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Title of the Thesis

Recent MRI Study of Acute Shoulder Trauma

Postgraduate Student: Sherif Adel Mansour Kamar
Degree: *M.B.B.Ch* Faculty of Medicine ASU

DIRECTOR: Prof. Dr. Ayman Mohamed Ibrahim
Academic Position: Professor of Radiodiagnosis
Department: Radiology department, Faculty of Medicine, Ain Shams University

Co-DIRECTOR: Dr. Allam El Sayed Allam
Academic Position: Lecturer of Radiodiagnosis
Department: Radiology department, Faculty of Medicine, Ain Shams University

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List of Abbreviations

AB	Anterior band
AC	Acromioclavicular
ALPSA	Anterior labroligamentous periosteal sleeve avulsion
ANOVA	Analysis of variance
AP view	Anterio-posterior view
ASU	Ain shams university
CHL	Coracohumeral ligament
FOOSH	Fall onto an outstretched hand
GLAD	Glenolabral articular disruption
IGHL	Inferior glenohumeral ligament
LHBT	Long head of the biceps tendon
MGHL	Middle glenohumeral ligaments
MRI	Magnatic resonance imaging
MSK	Musculoskeletal
PB	Posterior band
PHF	Proximal humerus fractures
RC	Rotator cuff
SASD	Subacromial-subdeltoid

SD	Standard deviation
SGHL	Superior glenohumeral ligament
SLAP	Superior labrum anterior posterior
SPSS	Statistical Package for Social Sciences

INTRODUCTION

There are many causes of painful shoulder syndrome; shoulder impingement come on top of the list, large number of factors could cause shoulder impingement syndrome. They are divided into two major groups: structural factors (related to the Acromion, acromioclavicular joint, coracoid process, bursa, humerus and rotator cuff) and functional factors. ***(Quillen et al, 2004).***

The anatomy of the shoulder is unique, it has a relatively shallow socket which results in amazing flexibility and range of motion to the shoulder joint which is unparalleled elsewhere in the body. The shoulder is basically like a ball and socket. The "ball" is the head of the humerus and the "socket" is the glenoid part of the scapula. In order to achieve this flexibility and range of motion but maintain a stable shoulder, there is a complex interplay between the joints, muscles and ligaments. Injury to any one of these structures can therefore result in significant ongoing pain, weakness, or instability. ***(Bozkurt and Açar, 2017).***

Shoulder injuries are common accounting for up to 20% of all athletic injuries. These injuries pose an important burden on injured athletes and their families. ***(Tummala et al, 2018).***

Magnetic resonance imaging (MRI) is considered a reliable technique for the evaluation of the different causes of shoulder pain. There are certain acute neck, back, shoulder, and knee conditions for which MRI should be considered after four to six weeks of conservative care if the findings could alter treatment. MRI of the shoulder is indicated after traumatic injury in young and middle-aged patients who have persistent pain and weakness because they may have a complete rotator cuff tear amenable to early repair. ***(Pompan, 2011).***

AIM/ OBJECTIVES
The purpose of this study is to review an accurate and highly sensitive diagnostic evaluation of frequently encountered acute traumas of shoulder joint in athletes, using MRI which is considered as a standard measure of diagnosis.

Chapter I:

Radiological anatomy and normal variants

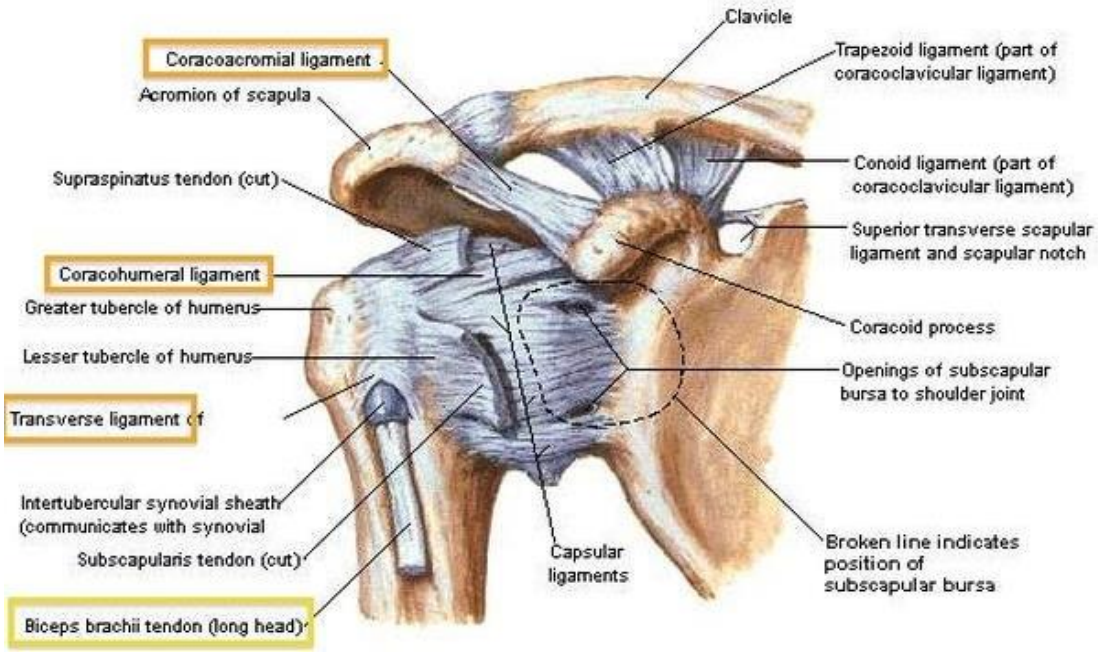

Figure (1): AP view of the shoulder region showing the basic anatomy of bones and ligaments.

Normal shoulder function is essential for day-to-day life and many popular sports. Imaging of the shoulder and its dysfunctions is one of the most challenging regions for all sports medicine practitioners. Magnetic Resonance Imaging is a very useful modality for evaluation of shoulder, because of its multiplanar capability and excellent soft tissue resolution. ***(Doshi et al., 2002).***

Bone anatomy

The shoulder joint is composed of three bones and five articulations. This includes the glenohumeral joint, the Acromio-clavicular joint, the scapulothoracic joint, the sternoclavicular joint and the coracoclavicular joint.

Clavicle is an "S" shape structure, which connects axial to the appendicular skeleton. The clavicle articulates with the sternoclavicular joint medially and acromioclavicular joint laterally. It is the only bony connection between the axial skeleton and the upper extremity. ***(Marieb & Hoehn 2007).***

The scapula consists of the scapular body, the scapular spine, the scapular neck, the acromion, the glenoid fossa and the coracoid process. The shape of the acromion had been initially divided into three types (which were known as the Bigliani classification), to which a fourth has been added. They are used as a standardised way of describing the acromion, as well as predicting to a degree the incidence of impingement. ***(Jones and Gaillard, 2016).***

Type 1 (12%) is a flat undersurface with a high angle of inclination.

Type 2 (56%) is a curved arc and decreased angle of inclination.

Type 3 (29%) is hooked anteriorly with a decreased angle of inclination. associated with increased incidence of shoulder impingement.

Type 4 (3%) is a convex (upturned) undersurface near the distal end.

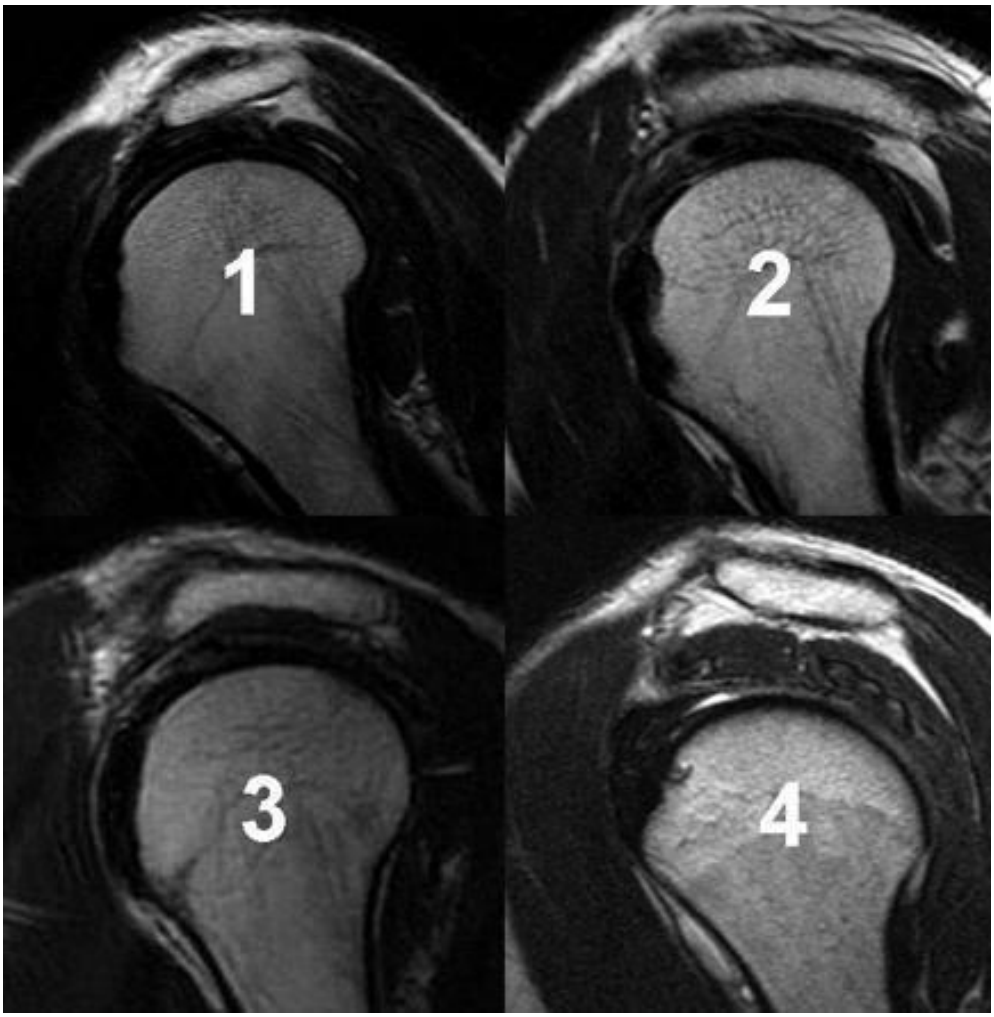

Figure (2): Sagittal view T2 weighted MRI of the shoulder region showing the 4 types of acromion process. 1. Flat, 2. Curved, 3. Hooked, 4. Convex.

The proximal humerus consists of the head, anatomical neck and the greater and lesser tuberosities. The intertubercular or bicipital groove is located between the greater and lesser tuberosities along the anterior surface of the humerus. ***(Rudez & Zanetti, 2008).***

Capsule

The articular capsule completely encircles the joint; it is attached to the circumference of the glenoid cavity beyond the glenoidal labrum. Inferiorly it is attached to the anatomical neck of the humerus. Usually there is an opening inferior to the coracoid process in the capsule, through which there is a communication between the joint and a bursa beneath the tendon of the Subscapularis. ***(Palmer et al., 2000).***

Ligaments

Coraco-humeral ligament: It is a broad band, which strengthens the superior part of the capsule. The ligament arises from the coracoid process, passes obliquely inferolaterally towards the greater tubercle of the humerus and blends with supraspinatus.

Gleno-humeral ligaments: The glenohumeral ligaments are band like thickenings of anterior capsule, which strengthen the capsule anteriorly. ***(Pouliart et al., 2007).***

Superior glenohumeral ligament (SGHL) has two sites of origin, supraglenoid tubercle just anterior to long head of biceps origin on superior labrum and the base of coracoid, while inserts superior to

lesser tuberosity. MRI plays an important role as arthroscopically SGHL may be hidden by the biceps tendon.

Middle Glenohumeral Ligaments (MGHL): MGHL arises from the anatomic neck and inserts into the mid-anterior labrum. Middle part of the ligament is seen just posterior to subscapularis. It shows maximum variation in size and shape among all three gleno-humeral ligaments. MGHL may appear cord like and frayed with absent anterior-superior labrum. It is then called as Buford complex or physiologic antero-superior sublabral hole. MGHL limits external rotation at 45 degree of abduction.

Inferior glenohumeral ligament (IGHL): it is the most important glenohumeral ligament. IGHL attaches to inferior two thirds of glenoid via glenoid labrum. It has two bands like thickening, anteriorly (anterior band, AB) and posteriorly (posterior band, PB) lax part, axillary pouch (AP), in between. IGHL is lax in adducted position. IGHL is the main static stabilizer of the shoulder in the abducted or functional position. ***(Pouliart et al., 2007).***

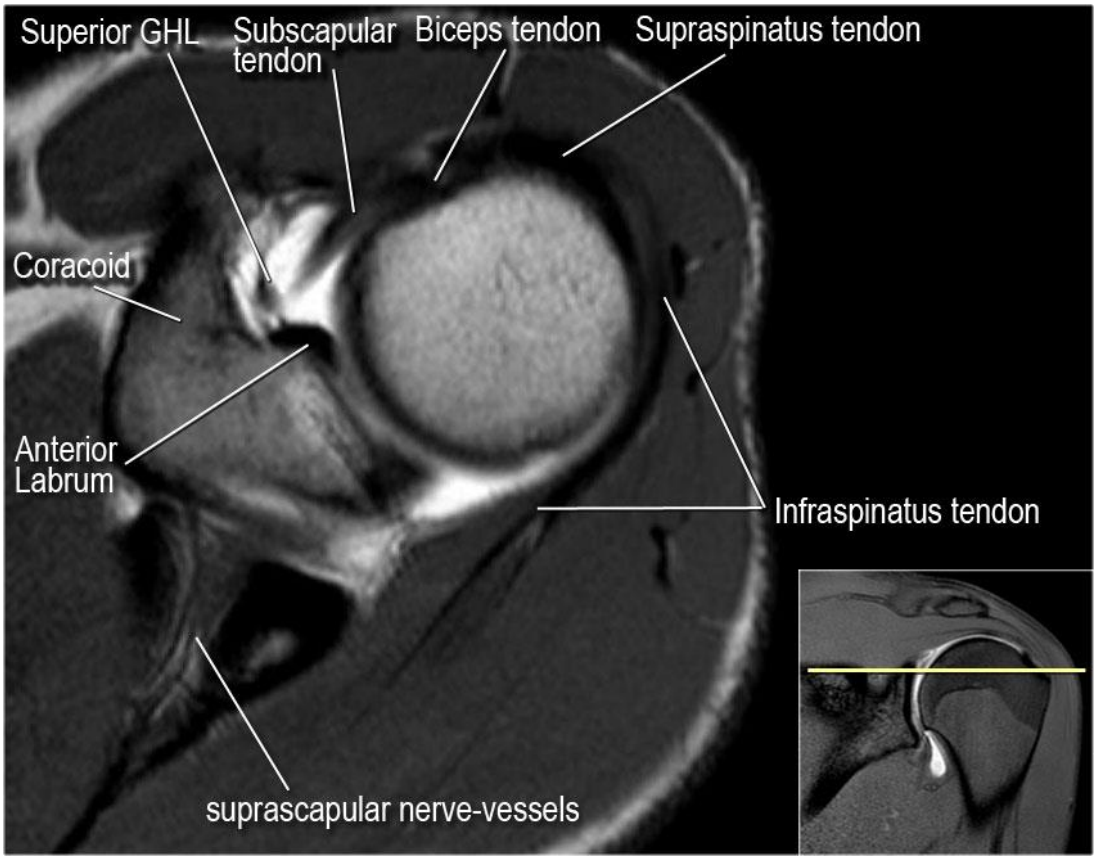

Figure (3): Axial view T2 weighted MRI of the shoulder showing the SGHL.

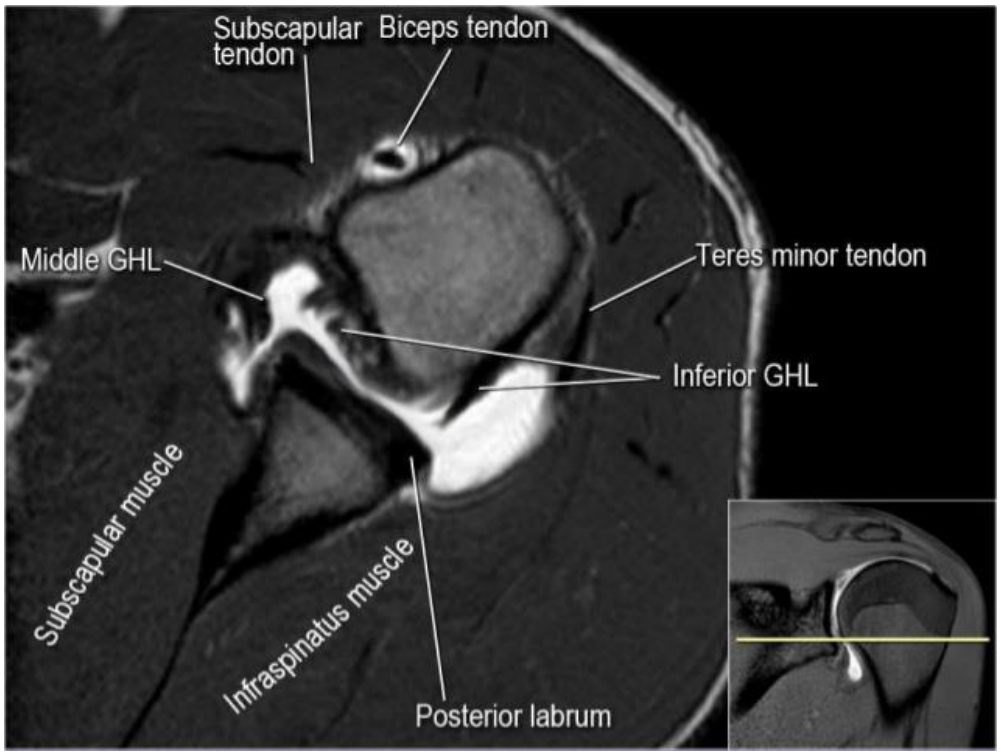

Figure (4): Axial view T2 weighted MRI of the shoulder showing the MGHL and IGHL.

The Glenoid Labrum

It is a fibrocartilaginous rim attached around the margin of the glenoid cavity. It increases the superior-inferior diameter of the glenoid by 75% and the anterior-posterior diameter by 50%. The base of the glenoid labrum is fixed to the circumference of the cavity, while the free edge is thin and sharp. It is continuous above with the tendon of the long head of the Biceps brachii, which blends with the fibrous tissue of the labrum. It deepens the articular cavity and protects the edges of the bone. ***(Doshi et al., 2002).***