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قسم تكنولوجيا الأشعة التشخيصية

ASSESSMENT OF SHOULDER JOINT ABNORMALITIES AMONG YEMENI POPULATION USING MAGNETIC RESONANCE IMAGING

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(يرفع الله الذين آمنوا منكم والذين أوتوا العلم درجات)

صدق الله العظيم

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Firstly, We thank Allah for his help to finish this work successfully. A specially thanks to our doctors: Dr. Abdullah Taher & Dr. Sadam Al-zofi & Dr. Amin Al-flahi. Also great thanks for all people who help us to finish this work.

Dedication

We dedicate this research to our fathers, mothers, family and everyone who contributed to the completion of this research, to our college and its teaching staff and to the soil of our beloved country.

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Abbreviations	Meanings
MRI	Magnetic Resonance Imaging
SLAP	Superior Labral Anteroposterior
SSP	The Supraspinatus
SSC	The Subscapularis Muscle
G.T	Greater Tuberosity
LHB	Long Head of Biceps
EPP	End Plate Potenial
GHJ	Glenohumeral Joint
C3	Third Cervical Nerve Segment
C4	Fourth Cervical Nerve Segment
C5	Fifth Cervical Nerve Segment
C6	Sixth Cervical Nerve Segment
CNR	Contrast to Noise Ratio
SNR	Signal to Noise Ratio
FOV	Field Of View
PD	Proton Density
STIR	Short Inversion Recovery
TSE	Turbo Spin Echo
Medic	Multi-Echo Data Image Compination
TI	Time Inversion
GRE	Gradient Echo

Abstract

Objectives

The main goal of the study was to assess shoulder joint pain among Yemenis population using (MRI).

Method

This descriptive analytical and cross-sectional study comprised **233** patient. The study population included the patients who visited the radiology departments and undergo MRI for shoulder joints in Sana'a city.

Results

In this study the age of the patients ranged from between **2** to **82** years with median of **42** years. The most common age group was (**33-47**) years, with percentage of cases **30.47%**. In the present study, the males were more than females, with percentages of **62.7%** and **37.7%** respectively, with male to female ratio of **1.7:1.** The abnormal findings were **90.55%** of cases, while the normal findings seen in **9.45%** of cases. The most common shoulder abnormalities was Tendonitis with **144** cases **(61.8%)**, GH Joint Effusion **79** cases **(33.9%)**, Rotator Cuff Tear **78** cases **(33.5%)**, Osteoarthritis **76** cases **(32.6%)**, Cysts Lesion **37** cases **(15.9%)**, Impingement Syndrome **37** cases **(15.9%)**, Bursitis **34** cases **(14.6%)**, Bone Marrow Edema **32** cases **(13.7%)**, Labral Tear **30** cases

(12.9%), Bankart Lesion **27** cases **(11.6%)**, Hill-Sachs Lesion **27** cases **(11.6%)**, Osteophytes **22** cases **(9.4%)**, Osteomyelitis **3** cases **(1.3%)**.

Conclusion

The abnormal findings were 90.55% of cases, from study sample. The most common shoulder abnormalities was Tendonitis consist 144(61.8%) cases.

MRI was more accurate for assessments of shoulder joint pain due to it is high quality diagnostic ability to accurate for demonstrate of soft tissue, muscle, tendons and ligament of shoulder joint.

CHAPTER ONE :

INTRODUCTION

1.1 Introduction

The human shoulder is consists of three bones: the clavicle, the scapula and the humerus 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 (Laughlin et al, 2009).

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 (Laughlin et al, 2009).

Magnetic resonance imaging (MRI) is primarily a medical imaging technique most commonly used in radiology to visualize the internal structure of the body (Brown, 1998).

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

Increasing complains of shoulder abnormalities and the limitation of radiological finding of the causes.

The main question of this research focused on the assessment of shoulder joint abnormalities prevalence among Yemenis population using Magnetic Resonance Imaging (MRI).

1.3 Objectives

1.3.1General Objective

The main goal of the study was to assess shoulder joint Abnormalities among Yemenis population in Sana'a city using (MRI).

1.3.2 Specific Objective

1) To assess the most common abnormality that effect the shoulder joint.
2) To investigate the association between shoulder abnormalities with demographic factors.

1.4 Significance of the Study

This study will provide information about the prevalence and association between the shoulder joint abnormalities with demographic factors.

1.5 Limitation

1) This study did not conduct association with congenital anomalies disease, fractures and tumor.
2) This study include limited sample size.
3) In this study, the time was limited and it was difficult for us to collect enough data.

1.6 Overview of the Study

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

CHAPTER TWO :

LITERATURE REVIEW

2.1 Theoretical background

2.1.1 Anatomy of Shoulder

The shoulder girdle consists of two bones: the clavicle and the scapula. The function of the clavicle and scapula is to connect each upper limb to the trunk or axial skeleton. Anteriorly, the shoulder girdle connects to the trunk at the upper sternum; however, posteriorly, the connection to the trunk is incomplete because the scapula is connected to the trunk by muscles only. Each shoulder girdle and each upper limb connect at the shoulder joint between the scapula and the humerus. Each clavicle is located over the upper anterior rib cage. Each scapula is situated over the upper posterior rib cage (Bontrager, 2013).

2.1.1.1Bony structure of the shoulder

2.1.1.1.1Scapula

The scapula is a flat triangular bone that lies on the posterior chest wall between the 2nd and 7th ribs. On its posterior surface, the spine of the scapula projects backward. The lateral end of the spine is free and forms the acromion, which articulates with the clavicle. The superolateral angle of the scapula forms the pear-shaped glenoid cavity, or fossa, which articulates with the head of the humerus at the shoulder joint. The coracoid process projects upward and forward above the glenoid cavity and provides attachment for muscles and ligaments. Medial to the base of the coracoid process is the suprascapular notch. The anterior surface of the scapula is concave and forms the shallow subscapular fossa. The posterior surface of the scapula is divided by the spine into the supraspinous fossa above and an infraspinous fossa below. The inferior angle of the scapula can be palpated easily in the living subject and marks the level of the 7th rib and the spine of the 7th thoracic vertebra (Richard, 1992).

2.1.1.2Humerus

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 process of the scapula to form acromioclavicular joint, clavicle provide stability for scapula, and serves for attachment for several arm, chest and back muscle as it shown in Fig 2.1 (Snell, 1992).

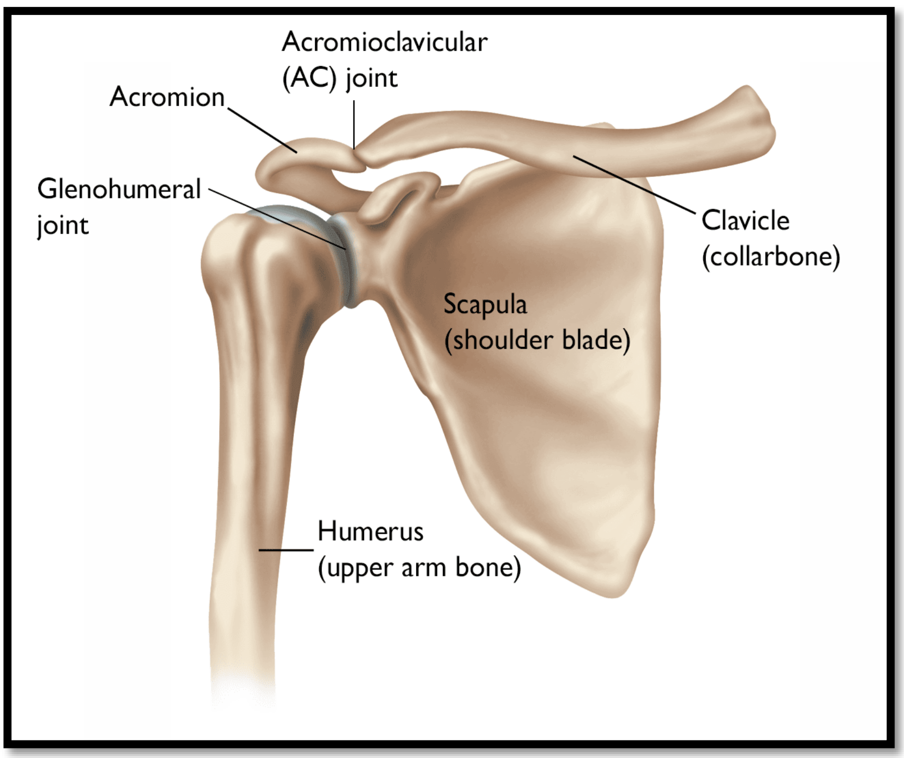


Figure 2.1Normal Bone Anatomy of Shoulder Joint (orthoinfo, 2023).

2.1.1.2 Soft Tissue of Shoulder Joint

2.1.1.2.1 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, 6 the acromion, and the crest of the scapular spine, below with brachial fascia (Ashby, 2006).

2.1.1.2.2 The Deltoid muscle

The deltoid is the largest and perhaps most important muscle in the shoulder girdle. It is made up of three major parts: the anterior deltoid taking its origin from the anterior and superior surfaces of the outer third of the clavicle and anterior acromion; the middle deltoid, originating from the lateral margin of the acromion; and the posterior deltoid, originating from almost the entire scapular spine. The deltoid covers the proximal portion of the humerus and converges into a thick tendinous insertion at the lateral surface of the humeral shaft. The most important function of the deltoid is forward elevation on the scapular plane. However, differences in activity of the three portions of the deltoid related to arm position have been observed by electromyographic analysis. The function of the deltoid is highly differentiated and is not restricted to only abducting moment of the arm. Although its integrity is critical to shoulder function, it has not been extensively studied with reference to its stabilising function. The axillary nerve and posterior humeral circumflex artery are the only nerve and the major blood supply of this muscle (Atlas of Functional Shoulder Anatomy, 2010).

2.1.1.2.3 Subscapularis Muscle

The subscapularis muscle (SSC) is the large and most powerful rotator cuff muscle. It arises from the anterior surface of the scapula. In the upper two thirds of the subscapularis there are tendinous bands that are interspersed in the midportion of the muscle and are condensed laterally into a single large, flat tendon, the lower one third remaining muscular and inserting along the humeral metaphysis. The upper fibres of the subscapularis tendon interdigitate with the anterior fibres of the supraspinatus tendon to contribute to the structure of the rotator cuff interval and of the transverse humeral ligament (Atlas of Functional Shoulder Anatomy, 2010).

2.1.1.2.4 Supraspinatus muscle

The supraspinatus (SSP) muscle lies in the supraspinatus fossa of the scapula. It is a long, thin muscle, whose muscle fibres arise from the medial portion and base of the fossa to converge into a tendinous portion that interdigitates with the subscapularis and infraspinatus to form a common continuous insertion on the humerus. The supraspinatus acts as a superior stabiliser of the humeral head, preventing its impingement against the undersurface of the acromion.

Any tears of the rotator cuff most often begin in the supraspinatus (Atlas of Functional Shoulder Anatomy, 2010).

2.1.1.2.5 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 (Ashby, 2006).

2.1.1.2.6 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 (Ashby, 2006).

2.1.1.2.7 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 (Ashby, 2006).

2.1.1.2.8 Biceps Brachialis 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 glenoid cavity and continues with glenoid labrum and unsheathed by a synovial membrane arches over 9 humeral head, passing behind transverse humeral ligament, descending in the intertubercular sulcus (Ashby, 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 (Ashby, 2006).

2.1.1.2.9: 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 intertubercular sulcus of the humerus (NCBI.NLM.NIH.GOV, 2023).

2.1.1.2.10: 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 (NCBI.NLM.NIH.GOV, 2023).

2.1.2 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).

2.1.2.1 Contraction 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).

2.1.2.2 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 asthe latent period, before contraction begins. This is a time taken 8 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).

2.1.2.3 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. 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 excite. The response of single motor units are therefore added together to produce a strong contraction by the muscle. 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).

2.1.2.4 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 9 plasma reticulum, calcium is detached from troponin, troponin ceases pulling on tropmycin resulting in muscle relaxation (William, 2003).

2.1.2.5 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-operate with pectoralis major in drawing the arm forward and medial rotation. The posterior fibers co-operate with latissimasdorsi 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).

2.1.2.6 Subscapularis muscle

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

2.1.2.7 Supraspinatus muscle

Nerve supply: supraspinatus is supplied by suprascapular nerve which receives fibers from C.4, 5 and C6 (Ashby, 2006).

2.1.2.8 Infraspinatus muscle

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

2.1.2.9 Teres minor muscle

Nerve supply: by a branch from posterior branch of the axillary nerve C5 andC6.Action: it acts as dynamic stabilizer for the shoulder joint, lateral rotation and weak adductor of the humerus (Ashby, 2006).

2.1.2.10 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 (Ashby, 2006).

2.1.2.11. Blood Supply

The subclavian artery arises from the brachiocephalic trunk on the right and directly from the aorta from the left. This becomes the axillary artery as it passes beyond the first rib. The axillary artery also supplies blood to the arm, and is one of the major sources of blood to the shoulder region. The other major sources are the transverse cervical artery and the suprascapular artery, both branches of the thyrocervical trunk which itself is a branch of the subclavian artery (Bogart, Bruce, 2007).

2.1.2.12 Rotator Cuff

The supraspinatus, infraspinatus, teres minor, and subscapularis, the muscles and tendons of the rotator cuff forma sleeve around the anterior, superior, and posterior humeral head and glenoid cavity of the shoulder by compressing the glenohumeral joint. In addition to stabilization, the rotator cuff provides the shoulder with tremendous mobility as it shown in Fig 2.2 (Favard et al, 2007).

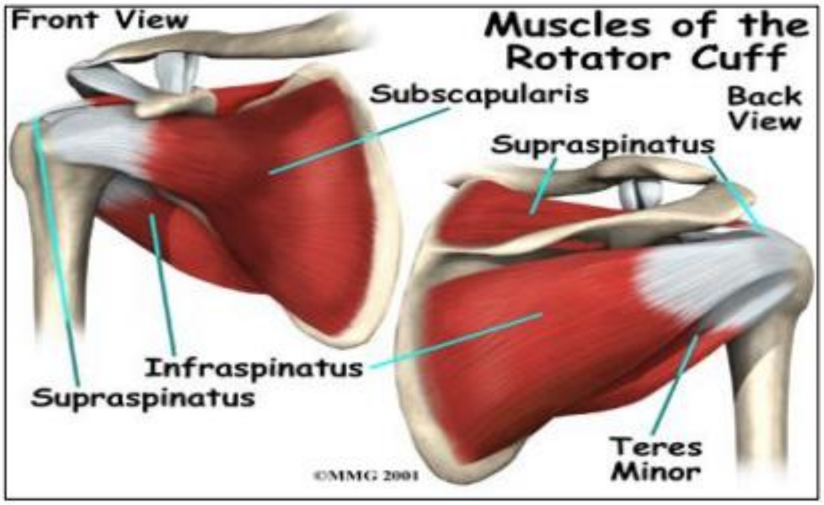


Figure 2.2 The Rotator Cuff (Favard et al, 2007)

2.1.3 PATHOLOGY

2.1.3.1 Shoulder Pain

The synovial membrane, capsule, and ligaments of the shoulder joint are innervated by the axillary nerve and the suprascapular nerve. The joint is sensitive to pain, pressure, excessive traction, and distension. The muscles surrounding the joint undergo reflex spasm in response to pain originating in the joint, which in turn serves to immobilize the joint and thus reduce the pain. Injury to the shoulder joint is followed by pain, limitation of movement, and muscle atrophy owing to disuse. It is important to appreciate that pain in the shoulder region can be caused by disease elsewhere and that the shoulder joint may be normal; for example, diseases of the spinal cord and vertebral column, and the pressure of a cervical rib can cause shoulder pain. Irritation of the diaphragmatic pleura or peritoneum can produce referred pain via the phrenic and supraclavicular nerves (Richard, 1992).

2.1.3.2 Labral Tear

The labrum is a ring of fibrocartilage around the edge of an articular joint such as the glenoid labrum of the shoulder joint and the acetabular labrum of the hip joint. Tearing of the labrum is referred to as a labral tear. Most common labral tears include superior labral anteroposterior (SLAP) tear and a Bankart lesion. A SLAP tear is most commonly seen in overhead throwing type of activities and is located where the biceps tendon attaches to the shoulder. A Bankart lesion is a labral tear that occurs when a shoulder is dislocated as it shown in Fig 2.3 (Michael, 2013).

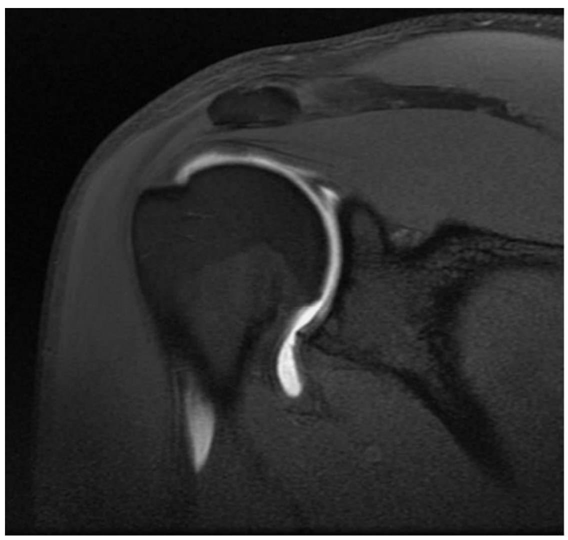


Figure 2.3 Oblique coronal T1W FS MR arthrogram

Oblique coronal T1W FS MR arthrogram shows high-signal intensity within the superior labrum consistent with a SLAP tear (Michael, 2013).

2.1.3.3 Rotator Cuff Tear

The rotator cuff of the shoulder is comprised of a thick, tough, tendinous capsule surrounding the four tendons representing the insertions of the supraspinatus, infraspinatus, the teres minor muscles (insert into the greater tuberosity and assist with external rotation), and the subscapularis (inserts into the lesser tuberosity and assists with internal rotation). Tearing of the rotator cuff can be categorized as partial or complete tears as it shown in Figs. 2.4 and 2.5 (Michael, 2013).

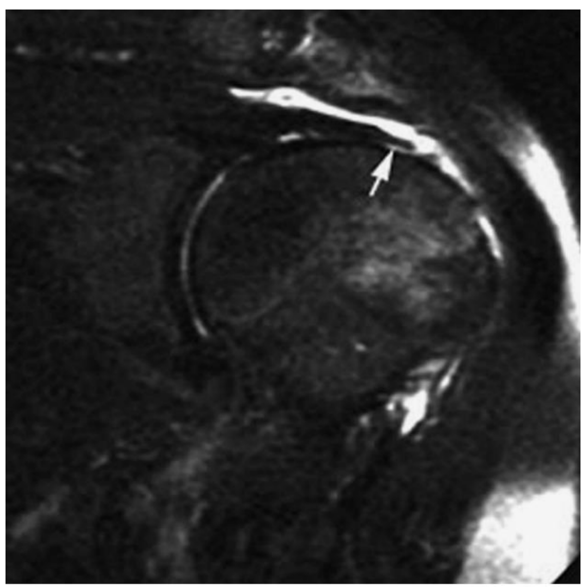


Figure 2.4 Rotator Cuff Tear.

T2-weighted oblique coronal MRI with fat suppression shows a full-thickness tear (arrow) of the distal rotator cuff tendon (supraspinatus muscle) with some medial retraction. A small amount of fluid is in the subacromial/subdeltoid bursa (Michael, 2013).


Figure 2.5 Rotator Cuff Tear.

T1-weighted coronal spin-echo MR shows disruption of the hypointense supraspinatus tendon. (Michael, 2013)

2.1.3.4 Pectoralis Major Tendon Tear

The origin of the pectoralis major muscle is the sternum, clavicle, and cartilages of the 1st to 6th ribs. Its insertion is to the bicipital ridge of the humerus. The pectoralis major muscle action is to flex, adduct, and rotate the arm. Complete or partial tearing may occur as it shown in Fig 2.6 (Michael, 2013).

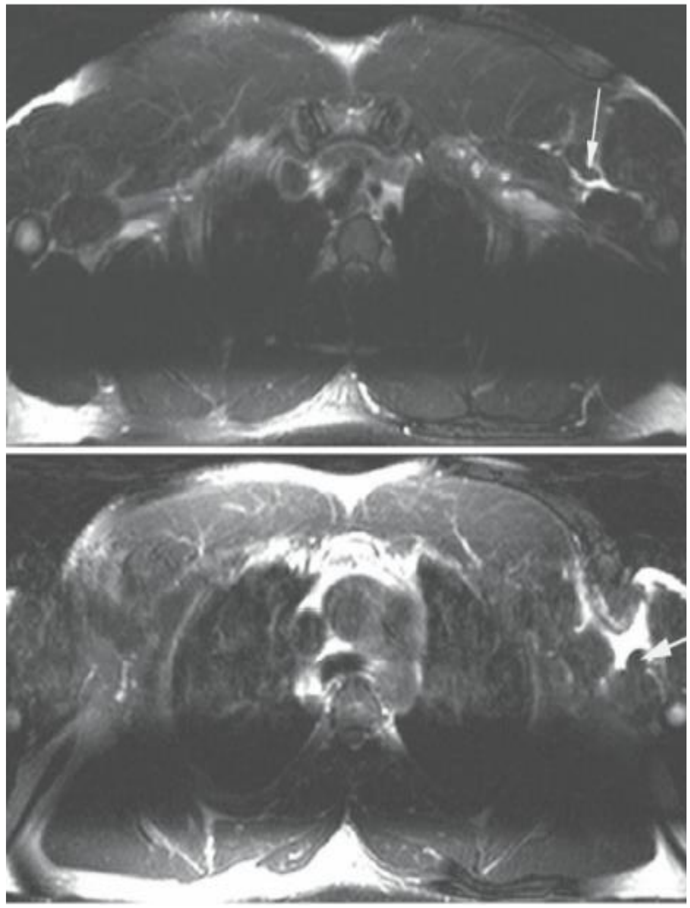


Figure 2.6 Pectoralis Major Tendon Tear.

MRI axial T2-weighted adjacent images show complete tear of the left pectoralis tendon near the humerus (arrow). Note: High signal surrounding complete tear (Michael, 2013).

2.1.3.5 frozen shoulder

A condition characterized by thickening and contraction of the shoulder joint capsule and surrounding synovium as it shown in Figs 2.7 and 2.8 (radiopedia, 2023).

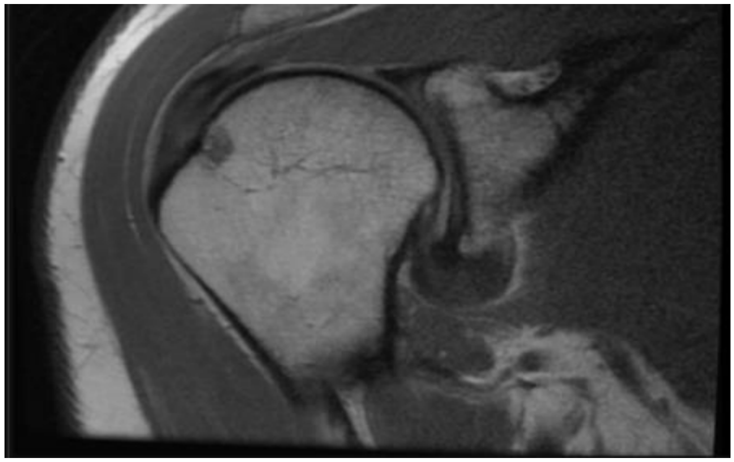


Figure 2.7 Coronal PD. (radiopedia, 2023)

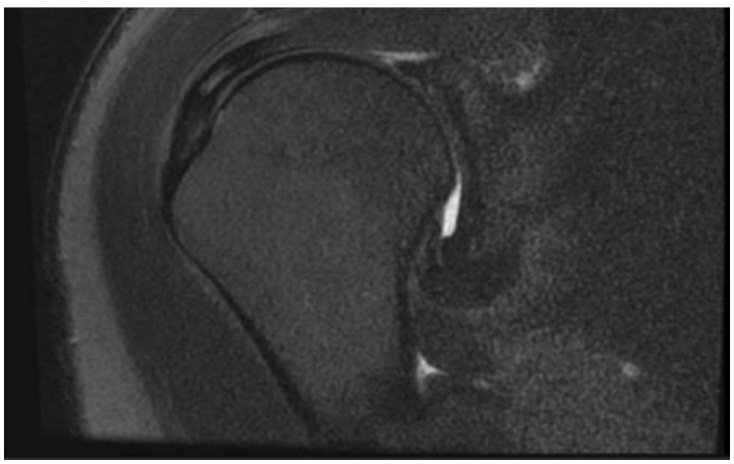
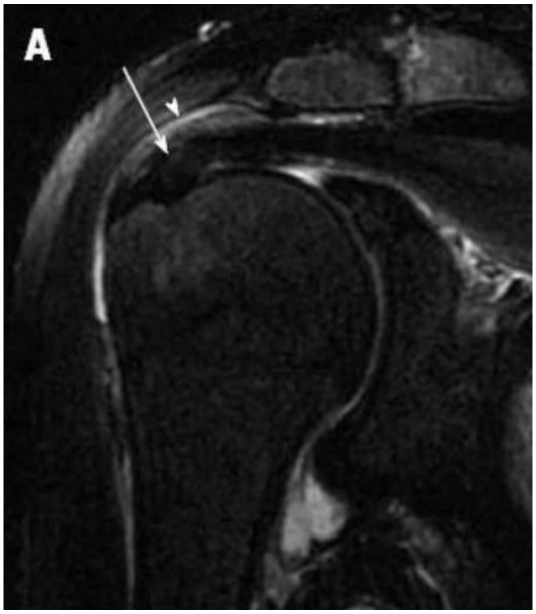


Figure 2.8 Coronal T2 fat sat. (radiopedia, 2023)

2.1.3.6 Shoulder Impingement Syndrome

The acromion (edge of the scapula) presses on the rotator cuff as the arm is lifted. If inflammation or an injury in the rotator cuff is present, this impingement causes pain as it shown in Figs. 2.9 and 2.10 (my.clevelandclinic, 2023).



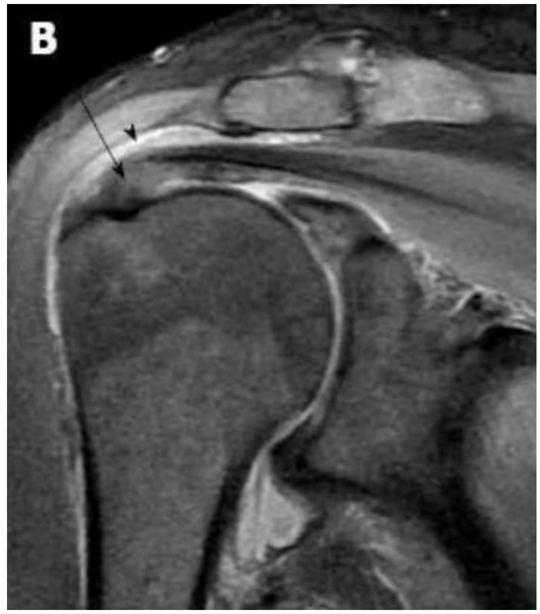


Figure 2.9 Coronal Stir. (Giaroli et al, 2006) Figure 2.10 Coronal T2 (Giaroli et al, 2006)

2.1.3.7 Shoulders Bursitis

Inflammation of the bursa, the small sac of fluid that rests over the rotator cuff tendons, Pain with overhead activities or pressure on the upper, outer arm are symptoms as it shown in Fig 2.11 (Bureau et al, 1996).

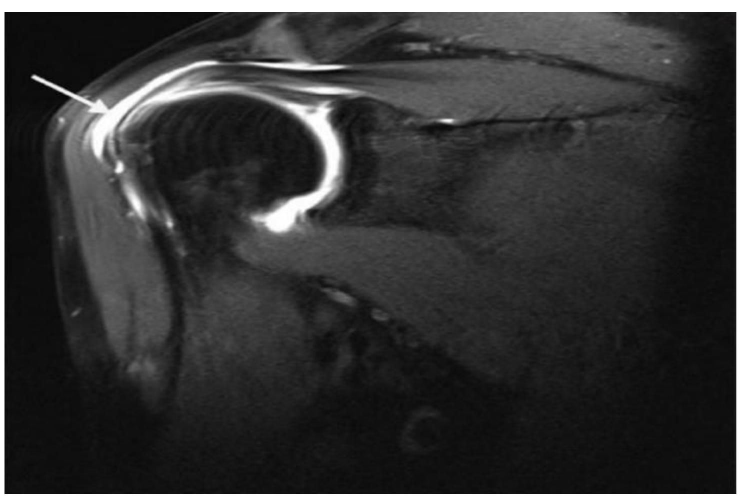


Figure 2.11 Shoulders Bursitis Coronal T2 stir (Bureau et al, 1996)

2.1.3.8 Osteoarthritis (OA)

Referred to as degenerative joint disease or degenerative arthritis is the result of mechanical or biological events, which lead to the deterioration of the articular cartilage as it shown in Figs. 2.12 and 2.13 (Michael, 2013).

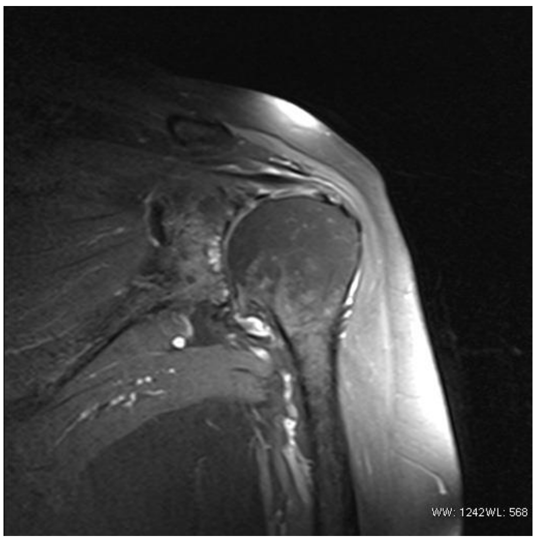


Figure 2.12 Coronal PD (radiopedia, 2023)

Figure 2.13 Coronal T1 (radiopedia, 2023)

2.1.3.9 Shoulders Tendonitis

Inflammation of one of the tendons in the shoulders rotator cuff as it shown in Fig 2.14 (tawfik et al, 2004).

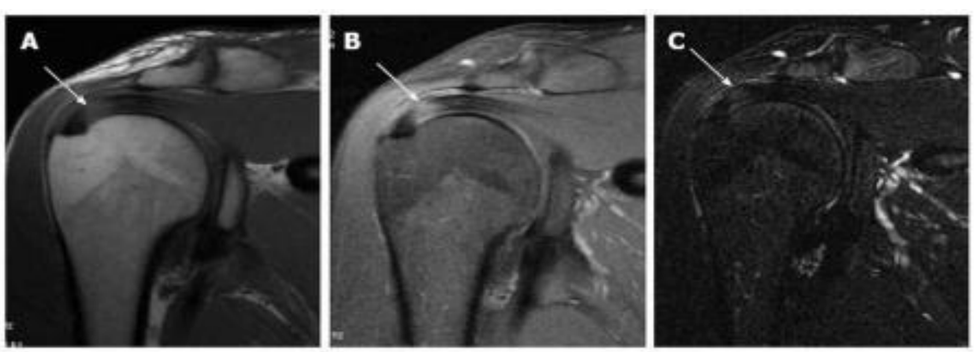


Figure 2.14Shoulders Tendonitis (tawfik et al, 2004)

2.1.4DIAGNOSTIC IMAGINING MODALITIES

2.1.4.1 Magnetic Resonance Imagining

MRI on of the advantages of MRI compared with other imaging modalities is the excellent soft tissue discrimination of the image (Catherine Westbrook, 2014).

2.1.4.2 MRI Component

2.1.4.2 .1 An MRI Scanner consists of

Large powerful magnet in which the patient lays a radio wave antenna used to send signals to the body and receive signals back, computer to converted signals to images (Catherine Westbrook, 2014).

2.1.4.3Parameters of Image Quality

Contrast to noise ratio (CNR), spatial Resolution, Signal to noise ratio (SNR), Scan time (Catherine Westbrook, 2014).

2.1.4.4Indication of MRI Shoulder

Evaluation of Shoulder pain, Diagnose of impingement syndrome, Suspected rotator tear, Evaluation of recurrent dislocation (instability), Frozen shoulder syndrome (Catherine Westbrook, 2014).

2.1.4.5 MRI Equipment

Immobilization pads and straps, Ear plugs, Shoulder array/ small surface coil pair or array/ small flexible coil (Catherine Westbrook, 2014).

2.1.4.6 Patient Positioning

The patient lies supine with the arms resting comfortably by the side slide 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 "hunching". The arm to be examined is strapped to the patient with the thump up (natural position) and padded so that the humerus is horizontal.

Place the coil to cover the humeral head and the anatomy superior and medial to it. If a surface or flexible coil is used, care must be taken to ensure that the flat surface of the coil is parallel to the Z axis when it is placed over the humeral head. Center the FOV on the middle of the glenohumeral joint. Patient and coil immobilization is essential for a good result instruct the patient not to move the hand during sequences. The patient is positioned so that the longitudinal alignment light and the horizontal alignment light pass through the shoulder joint (Catherine Westbrook, 2014).

2.1.4.7 Suggested Protocol

Localiser:

A three-plane localiser must be taken in the beginning to localise and plan the sequences. Localisers are usually less than 25sec. T1 weighted low resolution scans are used for this purpose. Take additional localisers if needed (mrimaster, 2023).

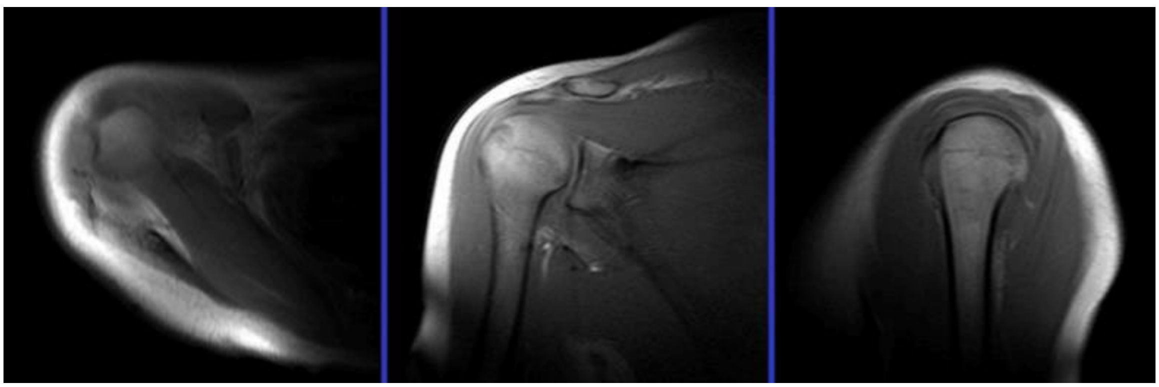


Fig 2.15: MRI localiser

T2* medic or PD fat sat (axial 3mm SFOV):

Plan the axial slices on the coronal plane; angle the position block perpendicular to glenohumeral joint. Check the positioning block in the other two planes. An appropriate angle must be used in the sagittal plane (perpendicular to the humeral head). Slices must be sufficient to cover the whole shoulder joint from top of acromioclavicular joint to two slices below the inferior glenohumeral Ligament (articular capsule). Adding saturation bands over the chest will help to reduce ghosting artifacts from breathing. Phase direction must be anteroposterior to avoid the wraparound and ghosting artifacts from the chest (mrimaster, 2023).

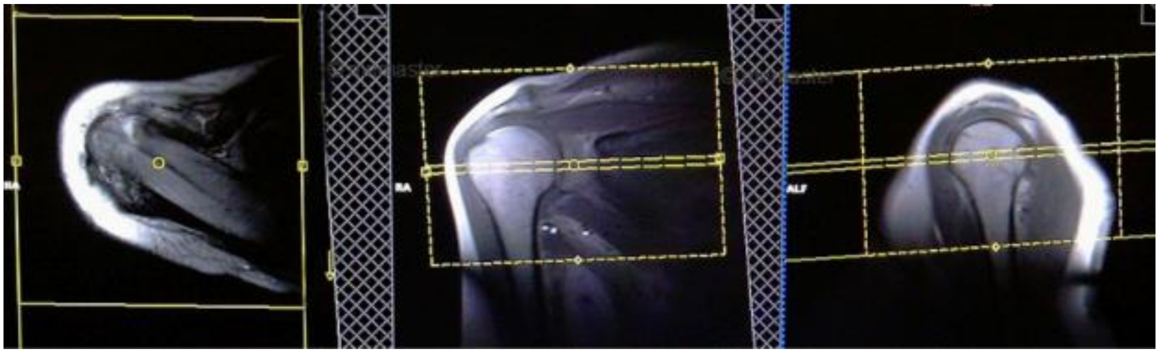


Fig 2.16: MRI planning

T1 tse + T2* medic or PD fat sat + T2 stir (coronal 3mm SFOV):

Plan the coronal slices on the axial plane; angle the position block parallel to supraspinatus tendon (do not angle the block more than 45°, angling more than 45 will result in changing the coronal plane to sagittal). Check the positioning block in the other two planes. An appropriate angle must be used in the sagittal plane (parallel to the humeral head). Slices must be sufficient to cover the whole shoulder joint from anterior portion of coracoid process to two slices posterior to the humeral head. Adding an oblique saturation band over the chest will help to reduce ghosting artifact from breathing (mrimaster, 2023).

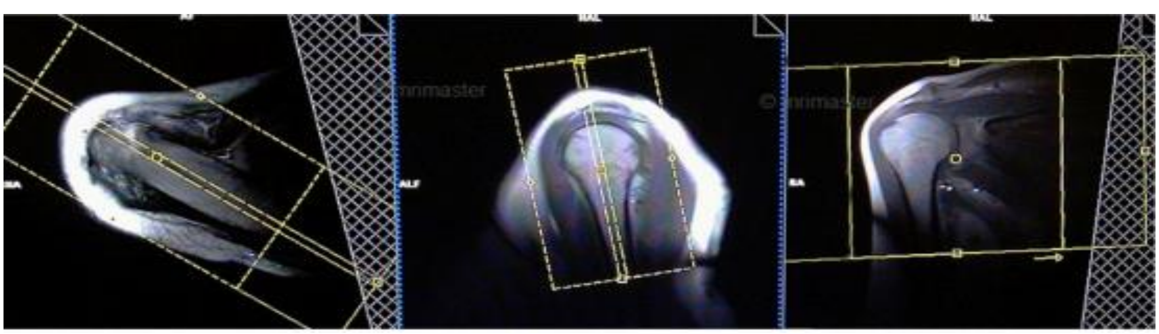


Fig 2.17: MRI planning

T2 TSE fat sat (sagittal 3mm SFOV):

Plan the sagittal slices on the axial plane; angle the position block perpendicular to supraspinatus tendon. Check the positioning block in the other two planes. An appropriate angle must be given in the coronal plane (parallel to the glenohumeral joint). Slices must be sufficient to cover the whole shoulder joint from deltoid muscle to two slices medial to the glenoid. Adding an oblique saturation band over the chest will help to reduce ghosting artifact from breathing (mrimaster, 2023).

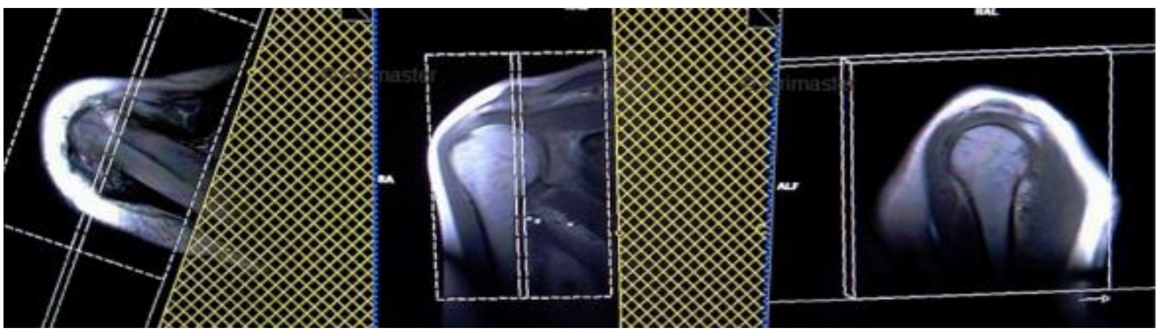


Fig 2.18: MRI planning

2.1.4.8 Image Optimization:

The SNR of shoulder is largely depends on the quality and type of coil used. Dedicated shoulder coils return a much higher and more uniform signal than a surface coil. If using dedicated coil, thinner slices and finer matrices can be used to achieve the necessary special resolution without lengthening the scan time. Spatial resolution the key to accuracy in shoulder imaging and the resolution must not drop below. SE and FSE are usually the sequences of choice but coherent GRE and STAIR are useful to visualize joint fluid. STAIR may provide better result than fat suppressed FSE if magnet shimming is suboptimal (Catherine Westbrook, 2008).

2.2 PREVIOUS STUDY

- Hema et al, 2012. Studied the Evaluation of Shoulder Joint in India using MRI, that made their prospective study in 81 patients noted 54 men and 27 women (average age 42.3 years) and they found that the rotor cuff tendinopathy account in supraspinatus maximum in 55 patient (67.6%), 2 patient infraspinatus 2%, hill sachs lesion in 8 patient (11%) ACJ capsulitis in 17 patient.

- HANA, 2018. Studied the shoulder joint pain using (MRI) in Khartoum, this was analytic descriptive study. A total of 50 patients (29 male, 21 female) aged from (20 - 70 years), all those complaining of persistent shoulder pain most of them were under gone routine plain shoulder. Study has come out with result including the shoulder joint pain in male (58%) more than female (42%), 52% of patients show evidence of rotator cuff tear, the most effected age group above 50 (50-60), explaining that elder population are susceptible to rotator cuff tear and the shoulder joint pain also increase with weight (38%) 80-99kg.

- Dr. Anupama Parihar et al 3, 2022. Studied the role of MRI in evaluation of internal derangement of shoulder joint in indian population, A cross sectional study the Sample size is 50 patient. The male to female ratio is 2.1:1. Majority of the patients, 22 (44%) were in the age group of 21 to 40 years, followed by 18 in the age group of 41 to 60 years (36%). The most common clinical presentation was pain in shoulder, seen in 43 patients (86%) followed by restricted movements in 34 patients (68%). rotator cuff pathologies were seen in 41 out of 50 cases (82%). The commonest rotator cuff pathology found to be partial tear of the supraspinatus tendon seen in 19(38%) patients. Impingement syndrome seen in 5(10%) patients.

- Tempelhof et al, 1999. Conducted the prospective study in German on 411. The Age-related prevalence rotator cuff tear in asymptomatic shoulders, overall prevalence of RC tears 23%, with high occurrence in patients over the age 70 and 80 years of 31% and 51% respectively.

- Arafat et al 17. Conducted the retrospective analysis of 114 patients reported 77 males and 37 females with a male to female ratio of 2:1. Arafat MR, Abdelhadi JM, Zayadeen AR, Tamimi AA, Jaouni MT. Evaluation of Shoulder Pathologies using MRI - Our experience at King Hussein Medical Centre. Middle East J Age and Aging 2013;10(5):35-41.

-Thwuiba, 2016. Studied the shoulder joint pain using (MRI) in Khartoum, using analytic descriptive study. A total of Study of 50 patients for this study (28 male 22 female,) aged from (16 years to 76 years). More than 70%(35) of patient showed evidences of rotator cuff tear of different grades the most common muscle effected was supraspinatus (64%)32 of cases.

- Yamamoto et al, 2010. Prevalence and risk factors of a rotator cuff tear in the general population. In a larger cohort of 683 Japanese villagers with a mean age of 57.9 years, Yamamoto et al observed RC tears in 36% symptomatic against 16.9% in asymptomatic subjects with an overall prevalence of 20.7%.

CHAPTER THREE:

Methodology

3.1 Method

3.1.1 Study design

This study followed a descriptive analytical and cross-sectional study method.

3.1.2 Study area

This study was conducted in Sana'a-Yemen.

3.1.3 The study population

All patient admitted to radiological department for Shoulder MRI scan.

3.1.4 Data collection

The data collected from University of Science and Technology Hospital, Modern European Hospital, Smart Scan Diagnosis Center, The Main Diagnosis Center, New Scan Diagnosis Center, Advanced Al Razi Diagnosis Center and Al-Fouad Medical Diagnostic Tower, from 2021 to 2023.

3.1.5 Sample size

The sample size was 233 with different age from 2 to 82 years

3.1.6 Inclusion criteria

All patients admitted to MRI department for Shoulder MRI scan with pathological changes or not.

3.1.7 Exclusion criteria

1. Patients with congenital anomalies.
2. Patients with fractures.
3. Patients less than one year also were excluded because the MRI findings for this age not accurate.

3.2 Materials

3.2.1 MRI Machine

The MRI for study shoulder joint was taken by closed magnet, with field of (1.5 Tesla) and open magnet, with field of (0.4 Tesla).

3.2.2 Shoulder Coil

Shoulder array/small-surface coil pair or array/small-flexible coil, immobilization pads, straps and earplugs.

3.2.3 Statistical analysis

The data was computed, processing, coding, analyzed using SPSS program. And presented in tables and pie & bar charts. And frequency analysis, Person correlation, and chi-square was carried out. Cut point of statistical significance where the $P \leq 0.05$ was considered.

3.3 Ethical consideration

An official written permission was issued for this study from the University Science and technology. Verbal explanation of the nature and aim of the study was provided for patient, medical and radiological staff.

CHAPTER FOUR :

Result and Discussion

4.1 Result

The data was computed, processed, coded, analyzed using SPSS program, frequency analyzed, Person correlation, and chi-square, presented in tables, pie and bar charts.

4.1.1 Age Group

The total study sample is 233 patient selected with variant age as showed in Table 4.1. Which described the distribution of study sample different ages between 2 years and greater than 78 years.

Table 4.1: The Distribution of study sample according to their Age group

Age group	Number	Percent
2 - 17	10	4.3
18 - 32	58	24.9
33 - 47	71	30.5
48 - 62	65	27.9
63 - 77	25	10.7
78+	4	1.7
Total	**233**	**100.0**

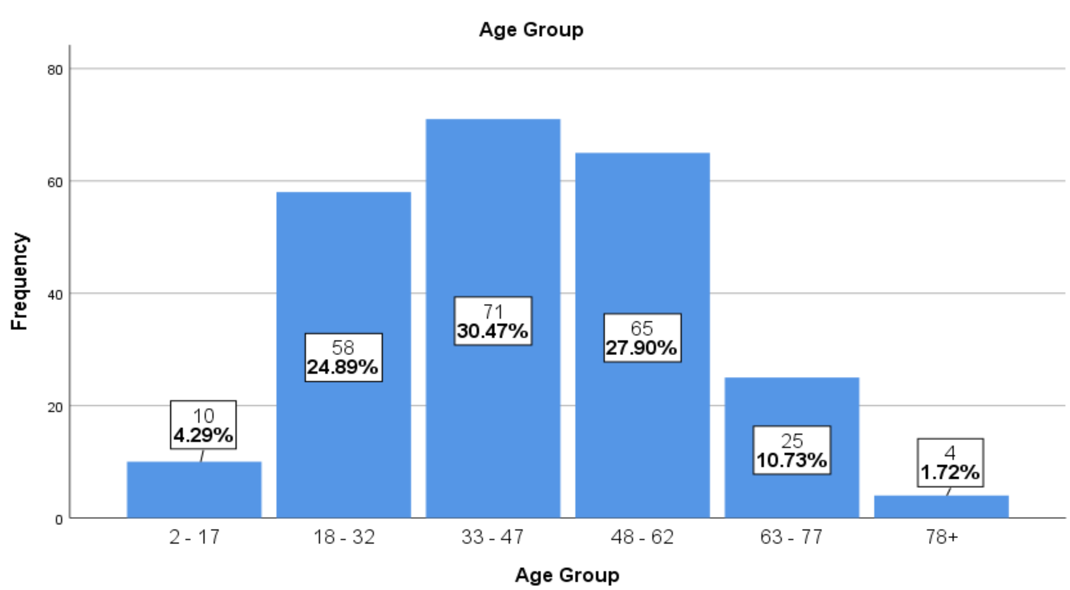


Figure 4.1: The Distribution of study sample according to their Age Group

The Table (4.1) and Figure (4.1) showed the most affected age group with shoulder joint abnormalities was (33 - 47) years, with present of (30.47%). The second and third age's groups, which affected by (48 – 62) years and (18 - 32) years the present 27.9%, 24.89% respectively. The less affected age's groups of shoulder abnormalities were (63-77) years and (2–17) years the present 10.73%, 4.29% respectively. The very less affected age group of shoulder abnormalities was (+78 years) which present 1.72%.

4.1.2 Gender

Table (4.2) and Figure (4.2) described the distribution of study sample according to their gender.

Table 4.2: The Distribution of study sample according to their Gender

Gender	Number	Percent
Male	146	62.7
Female	87	37.3
Total	**233**	**100.0**

The Table (4.2) and Figures (4.2) showed that's 146 of male patients (62.66%) as affected by shoulder abnormal and 87 of female patients (37.34%) as affected by abnormal shoulder. The most gender exposed to abnormal shoulder were male while their low percentage of female gender might have an abnormal shoulder.

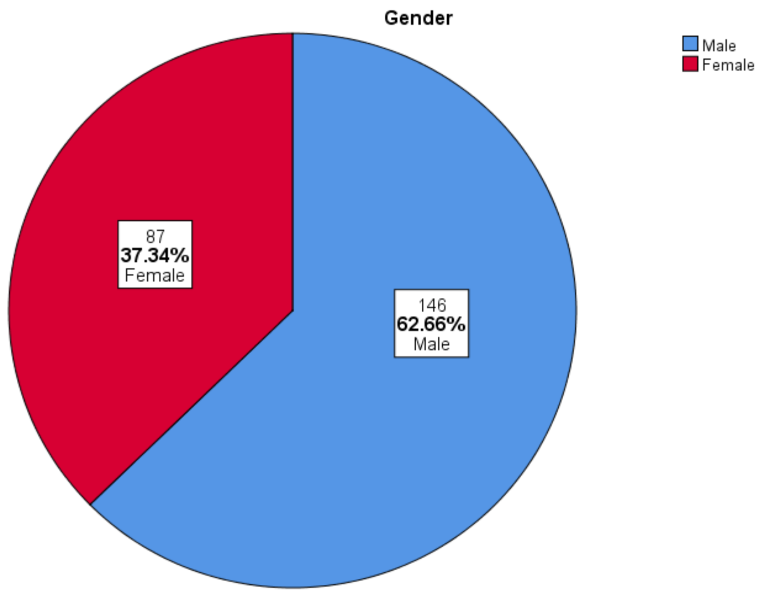


Figure 4.2: The Distribution of study sample according to their Gender

4.1.3 The Association between Age and Gender of study sample

The age's group divided to six groups, which distributed with gender as it shown in Table (4.3) and Figure (4.3).

Table 4.3: The Distribution of study sample according to their Age and Gender

Diagnosis		Gender		
		Male	Female	Total
2 – 17	N	7	3	**10**
	P %	3.0%	1.3%	**4.3%**
18 – 32	N	48	10	**58**
	P %	20.6%	4.3%	**24.9%**
33 – 47	N	46	25	**71**
	P %	19.7%	10.7%	**30.5%**
48 – 62	N	30	35	**65**
	P %	12.9%	15.0%	**27.9%**
63 – 77	N	14	11	**25**
	P %	6.0%	4.7%	**10.7%**
78+	N	1	3	**4**
	P %	0.4%	1.3%	**1.7%**
Total	N	146	87	**233**
	P %	**62.7%**	**37.3%**	**100.0%**

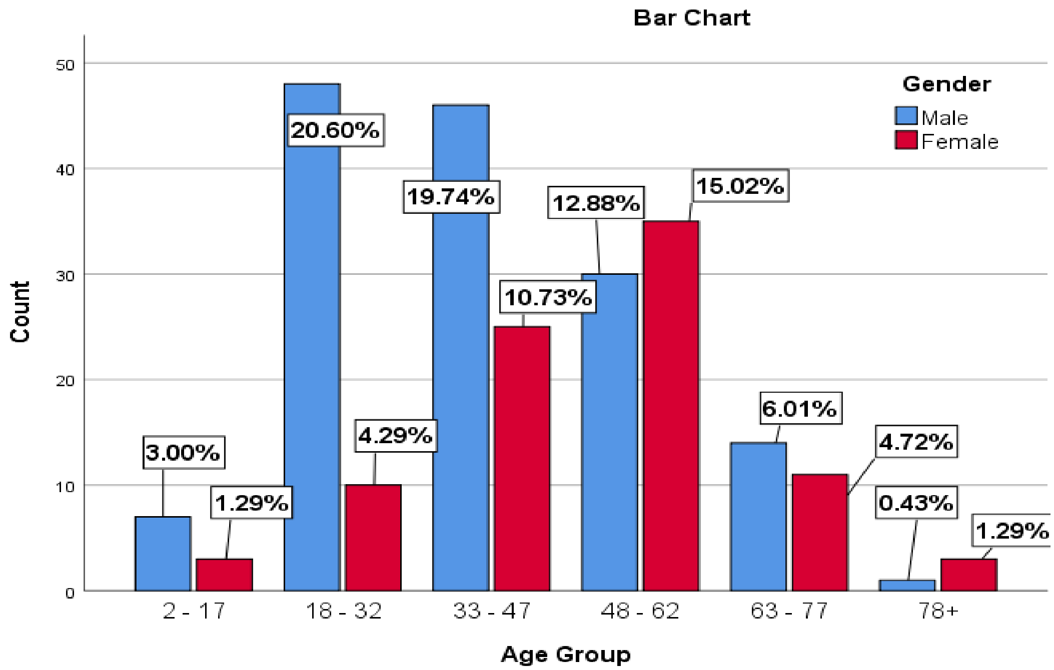


Figure 4.3: The Distribution of study sample according to their Age and Gender

Table (4.3) and Figure (4.3) demonstrated that the most group of male with shoulder abnormality were between (18–32) years that percent 20.60%, (48 cases), whereas the most group of female with shoulder abnormality were between (48–62) years that percent 15.02%, (35 cases). The less group of male with shoulder abnormality were more than (+78 years) that percent 0.43%, (1 cases), whereas the less group of female with shoulder abnormality were between (2–17) years and (+78 years) that percent's 1.29%, (3 cases).

4.1.4 MRI Diagnosis of Shoulder Abnormalities

All 233 patients exposed to MRI examination diagnosis as following in the Table (4.4) and Fig (4.4).

Table 4.4: The Distribution of study sample according to MRI Diagnosis of Shoulder Abnormalities

Diagnosis	Yes		No		Total	
	N	p %	N	p %	N	p %
Rotator Cuff Tear	78	**33.5**	155	**66.5**	233	**100**
Tendonitis	144	**61.8**	89	**38.2**	233	**100**
Labral Tear	30	**12.9**	203	**87.1**	233	**100**
Bankart Lesion	27	**11.6**	206	**88.4**	233	**100**
Hill-Sachs Lesion	27	**11.6**	206	**88.4**	233	**100**
GH Joint Effusion	79	**33.9**	154	**66.1**	233	**100**
Cysts Lesion	37	**15.9**	196	**84.1**	233	**100**
Impingement Syndrome	37	**15.9**	196	**84.1**	233	**100**
Osteoarthritis	76	**32.6**	157	**67.4**	233	**100**
Osteophytes	22	**9.4**	211	**90.6**	233	**100**
Bone Marrow Edema	32	**13.7**	201	**86.3**	233	**100**
Degenerative	39	**16.7**	194	**83.3**	233	**100**
Bursitis	34	**14.6**	199	**85.4**	233	**100**
Osteomyelitis	3	**1.3**	230	**98.7**	233	**100**

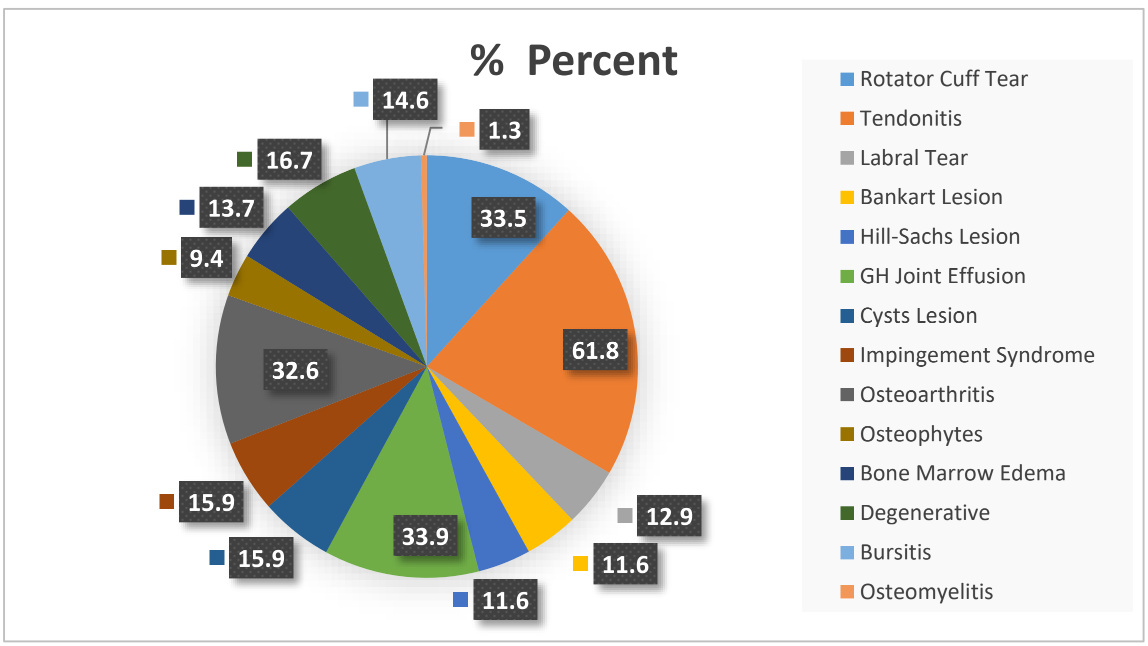


Figure 4.4: The Distribution of study sample according to MRI Diagnosis of Shoulder Abnormalities

Table (4.4) and Figure (4.4) illustrated that the most common shoulder abnormalities consist of (144 cases) diagnosed with Tendonitis with percentage of 61.8%, (79 cases) diagnosed with GH Joint Effusion with percentage of 33.9%, (78 cases) diagnosed with Rotator Cuff Tear with percentage of 33.5% and (76 cases) diagnosed with Osteoarthritis with percentage of 32.6%. In addition (39 cases) diagnosed with Degenerative with percentage of 16.7%, (37 cases) diagnosed with Cysts Lesion and Impingement Syndrome with both percentage of 15.9%, (34 cases) diagnosed with Bursitis with percentage of 14.6% and (32 cases) diagnosed Bone Marrow Edema with percentage of 13.7%. In addition (30 cases) diagnosed with Labral Tear with percentage of 12.9%, (27 cases) diagnosed with Bankart Lesion and Hill-Sachs Lesion with both percentage of 11.6%, (22 cases) diagnosed with Osteophytes with percentage of 9.4% and (3 cases) diagnosed with Osteomyelitis with percentage of 1.3%.

4.1.5 The Association between Shoulder abnormalities and Age

The age group divides it to six group, the most age group affected from shoulder abnormality were both age group (48–66), (33–47) were most affected from shoulder abnormality respectively. As it shown in the Table (4.5).

Table 4.5: The Distribution of study sample Shoulder abnormalities according to patients Age

Diagnosis		2 - 17		18 - 32		33 - 47		48 - 62		63 - 77		78+		Chi-Square	
		N	P %	N	P %	N	P %	N	P %	N	P %	N	P %	Value	sig
Rotator Cuff Tear	Yes	1	0.4	18	7.7	19	8.2	27	11.6	10	4.3	3	1.3	9.540[a]	0.089
	No	9	3.9	40	17.2	52	22.3	38	16.3	15	6.4	1	0.4		
Tendonitis	Yes	3	1.3	29	12.4	46	19.7	46	19.7	17	7.3	3	1.3	10.891[a]	0.054
	No	7	3	29	12.4	25	10.7	19	8.2	8	3.4	1	0.4		
Labral Tear	Yes	1	0.4	12	5.2	6	2.6	6	2.6	4	1.7	1	0.4	5.981[a]	0.308
	No	9	3.9	46	19.7	65	27.9	59	25.3	21	9	3	1.3		
Bankart Lesion	Yes	0	0	16	6.9	8	3.4	2	0.9	0	0	1	0.4	24.382[a]	0.000
	No	10	4.3	42	18	63	27	63	27	25	10.7	3	1.3		
Hill-Sachs Lesion	Yes	1	0.4	13	5.6	7	3	3	1.3	2	0.9	1	0.4	10.968[a]	0.052
	No	9	3.9	45	19.3	64	27.5	62	26.6	23	9.9	3	1.3		
GH Joint Effusion	Yes	1	0.4	16	6.9	17	7.3	29	12.4	15	6.4	1	0.4	17.793[a]	0.003
	No	9	3.9	42	18	54	23.2	36	15.5	10	4.3	3	1.3		
Cysts Lesion	Yes	0	0	5	2.1	11	4.7	15	6.4	5	2.1	1	0.4	7.271[a]	0.201
	No	10	4.3	53	22.7	60	25.8	50	21.5	20	8.6	3	1.3		
Impingement Syndrome	Yes	0	0	7	3	8	3.4	13	5.6	9	3.9	0	0	12.806[a]	0.025
	No	10	4.3	51	21.9	63	27	52	22.3	16	6.9	4	1.7		
Osteoarthritis	Yes	1	0.4	6	2.6	17	7.3	37	15.9	12	5.2	3	1.3	41.281[a]	0.000
	No	9	3.9	52	22.3	54	23.2	28	12	13	5.6	1	0.4		
Osteophytes	Yes	0	0	1	0.4	5	2.1	12	5.2	3	1.3	1	0.4	13.069[a]	0.023
	No	10	4.3	57	24.5	66	28.3	53	22.7	22	9.4	3	1.3		
Bone Marrow Edema	Yes	1	0.4	11	4.7	8	3.4	9	3.9	3	1.3	0	0	2.523[a]	0.773
	No	9	3.9	47	20.2	63	27	56	24	22	9.4	4	1.7		
Degenerative	Yes	0	0	3	1.3	9	3.9	20	8.6	6	2.6	1	0.4	18.742[a]	0.002
	No	10	4.3	55	23.6	62	26.6	45	19.3	19	8.2	3	1.3		
Bursitis	Yes	0	0	5	2.1	2	0.9	20	8.6	5	2.1	2	0.9	29.526[a]	0.000
	No	10	4.3	53	22.7	69	29.6	45	19.3	20	8.6	2	0.9		
Osteomyelitis	Yes	1	0.4	1	0.4	0	0	1	0.4	0	0	0	0	7.396[a]	0.193
	No	9	3.9	57	24.5	71	30.5	64	27.5	25	10.7	4	1.7		

Table (4.5) described the shoulder abnormalities according to age group. In Rotator Cuff Tear, Tendonitis, Labral Tear, Hill-Sachs Lesion, Cysts Lesion, Bone Marrow Edema and Osteomyelitis have no significant association between age group and shoulder abnormalities, whereas the p-value larger than 0.05 ($P > 0.05$). while the Bankart Lesion, GH Joint Effusion, Impingement Syndrome, Osteoarthritis, Osteophytes, Degenerative and Bursitis have significant association between age group and shoulder abnormalities, whereas the p-value smaller than 0.05 ($P < 0.05$).

4.1.6 The Association between Shoulder abnormalities and Gender

The most disease that affected both males and females were the Tendonitis by (88-58) patients respectively and percent's 37.80%, 24.90% were respectively. The second affected for males was GH joint effusion by 49 patients and percent 21%. The second affected for females were Osteoarthritis and Rotator Cuff Tear that represented in 35 patients and percent 15%, as it shown in Table (4.6) and Figure (4.6).

Table 4.6: The Distribution of study sample Shoulder abnormalities according to patients Gender

Diagnosis		Gender				Chi-Square	
		Male		Female		Value	p-value
		Yes	No	Yes	No		
Rotator Cuff Tear	N	43	103	35	52	2.844a	0.092
	P %	18.50%	44.20%	15.00%	22.30%		
Tendonitis	N	88	58	56	31	0.387a	0.534
	P %	37.80%	24.90%	24.00%	13.30%		
Labral Tear	N	25	121	5	82	6.289a	0.012
	P %	10.70%	51.90%	2.10%	35.20%		
Bankart Lesion	N	23	123	4	83	6.622a	0.01
	P %	9.90%	52.80%	31.70%	35.60%		
Hill-Sachs Lesion	N	21	125	6	81	2.983a	0.084
	P %	9.00%	53.60%	2.60%	34.80%		
GH Joint Effusion	N	49	97	30	57	0.021a	0.886
	P %	21.00%	41.60%	12.90%	24.50%		
Cysts Lesion	N	19	127	18	69	2.405a	0.121
	P %	8.20%	54.50%	7.70%	29.60%		
Impingement Syndrome	N	20	126	17	70	1.393a	0.238
	P %	8.60%	54.1%	7.3%	30.00%		
Osteoarthritis	N	41	105	35	52	3.660a	0.056
	P %	17.60%	45.10%	15.00%	22.30%		
Osteophytes	N	10	136	12	75	3.074a	0.08
	P %	4.30%	58.40%	5.20%	32.20%		
Bone Marrow Edema	N	24	122	8	79	2.414a	0.12
	P %	10.30%	52.40%	3.40%	33.90%		
Degenerative	N	18	128	21	66	5.455a	0.02
	P %	7.70%	54.90%	9.00%	28.30%		
Bursitis	N	12	134	22	65	12.743a	0.00
	P %	5.20%	57.50%	9.40%	27.90%		
Osteomyelitis	N	3	143	0	87	1.811a	0.178
	P %	1.30%	61.40%	0.00%	37.30%		

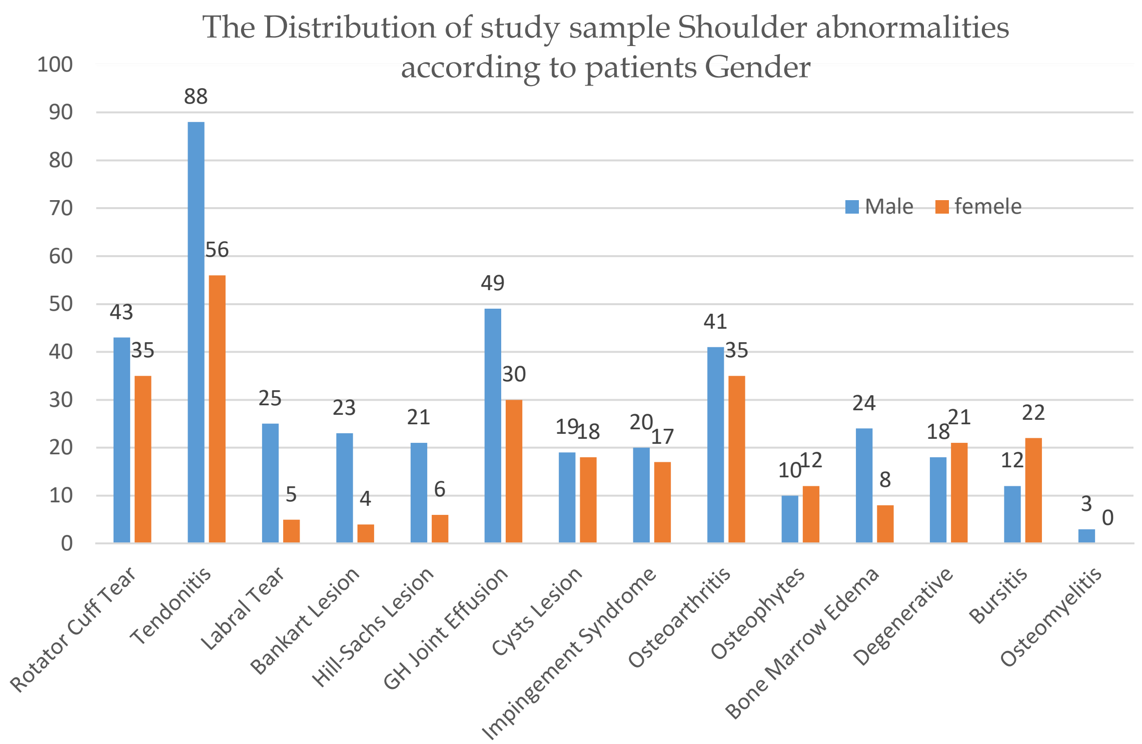


Figure 4.6: The Distribution of study sample Shoulder abnormalities according to patients Gender

The Table (4.6) and Figure (4.6) demonstrated the association between patients gender (male and female) according to Shoulder abnormalities. In Rotator Cuff Tear, Tendonitis, Hill-Sachs Lesion, GH Joint Effusion, Cysts Lesion, Impingement Syndrome, Osteoarthritis, Bone Marrow Edema and Osteomyelitis whereas the P-value didn't demonstrate statistically significant association between shoulder abnormalities and gender when the p-value larger than 0.05 ($P > 0.05$). While the Labral Tear, Bankart Lesion, Osteophytes, Degenerative and Bursitis whereas the P-value demonstrate statistically significant association between shoulder abnormalities and gender when the p-value smaller than 0.05 ($P < 0.05$).

4.1.7 The Score of Osteoarthritis

The Osteoarthritis divided it to five groups, was distributed according level grade. Table (4.7) and Figure (4.7).

Table 4.7: The Distribution of OA Score according grade level

Score of OA	Number	Percent
No	158	67.8
Early	13	5.6
Mild	53	22.7
Moderate	3	1.3
Severe	6	2.6
Total	233	100.0

The Table (4.7) and Figure (4.7) demonstrated all 233 patient underwent MRI exam and had a MRI report. The intact Osteoarthritis that represent 158 cases, 67.8%. The most common affected was Mild that represent 53 patient, 22.7%.

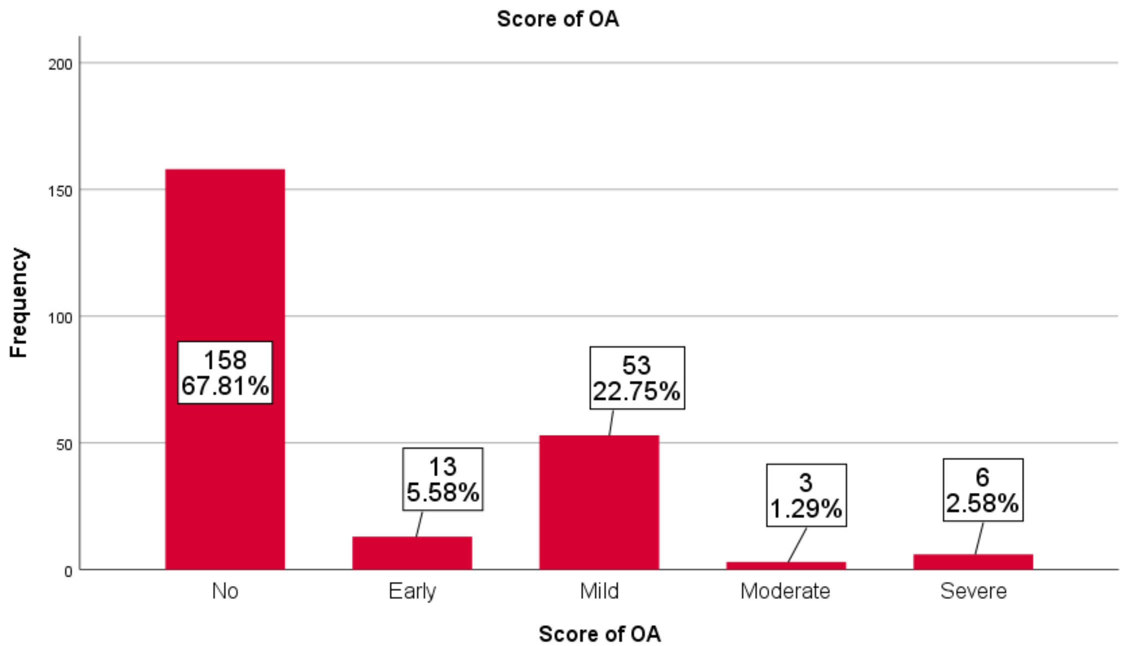


Figure 4.7: The Distribution of OA Score according level grade

4.1.8 The Association between of OA Score and Age group

The age group divided it to six groups, was association with Score of OA to demonstrate the most age group affected as it shown in Table (4.8) and Fig (4.8).

Table 4.8: The Distribution of OA Score according to age groups

Age Group	No	Early	Mild	Moderate	Severe	Total	Chi-Square Tests
							P-value
2 - 17	9	1	0	0	0	**10**	**0.000**
18 - 32	52	3	2	1	0	**58**	
33 - 47	55	1	15	0	0	**71**	
48 - 62	28	5	27	1	4	**65**	
63 - 77	13	3	7	1	1	**25**	
78+	1	0	2	0	1	**4**	
Total	**158**	**13**	**53**	**3**	**6**	**233**	

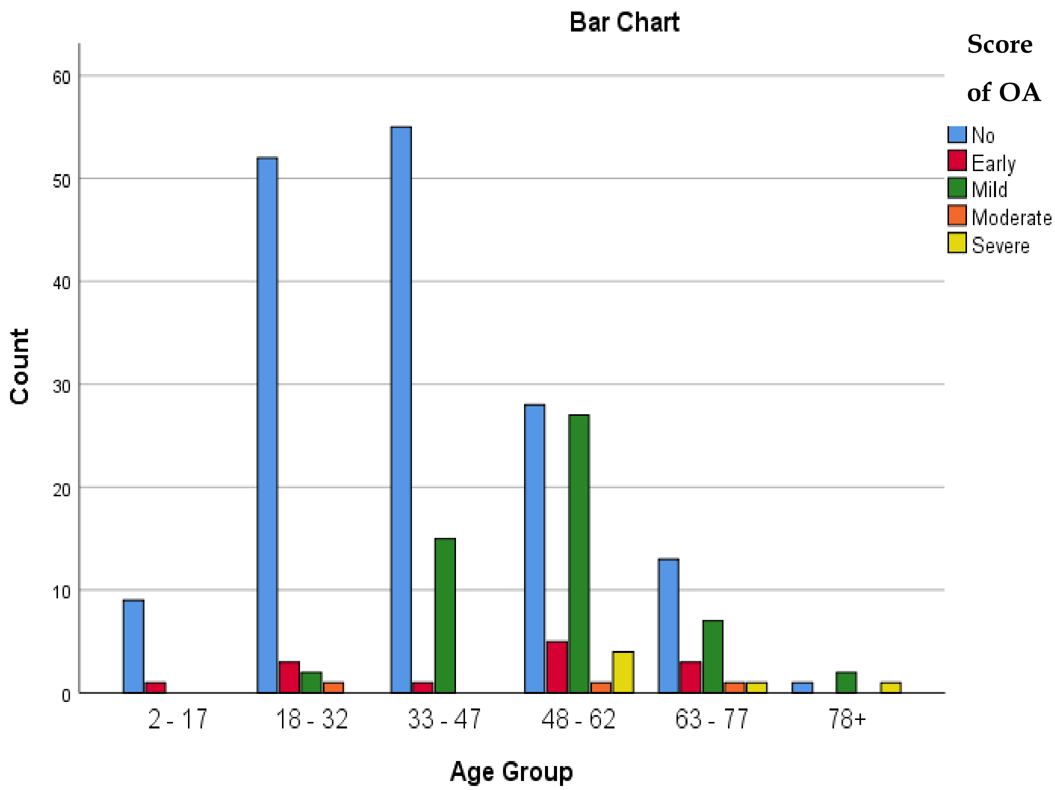


Figure 4.8: The Distribution of OA Score according to age groups

In Table (4.8) and Figure (4.8), the most age group affected was between (48–62) years. That was demonstrated statistically significant association between Score of OA and age group whereas the p-value smaller than 0.05 ($P < 0.05$).

4.1.9 The Association between of OA Score and gender

The assessment of OA Score with gender, the male more than female affected in general, the both percent's were 17.2%, 15% respectively, as it shown in Table (4.9).

Table 4.9: The Distribution of OA Score according to gender

Gender	No	Early	Mild	Moderate	Severe	Total
Male	106	10	26	3	1	**146**
Female	52	3	27	0	5	**87**
Total	**158**	**13**	**53**	**3**	**6**	**233**

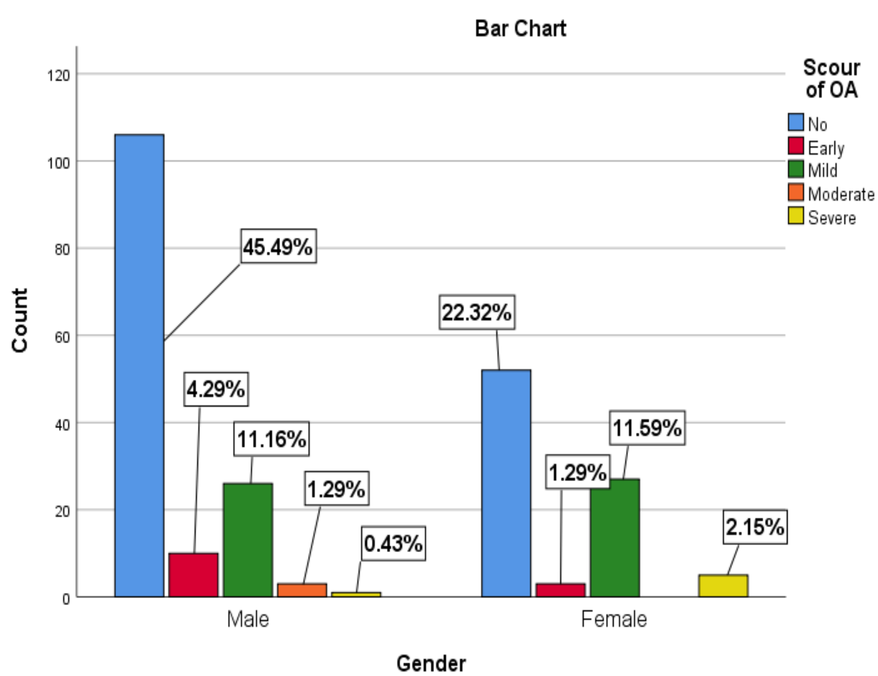


Figure 4.9: The Distribution of OA Score according to gender

The Table and Figure (4.9), the assessment of OA Score with gender, the male affected more than female, the both percent's were 17.2%, 15% respectively, but the mild and severe Osteoarthritis the female affected more than male.

4.2 Discussion:

Shoulder pain is a common complaint affecting all age groups. Causes of internal diseases of shoulder joint range from traumatic, inflammatory, degenerative, and in turn responsible for shoulder pain and instability. MRI is a commonly used modality of imaging shoulder joint for diagnosing internal diseases and majority of shoulder pathologies involving the tendons, muscles, ligaments, labrum, capsule and osseous structures.

This study included 233 cases with shoulder pain or clinically suspected with internal diseases of shoulder joint referred for MRI shoulder. In the current study the age of the patients ranged from 2 to 82 years with median of 42 years. The most common age group was (33 - 47) years, with percent 30.47% of cases, as it shown in Table and Fig (4.1).

In the present study males more than females, with 62.7% of cases were males, 37.7% were females, with male to female ratio of 1.7:1, as it shown in Table and Fig (4.2). This result was agree with the studies of (Hema et al, 2012), (Arafat et al, 2013), (Dr. Anupama et al, 2022) and (Thwuiba, 2016), they found that the males more than females affected with shoulder abnormality.

In the present study, the abnormal findings 90.55% of cases while normal findings seen 9.45% of cases. The most common shoulder abnormalities consist of (144 cases) diagnosed with Tendonitis with percentage of 61.8%, the most commonly seen in patient's age more than 33 years, 48%. The second shoulder abnormalities consist (79 cases) diagnosed with GH Joint Effusion with percentage of 33.9%, the most commonly seen in the age group was (48-62) years, 12.4%. In addition, (78 cases) diagnosed with Rotator Cuff Tear with percentage of 33.5%, the most commonly seen in the age group was (48-62) years, 11.6%. In addition, (76 cases) diagnosed with Osteoarthritis with percentage of 32.6%, the most commonly seen in the age group was (48-62) years as it shown in Table and Fig (4.4) and (4.5). This result was agree with the study of (Hema et al, 2012), who found the Tendonitis or tendinopathy was most common with shoulder abnormality.

The assessment of Osteoarthritis score, the most common affected was Mild that represent 53 cases, 22.7%, as it shown in Table and Fig (4.7). The most age group affected was between (48–62) years. That was demonstrated statistically significant association between Score of OA and age group whereas the p-value smaller than 0.05 ($P < 0.05$), as it shown in Table and Fig 4.8. The assessment of OA Score with gender, the male affected more than female, the both percent's were 17.2%, 15% respectively, but the mild and severe Osteoarthritis the female affected more than male, as it shown in Table and Fig (4.9).

For Bankart Lesion, GH Joint Effusion, Impingement Syndrome, Osteoarthritis, Osteophytes, Degenerative and Bursitis have significant association between age group and shoulder abnormalities, whereas the p-value smaller than 0.05 ($P < 0.05$). We saw these diseases of shoulder affected by ages as shown in the Table (4.5).

For Labral Tear, Bankart Lesion, Osteophytes, Degenerative and Bursitis whereas the P-value demonstrate statistically significant association between shoulder abnormalities and gender when the p-value smaller than 0.05 ($P < 0.05$). We saw these diseases of shoulder affected by gender as shown in the Table (4.6).

Chapter Five :

Conclusion and Recommendation

5.1 Conclusion

This study assessed shoulder joint abnormalities among Yemeni populations in Sana'a city using (MRI). That collected data such as age, gender and all abnormal finding from the shoulder MRI report. This study included total 233 cases with shoulder abnormalities. . In the current study the age of the patients ranged from 2 to 82 years with median of 42 years. The most common age group was (33 - 47) years, with percent 30.47% of cases. In the present study, the males more than females, with percentage of 62.7% and 37.7% respectively, with male to female ratio of 1.7:1. In the present study, the abnormal findings 90.55% of patients while normal findings seen 9.45% of patients. The most common shoulder abnormalities consist of (144 cases) diagnosed with Tendonitis with percentage of 61.8%, the most commonly patient's age more than 33 years, 48%. The second shoulder abnormalities consist (79 cases) diagnosed with GH Joint Effusion with percentage of 33.9%, the most commonly seen in the age group of (48-62) years, 12.4%. In addition, (78 cases) diagnosed with Rotator Cuff Tear with percentage of 33.5%, the most commonly seen in the age group was (48-62) years, 11.6%. In addition, (76 cases) diagnosed with Osteoarthritis with percentage of 32.6%, the most commonly seen in the age group was (48-62) years.

Regarding the assessment of Osteoarthritis score, the most common affected was Mild that represent 53 cases (22.7%), the most age group affected was between (48–62) years. That was demonstrated statistically significant association between Score of OA and age groups. The assessment of OA Score with gender, the male affected more than female, the both percent's were 17.2%, 15% respectively, but the mild and severe Osteoarthritis the female affected more than male.

For Bankart Lesion, GH Joint Effusion, Impingement Syndrome, Osteoarthritis, Osteophytes, Degenerative and Bursitis have significant association with age. In addition, Labral Tear, Bankart Lesion, Osteophytes, Degenerative and Bursitis have statistically significant association with gender.

MRI was more accurate for assessments of shoulder joint pain due to it is high quality diagnostic ability to accurate for demonstrate of soft tissue, muscle, tendons and ligament of shoulder joint.

5.2 Recommendation

- The Further study required long time to collect enough data because shoulder MRI examination is not prevalent exam such as lumber MRI or brain MRI.
- Further study should collect more data for getting accurate result and distinguish what the main cause's and risk factor effect the shoulder abnormalities.
- Magnetic resonance imaging examination for persistent shoulder pain recommended to be routine examination.

REFERENCES

1- RICHARD SNELL, 1992.Clinical anatomy for medical students. 4th edition ,Little brown company, Boston, Toronto.

2- Catherine westbrook hand of MRI technique, fourth edition

3- Michael l. grey, jagan m. ailnani. CT & MRI pathology a pocket atlas third edition.

4- Radiopedia.org, https://radiopaedia.org/

5- Mrimaster.org, https://mrimaster.com

6- Kenneth l, Bontrager, john p, lampignano Bontrager handbook of radiographic positioning and techniques eight edition.

7- my.clevelandclinic.org, https://my.clevelandclinic.org

8- BUREAU, N. J.; DUSSAULT, ROBERT G.; KEATS, THEODOR E. 1996. Imaging of bursae around the shoulder joint. Skeletal radiology, 25.6: 513-517.

9- GIAROLI, E. L., MAJOR, N. M., LEMLEY, D. E., & LEE, J. (2006). Coracohumeral interval imaging in subcoracoid impingement syndrome on MRI. American Journal of Roentgenology, 186(1), 242-246.

10- BOGART, BRUCE I.2007. Elsevier\'s Integrated Anatomy and Embryology.

11- FAVARD, L., BACLE, G., & BERHOUET, J. (2007). Rotator cuff repair. Joint Bone Spine, 74(6), 551-557.

12- WILLIAM F.GANONG, 2003. Review of Medical physiology, 21th edition.

13- SUKKAR, MOHAMED YOUSIF; ARDAWI, M. S. M.; EL MUNSHID, H. A 2000. Concise human physiology. Wiley-Blackwell.

14- orthoinfo.aaos.org, https://orthoinfo.aaos.org

15- NCBI.NLM.NIH.GOV, https://www.ncbi.nlm.nih.gov

16- Hema Chaudhary, sangeeta Aneja. MRI Evaluation of Shoulder Joint: Normal Anatomy & Pathological Finding A Pictorial Essay And Review. IOSR Journal of Dental and Medical Sciences (JDMS) Volume 2, Issue 2 (Nov.- Dec. 2012), PP 01-09 17.

17- Arafat MR, Abdelhadi JM, Zayadeen AR, Tamimi AA, Jaouni MT. Evaluation of Shoulder Pathologies using MRI - Our experience at King Hussein Medical Centre. Middle East J Age and Aging 2013;10(5):35-41.

18- Dr. Anupama Parihar (Resident), Dr.Mohit Dattatray Patil (Asst. Professor), Dr.L.Akhil rohan (Senior resident), Dr.Shephali pawar (Professor and HOD), Sassoon General Hospital, Pune India. International Journal of Medical Science in Clinical Research and Review Online ISSN: 2581-8945 Available Online at http://www.ijmscrr.in Volume 05|Issue 05 (September-October)|2022|Page: 733-741

19- HANA KHALAFALLAH, 2018. Study of shoulder joint pain using magnetic resonance imaging. Sudanese University Of Science And Technology College Of Graduate Studies

20- TEMPELHOF S, RUPP S, SEIL R. 1999.Age-related prevalence of rotator cuff tears in asymptomatic shoulders. J Shoulder Elbow Surg.;8:296–299.

21- YAMAMOTO A, TAKAGISHI K, OSAWA T, YANAGAWA T, NAKAJIMA D, SHITARA H, KOBAYASHI T. 2010. Prevalence and risk factors of a rotator cuff tear in the general population. J Shoulder Elbow Surg.; 19:116–120.

22- MARK A, BROWN, RICHARD C.SEMENKA 2011. 4th edition, MRI Basic principle and application.

23- MICHAEL MCKINELY, VALERIE LAUGHLIN 2009 6th edition, human anatomy.

24- ASHBY, Blake M.; DELP, Scott L. 2006, Optimal control simulations reveal mechanisms by which arm movement improves standing long jump performance. Journal of biomechanics, 39.9: 1726-1734.

25- Thwuiba Abdelhmed, 2016. Study of shoulder joint pain using magnetic resonance imaging. Sudanese University Of Science And Technology College Of Graduate Studies

26- Atlas of Functional Shoulder Anatomy, Giovanni et al, 2010

APPENDICES

Rt shoulder MRI A: coronal T1 – TSE , B: coronal T2 STIR , C: Axial T1-FS

CONCLUSION:

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- **The supraspinatous tendon shows altered signal intensity with edematous signal, impressive of acute on top of chronic tendinitis with impending rupture.**

- **Decreasing the acromiohumeral distance, impressive of shoulder impingement.**

- **Fluid seen around the long head of biceps at its bicipital groove, impressive of tenosynovitis.**

- **Altered signal intensity seen at the deep aspect of supraspinatous above coracoid process, impressive of sequelae of partial muscular injury**

- **Edematous signal seen at the articular surfaces of the acromioclavicular joint**

- **Otherwise non-significant right shoulder MRI findings.**

Rt shoulder MRI A:coronal T2 STIR , B:coronal T1 – TSE , C:Sag, T2-TSE

MRI FINDINGS:
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- **The supraspinatous tendon shows altered signal with edematous signal, impressive of tendinopathy.**
- **The acromioclavicular joint shows irregular joint space with subarticular subcortical bone marrow edematous change with marginal osteophytes, impressive of a type of arthropathy on a background of degenerative process.**
- **Narrowing of acromiohumeral distance with inferior peaking of the acromial process, that is aggravated by the above mentioned acromioclavicular arthropathy, impressive of shoulder impingement syndrome.**
- **Focal bone marrow edematous change of a diameter about 6mm seen immediately below the insertion of supraspinatous tendon, impressive of bone bruising.**
- **A film of fluid seen around the long head of bicipital groove, impressive of tenosynovitis.**
- **A focal area of altered signal intensity surrounded with fluid at subscapularis tendon, impressive of focal tendinopathy.**
- **Minimal joint effusion.**
- **No other significant right shoulder MRI study findings.**

ملخص البحث

الهدف

الهدف الرئيسي من الدراسة هو دراسة تقييم آلام مفصل الكتف بين سكان اليمن باستخدام جهاز الرنين المغناطيسي.

المنهجية

تضمنت هذه الدراسة الوصفية التحليلية عينة مقطعية شملت 233 حالة. حيث شمل مجتمع الدراسة المرضى الذين زاروا أقسام الأشعة وخضعوا للتصوير بالرنين المغناطيسي لمفصل الكتف في مدينة صنعاء.

النتائج

أظهرت نتائج الدراسة ما يلي، تراوحت أعمار المرضى في هذه الدراسة ما بين 2 إلى 82 سنة بمتوسط 42 سنة. وكانت الفئة العمرية الأكثر شيوعاً هي (33-47) سنة حيث بلغت نسبة الحالات 30.47٪. في الدراسة الحالية كان الذكور أكثر من الإناث، حيث كانت نسبة الذكور 62.7٪ من الحالات و37.7٪ من الإناث، ونسبة الذكور إلى الإناث 1.7: 1. وكانت 90.55٪ من الحالات لديها امراض في مفصل الكتف بينما كانت النتائج الطبيعية في 9.45٪ من الحالات.وكانت أكثر تشوهات الكتف شيوعًا كما يلي، التهاب الأوتار في 144 حالة (61.8٪)، 79 حالة انصباب مفصل الكتف (33.9%)، 78 حالة تمزق الكفة المدورة (33.5٪) ، هشاشة العظام 76 حالة (32.6٪) ، آفة الأكياس 37 حالة (15.9٪) ، متلازمة الاصطدام 37 حالة (15.9٪) ، التهاب كيسي 34 حالة (14.6٪) ، وذمة نخاع العظام 32 حالة (13.7٪) ، 30 حالة تمزق لابرال (12.9٪) ، آفة بانكارت 27 حالة (11.6٪) ، هيل-ساكس 27 حالة (11.6٪) ، عظمية 22 حالة (9.4٪) ، التهاب عظم ونقي 3 حالات (1.3٪).

الاستنتاج

اظهرت النتائج ان 90.55٪ من الحالات لديها امراض في مفصل الكتف، وكانت أكثر تشوهات الكتف شيوعًا هي التهاب الأوتار في 144 (61.8٪) حالة.

وظهر ان التصوير بالرنين المغناطيسي دقيق في تقييم تشوهات مفصل الكتف بسبب قدرته التشخيصية عالية الجودة للأنسجة الرخوة والعضلات والأوتار وأربطة مفصل الكتف.

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الجمهورية اليمنية

جامعة العلوم والتكنولوجيا

كلية الطب والعلوم الصحية

قسم تكنولوجيا الأشعة التشخيصية

تقييم تشوهات مفصل الكتف لدى السكان اليمنيين باستخدام التصوير بالرنين المغناطيسي

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2023