ANATOMY OF THE

Lower Limb

Professor

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- Overview
- Osteology

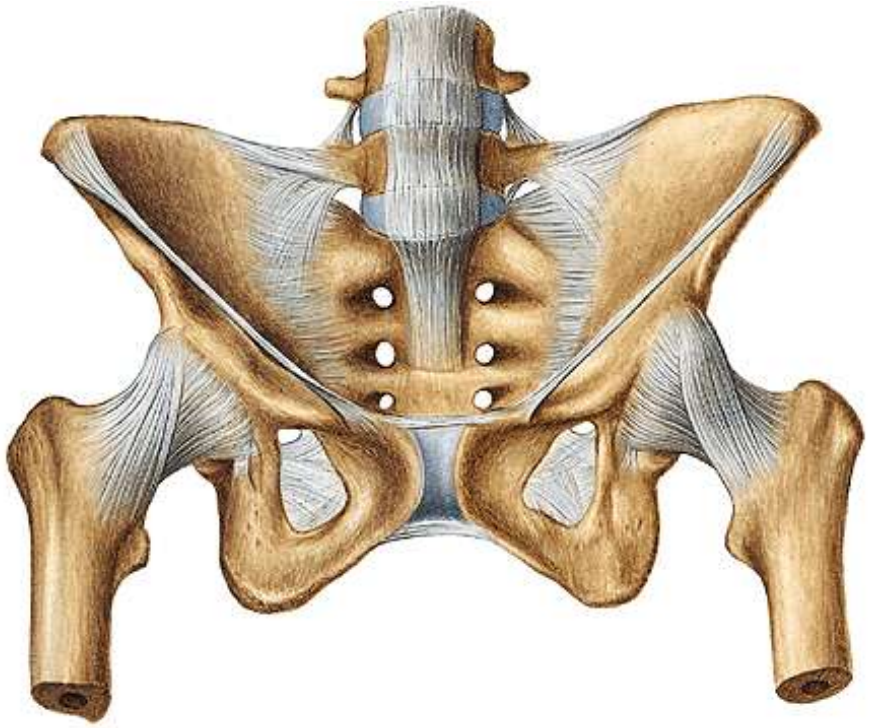
- To define the main functions of lower limbs
- To list the bony skeletal parts & describe them
- To describe the way of attachment of lower limbs to the trunk
- To describe various movements & innervations

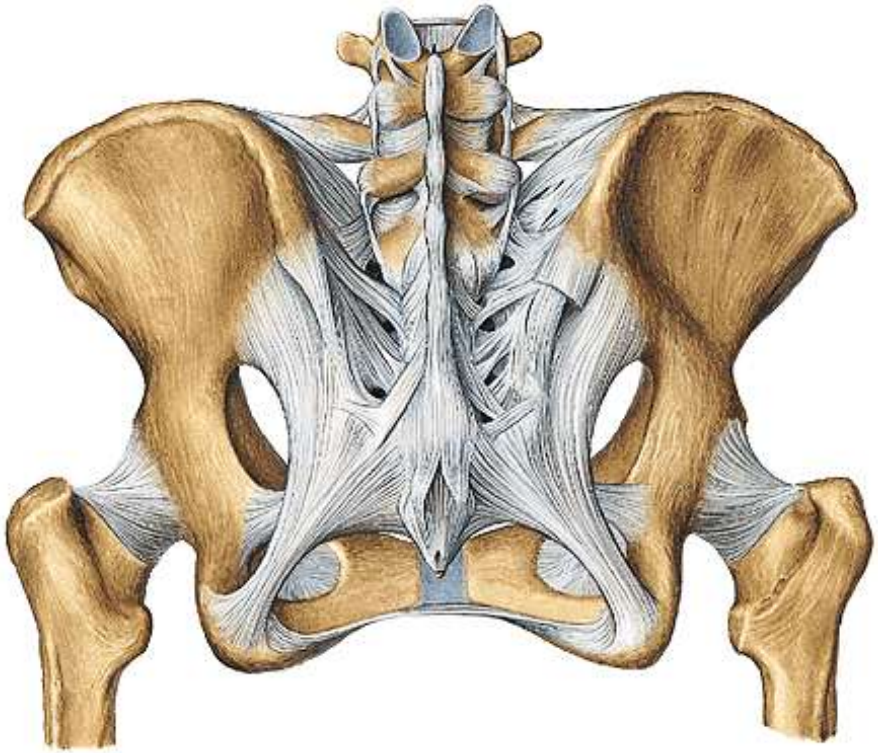
-Lower limbs are the weight bearing & locomotor organs

-The sacrum is the site where the whole weight of the upper part of the body is supported through its articulation with L5

-The sacroiliac joint transmits this weight to the hip bones

-The hip joint will carry most of this weight to the lower limb bones, the to the ground

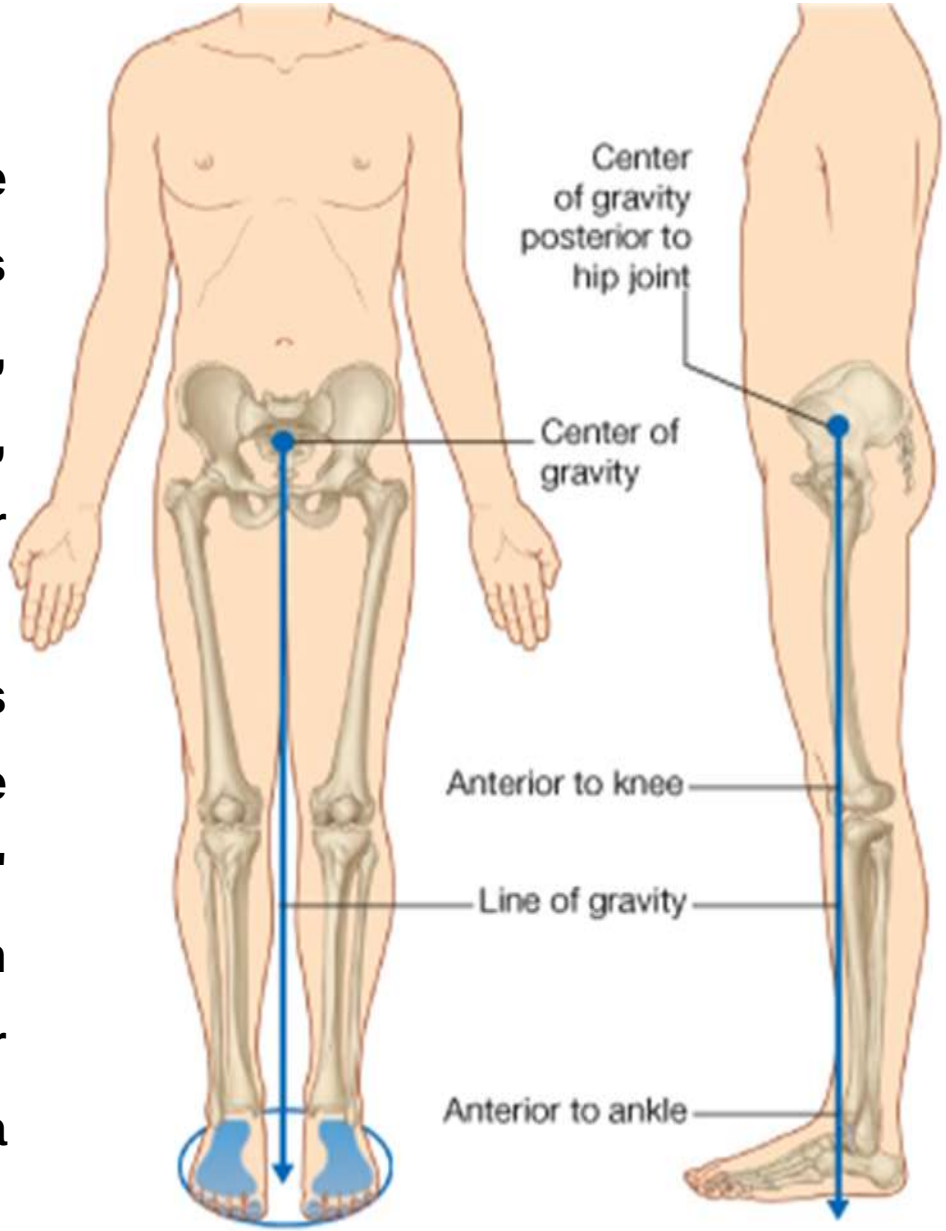




Functions:

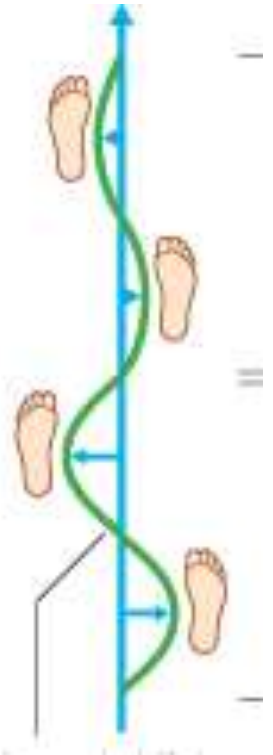
1- Weight support:

- When standing erect, a vertical line through the center of gravity is slightly posterior to the hip joints, anterior to the knee and ankle joints, and directly over the almost circular support base formed by the feet.
- The organization of ligaments together with the shape of the articular surfaces facilitates 'locking' of these joints into position when standing, so reducing the muscular energy required to maintain a standing position.

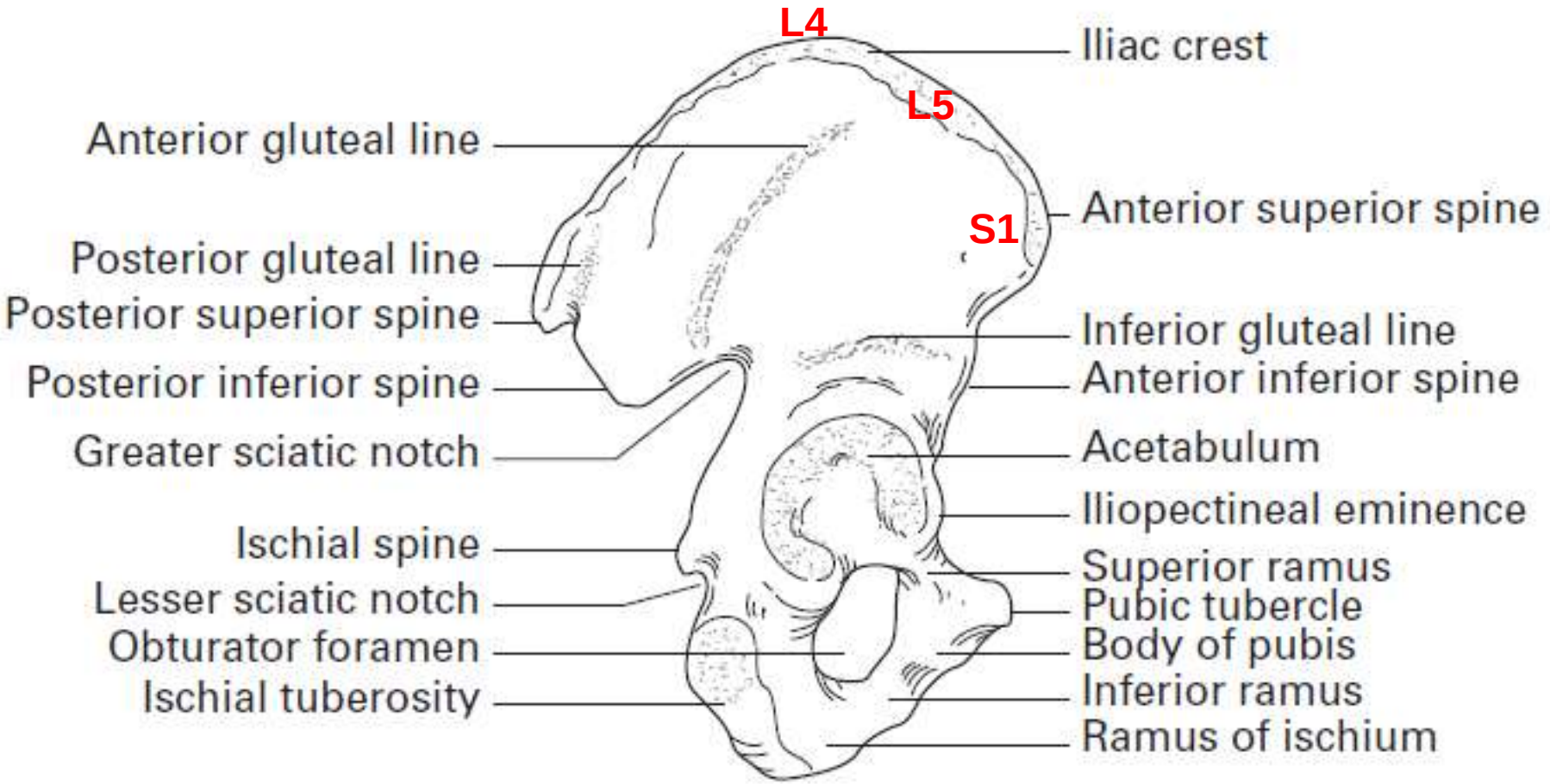


2- Locomotion:

- During walking, many anatomical features of the lower limbs contribute to minimizing fluctuations in the body's center of gravity and so reduce the amount of energy needed to maintain locomotion
- They include pelvic tilt in the coronal plane, pelvic rotation in the transverse plane, movement of the knees toward the midline, and complex interactions between the hip, knee, and ankle

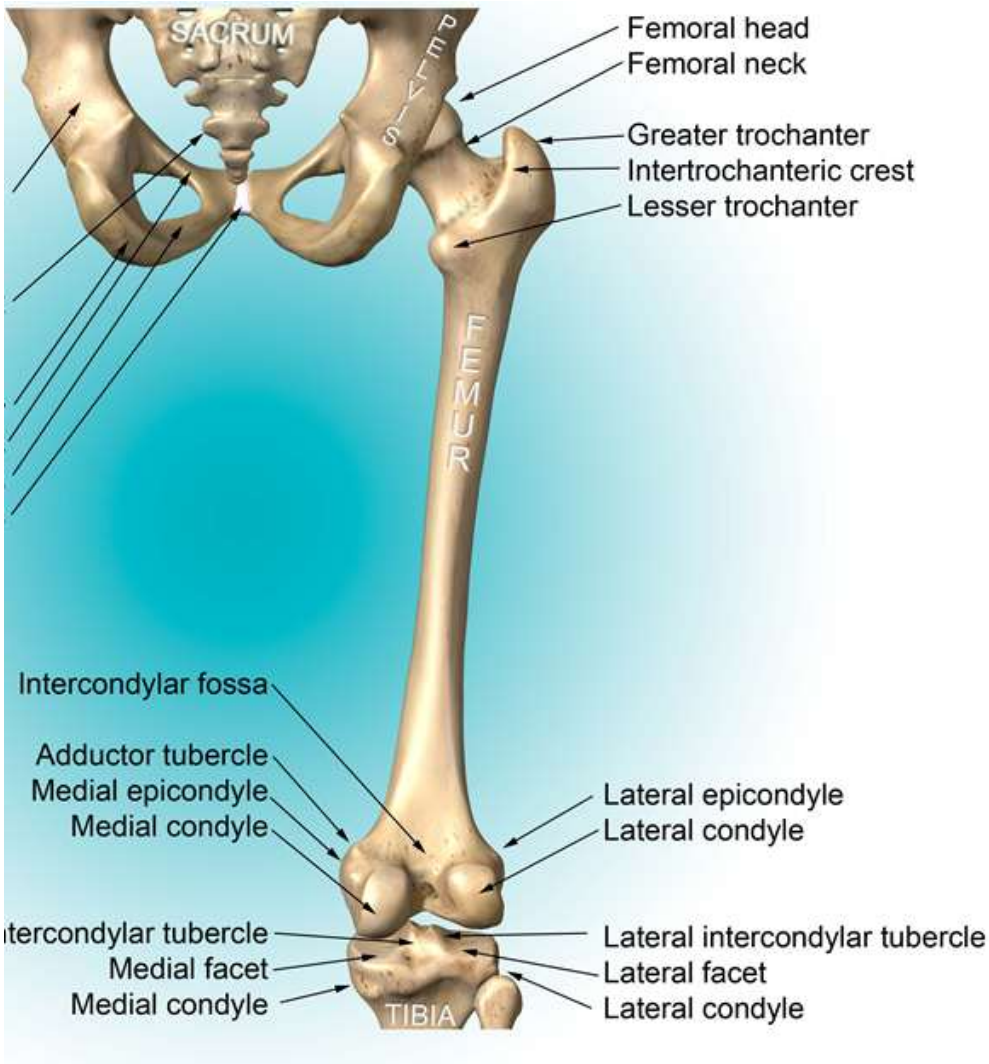


Parts:

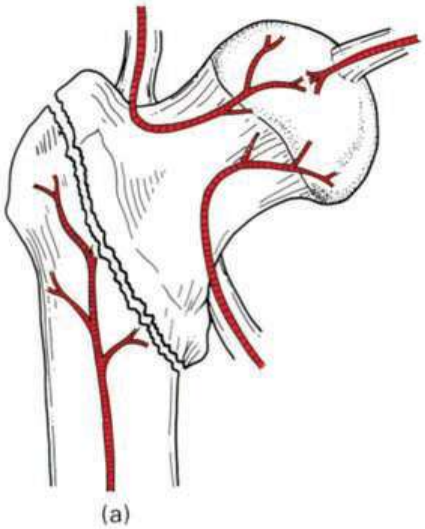

L4
L5
S1
Iliac crest
Anterior gluteal line
Anterior superior spine
Posterior gluteal line
Posterior superior spine
Inferior gluteal line
Posterior inferior spine
Anterior inferior spine
Greater sciatic notch
Acetabulum
Iliopectineal eminence
Ischial spine
Superior ramus
Lesser sciatic notch
Pubic tubercle
Obturator foramen
Body of pubis
Ischial tuberosity
Inferior ramus
Ramus of ischium

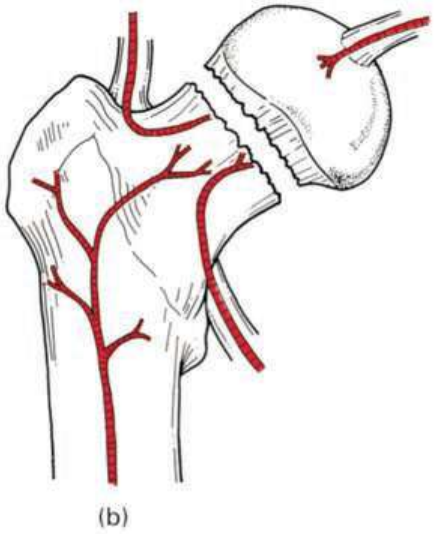
The femur:

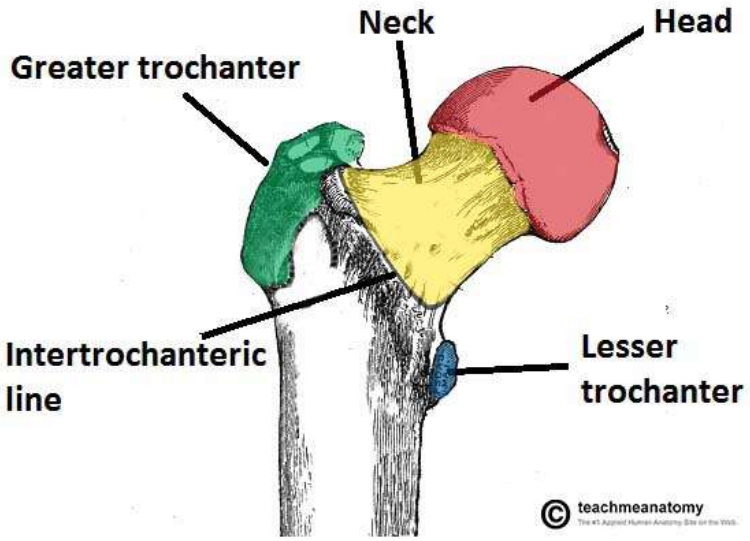
- Largest, longest, strongest bone in the body!!
- Receives a lot of stress
- Courses medially (more in women)

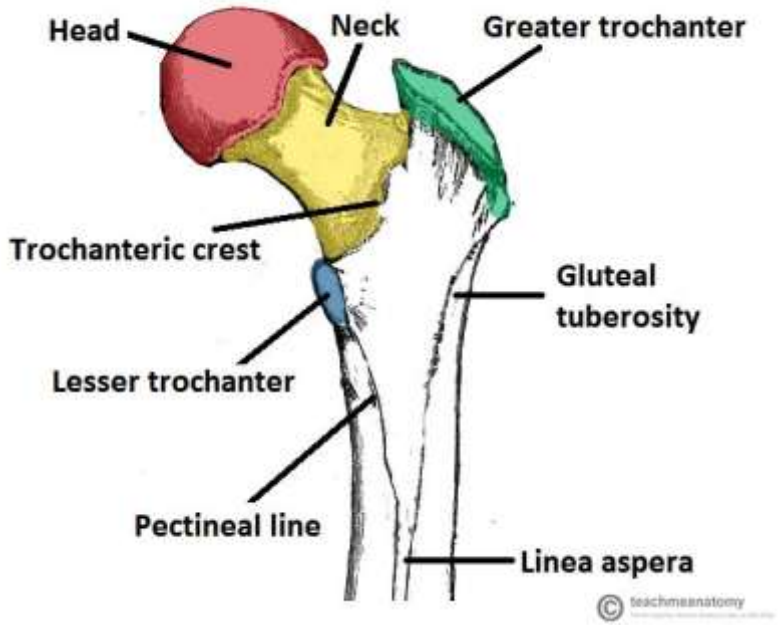


Upper end & blood supply:

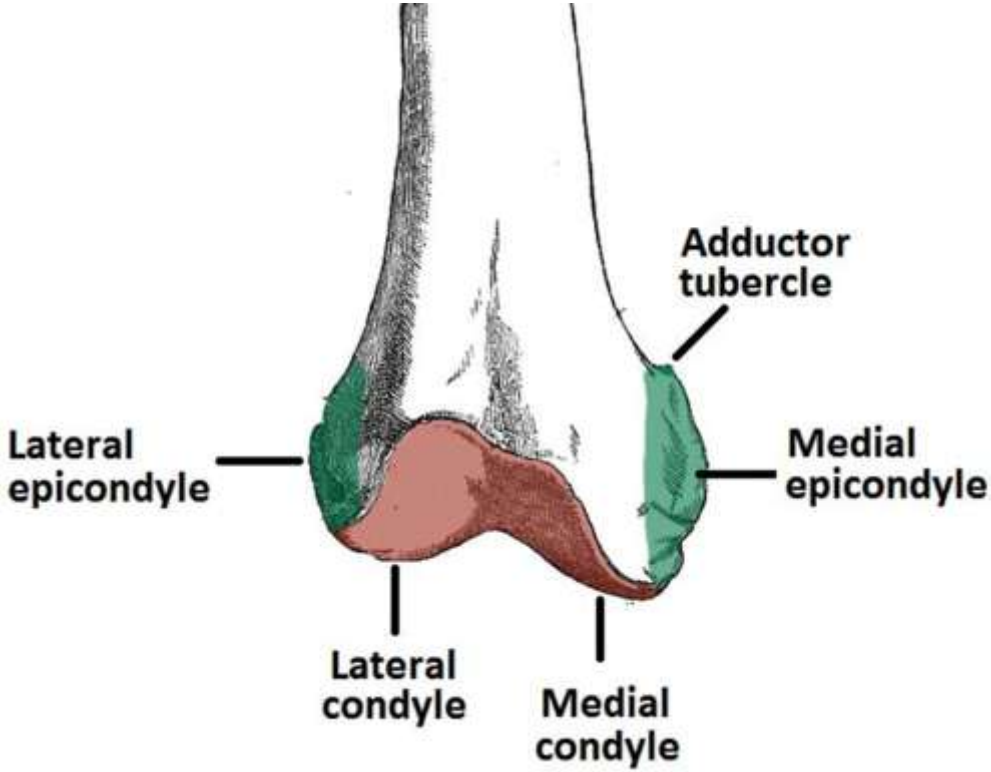






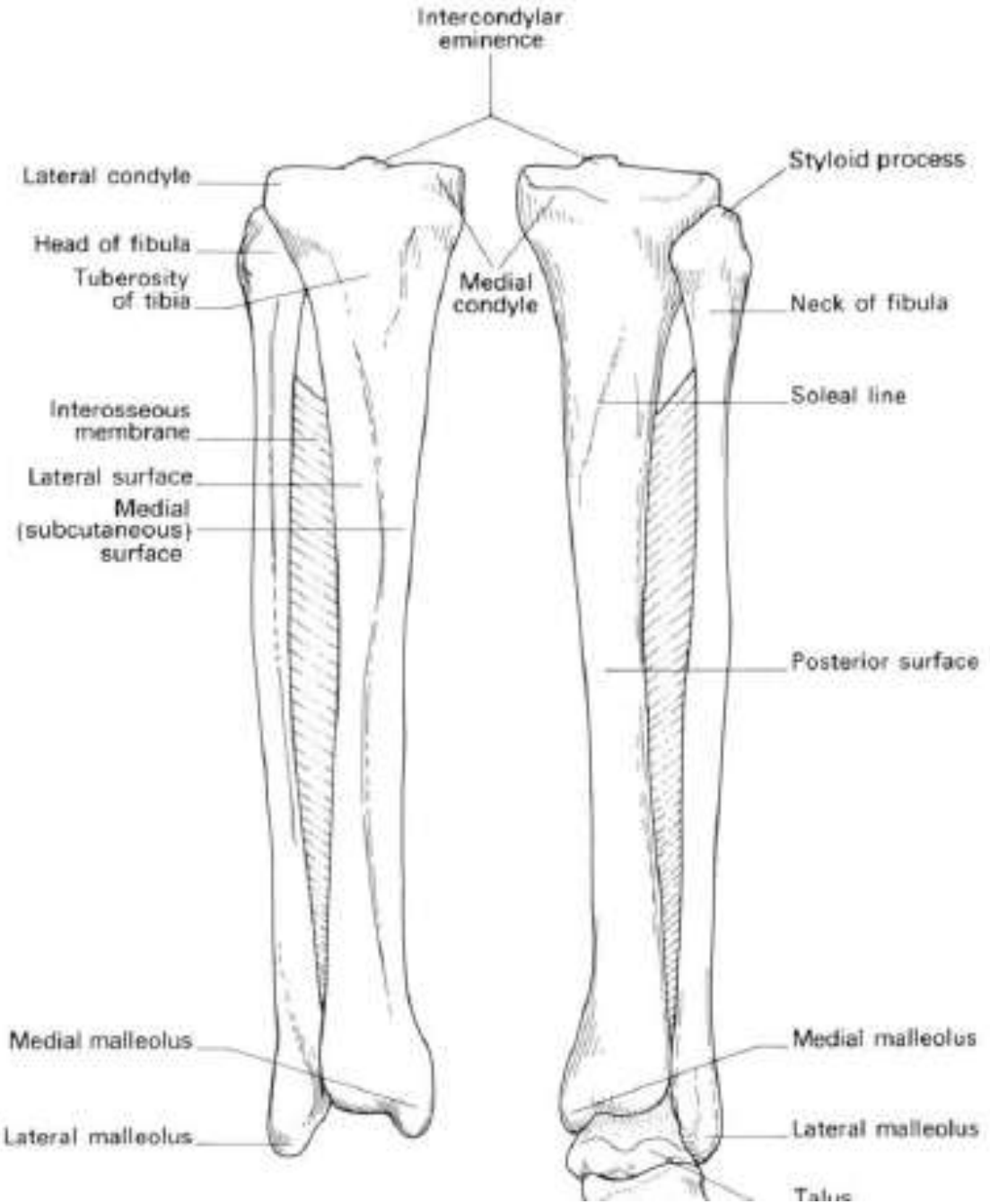


Lower end & patellofemoral articulation:



The leg bones:

- **Tibia**
  - Receives the weight of body from femur and transmits to foot
  - Second to femur in size and weight
  - Articulates with fibula proximally and distally
- **Fibula**
  - Does NOT bear weight
  - Muscle attachment
  - Not part of knee joint
  - Stabilize ankle joint



The foot:

- Function:
  - Supports the weight of the body
  - Act as a lever to propel the body forward
- Parts:
  - Tarsals
    - Talus = ankle
      - Between tibia and fibula
      - Articulates with both
    - Calcaneus = heel
      - Attachment for Calcaneal tendon
      - Carries talus
    - Navicular
    - Cuboid
    - Medial, lateral and intermediate cuneiforms
  - Metatarsals
  - Phalanges

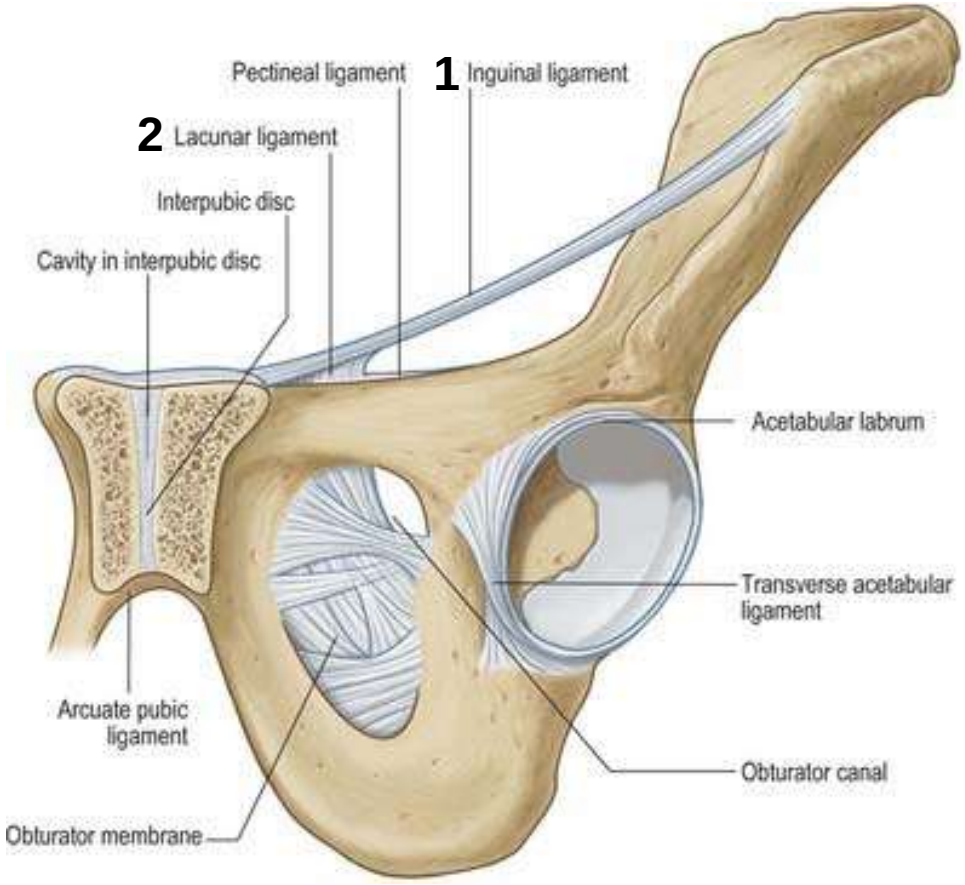
Important ligaments:

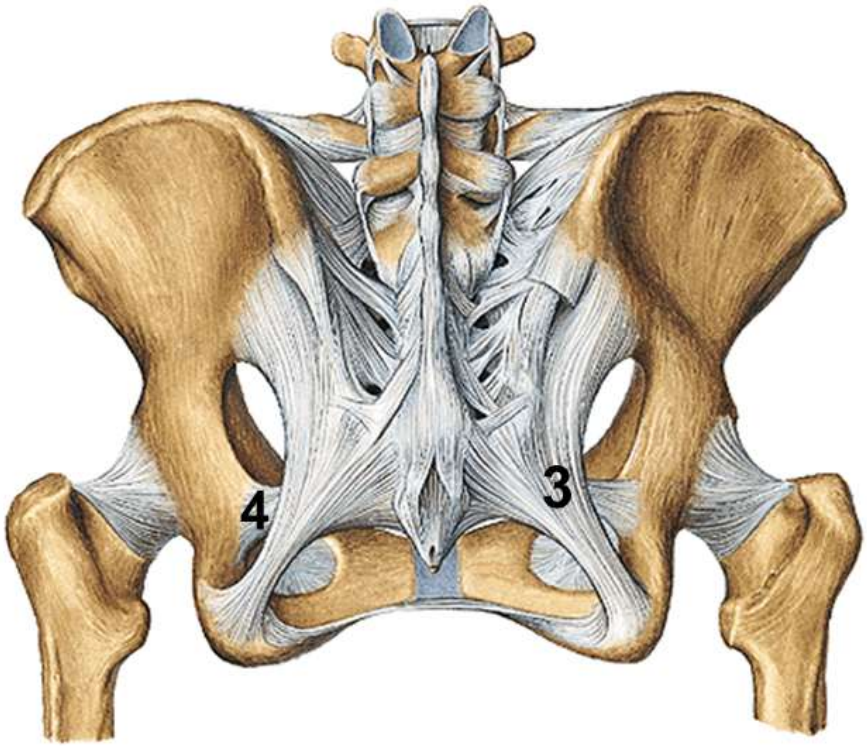
1- The inguinal ligament: extends between the anterior superior iliac spine & pubic tubercle.

2- Lacunar ligament: Lies behind the medial end of IL

3- Sactotuberous ligament: between the sacrum & ischial tuberosity

4- Sacrospinous ligament: between the sacrum & ischial spine



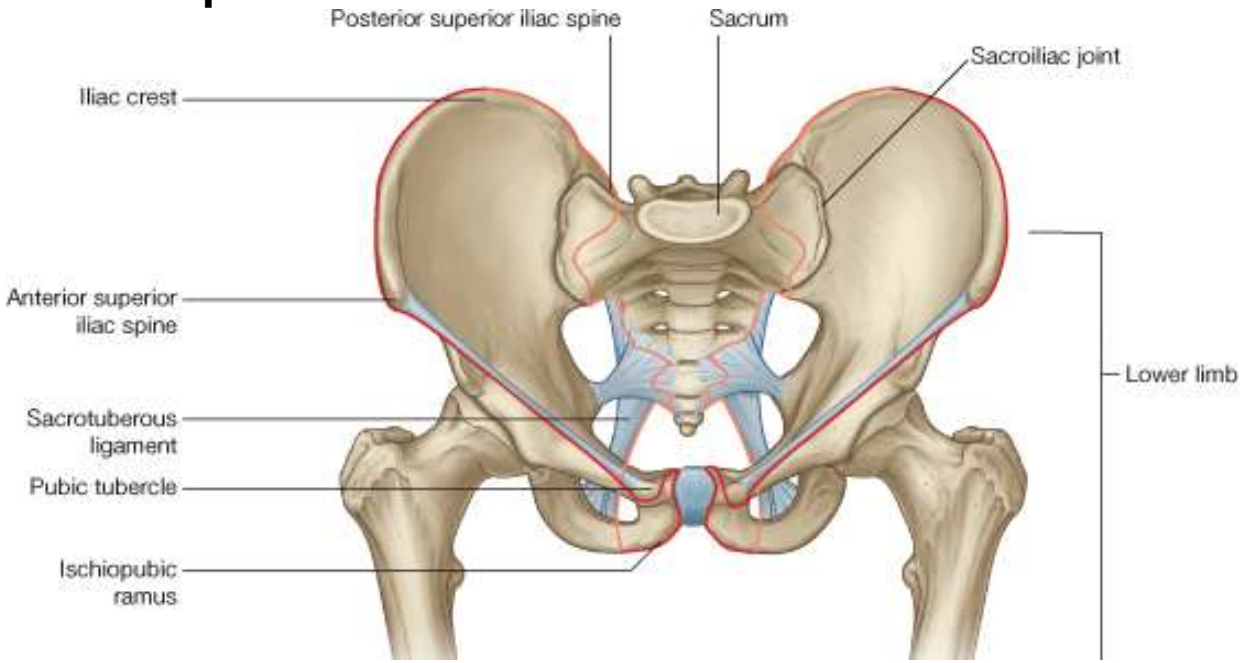


Lines of demarcation:

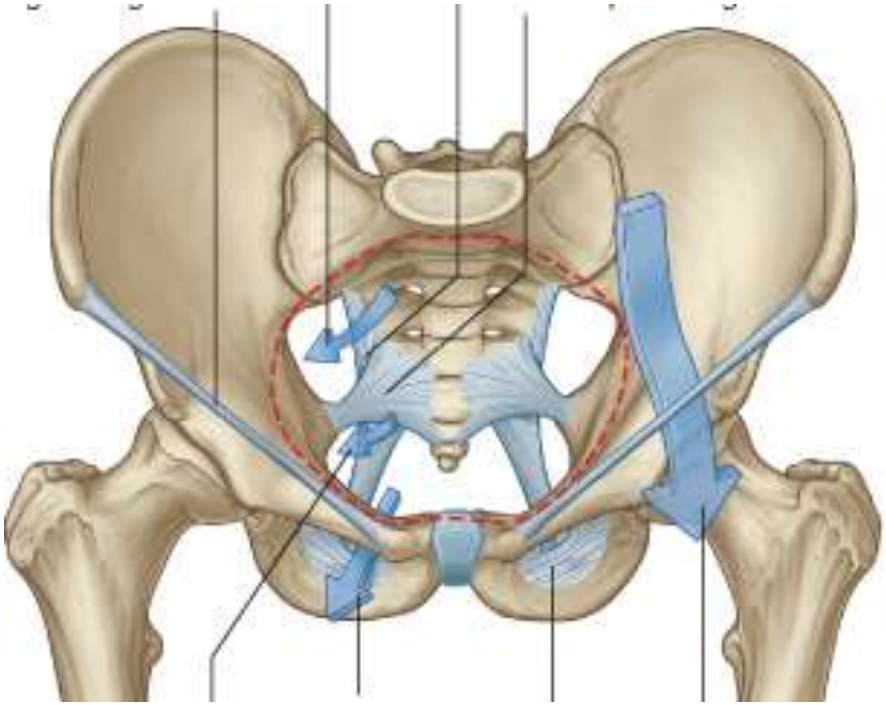
1- Between the pubic tubercle with the anterior superior iliac spine (position of the inguinal ligament) & extends to the PSIS to separate the lower limb from the anterior and lateral abdominal walls

2- Between PSIS & the coccyx to separate the lower limb from the muscles of the back

3- Between the medial margin of the sacrotuberous ligament, the ischial tuberosity, the ischiopubic ramus, and the pubic symphysis to separate the lower limb from the perineum



Unlike in the upper limb where most structures pass between the neck and limb through a single axillary inlet, in the lower limb, there are four major entry and exit points:



Pathway	Lower limb part	Body part
Gap between inguinal L & hip	Femoral triangle	Iliac fossa
Greater sciatic foramen	Gluteal region	Pelvis
Obturator canal	Medial compartment	Pelvis
Lesser sciatic foramen	Gluteal region	Perineum

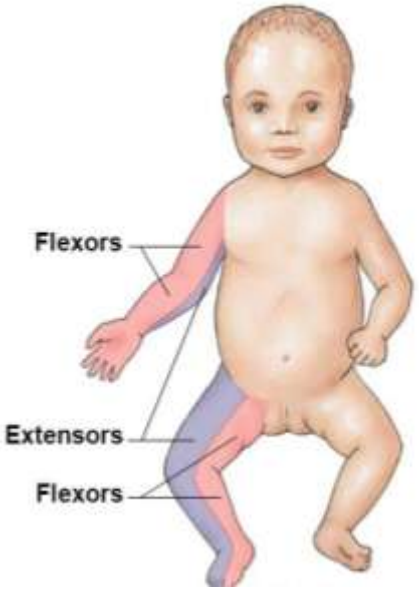
Embryological rotation:

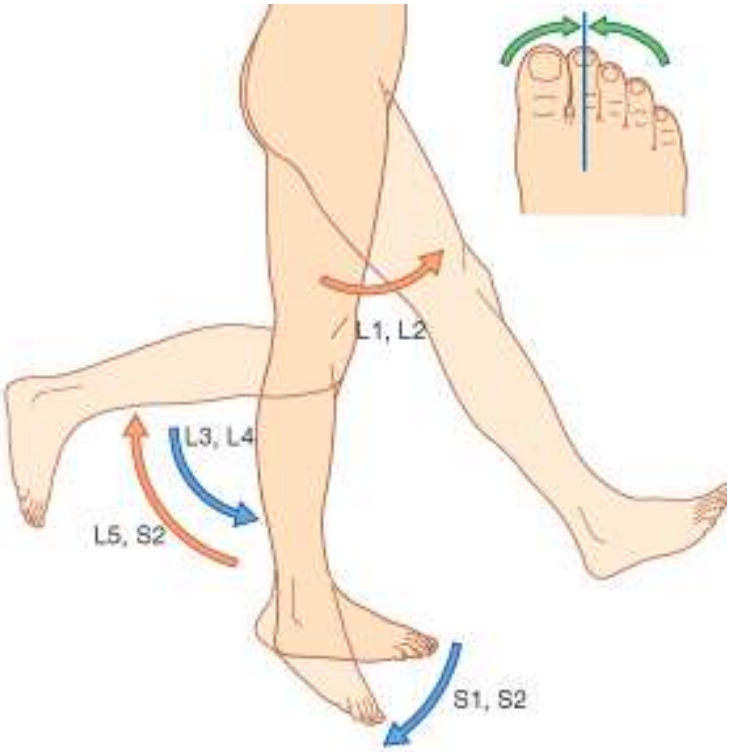
The LL bud had rotated in utero so that:

-Flexion of the hip remained the ventral movement of the thigh against anterior abdominal wall, while hip extension is the reverse

-Knee flexion is the posterior movement of the leg while extension is the ventral movement (straightening the leg)

-Dorsiflexion of the ankle is to move toes off the ground while plantar flexion is to press the ground by toes





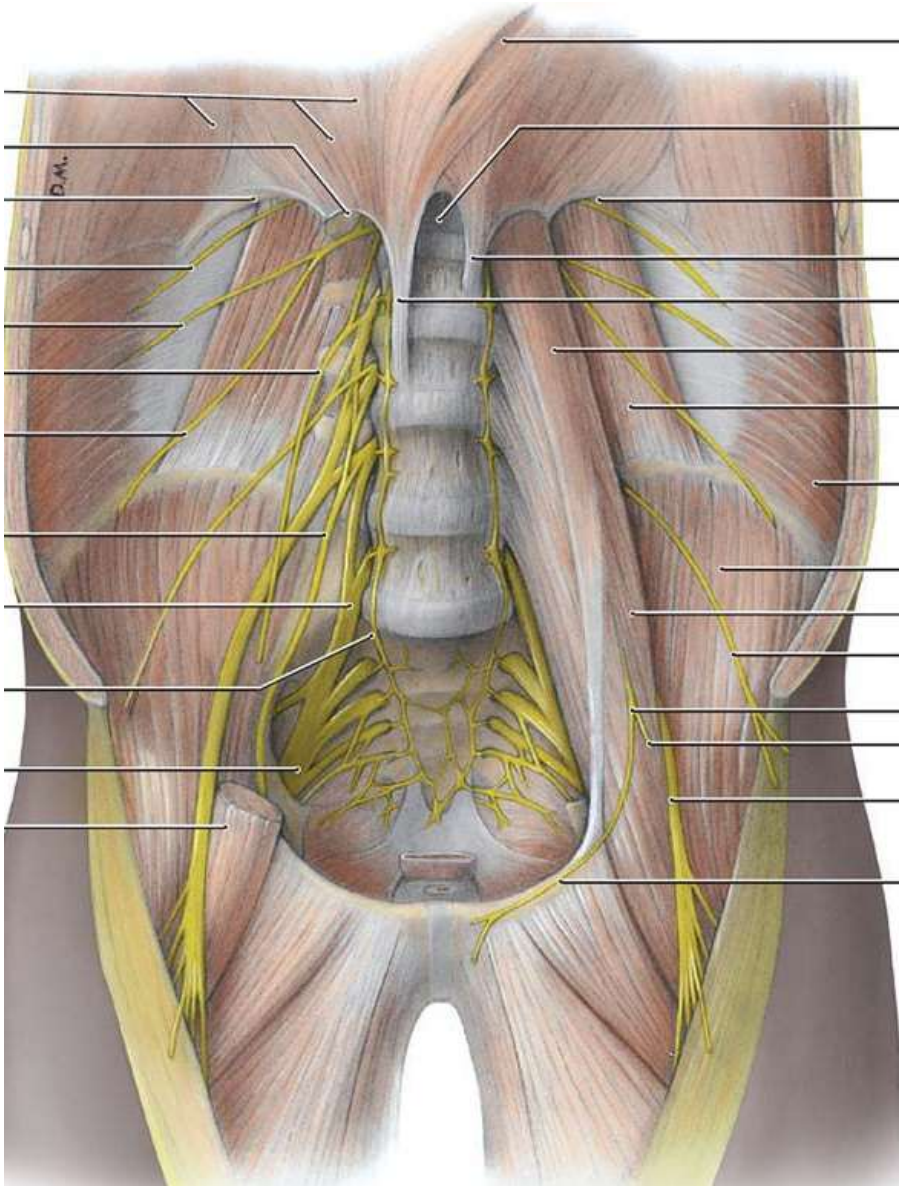
Lumbar plexus:

-The anterior primary rami of L1-L5 once leave the vertebral canal lie within psoas major substance

-They supply it & quadratus lumborum segmentally

-They divide into anterior & posterior divisions then re-unite within the muscle to give the branches

-All branches leave through psoas major in the posterior abdominal wall

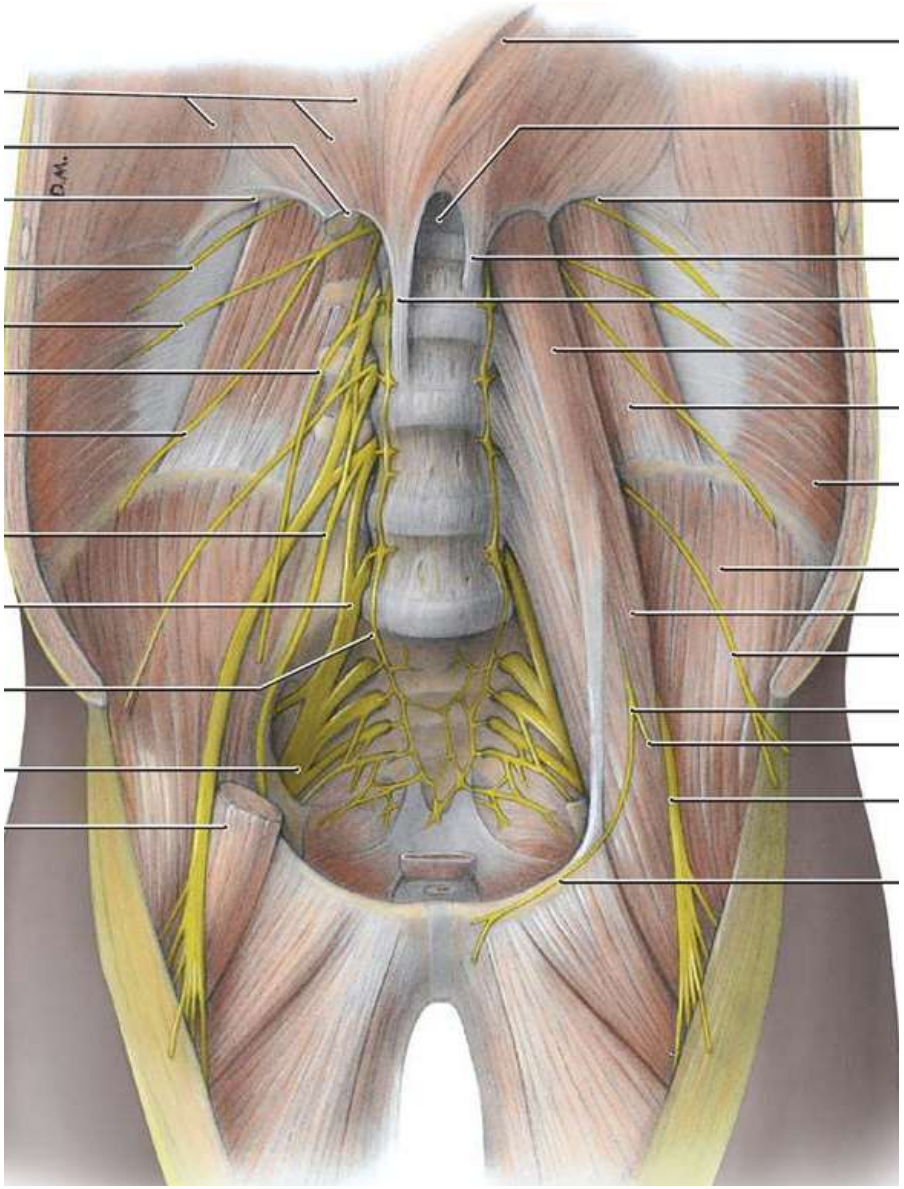


-**L1 goes to the abdomen & external genitalia**

-**L2-4 give the thigh nerves**

-**The reminder of L4 + L5 enter the pelvis as the lumbosacral trunk**

-**LS trunk shares with the sacral nerves in the formation of sacral plexus which will supply the rest of the lower limb & the pelvis**



Rules of innervation in the limbs:

-**Plexus roots are the anterior primary rami of corresponding spinal nerves (not the roots of spinal nerve)**

-**Most proximal muscles are supplied by highest roots of the plexus**

-**Flexor, adductor & medial rotator muscles are supplied by anterior plexus divisions**

-**Extensor, abductor & lateral rotator muscles are supplied by posterior plexus divisions**