ORIGINAL ARTICLE

RADIOGRAPHIC APPEARANCES OF ROTATOR CUFF TEAR BY EMPLOYING MR IMAGING TECHNIQUES TO FIND THE DEGREE OF RCT

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ABSTRACT

AIMS AND OBJECTIVES: To determine the role of MRI in the diagnosis of shoulder pain particularly due to the problems of RCT (Rotator Cuff Tear). Because the mode of management can be planned according to the degree of RCT, either partial or full thickness tear. **MATERIALS AND METHODS:** The study was conducted at the Department of Diagnostic Radiology & Medical Imaging, Jinnah Hospital, Lahore from Mar. 2008 to Jun, 2010. Twenty seven patients were studied who presented with the complaints of pain in either shoulder and clinician had the suspicion of RCT. Mean age group of involvement was seen between 25-65 yrs of age both in males and females. Equipment used was 1.5T MR system. Shoulder pain is a common complaint of pain by patients who visit the clinicians, third in frequency after headache and backache according to statistics of USA. Major cause of shoulder pain is rotator cuff tear or entrapment of supraspinatous tendon in sub-acromial arch. Predilection is seen in patients who are above 40yrs of age and in younger age group around 25yrs who are involved with sports activities like weight lifting, pitchers and throwing. Causes can be mechanical and biological. **RESULTS:** The imaging characteristics are more varied. In this presentation the involvement of partial and full thickness tears is evaluated. T1W, T2W and FSE imaging has reported a sensitivity of 84-99% and specificity of 78-98%. Angling the oblique coronal and sagittal images can improve the accuracy of MRI. **CONCLUSION:** With the development of new arthroscopic techniques for treating RCT's. MRI has played an increasingly important role as a non invasive adjunct without employment of any ionizing radiation for evaluating the extent of RCT.

Key Words: RCT (Rotator Cuff Tear), Rotator Cuff Impingement.

Introduction

Shoulder pain is the common complaint of patients who visit clinicians and it can be due to a number of causes. The major cause of shoulder pain in patients older or around 40 years is rotator cuff tear or impingement. In the present era of imaging technology MRI has an increasingly important role in making the diagnosis of RCT. As it is non invasive test and can give better soft tissue differentiation by using different sequences.

If we recall the pathophysiology it will be evident that two important etiologies of rotator cuff pain are mechanical causes such as flap of tendon which entraps under the acromion and biological causes such as synovitis. Although the rotator cuff is innervated but the sub acrominal bursa has 20 times more free nerve endings as compared to rotator cuff tendon. One can imagine the magnitude of pain if there is entrapment of subacromial bursa or entanglement of redundant synovium in patients of rotator cuff tendon impingement.

There are three mechanisms involved in the development of rotator cuff tear:

Extrinsic compression of the cuff

Intrinsic tendon degeneration

Muscle imbalance

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Charles Neer was the first person who popularized the theory that RCT in older patients were primarily the result of extrinsic compression by anterior acromion process, coracoacromial ligament, and acromio-clavicular joint- the structures that make up the coracoacromial arch. So in cases of surgery of RCT along with the decompression of coracoacromial arch the success rate of surgery was extremely successful reported by most surgeons.

Several authors have stressed the role of intrinsic tendon degeneration as the main etiology in the development of RCT. Rathburn and Mcnab demonstrated a zone of hypovascularity in the supraspinatous tendon approximately 1cm proximal to the site of insertion at the greater tuberosity. This corresponds to the critical zone where RCT's were noted to occur. Clark and Harry man took a step further noting that the articular surface fibers of the rotator cuff has sparse blood supply relative to the bursal surface fibers. Moreover the bursal surface fibers are able to elongate with more tensile load as compared to the articular surface fibers do not stretch and therefore rupture more easily.

Another cause of shoulder pain due to RCT is internal impingement. During abduction and external rotation, the under surface of the supraspinatous tendon and infraspinatous may normally lie between the greater tuberosity and the posterior glenoid. This mechanism is most commonly seen in cases of sports athletes with clinical diagnosis of internal impingement. Constellation of the findings on MRI aid in the diagnosis of internal impingement in cases of RCT.

Shoulder pain patients are third in frequency in USA after headache and backache. The incidence of rotator cuff disease increases as the age increases, Sher et al obtained MR images of asymptomatic individuals who were older than 60 years and found that 54% had either a partial thickness tear or full thickness RCT. Morbidity and mortality can be varied depending upon the severity of the symptoms. As a functioning rotator cuff is also necessary for many activities of daily life, such as brushing one's hair, lift or perform at or above the shoulder level. No race predilection is noted. Slightly higher incidence is noted in case of males.

Anatomy

The rotator cuff is made up of tendons of four muscles: the supraspinatous, infraspinatous, teres minor and subscaplaris. The tendons of supraspinatous, infraspinatous and teres minor blend 1.5cm from their lateral margin before they insert on to the greater tuberosity. The subscapularis tendon inserts independently onto the lesser tuberosity.

The rotator cuff interval separates the supraspinatous tendon from the subscapularis tendon. This gap between the tendons contain the coracohumeral ligament and superior glenohumeral ligament as well as allows the long head of the biceps tendon to pass from bicipital groove through the glenohumaral joint before inserting on to the superior glenoid. The supraspinatous tendon is the most important rotator cuff tendon because it is involved either alone or in combination in 95% of the tears.

The supraspinatous tendon is 9-11mm thick. Superficial to the supraspinatous tendon lies the subacromial-subdeltoid bursa, the largest bursa of the human body. The superior surface of the rotator cuff tendon is often termed bursal surface whereas the inferior or more caudal surface is called articular surface which lies adjacent to the synovial lining of the glenohumeral joint.

The classic clinical presentation of the rotator cuff impingement is a chronic pain in the lateral aspect of the shoulder aggravates by attempts to abduct the arm and often worse at night. Patients have a typically painful arc from 60-120° of abduction and forward flexion.

Materials and Methods

Twenty seven patients were studied in the Department of Diagnostic Radiology and Medical Imaging JHL, employing 1.5 T MRI who were referred from surgical, orthopaedic and medical departments with clinical suspicion of RCT. Mean age group of involvement was between 25-65 years. Imaging characteristics are more varied. TIW, T2W and FSE imaging sequences have reported a sensitivity of 84-99% and specificity of 78-98%. Angling the oblique coronal and sagittal images

improve the accuracy of RCT. For many orthopaedic surgeons the main role of shoulder MRI is to detect the full thickness tear. The most common appearance of a full thickness tear is high signal intensity on a T2W image that extends from the articular surface of the rotator cuff to the subacromial bursa. In chronic RCT's in which the shoulder joint had little or no effusion, the humeral head may be high riding such that no much high signal is seen at the tear site.

Partial thickness tears can be classified as articular, bursal or intratendinous. Articular surface partial tears were more common than bursal surface tears 3:1 is the incidence rate. Partial thickness tears appear on MRI as intermediate signals which disrupts the normal low signal surface of the rotator cuff.

Figure 1: Hyperintense signals are seen involving the whole thickness of the fibers of rotator cuff--post traumatic full thickness tear.

Figure 2: Fine hyperintense signals are noted along the bursal surface fibers of the rotator cuff indicating partial tear.

Figure 3: Normal hypointense signals are noted in all sequences in the rotator cuff.

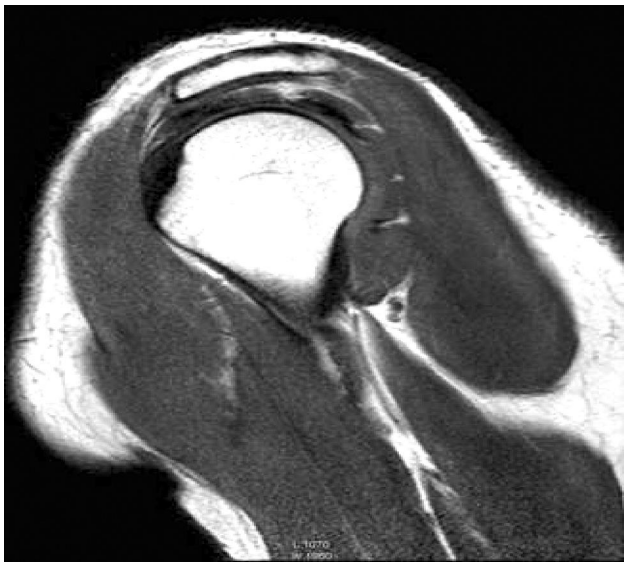

Figure 4: Articular surface fibers show increased signal intensity suggestive of partial RCT.

Results

There were 27 patients who were selected in this study referred from surgical, orthopaedic and medical department with clinical suspicion of RCT. Variables such as age, sex, clinical findings, and MR appearances were recorded. All data then analysed by SPSS 11.5 version. The mean age of involvement was found between 25-65 years. Male to female ratio was 16/11 (59.25% males and 40.74% females). Full thickness

tear was found in 21/27 (77.77%) and partial thickness tear was found in 6/27 (22.22%). Out of partial thickness tears 4 cases had articular surface fibers tear and 2 had bursal surface fibers tear i.e 3:1 ratio.

Discussion

The use of MRI is in dealing with the cases of shoulder pain with clinical diagnosis of RCT has played an important role as a non invasive test with better soft tissue delineation and without employment of any ionizing radiation for determining the extent of RCT. T1W, T2W and FSE imaging have reported a sensitivity of 84-99% and specificity of 78-98%. Most of the patients had full thickness tear as compared to the partial thickness tear amounting 7.77% & 22.22% respectively. The results when compared with the study of Rafii et al which reported 90 % of full thickness tears proven after surgery are 13% less in my study. Whereas the ratio of partial thickness tear involvement in cases of articular surface and bursal surface is 3:1 which are 100% similar and comparable.

Conclusion

With the development of new arthroscopic techniques for treating RCT's MRI has an increasingly important role for accurate diagnosis. In summary fat suppressed, T2W images acquired with a quality shoulder coil are accurate for diagnosing rotator cuff tear. False negative full thickness tears typically occur when the patients do not have an effusion and when the sub deltoid bursal capsule is thickened. Failure to diagnose partial thickness tears can be minimized by careful inspection of low signal surfaces of the rotator cuff and noting whether the low signal surface layers are disrupted. Hence, MRI is an important diagnostic tool to find out the early changes in RCT because long standing RCT's can result in the development of tendon edge retraction where it becomes extremely difficult to grasp and to reattach to the greater tuberosity.

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