Diagnostic Axial MRI of Rotator Cuff Injuries

Kirk Shane Russell¹, J.Antoni Parellada², John A. Carrino³, Mark E. Schweitzer⁴
¹Thomas Jefferson University, 111 11th Street, Philadelphia, PA 19107, Philadelphia, Pennsylvania United States; ²Thomas Jefferson University, 111 11th St, Philadelphia, Pa ; ³Thomas Jefferson University, 111 11th Street, Philadelphia, Pa ; ⁴Thomas Jefferson University, 111 11th Street, Philadelphia, PA 19107, Philadelphia, PA U.S.A.;

Introduction
MR has a high accuracy in evaluating for rotator cuff tears. The supraspinatus tendon is most commonly involved, particularly in its distal 2 cm.—termed, critical zone. Largely, the diagnosis depends on identifying signal abnormalities within the normal low signal intensity tendon fibers. Coronal oblique imaging shows the tendon of the supraspinatus to best advantage, since they are prescribed parallel to the course of the tendon. However, patient motion secondary to pain or sub-optimal prescription of coronal images occasionally leads to inadequate coronal oblique images. Although less informative, sagittal obliques images are also routinely utilized in this setting. Our study assessed the usefulness of axial images as an additional source of diagnostic information in determining the integrity of the rotator cuff.

Methods
At 1.5T, FSE, intermediate-weighted axial (TR=3050, TE =30, FOV=160, ETL=8, Matrix=256 x 256) images, of ninety-two patients with surgically proven rotator cuff status were retrospectively analyzed by two musculoskeletal radiologists blinded to the surgical reports and the non-axial MR sequences. Each case was classified into one of three categories: normal cuff/tendinosis, partial tear (bursal or articular-sided), and full-thickness tears. MR criteria for normal/tendinosis were no fluid-like signal changes or tendon disruption. Partial tears were defined as focal high intensity signal interruptions. Criteria for a full-thickness tear was a complete fluid-like gap in the tendon with or without proximal retraction of the leading edge of the tendon with or without exposure of the underlying humeral head. Secondary criteria utilized included muscle atrophy manifested by loss of outward convexity of the muscle belly, and fatty replacement of muscle fibers. The results of the image interpretation were compared to the final surgical findings. The specificity, sensitivity, accuracy, positive predictive value (ppv), and negative predictive value (npv) were then calculated.

Results
Of the 107 patients examined at surgery, 15% had partial tears and 56% had complete tears. 29% had tendonosis or normal rotator cuffs. The accuracy of the axial plane for partial tears was 73%, (sensitivity 75%, specificity 68%, ppv 57%, and npv 83%). The accuracy for full thickness tears was 80%, (sensitivity 85%, specificity 69%, ppv 85%, and npv 69%).

Discussion
Surprisingly, axial MR images are highly accurate in the evaluation of rotator cuff pathology. The best positive predictive value is for full-thickness tears, probably in relation to the common presence of secondary signs related to the chronicity of the process, such as muscle atrophy and tendon retraction. Axial images are also accurate in classifying a tendon as normal/tendinosis (negative predictive value =74%). Therefore, axial images offer valuable information, which can potentially increase the diagnostic accuracy of MR in assessing rotator cuff lesions.

References

---

Supraspinatus full-thickness tear, shown as a fluid-like signal gap traversing the fibers of the tendon.

Supraspinatus tendon undersurface tear, shown as a fluid-like extravasation of the tendon fibers in continuity with the glenohumeral joint.