

ROLE OF ULTRASONOGRAPHY IN THE DIAGNOSIS OF ROTATOR CUFF TEARS

Radiology

Article Submitted on: 11
October 2018
Article Accepted on: 27
October 2018

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Abstract:

Background: Rotator cuff tears are very common and their incidence increases with age. Shoulder ultrasonography has recently gained popularity in detecting rotator cuff tears because of its efficiency, cost effectiveness, time saving and real time nature of the procedure. Patients with rotator cuff tears may be detected earlier by USG and have expedited surgical repair.

Materials and Methods: Patients were prospectively reviewed from Dec 2016 to Aug 2018. They were divided into two groups. USG (-) group and USG (+) group. Age, gender, wait time from OPD visit to MRI exam, MRI exam to operation (OP), then OPD visit to OP, patient number for MRI exam, and number of patients who finally had rotator cuff tears within 2 groups were compared. 14 patients, 8 males and 6 females, between the age group of 38 to 76 years who sustained shoulder injury and clinically suspected rotator cuff tears of shoulder were included in the study.

Results: The wait time of OPD visit to OP and MRI to OP in patients who received shoulder USG was significantly less than that in patients did not receive shoulder USG screening. Only 3 (21.4%) of patients with suspected rotator cuff injury undergone arthroscopic cuff repair before USG was applied as a screening tool. The percentage increased to 46.8 after orthopedic surgeon started using USG as a screening tool for rotator cuff tears.

Conclusion: Office based shoulder USG examination can reduce the wait time for a shoulder MRI. The efficacy of determination of rotator cuff tears will also increase after the introduction of shoulder USG.

Keywords: Shoulder, rotator cuff tears, MRI, ROM, stiffness.

Introduction:

Rotator cuff tears are common cause of debilitating pain, reduced shoulder function and weakness. This condition affects 30% or more of patients older than 60 years and is encountered in about 50% of patients over 70 years.^{1,2} 40% of rotator cuff tears, if left untreated, increase in size, while none of these cases show decrease in size of the tear or spontaneous healing.³

According to the Moosmayer et al,⁴ out of 50 subjects with an asymptomatic rotator cuff tears at the study start, 18 developed symptoms at the mean time of 18 months. Performing physical examination in patients with stiff shoulder, however, is difficult because of pain and deficient shoulder ROM. Imaging studies therefore, are suggested in combination with physical test to reduce the uncertainty about diagnosing rotator cuff tears.⁵ MRI provides an

anatomic picture, demonstrates the quality of rotator cuff muscles and is very commonly used in clinical practice for detection of rotator cuff tears or shoulder stiffness. However, the cost of MRI examination is far beyond that of a USG examination. Shoulder USG performed by a technician and interpreted by a radiologist with expertise has been shown to be accurate in detecting full thickness and partial thickness of the rotator cuff.⁶ Sensitivity and specificity of the USG for the diagnosis of symptomatic full thickness rotator cuff tears were reported to range from 91 to 100% and 85 to 86% respectively.^{7,8} The technique also provides by bilateral information without being affected by the presence of intraosseous hardware, is better tolerated and allows the patient to view real time information with immediate results. It is also less expensive than MRI. If the integrity of the rotator cuff is confirmed by shoulder USG, orthopedic surgeons and patients can be more confident of achieving successful results with non-operative treatment in patients with stiff shoulder without rotator cuff tears.

Aims and Objectives:

To assess the utility of USG in the diagnosis of shoulder rotator cuff tears.

Materials and Methods:

14 patients who were suspected to have rotator cuff tears were included in the study. Patient information was anonymous and deidentified prior to analysis. Written informed consent was given by participants for their clinical records to be used in the study at the first OPD. Patients who were suspected to have rotator cuff tears were arranged for shoulder MRI exam at OPD or a day before surgery by a single orthopedic surgeon (AC). Patients presenting to the clinic with previously obtained MRI images from other hospitals were excluded from the study. Patients were divided into 2 groups, USG (-) and USG (+). Patients from USG (-) group (from Dec 2016 to Jul 2017) were those who had arranged MRI exam at OPD without any prior shoulder USG screening. Patients from USG (+) group (from Aug 2017 to Aug 2018) were those who had arranged MRI exam at OPD with prior shoulder USG screening on the same date. Patients in the USG (-) group underwent MRI exam without prior shoulder USG screening because radiologists in our hospital were not available to perform shoulder USG for orthopedics at that time.

Imaging techniques: All the patients had undergone standardized bilateral shoulder USG performed by expert radiologist. A full thickness rotator cuff tear was defined when the rotator cuff could not be visualized because of a complete avulsion and retraction under the acromion. A partial thickness tear was defined when a distinct hypoechoic or mixed hyperechoic and hypoechoic defect was visualized in both the longitudinal and transverse plane at the deep articular site of the rotator cuff. MRI scans were performed in all patients with suspected rotator cuff tears who did not undergo a shoulder USG scanning before Jul 2017 and all the patients with rotator cuff tears screened by shoulder USG after Aug. 2017. All examinations were performed in a closed 1.5-T magnet with field of view from 14 to 16 cm and the use of T1 and T2 – weighted image sequences in sagittal, coronal oblique, and axial planes. Intra-articular gadolinium was sometimes administered, especially when partial thickness tear of rotator cuff or concomitant labrum lesions were suspected. The total size in the anterior-posterior and medial-lateral dimensions were measured in cms using the MRI scale noted on the image.⁹

Indications for surgery: The indication for operation included shoulder pain of more than 3 months duration and lack of response to non-operative treatment including physiotherapy, non-steroidal anti-inflammatory medications and at least 3 cortisol injections. Patients with full thickness tear who had recent traumatic injury diagnosed through shoulder USG or MRI were offered the option of an operation within less than 3 months.

Results:

The USG (-) group included 6 patients, 4 males and 2 females, that had received arthroscopic repair from Dec 2016 to Jul 2017. The mean age ranged between 28 to 70 years. In the USG (+) group, there were 8 patients, 4 males and 4 females, that had received arthroscopic rotator cuff repair from Aug 2017 to Aug 2018. The mean age ranged between 28 to 76 years. Patients in USG (-) group had waited a mean of 36.4 ± 22.6 days from OPD to MRI exam, 42.8 ± 44.5 days from MRI to operation (OP) and 79.2 days from OPD to OP. Patients with USG (+) had waited 25.8 ± 13.2 days from OPD to MRI, 11.3 ± 18.7 days from MRI to OP and 37.1 days from OPD to OP. The wait time of OPD visit to OP and MRI to OP in patients who received shoulder USG was significantly less than that in patients did not

receive shoulder USG screening. Only 3 (21.4%) of patients with suspected rotator cuff injury undergone arthroscopic cuff repair before USG was applied as a screening tool. The percentage increased to 46.8 after orthopedic surgeon started using USG as a screening tool for rotator cuff tears. 50 patients received an MRI exam in the USG (-) group, while only 6 patients underwent operation eventually. The patients who had been suspected to have rotator cuff injury proceeded to undergo an arthroscopic rotator cuff repair. In the USG (+) group, 25 patients who were suspected to have rotator cuff tears diagnosed through history taking and physical examination were arranged for shoulder USG. Among them, 8 were diagnosed with rotator cuff tears from USG and MRI were arranged. 14 rotator cuff tears were found after both the imaging evaluation.

Discussion:

Currently no single test alone is sufficient to diagnose rotator cuff disease.⁵ MRI provides an anatomic picture, demonstrates the quality of rotator cuff muscles and the degree of tendon retraction, and shows other eventual intra-articular and extra-articular pathologies.⁷ However, MRI examinations are expensive to perform and motion artifacts can not be avoided, especially when the patient is with parkinsonism, which can be extremely problematic and restless patients are in those who suffer from claustrophobia.¹⁰

USG of the shoulder had been recently employed as a screening tool because it is simple, quick, affordable and provides an immediate imaging method as an adjunct to clinical evaluation and a high rate in detection of full thickness rotator cuff tears.¹¹ Yamamoto et al performed USG screening for rotator cuff tears in 683 residents of a Japanese mountain village and revealed that 283 shoulders in 211 individuals between 34 and 87 years of age had full thickness rotator cuff tears.¹²

USG is a cheaper and quicker than MRI and it is as accurate as MRI in the detection of rotator cuff tears.^{13,14} High-resolution USG is believed to have 100% sensitivity, 85% specificity and 96% accuracy in detecting full thickness rotator cuff tears.⁸ In a study of 61 patients, Brenneke and Morgan found that USG had a sensitivity of 95% and a specificity of 93% for the detection of full thickness tears.¹⁵ Thus USG may help to screen patients effectively prior to more advanced imaging methods in some cases.¹⁶

Our study is consistent with the other studies.

Conclusion:

Shoulder USG examination can be used in conjunction with the patients' clinical history and physical examination and provides important information regarding rotator cuff condition. It reduces wait time from first time OPD visit to final surgery and MRI to final surgery and in patients with rotator cuff tears. Improved diagnostic accuracy with better clinical correlation can not only facilitate subsequent treatment planning, but also lessen the overwhelming time schedule of a screening MRI for equivocal cases.

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