

REVIEW ARTICLE

**IDENTIFICATION OF ANATOMIC RADIOLOGIC GUIDELINES IN
HIP JOINTS**

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ABSTRACT

The hip joint is a triaxial spheroid joint (enartrosis), linking the pelvic belt and femur. It transmits the weight body both at rest and in motion. This paper aims to address bony elements of the coxofemoral joint. This paper is structured in two parts: the first part includes general concepts of anatomy and a second part comprising radiologic interpretation of bone elements of this joint.

KEYWORDS: *knee, anatomy, radiology.*

1. Introduction

Anatomical elements

The hip joint is a triaxial spheroid joint (enartrosis) linking the pelvic belt and femur transmitting the weight body both at rest and in motion.

The articular surfaces are represented by:

Femoral head: convex, representing two-thirds of a sphere with a radius of 20 to 25 mm, is upwards, medial and towards presenting the union of two thirds of its lower third with its two superior thirds, the femoral head fossa or round ligament fossa, where the round ligament attaches [1-3].

The anatomic neck extends between the head and the two tuberosities. The boundary between head

and neck is represented by two curves with external concavity - the upper curve is smaller and the inferior curve is wider - joining in the upper anterior area of the head and in middle part of its posterior side.

Femoral neck has a length of 3.5-4.5 cm and an angle of 120 ° in women or 130 ° in men with the bone [4].

Greater trochanter is a quadrangle bony prominence located outside the upper end of the femur. It shows:

- an exterior side: a rough line called the gluteal ridge;
- an interior side: in the posterior side it presents a cavity called the digital fossa (trochanteric fossa) [6-8].

Inferior and medial to the bottom of the neck there is a prominence called the lesser trochanter. In

the anterior side, the two trochanters are united by the intertrochanteric line that starts from the greater trochanter to the lesser trochanter detouring the lesser one in the lower side and going forward together with the internal trifurcation line of the rough line. It gives insertion to the joint capsule. In the posterior side, between the two trochanters there is a pronounced ridge, called the intertrochanteric crest on which inserts the quadratus femoris muscle [9].

Cotyloid cavity or acetabulum is a cup-shaped hollow in the hip-bone, hemispherical, limited by a circular protrusion called the cotyloid brow. On the brow there are three channels representing the three suture points of the three bone parts that make up the coxal bone (ilium, ischium and pubis bones). Of these three channels, the ischio-pubic channels is marked and called the acetabular notch or cotyloid notch. This notch is located immediately above the obturator foramen and the acetabular transverse ligament transforms it into a channel traversed by vessels and nerves functional to the femur head. Above the cotyloid brow there is a supracotyloid channel where the reflected tendon of the thigh right anterior muscle is inserted [10-12]. The inner surface of the cotyloid cavity (acetabulum) is divided into two well differentiated parts: one is non-articular and is called the acetabular fossa, it has a square shape and is located in the bottom of cotyloid cavity. It serves to the insertion of the femoral ligament. The second part is an articular part, is crescent shaped and edges the first part. The two horns of the crescent-shaped surface of the femoral head joint – one is anterior and opaque and the second horn is posterior and more pronounced – defines the acetabular notch [13].

Radiologic interpretation

Anteroposterior image:

The patient lies on the back with the leg in perfect extension. The foot will have to make an angle when flexed with the vertical end inside. The central line goes perpendicularly towards the femoral

head going through a mid-point of the inguinal fold. Comparative radiography of both joints is being performed by joining both legs and feet getting the image from above the pubic symphysis [14-16].

Cotyloid cavity appears on film as an optical semicircular section, what would be inside the bone, going through the ischio-pubic hollow, the center of the cotyloid bottom and the highest point of the cotyloid brow. The plan would be almost transverse. The upper third of the semi-circle is the tangential projection of the "acetabular roof" resembling a curved line with the concavity downwards, very opaque, strengthened by the arch forms of the parallel iliac bones giving image by summation. External extremity of this line contributes to image formation of the cotyloid brow [17]. The middle of the semicircle is interrupted ischio-pubic notch. This notch is delimited in its inferior side by a dark arch shadow with concavity inwards and upwards. The image is given by the tangential projection of the tubercle-glenoid groove consisting in compact blade. The anterior edge of the acetabular is unclear and appears as a thin spongy blade covering a small portion of the femoral head. Rear edge of acetabular is much broader and gives a net shadow covering $\frac{3}{4}$ of the femoral head. The shadows of the cotyloid edges are seen by the transparency of the femoral head [18]. They begin at the cotyloid brow and the anterior one ends on the superior side of the ischio-pubic cavity and the posterior one ends on the inferior part of the same cavity. Optical section from the acetabular fossa has an U-shape as follows: its external branch is a tangential projection of the cotyloid cavity bottom; its internal branch a tangential projection of the basin inner side at this level [19]. The arch that links the two branches concurs to the superior edge of the obturator hole for the ischio-pubic cavity. Internal branch can sometimes be intersected by a new line, called ischio-ischial line, reason for we can see three lines, of

which the new line cuts from top to bottom, at different levels the U-shaped outline. Femoral head is hemispherical and well defined, being viewed as a cavity in the same place where the round ligament fossa is. Diaphysis-epiphyseal scar can be seen often in adults. Both sides of the cavity can be seen by the head transparency. At the leading edge of both edges overlapping shadows over that of the femoral head, giving a more opaque area (figure 1).

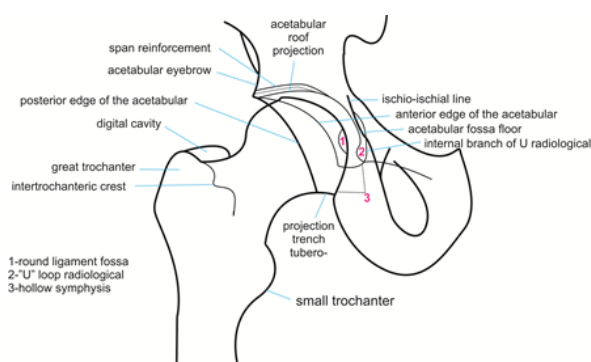


Figure 1. Coxofemoral joint in the incidence of anterior-posterior

The femoral neck is easy to be observed. It is limited and outside by the intertrochanterian line. Radiographic image shows the general system architecture spans the constitution of the femoral head and neck. The following images can be distinguished: trochanteric bundle, the cephalic bundle, the Gallois' and Bosquettes [1,6].

The articular radiologic space measures 4-5 mm in adults at the top and gradually widens in the central region, reaching 1 cm in the ligament fossa. From this fossa the space goes back down to 6-7 mm width, and then increases again slightly in the radiological U loop up to 1 cm and more. Pathological changes of joint space should be sought especially in the upper side[20].

Greater trochanter with the digital cavity and lesser trochanter can be seen very clearly, the latter being more visible in its external rotation. Small trochanter disappears when moving the thigh inside.

In the same time, the neck occurs with maximum length and is more horizontal. Lesser trochanter in external rotation occurs throughout its development but the neck shortens and appears vertical. Femoral neck axis forms a 125-150 degree angle with the diaphysis [2.21].

The obturator hole is well defined. Its upper contour is shaped like an arch, goes forwards, and unites with the arch formed by the inferior femoral neck contour resulting into a so-called cervico-obturator arch. This arc is more easily visible when the thigh is rotated inside revealing as broken in the image or dislocated and this is a clear sign for hip dislocation.

Profile projection:

The Belot procedure: lateral decubitus for the side to be examined. The members stretched in the exterior for the film and the other member is pushed back but in extension in order to leave open the examination area. The foot is placed over the inguinal fold. The axial ray will fall normally tangent to abdominal teguments at about two fingers over the pubic area going over the femoral head (figure 2).

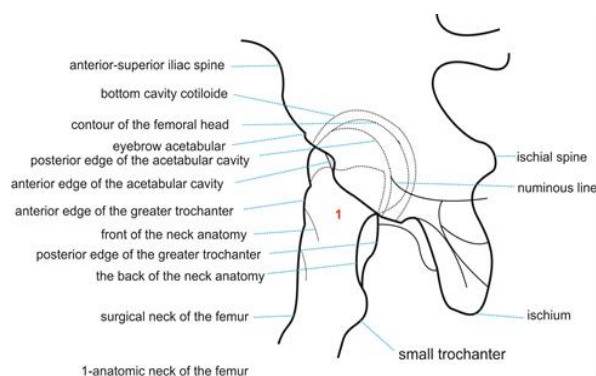


Figure 2. Coxofemoral joint in the incidence of cross (Belot incidence)

The Lilienfeld procedure: Lateral position with a slight tilt of the pelvis forward. Coxofemoral joints and knees slightly bent. Central ray falls perpendicular to the film, taking over the great trochanter, which is applied to the box, tangential to

the opposite buttock (figure 3) [22].

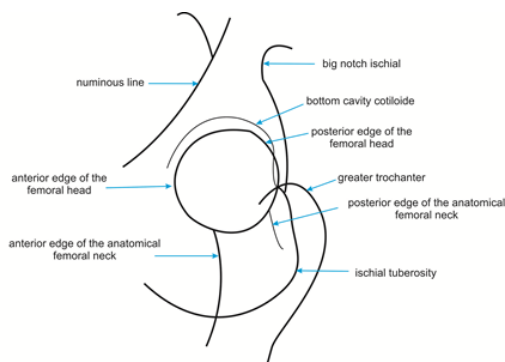


Figure 3. *Coxofemoral joint in the incidence of cross (Lilienfeld incidence)*

In this incidence, performed by the Balot procedure, the cotyl and articular space are mostly examined. Cotyloid cavity is deeper here and more concave compared with its anteroposterior incidence. The acetabular fossa is not visible because it's anterior, so the same joint space has the same width throughout its extent from cotyloid brow (out and up) to the ischio-pubic cavity (within and below). Acetabular edges are visible [3,6.8]. The head contour is visible too. In Lilienfeld's position, ischium and obturator hollow overlap the femoral epiphysis. Cotyloid cavity is visible from its back. Head and neck can be visible from profile and one can see fractures or fragment dislocations in the anterior-posterior direction.

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