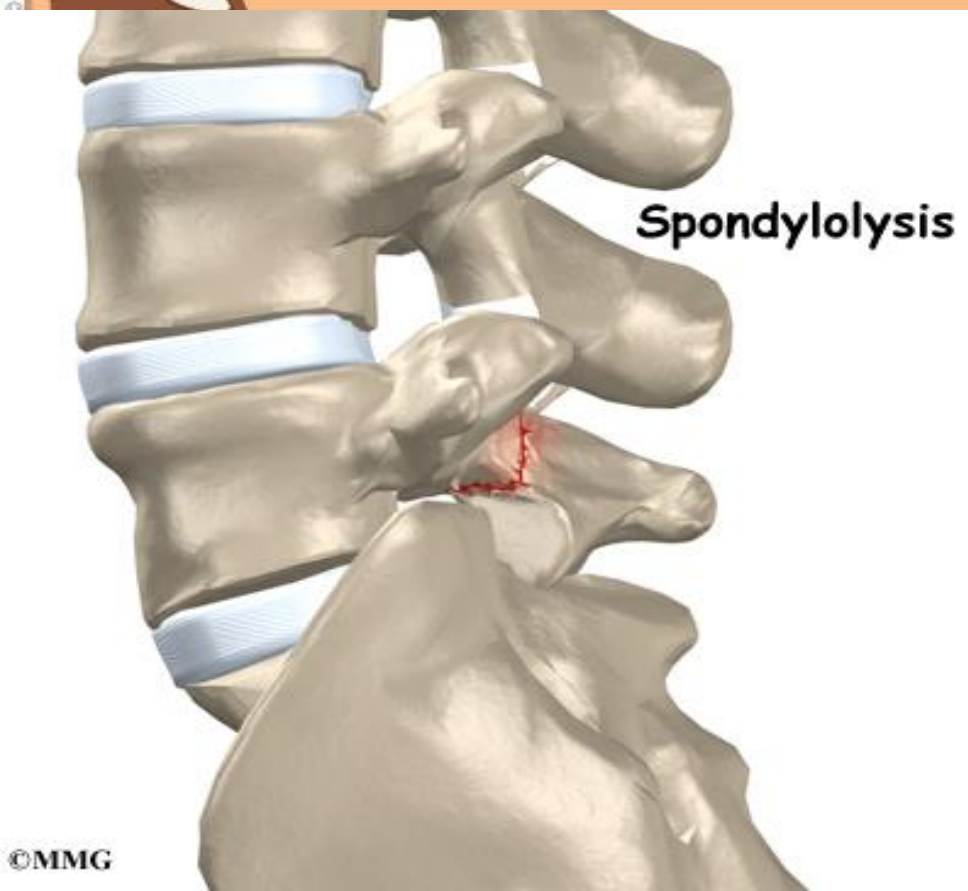
Lumbarization and sacralization



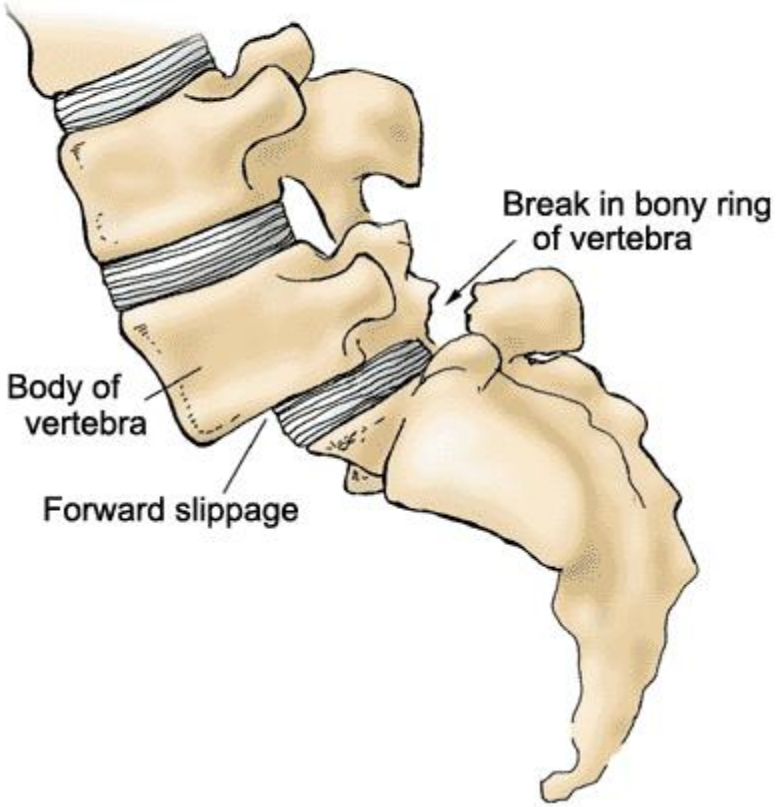
*Transitional lumbosacral vertebrae.

Vertical Integration





Spondylolisthesis



Vertical Integration

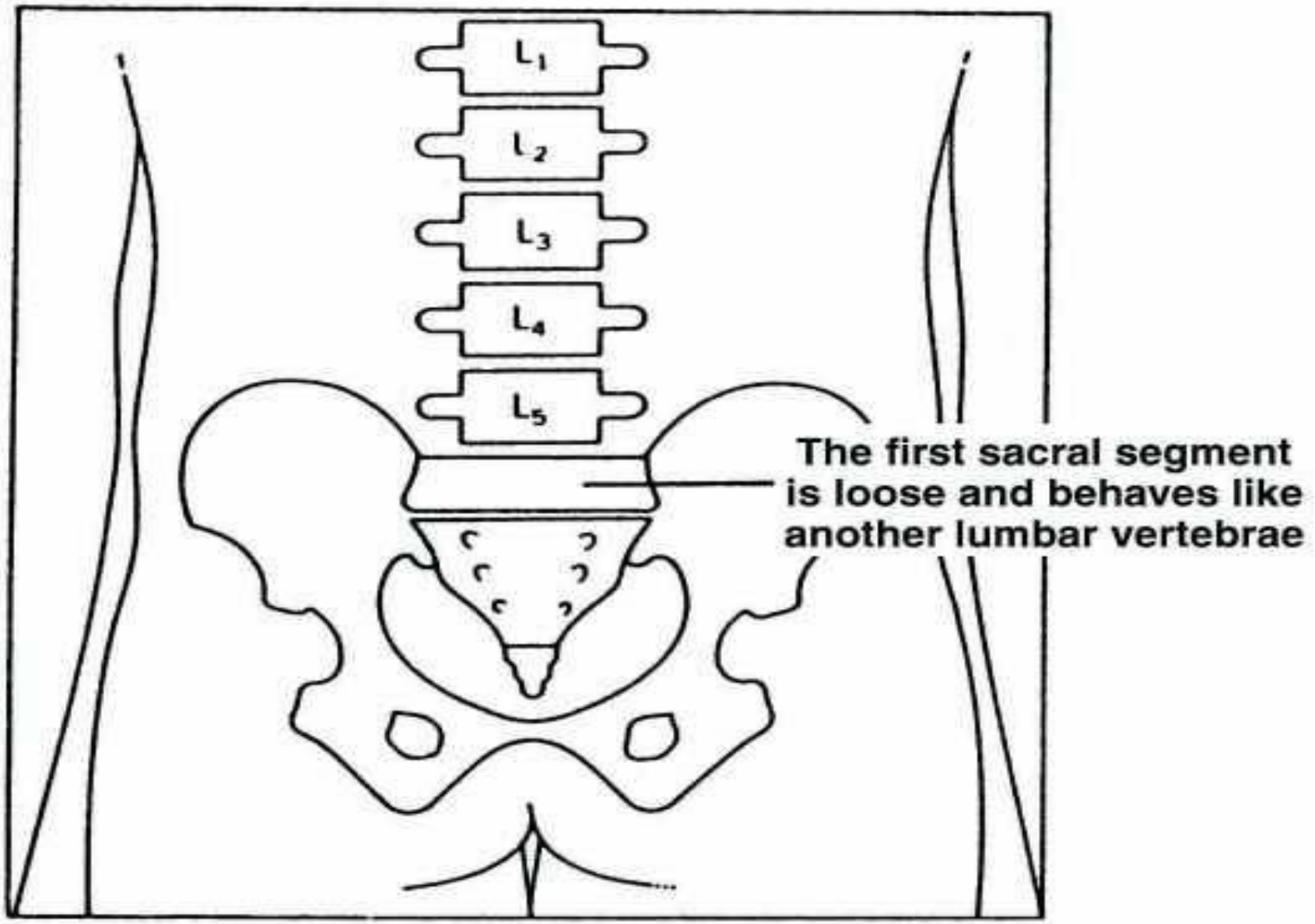
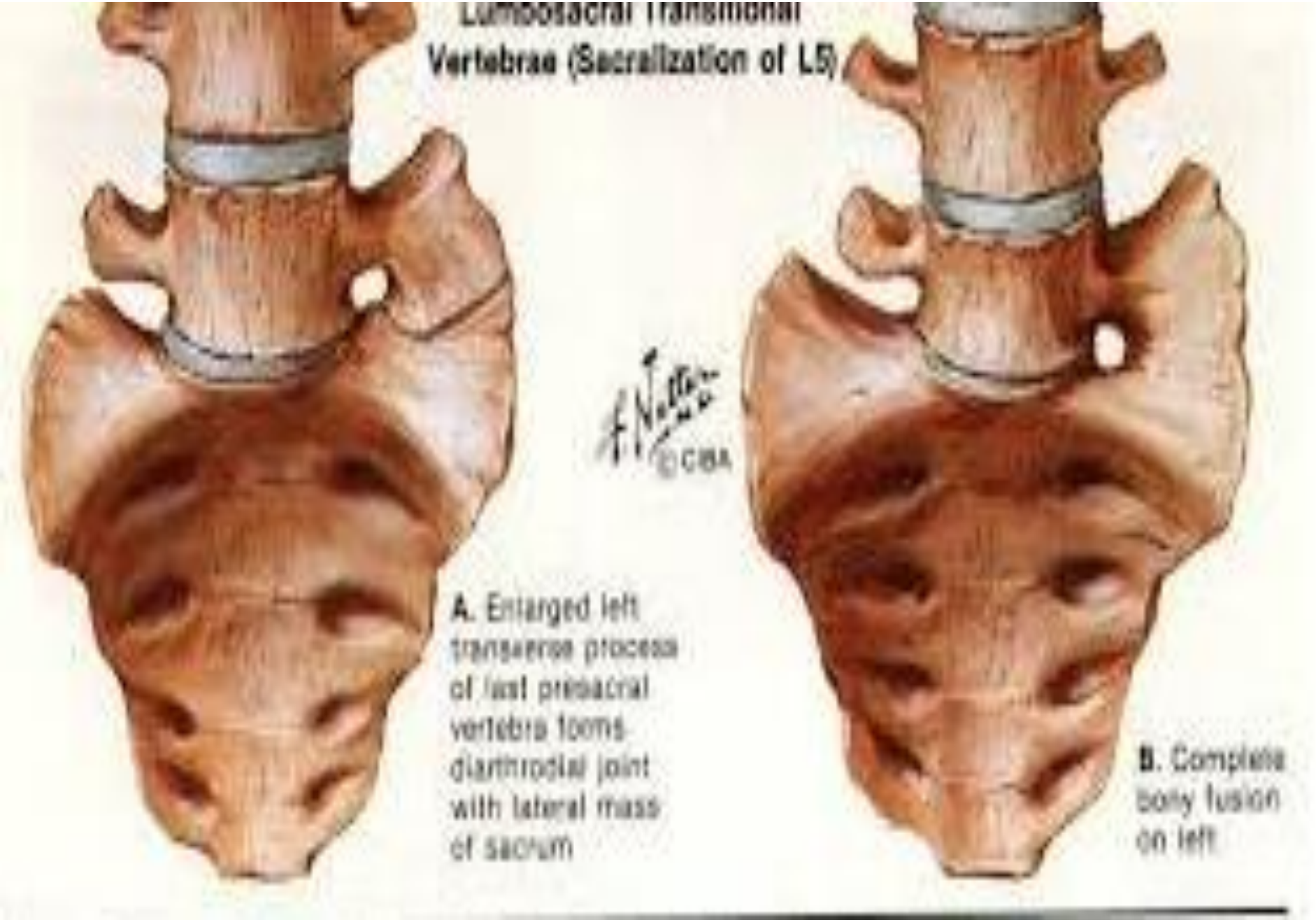


Figure 3.13.1 Lumbarisation.

Vertical Integration



Biomedical Ethics

Communication Skills

Interpersonal Skills in the Workplace

Active Listening	Affirming the speaker as they're talking and asking clarifying questions when they're done
Collaboration	Facilitating a brainstorm session with teammates to solve a problem together
Empathy	Regularly checking in with coworkers and offering space to talk about anything that's challenging them
Respect	Fostering an inclusive work environment by listening to everyone's contributions and opinions

Spiral Integration

Family Medicine & Professionalism

BACKGROUND

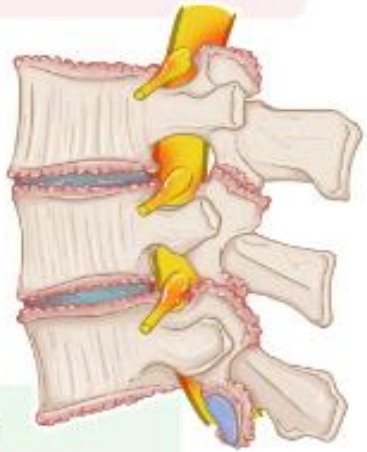
* RELIEF of BACK PAIN EXPERIENCED by SOMEONE with SPINAL STENOSIS when HUNCHED OVER

CAUSES

* SPINAL STENOSIS:
  - CONGENITAL
  - OSTEOARTHRITIS
  - DISC HERNIATION
  - TRAUMA

SIGNS & SYMPTOMS

* PAIN or CRAMPING in ONE or BOTH LEGS when STANDING or WALKING for LONG PERIODS
* NUMBNESS or TINGLING in FOOT or LEG
* WEAKNESS in FOOT or LEG
* BACK PAIN
* TYPICALLY NEUROLOGICAL EXAM is NORMAL
* LOSS of BLADDER CONTROL
* DIFFICULTY WALKING



DIAGNOSIS

* MRI

TREATMENT

* PHYSICAL THERAPY
* NSAIDs
* EPIDURAL INJECTIONS
* LAMINECTOMY
  - INCREASE SPACE around AFFECTED NERVES

OSMOSIS

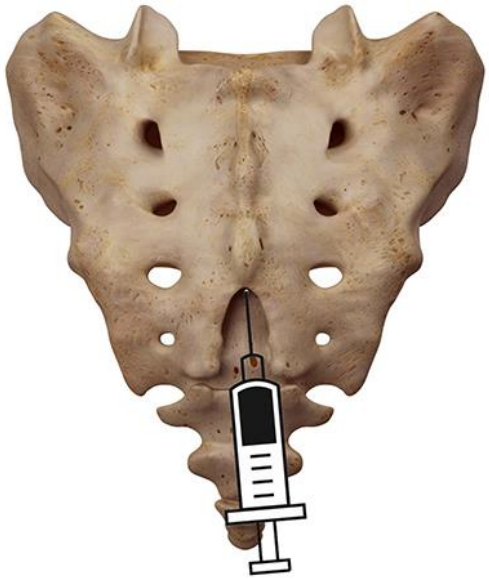


Figure 1. Posterior view of the injection in the hiatus.

Morphological and Morphometrical study of sacral hiatus in male and female sacrum of central Indian population

- **ABSTRACT** male and female sacrum Sacrum is a wedged shaped bone forming the caudal end of the vertebral column, formed by the fusion of five sacral vertebras. The opening present at the caudal end of sacral canal is known as sacral Hiatus. Epidural anesthesia is a special type of anesthesia, administered in sacral Hiatus. Anatomical landmarks and the knowledge of the actual shape and size of sacral hiatus and its variations play a major role in the success of caudal anesthesia.

- **RESULTS** In present study, it was observed that 31 (44.2%) sacrums were belongs to male and 39 (55.8%) were belongs to female. The most common shapes were Inverted V (54.3%) and Dumbell(42.8%) , least common shape was Inverted U

- **CONCLUSION** Identification of the caudal epidural space is not always possible even for experienced clinicians, and Anatomical variation may be an influence. The apex of the sacral hiatus is an important bony landmark in the success of CEB. There are anatomical variations in the sacral hiatus and the understanding of these variations may improve the success of caudal epidural Block which was reported by various workers in the previous studies. Insertion of a needle into the SH for caudal block is done at its base to avoid the anatomic variations of its apex.

Image-1: Inverted 'V' shape

Image-2: Dumbbell shape

Image-3: Inverted 'U' shape

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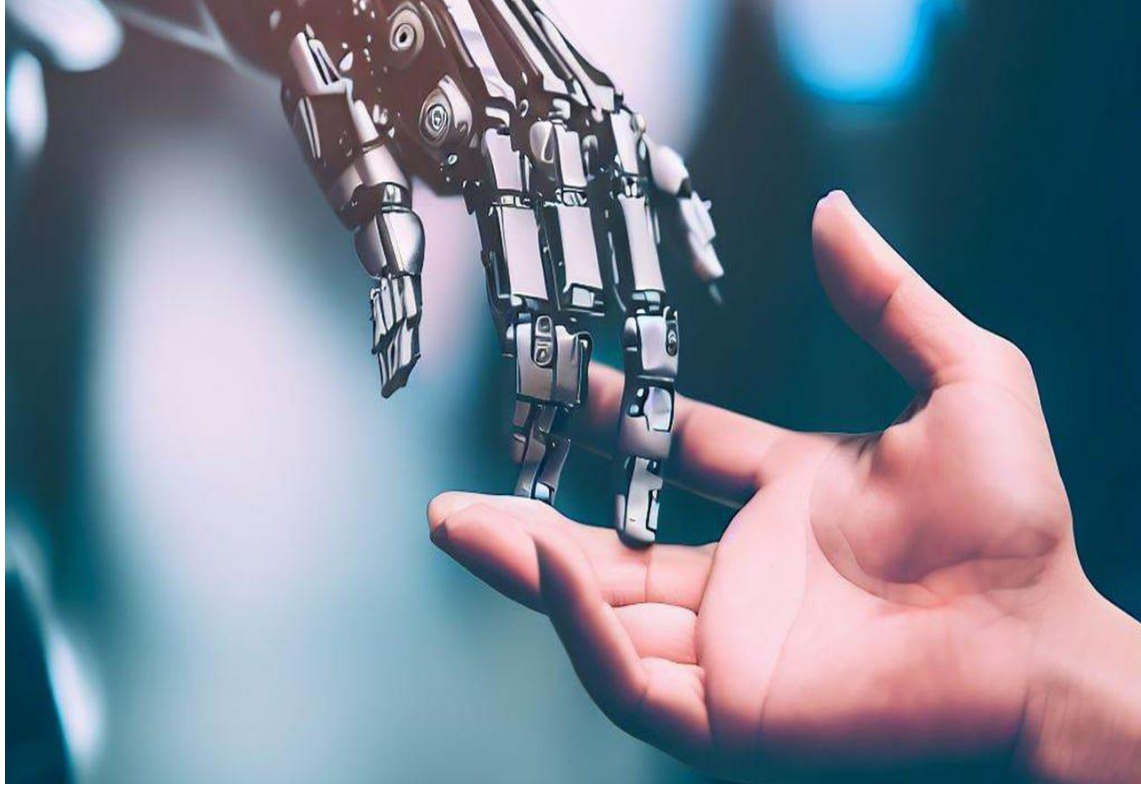
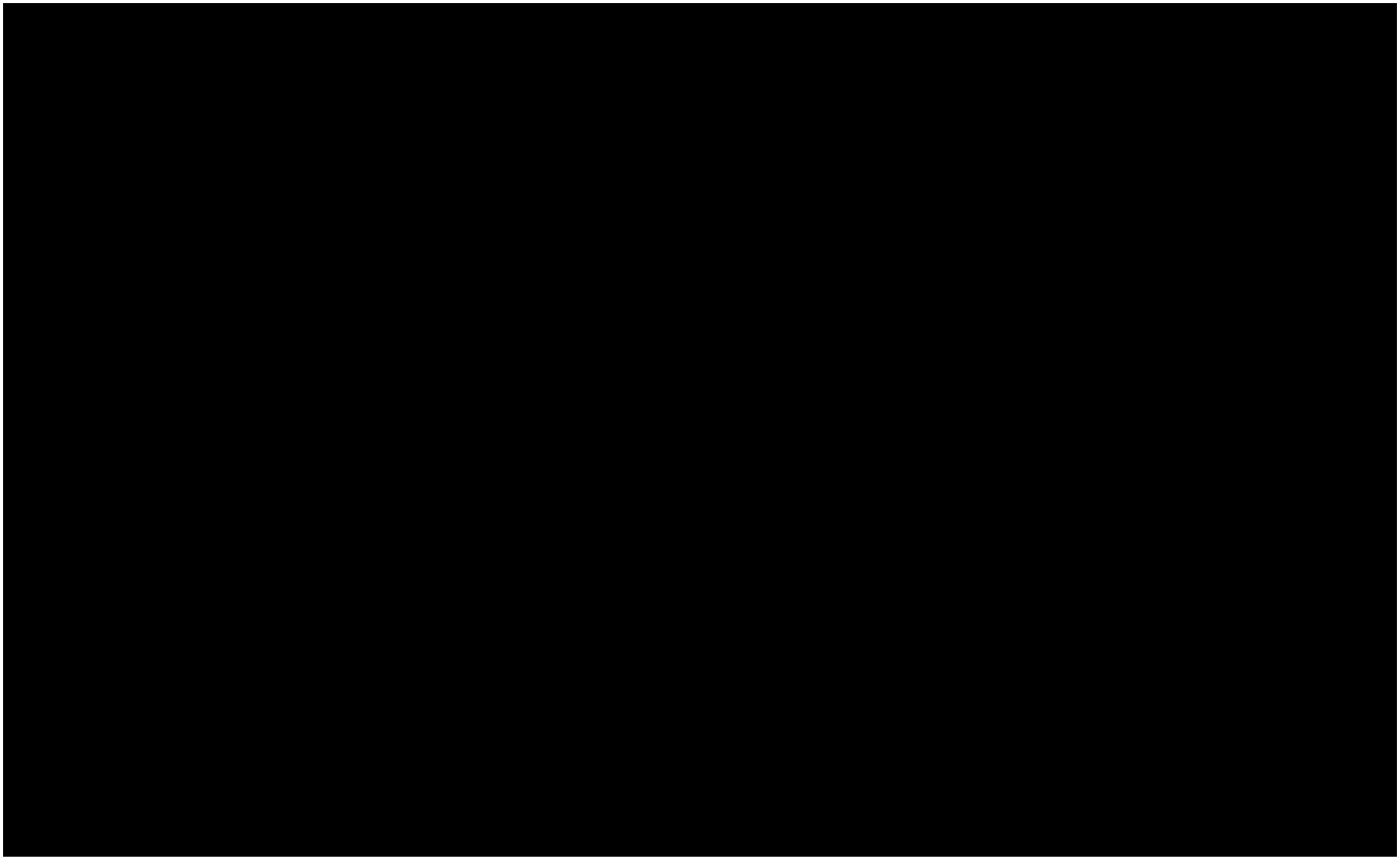
Artificial Intelligence



- AI-can potentially aid in enhancing diagnostic accuracy and efficiency
- AI-powered decision support system can also help clinicians in selecting appropriate treatment modalities
- AI-driven predictive models may help anticipate the risk of complications and recurrence in susceptible populations

Video




thank you