

MAGNETIC RESONANCE IMAGING OF THE SHOULDER JOINT

ESSAY

Submitted for Partial fulfilment of

Master Degree

In

Radiodiagnosis

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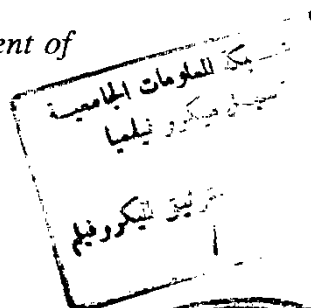
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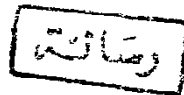
Hasan Elsayed Abdel Moneim

M.B, B.Ch.

Supervisor



المجلة
45689



Prof. Dr. HODA AHMED ELDEEB

Prof. of Radiodiagnosis

Ain Shams University

Faculty of Medicine
Ain Shams University
1991

TO

MY

PARENTS



ACKNOWLEDGEMENT

I am greatly honoured that I have worked under the supervision of Prof. Dr. Hoda Ahmed Eldeeb, Professor of Radiodiagnosis, Faculty of Medicine, Ain Shams University, for her continuous support, encouragement and kind help.

I would like to express my sincere gratitude to all professors and staff members as well as colleagues of the Radiodiagnosis Department, Faculty of Medicine, Ain Shams University.

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INTRODUCTION AND AIM OF WORK

The painful shoulder is a common clinical problem with numerous potential causes such as impingement syndrome, shoulder instability, avascular necrosis, synovial inflammatory conditions, trauma and neoplasms.

Conventional radiographic evaluation of the shoulder is limited to display osseous changes and calcification without direct visualization of the rotator cuff and glenohumeral capsular mechanism.

Arthrography and CT arthrography are invasive procedures and poor at diagnosis of partial rotator cuff tears. Ultrasound is promising operator dependent and can be limited by bone interference.

Recently, MRI of the shoulder is gaining acceptance as a highly valuable imaging modality of the shoulder.

The aim of this work is to illustrate MRI manifestations of different lesions of the shoulder joint as an accurate and non invasive technique.

Anatomy of the Shoulder Joint

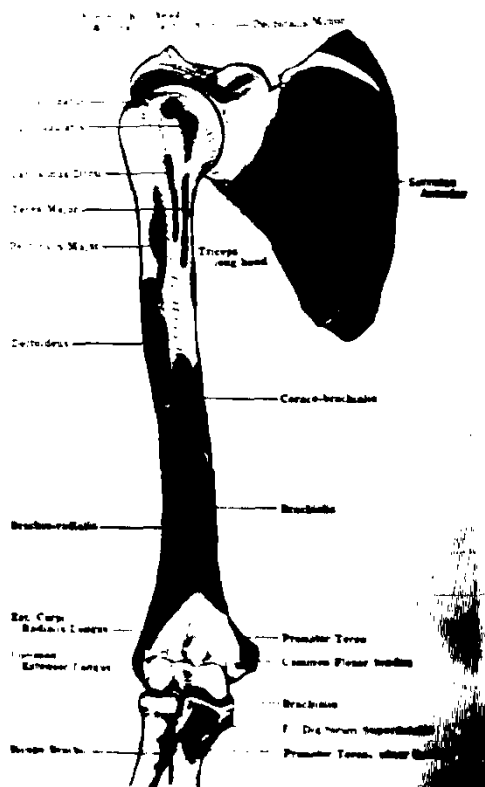


Fig. 1-1 a:

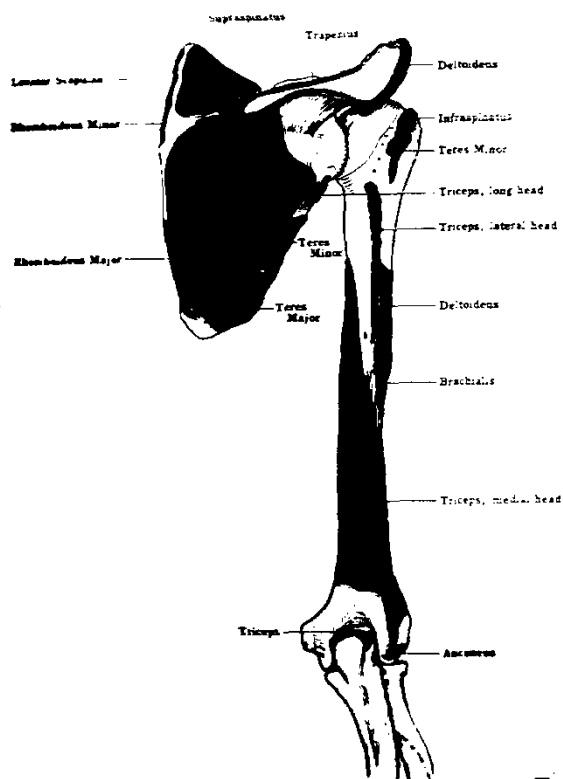
Bones of the upper limb showing attachments of muscles (posterior view)

Quoted from *Warwick and Williams, 1973.*

Fig. 1-1 b:

Bones of the upper limb showing attachments of muscles (anterior view)

Quoted from *Warwick and Williams, 1973.*



The shoulder joint is a synovial joint of ball and socket variety, the bones involved are the humeral head and the glenoid cavity of the scapula.

I- Articular Surfaces :-

A- Head of the humerus :-

The articular surface of the humeral head is almost hemispherical and is directed upwards, medially and slightly backwards. It represents approximately one third of an irregular sphere, with an average vertical dimension of 48mm. with a 25mm. radius of curvature, the average transverse dimension is 45mm. and 2mm. radius of curvature. The humeral head is inclined relative to the shaft and retroverted relative to the distal end of the humerus. The inclination angle is $130-150^{\circ}$ and the average retroversion angle is 30° (Saha, 1971).

The proximal end of humerus consists of the head, greater and lesser tuberosities. The anatomic neck of the humerus lies at the base of the articular surface of the proximal end of the bone. The neck is the site of attachment of the inferior aspect of the capsule. The greater tuberosity is located on the lateral aspect of the proximal humerus and serves as the site of insertion of the supraspinatus, infraspinatus, and teres minor muscles. The supraspinatus inserts on the promontary, or the highest point of the greater tuberosity. The infraspinatus and teres minor tendons localize, respectively, on the middle and lower thirds of the greater tuberosity and lie somewhat more posteriorly than the supraspinatus insertion. The lesser tuberosity is situated on the anterior portion of the proximal humerus, and the subscapularis tendon inserts there. The intratubercular (bicipital) groove is located between the greater and lesser tuberosities. The tendon of the long head of biceps brachii muscle passes through here and is surrounded by a synovial sheath. The tendon is secured within the groove by the transverse humeral ligament, which passes between the tuberosities over the synovial sheath of the tendon (Fig. 1-1 a,b) (Greenway et al., 1982).

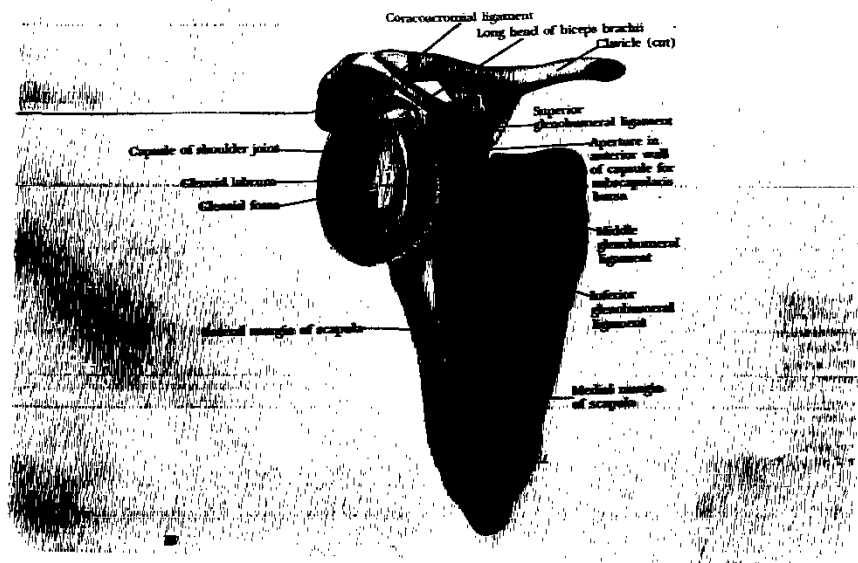


Fig. 1-2 :
Glenoid cavity.

Quoted from *Snall, 1978.*

B- Glenoid cavity :-

The articular surface is oval and concave. The average vertical dimension is about 35mm and the transverse diameter is about 25mm. The glenoid surface is approximately 1/4 the size of the humeral head and no element of stability is provided by their fitting. The glenoid cavity is deepened somewhat by a fibrocartilaginous rim attached to its margin, the glenoid labrum. However, Sarrafian in 1983 stated that it doesn't substantially increase the depth of the glenoid surface. The inner surface of the labrum is covered with synovium and is continuous with the hyaline cartilaginous surface of the glenoid. The outer surface of labrum attaches to the capsule and is continuous with the periosteum of the scapular neck.

The shape of the glenoid labrum changes with rotation of the humeral head, and the anterior labrum disappears with lateral rotation. The labrum is triangular in cross section, the base being fixed to the circumference of the cavity while the free edge is thin and sharp. The tendon of the long head of biceps and long head of triceps contribute to the structure and reinforce the glenoid labrum.

Both articular surfaces are covered with a layer of hyaline cartilage, that on the head of the humerus is thickest at its center and thinner peripherally, while the reverse is the case in the glenoid cavity. However, in most positions of the joint, the curvatures of the adjacent parts of the surfaces are not precisely the same. The closepacked position is reached when the humerus is abducted and laterally rotated (Fig. 1-2).

II- Fibrous Capsule :

It is attached medially to the circumference of the glenoid cavity beyond the glenoid labrum. It encroaches up on the origin of long head of biceps superiorly. Laterally, it is attached to the anatomical neck of humerus except on the medial side where it descends for more than 1cm. on the shaft. It is loose and lax that the bones

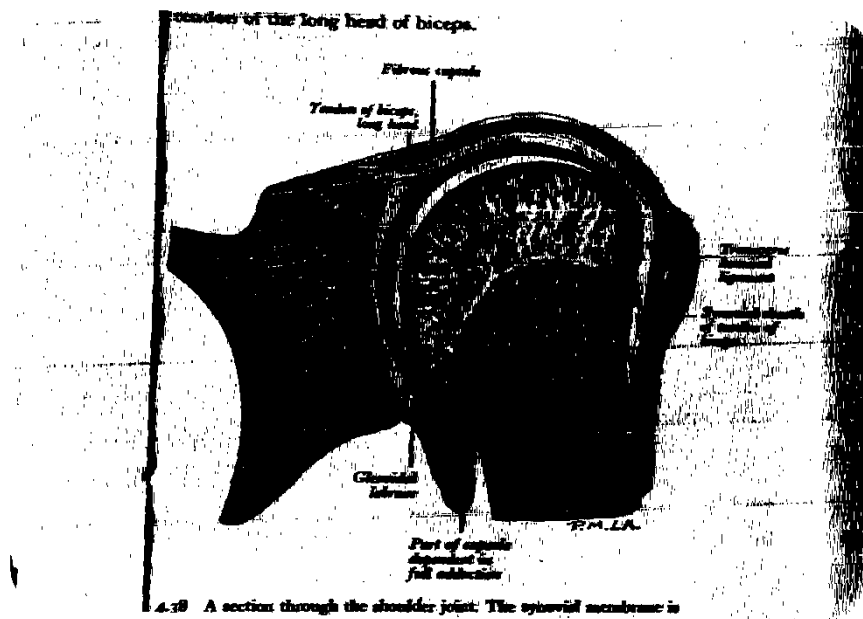


Fig. 1-3 :

Fibrous capsule.

Quoted from *Warwick and Williams, 1973.*

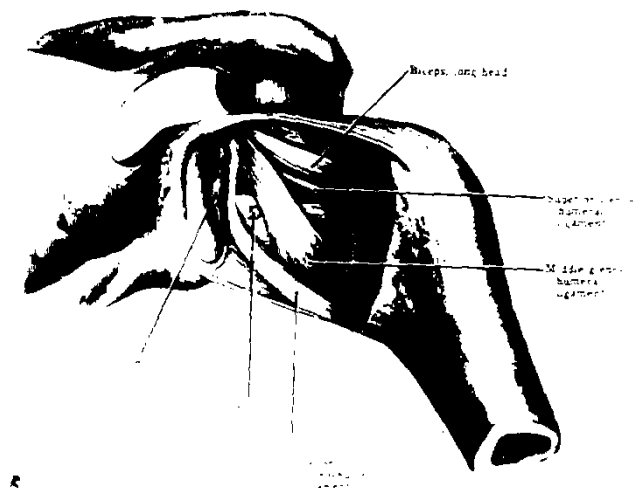


Fig. 1-4 :

Interior of the right shoulder seen from behind.

Quoted from *Anderson, 1978.*

may even be separated from each other for a distance of 2 or 3 cm. by a distractive force. However, this degree of unphysiological separation can be detected only after relaxing the superior capsule by some degree of abduction.

The capsule is strengthened by the supraspinatus from above, by the long head of triceps from below, by the tendon of the subscapularis from in front and by the tendon of the infraspinatus and teres minor from behind. These tendons are intimately blended with the fibrous capsule forming a cuff, the rotator cuff, they reinforce the capsule and provide active support for the joint during movement (Fig. 1-3) (*Warwick and Williams, 1973*).

The long head of triceps is separated from the inferior capsule by the axillary nerve and posterior circumflex humeral vessels. Thus, the inferior capsule is less supported and is subjected to the greatest strain during abduction, where it is stretched tightly across the round head of humerus.

Three thickenings, the glenohumeral ligaments, strengthen the capsule
(Fig. 1-4,5):

The superior glenohumeral ligament :

It originates from the upper segment of glenoid labrum and base of coracoid process. Directed transversely anterior and slightly under the coraco humeral ligament to be inserted on the upper part of the anatomic neck.

The middle glenohumeral ligament :-

It originates from below the superior glenohumeral ligament. Turkel et al., in 1981 described the origin as extending to the junction of the middle and inferior thirds of the glenoid rim. It is directed obliquely downwards and laterally to be inserted just medial to the lesser tuberosity under the subscapularis tendon, to which it adheres.

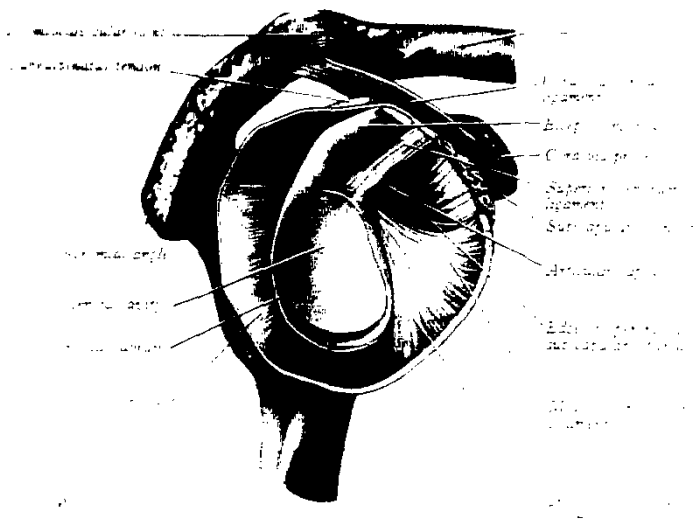


Fig. 1-5 :

Interior of the right shoulder seen from lateral side.

Quoted from *Warwick and Williams, 1973.*



Fig. 1-6 :

Synovial capsule of the shoulder joint.

Quoted from Anderson, 1978.