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Are radiologists superior to orthopaedic surgeons in diagnosing instability-related shoulder lesions on magnetic resonance arthrography? A multicenter reproducibility and accuracy study

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Background: We compared the diagnostic reproducibility and accuracy of musculoskeletal radiologists with orthopaedic shoulder surgeons in 2 large medical centers in assessing magnetic resonance arthrograms (MRAs) of patients with traumatic anterior shoulder instability.
Methods: Forty-five surgically confirmed MRAs were assessed by 4 radiologists, 4 orthopaedic surgeons, 2 radiologic teams, and 2 orthopaedic teams. During MRA assessment and surgery, the same 7-lesion scoring form was used. κ Coefficients, sensitivity, specificity, and differences in percentage of agreement or correct diagnosis ($P < .05$, McNemar test) were calculated per lesion and overall per the 7 lesion types.
Results: The overall κ between the individual radiologists ($\kappa = 0.51$, $\kappa = 0.46$) and orthopaedic surgeons ($\kappa = 0.46$, $\kappa = 0.41$) was moderate. Although the overall percentage of agreement between the radiologists was slightly higher than that between the orthopaedic surgeons in both centers (80.0% vs 77.5% and 75.2% vs 73.7%), there was no significant difference. In each medical center, however, the most experienced orthopaedic surgeon was exceedingly more accurate than both radiologists per the 7 lesion types (81.9% vs 72.4%/74.6% and 76.5% vs 67.3%/73.7%). In 3 of 4 cases, this difference was significant. Overall accuracy improvement through consensus assessment was merely established for the weakest member of each team.
Conclusion: Experienced orthopaedic surgeons are more accurate than radiologists in assessing traumatic anterior shoulder instability–related lesions on MRA. In case of diagnosis disagreement, these orthopaedic surgeons should base their treatment decision on their own MRA interpretation.

No Dutch regional ethics committee approval was required for this study, and the need for informed consent was waived. The study was, however, approved by the scientific committee (LTC Alysis Zorggroep) of Rijnstate Hospital (LTC479/270807), and the radiologic and orthopaedic departments were instructed accordingly.

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To restore traumatic anterior shoulder instability (TASI), surgery is often needed because the recurrence rate in young patients is 80% to 90%.[1,21,30,31,38-41] Although orthopaedic surgeons base their diagnosis on patient history, physical examination findings, and plain radiographs,[5,23,24,31,40-42] additional magnetic resonance arthrography (MRA) imaging is used to confirm the clinical diagnosis.[1,3,5,6,9-12,15-17,19-21,23,25,28-31,33-37,39,41]

The impact of MRA assessment by radiologists is high because imaging results (lesion type, location, and severity) may directly influence the treatment decision of the orthopaedic surgeon from a nonsurgical to arthroscopic or open surgical approach, and treatment success depends on the accuracy of the preoperative MRA diagnosis and agreement between the two disciplines.[1,3,6,9,12,16,21,30,31,36,39,41] The accuracy rates of radiologists for instability-related lesions are high, with sensitivities ranging from 79% to 100% and specificities from 85% to 100%,[4,9-12,14-16,18,20,21,23,29,31,35-37] although much lower accuracy rates also have been mentioned.[24,25,28,40,41] Agreement between radiologists about the presence of TASI-related lesions on MRA is, however, highly variable, with κ values ranging from poor (−0.003) to almost perfect (0.84).[13,15,20,28-30,38,41] The same seems true regarding MRA agreement between radiologists and orthopaedic surgeons (with κ values ranging from −0.007 to 0.86), although only a few authors have reported on this subject.[10,13,28,29]

When faced with disagreement about an MRA diagnosis in daily clinical practice, the orthopaedic surgeon has to decide whether he or she should base the treatment decision on his or her own MRA interpretation or that of the radiologist. The literature is not very helpful regarding this because the results have been inconclusive. Both superior[13] and inferior[24] accuracy rates of radiologists and no difference in accuracy[10,28,29] between radiologists and orthopaedic surgeons have been described.

Thus, we prospectively compared the diagnostic reproducibility and accuracy of experienced musculoskeletal radiologists with those of experienced orthopaedic shoulder surgeons assessing high-field MRAs of patients with TASI in 2 large medical centers. Furthermore, we evaluated the influence of consensus assessment compared with individual assessment. We hypothesized that the MRA assessments of the radiologists would be superior and that consensus assessment would outperform individual assessment.

Materials and methods

To perform a prospective diagnostic performance study, we designed the study protocol before data collection was started. All consecutive patients with suspected TASI who were referred for a 1.5-T MRA scan between 2007 and 2011, after undergoing TASI reduction and stabilizing surgery, were considered for enrollment. Patients who underwent previous shoulder surgery, who underwent a shoulder procedure between magnetic resonance imaging (MRI) and stabilizing surgery, who had epilepsy, or who were skeletally immature (aged <16 years) were excluded. Ultimately, 45 MRAs were included.

MRA (index test)

Shoulder MRA was performed per protocol at Rijnstate Hospital (Arnhem, The Netherlands) with a Siemens Magnetom Avanto Tim system, [32 × 8], with a small-extremity coil (Siemens AG, Munich, Germany) or an ACS Intera Gyroscan system (replaced in 2008 by an Achieva system) with a Synergy Flex-M surface shoulder coil (Philips, Best, The Netherlands). The sequences used have been fully described in an article we previously published.[41] The patient was positioned supine with the arm slightly abducted and externally rotated. During the abduction–external rotation (ABER) view, the patient placed the hand of the affected extremity behind the head or neck. Arthrography was performed within 30 minutes of MRI to obtain optimum imaging. With fluoroscopic guidance, through an anterior approach, a 21-gauge needle was inserted into the inferior or superior-medial quadrant of the humeral head. Correct intra-articular needle position confirmation was obtained by injecting 2 to 3 mL of iodinated contrast agent and 14 to 16 mL of diluted gadolinium complex (Xenetix 300 and Artirem; Guerbet Nederland, Gorinchem, The Netherlands) into the glenohumeral joint. The radiologic reports for MRAs of sufficient quality were submitted to the orthopaedic department to confirm diagnosis and to plan treatment.

Reference standard

All 45 shoulder stabilizations were performed at Rijnstate Hospital by experienced shoulder surgeons. MRAs were accessible during surgery. Patients received regional anesthesia with an interscalene brachial plexus block and were placed in the lateral decubitus or beach-chair position. After instability severity and direction testing, the affected arm was slightly abducted and externally rotated under gentle longitudinal traction. A 30°, 4-mm arthroscope was inserted through the posterior portal, and the other instruments were inserted through 2 anterior portals. The shoulder was systematically inspected according to a standardized