Groin Pain in Sports Injuries

Essay

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First, thanks are all due to GOD for Blessing this work until it has reached its end, as a part of his generous help throughout our life.

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List of abbreviations

AIIS	: Anterior inferior iliac spine.
ASIS	: Anterior superior iliac spine.
CT	: Computed tomography.
EMG	: Electromyo graphy.
FAI	: Femoroacetabular impingement.
Fig	: Figure.
GT	: Greater trochanter.
ITB	: Iliotibial band.
JHM	: Joint hypermobile syndrome.
Lig	: Ligament.
LT	: Lesser trochanter.
MRA	: Magnetic resonance arthrograghy.
MRI	: Magnetic resonance imaging.
NSAID	: Nonsteroidal antiinflamatory drugs.

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Anatomy of the groin region

Introduction:

The hip joint is a true ball-and-socket joint surrounded by powerful and well-balanced muscles, enabling a wide range of motion in several physical planes while also exhibiting remarkable stability. As the structural link between the lower extremities and the axial skeleton, the hips not only transmit forces from the ground up but also carry forces from the trunk, head and neck, and upper extremities. Consequently this joint is crucial to athletic activities in which it is often exposed to many greater than normal axial and tensional forces [1].

Anatomy of the hip joint:

The hip is a classical ball-and-socket joint. It meets the four characteristics of a synovial joint: it has a joint cavity; joint surfaces are covered with articular cartilage; it has a synovial membrane producing synovial fluid, and; it is surrounded by a ligamentous capsule [2].

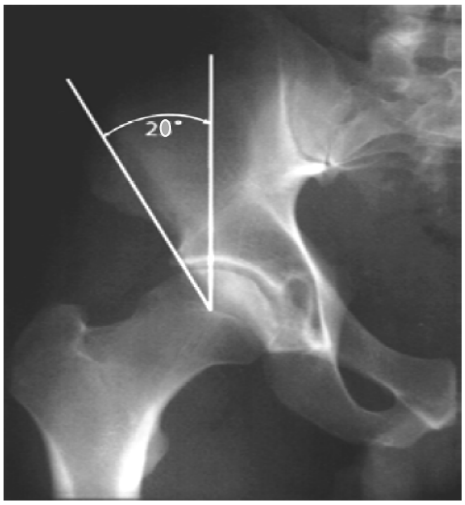
Bony anatomy.

The cup-shaped acetabulum is formed by the innominate bone with contributions from the ilium (approximately 40% of the acetabulum), ischium (40%) and the pubis (20%) [3]. In the skeletally immature these three bones are separated by the triradiate cartilage – fusion of this starts to occur around the age of 14 – 16 years and is complete usually by the age of 23y the actual articular surface appears a lunate shaped when viewed looking into the acetabulum. Within the lunate, or horseshoe shaped articular cartilage is a central area – the central inferior acetabular fossa. This fat filled space houses a synovial covered fat pad and also contains the acetabular attachment of the ligamentum teres. Inferior to this, the socket

of the hip is completed by the inferior transverse ligament [4].

The acetabular opening is oriented in an anterior, lateral, and inferior direction, whereas the head of the femur faces the acetabulum in a medial, cranial, and anterior direction. The coverage of the weight bearing surface of the femoral head is primarily related to the degree of inferior acetabular tilt as measured by the center-edge angle of Wiberg (Fig. 1) [5].

(Fig. 1). Diagram of the hip joint illustrating a center-edge angle of Wiberg (normal greater than 20°). This angle is formed by one line connecting the lateral rim of the acetabulum with the center of the femoral head, and a second line extending vertically from the center of the femoral head [6].

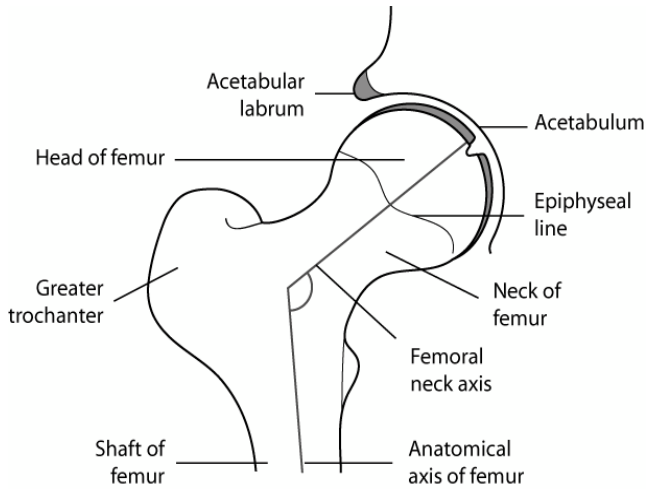


Attached to the rim of the acetabulum is the fibrocartilaginous labrum. The labrum has been closely studied as tears of the labrum are the most common indication for hip arthroscopy [7]. It plays a role in normal joint development and in distribution of forces around the joint [8,9].It has also been suggested it plays a role in restricting movement of synovial fluid to the peripheral compartment of the hip, thus helping exert a negative pressure effect within the hip joint [10].

The labrum runs around the circumference of the acetabulum terminating inferiorly where the transverse acetabular ligament crosses the inferior aspect of the acetabular

fossa (Fig.**2**).It attaches to the bony rim of the acetabulum and is quite separate from the insertion of the capsule [11].The labrum receives a vascular supply from the obturator and the superior and inferior gluteal arteries [12].

(Fig. 2). Cross-sectional view of the normal hip joint [11].



These ascend in the reflected synovial layer on the capsule and enter the peripheral aspect of the labrum. It has been observed that labral tears are most likely to occur at the junction of labrum and articular cartilage - this area has been termed the 'watershed region' [12].

The femoral head is covered with a corresponding articular cartilage beyond the reaches of the acetabular brim to accommodate the full range of motion. The covered region forms approximately 60 to 70% of a sphere. There is an uncovered area on the central area of the femoral head – the fovea capitis – for the femoral insertion of the ligamentum teres. The ligamentum teres, while containing a blood supply does not contribute to the stability of the joint. It is covered in synovium, so while it is intra-articular it is actually extra-synovial [11].

The head of the femur is attached to the femoral shaft by the femoral neck; the neck-shaft angle is usually 125±5° in the normal adult, with coxa valga being the condition when this value exceeds 130° and coxa vara when the inclination is less than 120°, (Fig. **3**). The importance of this feature is that the femoral shaft is laterally displaced from the pelvis, thus facilitating free joint motion. If there is significant deviation in angle outside this typical range, the lever arms used to produce motion by the abductor muscles will either be too small or too large. The neck-shaft angle steadily decreases from 150° after birth to 125° in the adult due to remodeling of bone in response to changing stress patterns. The femoral neck in the average person is also rotated slightly anterior to the coronal plane. This lateral rotation of the neck is referred to as femoral anteversion. The angle of anteversion is measured as the angle between a mediolateral line through the knee and a line through the femoral head and shaft. The average range for femoral anteversion is from 15 to 20°. (Fig **4)** [11].

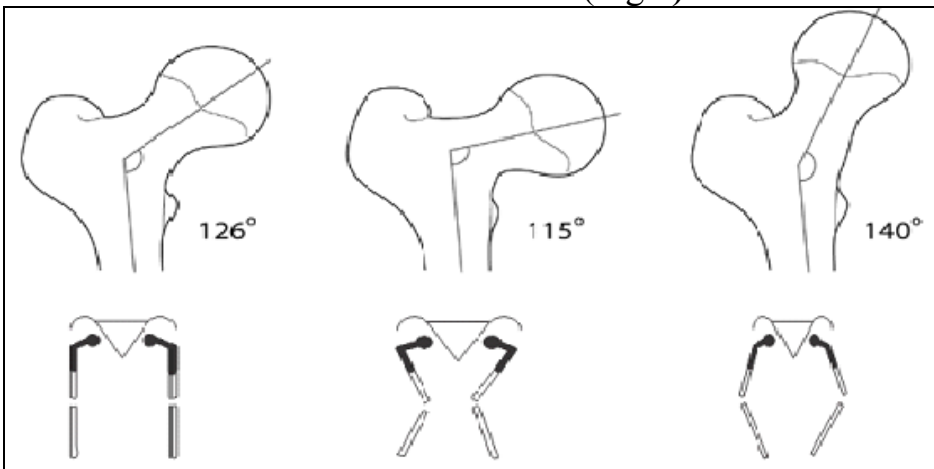
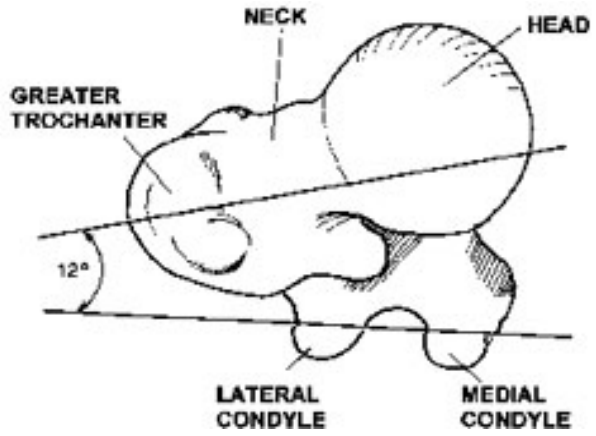


Fig. (3). (**a**) Normal femoral neck angle, (**b**) a decreased femoral neck angle (coxa vara), and (**c**) an increased femoral neck angle (coxa valga) [11].



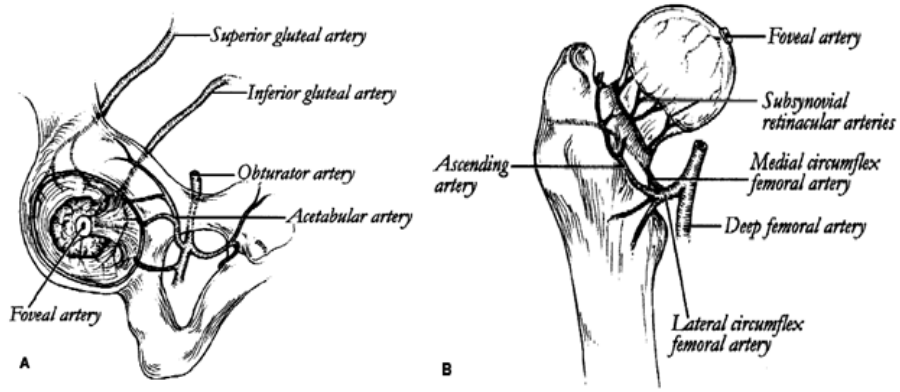
(Fig. **4**) **Angle of anteversion** Axis placed through femoral neck (NA) forms angle with TCA termed *angle of anteversion*. B, Angle femoral head, viewed from above. Angle of 15 to 25 degrees is considered normal. C, Change in angle of anteversion from internal rotation of leg [13]

The vascular supply.

The acetabulum is supplied by three main arteries: the obturator, the superior gluteal, and inferior gluteal (Fig.5A). The superior gluteal artery supplies both the superior and posterior portions of the acetabulum, and the inferior gluteal artery supplies the inferior and posterior portions [14].The acetabular branch of the obturator artery provides the primary blood supply to the medial aspect of the acetabulum. (Fig.5A) smaller, terminal branch of the posterior division of the obturator artery, known as the foveal artery, traverses the ligamentum teres to supply a small area of the femoral head around the fovea centralis [15]. The recess between the capsule and labrum is lined with highly vascularized, loose connective tissue. A group of three to four small blood vessels is found in a circumferential pattern within the substance of the labrum and along the labrum–bone junction [11].

The blood supply to the femoral head has been well studied due to the risk of vascular necrosis of the head when it

is disrupted, particularly in fractures of the femoral neck or dislocation of the hip. Three sources are noted the nutrient artery supplying the femoral head is not sufficient in adults to maintain bone health, and the circumflex femoral arteries (which enter the femur lower down) are required to provide adequate blood supply. **The medial and lateral circumflex femoral arteries** are usually branches of profunda femoris artery. **Articular arteries** of the hip joint come from branches of the medial and lateral circumflex femoral arteries that travel in the retinacula (reflections of the capsule along the neck of the femur toward the head) (Fig.5B). These provide the main blood supply to the hip joint. Hence if these circumflex arteries are lacerated during the fracture, avascular necrosis may occur to the head of femur. This process will severely limit the healing process. **Obturator Artery is a** branch of the internal iliac artery. It passes through the obturator foramen to the thigh and then divides into anterior and posterior branches that anastomose. The posterior branch gives off an **acetabular branch** that supplies the head of the femur [16].



(Fig. 5): Vascular supply to the hip joint. **A:** The blood supply to the acetabulum is provided by branches of the obturator, superior gluteal, and inferior gluteal arteries. **B:** The blood supply to the femoral head and neck is provided by the medial and lateral circumflex femoral arteries; both are branches of profounda femoris artery [16].

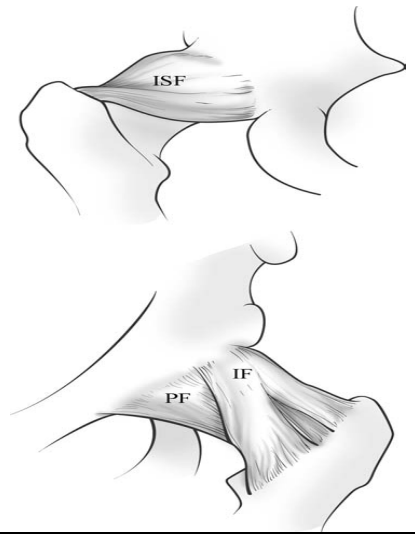
Ligaments and capsular anatomy.

The joint capsule is strong. While the ball and deep socket configuration naturally gives the hip great stability the ligamentous capsule undoubtedly contributes significantly. The capsule is formed by an intertwining of three separate entities. The iliofemoral ligament can be seen anterior to the hip in the form of an inverted 'Y'. It spans, in a spiraling fashion, from its proximal attachment to the ilium to insert along the intertrochanteric line. It is taught in extension and relaxed in flexion keeping the pelvis from tilting posteriorly in upright stance and limiting adduction of the extended lower limb. It is the strongest ligament in the body with a tensile strength greater than 350N.Inferior and posterior to the iliofemoral ligament and blending into its medial edge, the pubofemoral ligament contributes to the strength of the anteroinferior portion of the capsule. This is perhaps the weakest of the three ligaments. Posteriorly the ischiofemoral ligament completes the main ligamentous constraints – from its ischial attachment medially it inserts laterally on superolateral aspect of the femoral neck, medial to the base of the greater trochanter [3].

While the ligamentous capsule is very strong, two weak points can be noted - the first anteriorly between the iliofemoral and pubofemoral ligaments, and the second posteriorly between the iliofemoral and ischiofemoral ligaments. Although dislocation is rare in the native hip, with extreme external trauma the hip can dislocate through either of these weak points (Fig. **6**) [3].

(Fig. **6**).

(a) The ischiofemoral lig (b) The iliofemoral lig in the inverted "Y" shape and the pubofemoral lig [16].



There are two further ligaments at the hip joint. It contributes little in the way of stability to the hip and can be torn in traumatic dislocations. Some propose that it plays a role in joint nutrition. Its potential for degeneration is better appreciated with the increasing utilization of hip arthroscopy. The second is the zona orbicularis or angular ligament. This encircles the femoral neck like a button hole and again plays little role in stability [17].

Neurovascular anatomy.

The anterior and posterior portions of the hip have separate innervations. Anteromedially the joint is supplied by articular braches of the obturator nerve. The anterior aspect is contributed to by branches of the femoral nerve. The posterior aspect is innervated laterally by branches of the superior gluteal nerve. Medially contributions come from articular branches from the nerves to quadratus femoris and also articular branches from the sciatic nerve [16].

Surgeons approaching the hip must be aware of the surrounding neurovascular structures. The key structures