



CURRENT ROLE OF – NON-CONTRAST MRI (MAGNETIC RESONANCE IMAGING) OF SHOULDER FOR DIAGNOSIS OF ADHESIVE CAPSULITIS [A STUDY OF 40 PATIENTS OBSERVED DURING PERIOD OF 6 MONTHS – I.E. FROM THE MONTH JANUARY TO JUNE 2018]

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ABSTRACT Adhesive capsulitis is a commonest cause of pain & restricted range of motion at the shoulder joint. Purpose of the study is to investigate plain MRI findings in the clinically suspected cases of adhesive capsulitis. Methods: 40 cases of shoulder joint MRI were evaluated for coracohumeral ligament thickness, rotator interval infiltration, and axillary recess thickening/edema in such cases. MRI Results show: In detection of adhesive capsulitis, sensitivity is 76% and specificity is 53% for coracohumeral ligament thickening, sensitivity is 66% and specificity is 55% for coracohumeral ligament thickening and rotator interval infiltration, and sensitivity is 23% and specificity is 86% for coracohumeral ligament thickening, rotator interval infiltration, and axillary recess thickening/edema. Conclusions: Adhesive capsulitis can be accurately diagnosed on non-contrast MRI shoulder examinations with appropriate clinical criteria without need of arthrography/intervention.

KEYWORDS : Adhesive capsulitis, Frozen shoulder, MRI of shoulder joint

INTRODUCTION:

Adhesive capsulitis is a commonest cause of pain & restricted range of motion at the shoulder joint¹. The orthopedic clinical exam for adhesive capsulitis shows high sensitivity and specificity for confident diagnosis of adhesive capsulitis and is the reference standard for diagnosis². However, patients with adhesive capsulitis often suffer from concomitant shoulder pathologies including rotator cuff and gleno-humeral lesions, leading to a more difficult physical examination and a more difficult diagnosis. In the latter scenario, patients are often referred for MRI. As such, routine non-contrast MRI may be less commonly considered as a reliable modality in confirming the diagnosis of adhesive capsulitis and may be more likely ordered to primarily exclude rotator cuff and gleno-humeral lesions. Several findings have been described with adhesive capsulitis based on arthroscopic³, open surgical^{4,5}, and imaging experience^{6,7,8,9} including thickening of the coracohumeral ligament, rotator interval infiltration of the subcoracoid fat, and thickening and edema at the axillary recess and inferior glenohumeral ligament. Direct and indirect MR arthrographic findings of adhesive capsulitis or frozen shoulder are well described^{6,7} and include an imaging adaptation of the observations above. However, adhesive capsulitis most commonly occurs in patients' age 45 to 60 years old, a population for whom direct and indirect MR arthrography is rarely ordered. Several recent studies have been performed describing MRI findings of adhesive capsulitis and their role in the diagnosis of clinical adhesive capsulitis^{8,9}.

GondimTeixeira et al. described noncontrast MRI findings of adhesive capsulitis compared to indirect MR arthrogram findings with sensitivities and specificities based on single MR criterion⁹. No published study to date has strictly evaluated routine non-contrast MRI shoulder examinations with sensitivities and specificities for specific MRI findings and constellations of MRI findings to accurately diagnose adhesive capsulitis. In our study, we sought to investigate specific non-contrast MRI findings for confirmation of clinical adhesive capsulitis.

MATERIALS AND METHODS:

Total number of 40 patients presenting with clinically diagnosed as adhesive capsulitis in the orthopedic and medicine department of P.D.U Medical college Rajkot were examined by non contrast MRI for duration of 6 months (January-June 2018). Clinical diagnostic assessment included evaluation for clinical history of shoulder pain and clinical physician exam findings of restricted active and passive range of motion of the humerus with external rotation <90°, internal

rotation <75°, flexion <90°, or abduction <90°, which was then compared with the contralateral shoulder. MR imaging of the shoulder was performed using standard protocol on a 1.5 Tesla scanner with a dedicated shoulder receiver coil (Superconductive 1.5 tesla Signa HDxt). Maximal coracohumeral ligament thickness was measured on the non-fat suppressed sagittal oblique sequence and thickness >2 mm was considered abnormal. Rotator interval infiltration of the subcoracoid fat was graded as none, mild, moderate, or severe using the non-fat suppressed sagittal oblique and the non-fat suppressed coronal oblique sequences. Mild infiltration of rotator interval fat was defined as replacement of <25% of the fat signal. Moderate infiltration was defined as 25%–50% replacement of fat signal, and severe infiltration was defined as replacement of >50% of the volume of normal fat signal in the interval (Fig. 1). The axillary recess was evaluated for thickening >2mm at its most inferior point on the coronal fluid sensitive, fat suppressed sequences. Axillary recess pericapsular edema was also evaluated on the coronal fluid sensitive, fat suppressed sequences (Fig. 2).



Fig. 1. A 60-year-old woman with clinical adhesive capsulitis. (A) Sagittal oblique T2-weighted fast spin echo non-fat suppressed and (B) coronal T1-weighted spin echo non-fat suppressed MR images show thickening of the coracohumeral ligament (white arrow) and moderate rotator interval infiltration of the subcoracoid fat (white arrow head). A 50-year old woman with clinical adhesive capsulitis. (C) Sagittal oblique T2-weighted fast spin echo non-fat suppressed and (D) coronal T1-weighted spin echo non-fat suppressed MR images show marked thickening of the coracohumeral ligament (white arrow) and severe rotator interval infiltration of the subcoracoid fat (white arrow head).

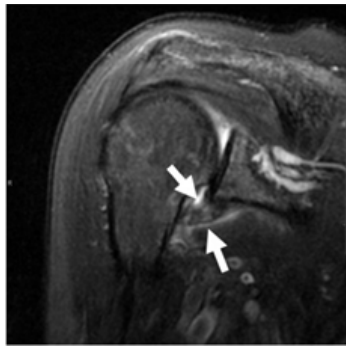


Fig. 2. A 55-year-old woman with clinical adhesive capsulitis. Coronal oblique T2- weighted fast spin echo fat suppressed sequence shows thickening and edema of the axillary recess (white arrows).

RESULTS :

Total 40 cases of non-contrast shoulder MRI were observed with a mean age 55.8 years (15 men, 25 women) using the single criterion of coracohumeral ligament thickening generated a consensus sensitivity of 76% and specificity of 53% for detection of adhesive capsulitis. Using the two criteria of coracohumeral ligament thickening and infiltration of the rotator interval fat generated a consensus sensitivity of 66% and specificity of 55%. Using all three criteria of coracohumeral ligament thickening, rotator interval infiltration, and axillary recess thickening ± pericapsular edema generated a consensus sensitivity of 23% and specificity of 86% (Table 1).

Table 1: Sensitivity, Specificity Of Mri Sign Of Adhesive Capsulitis (Criteria 1, 2, 3)

MRI signs of adhesive capsulitis	Sensitivity (%)	Specificity (%)
1) Coracohumeral ligament thickening	76	53
2) Coracohumeral ligament thickening + rotator interval infiltration	66	55
3) Coracohumeral ligament thickening + rotator interval infiltration + axillary recess thickening/edema	23	86

Table 2 : Frequency of MRI findings observed in the 40 cases of adhesive capsulitis:

MRI signs of adhesive capsulitis	No. of shoulders
	Adhesive capsulitis
Coracohumeral ligament thickening	15/40
Rotator interval infiltration of subcoracoid fat	12/40
Mild	4/12
Moderate	5/12
Severe	3/12
Axillary recess	15/40
Edema	8/15
Thickening	7/15

DISCUSSION:

MRI has been proven sensitive and specific for shoulder lesions including rotator cuff tendinopathy, glenoid labrum tears, and arthropathies, but its value in confirming a diagnosis of adhesive capsulitis has not been clearly established. Direct and indirect MR arthrography has been shown to accurately diagnose adhesive capsulitis or frozen shoulder^{6,7} but adhesive capsulitis is most prevalent in the 45 to 60-year-old age group, a population for which direct or indirect MR arthrography is rarely ordered. Rotator cuff interval findings in adhesive capsulitis including thickening of the coracohumeral ligament itself and fibrosis or synovitis in the rotator interval fat have been described in the orthopedics literature based on arthroscopy and open surgical evaluation^{3,4,5}. The anatomy of these structures is thought to play an important role in the restriction of external rotation of the shoulder seen in the setting of adhesive capsulitis^{4,10}. In our study, observations including coracohumeral

ligament thickening, rotator interval infiltration, and thickening/edema of the axillary recess. The axillary recess was considered thickened if it measured >2 mm, noting variability of measurements of the axillary recess reported in the literature^{7,8}. The increased specificity with inclusion of the axillary recess findings suggests that axillary recess involvement may be seen as synovitis and fibrosis at the rotator interval evolves. Routine noncontrast MRI shoulder examinations provide multiple imaging planes and both fat suppressed and non-fat suppressed sequences, ideal for an algorithmic approach in the assessment for adhesive capsulitis. In the setting of high clinical suspicion for adhesive capsulitis, the isolated finding of coracohumeral ligament thickening >2 mm yields a strong sensitivity for a confirmatory diagnosis. On the contrary, coracohumeral ligament thickness equal to or <2mm may help to exclude adhesive capsulitis. In the setting of moderate clinical suspicion for adhesive capsulitis, the addition of infiltration of the rotator interval fat may be useful to improve confidence of diagnosis. In the setting of atypical or low initial clinical suspicion for adhesive capsulitis, the constellation of findings of axillary recess thickening/ edema in conjunction with rotator cuff interval findings of coracohumeral ligament thickening and infiltration of the rotator interval fat strongly suggests a diagnosis of adhesive capsulitis with high specificity and may raise suspicion for adhesive capsulitis.

CONCLUSION:

In conclusion, adhesive capsulitis can and should be accurately and consistently diagnosed on routine non-contrast shoulder MRI in conjunction with appropriate clinical criteria. The finding of a thickened coracohumeral ligament shows strong sensitivity for adhesive capsulitis while the constellation of coracohumeral ligament thickening, rotator interval infiltration of the subcoracoid fat, and axillary recess thickening/ edema yields great specificity for adhesive capsulitis. Thus our study suggests that - we have to prefer MRI first for accurate diagnosis of adhesive capsulitis rather than any interventional procedures for safety of the patients.

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