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Magnetic Resonance Arthrography in Assessment of Glenohumeral Labroligamentous Injuries, Revisited with Emphasis on Challenges and Added Value of Abduction External Rotation Position

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Abstract

Background: The glenohumeral joint is the most common joint to become unstable and get dislocated. MRI and MR arthrography are the mainstay diagnostic imaging modality requested for preoperative planning.

Aim of Study: The aim of this study was to assess the diagnostic value of direct MRA, with inclusion of an additional Abduction and External Rotation (ABER), in evaluation of different labrum and ligamentous injuries, using arthroscopy as the gold standard.

Patients and Methods: An observational, analytical, and prospective study which included 92 patients, for whom MRI and MR ARTHROGRAPHY with additional ABER was done and the imaging results were compared to arthroscopy as gold standard.

Results: MRI and MR ARTHROGRAPHY with additional ABER revealed 49 labrum injuries, 6 ligamentous injuries and 3 capsular injuries. Other findings included 5 biceps/labrum anchor tear, 17 rotator cuff pathologies, 12 Hill Sachs and 2 reverse Hill Sachs injuries. The labral injuries: 24 anterior inferior labrum injury, 16SLAP, 7 posterior labrum injury, 2 superior anterior labrum injury. The glenohumeral ligaments injuries: 3 IGHL, 2 MGHL, and 1 patient had both MGHL and IGHL injury. Seventy patients underwent arthroscopy. Statistical analysis of MR ARTHROGRAPHY with ABER in evaluation of labrum and ligamentous injuries with reference to arthroscope as a gold standard yielded 97.4% sensitivity, 93.5% specificity, 95% PPV, 96.6% NPV and 95.7% diagnostic accuracy.

Conclusion: MR ARTHROGRAPHY with additional ABER demonstrated high sensitivity and excellent diagnostic accuracy for detection and description of the extent of glenoid labrum and glenohumeral ligaments injuries. Anatomical variants, especially at the superior quadrant, still may result in false positive tears. Adding ABER to MR ARTHROGRAPHY is challenging to the radiology team regarding patient positioning, imaging planning, anatomy interpretation, and lengthened scan time, however it is a good supportive imaging view especially in the evaluation of the anteroinferior quadrants and the IGHL injuries.

Key Words: *Shoulder arthrography – MR ARTHROGRAPHY – ABER – Dislocation – Instability – Labrum – Glenohumeral ligaments.*

Introduction

THE shoulder is the most common major joint to become unstable and get dislocated. This is because the glenohumeral joint is a complex ball and socket joint which has a large range of motion in favor maximum mobility and function rather than stability. Young active males under the age of 30 have an increased risk of recurrent instability often leading to inability to work or participate in sports **[1-6]**.

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Abbreviations:

ABER : Abduction and external rotation.
FN : False negative.
FP : False positive.
IGHL : Inferior glenohumeral ligament.
MGHL : Middle glenohumeral ligament.
MR ARTHROGRAPHY: Magnetic resonance arthrography.
MRI : Magnetic resonance imaging.
NPV : Negative predictive value.
PACS : Picture Archiving and Communicating System.
PI : Posterior inferior.
PPV : Positive predictive value.
TN : True negative.
TP : True positive.
SLAP : Superior labrum anterior-posterior.

A glenohumeral joint after dislocation, whether single or recurrent episodes, is expected to have labrum, ligamentous or rotator cuff injury. Magnetic Resonance Imaging (MRI) and Arthrography (MR ARTHROGRAPHY) of the glenohumeral joint has long been considered the mainstay for diagnosis of these injuries and preoperative planning [7,8]. Diagnosis of labrum and ligamentous injury by MRI is, however, a demandingpart of the musculoskeletal radiologist job. The complexity of the anatomy and the subtlety of the MRI findings necessitate deep knowledge of the anatomic details, the anatomical variants, and nevertheless experience in diagnosis of these injuries. The superiority of MR ARTHROGRAPHY lies in expanding the joint capsule with the ability of intraarticular contrast to leak through small defects, hence better delineate tears even subtle ones [9,10].

Acquiring MR ARTHROGRAPHY images with the patient arm in abduction external rotation (ABER) position has been proposed as an additional view that stretches the inferior glenohumeral ligament and puts tension upon the anterior inferior glenoid labrum, thereby increases sensitivity of detection of tears. Previous publications have highlighted circumstances in which ABER view had excellent results [11–14]. However, ABER view is still not routinely added to the MR ARTHROGRAPHYin most diagnostic centers, which may partially be due to technical difficulties, longer scan time or unfamiliarity with the imaging appearance of anatomical structures [15].

The purpose of this study was to assess the diagnostic value of direct MR ARTHROGRAPHY, with inclusion of an additional ABER view, in evaluation of different labrum and ligamentous injuries, using arthroscopy as the gold standard.

Patients and Methods

Patients:

This is an observational, analytical, and prospective study which included 92 patients, 66 males and 26 females, age range from 10 to 60 years (mean age 33.5 years). The included patients were referred from the orthopedic outpatient clinic at our hospital, between August 2018 and 2021, and were suspected to have labrum injury by clinical examination. Patients who had history of a previous shoulder operation were not included. The clinical presentation of the patients varied between shoulder pain, instability and frank dislocation. The included patients were subjected to MRI, fluoroscopy guided intra-articular contrast injection and MR ARTHROGRAPHY with an additional ABER view. Arthroscopy was done for 70 patients and the results were used as the gold standard. The remaining 22 patients, who didn't perform the arthroscopy, were either missed orreevaluated by the orthopedic consultant and concluded that those patients didn't need furtherarthroscopy and therefore were excluded from the statistics analysis. The study was done in a teaching hospital and was approved by the ethical committee in compliance with Helsinki Declaration.

Fluoroscopy guided intra articular contrast injection:

The patient was first consented and then guided to lie supine on fluoroscopy table with the arm external rotated and the forearm supinated. The shoulder area was then prepared and draped in a sterile fashion. The site of injection was marked under fluoroscopic guidance, anterior rotator interval approach. Subcutaneous injection of local anesthetic 5ml lidocaine 0.5% was done. The needle tip (22-gauge) was advanced under fluoroscopic guidance in an anteroposterior direction perpendicular to the fluoroscopic beam until it reaches the humeral head, followed by injection of a solution composed of 0.1ml gadolinium, 5ml non-ionic contrast and 10ml sterile saline. Intra-articular injection was confirmed by observing a column of contrast between the glenoid and the humerus.

MRI and MR ARTHROGRAPHY:

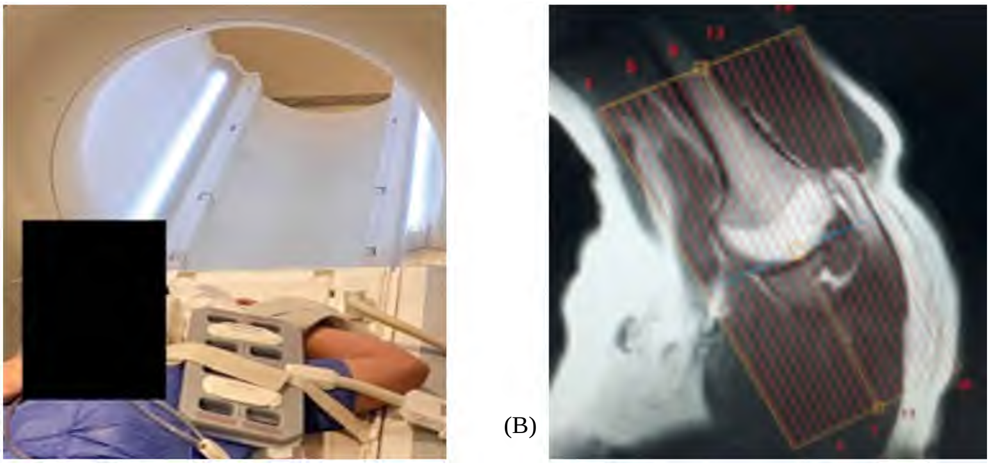
The MRI and MR ARTHROGRAPHY examinations were done using Philips (Achieva, Philips Medical System, Best, the Netherlands, Release 2.6 and Level 3) device, 1.5 Tesla magnet. The patient was placed supine with the head directed towards the scanner bore and the arm was externally rotated. Preliminary scout localizer images were obtained followed by routine axial, coronal oblique and sagittal oblique images (Table 1).

For MR ARTHROGRAPHY, the patient was transferred to the scanner within 10-15 minutes from the time of injection. The same surface coil was used. Postcontrast T1 FAT SAT was acquired in the 3 standard planes. To attain the ABER position, the coil was first removed, and the patient was asked to place the palm beneath the head while still lying supine. A flexible coil was then placed anteriorly over the shoulder (Fig. 1A). Coronal scout images demonstrating the humerus and glenoid were then used to place the cursors parallel to the long axis of the humerus and perpendicular to the glenoid to obtain oblique axial images of the glenohumeral joint (Fig. 1B). The acquisition time for ABER images was 3 minutes and 2 seconds.

Table (1): Imaging parameters of MRI and MR ARTHROGRAPHY.

	TR (mm^2/sec)	TE (mm^2/sec)	FOV (mm)	Slice Thickness (mm)	Matrix	NSA
MRI:						
- Coronal oblique T1 TSE	664	18	14	4	205/512	3
- Coronal oblique T2 TSE	2411	100	14	4	201/512	2
- Coronal oblique STIR TSE	2411	15	14	4	201/512	2
- Coronal oblique PD TSE	1400	16	18	4	201/512	3
- Axial GR TSE	551	18	17	4	179/512	3
- Sagittal oblique T2 TSE	3342	100	16	4	201/512	3
MR ARTHROGRAPHY:						
- T1 FAT SAT in axial, sagittal and coronal oblique planes	924	17	15	4	201/512	3
- ABER T1 FAT SAT	645	24	15	4	201/512	3

TSE : Turbo-spin echo. GR: Gradient Echo. TR: Repetition time.
STIR: Short T1 inversion recovery. FAT SAT: Fat saturation. TE: Echo time.
PD : Proton density. FOV: Field of view. NSA: Number of signal averages.



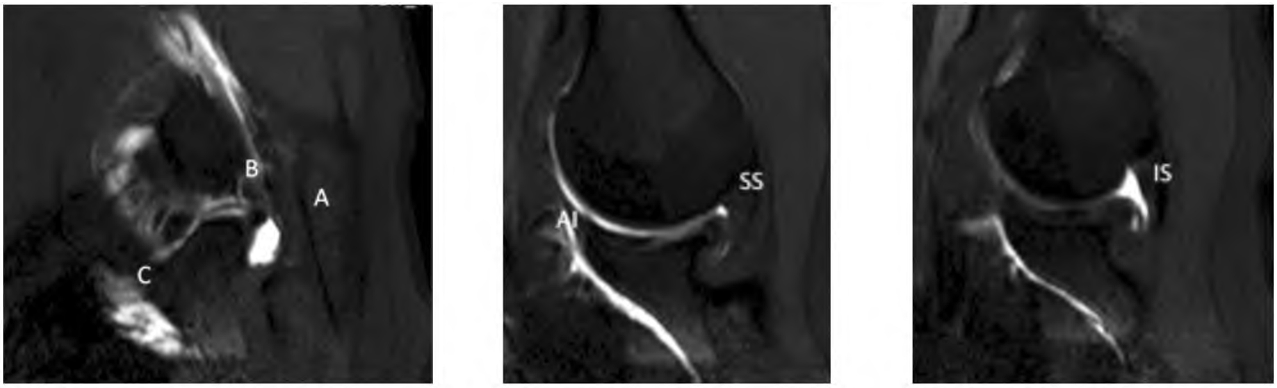
(A) (B)

Fig. (1): (A) ABER position that entails arm abduction and external rotation, flexion of the elbow with applying a flexible shoulder coil to fit in the MRI closed tube. (B) Localizer view, coronal oblique images are used to acquire the desired axial oblique T1-weighted fat-saturated ABER sequence, with the orientation is parallel to the humeral shaft and perpendicular to the glenohumeral articulation.

Interpretation of MRI and MR ARTHROGRAPHY images:

The obtained MRI and MR ARTHROGRAPHY images were transferred and viewed on a PACS work station and interpreted by two musculo-skeletal radiologists (15 and 25 years of experience). They viewed and interpreted the images independently and then discussion of discordant cases was done, and agreement was approved by both.

- Labral injuries were identified when any of the following was observed: Disfigurement, loss of normal contour, deficient volume, intra-articular contrast passing through the labrum. A diagnosis of labrum injury was done when the above-described abnormalities were observed in more than one image, in the same or different imaging planes. We routinely apply clockwise description for labrum injuries but to facilitate this study, the labrum injuries were classified into Superior Labrum Anterior Posterior (SLAP), anteroinferior (including classic Bankart and variants), posterior and superior anterior labrum injuries.
- Glenohumeral ligaments and capsule injuries were reported when there is a midsubstance disruption, discontinuity, avulsed attachment, contrast leakage.
- The long head biceps tendon attachment at the glenoid (biceps-labrum anchor) were checked and injuries were reported.
- ABER view: The long head biceps tendon is used as anatomical landmark to identify cranial images and the coracoid process to identify anterior structures (Fig. 2). Tears of the labrum (anterior and posterior quadrants) were reported.



(A) (B) (C)

Fig. (2): Images demonstrating the anatomical landmarks in ABER view. (A) Superior level image showing the long head biceps tendon and its anchor (B), the acromion (A) and the subscapularis tendon (S) and coracoid base (C). (B) Midlevel image showing the anteroinferior labrum (AI) with the inferior glenohumeral ligament attached and the supraspinatus tendon (SS). (C) Inferior level image showing the infraspinatus tendon (IS).

Arthroscopy:

Arthroscopic examinations of the shoulder were performed by orthopedic surgeon specialized in shoulder and elbow surgery with 15 years of experience. Arthroscopy was performed within 1 month from imaging. The osseous abnormalities involving the humeral head and glenoid, glenoid cartilage lesions, and labrum and ligamentous lesions were evaluated and recorded. The results were considered the gold standard in our study.

Statistical analysis:

Data were tabulated and digitalized on a personal computer using Microsoft Excel 2016 spread sheet program. Descriptive statistics, calculation of the true and false positive and negative cases compared to the gold standard are made using the statistical capabilities of the same Microsoft excel program. Sensitivity, specificity, diagnostic accuracy, positive predictive value (PPV) and negative predictive value (NPV) were calculated using the Microsoft Excel 2016 program.

Results

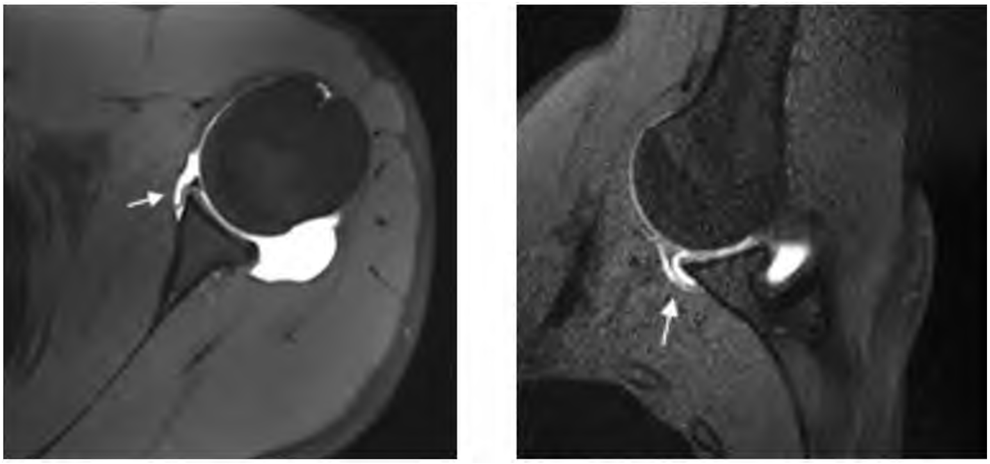
All the included patients underwent MRI and MR ARTHROGRAPHY with additional ABER view. Labroligamentous injuries were detected in 45 (64.2%) patients. A total of 49 labrum injuries, 6 ligamentous and 3 capsular injuries were reported. The labral injuries in order of frequency: 24 anterior inferior labrum injury (Figs. 3-6),16 SLAP (Fig. 7), 7 posterior labrum injury (Fig. 8), 2 superior anterior labrum injury (Table 2). In 5 patients (7.1%), a combination of more than 1 quadrant injury was seen. This included: 2 patients with SLAP and anteroinferior labrum injury, patients with anteroinferior and posterior labrum injuries and 1 patient with SLAP and posterior labrum injury. The glenohumeral ligaments injuries were 3 inferior glenohumeral-ligaments (IGHL) injury, 2 middle glenohumeral ligaments (MGHL) injury, and 1 patient had both MGHL and IGHL injury (Fig. 6). In 3 patients, partial tears of the posterior capsulolabrum attachment were seen in association with posterior inferior labrum tear. There was no complete capsule rupture. Other imaging findings included 5 biceps/labrum anchor tear (Fig. 7), 17 rotator cuff pathologies,12 Hill Sachs and 2 reversed Hill Sachs injuries.

The ABER images adequately demonstrated anteroinferior and posterior labrum injuries, and to some extent the anterior component of SLAP tears with limited depiction of its posterior component. ABER was superior in demonstration of the detached and displaced periosteal sleeves in antero-inferior Bankart variants after adequate stretching of the inferior glenohumeral capsule and contrast filling of a cleft between the sleeve and the glenoid. It adequately demonstrated middle and inferior glenohumeral ligaments tears.

At arthroscopy, out of 70 patients there was 38 true positive (TP), 2 false positive (FP), 29 true negative (TN) and 1 false negative (FN). The FP patients included superior and anterior inferior quadrants lesions described at MRI but not seen at arthroscope. At retrograde analysis, we concluded that sublarbrum foramen was misinterpreted as a superior labrum tear. Also, the dismissed anterior inferior labral injury was a misinterpretation of a relatively small sized anterior inferior labrum quadrant and adjacent thick MGHL. The FN case was partial injury of the IGHLwhich was beyond the resolution of the obtained images and subtle to be visible atthe MR ARTHROGRAPHY or the ABER. Statistical analysis of the obtained results demonstrated an overall sensitivity 97.4%, specificity 93.5%, PPV 95%, NPV 96.6% and diagnostic accuracy 95.7%.

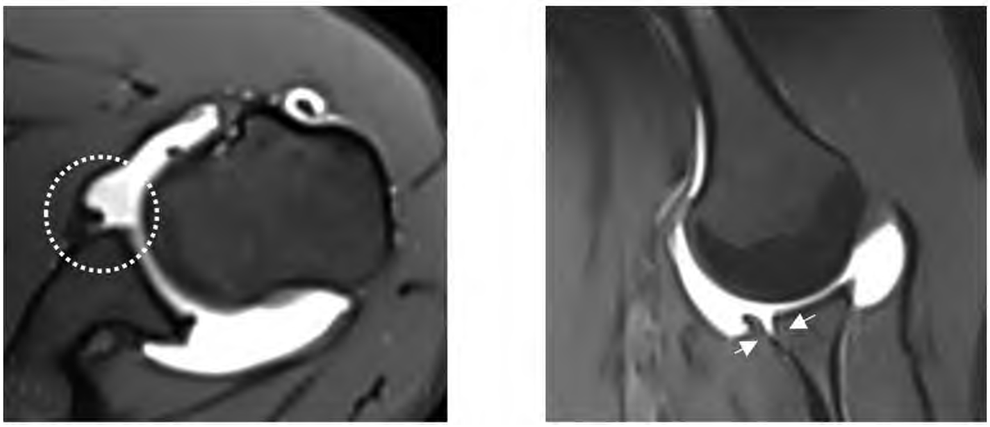
(A) (B) (C)

Fig. (3): Bankart lesion in 23-year-male patient, with history of recurrent dislocations. (A) MR ARTHROGRAPHY axial T1 FAT SAT showing torn, detached and medially displaced anterior inferior labrum (arrow). (B) MR ARTHROGRAPHY ABER T1 FAT SAT confirms Bankart lesion (arrow) and intact IGHL (curved arrow). (C) Arthroscopy images confirmed Bankart injury (arrow).



(A) (B)

Fig. (4): Perthes lesion in a 29-year-female patient presenting after one episode of dislocation. (A) MR ARTHROGRAPHY axial T1 FAT SAT showing contrast leak through a tear in the anteriorinferior labrum which appears not significantly displaced. (B) MR ARTHROGRAPHY ABER T1 FAT SAT confirms the tear with better delineation of a cleft of contrast penetration through a displaced, stropped periosteal sleeve and labrum.

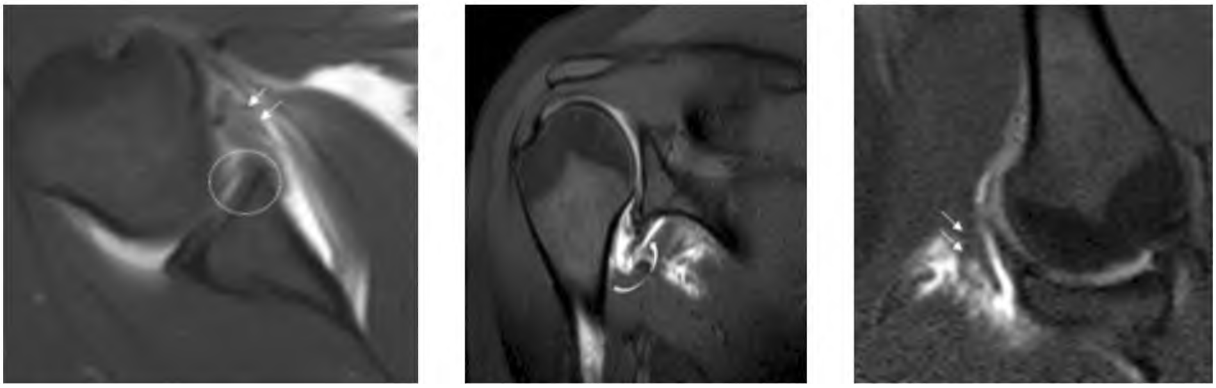


(A) (B)

Fig. (5): ALPSA lesion in a 27-year-male patient with history of recurrent dislocations. (A) MR ARTHROGRAPHY axial T1 FAT SAT showing deficient anteriorinferior labrum with medial and posterior tissue buckling (dotted circle). (B) MR ARTHROGRAPHY ABER T1 FAT SAT after the IGHL is stretched, contrast is now seen penetrating through a cleft (between 2 small arrows) deep to the previously buckled and retracted periosteal sleeve.

Table (2): Imaging findings at MRI and MR ARTHROGRAPHY with additional ABER view.

Type of injury	Number of cases
Anterior inferior quadrants injury:	
- Classic Bankart	14
- Bony Bankart	5
- Perthes	2
- ALPSA	2
SLAP	15
Superior anterior labrum injury	2
Posterior inferior labrum injury	4
Combined anterior inferior and SLAP	2
Combined posterior inferior and SLAP	1
Combined anterior inferior and posterior inferior	1
Total labrum injuries	44
Glenohumeral ligaments injury	6
Rotator cuff pathologies	17
Biceps labral attachment tear	5
Hill Sachs	12
Reverse Hill sachs	2



(A) (B) (C)

Fig. (6): Bankart lesion associated with inferior and middle glenohumeral ligaments injury in a female patient, 35 years old. (A) MR ARTHROGRAPHY axial, T1 FAT SAT showed disfigurement of the anteroinferior labrum denoting Bankart (dashed circle). Deep to the subscapularis tendon, the middle glenohumeral ligament is markedly thickened and disfigured denoting interstitial tear (double arrows). (B) MR ARTHROGRAPHY coronal oblique, T1 FAT SAT showed loss of normal U-shaped inferior glenohumeral ligament (curved arrow) and contrast leakage denoting ligament tear. (D) MR ARTHROGRAPHY ABER T1 FAT SAT confirmed inferior glenohumeral ligament tear (double arrow).

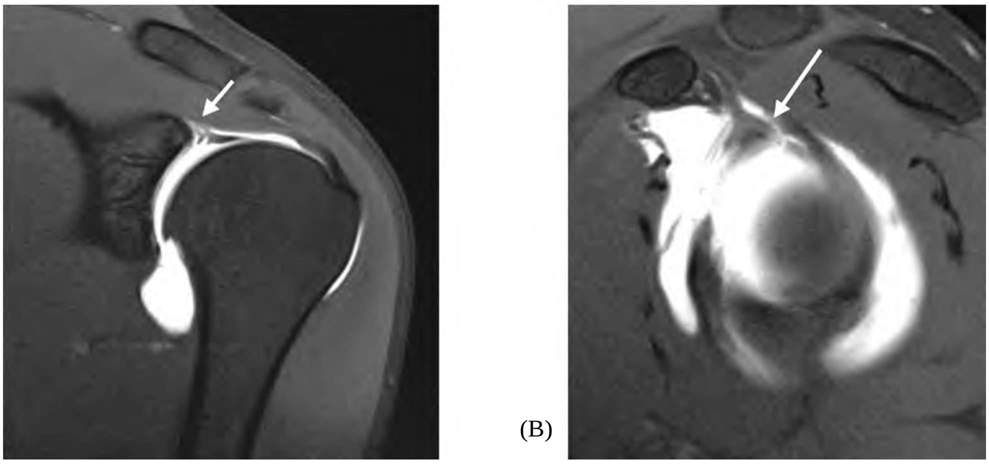
(A)  (B)

Fig. (7): (A & B) A 32-year-male presenting with pain and clicking. MR ARTHROGRAPHY (C) coronal oblique and (D) sagittal T1 FAT SAT showing type 2 SLAP tear with tear extension to the long head biceps attachment at the glenoid (arrows).

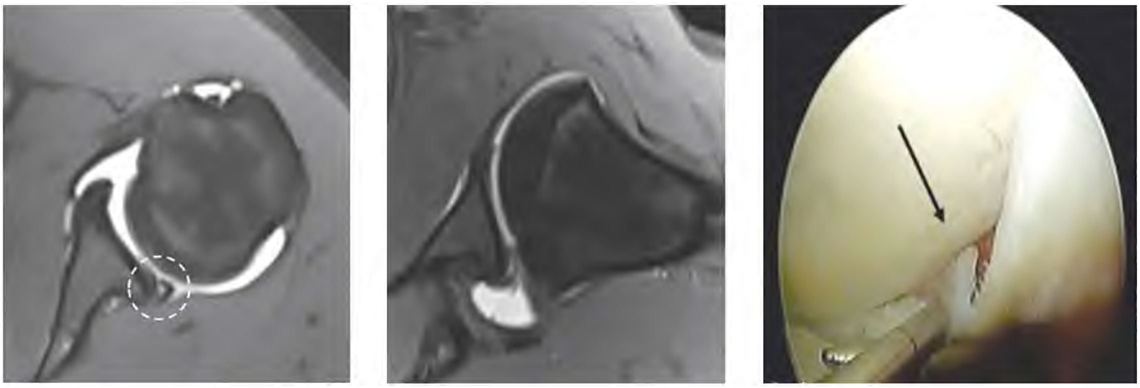


Fig. (8): Posterior labrum tear in a male patient, 29 years old, with features of instability on clinical examination. (A) MR ARTHROGRAPHY axial T1 FAT SAT showing contrast leak through a tear in the posterior labrum (dashed circle). (B) MR ARTHROGRAPHY ABER FAT SAT conforming the posterior labrum tear and showing intact anterior inferior labrum and IGHL. (C) Arthroscopy images confirms posterior labral injury(arrow).

Discussion

Shoulder labroligamentous injuries is one of the most frequently raised clinical questions in orthopedics referrals. MRI can be suggestive of labroligamentous injury especially in presence of a para-labral cyst, MR ARTHROGRAPHY however has superior diagnostic performance especially in young athletes *[16,17]*. Image guided direct MR ARTHROGRAPHY is considered a safe and a reliablediagnostic imaging investigation. It allows amore confident detection of intraarticular pathologies and has a well-established role in preoperative planning for labroligamentous injuries *[18–23]*.

MR ARTHROGRAPHY images in our study revealed a variety of labrum injuries with prevalence of anteroinferior quadrant injuries in the form of classic Bankart and its variants (i.e., Perthes and ALPSA), followed by SLAP. Posterior labrum quadrants injury was present individuallyand alsoas an extension of labrum tear stripping through more than one quadrant. The description of extensive tears involving multiple quadrants and the so called panlabral tearsis increasingly recognized and gaining attention in literature *[24]*. Such descriptive information is significantly important for planning arthroscopy portal *[25,26]*. Hence, a thorough assessment of the four quadrants of glenoid labrum at imaging is essential to avoid underestimation of the extent of labrum injury. Nevertheless, assessment of the glenohumeral ligaments help to improve the surgery outcomes *[27–30]*.

Our results revealed a high MR ARTHROGRAPHY sensitivity and excellent diagnostic accuracy for detection of labroligamentous injuries with arthroscope used as gold standard. Publications through the last three decades reviewed the role of MRI and MR ARTHROGRAPHY in labral and non-labral abnormalities from many and different perspectives.An overall agreement on the superiority of MR ARTHROGRAPHY is well recognized *[8,31-36]*. Improved MR ARTHROGRAPHYsensitivity and specificity are appreciated in more recent studies which is likely to be attributed to revolutions in new generations of MRI scanners *[37-41]*, and nevertheless improved accuracy of images interpretation by specialized and more experienced radiologists. A good communication between the radiologists and the orthopedic surgeons reflects onbetter comprehension of the clinical case, and build up a cumulative understanding and better interpretation of the imaging findings and limit reporting errors *[42-44]*. There is however still a tendency of misinterpretation of anatomical variants, especially at the superior anterior quadrants *[45]*. This reflects the importance of attention to secondary signs like paralabral cysts.

The addition of an ABER view is challenging to the radiology teamand discomforting to the patient. Such challenges include patient positioning, images planning, varied radiological anatomy, and extra scan timing *[15]*.As regards patient position, it is unlikely to attain an exact 90° of arm abduction in a closed bore magnet. Most patients are therefore repositioned to stay as comfortable as possible with the angle of shoulder abduction between 90° and 180°. Therefore, the appearance of anatomical structures at images will vary, posing a challenge to the radiographer placing the localizer cursors and to the radiologist interpreting the images. Hence, knowledge of the anatomical landmark is essential to avoid confusion. The additional time required to obtain ABER images is an important consideration. Images acquisition takes about 3 minutes, however, extra timing for patient repositioning and images planning lengthens the whole scan time which may require a total of extra 5 minutes.This however can be controlledby training the radiographer and the assistanton repositioning the patient to achieve a smooth and quick scan. Despite these challenges, we find ABER a helpfulimaging view, especially in the anteroinferior quadrants and the IGHL injuries [11,14,46]. The inferior capsule and glenohumeral ligaments get unfoldedallowing more confident detection of tears and more precise description and classification of the injury. The contrast penetration through detached labrum with excellent delineation of stripped, yet not completely torn periosteal sleeve is so helpful in Perthes and ALPSA.

In this study we didn't address the impact of the additional time consumed in obtaining the ABER images on the flow of scanning other scheduled patients. Time constraint is an important factor that should be balanced against the number and duration of scheduled scans; we are therefore planning to address this in a future study.

To conclude, MR ARTHROGRAPHY with additional ABER view demonstrated a high sensitivity and excellent diagnostic accuracy for detection and description of extent of labrum and ligaments injuries. Anatomical variations in size and configuration of the labrum, especially at the superior quadrantmay result in false positive tears or overestimation of extent of labrum injury. Adding ABER to routine MR ARTHROGRAPHY is challenging to the radiology team regarding patient positioning, imaging planning, anatomy interpretation and length ened scan duration, however it is a good supportive imaging view especially in the diagnosis of the anteroinferior quadrants and the IGHL injuries.

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دور التصوير بالرنين المغناطيسى لمفصل الكتف مع حقن الصبغة في تقييم إصابات الرباط الشفوى الحقانى العضدى، مع إعادة النظر و التركيز على التحديات والقيمة المضافة لوضع رفع الذراع مع دوران الخارجى للاختطاف

يعد مفصل الكتف العضدى أكثر المفاصل عرضة للخلع. التصوير بالرنين المغناطيسى للمفصل من أهم أساليب التصوير التشخيصى ولا سيما التصوير بعد حقن صبغة داخل محفظة المفصل. تمثل هذه التقنيات ضرورة مطلوبة للتخطيط الجيد لاختيار خطة العلاج المناسبة و قبل اداء الجراحة. هدفت هذه الدراسة إلى تقييم دور التقنيات التشخيصية للتصوير بالرنين المغناطيسى بعد حقن صبغةداخل المفصل، مع عرض للدور الاضافى لاستخدام وضعية ABER و التى تتضمن رفع الذراع للأعلى مع الدوران الخارجى للاختطاف، فى تقييم إصابات الشفة والأربطة المختلفة، مع استخدام نتائج منظار المفصل كمعيار أساسى للمقارنة.

كشفت نتائج هذه الدراسة اللتى تضمنت ٩٢ حالة عن ٤٩ إصابة فى الشفة، و٦ إصابات في الأربطة، و٣ إصابات فى المحفظة. كما شملت الحالات علىاصابت أخرى مثل ٥ تمزقات في مرساة العضلة ذات الرأسين/الشفة، و١٧ حالة مرضية فى كفة الأربطة المدورة، و١٢ حالة هيل ساكس، وحالتين هيل ساكس العكسية. بالنسبة لإصابات الشفة قسمت كالاتى: ٢٤ إصابة فى الشفة الأمامية السفلية، و١٦ إصابة فى الغضروف السفلى، و٧ إصابات فى الشفة الخلفية، وحالتين فى الشفة الأمامية العلوية. أما إصابات أربطة الكتف، وجد: ٣ إصابات فى IGHL، وحالتين فى MGHL، ومريض واحد كان مصابًا بكليهما. خضع ٧٠ مريضًا لعمل منظارللمفصل. أظهرت إحصاء نتائج التصوير بالرنين المغناطيسى مع حقن الصبغة واضافة وضع ABER عن نسبة حساسية ٩٧,٤٪، وخصوصية ٩٣,٥٪، وقيمة PPV ٩٥٪، وقيمة NPV ٩٦,٦٪ ودقة تشخيصية ٩٥,٧٪.

أظهر تصوير المفاصل بالرنين المغناطيسى مع حقن الصبغة و إضافة ABER حساسية عالية ودقة تشخيصية ممتازة في الكشف عن مدى إصابات الشفة الحُقّية وأربطة الكتف العضدى ووصفها. مع ذلك، قد تؤدى المتغيرات التشريحية، وخاصةً فى الربع العلوى، إلى نتائج إيجابية خاطئة. تُشكل إضافة ABER إلى تصوير المفاصل بالرنين المغناطيسى تحديًا لفريق عمل الأشعة فيما يتعلق بوضع المريض، وتخطيط التصوير، وتفسير التشريح، وإطالة وقت التصوير، إلا أنها فى النهاية تُمثل رؤية تصويرية داعمة و جيدة، خاصةً فى تقييم الأرباع الأمامية السفلية وإصابات IGHL.