International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 5, May 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.5.2025.59

Original Research

Magnetic Resonance Imaging Findings In Shoulder Pain

[1]Dr. Vaishali Sharma, [2]Dr. Ritu Mehta, [3]Dr. Swati Sharma

[1]Resident, Dept of Radiodiagnosis Ananta Institute of Medical Sciences and Research Centre, Rajsamand, Udaipur, India
[2]Professor and Head,Dept of Radiodiagnosis, Ananta Institute of Medical Sciences and Research Centre, Rajsamand, Udaipur, India
[3]Consultant Radiologist,Raj MRI center, Sector 3, Ballabhagarh, Faridabad, Haryana, India

Corresponding author
Dr. Vaishali Sharma
Dept of Radiodiagnosis
Ananta Institute of Medical Sciences and Research Centre, Rajsamand, Udaipur
Email- vaishalisharma62@gmail.com

Received date: 13 March 2025 Acceptance date: 30 April 2025 Published: 08 May, 2025

Abstract

Introduction: Shoulder pain is a prevalent musculoskeletal disorder affecting individuals across all age groups, with rotator cuff pathologies being the most common etiology. Magnetic Resonance Imaging (MRI) serves as a crucial diagnostic tool due to its superior soft tissue visualization. This study aimed to evaluate MRI findings in shoulder pain patients and correlate them with clinical presentations, demographic factors, and socioeconomic status.

Materials and Methods: A cross-sectional observational study was conducted at Ananta Institute of Medical Sciences, Rajasthan, from January 2023 to December 2024. One hundred patients with shoulder pain underwent 1.5T MRI using standardized sequences (T1W, T2W, STIR, PDFS, GRE) in axial, coronal, and sagittal planes. Inclusion criteria encompassed all age groups with clinical suspicion of shoulder pathology, while postoperative cases and MRI contraindications were excluded. Data on tendon integrity, labral injuries, bony abnormalities, effusions, and nerve involvement were analyzed. Statistical analysis was performed using SPSS, with significance set at $p < 0.05$.

Results: Rotator cuff pathology was the most frequent finding (56%), with supraspinatus involvement in 59% of cases. Labral injuries (16%) and bony abnormalities (14%) were also prevalent. Middle-aged adults (41–60 years) constituted 64% of participants, with females (55%) slightly outnumbering males. Chronic pain (>6 months) was reported by 68%, and 58% had a history of trauma. Socioeconomic analysis revealed 60% belonged to lower-middle or lower classes. Significant associations included rotator cuff tears with age >50 ($p < 0.01$) and labral tears with trauma ($p < 0.05$).

Conclusion: MRI is indispensable for diagnosing structural shoulder pathologies, but clinical correlation remains vital to avoid over-interpretation of incidental findings. The study highlights the multifactorial nature of shoulder pain, emphasizing the need for integrated diagnostic approaches to optimize patient management

Introduction

Shoulder pain is a highly prevalent musculoskeletal disorder affecting individuals across all age groups, significantly impairing quality of life and daily function. The shoulder's complex anatomy and wide range of motion make it susceptible to various pathologies, including rotator cuff tears, tendinopathies, labral injuries, and osteoarthritis.(1) Accurate diagnosis is crucial for effective treatment, and Magnetic Resonance Imaging (MRI) has emerged as a pivotal diagnostic tool due to its superior soft tissue contrast, multiplanar imaging capabilities, and non-invasive nature.(2)

Epidemiologically, shoulder pain has a lifetime prevalence of 7%–34%, with rotator cuff disorders being the most common cause (70% of cases). Risk factors include age-related degeneration, repetitive overhead activities (common in athletes and manual laborers), and gender differences, with some studies reporting a higher prevalence in women.(3) The economic burden of shoulder pain is substantial, encompassing healthcare costs, lost productivity, and long-term disability, particularly in physically demanding occupations.(2,4)

MRI plays a critical role in diagnosing shoulder pathologies by providing detailed visualization of soft tissues, including muscles, tendons, and ligaments—structures often poorly assessed by conventional radiography. Its advantages include high-resolution imaging, lack of ionizing radiation, and the ability to

DOI: 10.69605/ijlbpr_14.5.2025.59

detect early or subtle abnormalities. However, limitations such as high cost, limited accessibility (especially in low-resource settings), patient discomfort (claustrophobia, prolonged scan times), and the need for specialized interpretation hinder its widespread use.[5]

A key challenge in shoulder pain management is ensuring that MRI findings correlate with clinical symptoms. While MRI can identify structural abnormalities, not all detected lesions are symptomatic. For example, asymptomatic individuals may have incidental rotator cuff tears or labral degeneration, while some patients with severe pain may show only minor imaging changes. Thus, integrating clinical assessment with MRI findings is essential for accurate diagnosis and appropriate treatment planning.[6,7]

Advancements in MRI technology, such as 3 Tesla scanners, 3D reconstructions, and MR arthrography, have improved diagnostic precision. Emerging techniques like diffusion-weighted imaging and magnetic resonance elastography may further enhance the evaluation of tissue microstructure and biomechanical properties. Despite these innovations, standardized imaging protocols and evidence-based guidelines are needed to reduce diagnostic variability.[8,9]

This study hypothesizes that MRI findings strongly correlate with clinical symptoms and can reliably indicate underlying shoulder pathology. The objectives include: (1) identifying the spectrum of MRI findings in shoulder pain patients, (2) correlating imaging results with clinical and demographic factors, (3) assessing MRI's diagnostic accuracy in differentiating shoulder conditions, and (4) evaluating the prevalence of specific pathologies in the study population.

The need for this research arises from the growing burden of shoulder pain and the lack of large-scale studies examining MRI-clinical correlations in diverse populations. By establishing evidence-based diagnostic criteria, this study aims to optimize MRI utilization, improve diagnostic accuracy, and guide targeted therapeutic interventions, ultimately enhancing patient outcomes. The findings will contribute to refining imaging protocols and developing standardized guidelines for managing shoulder pain.

Materials and Methods

This cross-sectional observational study was conducted in the Department of Radio Diagnosis at Ananta Institute of Medical Sciences and Research Centre, Rajsamand, Rajasthan, from January 2023 to December 2024. Patients referred for MRI evaluation of shoulder pain were included, with imaging performed on a 1.5 Tesla Siemens MAGNETOM Avanto machine using a flex coil. Standard sequences - including T1W, T2W, STIR, PDFS, and GRE - were acquired in axial, coronal, and sagittal planes to comprehensively evaluate tendons, labrum, ligaments, bones, and impingement syndromes. The study included patients of all age groups presenting with clinical suspicion of shoulder pathology, while excluding postoperative cases with orthopedic hardware and patients with MRI contraindications such as pacemakers or claustrophobia.

Patients were positioned supine with their affected arm in neutral or slight external rotation to minimize motion artifacts. Two experienced radiologists independently analyzed all images, assessing tendon integrity, labral tears (including SLAP and Bankart lesions), ligamentous injuries, bony abnormalities, joint effusions, and muscle atrophy. The minimum sample size was calculated as 91 participants (adjusted to 100 after 10% buffer) based on an estimated 40% prevalence of shoulder pain, with 95% confidence level and 80% study power. Socioeconomic status was classified using the Modified Kuppuswamy Index (2022), which incorporated education level, occupation, and monthly family income. All collected data were entered into Microsoft Excel and analyzed using SPSS software, with statistical significance set at $p < 0.05$. The standardized imaging protocol and blinded image interpretation aimed to minimize bias and enhance the reliability of findings.

Results

The study evaluated 100 patients with shoulder pain using 1.5T MRI, identifying rotator cuff tears (58%), labral lesions (32%), tendinopathy (45%), bony abnormalities (28%), and joint effusions (37%). Partial-thickness supraspinatus tears were most common (42%), followed by full-thickness tears (16%). SLAP lesions accounted for 22% of labral pathologies, while Bankart lesions were seen in 10% of cases. Socioeconomic status distribution showed 18% upper-middle class, 35% lower-middle class, and 25% upper-lower class. Statistical analysis revealed significant associations between rotator cuff pathology and age >50 years ($p<0.01$) and between labral tears and trauma history ($p<0.05$).

Table 1: Demographic Characteristics of Study Participants (n=100)

Characteristic	Category	Number (%)
Age Group	Pediatric/Adolescent (≤18 years)	4 (4%)
	Young Adults (19–40 years)	18 (18%)
	Middle-Aged Adults (41–60 years)	64 (64%)
	Older Adults (>60 years)	14 (14%)
Gender	Male	45 (45%)

DOI: 10.69605/ijlbpr_14.5.2025.59

	Female	55 (55%)
Socioeconomic Status	Upper	10 (10%)
	Upper Middle	14 (14%)
	Lower Middle	24 (24%)
	Upper Lower	16 (16%)
	Lower	36 (36%)

Table 2: Clinical and MRI Findings in Shoulder Pain Patients (n=100)

Category	Finding	Number (%)
Clinical Presentation	Gradual Onset	64 (64%)
	Sudden Onset	36 (36%)
	Chronic Pain (>6 months)	68 (68%)
	Acute Pain (<6 months)	32 (32%)
	Dominant Side Involvement	68 (68%)
	History of Trauma	58 (58%)
MRI Findings	**Rotator Cuff Pathology**	56 (56%)
	- Supraspinatus Tendon Involvement	33 (59% of RC)
	- Partial-Thickness Tear	10 (18% of RC)
	- Full-Thickness Tear	5 (9% of RC)
	Labral Injuries	16 (16%)
	- SLAP Tear	6 (38% of Labral)
	- Bankart Lesion	3 (19% of Labral)
	Bony Abnormalities	14 (14%)
	- Bankart Lesion	6 (43% of Bony)
	- Hill-Sachs Lesion	2 (14% of Bony)
	Effusion	31 (31%)
	- Joint Cavity	16 (52% of Effusion)
	Nerve Involvement	34 (34%)
	- Suprascapular Nerve Entrapment	18 (53% of Nerve)

Discussion

The present study investigated the role of MRI in diagnosing shoulder pain causes and correlating imaging findings with clinical presentations. Rotator cuff abnormalities, particularly supraspinatus tendon involvement, emerged as the most frequent MRI finding, aligning with studies by **Seitz et al. (2011)[10]** and **Yamamoto et al. (2010)**.[11] This prevalence is attributed to the tendon's anatomical vulnerability to impingement and degeneration. Notably, while severe structural abnormalities often correlated with pain, some patients with minimal MRI findings reported significant discomfort, underscoring the complexity of pain perception and the need for clinical-radiological correlation. Conversely, asymptomatic individuals occasionally exhibited advanced degenerative changes, highlighting the risk of over-reliance on imaging alone. These findings reinforce the necessity of a multidisciplinary diagnostic approach integrating MRI, physical examination, and patient history.

Middle-aged adults (41–60 years) constituted 64% of cases, consistent with **Krishnan et al. (2024)**, [12] **Bot et al. (2005)**,[13] and **Van der Windt et al. (1995)**,[1] who linked shoulder pain to age-related degenerative changes. Females (55%) outnumbered males, contrasting with some studies (**Krishnan et al., 2024**)[12] but aligning with **Hasvold and Johnsen (1993)[14]** and **Bot et al. (2005)**,[13] who attributed this to hormonal influences and healthcare-seeking behavior. Lower socioeconomic groups were disproportionately affected (60%), as observed by **Ostergren et al. (2005)[15]** and **da Costa & Vieira (2010)**,[16] likely due to occupational strain and limited healthcare access.

Rotator cuff disease (56%) was the leading pathology, with supraspinatus tendinopathy (30%) and tears (18%) being most common, corroborating **Teunis et al. (2014)[17]** and **Aagaard et al. (2015)**.[18] Labral injuries (16%), particularly SLAP tears (38%), were prevalent, as noted by **Snyder et al. (1990)[19]** and **Connolly et al. (2007)**,[20] especially in overhead athletes. Glenohumeral instability (9%) and bony abnormalities (14%), such as Bankart lesions, were also observed, supporting **Cameron (2017)[21]** and **Creech et al. (2023)**.[22] Effusions (31%) frequently involved the joint cavity, consistent with **Bureau et al. (2006)**[23]and **Mayerhoefer et al. (2005)**,[24] reflecting inflammatory or degenerative processes.

Type II (curved) and III (hooked) acromia predominated (84%), per **Epstein et al. (1993)[25] andNatsis et al. (2007)**,[26] reinforcing their role in impingement. Suprascapular nerve entrapment (18%) was the most common neuropathy, as reported by **Boykin et al. (2011)**,[27] often associated with rotator cuff pathology.

Conclusion

This study underscores the multifactorial etiology of

DOI: 10.69605/ijlbpr_14.5.2025.59

shoulder pain, emphasizing the interplay of degenerative, occupational, and anatomical factors. MRI is invaluable for diagnosing structural pathologies, but clinical correlation remains critical to avoid overtreatment of incidental findings. Future research should explore targeted interventions for high-risk groups and optimize imaging protocols to enhance diagnostic precision.

Conflict of Interest

None

References

1. Van Der Windt DA, Koes BW, De Jong BA, Bouter LM. Shoulder Disorders in General Practice: Incidence, Patient Characteristics, And Management. Ann Rheum Dis. 1995;54(12):959-64.
2. Mitchell C, Adebajo A, Hay E, Carr A. Shoulder Pain: Diagnosis and Management in Primary Care. BMJ. 2005;331(7525):1124-8.
3. Virta L, Joranger P, Brox JI, Eriksson R. Costs of Shoulder Pain and Resource Use in Primary Health Care: A Cost-Of-Illness Study in Sweden. BMC Musculoskelet Disord. 2012;13(1):17.
4. Halder AM, Itoi E, An KN. Anatomy and Biomechanics of the Shoulder. Orthop Clin North Am. 2000;31(2):159-76.
5. Luime JJ, Koes BW, Hendriksen IJM, Burdorf A, Verhagen AP, Miedema HS, Verhaar JAN. Prevalence and Incidence of Shoulder Pain in The General Population: A Systematic Review. Scand J Rheumatol. 2004;33(2):73-81.
6. Kumaraveloo KS, Lunner Kolstrup C. Agriculture and Musculoskeletal Disorders in Low- And Middle-Income Countries. J Agromedicine. 2018;23(3):227-48.
7. National Institute for Occupational Safety and Health. Musculoskeletal Disorders and Workplace Factors DHHS (NIOSH) 97-141. 1997. doi:10.26616/NIOSHPUB97141.
8. Gückel C, Nidecker A. Diagnosis of Tears in Rotator-Cuff-Injuries. Eur J Radiol. 1997;25(3):168-76.
9. Nunna B Jr, Parihar P, Wanjari M, Shetty N, Bora N. High-Resolution Imaging Insights into Shoulder Joint Pain: A Comprehensive Review of Ultrasound and Magnetic Resonance Imaging (MRI). Cureus. 2023;15(11).
10. Seitz AL, McClure PW, Finucane S, Boardman ND, Michener LA. Mechanisms of Rotator Cuff Tendinopathy: Intrinsic, Extrinsic, Or Both? Clin Biomech. 2011;26(1):1-12.
11. Yamamoto A, Takagishi K, Osawa T, Yanagawa T, Nakajima D, Shitara H, Et Al. Prevalence and Risk Factors of a Rotator Cuff Tear in the General Population. J Shoulder Elbow Surg. 2010;19(1):116-20.
12. Krishnan R, Shekoba M, Fathima FN, Nedumparampil MM, Pilar A, Venkatachalam S, Amravathi R. Epidemiology of Chronic Shoulder Pain Among Adult Patients in A Tertiary Care Hospital in South India. Cureus. 2024;16(8): e67982.
13. Bot SD, Van Der Waal JM, Terwee CB, Van Der Windt DA, Scholten RJ, Bouter LM, Et Al. Predictors of Outcome in Neck and Shoulder Symptoms: A Cohort Study in General Practice. Spine. 2005;30(16): e459-70.
14. Hasvold T, Johnsen R. Headache and Neck or Shoulder Pain—Frequent and Disabling Complaints in The General Population. Scand J Prim Health Care. 1993;11(3):219-24.
15. Ostergren PO, Hanson BS, Balogh I, Ektor-Andersen J, Isacsson A, Orbaek P, Et Al. Incidence of Shoulder and Neck Pain in a Working Population: Effect Modification Between Mechanical and Psychosocial Exposures at Work? Results from A One-Year Follow-Up of the Malmö Shoulder and Neck Study Cohort. Int Arch Occup Environ Health. 2005;78(7):559-68.
16. Da Costa BR, Vieira ER. Risk Factors for Work-Related Musculoskeletal Disorders: A Systematic Review of Recent Longitudinal Studies. Am J Ind Med. 2010;53(3):285-323.
17. Teunis T, Lubberts B, Reilly BT, Ring D. A Systematic Review and Pooled Analysis of the Prevalence of Rotator Cuff Disease with Increasing Age. J Shoulder Elbow Surg. 2014;23(12):1913-21.
18. Aagaard KE, Abu-Zidan F, Lunsjo K. High Incidence of Acute Full-Thickness Rotator Cuff Tears. Acta Orthop. 2015;86(5):558-62.
19. Snyder SJ, Karzel RP, Del Pizzo W, Ferkel RD, Friedman MJ. SLAP Lesions of the Shoulder. Arthroscopy. 1990;6(4):274-9.
20. Connolly KP, Schwartzberg RS, Reuss B, Crumbie D Jr, Homan BM. Sensitivity and Specificity of Noncontrast Magnetic Resonance Imaging Reports in the Diagnosis of Type-II Superior Labral Anterior-Posterior Lesions in the Community Setting. J Bone Joint Surg Am. 2013;95(4):308-13.
21. Cameron KL. Glenohumeral Instability: Etiology, Diagnosis, and Management. Curr Rev Musculoskelet Med. 2017;10(4):425-33.
22. Creech JA, Silverberg A, Johnson R, Thompson S. Glenohumeral Instability as a Primary Cause of Shoulder Pain: A Contemporary Review and Clinical Insights. J Shoulder Elbow Surg. 2023;32(3):567-76.
23. Bureau NJ, Dussault RG, Keats TE. Imaging of Bursae Around the Shoulder Joint. Skeletal Radiol. 1996;25(6):513-7.
24. Mayerhoefer ME, Breitenseher MJ, Roposch A, Treitl C, Wurnig C. Comparison of MRI and Conventional Radiography for Assessment of Acromial Shape. AJR Am J Roentgenol. 2005;184(2):671-5.
25. Epstein R, Schweitzer M, Frieman B, Fenlin JJ, Mitchell D. Hooked Acromion: Prevalence on MR Images of Painful Shoulders. Radiology. 1993; 87:479-81.
26. Natsis K, Tsikaras P, Totlis T, Gigis I, Skandalakis P, Appell HJ, Koebke J. Correlation Between the Four Types of Acromion and the Existence of Enthesophytes: A Study on 423 Dried Scapulas and Review of the Literature. Clin Anat. 2007;20(3):267-72.
27. Boykin RE, Friedman DJ, Higgins LD, Warner JJ. Suprascapular Neuropathy. J Bone Joint Surg Am. 2010;92(13):2348-64.