RADIOLOGICAL ASSESSMENT OF CHRONIC HIP PAIN IN ADULTS

Essay

Submitted By

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Abbreviations

٢D	Two dimensions
٣D	Three dimensions
^{٩٩m}Tc	Technetium ٩٩
AP	Anteroposterior
AVN	Avascular necrosis
FDG	Fluorodeoxyglucose
FOV	Field of view
FSE	Fast spine echo
HDP	Hydroxyethylene diphosphanate
ITOH	Idiopathic transient osteoporosis of the hip
mCi	Milli Curi
MDP	Methylene diphosphonate
MRA	Magnetic resonance arthrography
MRI	Magnetic resonance imaging
OA	Osteoarthritis
PET	Positron emission tomography
PVNS	Pigmented villonodular synovitis
RA	Rheumatoid arthritis
RA	Rheumatoid arthritis
SE	Spin echo
SOC	Synovial osteochondromatosis
SPECT	Single photon emission computed tomography
STIR	Short time inversion recovery
T١	Longitudinal relaxation time

T١W	T١ weighted
T٢	Transverse relaxation time
T٢ W	T٢ weighted
TBMES	Transient bone marrow edema syndrome
TE	Time of echo
TOH	Transient osteoporosis of the hip
TR	Time of repetition

INTRODUCTION

Chronic hip pain is a common problem in the adults. It can be caused by numerous causes including occult trauma, infection, arthropathies, neoplasms, avascular necrosis, transient osteoporosis, or other causes.

Clinical data play an important role in evaluation of chronic hip pain. Routine radiographs are essential to plan further imaging studies. MRI, CT, ultrasonography, and radionuclide scans may all be used as second technique ***(Berquist et al., ٢٠٠٠).***

The imaging pathway for hip pain has evolved considerably with the advent of MRI. The latter has supplanted bone scintigraphy as the investigation of choice when occult fractures, bone marrow edema syndromes or avascular necrosis are suspected. MRI is also invaluable for evaluating synovial proliferative disorders of the hip such as pigmented villonodular synovitis and synovial osteochondromatosis. Furthermore by combining joint distension with multiplanar imaging, MR arthrography (MRA) allows detailed assessment of the acetabular labrum and cartilage ***(Fang and Teh, ٢٠٠٣)***.

CT still has a lot to offer in musculoskeletal work, being the best modality for examining cortical bone, and remaining the cross-sectional imaging technique of choice where MRI is unavailable or cannot be performed, for example in claustrophobic patients or those fitted with cardiac pacemakers **(*Grainger and Allison,* ١٩٩٧*)*.**

CT has a key role in delineating fractures and assessing the bony architecture of the hip ***(Fang and Teh, ٢٠٠٣)***.

٣D CT provides a dramatic representation of the overall fracture and orientation of fragments, although it has been shown to miss small undisplaced fracture lines and intra-articular fragments ***(Sutton, ٢٠٠٣)***.

Ultrasound has an important role in detecting joint effusions and bursitis, and for guiding intervention. The injection of local anaesthetic into the hip joint may allow confirmation of the hip as the source of symptoms. This may be achieved under fluoroscopic or ultrasound guidance ***(Fang and Teh, ٢٠٠٣)***.

There are several situations in which sonography can produce results at least equal to what is possible with MRI imaging examples include joint effusion, and soft tissue masses ***(Jacobson, ١٩٩٩).***

Sonographic evaluation of the joint and periarticular pathology clearly has applications in numerous clinical scenarios, not only for diagnosis but also in some situations for ultrasound-guided aspiration. It is a rapid, inexpensive technique. But it needs adequate equipment, training and expertise to be used as a first line imaging modality **(*Wang et al.,* ١٩٩٩).**

The bone scan is non specific, however, with the appropriate clinical and laboratory correlation, and the use of other complementary diagnostic modalities, it provides a valuable, sensitive, and unique means of assessing the diseases of the skeletal system ***(Grainger and Allison, ١٩٩٧).***

Aim of The Work

The aim of the work is to emphasize the role of each imaging modality in the diagnosis of hip pain.

ANATOMICAL CONSIDERATION

The hip joint is a multiaxial ball and socket synovial joint ***(Fang and Teh, ٢٠٠٣).*** This joint is composed of two parts; the head of the femur (ball), and the acetabulum (socket) ***(Feinberg and Post, ١٩٩٨).*** The acetabulum is formed by fusion of the three bones of the os innominatum. Ilium, Ischium and Pubis at a ”Y” shaped cartilage ***(Williams et al., ١٩٨٩).*** The cartilage devoid central region of the acetabulum, the acetabular fossa, is filled with fibrofatty tissue (Haversian pad) and is lined with synovium **(fig. ١)** ***(Petersilge, ٢٠٠٠).***

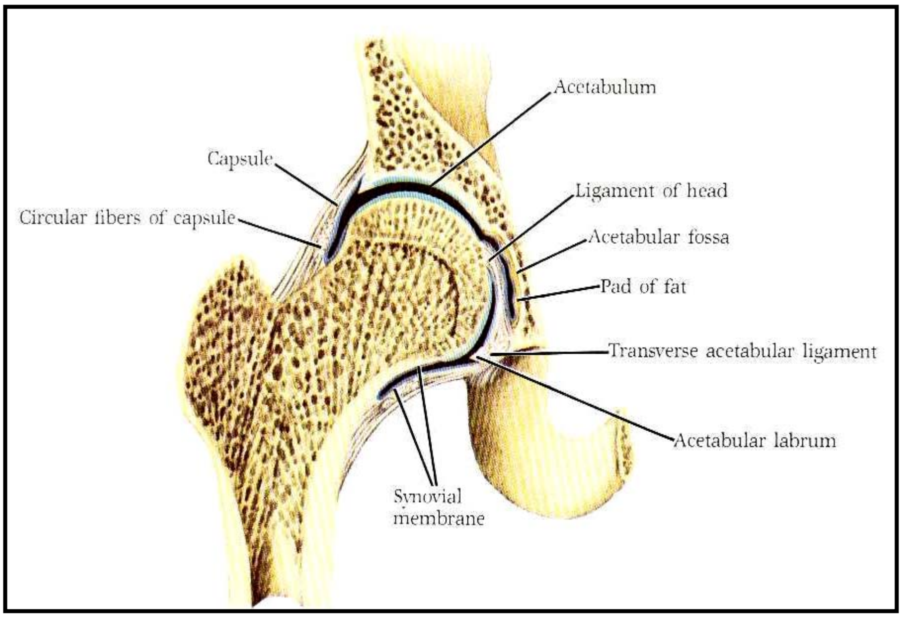

Fig. ١** Coronal section of the hip **(Quoted from Snell, ١٩٧٨).

Attached at the outer edge of the lunate is the acetabular labrum which is a fibrocartilaginous ring of triangular cross section. The acetabulum is spanned inferiorly by the transverse ligament which gives attachment to the ligamentum teres, which inserts into the fovea of the femoral head. The ligamentum teres transmits the foveal artery which only contributes a little to the blood supply of the adult femoral head. The joint capsule is attached circumferentially around the labrum and transverse ligament and passes laterally to enclose the femoral neck. Capsular fibres are reflected as retinacular fibres which bind down nutrient arteries, which supply the femoral head. Fractures occurring within the capsule therefore place the blood supply of the femoral neck at risk. Three ligaments strengthen the capsule: the iliofemoral ligament, the ischiofemoral ligament and the pubofemoral ligament. The ischiofemoral ligament arises from the posteroinferior margin of the acetabulum. Its fibres pass laterally, blending with the circular fibres of the capsule, the zona orbicularis ***(Fang and Teh, ٢٠٠٣).***

The fibrous capsule:

The capsule of the hip is strong and dense. It is attached circumferentially around the labrum acetabulare and transverse ligament. Above, it is attached to the margin of the acetabulum ٥ to ٦ mm beyond the glenoid labrum behind; but in front, it is attached to the outer margin of the labrum, and opposite to the notch where the margin of the cavity is deficient, it is connected to the transverse ligament and by a few fibers to the edge of the obturator foramen. It surrounds the neck of the femur, and is attached, in front, to the intertrochanteric line; above to the base of the neck; behind to the neck, about ١.٢٥ cm above the intertochanteric crest; below, to the lower part of the neck, close to the lesser trochanter ***(Williams et al., ١٩٨٩).*** From its femoral attachment, some of the fibers are reflected back along the neck of the femur as longitudinal band termed retinacular fibers ***(Sinnatamby, ١٩٩٩).***

The synovial membrane of the hip joint:

It lines the entire capsule, invests the retinacular fibers and forms a sleeve around the Haversian pad and ligamentum teres. Occasionally a perforation in the anterior part of the capsule permits communication between thr synovial cavity and the iliac bursa ***(Sinnatamby, ١٩٩٩).***

The acetabular labrium:

It is a fibrocartilagenous ring that rims the acetabulum and is triangular in cross section. The labrum is thicker posterosuperiorly and thinner anteroinferiorly. The labrum is attached directly to the osseous rim of the acetabulum. It blends with the transverse ligament at the margins of the acetabular notch. A cleft is created where the ligament and labrum join, and this cleft should not be confused with a labral tear ***(Gzerny et al., ١٩٩٩).***

Ligaments of the hip joint (fig. ٢)*:*

The iliofemoral ligament lies in front of the joint. It is triangular in shape. It is intimately connected with the capsule. It is attached, above to the lower part of the anterior inferior iliac spine; below, it divides into two bands, one of which passes downward to the lower part of the intertrochanteric line; the other is directed downward and lateral ward to attach to the upper part of the same line. In some cases, there is no division, and the ligament spreads out into a flat triangular band which is attached to the whole length of the intertrochanteric line.

The pubofemoral ligament is also triangular, with its base at the innominate bone, where it is attached to the iliopectineal eminence, the superior ramus of the pubis and the obturator membrane. Below it blends with the capsule and with the deep surface of the medial fibers of the iliofemoral ligament.

The ischiofemoral ligament consists of a triangular band of strong fibers, which thickens the back of the capsule. It spring from the ischium below and behind the acetabulum, and blend with the circular fibers of the capsule, the zona orbicularis ***(Williams et al., ١٩٨٩, Fang and Teh, ٢٠٠٣).***

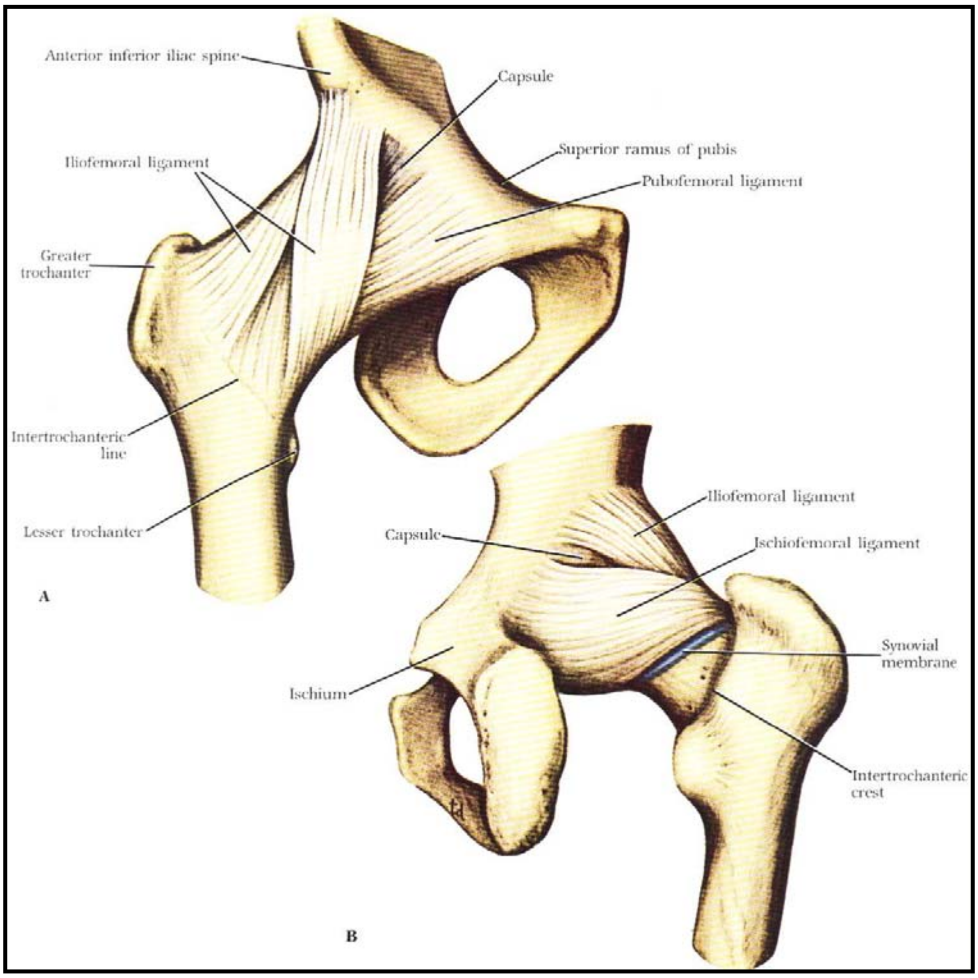

Fig. *٢ ligaments of the hip. A. Anterior view.*
B. Posterior view ***(Quoted from Snell, ١٩٧٨).***

Blood supply:

The medial and lateral circumflex arteries provide most of the blood supply to the femoral head and proximal femur through the anastomosis at the base of the neck and head. The lateral part of the extra capsular arterial ring provides most of the blood to the femoral head. The obturator artery provides variable vascular supply to the head through the ligamentum teres. The capsule and synovial membrane are supplied by nearby vessels ***(Stoller, ١٩٩٦).***

Nerve supply:

The hip joint is supplied by articular branches from the sacral plexus, sciatic, obturator, accessory obturator and a filament from the branch of the femoral supplying the rectus femoris ***(Williams et al., ١٩٨٩).***

Muscles surrounding the hip (fig ٣):

Anteriorly: Iliopsoas, pectineus, rectus femoris muscles, iliopsoas and rectus femoris muscles separates the femoral vessels and nerve from the joint.

Posteriorly: Obturator internus, the gemelli and the sciatic nerve.

Inferiorly: Obturator externus tendon **(Williams et al., ١٩٨٩).**

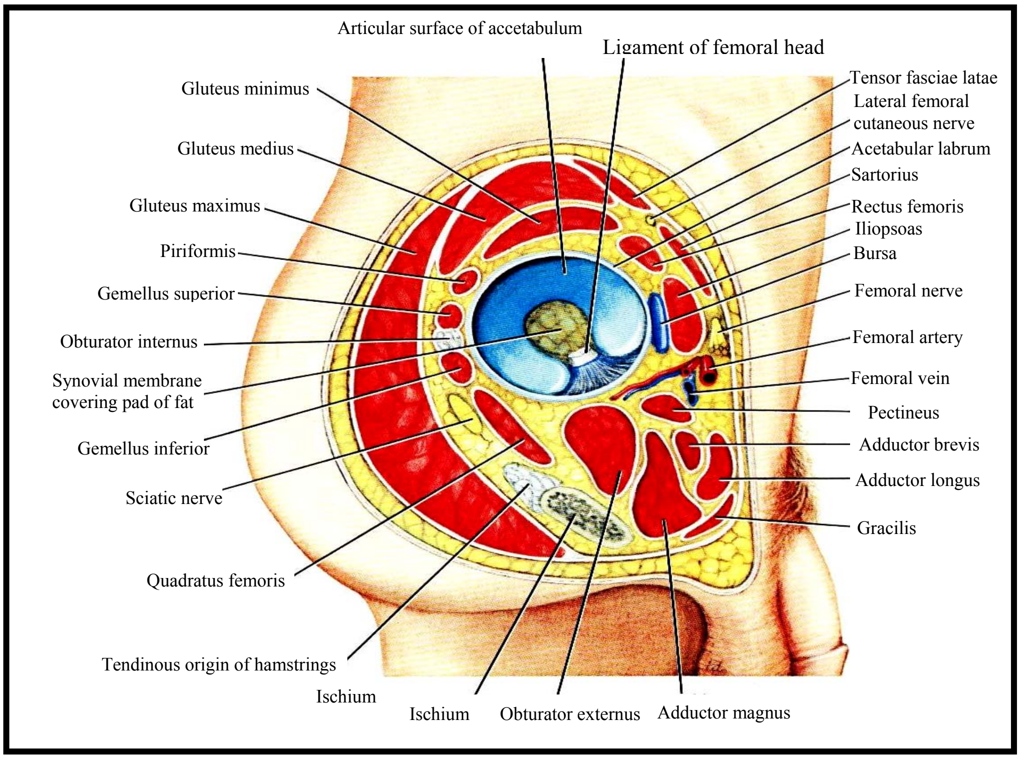

Fig. ٣** Relations of the hip joint* ***(Quoted from Snell, ١٩٧٨).