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Inferior Glenohumeral Ligament (IGHL) Injuries: A Case Series of Magnetic Resonance (MR) Imaging Findings and Arthroscopic Correlation

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ABSTRACT

Introduction. The inferior glenohumeral ligament (IGHL) complex commonly is assessed by both magnetic resonance imaging (MRI) and magnetic resonance (MR) arthrogram. Our study compared the accuracy of MR arthrogram compared to MRI using arthroscopic correlation as the gold standard.

Methods. A retrospective review of cases reporting an IGHL injury was performed. Seventy-seven cases met inclusion criteria, while five had arthroscopic reports that directly confirmed or refuted the presence of IGHL injury. Two arthroscopic reports confirmed concordant IGHL injuries, while three arthroscopic reports mentioned discordant findings compared to MR. All three discordant cases involved MR arthrogram. Findings included soft tissue edema, fraying of the axillary pouch fibers, and cortical irregularity of the humeral neck. Of the two concordant cases, one was diagnosed by MRI, revealing an avulsion of the anterior band, while the second was diagnosed by MR arthrogram showing ill-defined anterior band fibers. Many cases involved rotator cuff or labral tears, which may have been the focus of care for providers, given their importance for shoulder stability. Additionally, a lack of diagnostic confidence in MR reports may have influenced surgeons in the degree to which they assessed the IGHL complex during arthroscopy.

Conclusion. Radiologists seemed more likely to make note of IGHL injuries when MR arthrograms were performed; meanwhile, all three discordant cases involved MR arthrogram reads. Therefore, additional larger studies are needed with arthroscopic correlation to elucidate MR findings that confidently suggest injury to the IGHL complex, to avoid false positive radiology reports. ***Kans J Med 2020;13:275-279***

INTRODUCTION

The inferior glenohumeral ligament (IGHL) complex, composed of an anterior band, posterior band, and interposed axillary pouch, is an important structural stabilizer of the inferior aspect of the shoulder that provides protection against shoulder instability and dislocation.[1-6] Anterior shoulder instability is a relatively common problem following traumatic shoulder injury, with a reported incidence of 24 per 100,000 person-years.[7-9] The most common type of IGHL injury, humeral avulsion of the glenohumeral ligament (HAGL), has an estimated prevalence of 1.6% on shoulder magnetic resonance (MR) examinations,[10] and has been documented in 1 - 9% of patients with recurrent shoulder instability.[2,11] Current management of IGHL injuries involves either conservative management with immobilization followed by physical therapy, arthroscopic repair, or less commonly, open surgical repair. Prior research has demonstrated magnetic resonance imaging (MRI) to be highly sensitive and specific for the diagnosis of soft tissue injuries of the shoulder.[12,13] Shoulder magnetic resonance arthrography has shown greater accuracy in the evaluation of rotator cuff and labral pathology compared to conventional shoulder MRI without intra-articular contrast.[14-20] Both MR arthrography and conventional MR without intra-articular contrast are used to diagnose IGHL injuries at our institution.

In general, diagnosis of IGHL tear can be a challenge. When evaluating the IGHL, it first is important to consider the anatomy and what variations of injury can occur. The IGHL is an inferior capsular structure which, in conventional imaging position (patient's arm adducted), appears as a redundant fold in the shape of a U on coronal oblique images. Either the anterior band, the axillary pouch, or the posterior band can be injured. In making the diagnosis of an IGHL tear, one would attempt to identify a complete tear of the fibers or a complete avulsion from the fiber attachment site. An avulsion of the fibers can occur either from the glenoid attachment or humeral attachments. An intrasubstance tear of the axillary pouch also can occur. In either case, identification of fluid or contrast signal intensity to define the site of tear/avulsion is key. Avulsion of the anterior or posterior IGHL bands can be identified on coronal sequences when the avulsed fibers fall inferiorly, resulting in a J shape rather than the expected U shape with an intact IGHL.[21]

Although research, such as Liavaag and colleagues,[22] has been performed regarding imaging of IGHL injuries, several important questions remain unanswered. First, few studies have used direct visualization at arthroscopy to assess diagnostic accuracy of MR for shoulder injuries.[12,14,17] However, to our knowledge, no study has used direct visualization by arthroscopy to assess diagnostic accuracy of MR for IGHL injuries. Also, little is known regarding the natural history of conservative management of IGHL injuries. One study reported that nearly 67% of IGHL injuries documented by MRI went on to resolve spontaneously on follow-up imaging within three months of conservative management.[22] In addition, it is unclear if different subtypes of IGHL injury necessitate different surgical approaches.[23] Finally, it is unknown whether MR arthrography increases accuracy of diagnosing IGHL injuries compared to conventional MRI without intra-articular contrast or whether the time between traumatic shoulder injury or the presence of joint effusion affects diagnostic accuracy.

As a result, the increasing recognition of IGHL injury as a contributor to shoulder instability further accentuates the need for greater understanding of the diagnostic accuracy of MR in detecting these injuries, as well as the natural history of IGHL injury when managed conservatively. Our study investigated the accuracy of IGHL injury diagnosis at our center using arthroscopy findings as a gold standard.

METHODS

This study was approved by our hospital's institutional review board for human investigation. A retrospective review of all patients diagnosed with IGHL injury by conventional MRI or MR arthrography at the University of Kansas Medical Center (KUMC) between January 1, 2000 and December 31, 2017 was conducted using keywords (see Appendix). Initial imaging findings and follow-up imaging results were obtained from the Picture Archiving and Communications Systems (PACS) system. Patient demographics and clinical information were obtained from the medical record, including date of birth, gender, race, ethnicity, history of trauma, history of shoulder dislocation, and whether there had been prior IGHL repair.

RESULTS

A total of 199 MR exams were evaluated. The exclusion criteria of patient age less than 18 years, prior surgery on the affected shoulder, or review of the MR report revealing that no IGHL injury was diagnosed, were met in 122 cases. Of the 77 cases which met inclusion criteria, 72 lacked explicit mention to confirm or refute the IGHL injury diagnosed on MR (Figure 1). This left a total of five cases to analyze which had both an MR report diagnosing IGHL injury and an arthroscopy report which addressed the presence or absence of IGHL injury (Table 1). Of these five, two cases had arthroscopy findings concordant with the IGHL injury diagnosed at MR, while the remaining three arthroscopy reports explicitly refuted the presence of an IGHL injury.

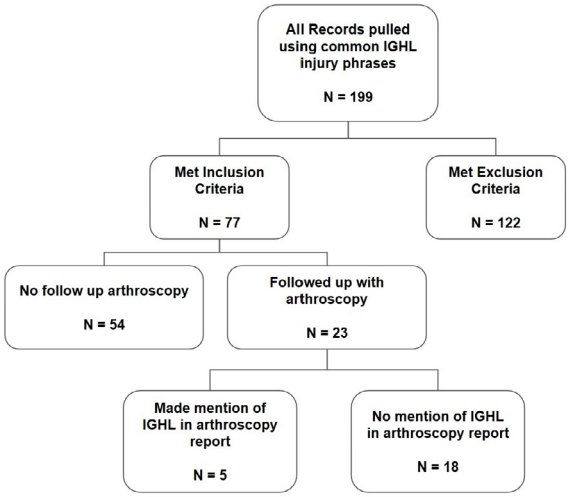

Figure 1. Flowchart of identified cases.

Of the two concordant cases, one injury was due to trauma sustained during a high-speed motor vehicle collision. Clinically, this patient had significant instability. MRI of the shoulder without intra-articular contrast revealed avulsion of the anterior band and axillary pouch fibers of the IGHL, which were displaced into the glenohumeral joint space (Figure 2). This tear was repaired surgically and clinical follow-up indicated stability of the affected shoulder. The second concordant case was evaluated by MR arthrography. In this case, there was a history of both non-traumatic and traumatic recurrent anterior shoulder dislocation. The patient underwent operation due to persistent shoulder pain and instability, which was refractory to conservative management (physical therapy). MR imaging of the second concordant case revealed ill-definition of the fibers of the anterior band and axillary pouch of the IGHL which was confirmed at arthroscopy as a small rent in the inferior aspect of the joint capsule, which was not repaired surgically. This patient was found to have a posterior labral tear at arthroscopy which was repaired, followed by an uneventful postoperative course.

Table 1. Patient characteristics.

	Case 1	Case 2	Case 3	Case 4	Case 5
Age at MR	33	35	28	39	35
Gender	Male	Female	Female	Male	Male
Race	White	White	Unknown	White	White
Ethnicity	Non-Hispanic/ Latino	Non-Hispanic/ Latino	Unknown	Non-Hispanic/ Latino	Non-Hispanic/ Latino
Presentation	Instability	Instability	Trauma-MVC	Trauma-Explosion	Trauma-Sports
History of Dislocation	Yes, at or immediately before time of presentation	Yes, history of recurrent dislocation	No	No	No
IGHL Injury Type	HAGL	Remote IGHL injury	Posterior HAGL	HAGL	Chronic IGHL tear
MRI Exam Type	MRI	MRA	MRA	MRA	MRA
Joint Effusion	Trace/small	Missing	Missing	None	None
Associated Injury	Scapula fracture	Hill Sachs Lesion	None	None	Rotator Cuff Tear - Supraspinatus
Arthroscopy Concordance	Concordant	Concordant	Discordant	Discordant	Discordant
Documented Recovery	Yes	Yes	Yes	Yes	No

Abbreviations: MR = magnetic resonance; MRI = magnetic resonance imaging; MRA = magnetic resonance angiography; MVC = motor vehicle crash; HAGL = humeral avulsion of the glenohumeral ligament; IGHL = inferior glenohumeral ligament.

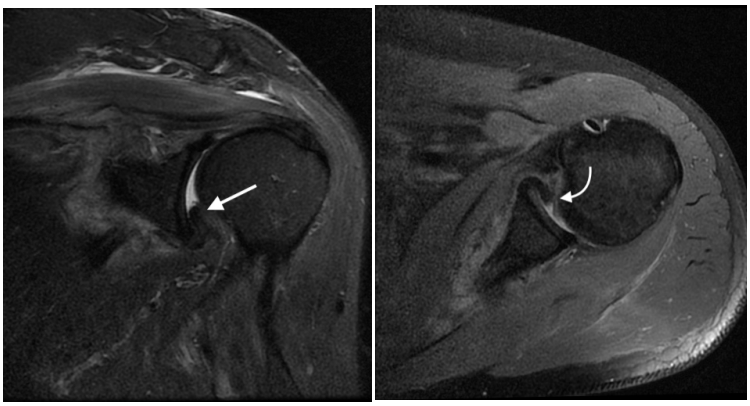

Figure 2. Coronal T2 fat saturated image (left) demonstrated avulsion of the anterior band of the IGHL from its humeral attachment (straight white arrow), consistent with a HAGL lesion. Axial proton density fat saturated image (right) demonstrated the displaced anterior band of the IGHL into the glenohumeral joint space (curved white arrow). Note the posterior subluxation of the humeral head relative to the glenoid process in the imaging position.

All three discordant cases were MR arthrograms. These had varying MR findings/descriptions of IGHL injury. One described soft tissue edema around the posterior band IGHL fibers. A second discordant case demonstrated irregularity of the inferior joint capsule and fraying of the axillary pouch fibers of the IGHL, as well as cortical irregularity of the humeral neck, suggesting the site of IGHL avulsion. There also was apparent intra-articular contrast extravasation noted, suggesting a disruption in the inferior joint capsule. This patient clinically lacked history of trauma and objective or subjective instability, but rather only presented with chronic shoulder pain. The third discordant case mentioned findings of abnormal IGHL contour and IGHL irregularity, suggesting this represented a chronic tear of the IGHL. The arthroscopy report specifically commented that both the anterior and posterior bands of the IGHL were intact. A superior labral tear was identified and repaired at surgery in this case.

DISCUSSION

There were several limitations to this retrospective cohort review study. The main limitation was due to lack of arthroscopic correlation for cases where an IGHL injury was diagnosed by MR. Specifically, 72 cases were identified with MR reports diagnosing IGHL injury, which went on to arthroscopy and had operative reports which did not mention the presence or absence of IGHL injury. Many of these patients had labral tears and/or rotator cuff tendon pathology which were repaired. It may be that the predominant clinical concern in these patients pertained more to labral and rotator cuff pathology, therefore, the IGHL was not a primary focus of concern. An additional possibility is that some of the studies, particularly the non-arthrographic studies, had reports which entertained other etiologies for findings thought to represent IGHL tears. This lack of diagnostic confidence and certainty may have influenced the surgeons.

Another important consideration with respect to our study was the propensity for untreated IGHL injuries to heal. Liavaag et al.[22] studied a cohort of patients with primary shoulder dislocations and identified HAGL lesions by MRI in 21% of patients who were imaged within seven days of injury compared to only 7.1% of patients were imaged at follow-up (21 - 54 days after initial injury). It is conceivable that some situations of discordance could be explained by interval healing between the MR exam and arthroscopy.

Due to the small number of cases (n = 5) which were analyzed completely, few similarities can be identified between the cases. Of the concordant cases, one was a non-arthrogram MRI of the shoulder and the other was an arthrogram. Of the three discordant cases, all three were arthrograms. The fact that four of five analyzable cases were arthrograms may be due in part to the better distension of the joint capsule with MR arthrogram, which improves visualization and characterization of the IGHL. The improved visualization seemed to result in reports which more confidently attributed findings to IGHL tears. More confident reporting likely influenced the surgeons to evaluate more closely the IGHL at arthroscopy.

It seems evident from our study that radiologists were more likely to comment on the IGHL when an MR arthrogram was performed. The three discordant cases in this series illustrated the importance of critically scrutinizing subtle findings detected on MR arthorgrams to not overcall the injury. Other considerations of note have been explored by Wang et al.[24] pertaining to true and false positive MR arthrograms with respect to IGHL integrity. Specifically, they reported that isolated extravasation of contrast from the posterior portion of the axillary pouch of the IGHL was seen only in cases of iatrogenic extravasation and never identified with a true tear. This factor could have played a role in one of our three discordant false positive cases which demonstrated contrast extravasation. Overall, detailed evaluation of the IGHL was improved with an MR arthrogram, but each of our three discordant cases lacked a clearly visualized avulsion of the IGHL fibers.

In conclusion, additional larger studies are needed with arthroscopic correlation to identify meaningful MR findings which may increase diagnostic confidence and allow radiologists to be more accurate when alerting surgeons to the presence of IGHL pathology. It is possible that, as more research is performed demonstrating the clinical significance of IGHL injury in the setting of shoulder instability, that surgeons will be more likely to evaluate the integrity of the IGHL at arthroscopy in patients with pain and instability, which, in turn, will increase arthroscopic correlation with MR findings to improve sensitivity and specificity of detecting these important injuries.

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Keywords: joint instability, avulsion fracture, shoulder dislocation, humerus, injuries

APPENDIX

Terms Used as Keywords for Retrospective Review of MR Reports

1. Inferior glenohumeral ligament injury
2. IGHL injury
3. Inferior glenohumeral ligament tear/torn
4. IGHL tear/torn
5. Humeral avulsion of the glenohumeral ligament
6. HAGL
7. Bony humeral avulsion of the glenohumeral ligament
8. BHAGL
9. Glenoid avulsion of the glenohumeral ligament
10. GAGL
11. Posterior humeral avulsion of the glenohumeral ligament
12. PHAGL
13. Reverse humeral avulsion of the glenohumeral ligament
14. RHAGL
15. Axillary pouch tear/torn
16. Axillary pouch injury
17. Floating/Anterior inferior glenohumeral ligament injury
18. Floating/Anterior inferior glenohumeral ligament avulsion
19. AIGHL
20. Anterior ligamentous periosteal sleeve avulsion
21. ALIPSA