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Original Article

Humeral avulsion of glenohumeral ligaments – Detection on magnetic resonance arthrography

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ABSTRACT

Background: Humeral avulsion of the glenohumeral ligaments (HAGL) is an important cause of shoulder instability, with magnetic resonance arthrography (MRA) routinely being used for diagnosis. Our aim was to compare the diagnostic value of MRA to shoulder arthroscopy for the detection of HAGL lesions and to calculate its prevalence.

Methods: Patients who underwent a shoulder arthroscopy with a single surgeon and pre-operative MRA between February 2011 and March 2012 for instability were identified. MRAs were reported by experienced musculoskeletal radiologists and compared to arthroscopy findings for the presence of HAGL lesions. Sensitivity, specificity, positive and negative predictive values, prevalence and positive and negative likelihood ratios were calculated.

Results: A total of 194 patients were identified with a HAGL lesion prevalence of 4.64% on arthroscopy. The sensitivity of MRA in detecting HAGL was 0.44 (CI: 0.14–0.79) and the specificity was 0.97 (CI: 0.94–0.99). The positive predictive value was 0.44 (CI: 0.14–0.79) and negative predictive value was 0.97 (CI: 0.94–0.99). The positive likelihood ratio was 16.44 (CI: 5.30–51.00) and negative likelihood ratio was 0.57 (CI: 0.32–1.02).

Conclusions: MRA appears to be specific and accurate in excluding HAGL lesions, but not sensitive. HAGLs were associated with numerous other injuries such as bankart, SLAP and Hill–Sach lesions. The prevalence of 4.64% is comparable to previous studies.

1. Introduction

Humeral avulsion of glenohumeral ligaments (HAGL) is an important cause of shoulder instability.[1] Instability usually arises as a result of acute trauma from glenohumeral subluxation or dislocation, with a combination of hyperabduction and external rotation.[2] MRA is well established in assessing glenohumeral pathology but its role in identifying HAGL lesions is under-reported in literature.[3] Jana et al. and Carlson described the J-sign referring to the conversion of the U-shaped axillary pouch to a J-shape as the inferior glenohumeral ligament (IGHL) complex drops inferiorly.[3,4] Other characteristics include increased intensity, thickening of the inferior capsule, a

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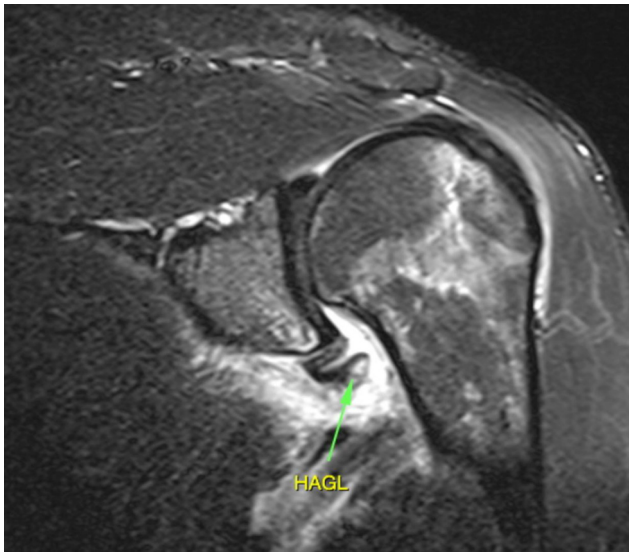

Fig. 1 – A MRA demonstrating a HAGL lesion.

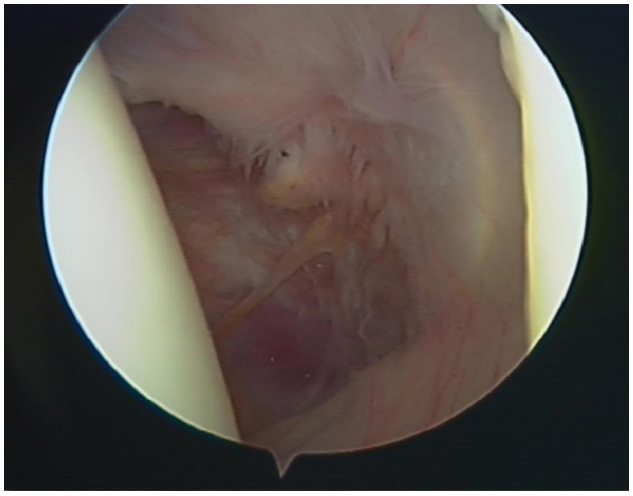

Fig. 2 – A HAGL lesion on shoulder arthroscopy.

thickened wavy contour and higher intensity within the ligament itself, and extravasation of contrast material along the humeral neck (Fig. 1).[3,4]

Shoulder arthroscopy is the gold standard in detecting HAGL lesions through direct visualisation.[5] The distinguishing sign is visualisation of fibres of the subscapularis through the avulsed inferior joint capsule.[6] Bokor et al. described a disruption of the 'wave' between the reflection of the inferior capsule onto the humeral neck to be a reliable sign of HAGL lesions.[7]

The aim of our study is to assess the diagnostic value of MRA in detecting HAGL lesions compared with arthroscopy and to calculate the prevalence within our study group (Fig. 2).

2. Materials and methods

Shoulder arthroscopies performed by a single Consultant Orthopaedic Surgeon between February 2011 and March 2012 for instability were identified using the surgeon's operative records. All patients attended an initial outpatient clinic and were found to have clinical instability on examination, with suspicion of glenohumeral pathology including the possibility of a HAGL lesion. Of these patients, only those who had a pre-operative MRA were included and identified through PACS (Centricity PACS, GE Healthcare), Bluespier (Bluespier International, Droitwich, UK) and clinic letters. Patients were included regardless of demographics, background, side of operation or indication. The MRAs were requested by the Orthopaedic Surgeon to ensure that radiologists were made aware of the positive clinical findings on the request forms. The investigations and procedures were conducted over three hospital sites. 1.5T MRI scanners with gadolinium as contrast were used throughout with a routine standard protocol of T1 and T1 fat–sat axial, T1 fat–sat coronal and sagittal obliques, T2 fat–sat coronal oblique. All MRAs were reported by experienced specialist musculoskeletal radiologists. Findings were only included as positive when the radiologists or arthroscopist were definitive in their diagnosis.

2.1. Statistics

Sensitivities, specificities, positive and negative predictive values (PPV/NPV), positive and negative likelihood ratios (PLR/NLR) were calculated using Statistical Package for Social Sciences (SPSS) version 22.0 (SPSS Inc. Chicago, IL, USA, 2014).

3. Results

A total of 744 patients underwent shoulder arthroscopic procedures for instability, of which 194 patients had a pre-operative MRA. Patients whose pathology was easily identifiable, or not related to a HAGL, on clinical examination or simpler radiological investigations such as ultrasound and X-rays did not have an MRA. The mean age was 29.9 years with a range between 13 and 69 years. 73%/27% of patients were males/females. Right to left ratio was nearly equal (52%:48%).

The prevalence of HAGL lesions on arthroscopy was 4.64% (9/194 cases). There were 4 true positives, 180 true negatives, 5 false positives and 5 false negatives. The sensitivity and specificity was 0.44 (CI: 0.14–0.79) and 0.97 (CI: 0.94–0. 99) respectively. The PPV was 0.44 (CI: 0.14–0.79) and NPV was 0.97 (CI: 0.94–0. 99). The PLR was 16.44 (CI: 5.30–51.00) and NLR was 0.57 (CI: 0.32–1.02). Table 1 summarises the statistical analysis.

Table 1 – A table to show the sensitivity, specificity, positive likelihood ratios (PLR), negative likelihood ratios (NLR), positive predictive value (PPV) and negative predictive value (NPV) with 95% confidence intervals.

Statistical test	Value	95% confidence intervals
Sensitivity	0.44	0.14–0.79
Specificity	0.97	0.94–0.99
Positive likelihood ratio	16.44	5.30–51.00
Negative likelihood ratio	0.57	0.32–1.02
Positive predictive value	0.44	0.14–0.79
Negative predictive value	0.97	0.94–0.99