بسم الله الرحمن الرحيم

Sudan University of Science and Technology

College of Graduate Studies

Study of shoulder pain using MRI

دراسة آلام الكتف باستخدام تقنية الرنين المغنطيسي

A thesis submitted for partial fulfillment Requirement of Master degree in Diagnostic Radiological Technology

By

Nada Abdalla Ali Attar

Supervisor

Dr. Mona Ahmed Mohammed Ahmed

Dedication

This research is dedicated to........

My father

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My Mother

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My Husband

Acknowledgment

Firstly I thank my God for his help to finish this work successfully.

I would like to express my deepestthanks to my

Supervisor:***Dr.Mona Ahmed Mohamed*** for her guidance.

Also great thanks for all people who help me to finish this work.

Abstract:

The main objective of study to determine the underline of shoulder pain, this study carriedout in the Alamal diagnostic center and Modern Medical centerin Khartoum state which equipped by high quality machine among them MRI Philips 1.5 tesla and GE 1.5 tesla for Modern medical center.

A total of 50 patients for this study, almost all those complaining of persistent shoulder pain, most of them were under gone routine plain shoulder radiographs.

More than 41%(30) of patient showed evidences of rotator cuff tear of different grades ,that would not be seen in radiography ,most of them were elder patient, explaining that elder population are susceptible to cuff tears, and at high risk and occurrence of the shoulder pain increase with age and hard work and weight .

The study verified that MRI the best to demonstrate soft tissue with high quality diagnostic. The persistent shoulder pain is recommended to transfer to many routine examinations, and the exam must be done by well-trained technologist who is familiar with the scan protocols to give full diagnosable image.

مستخلص البحث

اجريت هذه الدراسة بالمركز التشخيصى لمستشفى الامل الوطنى والمركز الطبى الحديث حيث يوجد بهما جهازى رنين مغنطيسى ذو كفاءة عالية 1.5 تسلا, تهدف هذه الدراسة الي دراسة الام الكتف باستخدام تقنية الرنين الميغناطيسي.

أجريت هذه الدراسة على 50 مريضا اغلبهم يعانون من ألام مزمنة فى الكتف وكانت أعمارهم تتراوح بين 25-70 عاما وأجريت لهم فحوصات أشعة روتينية سابقة.

كما كان متوقعا فان النتائج كانت مرضية ومطابقة لما فى معظم الدراسات السابقة حيث أوضحت فحوصات الرنين المغنطيسي أكثر من 41%من العدد الكلى يعانون من تمزقات فى اربطه عضلات الكتف والتى لم تكن واضحة فى الأشعة الروتينية كما أوضحت ان المرضى الذين يعانون من الوزن الزائد والمرضى كبار السن والمرضى الذين يعملون أعمال شاقة معرضون اكثر من غيرهم للأم الكتف .

اوضحت هذه الدراسة ان فحوصات الرنين المغنطيسي ذات دقة عالية لتبين تمزقات الاربطةوالعضلات وألانسجة المحيطة بالكتف والاضلاع.

ونسبة لهذه المميزات اقترح الباحث تفعيل دور هذه الوسيلة وجعلها أساسية وتدريب الكوادر العاملة فى هذا المجال من أخصائي واختصاصي الأشعة.

Abbreviations

MRI	Magnetic resonance imaging
C3	Third cervical nerve segment
C4	Fourth cervical nerve segment
C5	Fifth cervical nerve segment
C6	Sixth cervical nerve segment
GT	Greater tuberosity
LHB	Long head of biceps
T1	Inversion time
PD	proton density
SE	Spin echo
FSE	Fast spin echo
FOV	Field of view
CT	Computed Tomography
US	Ultra Sound
Hrs	Hours

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Chapter one

Introduction

1.1: Introduction:

The human shoulder is made up of three bones: the clavicle (collarbone), the scapula (shoulder blade), and the humerus (upper arm bone) as well as associated muscles, ligaments and tendons. The articulations between the bones of the shoulder make up the shoulder joints. The major joint of the shoulder is the glen humeral joint, which "shoulder joint" generally refers to. In human anatomy, the shoulder joint comprises the part of the body where the humerus attaches to the scapula, the head sitting in the glenoid fossa. The shoulder is the group of structures in the region of the joint. (Laughlin2009).

Shoulder joint is a most movable joint in the body therefore being unstable because the humeral ball is larger than scapular socket that hold it, to remain in its stable position the shoulder must be anchored by muscle, tendons and ligament, because the shoulder can be unstable it is a common site of many problems, including strain, rotator cuff tear, dislocation tendonitis, frozen shoulder, degenerative disease. (Laughlin2009).

Magnetic resonance imaging (MRI), or nuclear magnetic resonance imaging (NMRI), is primarily a medical imaging technique most commonly used in radiology to visualize the internal structure and function of the body. (Brown1998).

The best diagnostic method of shoulder pain is a magnetic resonance imaging. The most common indications for shoulder MRI are suspected rotator cuff tear, shoulder instability, osteonecrosis, neoplasm and infection. (Mark 1998).

1-2 Problem of the study:

Shoulder pain is most common in Sudanese population the plain x-ray is failed in diagnosing of strains , sprain , tendonitis , bursitis , rotator cuff tears ,frozen shoulder and tear of the shoulder joint so that Magnetic Resonance Imaging (MRI) is capable to accurately diagnose the cause of pain in shoulder without ionizing radiation.

1-3 Objective of the study:

1-3-*1General objectives:*

- To study the shoulder pain using MRI.

1-3-2 *Specific objectives:*

- To assess the tendon- joint space.
- To detect the main underline causes of MRI finding.
- To correlate between shoulder pain, patient age, patient work and weight.
- To show optimum protocols in MRI with demonstrate in specific pathology.

1-4 Significance of the study:

This study explain the role of the magnetic resonance imaging in shoulder joint pain and help in good diagnosis of any shoulder abnormalities.

1-5 Overview of the study:

This study consisted of five chapters, chapter one is introduction and problem of the study and objective and significance of the study and overview of the study. Chapter two includes literature review and previous studies. Chapter three includes material and methodology. Chapter four includes data collection, results and analysis Chapter five includes conclusion and recommendation and appendix.

Chapter two

Chapter two

Literature Review and theoretical background

2.1: ***Anatomy***:

Shoulder girdle is composed of two main component on either sides, the scapula posterity and the clavicle interiorly, it is incomplete ring, open in the back between the two scapulae and complete in the front as clavicles are connected the sternum in the midline, the main purpose of this girdle is to maintain supportment to upper extremities, an provide attachment for muscles. (Snell 1992).Fig.(2-1).

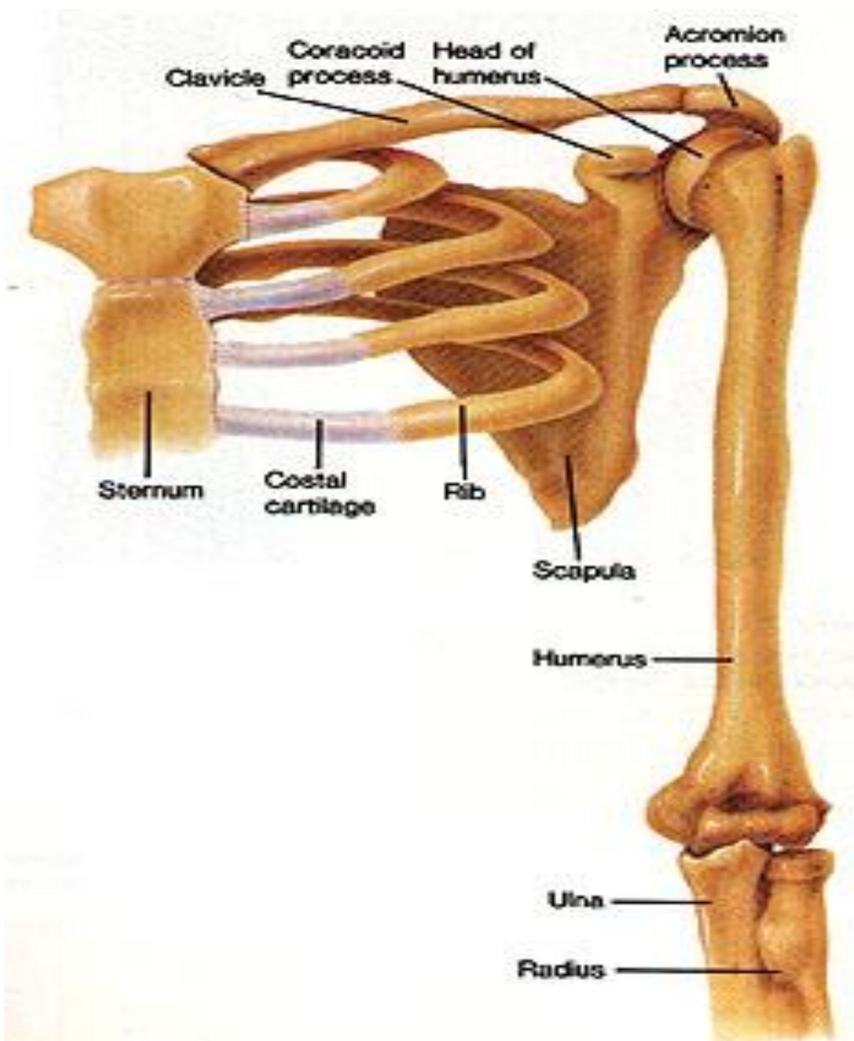


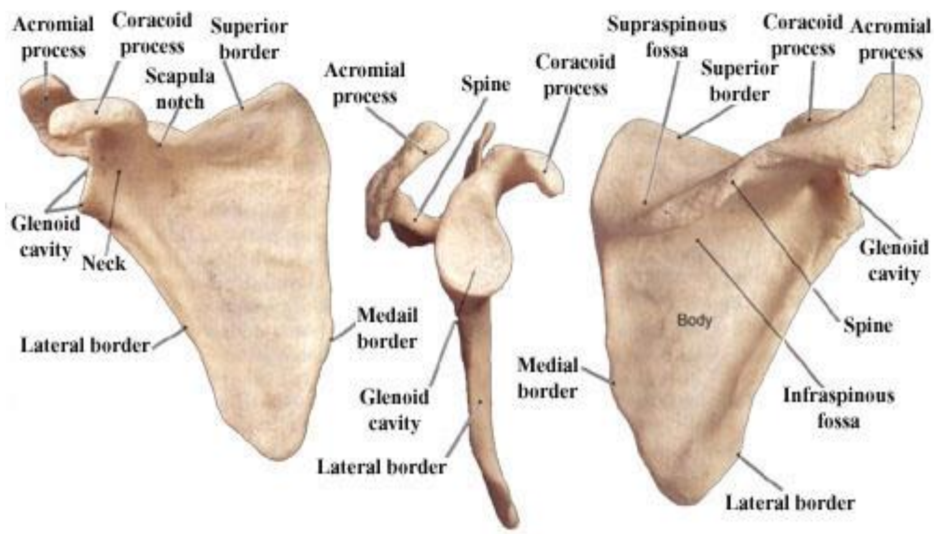
Figure [2-1]: Anatomy of the shoulder (Faisal 2012)

Chapter five

2.1.1Bony structure of the shoulder:

2.1.1.1Scapula:

This bone has three prominent features, spine, acromion and coracoids processes. The spine is posterior aspect running obliquely across the scapula. The acromion process forms the tip of shoulder, and articulates with clavicle at acromio clavicular joint, providing attachment for several muscles of arm and chest. The coracoids process, which curves forward and down – ward below the clavicle, provides also attachment for arm and Chest muscles. Between these two processes, acromion and coracoids is a gleniod cavity, a hollow depression which articulate with humeral head to form a ball and socket glen humeral joint (Richard 1992). Figure. (2.2).



A B C

Figure [2.2]: (A) scapula, Anterior aspect (B) lateral (C) posterior view (Faisal 2012)

2-1.1.1.2Humerus:

A longest bone of upper limb having expanded upper end, shaft and lower end, we shall district the description on upper end. This consists of the convex articular surface, the anatomical neck and two tubercles, greater and lesser tubercles. The head has an area 3 times more than gelnoid cavity, the tubercles are separated by biceptal groove, and this groove averages 4.3 mm in depth. Grooves which has less than 3mm depth are considerable shallow and has a high risk of long head of Biceps (LHB) dislocation or subluxation, the medial aspect of the groove which forms lesser tubercle is lower than lateral aspect of the groove resulting in higher incidence of medial subluxation of long head of Biceps (LHB) than lateral . (Snell, 1992).

2-1-1-3 Clavicle:

This bone courses almost horizontally across either chest sides, from the neck base to the shoulder, medially it articulates with sternum at the level of manubrium, and laterally it articulate with [p process of the scapula to form acromio clavicular joint, clavicle provide stability for scapula ,and serves for attachment for several arm ,chest and back muscle (Sneel 1992) .

Shoulder joint is protected superiorly by the two processes of the scapula, acromion and coracoids, and hold together by various muscles and tendon fibers.

A loose capsule completely encircles the shoulder joint and attached around the circumference of gleniod cavity and anatomical neck of humorus this capsule is surrounded by several muscles and tendons which reinforce the joint and keep the humeral head and scapular in close proximity.

2.1.2 Soft tissue of shoulder joint:

2-1-2-1 The deep fascia:

The deep fascia covers the deltoid and sends a numerous septa between fascicule. In front, it is continuous with pectorals fascia, behind, where it is thick and strong with fascia infraspinatus, above, it is attached to the clavicle, the acromion, and the crest of the scapular spine, below with brachial fascia. (Standing 2006).

2-1-2-2 The Deltoid muscle:

Is a thick triangular muscle which covers the shoulder joint, it arises from the anterior border and upper surface of 1ateral third of the clavicle, from the lateral margin and upper surface of acromion, and from the lower lip of scapular spine. The fibers converge towards their insertion, the middle fibers passing vertically, the anterior inclining backwards, and the posterior fibers forward, these thin groups of fibers unites in a thick tendon which inserted into the deltoid tuberosity on the lateral side of the humeral shaft. This muscle is remarkably coarse in texture, the part arising from acromion consist of oblique fibers. (Standing2006).

The bulk of the muscle spread out over the projection formed by the greater tuberosity, accounts for the rounded contour of normal shoulder, and its limits can be determined accurately through the skin, if the arm is maintain in a true abduction against gravity. (Standing 2006).

2-1-2-3 Subscapularis muscle:

Is a large triangular muscle which fills the sub scapular fossa and arises from its medial two thirds, the fibers pass laterally and gradually converging , end in a tendon which inserts into the lesser tuberosity, some of these fibers continues crossing bicipital groove forming transverse ligament. Fig (2.3) interiorly: posterior wall of the axilla, posterior, scapula and capsule of shoulder joint, lower border, teres major and latissimus dersi.(Standing2006).

2.1.2-4: Supraspinatus muscle:

The supraspinatus muscle occupies supraspinatus fossa arising from its medial two thirds and supraspinatus fascia the muscle fibers pass under the acromion and converge to a tendon which crosses the upper part of shoulder joint and inserted into the highest of the three impressions of the greater tubercle G.T of humerus. Fig (2.3) (Standing 2006)

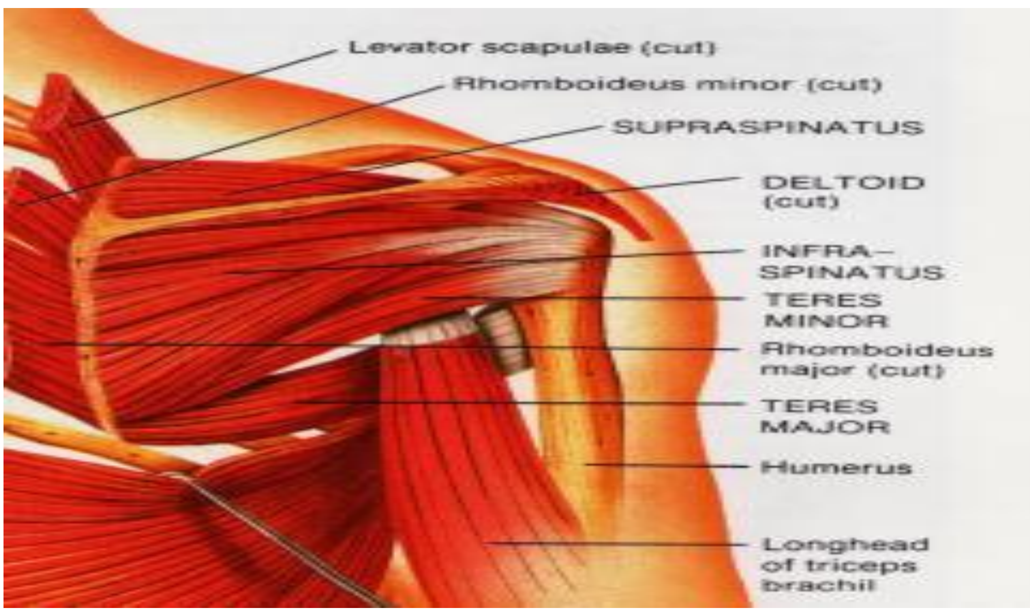


Figure (2-3) shoulder muscle (www.hawaiianshirtary.com)

2-1-2-4 Infraspinatus muscle:

It is a thick triangular muscle, which occupies the chief part of supraspinatus fossa. This muscle arises from the two medial third of infraspinatus fossa and deep fascia of infraspinatus. A bursa lies between the bare area of scapula and the muscle, sometimes it communicates to the shoulder joint, the tendons of this muscle insert into the smooth area on the central facet of greater tuberosity between supraspinatus above and teres minor below. Fig. (2.3) and (2.4) (Standing 2006).

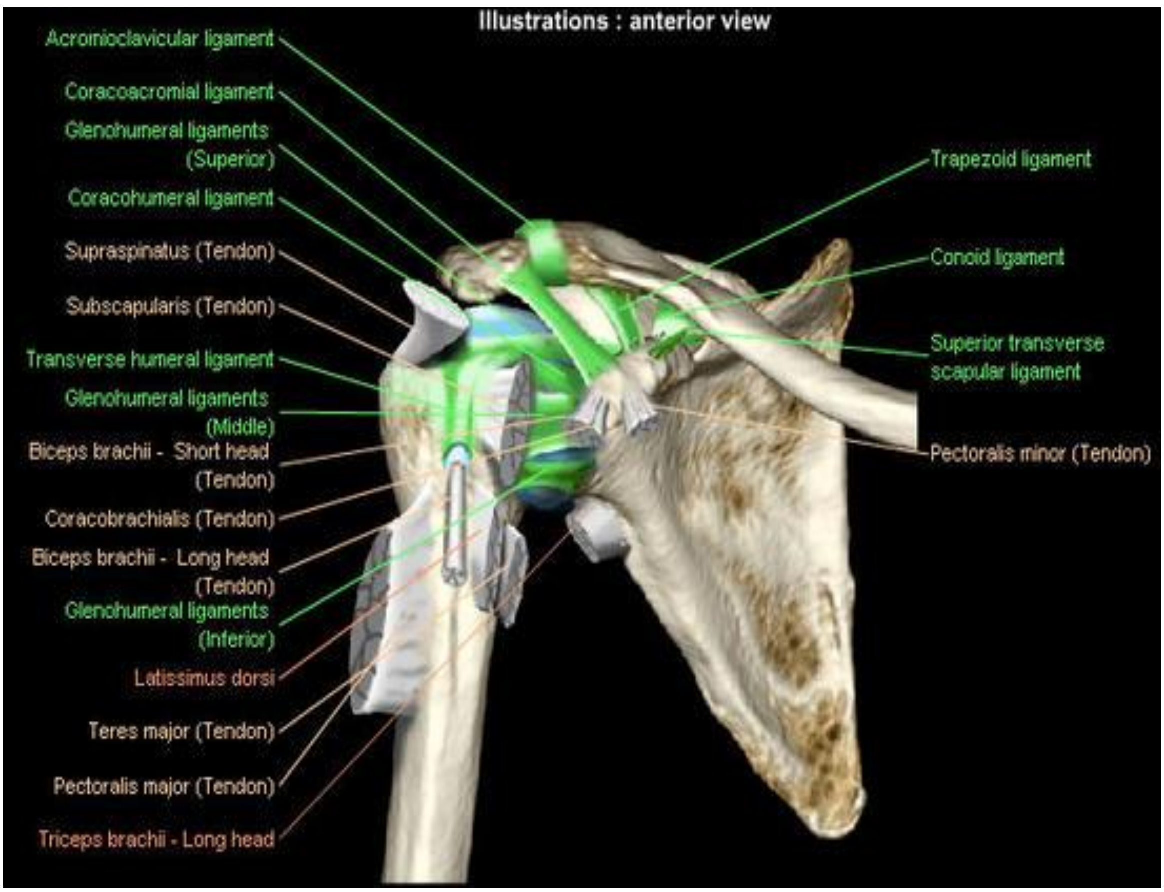


Figure. [2.4] shoulder tendons and ligaments(Alamin 2012)

2-1-2-5 Teres minor muscle:

Is a narrow elongated muscle, this muscle arises from the dorsal surface of auxiliary border of the scapula, passing upwards and laterally with lower border of infraspinatis and behind the long head of triceps, its tendons attached to the lowest facet on the greater tuberosity G.T. Fig (2. 3) (Standing 2006).

2-1-2-6 Teres Major:

Is a thick, somewhat flattened muscle, arises from the dorsal surface of inferior angle of the scapula, and inserted into the medial lip of the interlubercular sulcus of the humerus. (Standing 2006).

2-1-2-7 Biceps Bjrachialis muscle:

Is a long, bursiform muscle placed on the front of the arm, it has two heads, the short head arises by a thick flattened tendon from the apex of the coracoids process with coracobrachialis, the long head takes origin within the fibrous capsule of shoulder joint at the apex of gleniod cavity and continues with gleniod labrum and unsheathed by a synovial membrane arches over humeral head, passing behind transverse humeral ligament, descending in the interlubercular sulcus. (Standing 2006).

Relation: Overlapped by pectoralis major and deltoid muscles, but in the rest it is superficial, being covered only by fasciae, and skin, below it is on the brachial, and its medial border related to coracobrachialis, its lateral border is in relation with deltoid and brachioradialis. (Standing 2006).

2-1-2-8: The pectoralis major muscles:

Is abroad triangular muscle which covers the front of the upper part of the chest . It arises from the anterior surface of the sternum and from the costal cartilage of the 2nd to 6th ribs. It inserted into the lateral lip of the interlubercular sulcus of the humerus. (Dean1987).

2.1.2.9:The pectoralis minor muscles:

Is a small muscles which lies deep to the pectoralis major .It is arises from the 2nd , 3rd and 4th ribs and is inserted into the coracoids process of scapula .(Dean,1987).

2.2: Physiology:

The ability of human to move is predicated on specific cells that have become highly differentiated, so that they function almost exclusively in contraction. There are three types of muscle, skeletal, smooth, and cardiac muscles. There are basic similarities among the three muscle types. They are all mesoderm ally derived and are elongated parallel to their axis of contraction, they possess numerous mitochondria to accommodate their high energy requirements, and all contain contractile elements known as my filament in form of action and myosin, as well additional contractile-associated proteins(Sukkar, 2000).

2-2-1Contraction of muscle:

Contraction is defined as active process of generating a mechanical force in muscle. The force exerted by contracting muscle on the object is known as muscle tension and the force exerted on muscle by a weight is known as load. To lift a load muscle tension must be greater than muscle load (William, 2003).

2-2-2 Simple muscles twitch:

The contraction to a single action potential is called simple muscle twitch following the stimulus, there is an interval of a few milliseconds, known as the latent period, before contraction begins.

This is a time taken for action potential to develop if muscle is stimulated through its nerve, the latent period is longer because of the time taken in transmission at neuromuscular junction (William 2003).

2-2-3 Summation of contraction:

A single twitch is of no mechanical value because its duration is very short. To produce sustained and coordinated muscle movements, single twitches' summate in two different ways. (Sukkar, 2000).

Spatial summation: The muscle fibers, together with the motor neuron which innervate them, constitute a motor unit. In spatial summation, stimulation of numerous nerve fibers causes an increasing number of motor units to excited. The response of single motor units are therefore added together to produce a strong contraction by the muscle.(Sukkar, 2000).

Temporal summation: When frequency summation rises above 10/s the second stimulus contraction develops before the first one is over. As frequency increases, the degree of the summation becomes greater producing stronger contraction every time in stepwise fashion. When muscle is stimulated at a progressively greater rate, a frequency is reached at which contractions fuse together and cannot be distinguished. This is called tantalization and contraction is a titanic contraction, which is smooth and maintained. Most contractions of muscles in everyday life are of this nature. They allow useful work to be done (Sukkar, 2000).

2-2-5.The events in muscle contraction:

Acetylcholine released by the motor nerve at the neuromuscular junction leads to formation of the EPP. In turn depolarizes the sarcolemma leading to formation of muscle action potential spreads to inside of the cell causing muscle contraction.

Relaxation back into sacra plasma reticulum, calcium is detached from troponin, troponin ceases pulling on tropmycin resulting in muscle relaxation (William 2003).

2-2-6 The Deltoid muscle:

Nerve supply: The deltoid muscle is supplied by auxiliary nerve C5 and C6.

Actions: The muscle is capable of acting in parts or as a whole, the anterior fibers co-operates with pectoralis major in drawing the arm forward and medial rotation. The posterior fibers co-operates with latissimas dorsi and major in drawing the arm backwards and they act as lateral rotation for humerus, the multitenant, acromial part is stronger and most important part aided by supraspinatus, it raises the arm from the side (true abduction). (Standing 2006).

2-2-7 Subscapularis muscle:

Nerve supply: supplied by upper and lower subscapular nerve arising from upper trunk of brachial plexus receiving fibers from C5 and C6 (Susan Standing 2006).

2-2-8 Supraspinatus muscle:

Nerve supply: supraspinatus is supplied by suprascapular nerve which receives fibers from C.4,5 and 6 (Standing 2006).

2-2-9 Infraspinatus muscle:

Action: bracing the head of the humors to gleniod cavity, giving stability to the joint, the muscle has also a powerful lateral rotation of the humerus (standing, 2006).

2-2-10 Teres minor muscle:

Nerve supply: by a branch from posterior branch of the axillary nerve C5 and C6.

Action: it acts as dynamic stabilizer for the shoulder joint, lateral rotation and weak adductor of the humerus. (Standing 2006).

2-2-11 Biceps Brachialis muscle:

Nerve supply: The biceps is supplied by the musculocutaneous nerve from the lateral cord of brachial plexus receiving fibers from C.5 and C.6.

Action: Is a powerful supinator of the forearm, flexes the elbow joint, and to slight extent the shoulder joint. The long head exercises downward pressure on the upper end of the humerus , and so help to prevent the head of the bone from gliding upward under the influence of the deltoid. (Standing,2006).

2-3 Pathology:

Shallowness of glenoid fossa of scapula and lack of support provided by weak ligament make this joint an unstable structure, its strength almost entirely depend on the tone of rotator cuff, subscapularis in front, spraspinatus above, and infraspinatus and teres minor behind.

The least sported part of the joint lies in the inferior location, where it unprotected by muscles. (www.physioroom.com/injuries/shoulder).

2-3-1 Shoulder pain:

The skin over shoulder and halfway down the lateral surface of the deltoid muscle is supplied by the supra scapular nerves (C3,C4) pain may be referred to the region as a result of inflammatory lesion involving the diaphragmatic pleura or peritoneum. The afferent stimuli reach the spinal cord via phrenic nerves (C3,C4) and C5 pleurisy, peritonitis. Subphrenic abscess, or gallbladder disease may therefore be responsible for shoulder pain. (www.physioroom.com/injuries/shoulder).

2-3-2 humeral head fractures:

Humeral head fractures occur during the process of anterior and posterior dislocations of shoulder joint, the fibro-cartilaginous gleniod labrum of the scapula produce the fracture.

Bony fragment will have attachment to supraspinatus, teres minor whose tendons make a part of rotator cuff.

2-3-3 Lesser tuberosity fractures:

Occasionally lesser tuberoisity fractures accompany posterior dislocation of shoulder joint then, bone fragment receive insertion of the subscapularis tendon a part of rotator cuff.

2-3-4 Rotator cuff tendinitis:

Excessive overhead activity of the upper limb may be the cause of the tendonitis. During abduction of shoulder joint the supraspinatus tendon is exposed to friction against the acromion. Under normal condition the amount of the friction is reduced by subacromial bursa (www.physioroom.com/injuries/shoulder).

Degenerative changes in underlying tendon, extending into other rotator cuff tendons which is known as subacormial bursitis, Supraspinatus tendon or precapsultits characterized by spasm of pain in middle range of abduction (www.physioroom.com/injuries/shoulder).

2-3-5: Dislocated shoulder Injury:

In dislocated shoulder the normal rounded appearance of the shoulder will be replaced by a more squared-off edge. It characterized by sever shoulder pain, loss of shoulder movement and holding arm protectively against the chest (www.physioroom.com/injuries/shoulder).

2-3-6: Rotator cuff calcific Tendonitis injury:

Rotator cuff calcific Tendonitis injury is characterized by calcium deposits in the tendon of the rotator cuff muscles oh the shoulder .the common symptoms of it are severe shoulder pain, Arm and neck pain, and shoulder weakness(www.physioroom.com/injuries/shoulder)

2-3-7: Broken Collar bone Injury:

A broken Collar bone (broken clavicle) is a very common shoulder injury. A broken Collar bone frequently occurs when someone falls onto an out stretched hand. The force transmitted up the arm is often enough to cause this painful shoulder fracture. (www.physioroom .com/injuries /shoulder).

2-3-8 Rotator cuff tear:

Rotator cuff tear occurs in advanced cases of cuff tendinitis; the necrotic supraspinatus tendon can become calcified or ruptured. Rupture of tendon can seriously interfere with the normal abduction movement of shoulder joint. It will be remembered that the main function of the supraspinatus muscle is to hold the head of humerus in glenoid fossa a commencement of abduction. The patient with ruptured supraspinatus tendon is unable to initiate abduction of the arm.

However if the arm is passively assisted for the first 15 of abduction, the deltoid can then take over and complete the movement to the right angle. (www.physioroom.com/injuries/shoulder).

2-4: Imaging Modalities:

2-4-1 Plain radiographs (X-ray)

X-rays evaluate bone dislocations, malalignments, fractures, and other changes to the bone tissue. Often x-rays are used to rule out a fracture problem; if the bone appears normal, then the focus can be shifted to other areas of concern. In the x-rays below, the bone structures are white or light gray in tone, and the soft tissue surrounding the bone remains dark. , the other structures such as nerves, muscles, tendons, or rotator cuff are not usually seen. Figure: [2.5].

Figure.[2.5] show plain radiography shoulder joint. (Faisal 2012)

2-4-2 Computed Tomography (CT):

Computed tomography may be used to evaluate bony lesions, including glenoid rim fractures, humeral fractures, and acromioclavicular joint disease. Computed tomography arthrograms may have a role in assessing labral tears and full-thickness rotator cuff tears. The use of CT arthrography has fallen into disfavor compared with MRI because of the risks associated with contrast exposure and poor sensitivity for partial-thickness rotator cuff tears or associated soft tissue injury. Figure.[2.6]

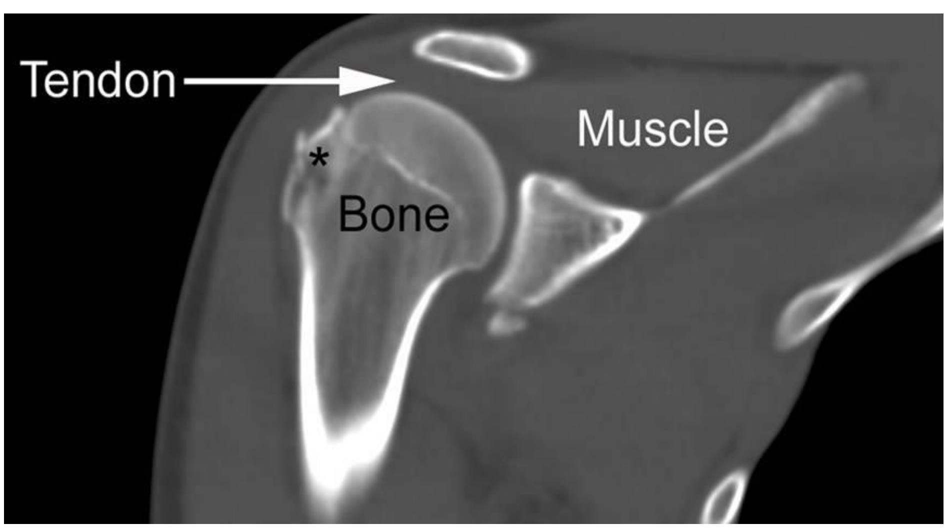


Figure.[2.6] show computed tomography shoulder joint

(Faisal 2012)

2-4-3. Ultrasound (US):

Ultrasound has been used in the evaluation of rotator cuff tears with varying degrees of sensitivity and specificity. This inconsistency may be related to variation in operator skill. Advantages of ultrasound include relatively low cost, speed, and noninvasiveness. Figure.[2.7]

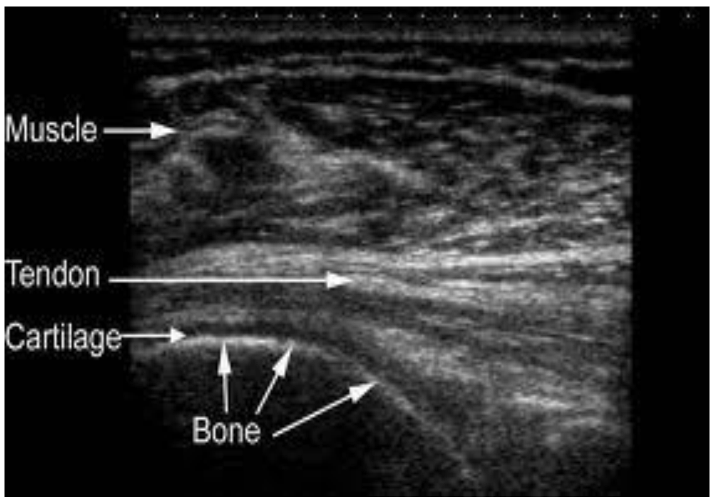


Figure.[2.7] show ultrasound shoulder joint (Faisal 2012)

2-4-4 Magnetic resonance imaging (MRI):

Magnetic resonance imaging has become the gold standard for diagnostic imaging of the shoulder related to soft tissue injury. The advantages include its noninvasive nature, lack of contrast exposure, no ionizing radiation, high degree of resolution, and the ability to evaluate multiple potential pathologic processes. Magnetic resonance imaging is the preferred test for evaluating impingement syndrome and rotator cuff pathology. A normal MRI greatly reduces the chances of a rotator cuff tear, Magnetic resonance imaging is also useful in the evaluation of vascular necrosis, biceps tendon disorders, inflammatory processes, and tumors. and labral lesion . Finally, it is important to note that up to one third of all asymptomatic patients and more than half of those older than 60 years demonstrate asymptomatic rotator cuff tears on MRI. Figure: [2.8]

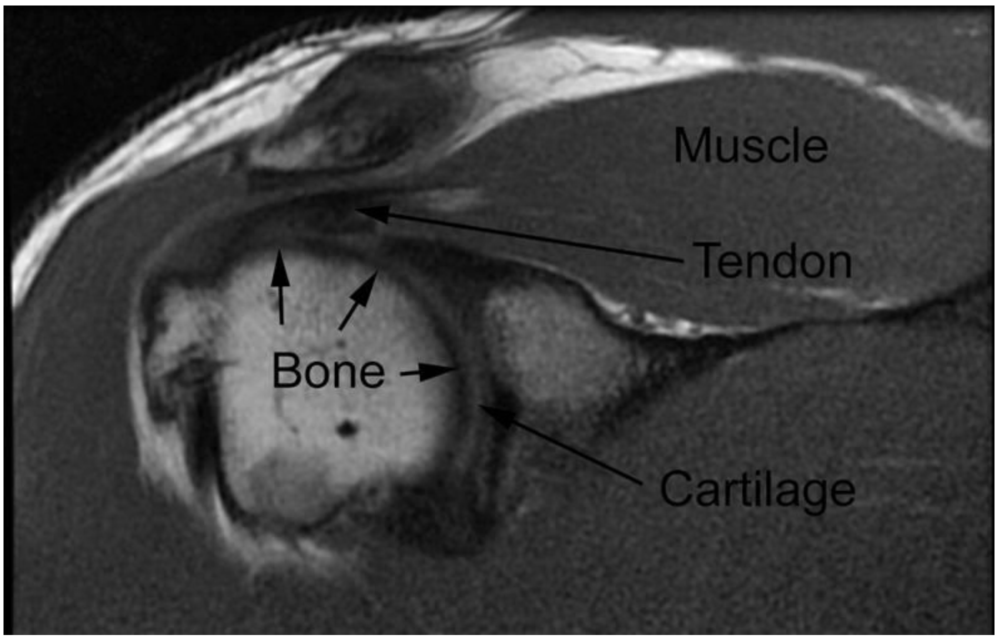


Figure: [2.8] show magnetic resonance imaging shoulder joint

(Amin 2012)

2-5 History of Magnetic Resonance Imaging (MRI):

July 3rd, 1977- the first live human scan was done. It took 5 hrs to complete.

1980's –NMR was renamed MRI due to the word "nuclear".

1984 –The 1st MRI units were sold commercially. (Brown 1998)

2-6 How MRI work:

The magnetic field aligns atomic particles called protons that are present in most of the body tissue .Radio waves make this particles given a signal received in the scanner this signal converter device the computer process this data and give us various of sections (axial-horizontal –coronal) and high quality image.(Mark A.Brown.et al 1998). MRI scans are frequently used to evaluate the internal structures of the shoulder. A variety of trends have increased the use of MRI in evaluating the shoulder - more sports activity, repetitive motion injuries, and we've remained much more active into our later years than previous generations. A shoulder MRI generally takes about 30 minutes or so to complete. wear loose comfortable clothing and remember to remove all metal (jewelry, phones, rings, etc) before going into the MRI scan room. Patient surgery or have a history of cancer, probably have the test done with Intra venous (IV) MRI contrast. Some shoulder MRIs are done after a direct injection of contrast into the joint. This is called an MR arthrogram of the Shoulder. (Tirman 1996).

2-7: Previous studies:

Shah, et al (2008) were studied eight-nine chronic stroke survivors with post-stroke shoulder pain underwent T1 and T2 weighed Multiplanar, multi sequence magnetic resonance imaging of the painful paretic shoulder. All scans were reviewed by one radiologist for the following abnormalities: rotator cuff, biceps and deltoid tears, tendonopathies and atrophy, subacromial bursa fluid, liberal ligament complex abnormalities, and acromio-clavicular capsular hypertrophy. Clinical variables included subject demographics, stroke characteristics and the Brief Pain Inventory Questions 12 (BPI 12). The relationship between MRI findings and clinical characteristics were assessed via logistic regression. Thirty-five percent of subjects exhibited a tear of at least 1 rotator cuff, biceps or deltoid muscle. Fifty-three percent of subjects exhibited tendon pathy of at least 1 rotator cuff, bicep or deltoid muscle. The prevalence of rotator cuff tears increased with age. However, rotator cuff tears and rotator cuff and deltoid tendonopathies were not related to severity of post-stroke shoulder pain. In approximately 20% of cases, rotator cuff and deltoid muscles exhibited evidence of atrophy. Atrophy was associated with reduced motor strength and reduced severity of shoulder pain.

DellaSala and Bianchini (1996) were studied Eighty patients complaining of shoulder pain were examined with MRI from January, 1993, through December, 1994. Thirty of them were submitted to surgery, with an exhaustive inspection of shoulder structures and the treatment of abnormal findings. In this subgroup of surgical patients, MRI had depicted 16 complete tears of the rotator cuff, 4 partial tears, 8 cases of subacromial impingement, I humeral head osteochondritis and, finally, I humeral head osteochondritis with complete rotator cuff tear. Surgical findings confirmed

MR diagnosis in 97% of cases. MR findings were then compared with literature data and some atypical features were observed in our series. MRI was totally reliable in complete cuff tears (16/30 patients), always showing the involvement of supraspinatus tendons and, in some cases, of other cuff tendons. In partial cuff tears (4/30 patients), besides the classic pattern of a fissure in the deep/superficial supraspinatus tendon, we observed intra- and peritendinous changes, with no tendon interruption, due to diffuse micro lesions. When impingement due to subacromial space narrowing, with no cuff tear, was present (8/30 patients), MRI depicted different causes--e.g., acromioclavear arthritis, coracoacromial ligament hypertrophy and posttraumatic changes. MRI showed tendinitis in all patients but overestimated it in one case where partial cuff tear was not confirmed surgically--the only false positive in series. At surgery, all these cases were classified as stage I-II impingement (according to Meer’s classification).

Chapter three

Chapter three

Material and Methods

3.1 Materials:

3.1.1. Patients:

In these study 50 patients (male 32 and female 18) with ages range between (25 -70 years) complaining of shoulder joint pain all patients underwent magnetic resonance imaging.

Study patient with shoulder pains both genders and all ages were included, and patient was undergoes to MRI scan.

Where exclusion criteria were: Patients with shoulder trauma and no bone disease.

3-1 Equipment:

3.1.1 *MRI machine:*

The MRI for study shoulder joint was taken by different MRI unit, (Philips Alamal diagnostic center, closed magnet, with magnetic field strength of 1.5 Tesla), (general electrical systems {GE}. Figure 3-1.

Modern medical center, American, closed magnet, with field of 1.5 Tesla).

3.1.2Shoulder coil

Shoulder array/small surface coil pair or array/small flexible coil, immobilization pads and straps and ear plugs. Figure 3-2.

Figure 3 – 1 : Philips MRI machine was used in the study(Alamal diagnostic center)

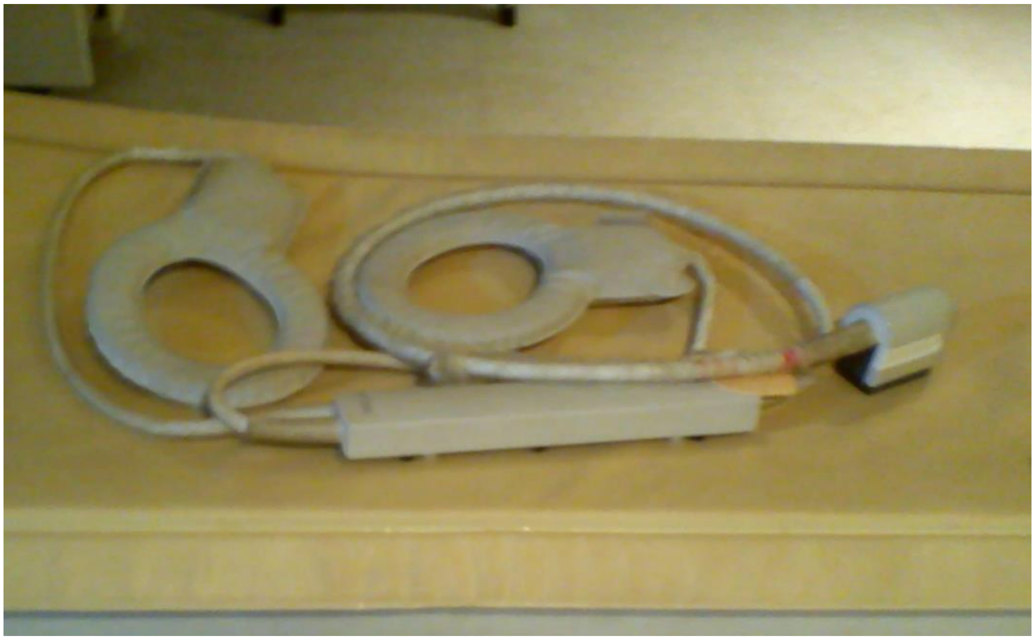


Figure 3 – 2: MRI coil was used in the study (Alamal diagnostic center)

3-2 Methods

3-2-1 Technique:

Patient positioned on the MRI examination table lies supine with the arm resting comfortably by the side. Slid the patient across the table to bring the shoulder under examination as close as possible to the center of the bore. Relax the shoulder to remove any upward.

The arm to be examined is strapped to the patient, with the thumb up (neutral position) and padded so that the humerus is horizontal. Place the coil to cover the humeral head and the anatomy superior and Z axis when it is placed over the humeral head.

Center the FOV on the middle of the glenohumeral head joint. Patient and coil immobilization is essential for a good result. Instruct the patient not move the hand during sequences.] The patient positioned so that the longitudinal alignment light and the horizontal alignment light pass through the shoulder joint.

3-4: Protocol used

Axial T1-T2, Sagittal T2,CoronalT1 –T2+stir,
and an Axial T2* GRE ,Axial T1 SE, Coronal T1FSE ,Coronal PD and Sagittal T2 FSE

3.2.2 Method of evaluation:

The master data sheet was divided into: the patient gender, patient age, patient weight, patient work, MRI protocol.

3.2.3: Who identify the type of pathology:

The image radiography diagnosed by qualified radiologist.

The data were analyzed by using simple statistical graphs, mean, standard deviation, percentage.

Chapter four

Chapter four

Results

Table 4 -1: Show the distribution of patient gender

	Frequency	Present
Male Female	31 19	62% 38%
Total	50	100%

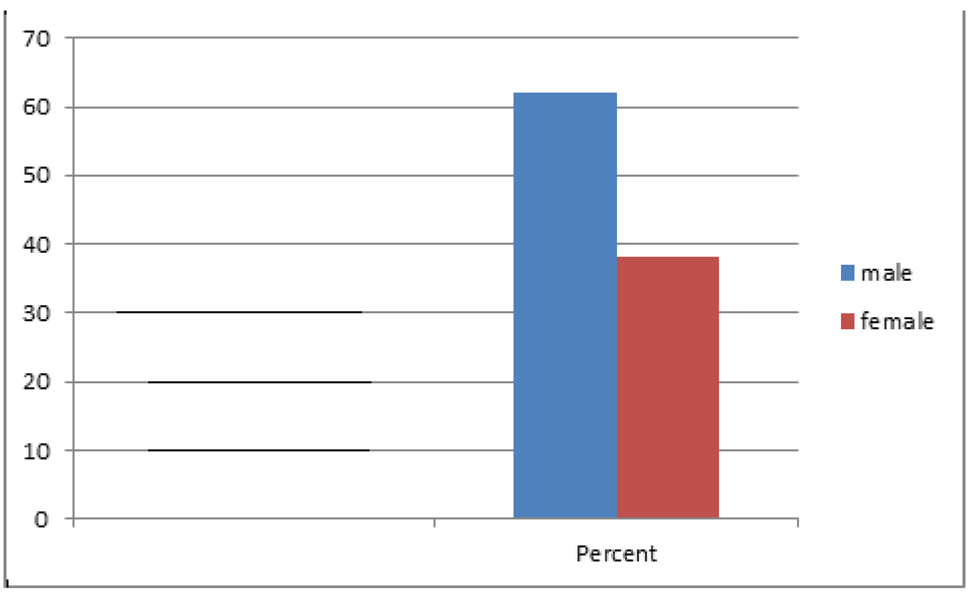


Figure 4 -1: Showed distribution of patient gender

Table 4-2: Show the patient's age distribution

age	frequency	present
>25	4	8.0%
25-34	6	14.0%
35-44	7	12.0%
45-54	11	22.0%
55-64	13	26.0%
65-74	9	18.0%
Total	50	100.0%

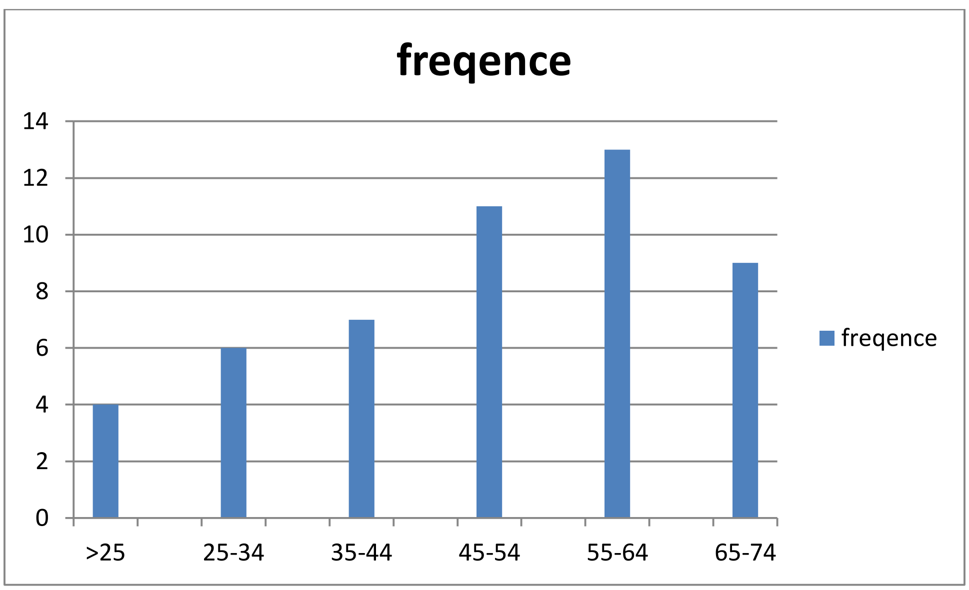


Figure 4-2: Showed the patient's age distribution

Table4-3: Show the patients weight distribution

Weight	Frequency	Percent
<60	1	2.0%
60-79	18	36.0%
80-99	31	62.0%
Total	50	100%

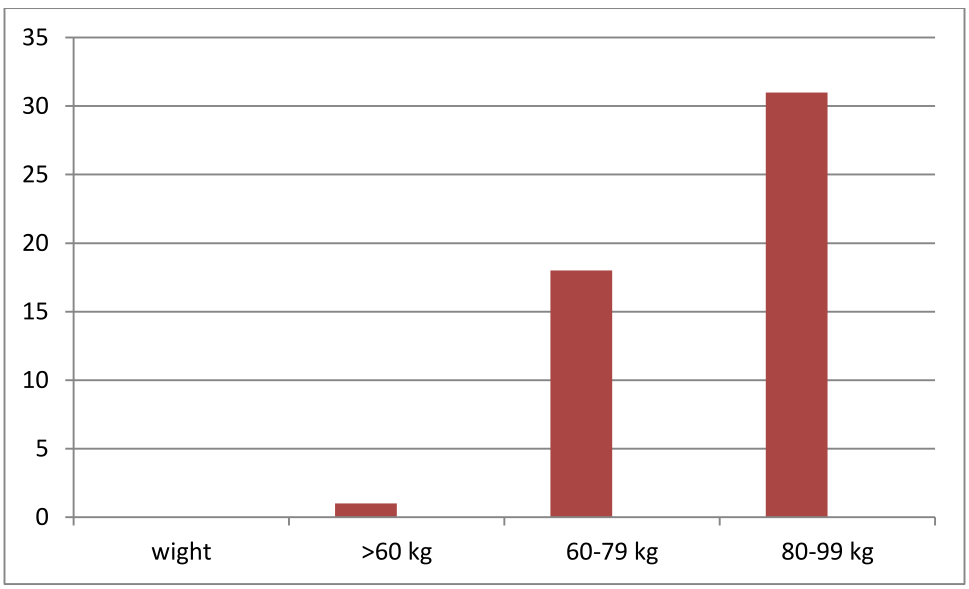


Figure 4-3: Showed the patients weight distribution

Table4-4: Show the patients occupation.

Occupation	Frequency	Present
Labor	37	74%
Clerk	13	26%
Total	50	100%

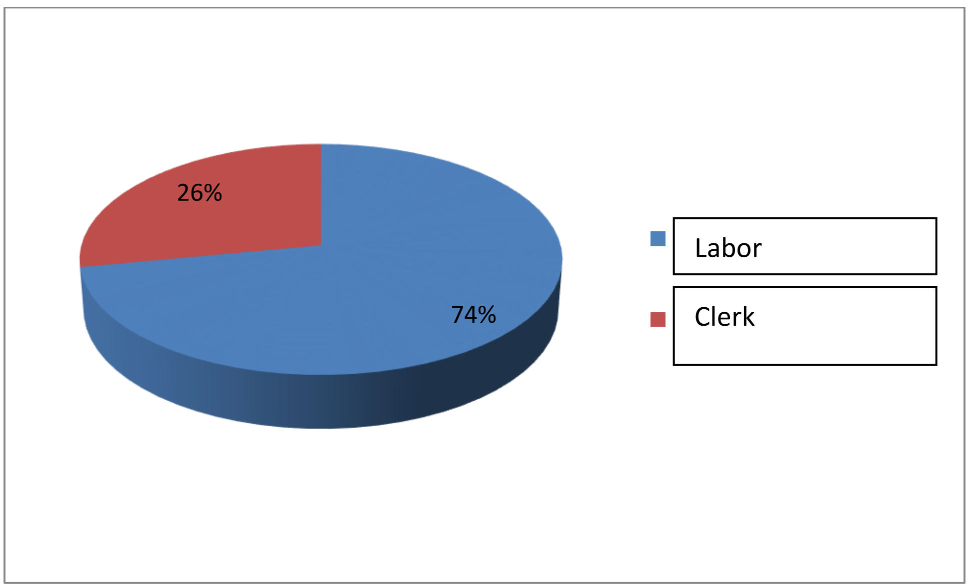


Figure 4-4: Show the patients work

Table 4-5: Showed the MRI finding of shoulder pain Relation to frequency.

Status	Frequency
Rotator cuff tear	30
Osteoarthritis	13
Bnkart lesion	6
Hill-sachs lesion	6
Tendonitis	5
Osteophayte	7
Greater tuberosity humorous hypertens	3
Degenerative	3

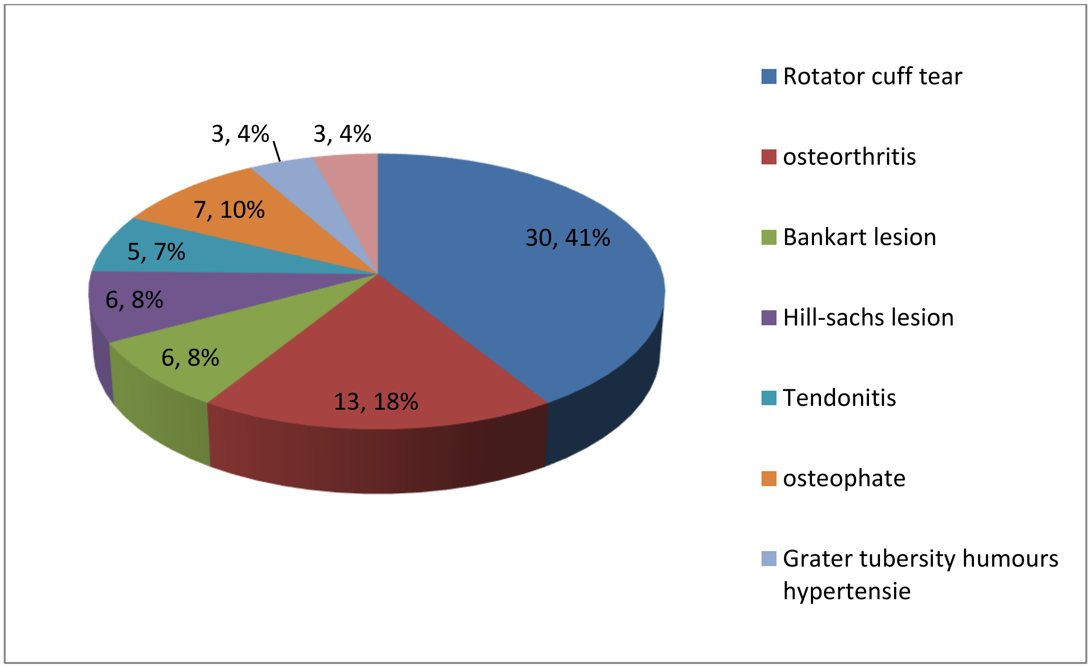


Figure 4-5: Show the most common cause of shoulder pain in Relation to frequency

Table 4-5: Show the Diagnosis * Work Cross tabulation

Diagnosis	Work		Total
	Labor	Clerk	
RCT BL HSL O	5	1	6
RTCT BL	1	0	1
RCT O	5	2	7
RCT	16	5	21
RCT HSL O	2	0	2
RCT TLHB O	1	0	1
OS	2	3	5
DG	1	2	3
GTHHP	4	0	4
Total	37	13	50

* RCT: Rotator cuff tear . * BL: Bnkart lesion *HSL:Hill-sachs lesion

* O: Osteoarthritis . *TLHB: Tendonitis long head biceps .

*OS: Osteophayte . *DG: Degenerative .

*GTHHP: Greater tubersity humorous hypertins .

Table 4-6: Show the Diagnosis * Gender Cross tabulation

Diagnosis	Gender		Total
	Male	Female	
RCT BL HSL O	3	3	6
RTCT BL	1	0	1
RCT O	5	2	7
RCT	13	8	21
RCT HSL O	2	0	2
RCPT TLHB O	1	0	1
OS	1	4	5
DG	1	2	3
GTHHP	4	0	4
Total	31	19	50

* RCT: Rotator cuff tear . * BL: Bnkart lesion *HSL:Hill-sachs lesion

* O: Osteoarthritis . *TLHB: Tendonitis long head biceps .

*OS: Osteophayte . *DG: Degenerative .

*GTHHP: Greater tuberosity humorous hypertins .

Table 4-7: show the gender*work cross tabulation

	Male	Female	P-value
Hard work	25	31	0.00
Non hard work	6	6	1.00
Total	25	31	0.00

Chapter five

Chapter five

Discussion, conclusion, and recommendations

5.1. Discussion:

Magnetic resonance imaging is an effective modality for detecting shoulder pathology. In this study the researcher studied the shoulder pain from the different aspects to obtain useful results.

We found that the heavy weight is the maximum effected patient , were the weight between(80-99kg) that represent 62% of samples and the minimum affected weight were (<60kg) that represent 2% of sample. That mean the possibility of the occurrence of the shoulder pain increase with weight .this shown in table (4-3).this agree with Faisal alameen 2012.

In this study the effect of patient work or job in shoulder pain is very clear, in which 74% of patients are labor, and 26% are clerk that means the heavy work is a risk factor of shoulder pain. This shown in table (4-4).

The main finding of this study with cause shoulder pain is rotator cuff tear this similar result of (Rajiv 2008) that rotator cuff tear was common causes.

The coronal T1 FSE the best protocol to evaluate rotator cuff tear and also additional protocol seen rotator cuff tear coronal PD.

The T2 was excellent for visualization of humeral head .also Axial T1 SE anterior glenoid labrum to best show bankart lesion.

5. 2. Conclusion:

Rotator cuff tear is common cause of shoulder pain in aged people above 50 year.

Other risk factors that contributing in shoulder pain are patient weight , age and work.

MRI is a method of choice in assessments of shoulder joint pain due to the different causes.

5.3 Recommendations:

1. Magnetic resonance imaging examination for persistent shoulder pain is recommended to be routine examination.

2- The exam must be done by will trained technologist who is familiar with the scan protocols to give full diagnosable image.

3. MRI machine and its accessories such as flexible coil should be available in radiology department.

4. Study the best protocol to evaluate the shoulder pain.

5- Further study is recommended.

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Appendix:

(A) Data collection sheet:

NO	SEX	Age	weight	work	MRI protocol	Clinical indication	comment	Diagnosis
1	f	58	90	Non hard work and labor	Axial T1-T2 coronal T1 coronal PD sagittal T2	Shoulder pain	Chronic shoulder pain	Rotator cuff tear Bankart lesion Hill-sac's lesion Osteoarthritis
2	m	49	85	Hard work and labor	Axial T2*+T1 coronal T1-T2 coronal PD sagittal T2	Shoulder pain		Bankart lesion Hill-sac's lesion Rotator cuff partial tear
3	m	51	75	Hard work and labor	Axial PD sagittal T1 coronal T1-PD axial T2*	Shoulder pain		Rotator cuff partial tear Osteoarthritis
4	m	50	80	Hard work and labor	Axial T1 axialT2* coronal T1+PD sagittal T2	Shoulder pain		Rotator cuff partial tear Osteoarthritis
5	m	34	75	Hard work and labor	Axial T1-T2 coronal T1 coronal PD	Shoulder pain		Rotator cuff partial tear
6	m	23	75	Hard work and labor	Axial T2 coronal T1-T2 coronal PD sagittal T2	Shoulder pain		Rotator cuff small partial tear
7	m	43	85	Hard work and labor	Axial T1-T2 coronal T1 coronal PD sagittal T2	Shoulder pain		Rotator cuff partial tear .Bankart lesion Hill-sachs lesion Osteoarthritis Small synovial effusion Tendonitis of the long head of biceps
8	m	64	85	Hard work and labor	Axial T1 axialT2* coronal T1+PD sagittal T2	Shoulder pain		Rotator cuff partial tear Tendonitis of the long head of biceps Osteoarthritis

9	F	64	65	Non hard work and labor	Axial T1 axialT2* coronal T1+PD sagittal T2	Shoulder pain		Rotator cuff tear Osteoarthritis
10	M	23	85	Hard work and labor	Axial T1 axialT2* coronal T1+PD sagittal T2	Shoulder		Rotator cuff small
11	f	54	85	Hard work and labor	Axial T1 coronal PD+T1+T2 sagittal T2	Shoulder pain		Rotator cuff tear Osteoarthritis Bankart lesion Hill-sachs lesion Joint synovial effusion
12	m	59	90	Hard work and labor	Axial PD sagittal T1 coronal T1-PD axial T2*	Shoulder pain		Rotator cuff tear Osteoarthritis
13	f	67	85	Non hard work and labor	Sagittal T1 coronalT1+PD axial T2*	Shoulder pain		Rotator cuff tear Osteoarthritis Small synovial joint effusion
14	m	52	85	Hard work and labor	Sagittal T1 coronalT1+PD axial T2*	Shoulder pain		Rotator cuff partial tear Osteoarthritis
15	m	55	70	Hard work and labor	Axial Sagittal Coronal T1.T2	Shoulder pain	trauma	Hill-sashes lesion Large joint effusion
16	m	60	80	Hard work and labor	Axial Sagittal Coronal T1.T2	Shoulder pain	trauma	Gleno-humeral joint organized hematoma Humeral headcalcification
17	f	55	76	Hard work andlabor	Axial Sagittal Coronal T1.T2	Shoulder pain		Partial tear Osteophytes-oa
18	f	72	90	Non hard work and labor	Axial Sagittal Coronal T1.T2	Shoulder pain		Very suggestive partial tear a/c joint effusion degenerative cyst labarum tear

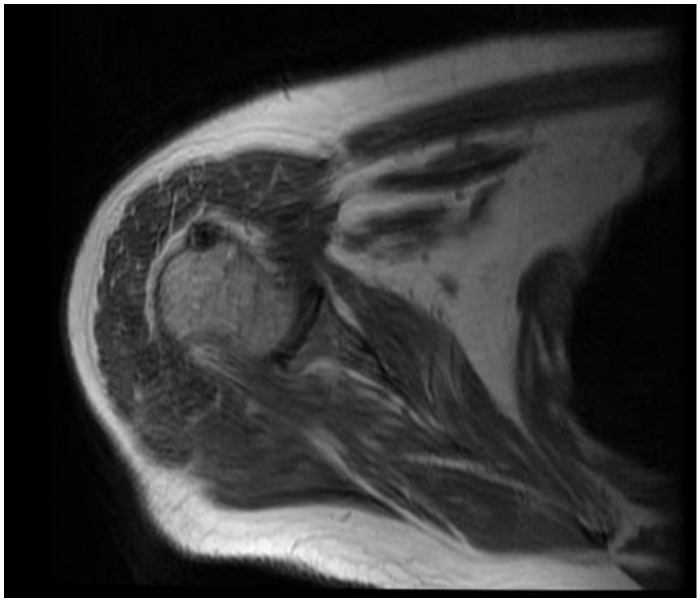
19	f	50	95	Non hard work and labor	Axial Sagittal Coronal T1.T2	Shoulder pain		Mild osteopytsis humeral head Fluid biceps tendon tenosynovitis
20	f	35	73	Hard work and labor	Axial Sagittal Coronal T1.T2	Shoulder pain		Rotator cuff tear
21	f	50	95	Non hard work and labor	Axial Sagittal Coronal T1-T2	Shoulder pain	Cervical pain +MRI	Very suggestive of partial tear contusion-impiniment significant osteo-phytosis
22	f	55	70	Non hard work and labor	Axial Sagittal Coronal T1-T2	Shoulder pain		Very suggestive of partial tear significant osteo-phytosis of A|c
23	m	27	82	Hard work and labor	Axial T1-T2 sagittal T2	Shoulder pain		Complex tear effusion of subacromial
24	m	65	76	Hard work and labor	Axial T1-T2 sagittal T2	Shoulder pain		Degenerative change noted insertion of common rotator tendon
25	m	50	83	Hard work and labor	Axial T1-T2 sagittal T2	Shoulder pain	trauma	Rotator cuff tear tendon
26	m	28	65	Hard work and labor	Axial T2 Sagittal T1-T2 Coronal: stir	Shoulder pain		Rotator cuff tear
27	m	71	86	Hard work and labor	Axial T2 Sagittal T1-T2 Coronal: stir	Shoulder pain		Partial tear banker's plus synovial effusion
28	m	55	58	Hard work and labor	Axial T2 Sagittal T1-T2	Shoulder pain		Osteophyte A.c joint
29	f	40	80	Non hard work and labor	Axial T2 Sagittal T1-T2 Coronal: stir	Shoulder pain cervical pain		Ostephytes of the AC joint
	m	50	90	Hard	Axial T1-T2	Shoulder		*Bankart lesion*

30				work and labor	sagittal T2	pain		Hills aches lesion
31	f	25	78	Hard work and labor	Axial T2 Sagittal T1-T2 Coronal: stir			Rotator cuff tear
32	m	28	74	Hard work and labor	Axial T2 Sagittal T1-T2 Coronal: stir	Shoulder pain	trauma	Grater tubersity humorous hyperintnse bruising
33	m	24	76	Hard work and labor	Axial T2 Sagittal T1-T2 Coronal: stir	Shoulder pain		Tendonitis
34	m	40	80	Hard work and labor	Axial T2 Sagittal T1-T2	Shoulder pain		Grater tubersity humorous with hyperintnse narrow edema
35	m	20	65	Hard work and labor	Axial T2 Sagittal T1-T2 Coronal: stir	Shoulder pain		Rotator cuff tear
36	m	33	70	Hard work and labor	Axial T2 Sagittal T1-T2	Shoulder pain		Grater tubersity humorous hyperintnse
37	m	55	73	Hard work and labor	Axial T2 Sagittal T1-T2	Shoulder pain		Large joint effusion
38	m	53	85	Hard work and labor	Axial T1 axialT2* coronal T1+PD sagittal T2	Shoulder pain		Rotator cuff tear osteoarthritis
39	f	66	84	non Hard work and labor	Axial T1 axialT2* coronal T1+PD sagittal T2	Shoulder pain		Rotator cuff tear
40	m	24	85	Hard work and labor	Axial T1 axialT2* coronal T1+PD sagittal T2	Shoulder pain		Small rotator cuff tear
41	m	60	90	Hard work and labor	Axial T1 axialT2* coronal T1+PD sagittal T2	Shoulder pain		Rotator cuff tear Osteoarthritis

42	m	57	80	Hard work and labor	Axial T2 Sagittal T1-T2	Shoulder pain		Humeral head calcification
43	f	70	90	non Hard work and labor	Axial T2 Sagittal T1-T2	Shoulder pain		Very suggestive effusion partial tear A/c joint
44	m	52	90	Hard work and labor	Axial T2 Sagittal T1-T2	Shoulder pain		Bankart lesion Hills-aches lesion
45	f	42	80	Non hard work and labor	Axial T2 Sagittal T1-T2	Shoulder pain	Cervical pain	Ostephytes the A/C joint
46	f	26	78	Non hard work and labor	Axial T2 Sagittal T1-T2	Shoulder pain		Rotator cuff tear
47	f	72	90	Non Hard work	Axial T2 Sagittal T1-T2 Coronal: stir	Shoulder pain		A/C joint effusion degernative
48	f	43	85	Hard work and labor	Axial Sagittal Coronal T1-T2	Shoulder pain		Rotator cuff tear
49	m	26	70	Hard work and labor	Axial Sagittal Coronal T1-T2	Shoulder pain		partial cuff tear
50	f	40	75	Hard work and labor	Axial Sagittal Coronal T1-T2	Shoulder pain		Bnkart lesion Hills-aches lesion

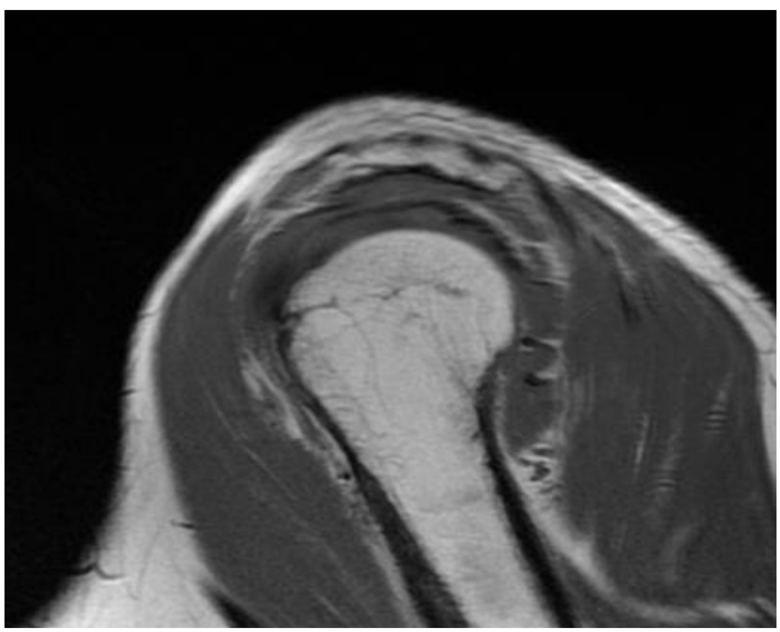
(B) Images:

Image-1



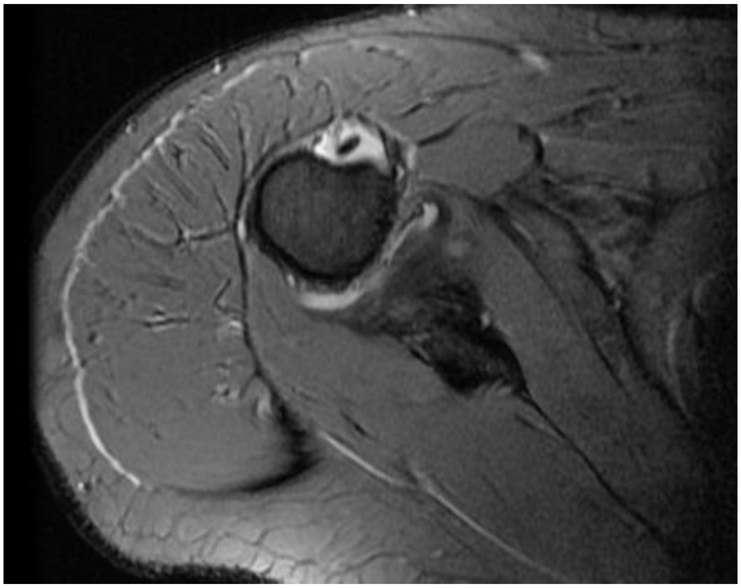
Axial MRI T1 SE female patient 64 years old show rotator cuff tear

Image -2



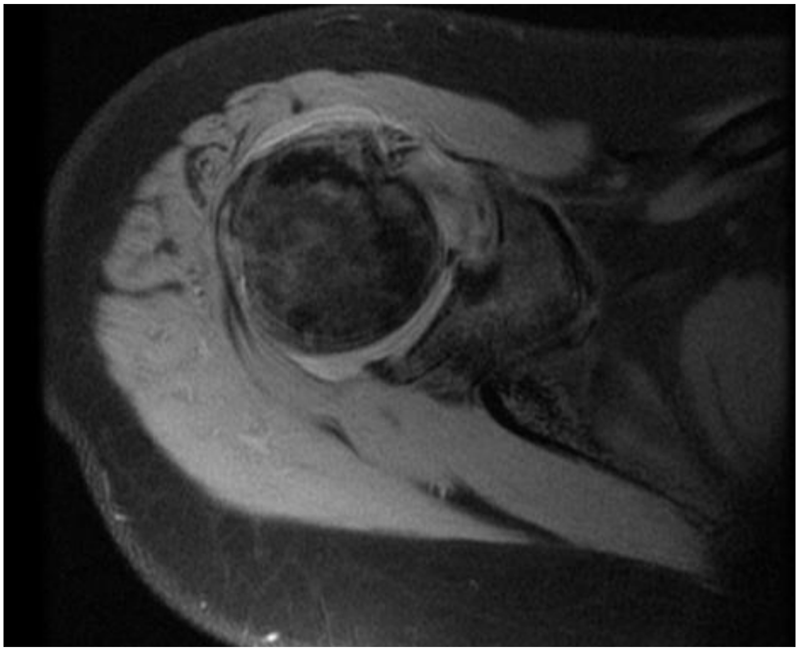
Sagittal T1 SE MRI male patient 52 years old show Osteoarthritis.

Image -3:



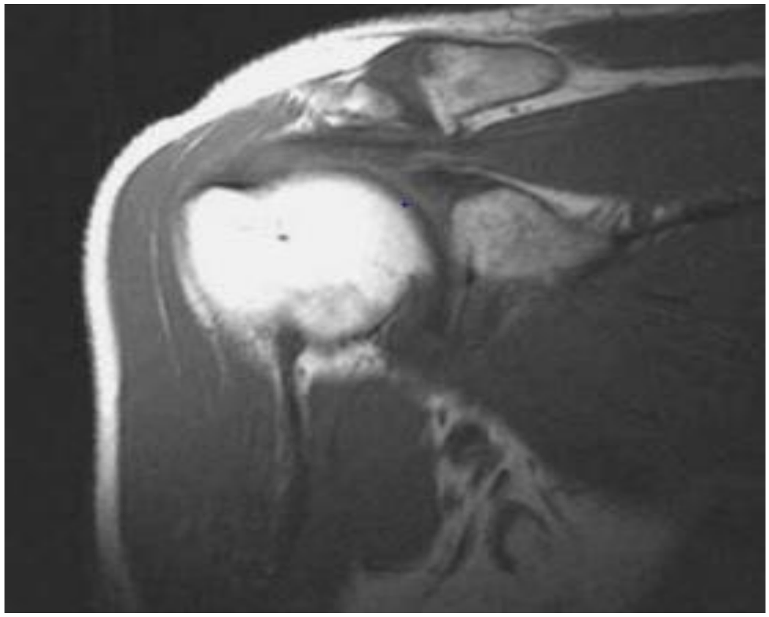
Axial T2*GRE MRI male patient 43 years old show Bankart lesion.

Image -4:



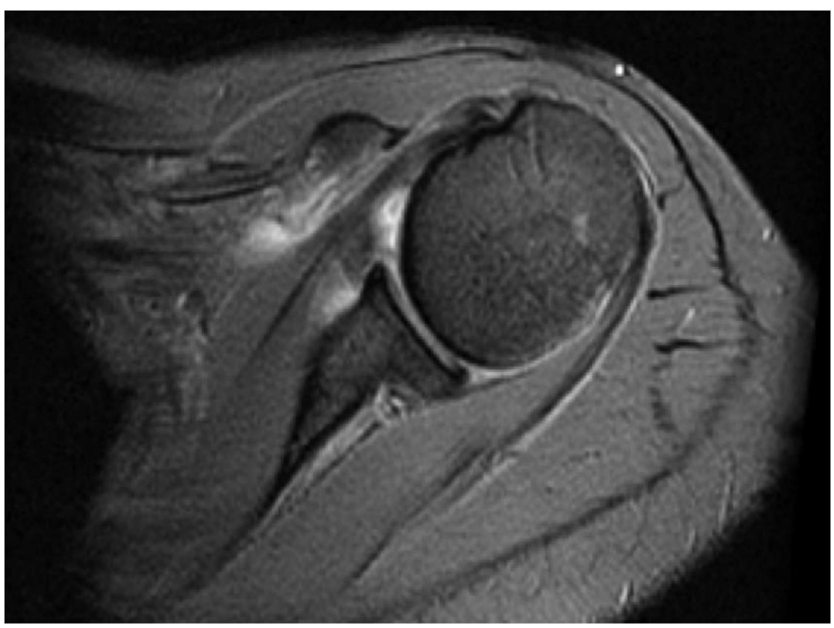
Axial T1 FSE MRI   female patient 54 years old show Bankart lesion+ Hill-sachs lesion.

Image -5:



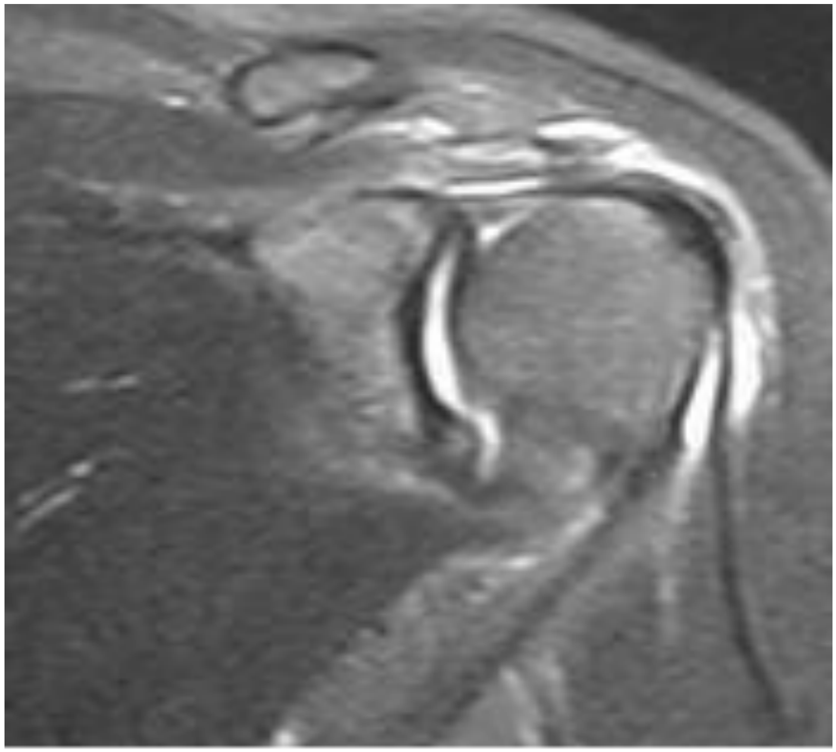
Coronal T1 FSE MRI male patient 64 years old show Tendonitis.

Image -6:



Axial T1 SE MRI male patient 66 years old show ostephytosis.

Image -7:



Axial T1 FSE MRI male patient 55 years old show Greater tuberosity humorous hyper intense.