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**Class BS DT**  
**SECTION B**  
**FINAL TERM viva**



# QUESTION

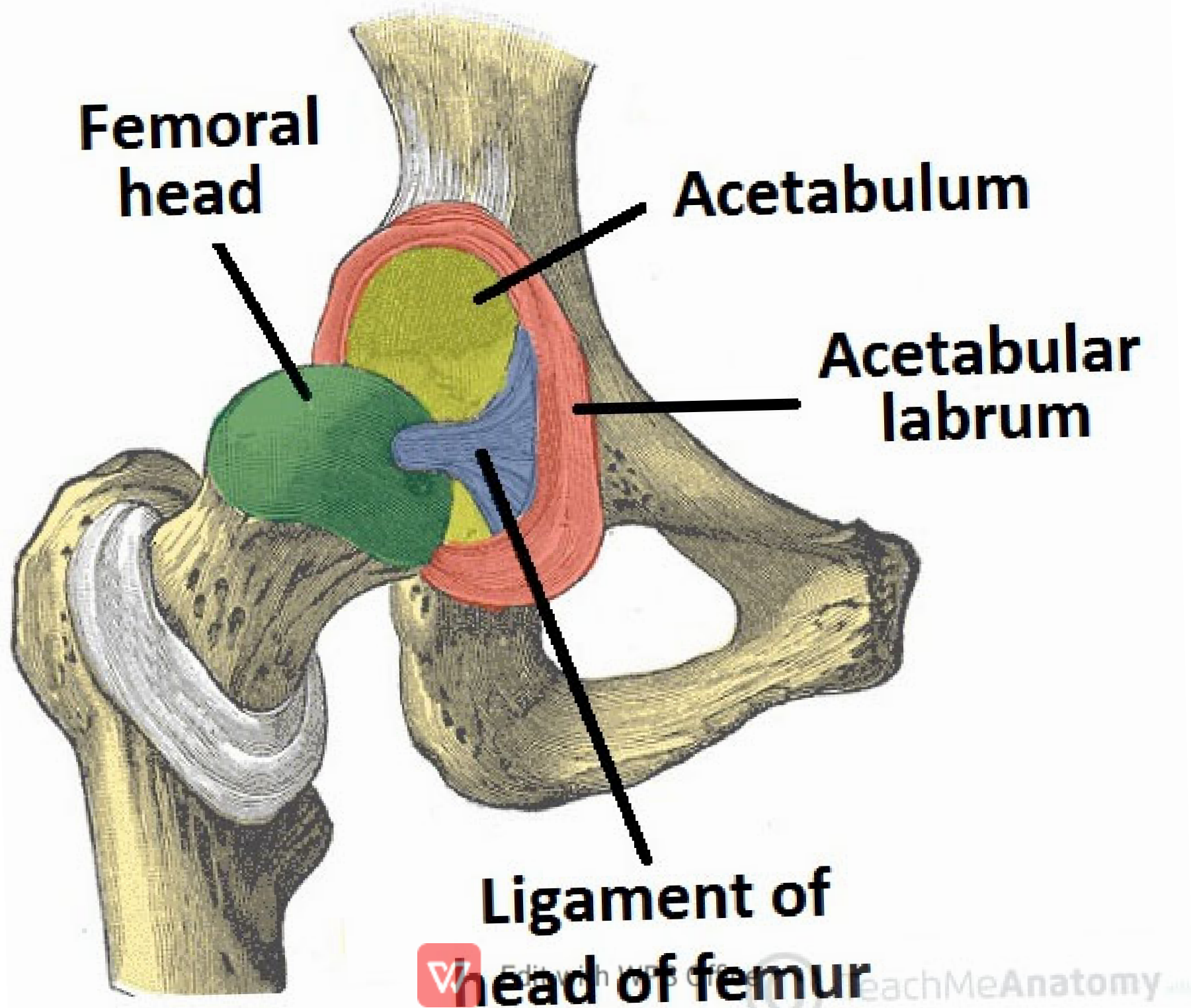
- Write a comprehensive note on hip joint



# HIP JOINT

- The hip joint is a ball and socket type of synovial joint that connects the pelvic girdle to the lower limb. In this joint, the head of the femur articulates with the acetabulum of the pelvic hip bone





**Femoral head**

**Acetabulum**

**Acetabular labrum**

**Ligament of head of femur**

- The hip joint is a multiaxial joint and permits a wide range of motion flexion, extension, abduction, adduction, external rotation, internal rotation and circumduction. Compared to the glenohumeral shoulder joint, however, this joint sacrifices mobility for stability as it is designed for weight bearing



- The entire weight of the upper body is transmitted through this joint to the lower limbs during standing. The hip joint is the most stable joint in the human body.



- **Types**

- Synovial ball and socket; multiaxial

- **Articular surfaces**

- Head of femur, lunate surface of acetabulum

- Ligaments

- 



# Ligaments

- Capsular: iliofemoral, pubofemoral, ischiofemoral
- **Intracapsular**
- : transverse ligament of the acetabulum, ligament of the head of the femur





- **Innervation**

- Femoral nerve, obturator nerve, superior gluteal nerve, nerve to quadratus femoris

- **Blood supply**

- Medial and lateral circumflex femoral arteries, obturator artery, superior and inferior gluteal arteries

- **Movements**

- Flexion, extension, abduction, adduction, external rotation, internal rotation and circumduction



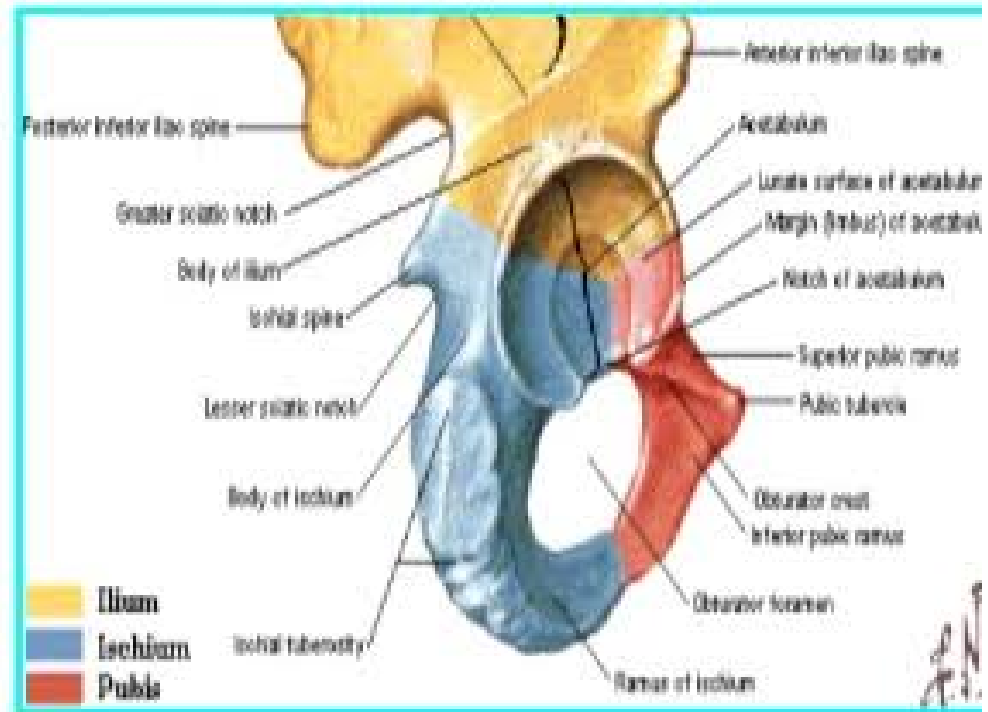
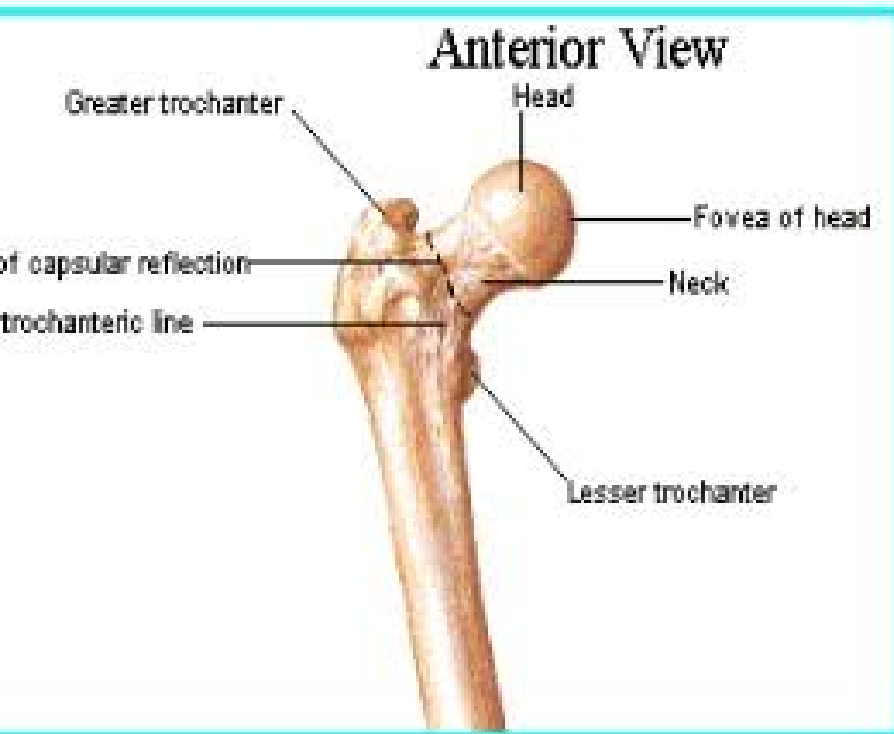
# Articulation surface

- The hip joint is the articulation between the ellipsoid head of the femur and the hemispherical concavity of the acetabulum located on the lateral aspect of the hip bone. The femoral head is covered with articular hyaline cartilage with the exception of a rough central depression, the fovea capitis, which is a surface of attachment for the ligament of the femoral head ligamentum teres capitis femoris



# ARTICULAR SURFACES OF HIP

lunate surface of the acetabulum  
 spherical head of femur



- The acetabulum is formed by the fusion of the ilium, ischium and pubic bones. It plays a significant role in the stability of the hip joint as it almost entirely encompasses the head of the femur. The acetabulum bears a prominent semilunar region known as the lunate surface that is covered by articular cartilage



- The deep central nonarticular floor of the acetabulum is referred to as the acetabular fossa. This area is devoid of cartilage and is continuous with the acetabular notch. It contains loose connective tissue (fibroelastic fat pad) which is covered by synovial membrane.



- The superior aspect of the acetabulum and that of the femoral head bear the greatest pressures. These areas generally have the thickest articular cartilage. The concave acetabulum and the rounded femoral head of the hip joint, in addition to the anatomical relationship between the femur and the pelvis, particularly in the upright position, make this joint incongruent. The articular surfaces are most congruent when the hip joint is in a partially flexed and abducted position



# Ligaments

- The ligaments of the hip joint can be divided into two groups; capsular ligaments and intracapsular ligaments. Capsular ligaments are intrinsic ligaments of the joint capsule. There are three capsular ligaments that play a key role in maintaining the integrity of the joint during various movements



- **iliofemoral**
- pubofemoral and ischiofemoral ligaments. The intracapsular ligaments of the hip joint are found inside the capsule and include the transverse ligament of the acetabulum and the ligament of the head of the femur.





- The iliofemoral ligament is a thick triangular ligament that lies on the anterior and superior aspects of the hip joint, and blends with the joint capsule. Its proximal attachment is between the anterior inferior iliac spine and the acetabular rim



- it attaches to the intertrochanteric line. The central part of this ligament is thinner compared with its outer bands, giving the ligament an inverted Y-shape. It is the strongest ligament in the body and functions to prevent hyperextension of the hip joint when standing.



- During extension, this ligament tightens, constricting the capsule and securing the femoral head tightly in the acetabulum. This action restricts extension of the hip joint beyond the vertical position to between 10° to 20°.



# Pubofemoral ligament

- The pubofemoral ligament lies anteroinferiorly and reinforces the anterior and inferior aspects of the joint capsule. It arises from the iliopubic ramus, the superior pubic ramus and the obturator crest of the pubic bone



- It travels laterally and inferiorly to the lower aspect of the intertrochanteric line, blending with the fibrous layer of the joint capsule and the medial band of the iliofemoral ligament.



# The thinnest region

- The thinnest region of the joint capsule is between the medial fibers of the iliofemoral and the pubofemoral ligaments where there is a circular aperture



# The weakest of three capsula ligaments

- The ischiofemoral ligament is the weakest of all the three capsular ligaments. It lies posteriorly, and strengthens the posterior aspect of the joint capsule. It is attached medially to the ischial bone below the acetabulum



# Transverse ligament of the acetabulum

- The transverse ligament of the acetabulum is a strong flat ligament that bridges the acetabular notch creating the acetabular foramen through which neurovascular structures enter the hip joint. It completes the inferior deficiency of the acetabular rim and is continuous peripherally with the acetabular labrum.





# ligamentum teres capitis femoris

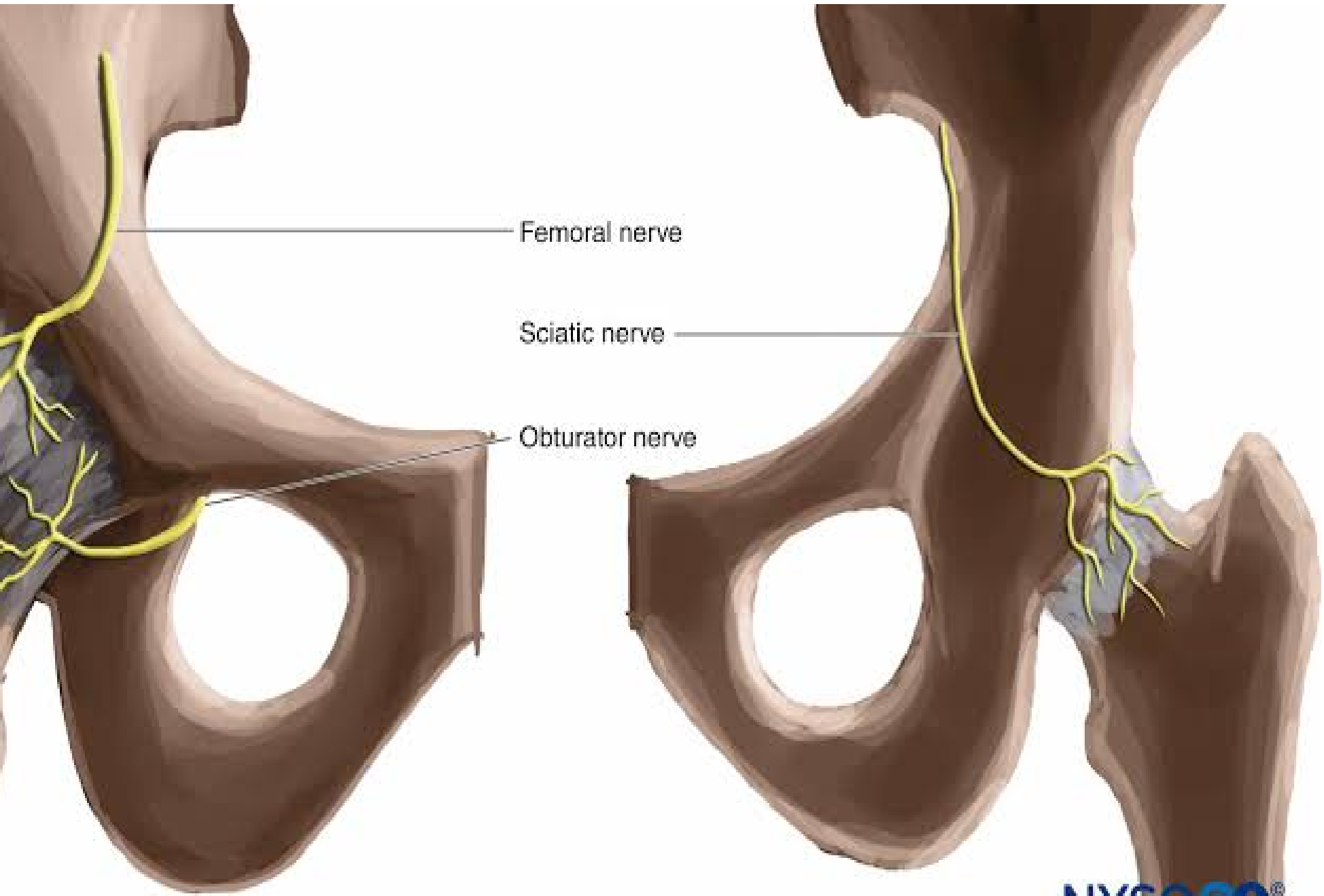
- This is also called the head of femur
- This ligament is a flattened triangular band of connective tissue that has no significant contribution to the strength and stability of the hip joint. Its apex attaches to the fovea capitis while its base attaches to the acetabular notch and the transverse acetabular ligament. It is covered by synovial membrane and carries a small branch of the obturator artery, the artery to the head of the femur, which contributes to the blood supply of the femoral head.



# Innervation

- The hip joint is innervated by the articular branches of multiple nerves that emerge from the lumbosacral plexus (L2-S1). The nerve supply to a specific region of the joint typically corresponds to the innervation of the muscle that crosses it:





Femoral nerve

Sciatic nerve

Obturator nerve

Anterior



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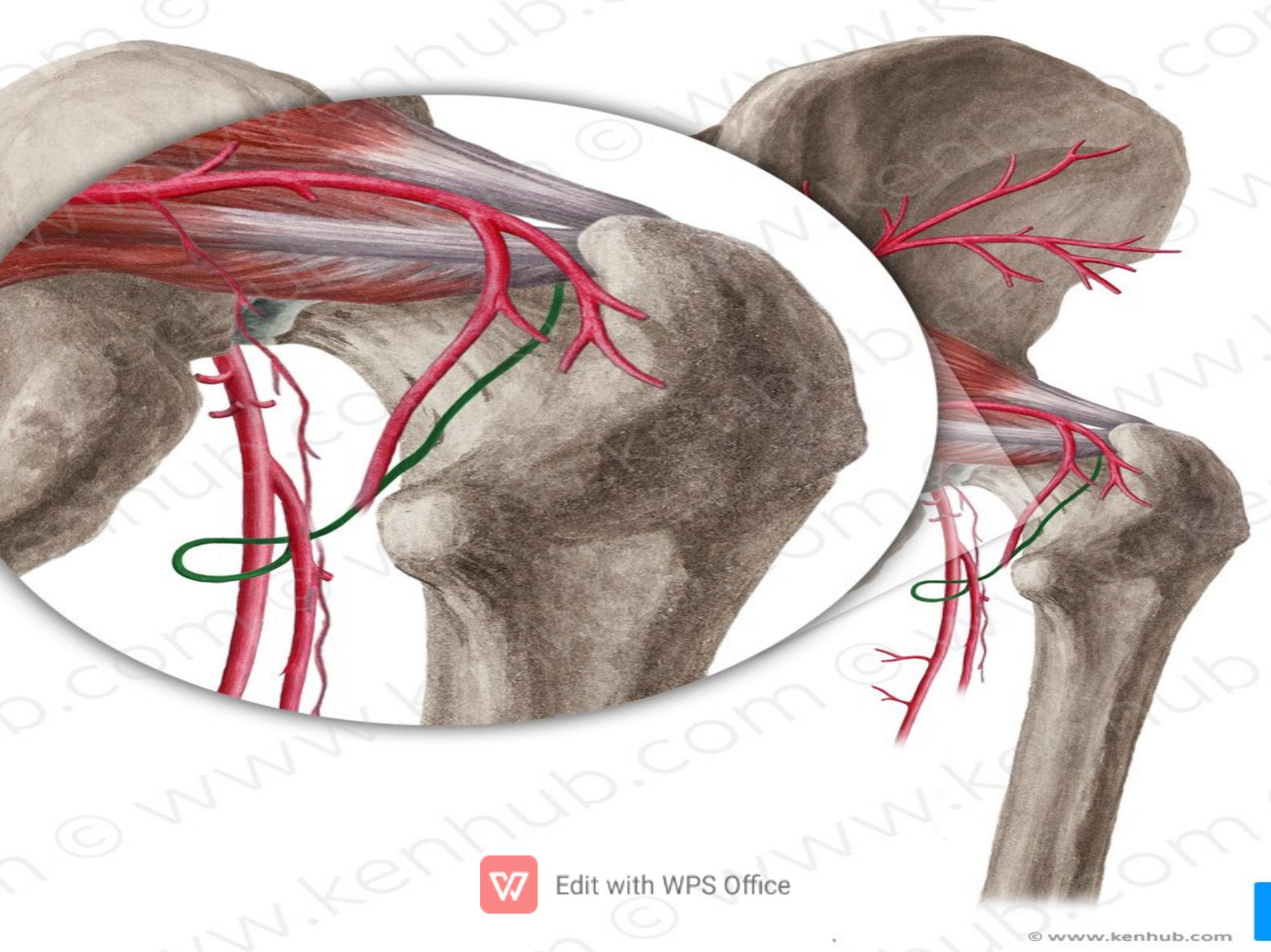
- The **femoral nerve** innervates the anterior aspect
- The **obturator nerve** supplies the inferior aspect
- The **superior gluteal nerve** supplies the superior aspect
- The **nerve to the quadratus femoris** innervates the posterior aspect.
- It is important to note that pain sensations from the vertebral column can be referred to the hip joint, while primary hip pain may be referred to the knee as they share similar innervation.



# Blood supply

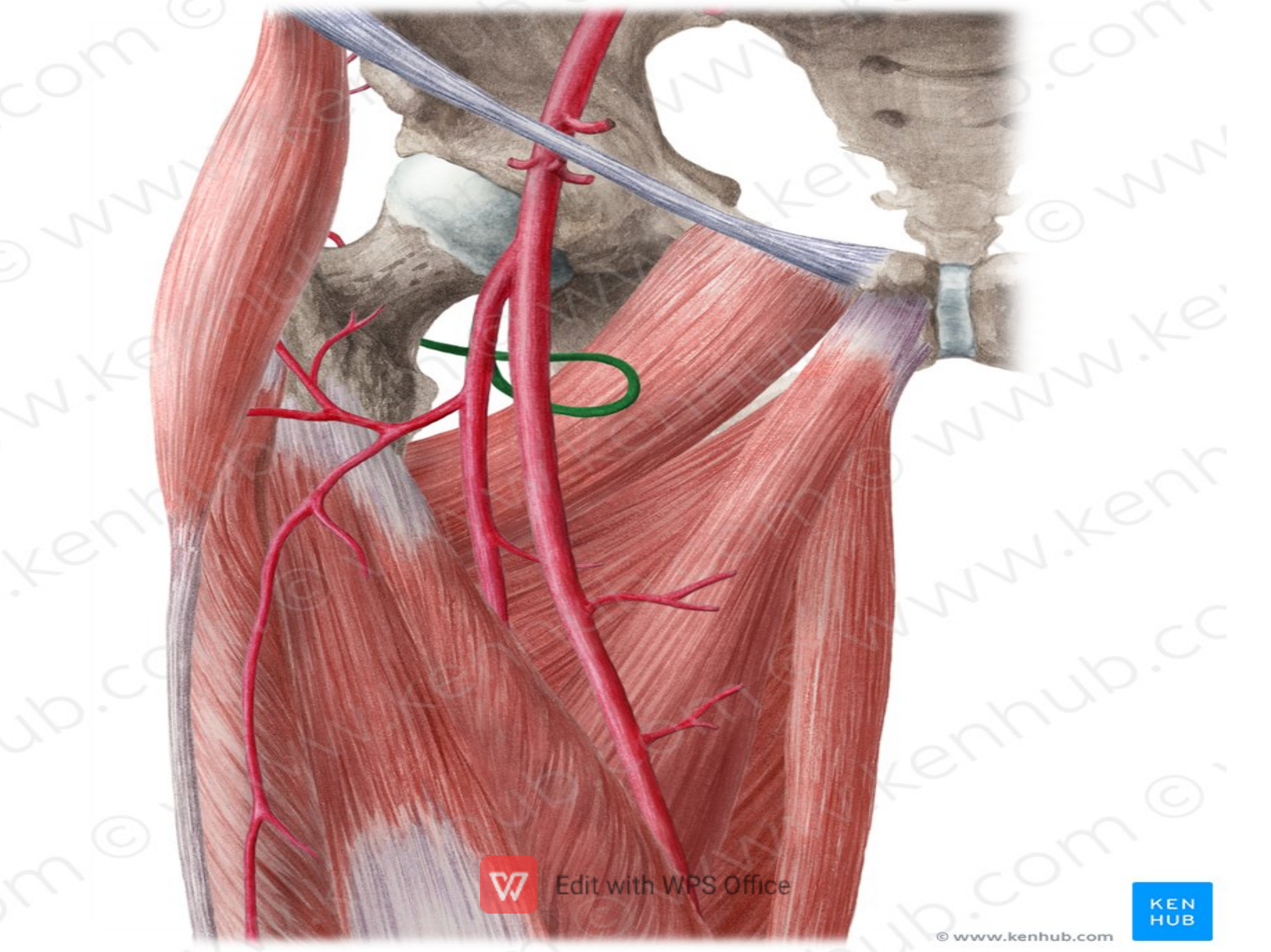
- The blood supply of the hip joint is from the medial and lateral circumflex femoral arteries (branches of the deep artery of the thigh), the obturator artery and the superior and inferior gluteal arteries. Together, these arteries form a periarticular anastomosis around the hip joint.





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- This anastomotic network gives rise to the retinacular arteries which supply the greatest volume of blood to the head and neck of the femur. Additionally, the obturator artery gives rise to the artery of the head of the femur within the ligament of the head of the femur.





# Movements

- Being a ball-and-socket joint, the hip joint permits movements in three degrees of freedom flexion, extension, abduction, adduction, external rotation, internal rotation and circumduction



# Flexion

- Flexion of the hip joint draws the thigh towards the trunk. When the knee is flexed, the hip joint can be fully flexed with the thigh coming in contact with the anterior abdominal wall. The range of movement during passive flexion is about 120° and reaches around 145° during active flexion. Hip flexion is limited by the tension in the hamstrings when the knee is extended.



# Hip Joint Movements:

- Flexion =  $0^{\circ}$  -  $120^{\circ}$
- Extension =  $0^{\circ}$  -  $20^{\circ}$



# Extension

- Extension of the hip joint moves the thigh away from the trunk. Extension of the joint beyond the vertical is limited to about 30° by the tension of the capsular ligaments and the shape of the articular surfaces.



# Abduction and adduction

- Abduction and adduction of the hip joint occur in the coronal plane and have a free range of movement of about 45°. With the hip flexed, the range of abduction is far greater than when extended. Abduction of the hip joint is limited by tightness in the adductor muscles and the pubofemoral ligaments. Hip flexion also makes adduction easier. Adduction, on the other hand, is limited by the contralateral limb, tension in the abductor muscles, the lateral part of the iliofemoral ligament and the fascia lata of the thigh.



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# Internal and external rotation

- Internal and external rotation of the hip joint occurs in the horizontal plane about the mechanical axis of the femur rather than the long axis of the femoral shaft. The mechanical axis runs from the head of the femur to the intercondylar notch of the distal femur





- During internal rotation, the femoral shaft moves anteriorly, causing the toes to point medially. The reverse occurs in external rotation where the femoral shaft moves posteriorly, causing the toes to point away from the midline. External rotation is much freer and more powerful than internal rotation





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# Muscles acting on the hip joint

- The major muscles that produce movements of the hip joint are categorized into functional groups; flexors, extensors, adductors, abductors, lateral rotators and medial rotators. A single muscle may fall under two functional groups. Multiple muscles participate in both flexion and adduction as well as abduction and internal rotation.



- **Flexion**
- Psoas major, iliacus and rectus femoris; assisted by pectineus, tensor fasciae latae and sartorius
- **Extension**
- Gluteus maximus, biceps femoris, semitendinosus,
- semimembranosus and adductor magnus
- **Abduction**
- Glutei medius and minimus; assisted by tensor fasciae latae, piriformis and sartorius



- **Adduction**

- Adductors longus, brevis and magnus, gracilis; assisted by pectineus, quadratus femoris and the inferior fibres of gluteus maximus

- **Internal rotation**

- Glutei minimus and medius; assisted by tensor fasciae latae and most adductor muscles



- **External rotation**

- Gluteus maximus, obturator internus, superior and inferior gemelli, quadratus femoris, piriformis; assisted by obturator externus and sartorius
- Mnemonic: Patched Goods Often Go On Quilts (PGOGOQ)
- (Piriformis, Gemellus superior, Obturator internus, Gemellus inferior, Obturator externus, Quadratus femoris)



# Flexion

- The main flexors of the hip joint are the iliopsoas muscle (psoas major and iliacus) and the rectus femoris muscle. The pectineus, tensor fasciae latae and sartorius muscles assist as weak flexors. Also, the adductor longus and brevis can assist with flexion of the hip joint in addition to its adductor function.





# Extensor

- The primary extensor of the hip joint is the gluteus maximus muscle, assisted by the hamstring muscles (biceps femoris, semitendinosus, semimembranosus) and the adductor magnus muscle.



# Abductor

- The primary abductors of the hip joint are the gluteus medius and the gluteus minimus muscles. The tensor fasciae latae, piriformis and sartorius muscles also assist in hip abduction. The hip abductors play an active role in stabilizing the pelvis during specific phases of the gait cycle.



# Adductor

- The major adductors of the hip joint are the adductors longus, brevis and magnus and the gracilis muscle. These are assisted by pectineus, quadratus femoris and the inferior fibres of gluteus maximus.



# Internal rotation

- The anterior fibres of glutei minimus and medius are the principal muscles responsible for internal rotation of the hip joint. These muscles are assisted by the tensor fasciae latae and most adductor muscles



# External rotation

- External rotation is produced by the gluteus maximus together with a group of 6 small muscles lateral rotators piriformis, obturator internus, superior and inferior gemelli, quadratus femoris and obturator externus.



**THE END**



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