

ORIGINAL RESEARCH ARTICLE

MRI IN THE EVALUATION OF ROTATOR CUFF TENDONS IN CHRONIC SHOULDER PAIN

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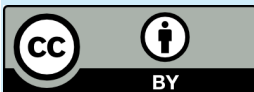
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ABSTRACT

Background: Shoulder pain is the third most common cause of non-traumatic musculoskeletal pain with rotator cuff pathology being the most common cause. Magnetic Resonance Imaging (MRI) is the imaging modality of choice which helps in accurate diagnosis for making a treatment plan as wrong treatment strategy may lead to poor prognosis.

Methods: A descriptive prospective study conducted in 100 individuals with non-traumatic chronic shoulder pain referred to Department of Radiodiagnosis and Imaging, Dhulikhel Hospital, Kavre between 27th August 2020 to 29th August 2021. MRI images were acquired and analyzed by using IBM SPSS 21.0 version Pearson correlation coefficient, Spearman correlation and chi square tests were used for statistical analysis.

Results: Rotator cuff pathology was most commonly encountered with supraspinatus being the most frequently involved tendon seen in 28(63.6%), followed by subscapularis 10(22.7%), infraspinatus 4(9%) and teres minor 2(4.5%). Similarly, MRI detected partial tear of supraspinatus in 23(52.2%), partial tear of subscapularis in 8(18.1%), partial tear of infraspinatus in 3(6.8%) and partial tear of teres minor in 2(4.5%) patients. Likewise, complete tear of supraspinatus was observed in 5(11.3%), complete tear of subscapularis in 2(4.5%) and complete tear of infraspinatus in 1(2.2%).

Conclusions: Rotator cuff pathologies were the most common causes of chronic shoulder pain, predominantly partial tear of supraspinatus, followed by subscapularis, infraspinatus and teres minor. Magnetic resonance imaging has become the gold standard for diagnostic imaging of the shoulder related to soft tissue injury.

INTRODUCTION

Shoulder pain is the third most common musculoskeletal pain accounting for annual incidence of 14.7 per 1000 patients per year with a lifetime prevalence of up to 70%.¹ Chronic, shoulder pain is defined as pain lasting at least 6 months, often without a definite inciting traumatic event.²

Common causes of chronic shoulder pain include rotator cuff impingement, tendinosis, tears, adhesive capsulitis, subacromial-subdeltoid bursitis, glenohumeral and acromioclavicular (AC) osteoarthritis (OA) etc.³ Rotator cuff related shoulder pain (RCRSP), a broad term that includes rotator cuff tendinopathy, partial and full thickness tears and impingement, accounting for 50%–85% of shoulder pain.⁴

Anterior shoulder dislocation may be associated with rotator cuff tears causing recurrent anterior instability.⁵ Other possible secondary causes of rotator cuff disease include overuse of scapular stabilizers, adhesive capsulitis, and glenohumeral instability, leading to impingement.⁶

MRI is the imaging modality of choice due to its multiplanar

image acquisition and non-invasive nature.⁷ It also offers benefits like obtaining detail information of cuff defects, adjacent structures, muscle atrophy, cross-sectional area of muscle and fatty degeneration. Accurate diagnosis is crucial in making a treatment plan for patients as wrong treatment strategy may lead to poor prognosis.⁸

In context of Nepal, although MRI is performed in some tertiary centers, there are few studies about the role of MRI in the evaluation of chronic shoulder pain. This study aimed to fill that gap and will try to extract other clinically radiologically relevant information that can be understood by MRI of the shoulder joint.

METHODS

This was a descriptive prospective study conducted between 27th August 2020 to 29th August 2021 in individuals between 18 to 80 years of age with chronic shoulder pain (lasting at least 6 months, without a definite inciting traumatic event) referred to Department of Radiodiagnosis and Imaging, Dhulikhel Hospital, Kavre. Patients with known history of malignancy, those with

previous operative history over affected shoulder joint, and patients having contraindications for MRI such as pacemaker, MRI non-compatible metallic implants and claustrophobia were excluded.

Ethical approval was obtained from Kathmandu University School of Medical Sciences Institutional Review Committee (No.71/20). Convenience sampling technique was used. Written informed consent was obtained from each patient. The objectives and protocol of the study was explained in detail. A clinical data proforma was filled up.

MRI of the shoulder joint was performed in 1.5T Philips Ingenia MRI system. A single-loop curved surface coil was firmly fitted to the patient's shoulder. A pillow was placed beneath the knees to reduce the stress on the back and pads placed at pressure points. The patient lied supine on the MR table with the arm beside the body in a neutral position. A preliminary scout image was taken in the coronal plane to serve as a localizer for subsequent pulse sequences. The next sets of images were acquired in the trans-axial plane perpendicular to the long axis of the glenohumeral articulation on the coronal scout images. It extended from the top of the acromion through the inferior margin of the glenoid. Coronal oblique images were obtained in a plane parallel to the supraspinatus tendon so that the rotator cuff muscles and tendons could be seen in continuity. The cursors were placed along the axis of the central supraspinatus tendon on the axial images. Sequences in the oblique-coronal plane were obtained from the region in front of the coracoid process through the posterior musculature. An oblique-sagittal plane was then selected perpendicular to the oblique-coronal images and parallel to the glenoid rim. The field of view included the acromion, entire humeral head and scapula. T1- Coronal, T2-Axial, Coronal and Sagittal, PD-Sagittal, STIR-Coronal images were acquired, saved and studied. At the end of the study, causes and incidences of pain, due to rotator cuff injury, in the proposed sample size were studied.

IBM SPSS 21.0 version was used to perform quantitative and statistical analysis. Demographic and clinical data were analyzed using descriptive studies. Pearson correlation coefficient, Spearman correlation and chi-square tests were used for statistical analysis.

RESULTS

Patient's ages ranged from 18-66 years, with a mean of 42.82 years (Table 1). Chronic shoulder pain was most prevalent in the age group 30-60 years (66%), 11% of the patients were more than 60 years and rest were less than 30 years (23%). 54% of the patients were male and 46% of the patients were female with male: female ratio was 1.17:1.

Table 1: Age category of patients with chronic shoulder pain

Age (years)	No. of patients
< 30	23
30-60	66
> 60	11

Patients presented with pain in both right as well as left side. Among the patients with chronic shoulder pain, the right side was involved more frequently (64%) than the left side (36%). The duration of pain ranged from 6 months to 27 months with a mean duration of 10.04 months. Most of the patients presented within 10 months of onset of pain. Rotator cuff pathology was the most common pathology seen in 44 patients, followed by bursitis in 16, acromio-clavicular joint arthropathy in 7, synovitis in 4, Hill Sachs lesion in 3, adhesive capsulitis in 1, biceps pathology in 1, synovial chondromatosis in 1 and normal study was observed in 23 patients (Table 2).

Table 2: MRI diagnosis and sex distribution in patients with chronic shoulder pain

MRI diagnosis	No. of patients	Male n (%)	Female n (%)
Rotator cuff pathologies	44	22(50)	22(50)
Adhesive capsulitis	1	1 (100)	0
Bursitis	16	6 (37.5)	10 (62.5)
Acromio-clavicular joint arthropathy	7	3 (42.8)	4 (57.1)
Biceps pathologies	1	1 (100)	0
Synovial chondromatosis	1	0	1 (100)
Synovitis	4	2 (50)	2 (50)
Hill Sachs lesion	3	3 (100)	0
Normal study	23	16 (69.5)	7 (30.4)
Total	100	54	46

Among the rotator cuff pathologies, supraspinatus was the most frequently involved tendon seen in 28(63.6%), followed in order of frequency by subscapularis 10(22.7%), infraspinatus 4(9%) and teres minor 2(4.5%) (Table 3).

Table 3: Distribution of rotator cuff pathologies (N=44)

RC tendon involved	Frequency (%)
Supraspinatus	28(63.6)
Subscapularis	10 (22.7)
Infraspinatus	4 (9)
Teres minor	2 (4.5)

Similarly, MRI detected partial tear of supraspinatus in 23(52.2%), partial tear of subscapularis in 8(18.1%), partial tear of infraspinatus in 3(6.8%) and partial tear of teres minor in 2(4.5%) patients. Likewise, complete tear of supraspinatus was observed in 5(11.3%), complete tear of subscapularis in 2(4.5%) and complete tear of infraspinatus in 1(2.2%) (Table 4).

Table 4: Involvement of rotator cuff pathology (N=44)

RC tendon involved	Frequency(%)
Partial tear of supraspinatus	23 (52.2)
Partial tear of subscapularis	8(18.1)
Complete tear of supraspinatus	5(11.3)
Partial tear of infraspinatus	3(6.8)
Partial tear of teres minor	2(4.5)
Complete tear of subscapularis	2(4.5)
Complete tear of infraspinatus	1(2.2)

Type II acromion was the most common seen in 52 patients followed by Type I in 44 patients and Type III was seen in 4 patients with no reported cases of type IV acromion (Table 5).

Table 5: Type of acromion among the patients

Type of acromion	N=100 (n=%)
Type I	44
Type II	52
Type III	4

DISCUSSION

The shoulder joint is functionally and structurally complex and is composed of bone, hyaline cartilage, labrum, ligaments, capsule, tendons and muscles. It links the trunk to the upper limb and plays an important biomechanical role in daily activities. Indications for imaging of the shoulder have considerably increased in the last few years.⁹ Early and accurate diagnosis of the cause of shoulder joint pain is of utmost importance.

The mean age of the patients in our study was 42.82 years which was less than the study conducted by Krief et al¹⁰ where the mean age of the patients was 52 years. The probable cause of early age involvement in our part of the world may be related to the socioeconomic context where most of the patients are manual labor workers.

Rotator cuff pathologies were more common among those aged between 30-60 years which were similar with a previous study conducted by Jiang L et al.¹¹ This may be related with the more wear and tear in this active age group.

The relationship between dominant hand and shoulder pain remains controversial. In this study, the patients showed predominance of lesions on the right shoulder. This is likely due to right handedness in majority of the people. Our study is in accordance with study performed by Krief and Hugué¹⁰ that found right hand dominance and was different from study by Jiang L et al¹⁰ which showed that there was no relationship to the side of the dominant hand. Rotator cuff related shoulder pain (RCRSP) is a broad and common diagnosis used to encompass disorders associated with rotator cuff problems.¹²

In this study, rotator cuff pathologies were the commonest finding. It accounted for 44% of the total lesions seen. Supraspinatus tendon was the most common one to be involved (63.6%) including 23 cases of partial tear and 5 cases

of complete tear. Subscapularis tendon involvement was found to be involved in 10 cases with partial tear in 8 patients and complete tear in 2 patients, followed by subscapularis and teres minor. Our findings are comparable to the results of Cadogan A et al¹³ and V. Chianca et al.¹⁴ The causes of rotator cuff tears are multifactorial. Both the intrinsic and extrinsic factors play a role in rotator cuff tears. However, in this type of injury, the supraspinatus tendon is involved in most of the cases.

In a study by Guo X et al,¹⁵ the authors found that type I acromion (flat shape), type II (curved shape) morphology in 47.26% and 49.66% population respectively with type III (hooked shape) in 3.08%. This incidence is comparable to our study. The shape of acromion has significant association with rotator cuff pathologies. Rotator cuff injuries were more commonly seen in type II and type III acromion with type III acromion showing strong association with rotator cuff injuries (tears and tendinosis) which is also in agreement with other similar studies.¹⁵

Our study also has some limitations. Observational bias could have occurred during the evaluation of MR images. Similarly, artifacts including patient's motion at times could have interrupted the detailed evaluation of MRI sections.

CONCLUSION

MRI is considered as gold standard for diagnostic imaging of the shoulder joint due to its non-invasive nature, lack of contrast exposure, nonionizing radiation, high degree of resolution, and the ability to evaluate multiple potential pathologic processes. Our study showed rotator cuff pathologies to be the most common cause of chronic shoulder pain. Of the rotator cuff tendons partial tear of supraspinatus was the most frequently found abnormality, followed by subscapularis, infraspinatus and teres minor in the decreasing order of frequency. We also found a significant association between acromial morphology and rotator cuff pathologies.

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