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SPECTRUM OF PATHOLOGIES ON MRI IN PATIENTS WITH CLINICALLY SUSPECTED INTERNAL SHOULDER DERANGEMENT WITH STUDY OF CLINICAL AND DEMOGRAPHIC PARAMETERS

Radio-Diagnosis

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ABSTRACT

Introduction: Accurate diagnosis of shoulder pathologies is vital for optimal treatment. This study was done to assess the spectrum of pathologies on MRI in patients with suspected internal derangement of shoulder with study of clinical and demographic parameters. **Methods:** This prospective study was conducted in a tertiary care teaching hospital from 1st September 2023 to 31st August 2024. A total of 64 patients, who underwent shoulder MRI on clinical suspicion of internal derangement, were included. MRI was performed using Siemens Skyra 3 Tesla and Siemens Sempra 1.5 Tesla scanners. Statistical analysis was carried out using Descriptive statistics and graphical representation. **Results:** Out of 64 patients 54.6% of the males, with the highest representation in the 31-40 age groups (60%). Common complaints included pain in right shoulder and restricted mobility. Rotator cuff tears (76%) were the most frequent abnormality, followed by rotator interval pathologies(45%), degenerative AC arthropathy (42%) and adhesive capsulitis (26.5%). **Conclusion:** MRI identifies a broad spectrum of shoulder pathologies, revealing a significant prevalence of rotator cuff injuries, particularly among males and those aged 50-70. MRI has essential role in diagnosing shoulder pathologies, facilitating timely and precise clinical decision-making.

KEYWORDS

MRI, shoulder joint pathologies, internal shoulder derangement

INTRODUCTION

The shoulder joint is a complicated joint both functionally and structurally. It is made up of muscles, tendons, ligaments, capsule, hyaline cartilage, labrum and bone. It serves as a biomechanical link between the upper limb and the trunk and is crucial to daily activities.[1] After low back pain and cervical pain, shoulder pain is the third most common cause of musculoskeletal pain. According to reports, the annual incidence of shoulder pain in primary care is 14.7 cases per 1000 patients, with a 70% lifetime prevalence.[2] The acromioclavicular and glenohumeral joints make up the shoulder complex. The latter involves the head of the humerus and the glenoid fossa of the scapula and is a form of synovial ball-and-socket joint. It is the most mobile and least stable joint in the human body because it permits a wide range of motions. One kind of diarthrodial synovial joint that permits shoulder abduction and flexion is the acromioclavicular joint. The glenoid labrum, capsular ligaments, and negative intra-articular pressure are the three static stabilizers that make up the shoulder joint. The two dynamic stabilizers are the rotator cuff muscles and the biceps tendon. The rotator cuff complex, which includes the teres minor, infraspinatus, supraspinatus, and subscapularis, is what keeps the humeral head in the glenoid cavity.[3] Different imaging modalities are used to boost the accuracy of identifying the source of shoulder pain because clinical examination alone is insufficient for determining the origin of pain.[4] In order to image the shoulder joint and diagnose rotator cuff disorders, conventional radiography, ultrasonography (USG), computed tomography, magnetic resonance imaging (MRI), and arthrography are crucial.[5] The soft tissue structures surrounding the shoulder joint, particularly the cuff tendons, can be assessed using USG and MRI.[6] When analysing soft tissue, such as tendon swelling and muscle cuff rips, MRI offers a high spatial resolution. Tear classification is easier to see while using MR. Its benefits also include the lack of radiation dangers and superb multiplanar delineation without contrast.[5] Muscle atrophy, fatty degeneration, cuff issues and surrounding structures are all covered in depth by MRI, and these findings have an impact on the physiologic and mechanical health of the rotator cuff.[7] MRI has become an essential diagnostic technique with excellent spatial resolution and multiplanar imaging capacity for evaluating the shoulder joint, surrounding ligaments, muscles, and soft tissues since the invention of surface coils used in shoulder joint imaging.[8]

This study was done to assess the spectrum of pathologies on MRI in patients with suspected internal derangement of shoulder with study of clinical and demographic parameters.

MATERIAL AND METHODS

This prospective study was carried out at a tertiary care teaching hospital 1st September 2023 and 31st August 2024 and included 64 patients of both genders who were referred to the department of Radiodiagnosis, for MRI imaging of shoulder for suspected internal shoulder derangement.

Inclusion Criteria

Patients with suspected internal shoulder derangement who have undergone MRI.

Exclusion Criteria

- MRI suggestive of joint infection or neoplastic pathology
- Past history of shoulder surgery.

Imaging Protocols

Prior to the MRI examination, appropriate medical history, physical examination, investigations, and signed consent from each patient were obtained. Patients who met the inclusion criteria were subjected to MRI Shoulder on Siemens Magnetom Skyra 3 Tesla wide bore 48 Channel and Siemens Sempra 1.5 Tesla 18 channel MRI scanners. The MR imaging protocol includes T1 & PDFS weighted sequences in sagittal and coronal planes, T2 weighted in axial, coronal and sagittal planes and STIR images.

A statistical analysis was performed manually using number (percentage) or mean (standard deviation). The categorical variable association was analyzed using Chi-square test. A p value < 0.05 was considered significant. The Institutional Ethics Committee waived the requirement for informed consent due to the non-interventional data-based nature of the study.

RESULTS

Table 1: Age And Sex Wise Distribution Of Patients

Age Group	GENDER		Total
	Female	Male	
<20	2	0	2
	100.0%	0.0%	3.1%
21-30	4	10	14

	28.5%	71.5%	21.8%
31-40	8	12	20
	40%	60%	31.3%
41-50	9	8	17
	52.9%	47.1%	26.6%
>50	6	5	11
	54.5%	45.5%	17.2%
Total	**29**	**35**	**64**
	45.4%	**54.6%**	**100.0%**

Table 2: Distribution Of Presenting Complaints

Chief complaints	Frequency	Percentage
Pain	55	86%
Restricted mobility	33	52%
Recurrent dislocation	10	16%

Table 3: Age Wise Distribution Of Shoulder Pathologies

	Age group (years)				Frequency	Percentage
	<30	30-50	50-70	>70		
Rotator Cuff Tear	6	8	25	8	47	73.4%
Rotator interval Pathologies	7	6	12	4	29	45.3%
Acromioclavicular hypertrophic osteoarthropathy	2	3	20	2	27	42.1%
Bankart & Hill-Sachs lesion	3	6	2	0	11	17.1%
Impingement Syndrome	1	4	7	2	14	21.8%

Table 4: Spectrum Of Painful Shoulder Lesions On MRI

	No. of lesions	Percentage distribution
Partial-thickness tear of supraspinatus	29	45.3%
Full-thickness tear of supraspinatus	13	20%
Partial-thickness tear of subscapularis	7	11%
Full-thickness tear of subscapularis	4	6%
Other rotator cuff tears	6	9%
Biceps tear/ tendinopathy	11	17%
Rotator cuff tendinosis/ tendinopathy	30	47%
Adhesive capsulitis	17	26.5%
Rotator interval ligament tears/ sprain	12	19%
Bankart lesion & variants	6	9%
Hill-Sachs lesion	5	8%
Superior Labral Anterior Posterior (SLAP)Tear	9	14%
Impingement syndrome	14	21.8%
Sub-coracoid Bursitis	10	15.6%
Sub-acromial sub-deltoid Bursitis	15	23.4%
Joint effusion	19	26.7%
Degenerative AC arthropathy	18	28.1%

DISCUSSION

One of the main causes of shoulder discomfort in India has been identified as work-related musculoskeletal issues.[9] According to reports, the prevalence of shoulder pain in India's population is 2.4% in urban areas and 7.4% in rural areas.[10] Similar to a study by **Onyambu CK et al**., 70% of patients in our study experienced discomfort on the right side and 30% on the left.[4]

According to our observations and the findings of a study by **Mitchell, Caroline et al**., rotator cuff injuries were the primary cause of shoulder pain.[11] In our study 73.4% (n=47) cases are of rotator cuff tears, out of which the most common lesion was partial-thickness supraspinatus tear, noted in 45.3% (n=29) cases followed by full-thickness supraspinatus tear in 20% (n=13) & partial-thickness subscapularis tear in 11% (n=7) cases. Rotator cuff tendinopathy was the most common associated finding in patients with rotator cuff tears seen in 47% (n=30) cases. No case of partial tears of the subscapularis and infraspinatus tendons without a corresponding tear of the supraspinatus tendon was observed in this study.

Elderly individuals had a higher frequency of rotator cuff tears, suggesting a clear correlation between rotator cuff tears and age. In our study 70% of rotator cuff tears are in those older than 60 years of age which was similar to study by **Milgrom, C et al.**[12] and **May, Todd et al.**[13]

Among various rotator interval diseases, the greatest involvement of the biceps tendon was observed in 17% (n=11). Just 13% of patients had rotator interval involvement that was isolated and unrelated to the cuff. Therefore, our study, which was comparable to that of **Frank, Rachel M. et al**., implies that isolated rotator interval injury is uncommon.[14]

Impingement is thought to be a significant contributing factor to rotator cuff tears and eventually pain; it was identified in 21.8% (n=14) of the patients in our study and was connected to rotator cuff tears in 87% of the patients, indicating that our findings were consistent with the claim made by Neer et al. that impingement was the cause of 95% of rotator cuff tears.[15]

Adhesive capsulitis was seen in 17(26.5%) cases. 6 (9%) patients had MRI diagnosis of Bankart lesion & its variants and the majority of these individuals had acute or recurring dislocation, and 8% (n=5) of them also had a related Hill-Sachs condition. While SLAP tears were seen in 14% (n=9) cases. Glenohumeral joint effusion was seen 19(26.7%), bursal effusions in 25 (39%) cases and degenerative AC arthropathy in 18(28%) cases.

This study is in partial agreement with study by Bhatnagar et al[1] who repoted rotator cuff abnormalities in 39(78%) patients, AC joint arthrosis in 27(54%) patients, bursitis/bursal fluid in 38(76%) patients, subacromial impingement in 25(50%) patients, subcoracoid impingement in 4(8%) patients, glenohumeral joint effusion in 23(46%) patients, labral pathologies in 10(20%) patients, long head of biceps tendinosis in 9(18%) patients and rotator interval abnormalities in 5(10%) and study by Idowu etal[17] who reported supraspinatus tendinopathy (73%), acromioclavicular joint arthropathy (68%), and subacromial-subdeltoid (SASD) bursitis (64%) as the most frequently detected pathologies. Other demonstrated derangements included glenohumeral joint effusion (24%), long head of biceps tendon sheath effusion (18%), labral abnormalities (16%), subcoracoid bursitis (4%), Hill Sach's deformity (3%), anterior glenohumeral dislocation (2%), fatty degeneration of the supraspinatus/infraspinatus muscles (2%), adhesive capsulitis (1%).

CONCLUSION

As a non-invasive imaging technique, MRI can be used to assess individuals who complain of shoulder pain. Excellent soft-tissue detail and multiplanar capabilities are provided by MRI. The availability and pricing factors are the main restrictions. Second, individuals who have implants, prosthetics, or claustrophobia should not undergo MRI. In patients experiencing shoulder pain, we identified a broad range of MRI findings, such as bursitis, acromioclavicular arthrosis, adhesive capsulitis, impingement syndrome, labro-ligamentous tears/sprains, hill-sachs defect, bursitis, rotator cuff tears & tendinopathy, and joint effusion. Age stratification indicated that rotator cuff tears, tendinosis and rotator interval pathologies are predominantly affected individuals in their 51-70s, highlighting the age-related vulnerability of the shoulder. MRI can improve clinical decision-making and helps to get better patient outcomes through timely and accurate diagnosis. Future studies may expand on these findings by exploring the correlations between specific imaging features on a large population.

REFERENCES

1) Bhatnagar S, Amandeep D, Bakshi S, Singh A. Spectrum of abnormalities of magnetic resonance imaging in shoulder pathologies Journal of Cardiovascular Disease Research 2022;13(5):2850-63.
2) 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.
3) Sood A, Kashikar S V, Mishra G V, et al. (September 06, 2023) The Spectrum of Shoulder Pathologies on Magnetic Resonance Imaging: A Pictorial Review. Cureus 15(9): e44801. doi:10.7759/cureus.
4) CK Onyambu, LM M'Arithi. MRI evaluation of patients with shoulder pain at three imaging centres in Nairobi. East African Orthopaedic Journal [Internet]. 2014; 8(1):10–5.
5) Koganti DV, Lamghare P, Parripati VK, Khandelwal R, Reddy AD. Role of Magnetic Resonance Imaging in the Evaluation of Rotator Cuff Tears. *Cureus*. 2022;14(1):e21025.
6) de Jesus JO, Parker L, Frangos AJ, Nazarian LN (2009) Accuracy of MRI, MR arthrography, and ultrasound in the diagnosis of rotator cuff tears: a meta-analysis. AJR Am J Roentgenol 192(6):1701–1707. doi:10.2214/AJR.08.1241.
7) Morag Y, Jacobson JA, Miller B, De Maeseneer M, Girish G, Jamadar D. MR imaging of rotator cuff injury: what the clinician needs to know. *Radiographics*. 2006;26(4):1045-1065. doi:10.1148/rg.264055087.
8) Ashir A, Lombardi A, Jerban S, Ma Y, Du J, Chang EY. Magnetic resonance imaging of the shoulder. *Pol J Radiol*. 2020;85:e420-e439. doi:10.5114/pjr.2020.98394.
9) Kumar, Vijaya K et al. "Prevalence of work-related musculoskeletal complaints among dentists in India: a national cross-sectional survey." *Indian journal of dental research*.2013;24(4): 428-38.
10) Joshi, Vaijayanti Lagu, and Arvind Chopra. "Is there an urban-rural divide? Population

surveys of rheumatic musculoskeletal disorders in the Pune region of India using the COPCORD Bhigwan model." *The Journal of rheumatology*.2009;36(3): 614-22.
11) Mitchell C, Adebajo A, Hay E, Carr A. Shoulder pain: diagnosis and management in primary care. *BMJ*. 2005;331(7525):1124-1128. doi:10.1136/bmj.331.7525.
12) Milgrom C, Schaffler M, Gilbert S, van Holsbeeck M. Rotator-cuff changes in asymptomatic adults. The effect of age, hand dominance and gender. *The Journal of bone and joint surgery British volume*. 1995;77(2):296–8.
13) May T, Garmel GM. Rotator Cuff Injury. [Updated 2023 Jun 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK547664/
14) Frank RM, Taylor D, Verma NN, Romeo AA, Mologne TS, Provencher MT. The Rotator Interval of the Shoulder: Implications in the Treatment of Shoulder Instability. Orthopaedic Journal of Sports Medicine. 2015;3(12). doi: doi:10.1177/2325967115621494
15) Neer CS., 2nd Impingement lesions. *Clinical orthopaedics and related research.* 1983;(173):70–7.
16) Umer M, Qadir I, Azam M. Subacromial impingement syndrome. *Orthop Rev (Pavia)*. 2012;4(2):e18. doi:10.4081/or.2012.
17) Idowu, Bukunmi Michael[1]; Onigbinde, Stephen Olaoluwa[2]; Afolabi, Babalola Ishmael[3]; Ogholoh, Oghenetejiri Denise[4]; Nwafor, Nkem Nnenna[5]; Okedere, Tolulope Adebayo[6]. Assessment of shoulder joint derangements with magnetic resonance imaging in adult Nigerians. Journal of the West African college of surgeons.2024; 14(3):307-313.