



ADDISABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
DEPARTMENT OF RADIOLOGY

MRI Patterns of Shoulder Abnormalities

RETROSPECTIVE CROSS SECTIONAL STUDY DONE AT TIKUR ANBASSA AND
SAINT PAULOS TEACHING HOSPITALS, ADDIS ABABA ETHIOPIA

FROM APRIL 2019- SEPTEMBER 2020 G.C

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LISTS OF ABBREVIATIONS

TASH—Tikur Anbessa specialized hospital

US-----Ultrasound

MRI---Magnetic resonance imaging

RCT-----Rotator Cuff Tear

PACS---Picture Archive and Communication System

MRI---- Magnetic resonance imaging

T1W--T1 weighted image

ACJ---Acromioclavicular joint

AC--- Adhesive capsulitis

T2W-- T2 weighted image

PDW--Proton density weighted

FLAIR ---Fluid attenuated inversion recovery

USA----- United States of America

Abstract

Background

Shoulder pain is one of the common reason for the hospital visit, it is a nonspecific symptom with multiple underlying causes, in young mostly it is due to trauma a and in old age the result of age-related degeneration and tear involving the joint and supporting structures, radiology plays an important role in uncovering the underlying conditions the 1st imaging modality used in our set up is a plain film which has poor sensitivity and specificity subsequent choice of imaging depends on Clinical diagnosis like MRI, MRA and US

MRI has better sensitivity and specificity than ultrasound for most of the pathologies causing shoulder pain, and up to my knowledge no available data is found stating the different pathologic pattern of MRI finding in a patient with shoulder pain

Objective

Objective of the study is to establish the pattern of MRI finding of shoulder pathologies seen in patients with shoulder complaint.

Materials and methods

Retrospective cross-sectional study was conducted on a total of 166 patients using conventional 1.5 T MRI in two teaching hospitals

Results

The most commonly imaged shoulder was the Right shoulder with 104(62.7%) of the cases .Rotator cuff tear was the most common lesion seen in 72(43.6%) of the cases of which partial thickness tear which was seen in 60 (82.2%) of the cases followed by Rotator cuff tendinosis which is encountered in 45 (27.1%) of the cases

Conclusion: This study concludes that right shoulder is more affected than the left, partial thickness supraspinatus tear was the commonest lesion identified

CHAPTER ONE

Introduction

1.1 Background

Shoulder pain is a frequently observed musculoskeletal complaint that forces the patient to seek medical care mostly it either because of intrinsic disorders of the shoulder or referred from other sites. Among the intrinsic causes include injuries and acute or chronic degeneration or inflammation of the shoulder joint, tendons, surrounding ligaments, or periarticular structures are well documented (1).It has a significant social and economic impact.

In the USA, it is the third commonest musculoskeletal disorder after low back pain and cervical pain affecting 17% of men and 25% of women in the elderly population. Incidence increases with age. 21% of people over 70 years have shoulder pain (2).Clinical examination alone provides limited information, making supplementary imaging an essential component of decision making by determining the pattern of pathologies.

Since most of pathologies causing shoulder pain arise from soft tissue rather than osseous lesions MRI is an excellent modality in depicting shoulder pathology. Better soft-tissue contrast and multi planar capabilities enable it an outstanding device in shoulder imaging.

The incidence of shoulder pain is varied among different countries well as different age and sex groups of a population in the same country.

Rotator cuff anatomy and tear

The rotator cuff consists of the supraspinatus, Infraspinatus, subscapularis, and teres minor muscles and tendons. At the distal aspect of the rotator cuff, the supraspinatus and infraspinatus tendons splay out and interdigitate, forming a common continuous insertion on the middle facet of the humeral greater tuberosity(3-6)

Rotator cuff tears are one of the most common causes of shoulder pain mostly in older patients ,both accurate diagnosis and determination of the extent of the rotator cuff tear are

critical for treatment ,management decisions and preoperative planning. clinical examination alone provides limited information, making supplementary imaging an essential component of decision making(7, 8)

MRI and US imaging are among the routinely used imaging techniques in the assessment of suspected rotator cuff tear(9, 10) . The frequency of use of the respective technologies depends on access to equipment, provider preference, and operator experience

Historically, MRI was the method of choice, given its proven accuracy and high sensitivity in diagnosing rotator cuff pathology.

the use of MRI is appealing because it is less dependent on operator factors, , and it is better for the evaluation of morphologic changes in structures such as the Glenoid labrum, joint capsule, articular cartilage, and surrounding muscles and bone that may contribute to symptoms. Ultrasound is among the most operator dependent imaging methods, and its reliability and accuracy correlate directly with user experience(9, 11, 12).Rotator cuff tear can be partial thickness involving only the articular or bursal surface or can be full thickness extending across both surface s.

Rotator cuff tendinopathy

A tendinopathy is an overuse condition that manifests itself as pain in and around tendons(13, 14)Tendons must be able to handle tensile loads and their ability to do so relies on Type 1 collagen(14, 15). However, a key feature of tendinopathy can be seen through collagen structure analysis by showing the disruption of tendon micro architecture, which helps to understand the response to variable amounts of cyclic loading.(15-17) .The function of the upper limb is critical in deciding the treatment approach and determining the patient's prognosis.(14, 18) Clinical evaluation of the shoulder correlates well with magnetic resonance imaging (MRI) findings.(18) The MRI findings of rotator cuff tendinopathy are characterized by thickened inhomogeneous rotator cuff tendon with increased signal intensity on all pulse sequences.(19, 20)

Glenohumeral and acromioclavicular osteoarthritis

Osteoarthritis is the most frequent cause of disability in the USA (21, 22). Although not as prevalent as OA of the hip or knee, OA of the shoulder has been demonstrated, in cadaver and radio-graphic studies, to affect up to 32.8% of patients over the age of sixty years(23, 24). The prevalence of shoulder OA increases with age and women appear to be more susceptible than men (25).

OA of the shoulder is manifested by imaging as cartilage loss, joint space loss and osteophyte formation, it can also cause significant injury to the tendons of rotator cuff muscles.

Adhesive capsulitis

AC is a diffuse inflammatory process involving all of the soft tissue components of the scapulohumeral joint including the synovial surface of the joint capsule, the glenohumeral ligaments, the peri-articular tendons and bursae (particularly the sub-acromial bursae), or the biceps tendon sheath(26). Clinical symptoms of AC include a gradual onset of pain, inability to sleep on the affected arm, restriction of both active and passive elevation as well as restricted external rotation(26). Because of its nonspecific clinical feature image plays an important role, magnetic resonance arthrography of the shoulder is the investigation of choice. The commonest finding seen on imaging are, thickening of inferior glenohumeral ligament and joint capsule, the presence of heterogeneous soft tissue within the rotator interval, sub-coracoid fat obliteration and fibrosis, thickening and fibrous changes of coracohumeral ligament(27).

1.2 Significance of the Study

Since Shoulder pain is one of the commonest causes of morbidity and disability in society it should be properly managed and management mostly relies on finding depicted with different imaging modalities, among the imaging modalities MRI is found to be accurate because of its better soft-tissue contrast resolution compared with other imaging modalities. MRI is introduced since 2012 but no data is available showing MRI pattern of pathologies among patients who scanned for shoulder pain, so this study aims to set up a baseline data regarding MRI pathologic pattern in patient with shoulder complaints for future reference

CHAPTER TWO

Literature review

A study done in UK IN A year 2006 showed that prevalence and incidence of people consulting for a shoulder condition was 2.36% [95% confidence interval (CI) 2.32–2.40%] and 1.47% (95% CI 1.44–1.50%), respectively. Prevalence increased linearly with age whilst incidence peaked at around 50 yr then remained static at around 2% .

A study done in the Nether land with A total of 526 patients during an average follow-up of 7.6 years, because of their shoulder complaints (average of 0.33 consultations per year). The average incidence was 29.3 per 1000 person-years. Women and patients within the 45–64 age category have the very best incidence. Patients in the 45–64 age category had the highest probability of repeated GP consultations during follow-up(28).

According to the cross-sectional study done among Barbers in Gondar Town, Northwest Ethiopia which has a response rate was 98.3%, the mean age was 26.39 (SD + 4.805) years. Shoulder pain has a prevalence of 27.1%. Age (AOR: 2.614; 95% CI (1.287, 5.307)), alcohol use (AOR: 3.556; 95% CI (2.212, 5.717)), frequent standing (AOR: 1.536; 95% CI (1.006, 2.346)), physical exercises (AOR: 1.938; 95% CI (1.216, 3.089)), and low monthly salary (AOR: 3.125; 95% CI (1.157, 5.441)) were factors associated with work-related upper extremity disorders(29).

Across-sectional study in 848 primary and secondary school teachers in Gondar town, Northwest Ethiopia total of 754 teachers participated, with a mean age of 42 ± 9.73 years (88.9% response rate).prevalence of shoulder and/ neck pain among school teachers was 57.3% with 95%CI (53.4–61.0%). Regular physical exercise (OR = 0.18, 95% CI: 0.08–0.42), teaching experience (OR = 2.85, 95% CI: 1.09–7.42), static head down posture (OR = 2.26, 95% CI: 1.55–3.33), elevated arm over shoulder (OR = 2.71, 95% CI: 1.86–3.95), prolonged sitting (OR = 1.50,95% CI: 1.02–2.23) and hypertension (OR = 2.18, 95% CI: 1.24–3.82) were factors found to be significantly associated with shoulder and/neck pain (30).

But no data regarding the incidence of shoulder pain at the population level found in Ethiopia.

A study done in India among 36 patients with shoulder pain 20 of patients were males and 16 were females. Causes of shoulder pain as diagnosed by MRI were Rotator cuff tears especially Supraspinatus tears with partial tears in 7 patients and a complete tear in 5 patients. Infraspinatus tear was seen in one patient. Labral tears were the second most common cause of shoulder pain with Antero inferior Labral tears accounting for 5 patients and SLAP tears for 3 patients. Associated Hillsachs lesion could only be found in 1 patient. And he was able to characterize labral tears in only 3 patients into Perthes lesion in 1 patient, humeral avulsion of the inferior gleno humeral ligament (HAGL) in 1 patient and Glenolabral articular disruption (GLAD) in one patient. In 2 patients he couldn't

Characterize labral tear since MR arthrography is superior to conventional MR imaging for the diagnosis of labral lesions (even at 3 T)

he had 3 cases of SLAP (superior labral anteroposterior) tears in our study. A SLAP lesion is a tear of the superior labrum, usually centered at the LHBT origin, and it can extend to the anterior and posterior labrum It can also propagate along the periarticular fiber system to the surrounding anatomic structures (the superior glenohumeral ligament, IGHL, rotator interval, or LHBT origin)

Clinical diagnosis of SLAP

lesions is difficult; most patients present with nonspecific shoulder pain, associated shoulder injuries, and no objective clinical instability, Therefore, MRI shoulder has a very important role in its detection. The third most common cause of shoulder pain found was adhesive capsulitis and AC joint arthropathy each accounting for 4 cases. The most common findings in our study were abnormal soft tissue thickening within the rotator interval with signal alteration and thickened axillary recess. AC joint arthropathy was seen in patients above 40 years of age. There was a single case of Infraspinatus tear, Parsonage-Turnersyndrome, subscapularis bursitis and bicipital tendinosis each(31).another study done in India among 32 patients with shoulder pain. Rotator cuff tears was the commonest finding followed by sub-acromial impingement syndrome, adhesive capsulitis, acute bursitis, labral tears, acromioclavicular joint arthropathy and biceps tendinitis, the age of the patients is between (18 - 80) years 28 (70%) were males and 12 (30%) were females(32).

a Study conducted in Kenya among seventy patients referred for MRI imaging, A total of 120 lesions were seen and were more common on the right shoulder 104(86.7%) compared to the left which had only 16(13.3%) lesions.

The commonest lesion was tendinosis with 34 (47.2%) cases and was seen more on the right shoulder. There were 20 (27.8%) structure tears that mostly involved the supraspinatus tendon. Degenerative disease was found in 13 (18.6%) patients. And

Among the patients examined, the proper shoulder had more pathology than the left. Tendinosis of the supraspinatus tendon was the commonest pathology. In rotator cuff tears, supraspinatus was more frequently involved(33).

A study conducted in Nigeria among Sixty six subjects who undergone MRI scanning for shoulder pain. Adhesive capsulitis was the most common condition followed by rotator cuff tear and sub-acromial sub-deltoid bursitis while septic arthritis and avascular necrosis were least diagnosed 22.7%

of the subjects could not, however, be categorized .over all the condition found to affect females more than males(34).

Another prospective study showed that Rotator cuff tear was the most common lesion noted in 85% cases, out of which the predominant lesion was full-thickness supraspinatus tear, in 29.6% cases. Rotator cuff tendinosis & Impingement syndrome were the second & third most common lesions encountered on MRI in painful shoulder, observed in 77.7% & 39% of the patients respectively(35).

In 2007 research done in Greece. showed that the accuracy in the detection of full-thickness tears was 98 and 100% for ultrasonography and magnetic resonance imaging, respectively. The accuracy within the detection of bursal or articular partial-thickness tears was 87 and 90% for ultrasonography and resonance imaging, respectively(12).

In 2008 A study conducted in England Involving Ninety-six patients with clinically suspected rotator cuff tear who underwent ultrasonography and magnetic resonance imaging of the shoulder. The accuracy within the detection of full-thickness tears was 98 and 100% for ultrasonography and resonance imaging, respectively. The accuracy within the detection of bursal or articular partial-thickness tears was 87 and 90% for ultrasonography and resonance imaging, respectively(36).

In 2016 study in Egypt showed, Compared to MRI, ultrasound for partial-thickness tears, has sensitivity, specificity, PPV, NPV and accuracy were 88%, 89%,83 % But in full-thickness tears, its sensitivity and specificity were 100% each(10).

But no study is done in Ethiopia comparing the accuracy of ultrasound and MRI in identifying rotator cuff tear

A prospective study done in egypt in 2013 on Fifty-six patients with RCT (either partial or full thickness tear) and 30control volunteers were enrolled in this study. Their shoulders were imaged by MRI. The acromial shapes were classified into type I (flat), type II (curved), type III (hooked) and type IV (convex).Full thickness tear was significantly associated with type-III ($P < 0.05$)(37).

Study done in Japan in 2002 using 193 shoulder MRI having rotator cuff tear Comparison of the incidence of each acromial shape between groups of specimens with and without rotator cuff tears revealed no significant differences. they suggests that the correlation between rotator cuff tears and a type III acromion is not as strong as has been suggested in the literature(38).

A retrospective study done in India on the Correlation of acromial morphology in association with rotator cuff tear on 68 patients with rotator cuff tear, supraspinatus was the most commonly affected tendon, Partial tears of rotator cuff were more common than complete tears. The acromial type did not show any correlation with any particular cuff lesion(39).

A study done in USA in 2006 on 588 patients , 212 had an intact rotator cuff bilaterally, 199 had a unilateral rotator cuff tear (either partial or full thickness), and 177 had a bilateral tear (either partial or full thickness). The presence of rotator cuff disease was highly correlated with

age. The average age was 48.7 years for patients with no rotator cuff tear, 58.7 years for those with a unilateral tear, and 67.8 years for those with a bilateral tear. Logistic regression analysis indicated a 50% likelihood of a bilateral tear after the age of sixty-six years ($p < 0.01$). In patients with a bilateral rotator cuff tear in whom one tear was symptomatic and the other tear was asymptomatic, the symptomatic tear was significantly larger ($p < 0.01$). The average size of a symptomatic tear was 30% greater than that of an asymptomatic tear. Overall, patients who presented with a full-thickness symptomatic tear had a 35.5% prevalence of a full-thickness tear on the contralateral side. Showing a high correlation between the onset of rotator cuff tears (either partial or full thickness) and increasing age(40).

CHAPTER THREE

Objectives

3.1 General Objective

- Determine the pattern of MRI findings in patients who undergo MRI scanning in 2 hospitals.

3.2 Specific Objective

- To determine the pattern of different shoulder pathology seen on MRI
- Establish association of MRI finding with underlying demographic data

CHAPTER FOUR

Materials and methods

4.1 Study area and period

The study was conducted from April 2019- September 2020 G.Cin TASH and Saint Paulos hospital .both hospital are the largest main teaching hospital, located in the capital city of Ethiopia, The Hospitals were built by Emperor Haile Selassie I of Ethiopia . Both hospitals provide a tertiary level referral treatment with catchment population of over 5 million each.

4.2Study Design

Retrospective cross sectional study employed

4.3 Population

4.3.1Source Population

All patients with shoulder complaint who were being evaluated at TASH and SPMCH during the study period in the study period.

4.3.2Study population

All patients with shoulder complaint who undergo shoulder MRI evaluation during the specified study period

4.3.3 Inclusion and Exclusion Criteria

4.3.3.1 Inclusion criteria

All patients who undergo shoulder MRI evaluation during the specified study period

4.3.3.2 Exclusion criteria:

Incomplete reporting and incomplete sociodemographic data

4.4. Sampling technique and size determination

A non-probability convenient sampling was used and all patients with shoulder MRI that has fulfilled both the inclusion and exclusion criteria during the study period was included in the study.

4.5 Data Collection

Data collection was undertaken by the principal investigator using structured questionnaire. Patients chart were reviewed to look sociodemographic data.

The shoulder MRI reports which were read by a total of 18 radiologist were reviewed and findings are recorded in the questionnaires.

4.6Operational Definitions

Bursa -Small fluid-filled sacs lined by a synovial membrane which may or may not communicate with joint space

Bursitis –Bursal inflammation evidenced by fluid accumulation with distension

Rotator cuff tear -Hyper intense signal area within the tendon on T2W, fat-suppressed, intermediate-weighted sequences which matches to fluid signal.

Partial thickness rotator cuff tears – Tear the involves only articular or bursal surface

Full thickness rotator cuff tears – Tear that extends from the bursal surface to the articular surface.

Tendinopathy – intermediate hyper intense signal tendon on T2 which does not much signal intensity of water

SLAP tear - tear involving superior glenoid labrum, where the long head of biceps tendon inserts with or without extension in to the tendon .

Adhesive capsulitis - thickening of inferior glenohumeral ligament and joint capsule ,the presence of heterogeneous soft tissue with in the rotator interval ,sub coracoid fat obliteration and fibrosis, thickening and fibrous changes of coracohumeral ligament

Dislocation - displacement of head of the humerus out of the shoulder joint.

Hill sachs lesion - focal bone loss, defect and deformity of the humeral head at and above the level of coracoid process..

Bankart lesion: separation of the anterior glenoid labrum, with or without glenoid fracture fragment demonstrating linear high T2/PD intensity.

Joint degeneration joint space loss, cartilage loss, osteophytes

Acromial shape Type I straight under surface
 Type II concave under surface
 Type II hooked under surface
 Type II convex under surface

4.7 Data quality control

To evaluate the clarity of the questionnaire ,the findings and observations obtained will be used to modify the questionnaire and the data collection process accordingly

4.8 Data analysis and interpretation

The data was checked for clarity and completeness. Data was analyzed using nonparametric statistical methods with the help of SPSS version 25 software package.

4.9 Ethical considerations

The information obtained from patients medical records as well as imaging reports of the patients will be kept confidential & Permission will be obtained from research & ethics committee

4.10. The Limitations of the Study

Shoulder MRI reported by different radiologist
Reading Charts for some of the patients was missing

CHAPTER FIVE

Results

Background Information

A total of 166 patients were included in the study. And from the participant's 84 (49.4%) were males and the rest 82(50.6%) were females. And the participant's age ranged from as young as 15 years up to 80 years of age. And the mean age was found to be 44 ± 14.4 years. And the majority of the Imaging studies were taken at St Paul Hospital with 121(72.9%) of the cases while the rest 45 (27.1%) of the cases were imaged at Black Lion Hospital. (Table 1)

The most commonly imaged shoulder was the Right shoulder with 104(62.7%) of the cases while the rest 62(37.3%) patient's had their left shoulder imaged. And shoulder pain was the major clinical complaint in 123(74.1%) patients while the rest 43(25.9%) patients didn't have any shoulder pain at time of Imaging (Table 1)

Imaging Findings

Rotator cuff

Rotator cuff pathologies were common among the study population and the most common rotator cuff abnormality seen were rotator cuff tears which were present in 72(43.6%) of the cases. The most common rotator cuff muscle torn was the Supraspinatus muscle which was torn in 65(89%) of the cases. (Fig 1)

The most common type of tear was partial thickness tear which was seen in 60 (82.2%) of the cases. And the articular side of the joint was the most commonly torn side with 17(45.9%) of the cases followed by the bursal side of the tendon with 14 (37.8%) of the cases. A full thickness tear was seen in 12(17.8%) of the cases with 3(20%) of the cases having an associated retraction. (Table 2)

The second most common pathology noted in the rotator cuff was Rotator cuff Tendinopathy which was present in 45 (27.1%) of the cases. And the most commonly injured tendon was the supraspinatus tendon which was involved in 21(45.7%) of the cases. (Fig 2)

In our study Most of the rotator cuff tendon tear and tendinopathy is observed in the age group between 40-60. (Table 5)

Shoulder Joint (GH and AC)

The most common shoulder joint pathology noted was Degenerative changes which were present 46 (27.7%) of the cases. And the most commonly affected Joint affected by Degenerative changes was the Acromioclavicular Joint which was affected in 43(93.5%) of the cases while the Glen humeral Joint was affected in only 3(6.5%) of the cases.

The second most common shoulder joint Pathology noted was shoulder joint Dislocation. And a total of 19(11.4%) patients had Evidence of Dislocation upon Imaging and 5 (26%) of those patients had signs of active Dislocation at the time of Imaging while the other 14 (84%) patients didn't have Active Dislocation at the time of Imaging.

There was an associated Bankart lesions in 18 (10.9%) of the patients and the most common Type of Bankart lesion that was detected was the classic Bankart lesion which was seen in 11(61.1%) of these cases followed by the osseous bankart lesion which was seen in 6(33.3%) of the cases and there was a single cases of Reverse bankart lesion detected which was associated with a posterior dislocation. A Hill sacs deformity of the Humeral head was seen in 19(11.4%) of the patients imaged.

Acromial shape type

The most common type of acromion shape seen in this study was the Type 1 acromion with 68(42.0%) followed by Type 2 acromion which accounted for 57(35.2%), Type 3 acromion with 34(21%) of the cases and the least common Type of Acromion shape was the Type 4 acromion with 3(1.9%) of the cases. There were no statistically significant association seen Between Type of acromion and presence of Rotator cuff Tear of Tendinopathy (Table 4)

Labrum

Labral tears were seen in 15(9.1%) of the patients imaged and the most common type of labral tear detected was the superior labral tear which was seen in 10(66.7%) of the cases which was followed by the inferior labral tear which was seen in 4 (26.7%) of the cases.

Bursae

Bursal inflammation was noted in 34(20.5%) of the patients and the commonly inflamed bursae was the sub acromial sub deltoid bursae which was involved in 25(69.4%) of the cases followed by inflammation of both the sub coracoid and the sub acromial sub deltoid Bursae which was seen in 10(27.8%) of the cases.

Neoplasms

There were a total of 13(7.8%) patients who had tumors in their shoulders upon imaging and the most common neoplasm detected in the shoulder was Osteosarcoma which was seen in 5(38.5%) of the patients followed by Ewing sarcoma, high grade sarcoma and an osteochondroma which was seen in 2(15.4%) patients each. (fig 3)

Miscellaneous lesions

Fractures were seen in 2(1.2%) of the cases and in both cases the location of the fracture were at the Humeral neck. 11(6.6%) patients had signs of Adhesive capsulitis on Imaging. And 3(1.8%) patients had signs of Avascular Necrosis of the humeral head.

Table 1: background information of patients who underwent shoulder MRI at Black Lion and St Paul Hospital from April 2019- September 2020 G.C

Variables		Frequency	Percentage
Sex	Male	82	49.4 %
	Female	84	50.6%
	Total	166	100%
Age Range	<20 years	5	3 %
	20-40 years	49	29.7%
	40-60 years	81	49.1%
	>60 years	30	18.2%
	Total	165	100%
Shoulder imaged	Right	104	62.7%
	Left	62	37.3%
	Total	166	100%
Shoulder pain	Present	123	74.1%
	Absent	43	25.9%
	Total	166	100%
Place of Imaging	St Paul Hospital	121	72.9%
	Black Lion Hospital	45	27.1%
	Total	166	100%

Table 2: Patterns of Rotator cuff injury among patients who underwent shoulder MRI at Black lion and St Paul Hospital from April 2019- September 2020 G.C

Rotator cuff Injury patterns		Frequency	Percentage
	Present	73	43.9%
	Absent	93	56.1%
	Total	166	100%
Type of Tear	Partial Thickness	60	82.2%
	Full Thickness	13	17.8%
	Total	73	100%
Location of Partial Tear	Bursal side	14	37.8%
	Articular side	17	45.9%
	Intra-substance	6	16.2%
	Total	37	100%
Full thickness tear	Retraction present	3	20%
	Retraction absent	12	80%
	Total	15	100%
Rotator cuff Tendinopathy	Present	45	27.1%
	Absent	121	72.9%
	Total	166	100%

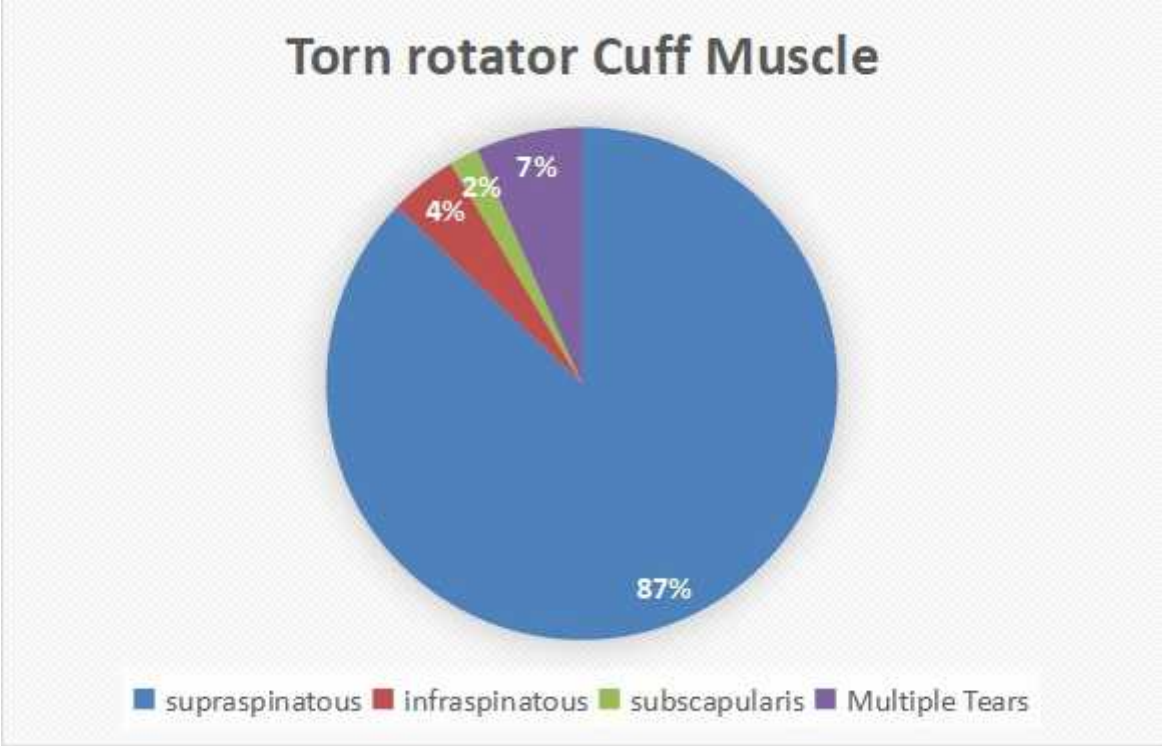


Figure 1 Pattern of Rotator cuff tears in patients who underwent Shoulder MRI at Black lion and St Paul Hospital from April 2019- September 2020 G.C

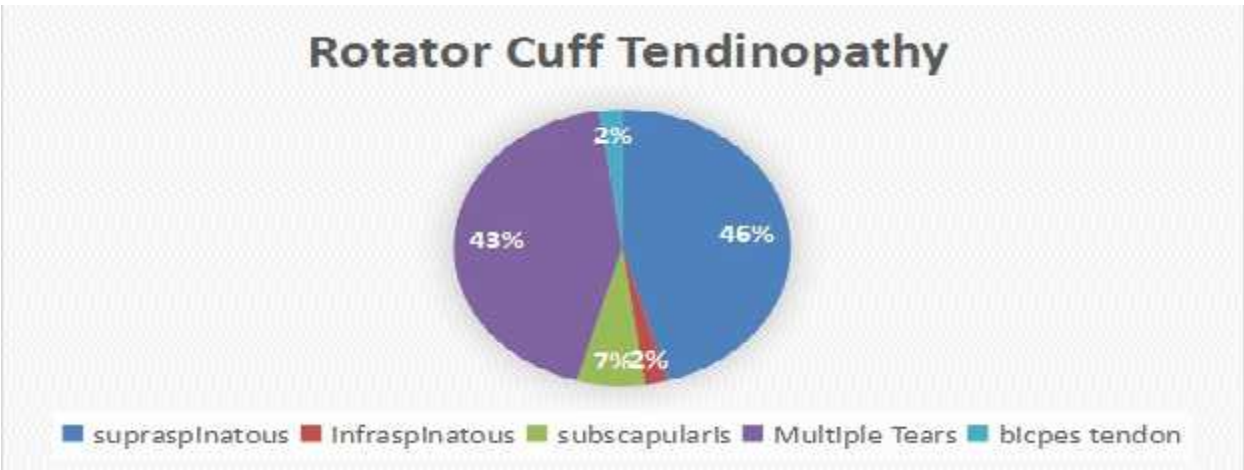


Figure 2 : Pattern of Rotator cuff Tendinopathy in patients who underwent shoulder MRI at Black Lion and St Paul Hospital from April 2019- September 2020 G.C

Table 3: Pattern and prevalence of Degenerative Joint pathology among patients who underwent shoulder MRI at Black lion and St Paul Hospital from April 2019- September 2020 G.C

Variables	Categories	Frequency	Percentage
Degenerative changes	Present	46	27.7%
	Absent	120	72.3%
	Total	166	100%
Affected Joint	Acromioclavicular Joint	43	93.5%
	Glenohumeral Joint	3	6.5%
	Total	46	100%

Table 4: Pattern and prevalence of shoulder Joint Dislocation in patients who underwent shoulder MRI at black Lion and St Paul Hospital from April 2019- September 2020 G.C

Variables	Categories	Frequency	Percentage
Joint Dislocation	Active Dislocation	5	26.3%
	Previous Dislocation	14	73.7%
	Total	19	100%
Associated Joint pathologies	Hill- Sacks Lesion	19	100%
	Classic Bankart	11	61%
	Osseous Bankart	6	33.3%
	Reverse Bankart	1	5.6%

Table 5: Association between Type of Acromion and Rotator cuff tear and Tendinopathy in Patients who underwent Shoulder MRI in Black Lion Hospital and St Paul Hospital from April 2019- September 2020 G.C

Variables	categories	Shoulder Tendinopathy			Rotator cuff Tear		
		Present	Absent	Association	Present	Absent	Association
Type of Acromion	Type 1	17	51	$X^2 = 2.321$ $P = 0.508$	31	36	$X^2 = 7.362$ $P = 0.061$
	Type 2	19	38		20	37	
	Type 3	9	25		20	14	
	Type 4	0	3		0	3	

Table 6: Association between Age of the patient and The presence of Rotator cuff tear and Tendinopathy in Patients who underwent Shoulder MRI in Black Lion Hospital and St Paul Hospital from April 2019- September 2020 G.C

Variables	Categories	Shoulder Tendinopathy			Rotator cuff Tear		
		Present	Absent	Association	Present	Absent	Association
Age Range	<20 years	0	5	$X^2 = 8.876$ $P = 0.031$	0	5	$X^2 = 9.285$ $P = 0.026$
	20 – 40 years	7	42		16	33	
	40 – 60 years	27	54		38	43	
	>60 years	11	19		17	12	

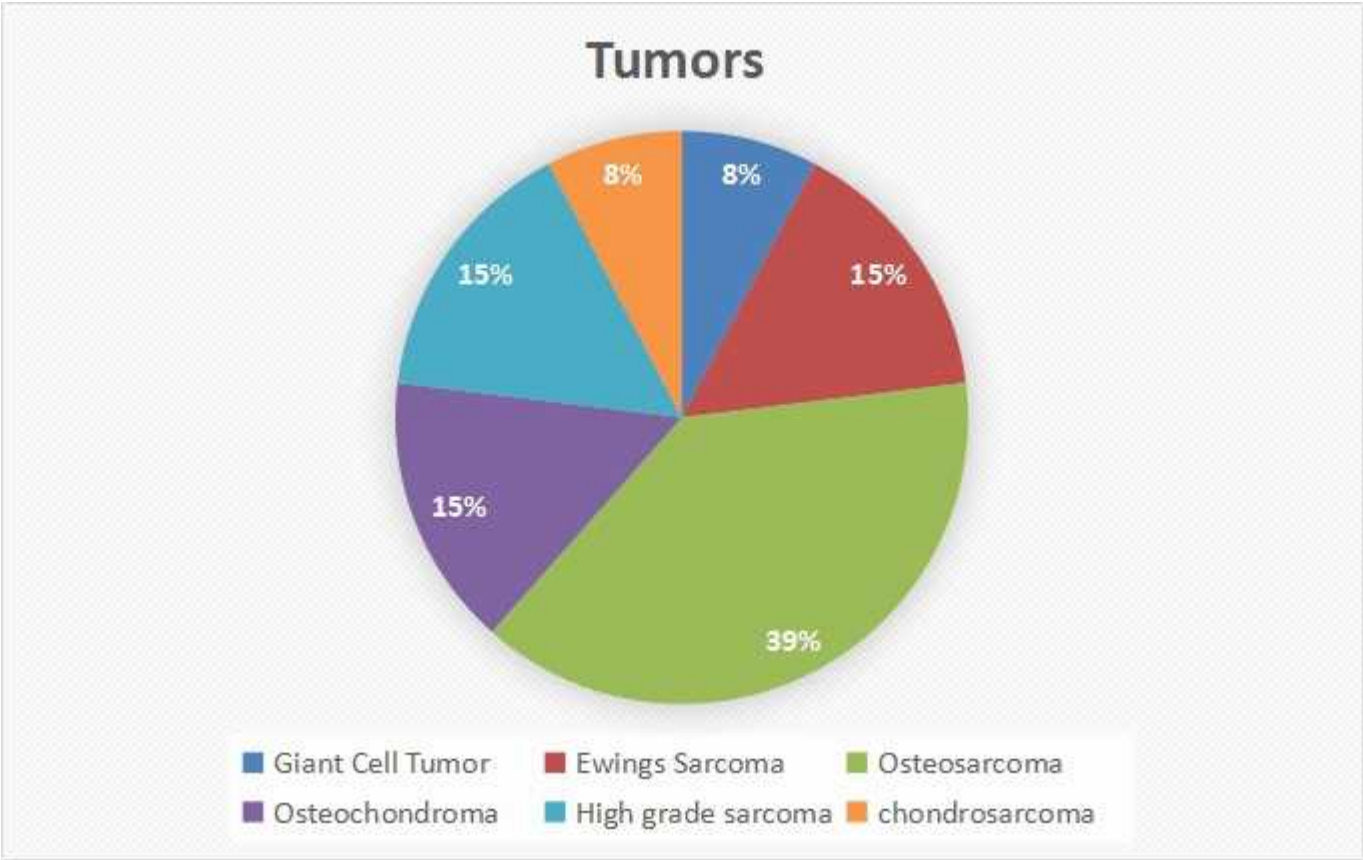


Figure 3 Figure 3 patterns of tumors seen in patients who underwent shoulder MRI at Black Lion and St Paul Hospital from April 2019- September 2020 G.C

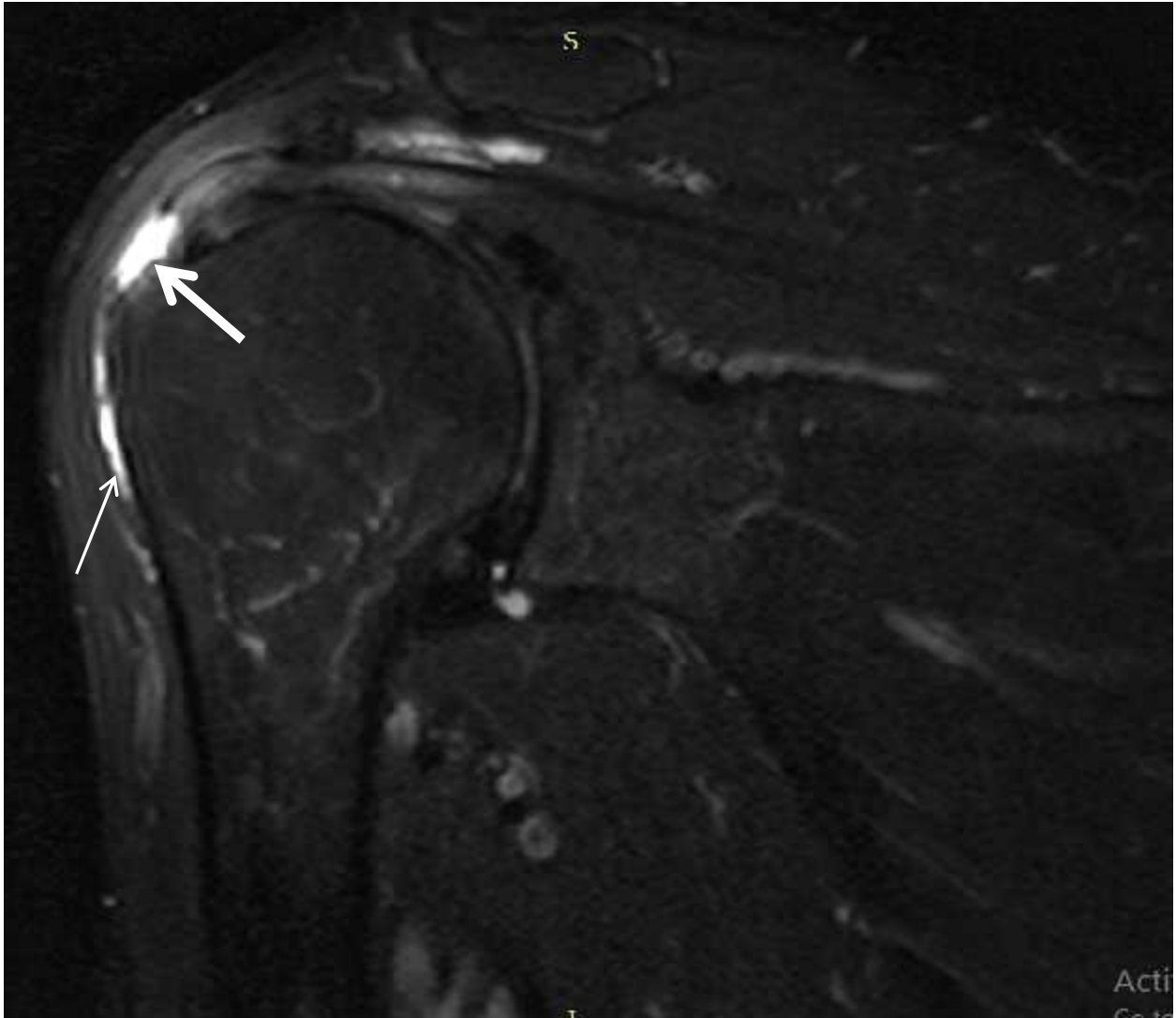


Figure 4 : Oblique coronal T2 SPAIR image of a 50 years old woman presented with pain on rising her hand there is a leading edge bursal side right supraspinatous tendon partial thickness tear(thick arrow) with fluid within the subaracromialsubdeltoid bursa (thin arrow)



Figure 5: Oblique coronal T2 SPAIR image of a 54-year-old man with chronic right shoulder pain . There is thickening and hyper intense signal intensity change involving the supraspinatous tendon (long arrow), which has lower signal intensity relative to the fluid signal within the sub deltoid bursa (short arrow)



Figure 6 (a) Oblique coronal TS SPAIR and (b) Oblique sagittal T2 SPAIR image in a patient in a 43 years old patient with clinical suspicion of labral tear shows fluid signal intensity replacing the supraspinatous tendon at its insertion site across the entire bursal and articular surface. Supraspinatous tendon (arrows)

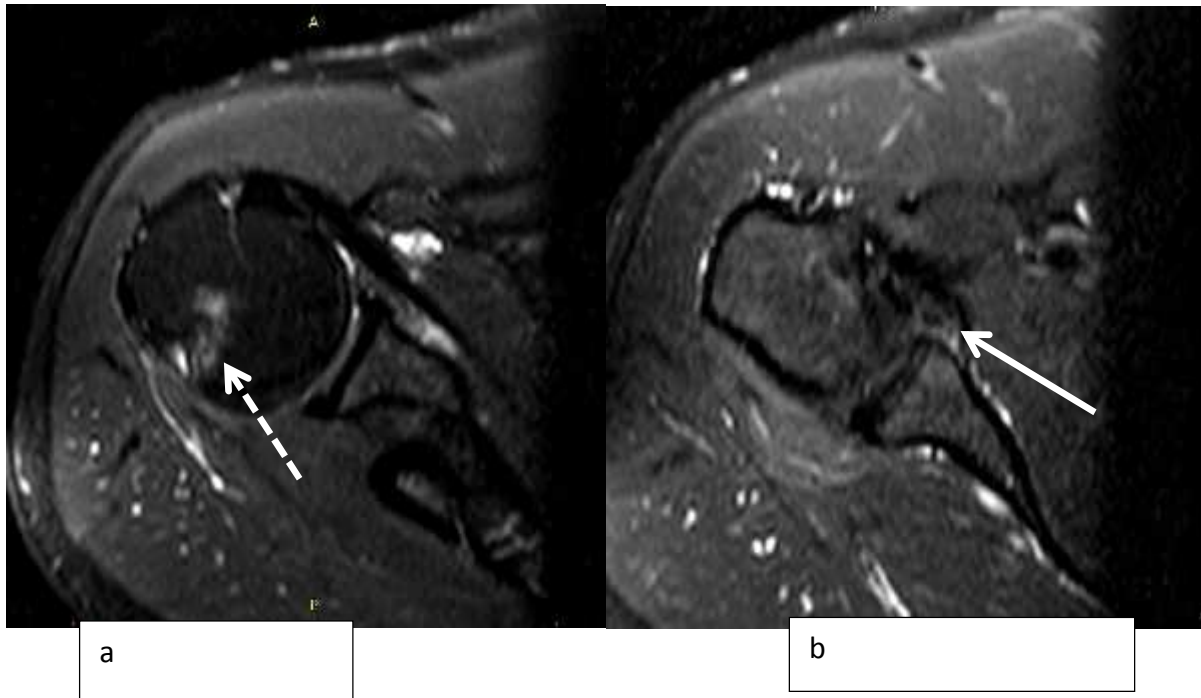


Figure 7 : (a- higher section - lower section) Oblique axial T2 SPAIR weighted image of a 50 year-old man with history of right shoulder pain of 3 years duration, there is right humeral head posterolateral bone defect with adjacent bone marrow increased signal intensity suggesting Hillsachs lesion (white dotted arrow) and increased signal intensity with in the antero-inferior labrum, intact glenoid bon cortex suggesting soft tissue bankart. (Suggestive of previous anteriorshoulder dislocation)

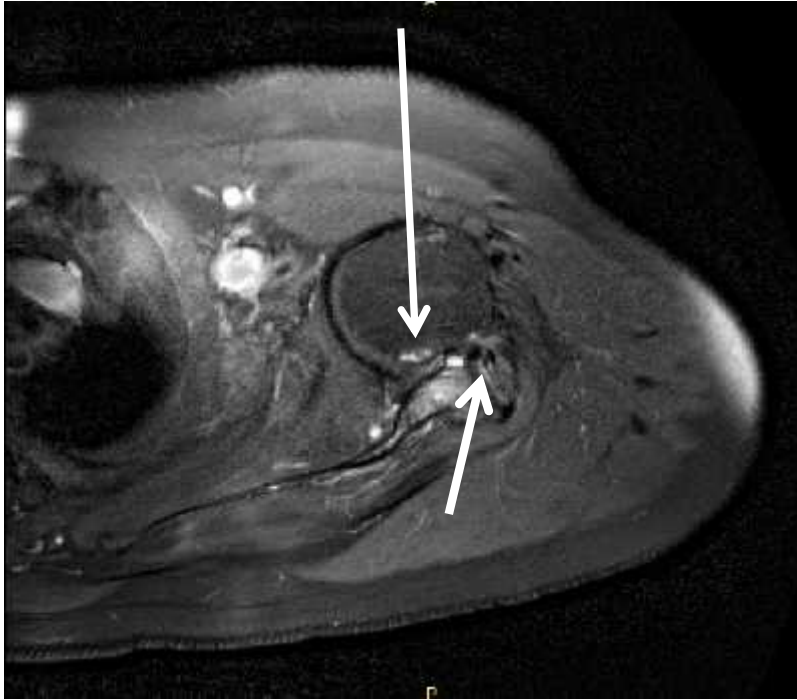


Figure 8: Oblique axial PDW SPAIR weighted image of a 54year-old woman with history of neglected anterior dislocation left shoulder pain of 3 years duration ,anterior and medially displaced humeral head with posterolateral bone defect having adjacent bone marrow edema suggesting Hillsachs lesion (long arrow) and avulsed anterior inferior labrum with glenoid cortical defect and bone marrow increased signal intensity suggesting bony bankart(short arrow) (active anterior shoulder dislocation)

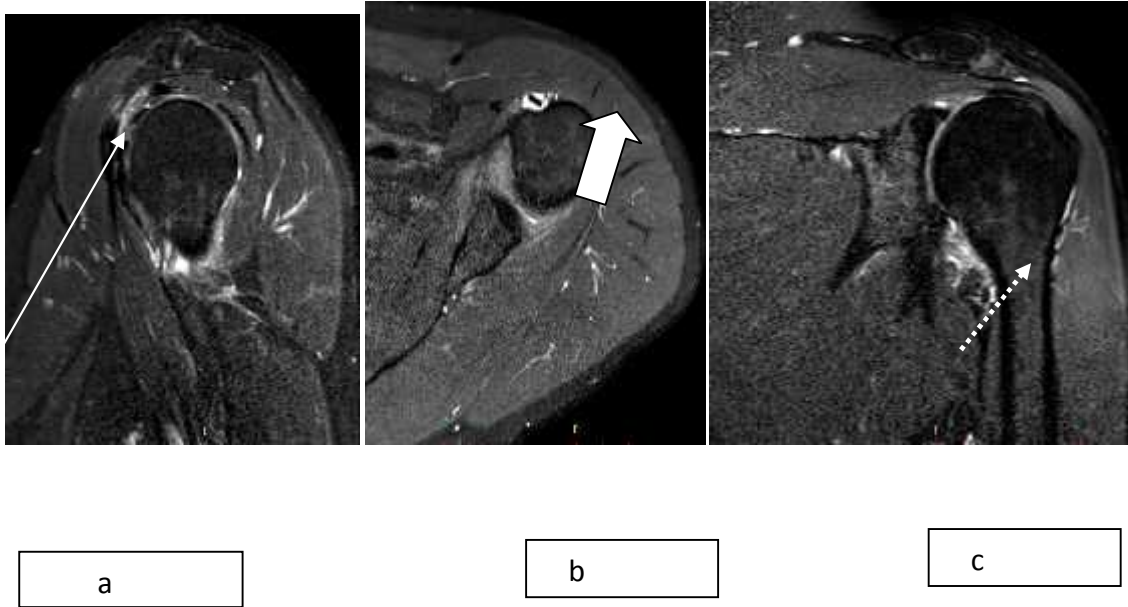


Figure 9 ,a 61 years old male patient presented with limitation of shoulder mobility with clinical impression of adhesive capsulitis oblique sagittal(a) and oblique axial (b) and oblique coronal (c)T2 SPIR sequences shows thickening and increased heterogeneously increased signal intensity of the axillary recess(white dotted arrow). With intermediate signal intensity tissue within the rotator interval (thin white arrow) and fluid within the synovial sheath of the long head of biceps tendon disproportionate to glenohumeral joint (thick white arrow)

Discussion

In our study male outnumbered females and the commonest age group found to have their shoulder imaged is between age 40- 60, predominantly the right shoulder

This is consistent with a study done by Chard et al. with total sample size of 644. Adelowo et al. in Nigeria also found that females have more shoulder disorders than men's in his study(2, 34).

On the contrary Onyambu and M'Arithi in Kenya with a sample size of 70 found out that males have higher incidence of shoulder disorders(33). Another study done in Punjab India by with sample size of 81 showed that shoulder disorders were more common in males(35).

The most commonly imaged shoulder was the Right shoulder with 104(62.7%) of the cases while the rest 62(37.3%) patients had their left shoulder imaged. Which is consistent with the study done by Onyambu and M'Arithi(33).

In conclusion socio-demographic factor regarding sex, our study is different from the other studies the possible reasons are variable sample size.

Pattern of MRI Imaging Findings

Rotator cuff pathologies were the commonest imaging finding seen among the study population and the most common rotator cuff abnormality seen is articular side partial supraspinatus tear

The second most common pathology noted in the rotator cuff was Rotator cuff Tendinopathy involving the supraspinatus tendon

This is consistent with a study done by Kaur, Tiwari et al. Study was conducted on 81 patients in the age group of 16 to 72 years, Rotator cuff tear was the most common lesion noted in 85% cases, out of which the predominant lesion was full-thickness supraspinatus tear, in 29.6% cases. Rotator cuff tendinosis & Impingement syndrome were the second & third most common lesions observed in 77.7% & 39% of the patients respectively. 49% cases showed lesions of both rotator cuff & rotator interval, however only 3% had isolated involvement of rotator interval. 42% had

MRI diagnosis of labro-ligamentous tears with bankart lesion & its variants accounted maximum (25%) and its co-occurrence with hill-sachs defect noted in 81% cases(35).

Another study Consisting of 32 patients referred for MRI Showed that rotator cuff tears were the commonest finding among the study population followed by impingement syndrome and adhesive capsulitis(32).

suahil et al also showed that Rotator cuff tears ,especially Supraspinatus tears with partial tears in 7 patients and complete tear in 5 patients , to be the commonest shoulder pathology in his study followed by labral tears ,AC joint degeneration and adhesive capsulitis(31) .

On the other hand the study done in Kenya by Onyambu and M'Arithithe commonest lesion seen shoulder MRI is tendinosis more on the right shoulder ,supraspinatus tendon was most involved tendon followed by biceps and subscapularis tendon respectively(33)

(Adelowo, Ogunton et al. 2009)showed the commonest shoulder pathologic condition to be adhesive capsulitis followed by rotator cuff syndrome(34)

There is a significant association observed between the rotator cuff tears and tendinopathy with an increased age as higher no of RC tears were noted in patient older age group of the studiedpopulation with p value of 0.026 and 0.031 respectively which is consistent with many studies.

Acromial shape type and rotator cuff pathologies

Recently association of the rotator cuff tear, tendinopathy with acromial morphology is a controversial topic.

Acromial morphology plays without any doubt an important role in the pathogenesis impingement and its evolution to cuff rotator tears and tendinopathy The most common type of acromion shape seen in this study was the Type 1 acromion followed by Type 2 acromion the least common Type of Acromion shape was the Type 4 acromion .There were no statistically significant association seen Between Type of acromion and presence of Rotator cuff Tear of

Tendinopathy (Table 4) ,which is also documented in multiple papers (39) .Hirano, Idea et al. found that the acromion type did not show any correlation with any particular cuff lesion. And acromial shape and rotator cuff pathology incidence between groups of specimens with and without rotator cuff tears revealed no significant differences(38).

On the contrary Mohamed, Abo-Sheisha et al. Showed the presence of strong association between full thickness RCT and type three acromial shape as does bigliani in 1986(37).

So this a topic requires further studies to be done.

The most common shoulder joint pathology noted were Degenerative changes affecting the Acromioclavicular Joint followed by Gleno humeral Joint

The second most common shoulder joint Pathology noted was anterior shoulder joint Dislocation. With most have evidence of prior dislocation with about quarter of patients demonstrated active dislocation up on imaging most patient have associated classic bankart and Hill sacs deformity of the Humeral head

There was also a single cases of Reverse bankart lesion detected which was associated with a posterior dislocation.

superior labral tear was the most common labrum Labral pathology identified - Sub acromial sub deltoid bursal inflammation with the commonest bursal pathology identified followed by the sub coracoid bursa

Miscellaneous lesions

There were a total of 13(7.8%) patients who had tumors in their shoulders upon imaging and the most common neoplasm detected in the shoulder was Osteosarcoma which was seen in 5(38.5%) of the patients followed by Ewing sarcoma, high grade sarcoma and an osteochondroma which was seen in 2(15.4%) patients each. (Fig 3)

Fractures were seen in 2(1.2%) of the cases and in both cases the location of the fracture were at the Humeral neck. 11(6.6%) patients had signs of Adhesive capsulitis on Imaging. And 3(1.8%) patients had signs of Avascular Necrosis of the humeral head.

CONCLUSION

In our study women are more commonly affected which is in contrary to most African studies this could be due to variable sample size and the commonest age group

The commonest age group imaged for shoulder complaint found to be the age between 40- 60 yrs.

Right shoulder is commonly affected

The commonest shoulder disorder is supraspinatus articular side partial tear

Recommendation

- Further study with greater sample size and correlation of other MRI parameters is recommended
- Since the commonest finding is rotator cuff tear and tendinopathy further Study comparing the accuracy of shoulder MRI and ultrasound is recommended
- Use structured reporting format

References

1. Anderson BC, Anderson RJ, Fields KB, Grayzel JJU, Waltham. Evaluation of the patient with shoulder complaints. 2011.
2. Chard M, Hazleman R, Hazleman B, King R, Reiss BJA, Rheumatology ROJotACo. Shoulder disorders in the elderly: a community survey. 1991;34(6):766-9.
3. Clark J, Harryman 2nd DJTJob, volume jsA. Tendons, ligaments, and capsule of the rotator cuff. Gross and microscopic anatomy. 1992;74(5):713-25.
4. Holibka R, Holibková A, Laichman S, Ruzickova KJBPMFUPOCR. Some peculiarities of the rotator cuff muscles. 2003;147(2):233-7.
5. Minagawa H, Itoi E, Konno N, Kido T, Sano A, Urayama M, et al. Humeral attachment of the supraspinatus and infraspinatus tendons: an anatomic study. 1998;14(3):302-6.
6. Morag Y, Jacobson JA, Miller B, De Maeseneer M, Girish G, Jamadar DJR. MR imaging of rotator cuff injury: what the clinician needs to know. 2006;26(4):1045-65.
7. Boenisch U, Lembcke O, Naumann TJEjor. Classification, clinical findings and operative treatment of degenerative and posttraumatic shoulder disease: what do we really need to know from an imaging report to establish a treatment strategy? 2000;35(2):103-18.
8. Okoroha KR, Mehran N, Duncan J, Washington T, Spiering T, Bey MJ, et al. Characterization of rotator cuff tears: ultrasound versus magnetic resonance imaging. 2017;40(1):e124-e30.
9. Elfaal MWJHMJ. Shoulder ultrasonography accuracy compared with magnetic resonance imaging in the detection of rotator cuff injuries. 2018;212(5786):1-4.
10. Saraya S, El Bakry RJTEJoR, Medicine N. Ultrasound: Can it replace MRI in the evaluation of the rotator cuff tears? 2016;47(1):193-201.
11. Fischer CA, Weber M-A, Neubecker C, Bruckner T, Tanner M, Zeifang FJJoo. Ultrasound vs. MRI in the assessment of rotator cuff structure prior to shoulder arthroplasty. 2015;12(1):23-30.
12. Fotiadou AN, Vlychou M, Papadopoulos P, Karataglis DS, Palladas P, Fezoulidis IVJEjor. Ultrasonography of symptomatic rotator cuff tears compared with MR imaging and surgery. 2008;68(1):174-9.

13. Andres BM, Murrell GAJCo, research r. Treatment of tendinopathy: what works, what does not, and what is on the horizon. 2008;466(7):1539-54.
14. Factor D, Dale BJJospt. Current concepts of rotator cuff tendinopathy. 2014;9(2):274.
15. Neviasser A, Andarawis-Puri N, Flatow EJJos, surgery e. Basic mechanisms of tendon fatigue damage. 2012;21(2):158-63.
16. Arya S, Kulig KJJoap. Tendinopathy alters mechanical and material properties of the Achilles tendon. 2010;108(3):670-5.
17. Longo UG, Franceschi F, Ruzzini L, Rabitti C, Morini S, Maffulli N, et al. Histopathology of the supraspinatus tendon in rotator cuff tears. 2008;36(3):533-8.
18. Ardic F, Kahraman Y, Kacar M, Kahraman MC, Findikoglu G, Yorgancioglu ZRJAjopm, et al. Shoulder impingement syndrome: relationships between clinical, functional, and radiologic findings. 2006;85(1):53-60.
19. Appleyard BK, Kuah D, Murrell GA. Reliability of MRI assessment of supraspinatus. 2007.
20. Sein ML, Walton J, Linklater J, Harris C, Dugal T, Appleyard R, et al. Reliability of MRI assessment of supraspinatus tendinopathy. 2007;41(8):e9-e.
21. Chillemi C, Franceschini VJA. Shoulder osteoarthritis. 2013;2013.
22. Control CfD, Morbidity PJM, report Mw. Prevalence and most common causes of disability among adults--United States, 2005. 2009;58(16):421-6.
23. Kerr R, Resnick D, Pineda C, Haghghi PJAjor. Osteoarthritis of the glenohumeral joint: a radiologic-pathologic study. 1985;144(5):967-72.
24. Petersson CJJAOS. Degeneration of the gleno-humeral joint: an anatomical study. 1983;54(2):277-83.
25. Cushnaghan J, Dieppe PJAotrd. Study of 500 patients with limb joint osteoarthritis. I. Analysis by age, sex, and distribution of symptomatic joint sites. 1991;50(1):8-13.
26. Zhao W, Zheng X, Liu Y, Yang W, Amirbekian V, Diaz LE, et al. An MRI study of symptomatic adhesive capsulitis. 2012;7(10):e47277.

27. Njagulj V, Ragaji A, Bjelan M, Ninkovic S, Milankov M, Koprivsek K, et al., editors. Spectrum of MR Imaging Findings and Diagnosis of Adhesive Capsulitis 2014: European Congress of Radiology-ECR 2014.
28. Greving K, Dorrestijn O, Winters J, Groenhof F, Van Der Meer K, Stevens M, et al. Incidence, prevalence, and consultation rates of shoulder complaints in general practice. 2012;41(2):150-5.
29. Mekonnen TH, Abere G, Olkeba SWJPR, Management. Risk factors associated with upper extremity musculoskeletal disorders among barbers in Gondar town, Northwest Ethiopia, 2018: a Cross-sectional study. 2019;2019.
30. Temesgen MH, Belay GJ, Gelaw AY, Janakiraman B, Animut YJBmd. Burden of shoulder and/neck pain among school teachers in Ethiopia. 2019;20(1):18.
31. <suahil rafi q 8 india.pdf>.
32. Chitnis A. ROLE OF MRI IN EVALUATION OF SHOULDER PAIN.
33. Onyambu C, M'Arithi LJEOJ. MRI evaluation of patients with shoulder pain at three imaging centres in Nairobi. 2014;8(1):10-5.
34. Adelowo O, Ogunton S, Ojo OJEA mj. Shoulder pain syndrome among Nigerians. 2009;86(4).
35. Kaur H, Tiwari P, Sharma M, Jha V, Sharma S. The spectrum of MRI findings in painful shoulder: A prospective study of 81 cases. International Journal of Radiology and Diagnostic Imaging. 2020;3(1):202-6.
36. Al-Shawi A, Badge R, Bunker TJTJob, volume jsB. The detection of full thickness rotator cuff tears using ultrasound. 2008;90(7):889-92.
37. Mohamed RE, Abo-Sheisha DMJTEJoR, Medicine N. Assessment of acromial morphology in association with rotator cuff tear using magnetic resonance imaging. 2014;45(1):169-80.
38. Hirano M, Ide J, Takagi KJJos, surgery e. Acromial shapes and extension of rotator cuff tears: magnetic resonance imaging evaluation. 2002;11(6):576-8.

39. Kaur R, Dahuja A, Garg S, Bansal K, Garg RS, Singh P. Correlation of acromial morphology in association with rotator cuff tear: a retrospective study. *Pol J Radiol.* 2019;84:e459-e63.
40. Yamaguchi K, Ditsios K, Middleton WD, Hildebolt CF, Galatz LM, Teefey SAJJ. The demographic and morphological features of rotator cuff disease: a comparison of asymptomatic and symptomatic shoulders. *2006;88(8):1699-704.*

Data collection form on the pattern of shoulder MRI finding

Social demographic data

- 1 Age in yrs ... Sex Male Female
- 2 Institution TASH St Paul

Medical history

- 3 Shoulder imaged Right if so pain full Yes No
- Left if so pain full Yes No

Shoulder lesion pattern seen on MRI

- 4 RC tear - Yes No , If yes SS IS TM SC many

If yes: Partial thickness Full thickness

If partial thickness: Articular Bursal side

If full thickness retraction Yes No

- 5 Tendinopathy - Yes No ,if yes SS IS TM TM Biceps tendon many

- 6 Labral tear - Yes No if yes superior inferior posterior

If Labral tear is superior type of tear seen type I Type II Type III Type IV Other

- 7 Bursitis- Yes No if yes SASD Sub coracoids

- 8 Adhesive capsulitis Yes No

9 Fracture of humerus, acromion or clavicle Yes No

10 Dislocation, Yes No , if yes anterior posterior , inferior

11 Hillsachs lesion Yes No

12 Bankart yes no if yes type classic Bankart osseous reverse Perthes
ALPSA GLAD

13 Degeneration Yes No , if yes GH AC

14 Type of acromion Type I Type II Type III Type IV

15 AVN of humeral head Yes No

15 Soft tissue or bone tumor Primary Yes No

If yes for primary specify

Metastasis Yes No