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EVALUATING THE DIAGNOSTIC ACCURACY OF MAGNETIC RESONANCE IMAGING IN PARTIAL AND FULL THICKNESS ROTATOR CUFF TEAR.

Radio-Diagnosis

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ABSTRACT

The shoulder joint is one of the most mobile joints of the body with maximum range of motion occurring due to joint stability maintained by dynamic and static stabilizers. Of the dynamic stabilizers, rotator cuff is the most crucial and commonly involved component in the shoulder pain. Despite of proper history and physical examination, rotator cuff tear (RCT), need diagnostic imaging evaluation by a comprehensive and accurate imaging tool like magnetic resonance imaging (MRI) for analyzing the extent of tear. MRI is as accurate as arthroscopy in diagnosing partial (PTT) and full (FTT) thickness tear and as a preliminary diagnostic imaging modality. ***Objective –*** Evaluate diagnostic accuracy of MRI in analyzing the PTT and FTT by correlation of MRI findings with arthroscopy. ***Methodology*** – Study composed of 47 patients with provisional clinical diagnosis of RCT, meeting the criteria for both MRI and arthroscopic evaluation. MRI was done, followed by 'gold standard' investigation with arthroscopy. Statistical correlation of MRI and arthroscopy finding was done with sensitivity, specificity, predictive value and accuracy, along with kappa statistic to find the level of agreement in diagnosing full and partial thickness tear by MRI. ***Result*** – There was perfect agreement between MRI and arthroscopy in diagnosing the FTT and substantial agreement for PTT, based on statistical value of Kappa for FTT as 0.93 and for PTT as 0.63 with P value at 5% significance level as <0.001. ***Conclusion-*** The study demonstrated high sensitivity and specificity of MRI with statistically perfect and substantial agreement of diagnosing FTT and PTT, respectively, with reference to arthroscopy. Thus, MRI apart from providing useful information about the extent of tear, also provides the characteristic features of tear which makes it imperative before initiation of any therapeutic plan.

KEYWORDS

Magnetic Resonance Imaging, Arthroscopy, Rotator Cuff Tear

INTRODUCTION

The glenohumeral joint is one of the most mobile (synovial ball and socket) joint of the body with maximum range of motion (ROM) occurring at the cost of joint stability. The stability of the large humeral head in comparison to shallow glenoid fossa is maintained by dynamic stabilizers (rotator cuff tendon of supraspinatus, subscapularis, infraspinatus and teres minor) and static stabilizers (glenoid labarum, joint capsule, glenohumeral ligaments and the periarticular soft tissue). Of the various etiologies for shoulder pain, A J K Ostör et.al found that the rotator cuff tendinopathy (85%) is the leading cause of patient discomfort and reduced quality of life. ***[1]*** Studies have shown that while overuse tendinopathy is mostly seen in the younger population, tendon degeneration due to aging/collagen-vascular disease (causing hypo-vascularity of the critical zone of the tendon) is a frequent association with the elderly. ***[2]*** Such that, this degenerative tendinopathy, also known as tendinosis; often progresses to partial thickness tear (PTT) which in turn, propagates to a full thickness tear (FTT) with chronic pathological changes of muscle retraction, fatty infiltration and atrophy. ***[2,3,4]***

Proper history and physical examination of the shoulder pain, often helps to deduce accurate diagnostic imaging modality like plain radiographs, ultrasonography (USG), computed tomography (CT) or magnetic resonance imaging (MRI), especially, for rotator cuff pathologies. ***[4,5]*** The initial screening imaging modality of suspicious RCT is, USG, which is cost-effective and readily available. However, it is operator and high-resolution equipment dependent with difficulty in distinguishing chronic tear and tendinopathies. ***[2,4]***. Several studies have shown that MRI is considered the most comprehensive and accurate diagnostic imaging tool for complete pre-procedural evaluation of rotator cuff tear - extent, location, retraction, infiltration and atrophy. ***[3,6]*** Though, arthroscopy with direct visualization is the "gold standard" investigation of choice for rotator cuff pathologies like impingement, labarum injury, adhesive capsulitis, rotator cuff tear location and extent, and instability; it is, however, an invasive procedure associated with complications like infection or damage to adjacent neurovascular bundle/articular cartilage. ***[7]***.

Thus, MRI with an excellent, non-invasive, multiplanar, high spatial resolution of soft tissue contrast assessment, is considered as the investigation of choice for RCT. Since, various MRI anatomical parameters like dimension, depth, shape of tear, tendon retraction, tear extension, muscle atrophy and fatty degenerative changes helps to delineate partial tear from complete tear; this imaging finding of distinguishing partial tear from complete tear is equivocally important for the clinician in therapeutic decision plan, surgical intervention and post-operative management. ***[8,9]***

Therefore, the purpose of this study is to demonstrate the diagnostic accuracy and characteristic features of partial versus complete RCT on MRI by co-relating it with the arthroscopic findings.

MATERIAL AND METHOD:

This prospective study was conducted under the Department of Radio-diagnosis, Bankura Sammilani Medical College and Hospital (BSMCH), Bankura, West Bengal on 76 patients between the age group of 20 – 60 years who were referred from the department of Orthopedic, with the provisional clinical diagnosis of rotator cuff tear, meeting the criteria for both MRI and arthroscopic evaluation. Since, out of 76 eligible candidates; only 47 subjects underwent both MRI and arthroscopic evaluation and formed the basis for the sample size (N = 47) in this study. Out of 29 patients who were excluded from study, 12 were lost to follow-up, 6 had contraindication for MRI (cardiac pacemaker or metallic implants) and 11 were unfit for arthroscopy.

***Inclusion Criteria*:**

All clinically suspicious cases with provisional diagnosis of rotator cuff tear, who were referred to our department of Radio-diagnosis, BSMCH, Bankura.

***Exclusion Criteria*:**

- Patients with contraindication for MRI procedure (those having metallic implants, cardiac pacemaker, aneurysmal clips or metallic foreign body).
- Claustrophobic patient.
- Patients unfit for arthroscopy.
- Patient with different shoulder etiopathologies like osteoarthritis,

infection, joint arthropathy which may hinder with the diagnostic findings of the current study.
- No consent.

Imaging Variables:
- Tendinosis
- Partial thickness tear (PTT)
- Full thickness tear (FTT)

METHODOLOGY:

The study was conducted after getting proper approval from the Institutional Ethics Committee of the Bankura Sammilani Medical College and Hospital, Bankura, West Bengal. All the patients who were referred form the Department of Orthopedics of BSMCH with high suspicious of rotator cuff tear after thorough clinical assessment were scrutinized for diagnostic evaluation with MRI followed by arthroscopy based on inclusion and exclusion criteria. The clinical evaluation for plausible tear of supraspinatus was assessed as weakness in external rotation, initial 20° abduction, night pain, the arc pain (during decent of abducted arm) and impingement analyzed with Jobe/ empty can test or Neer test or Hawkin test. Meanwhile, weakness in resisted external rotation, dyskinesia of scapula on <90° abduction, drop-arm test and lift-off test were performed for evaluating subscapularis, infraspinatus and teres minor tear.

Written consent was taken for all the patients who were willing to participate after explicit explanation of the purpose and procedure of the study in their own vernacular language. Socio-demographic parameters were entered in the questionnaire. Further pre-operative MRI evaluation of PTT and FTT was done using appropriate MRI sequences on axial, coronal oblique and sagittal oblique planes of the shoulder joint; with corresponding assessment with arthroscopic findings based on post-operative (OT) notes.

TOOLS:

Magnetic Resonance Imaging – Non-contrast MRI scans were obtained on a dedicated phased array shoulder joint coil using GE Brivo MR355 1.5 Tesla machine. Based on the European Society of Musculoskeletal Radiology standardized MRI shoulder evaluation protocol, the 5 basic sequences in three anatomical planes were - Coronal oblique – T2, PD-FS (Proton Density-Fat saturation); Sagittal oblique – T1 (so as to analyze muscle atrophy), PD-FS and Axial – PD-FS. ***[10]*** Additional sequences like Axial – T2, GRE (MPGR Cartilage sensitive sequence with variable T2* susceptibility), Sagittal oblique - T1 SE (Spin Echo), T2 FSE (Fast spin echo) along with coronal T1 and STIR were also obtained. ***[6,11,12] [Table 1]*** STIR, is an inversion recovery sequence with 180-degree pulse given before SE or GRE echo sequence. It is used for suppression of T1 value / fat tissue with a good contrast-to-noise ratio despite of poor signal-to-noise ratio. Since, most of the pathologies (marrow oedema, fluid collection, bursal inflammation and various lesions in the bone) have proteinaceous content with prolonged T1 and T2 relaxation times; so, STIR is more robust with resultant high signal intensity compared to T2- FS images.

Table 1: Standardized MRI Shoulder Protocol. [10]

Sequence	FOV (mm)	Matrix	Slice Thickness (mm) / Gap (mm)	TR/TE (ms)
Coronal oblique – T2	140	256 x 256	3/0.5	3700/max.
Coronal oblique - PD FS	140	256 x 256	3/0.5	3000/45
Sagittal oblique - T1	140	256 x 256	3/0.5	650/min.
Sagittal oblique - PD FS	140	256 x 256	3/0.5	3000/45
Axial - PD FS	140	256 x 256	4/0.5	3000/45
Axial GRE	140	256 x 256	0.6/0.4	2750/15

Arthroscopy - is a "gold standard" investigation by assisting in direct visualization of tear; either in the form of, bursoscopy for delineation of the superior (bursal side) or as glenohumeral arthroscopy for undersurface (articular side) PTT. Along with the repair of the tear in the same sitting. These post-operative arthroscopic characteristic (extent of tear) findings were cross-analyzed with the pre-operative MRI findings for diagnostic accuracy of MRI in PTT and FTT.

***Outcome Parameters And Definitions*:**

· Rotator cuff tear- by definition is the discontinuity in any of the four rotator cuff muscles and tendons. As per, International Society of Arthroscopy, Knee Surgery and Orthopedic Sports Medicine [ISAKOS] consensus, RCT are classified into posterior-superior tear (involving supraspinatus, infraspinatus and/or teres minor) and anterior tear (affecting subscapularis), which are further sub-classified as partial or full thickness tear. ***[13]***

· Partial thickness tear – Articular or bursal side tear classified based on the extent of tendon involvement by Ellman classification as grade 1 (<25% which is <3mm), grade 2 (25-50% which is 3-6mm) or grade 3 (>50% which is >6mm). ***[14]*** Interstitial RCT were not included in this study due to lack of assessment of such tears by arthroscopy. Similarly, Snyder arthroscopic classification was used to analyze the location (A-articular, B-Bursal, C- Complete) and severity of tendons involved in RCT but it is still descriptively reported in MRI. ***[15] [Table.2]***

Table 2: Snyder Classification For RCT.

Severity	Partial Tear	Complete Tear
1	<1cm, minimal bursitis/ synovitis/ capsular fraying.	Small (<1cm), pinhole
2	<2cm, frying with disruption of few cuff fibers with bursitis/ synovitis/ capsular injury.	Medium (1-3 cm), involving one tendon.
3	<3cm, fraying and fragmentation of fibers on the cuff surface.	Large (3-4 cm), entire tendon with minimal retraction at torn ends.
4	Severe with a flap creation involving >1 tendon.	Massive (>4cm), ≥ 2 tendons, retraction and scarring.

- Full Thickness tear – Classified based on pattern, extent and tendon retraction. ***[16]***
- Pattern of tear – Davidson and Burkhart classify FTT into 4 different geometrical shapes as crescent-shaped, U-shaped, L-shaped or inverted L shaped on arthroscopy. Though, these are difficult to analyze on MRI; on coronal and sagittal planes or 3D MRI these morphological patterns, however, can be easily delineated.
- Extension – can be analyzed based on Snyder classification.
- Retraction – can be analyzed based on Patte classification as – grade 1 - minimal retraction, grade 2 – at the level of humeral head, and grade 3 – retracted to the level of superior glenoid margin.
- Sensitivity – percentage of detecting the "diseased" by a "test"; "true positive". Here, it is the "true positive" value of MRI in detecting individuals who actually have RCT.
- Specificity – percentage of detecting the "non-diseased" by a "test"; "true negative". Here, it is the "true negative" value of MRI in detecting individuals who do not have RCT.
- Positive predictive value (PPV) – percentage of "diseased" individuals correctly diagnosed with positive test result.
- Negative predictive value (NPV) – percentage of "non-diseased" individuals correctly diagnosed with a negative test result.

***Statistical Analysis*:**

Descriptive statistical analysis was done in this study by entering the data into MS-Excel sheet. Mean and standard deviation was calculated for continuous variables; while, percentage (%) was calculated for categorical variables. The p - value for statistically significant level in this study was kept as < 0.05. The 2 statistical study outcome variables, PTT and FTT were analyzed using Chi-square/ Fisher's Exact test by SPSS software version 24. Kappa statistic was used to measure agreement between MRI and arthroscopy. Thus, the diagnostic imaging accuracy of PTT and FTT, sensitivity, specificity of MRI was evaluated with respect to arthroscopic findings.

RESULTS:

Demographic variability in cases was seen as majority of the strata fell into elderly (33/47) age group of 40-60 years (70.2%) age as compared to young (14/47) age group of 20-39 years (29.8%) with the mean age as 52.5 year. Based on etiology, 72% presented with acute traumatic manifestation, predominantly involving the younger (athletic) age group; 16% presented with acute event associated with ongoing imaging corroborating with the history as an acute-on-chronic manifestation, and remaining 12% presenting with chronic manifestation.

In our study, there was male predominance, 76.6% (36) in comparison to females 23.4% (11). Mostly presenting with signs and symptoms of shoulder pain and/or restricted ROM involving the dominant (right) hand (89.4%). Though, seen as unilateral manifestation but of 7 RCT cases which presented with bilateral involvement, 5 cases were of elderly patients.

Majority of the patients presented late with chronic (> 3 months) (61.7%) sequalae of a previous neglected case of trauma or confirmed case of tendinopathy with poor response to conservative management like use of non-steroidal anti-inflammatory drugs (NSAID) or subacromial injections with steroid or degenerative tendinopathy/ tendinosis becoming conspicuous with just a trivial trauma in an elderly patient; compared to acute (<3 month) (38.3%) manifestation of trauma due to fall on an outstretched hand or high energy mechanism injuries like sports injury with forceful overhead activity. ***[Table.3]***

Table 3: Distribution Based On Time Span Of Symptom Manifestation. (N=47)

Time Span	**20-39 years % (Male/ Female)**	**40-60 year % (Male/ female)**	**Total (%)**
Acute (<3 months)	55.6% (9/1)	44.4% (6/2)	18 (38.3%)
Chronic (>3 months)	13.8% (2/2)	86.2% (19/6)	29 (61.7%)

The study diagnosed 20 (42.6%) FTT and 27 (57.4%) PTT on MRI with 19 cases of articular side tear (involving 12 patients of age <35 years) and remaining 8 with bursal side tear (involving 5 patients of age >44 years). ***[Table.4]*** This was compared to 17 (36.2%) FTT (one case showing massive (5.4 cm) FTT (C4) of supraspinatus and infraspinatus with Goutallier - grade 1 fatty infiltration in the supraspinatus and subluxation of long head of biceps from the intertubercular groove) and 30 (63.8%) PTT on arthroscopy. Meanwhile, based on the arthroscopic findings, two cases of, articular partial tear of Ellman grade 3 and one case of tendinosis of supraspinatus tendon with SASD bursitis, respectively, were misdiagnosed as supraspinatus FTT on MRI due to heterogenous intermediate signal intensity. ***[Table.5]***

Table 4: MRI Diagnosed Rotator Cuff Tear. (N=47)

MRI DIAGNOSED ROTATOR CUFF TEAR			
FULL THICKNESS TEAR 42.6% (20/47)	PARTIAL THICKNESS TEAR 57.4% (27/47)		
C4 >5cm – 10% (2) C3 3-5 cm -15% (3) C2 1-3cm -60% (12) C1 <1cm – 15% (3)	Grade 1 (29.6%) <25% (<3mm)	Grade 2 (22.2%) 25-50% (3-6mm)	Grade 3 (48.2%) >50% (>6mm)

Of 20 FTT, one C3 had Patte grade 1 retraction and both C4 cases of RCT had grade 2 retraction. Meanwhile, of articular (19) side PTT, A1 – 2 cases, A2 – 7 cases, A3 – 9 cases and, one case of A4 type; and, of bursal side (8) PTT, 3 cases were of B2 and 5 cases were of B3, with no case of B1 and B4.

Table 5: Distribution Of Tendon Involvement And Extent Of Tear Based On MRI And Arthroscopic Findings. (N=47)

Tendon Involvement	**Type of tear**	**MRI**	**Arthroscopy**
Supraspinatus	Partial Thickness	18	17
	Full Thickness	17	14
Infraspinatus	Partial Thickness	5	7
	Full Thickness	2	2
Subscapularis	Partial Thickness	4	5
	Full Thickness	1	1
Teres minor	Partial Thickness	0	1
	Full Thickness	0	0
Total		47	47

This study also found additional imaging features apart from tear mostly in <30 years age (29.8%) as subacromial-subdeltoid (SASD) bursitis (69.7%), reduced acromio-humeral (AH) gap (12.1%), thickening of coracoacromial (CA) ligament (3%) and subacromial spur (15.2%).

Our study demonstrated that there was perfect agreement between MRI and arthroscopy in diagnosing the FTT and substantial agreement for PTT, as evident form our study with Kappa value for full thickness tear as 0.93 and for partial thickness tear as 0.63 with P value at 5% significance level as <0.001. ***[Table.6,7]***

Table 6: Diagnostic Accuracy Of MRI In Case Of Full Thickness Tear Of Rotator Cuff. (N=47)

N=47		**Arthroscopy**		**Total**
		Positive	**Negative**	
MRI	Positive	8	0	8
	Negative	1	38	39
Total		9	38	47

Sensitivity – 88.8%, Specificity – 100%, PPV – 100%, NPV – 97.4%, Accuracy – 97.9%.

Table 7: Diagnostic Accuracy Of MRI In Case Of Partial Thickness Tear Of Rotator Cuff. (N=47)

N=47		**Arthroscopy**		**Total**
		Positive	**Negative**	
MRI	Positive	13	5	18
	Negative	3	26	29
Total		16	31	47

Sensitivity – 81.3%, Specificity – 83.9%, PPV – 72.2%, NPV- 89.7%, Accuracy – 83%

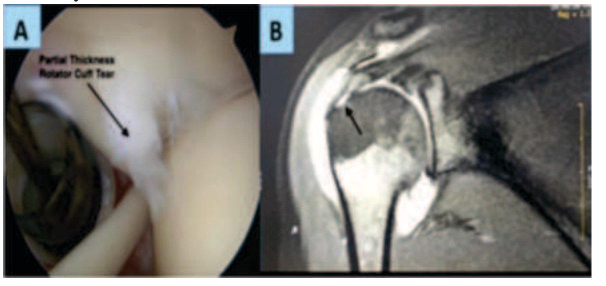

Figure 1: A: Arthroscopic image of articular side partial tear with fraying of tendon fibers from the humeral head. B: Coronal T1-weighted fat saturated MRI image showing tendinosis with rim-rent articular surface partial (A2) tear of supraspinatus tendon, along with mild joint effusion and fluid in the subacromial-subdeltoid bursa.

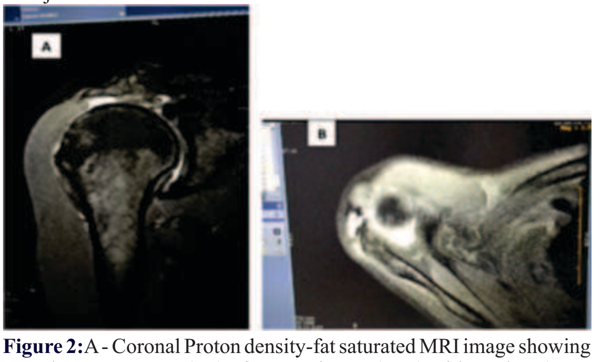

Figure 2: A - Coronal Proton density-fat saturated MRI image showing complete 3.6 cm tear (C3) of supraspinatus (SST) with grade 1 (Patte classification) retraction of tendon with joint effusion. B – Axial Proton density-fat saturated MRI image showing "U – shape" pattern of tear involving SST.

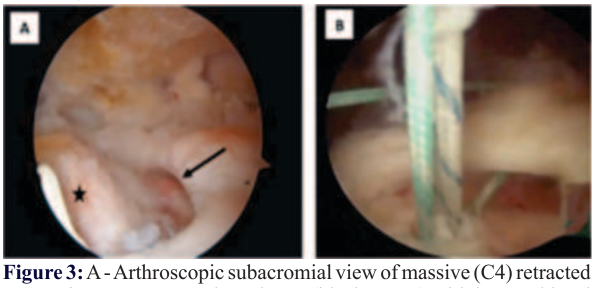

Figure 3: A - Arthroscopic subacromial view of massive (C4) retracted supraspinatus 'crescent-shaped' tear (black arrow) with humeral head (star) on the left. B – Medial mattress sutures with anchoring of retracted supraspinatus tendon fibers back to the humeral head.

DISCUSSION:

There was male (76.6%) predominance of rotator cuff injuries compared to female (23.4%) and majority of the females presenting with chronic RCT were in the age group of 40-60 years (54.5%) in our study. This invariably gave insight into the protective effect of cyclical estrogen in the pre-menopausal females due the fact that estrogen decreases the lysyl oxidase activity and thus tendon stiffness. *[17]* Hence, predisposing females with lesser risk of tendinosis associated tear compared to their male counterpart in the pre-menopausal age group; yet, the risk becomes equivocal in both the genders after the menopause.

Herein, our study the younger age group (20-39 years) constituted 29.8% and presented more commonly with acute traumatic (72%) RCT which was associated with high energy avulsion force leading to tear of supraspinatus tendon from the articular surface and greater tuberosity avulsion injury; usually, seen on MRI as a rim rent articular tear with marrow oedema. This type of tear is also known as, partial articular supraspinatus tendon avulsion – PASTA tear. *[16]*

There was disparity in RCT presentation more in the elderly (40-60 years) population (70.2%) compared to younger patients, giving inkling to degeneration as the plausible major etiopathological factor in the elderly. We also found that, of these 33 elderly patients, 87.9% (29) had underlying co-morbidities such as diabetes, hypertension, chronic bronchitis, Parkinson, et cetera. This finding in our study is consistent with Yadav et. al and Rudzki et. al, rotator cuff intrinsic theory of tear due to age-related degeneration, hypo-vascularity of critical zone (1-1.5 cm away from the enthesis site of the tendon on the humeral head), inflammation and oxidative stress; triggering apoptosis of tenocytes causing tendinosis. *[18,19]* Ultimately, leading to superior migration of humeral head towards the undersurface of acromion due to unopposed action of deltoid, 'high riding shoulder' with cascade of events like PTT, FTT, massive RCT, muscle atrophy and cuff arthropathy. The extrinsic mechanism of tear is due to primary or secondary impingement based on Neer et.al, in the form of subacromial-subdeltoid bursitis (69.7%), reduced acromio-humeral gap (12.1%), thickening of coracoacromial ligament (3%) and subacromial spur (15.2%), which was predominantly seen in the younger athletic patients (29.8%). *[20]*

Our study found that by the time the patient presented for diagnostic imaging, patient already had FTT – 63.8% (30/47) or >50% PTT (grade 3) – 48.2% (13/27); mostly because the case presentation, especially in the elderly population (70.2%) is asymptomatic (84.8%) or neglected, either due to co-morbidities or due to poor response to non-surgical treatment. Thus, mandating the need for early empirical surgical intervention with diagnostic screening post 60 years age. *[2,18,19]*.

On MRI, 57.4% (27) of FTT cases showed predominantly one tendon involvement, mostly, supraspinatus (85%) tendon tear. FTT on MRI was seen as a complete discontinuity in the tendon from articular to bursal side as fluid signal intensity on T2WI, extending on either side of the tendon as a direct communication between the bursa and joint cavity. In almost 90% of MRI diagnosed FTT, findings were consistent with arthroscopy; yet, in two MRI reported cases of supraspinatus FTT, arthroscopy showed A3 and A4 (>50% type of articular side PTT RCT), because of the fact that these two dubious cases of intermediate signal intensity on T2WI and PD-FS, were associated with chronic scarring or mucoid degeneration of tendon and were erroneously reported as FTT. Meanwhile, in one case of SASD bursitis with tendinosis on arthroscopy showed focal signal intensity on T2WI of MRI as supraspinatus FTT, representing overdiagnosis of tear by MRI. Whilst, the ancillary findings of joint effusion, bursitis, superior migration of humeral head, muscle retraction and atrophy were also considered into account for MRI diagnostic reporting of FTT. *[20]* For instance, one C3 type FTT had Patte grade 1 retraction and two C4 type FTT cases had grade 2 retraction.

Meanwhile**,** 42.6% (20) PTT cases were seen as an area of focal defect in the tendon and surface frying with high signal intensity on T2-FS MRI images. On MRI, articular side tears were seen as a tendon defect with cartilage interface sign and bursal side tears showed SASD bursa herniating into the defective site. The fluid signal on MRI in PTT was either due to fenestrations within the torn cuff or irritation of the bursa by impingement. On arthroscopy, majority of the PTT of articular side showed enthesis site tear of tendon from the humeral head involving the supraspinatus tendon or the bursal side involving the critical zone of the tendon in our study. Since, there were 70.4% (19/27) articular tears involving 85.7% (12/14) of younger age group patients; as inferred from the arthroscopy post MRI; thus, our study findings were in accord with Chistoph et. al findings of rim-rent or partial articular surface tendon avulsion – PASTA tear of supraspinatus being more common in young athletic patients than reverse PASTA tear. *[21]*

CONCLUSION:

Therefore, our study demonstrated high sensitivity and specificity of MRI in diagnostic evaluation of both full and partial tear based on various recent studies and MRI characteristic findings. *[7,22]* For FTT, MRI showed 88.8% sensitivity and 100% specificity. Meanwhile, 81.3% sensitivity and 83.9% specificity for PTT. The diagnostic accuracy of MRI in FTT was 97.9%; but was found a little less accurate, 83%, for diagnosis of PTT. This was a plausible limitation found in our study and an alternative imaging investigation of choice like MR arthrography can be considered over routinely MRI for diagnosing PTT with even more confidence, where no surgical intervention is expected. However, there was perfect agreement between MRI and arthroscopy in diagnosing the FTT and substantial agreement for PTT, based on statistical value of Kappa for FTT as 0.93 and for PTT as 0.63 with P value at 5% significance level as <0.001. Thus, signifying the preliminary importance of MRI as an equivocal diagnostic tool to analyze the extent of tear compared to arthroscopy and making MRI imperative before initiation of any therapeutic plan.

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