RESULTS

This study included 60 patients suffering from subluxation, dislocation, as well as those who had previous traumatic accident.

All patients were examined using the conventional MRI technique and their results were evaluated.

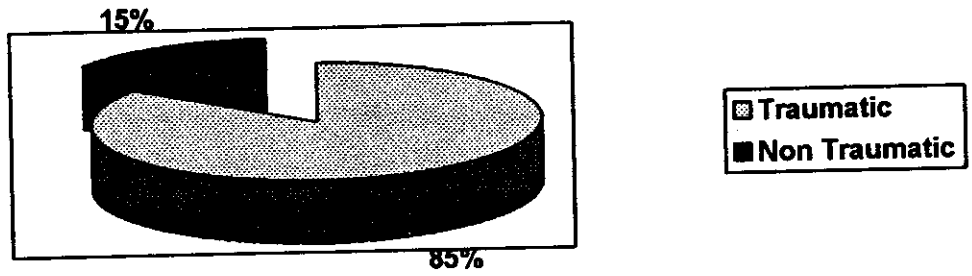
According to the elucidated MR findings, other adjuvants techniques and different MR pulse sequences such as STIR and Fat.Sat were used to furtherly aid and clarify the previously found data on conventional MR study.

We have used MR arthrography in 29 patients (28 by direct MR arthrography and one by indirect arthrography). Seven cases were subjected to plain CT and CT arthrography.

Arthroscopic details and findings were available in 6 of the patients.

Patients were categorized according to the cause of instability into two major groups whether:-

- Traumatic patients and these represented 51 cases forming 85%.
- Non traumatic patients and they represented 9 patients forming 15% of cases.



Graph (3) Traumatic to non traumatic ratio.

Accurate analysis and evaluation of the elicited findings and pathological lesions that were revealed whether by conventional MR or other adjuvants technique of examination was done.

Accordingly the elucidated results, have revealed that instability can occur due to either lesions affecting the shoulder **static stabilizers** which are the labroligamentous complex or the **dynamic stabilizers** which are the rotator cuff muscles and tendons as well as the surrounding bones.

Each of the previously mentioned group was furtherly classified according to the identified, shoulder pathology into either:-

I. Labroligamentous complex lesions:-

II. Rotator Cuff and Osseous Lesions:-

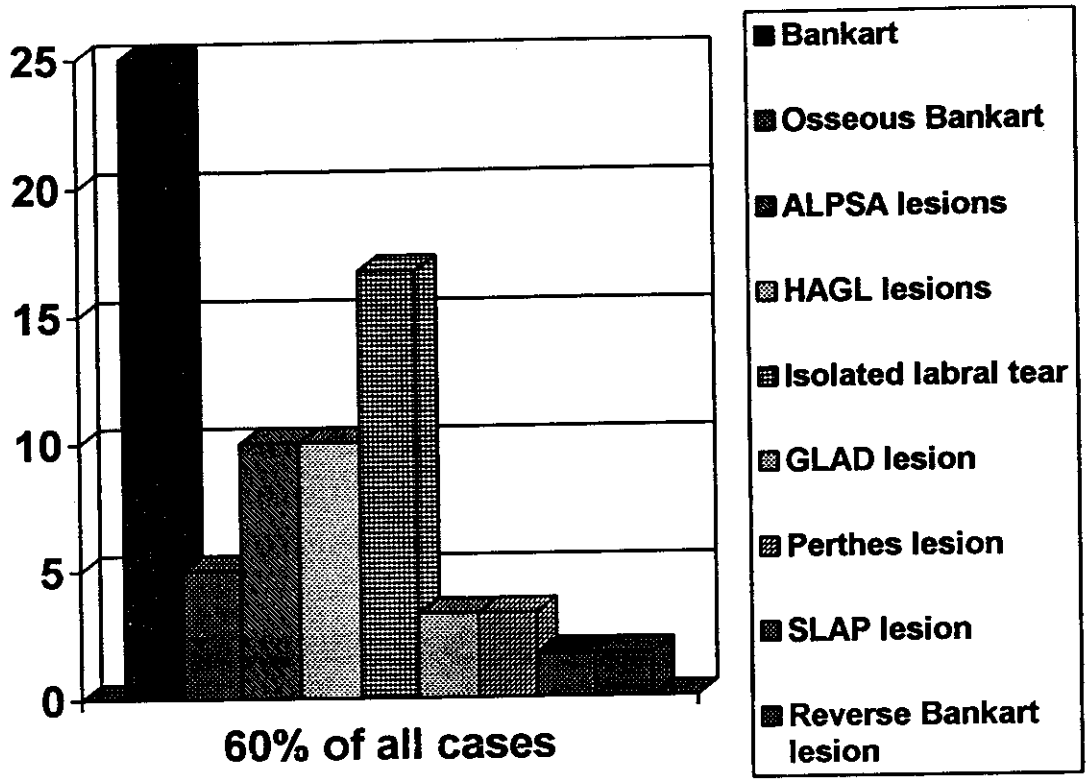
Traumatic cases

- All the 51 patients had suffered from previous trauma.

- Forty nine of them were males forming 96% of cases there age ranged from 20 to 70 years.
- Three cases were females forming 4% and their age ranged from 25 to 54 years.

Table (5) Shows the percentage of the labroligamentous lesions in traumatic cases.

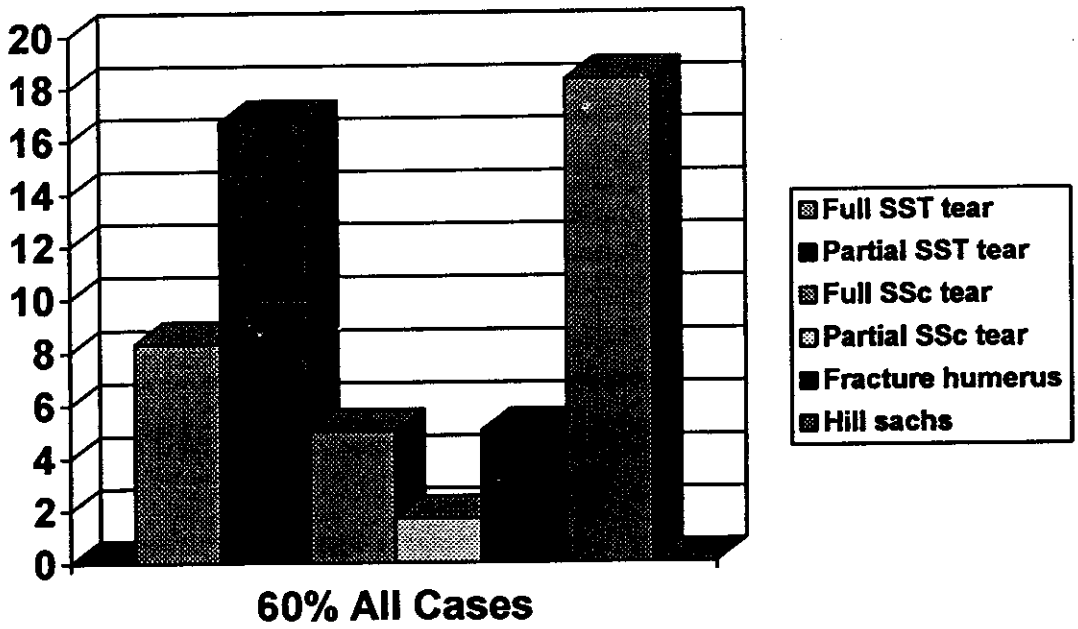
	No. of Cases	*Traumatic Cases (n=51)*	*All Cases (n=60)*
Bankart	15	29.4%	25%
Osseous Bankart	3	5.9%	5%
ALPSA lesions	6	11.8%	10%
HAGL lesions	6	11.8%	10%
Isolated labral tear	10	19.6%	16.7%
Glad lesion	2	3.9%	3.3%
Perthes lesion	2	3.9%	3.3%
Slap lesions	1	1.96%	1.7%
Reverse Bankart's lesion	1	1.96%	1.7%



Graph (4) *Percentage of the labroligamentous lesions in traumatic cases.*

Table (6) Shows the percentage of rotator cuff and osseous lesions in traumatic cases.

		No. of Cases	*Traumatic Cases (n=51)*	*All Cases (n=60)*
i.	***Rotator cuff lesions***			
	1. Full thickness SST tear	5	9.8%	8.3%
	2. Partial SST tear	10	19.6%	16.7%
	3. Full thickness SScT tear	3	5.9%	5%
	4. Partial SScT tear	1	2%	1.7%
ii.	***Osseous lesions***			
	1. Hill Sachs	11	2.16%	18.3%
	2. Fracture humerus	3	5.9%	5%



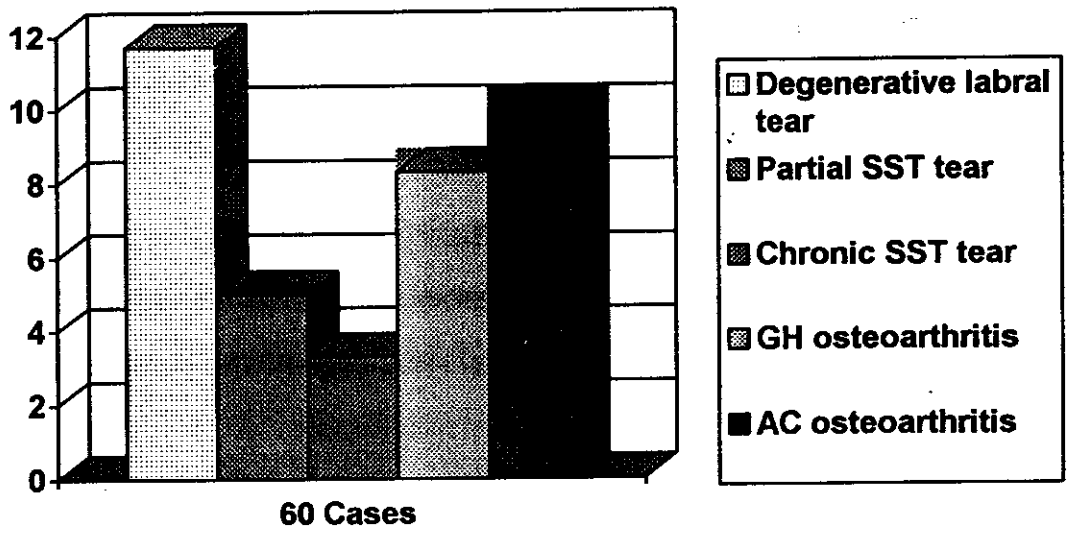
Graph (6) *Percentage of rotator cuff and osseous lesions in traumatic cases. (SST= supraspinatous tendon; SSc Tear = subscapularis tendon).*

Non Traumatic Cases

They were total of 9 cases, 6 of them were males representing 66% with their age ranging from 54 to 58 years, 3 of them were females representing 33% and their age ranged from 50 to 57 years.

Table (7) Shows the percentage of various lesions in non traumatic cases.

	No. of Cases	*Non Traumatic Cases (n=9)*	*Total Number (n=60)*
Labroligamentous Complex Lesions			
Degenerative labral tears	7	77.8%	11.7%
Rotator Cuff Lesions and Osseous Lesions			
Partial tear of the SST	3	33.3%	5%
Chronic tear of the SST	2	22.2%	3.3%
GH joint osteoarthritis	5	71.4%	8.3%
AC joint osteoarthritis	6	85.7%	10%



Graph (6) *Percentage of variable lesions in non traumatic cases.*

Total number of cases who had labral tear whether traumatic or degenerative were 21 patients representing (35%) of all cases.

Partial tear of the supraspinatus tendon whether traumatic or degenerative were 13 patients representing (21.7%).

The use of Fat Sat MR pulse sequence was performed in 30% of the patients with rotator cuff lesions. This MR pulse sequence hinders the brightness of the fat planes surrounding the rotator cuff tendon and subsequently any superficial tears of the supraspinatous tendon can be clearly demonstrated increasing the MR sensitivity.

The conventional MR results in 29 patients revealed labral ligamentous complex lesions, and they were candidate for MR arthrography. Twenty eight patients were subjected to direct MR arthrography and one patient to indirect arthrography. The former was more valuable as it adequately distended the joint capsule and clearly identified the labral or ligamentous pathology.

The use of direct MR arthrography has greatly increased the sensitivity and specificity for the diagnosis of labroligamentous complex lesions and eventually has increased the diagnostic accuracy.

Six patients had undergone arthroscopic examination two of them has partial tear of the supraspinatous tendon and it was clearly demonstrated on conventional MR examination.

Two had Bankart's lesions that were adequately diagnosed by MRI after performing MR arthrography.

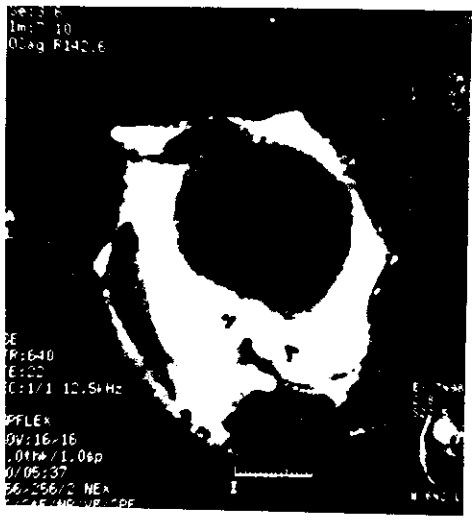
One patient had loose bodies that were not identifiable on MR examination and was diagnosed by arthroscopy.

The last patient was diagnosed by arthroscopic examination having superficial labral tear that was missed on MRI.

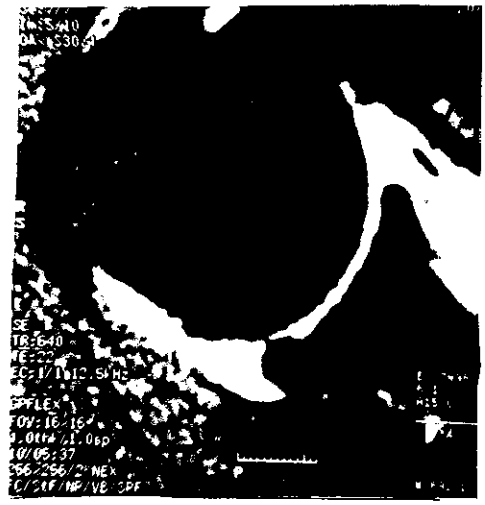
CASE PRESENTATION

Normal MR Arthrography

Demonstration for normal MR arthrography in T_1WI with Fat Sat (Fig. 34A-C).



(A) Sagittal



(B) Axial

(C) Coronal

Fig. (34A-C) (A) Normal IGL with its two bands (arrow) (B) Axial normal MGL (arrowhead) and anterior labrum; (C) Coronal showing longhead of biceps tendon.

Case (1)

30 years old male patient, suffered from a trauma to his shoulder three years ago and he came complaining of shoulder instability.

Conventional MRI was performed 2 yrs before for the patient and was reported normal.

He was examined initially by conventional MRI in full sequence and in view of the elicited findings there was strong suspicion of **Bankart's** lesion.

Indirect MR arthrography was performed and he was instructed to exercise his shoulder for 15 min then various MR planes on T_1WI was obtained. The findings was not confirmative, so direct MR arthrography was performed and the patient was examined in all MR planes using T_1WI. Adequate capsular distension aided the proper visualization of the torn anterior inferior labrum and IGL so the diagnosis of **Bankart's** lesion was confirmed (Fig. 35A-D).

Fig. (35) (A-B) Indirect MR arthrography in axial T_1W images showing abnormal signal of the anterior inferior labrum and likely detached (arrow).

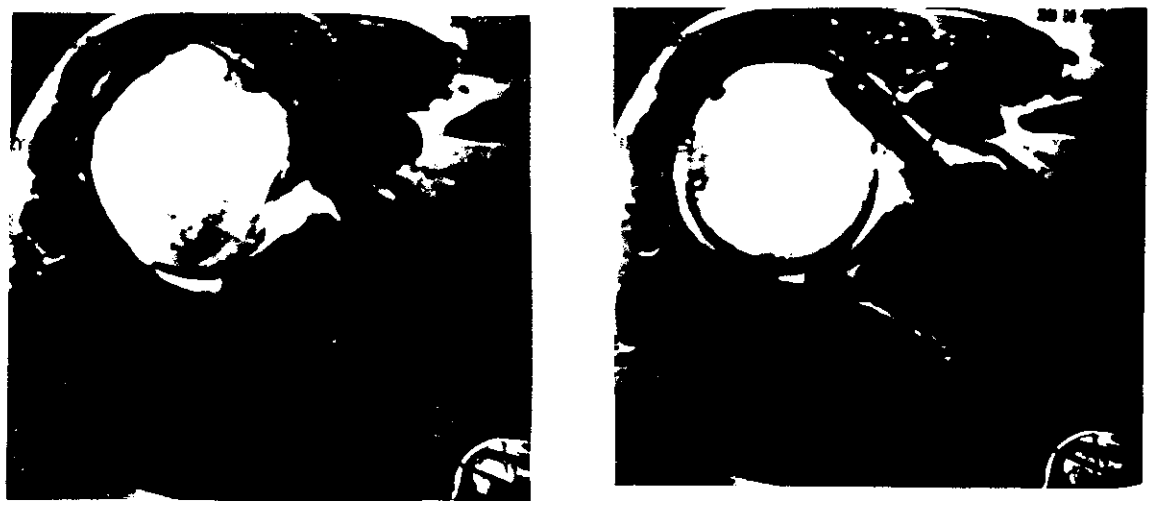


*Fig. (35) (C-D) Direct MR arthrography in axial T_1WI where adequate capsular distension revealed the torn anterior IGHL complex i.e. typical **Bankart's** lesion (arrow).*

Case (2)

A 32 years old male had a long standing recurrent shoulder dislocation secondary to an old vigorous trauma to the shoulder.

Patient was examined initially by conventional MR using the standard pulse sequence and proceeded directly to direct MR arthrography which revealed **Bankart's** lesion, **Hill Sachs** fracture and the presence of loose bodies (Fig. 36A-D).

This patient had undergone arthroscopic examination about one week later to MR examination and confirmed the elicited MR findings and the presence of the loose bodies.

Fig. (36A-B) Direct MR arthrography in (A) coronal, (B) sagittal T_1WI with Fat Sat showing Hill Sach's fracture (arrow) and intra-articular loose bodies (arrowhead).

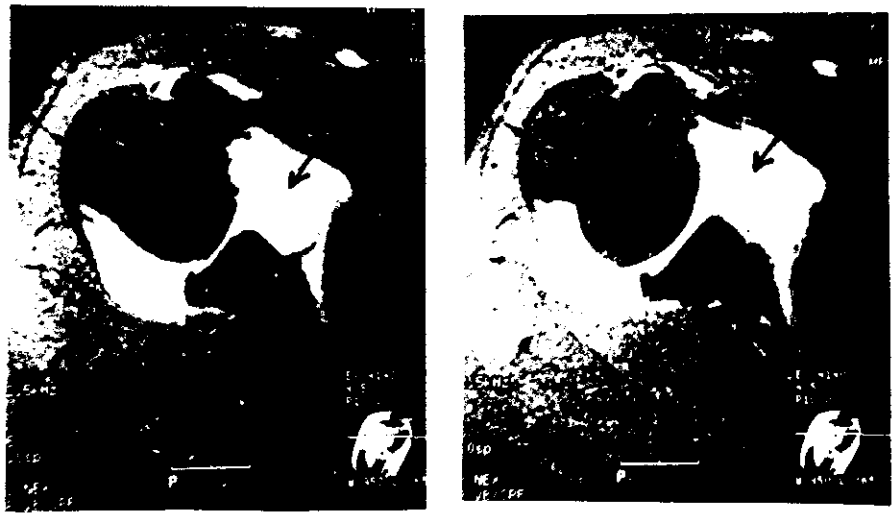


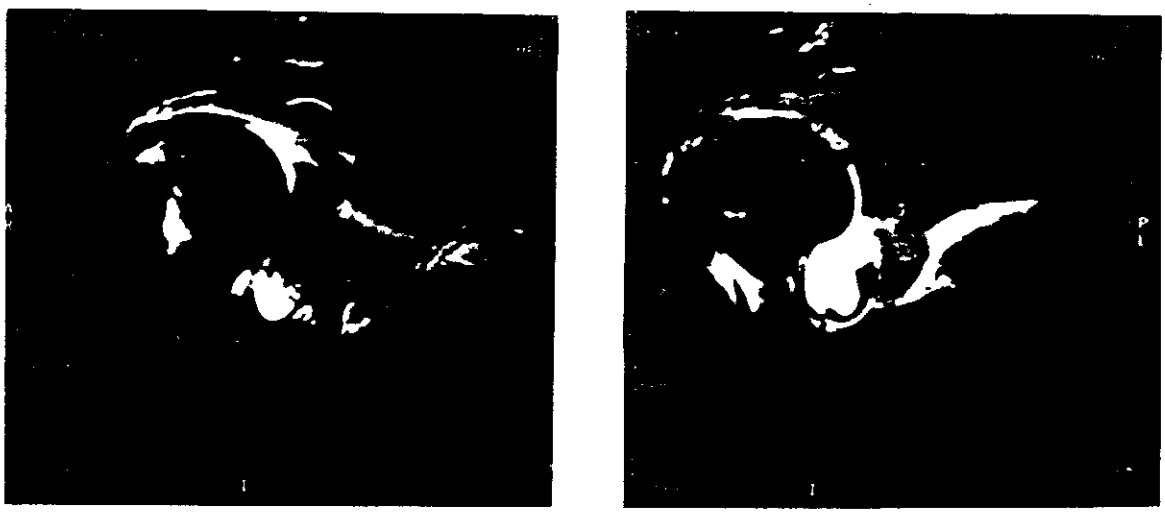
Fig. (36C-D) *Direct MR arthrography in axial T_1WI with fat sat revealed typical* ***Bankart's*** *lesion with torn, detached anterior IGHL complex (arrows).*

Case (3)

A young male patient, 29 years, who had acute history of trauma.

This patient came few hours after the trauma, conventional MR study was done with the usual pulse sequences and additional STIR was implemented to high lighten the marrow changes noted.

Osseous Bankart's lesion, **Hill Sachs'** fracture, partial tear of the supraspinatous tendon as well as joint fluid collection likely haemoarthrosis was diagnosed (Fig. 37A-D).



(A) **(B)**

Fig. (37A-B) Conventional MR in coronal STIR/WI.

(C) **(D)**

Fig. (37C-D)Conventional MR in axial STIR/WI and MPGR/T_2WI revealed:-

***Osseous Bankart's lesion**, where fracture of the anterior inferior glenoid margin noted with subsequently torn IGHL complex (arrows).*

***Hill Sach's** fracture (arrowhead).*

*Partial tear of the **supraspinatous tendon** (long arrow).*

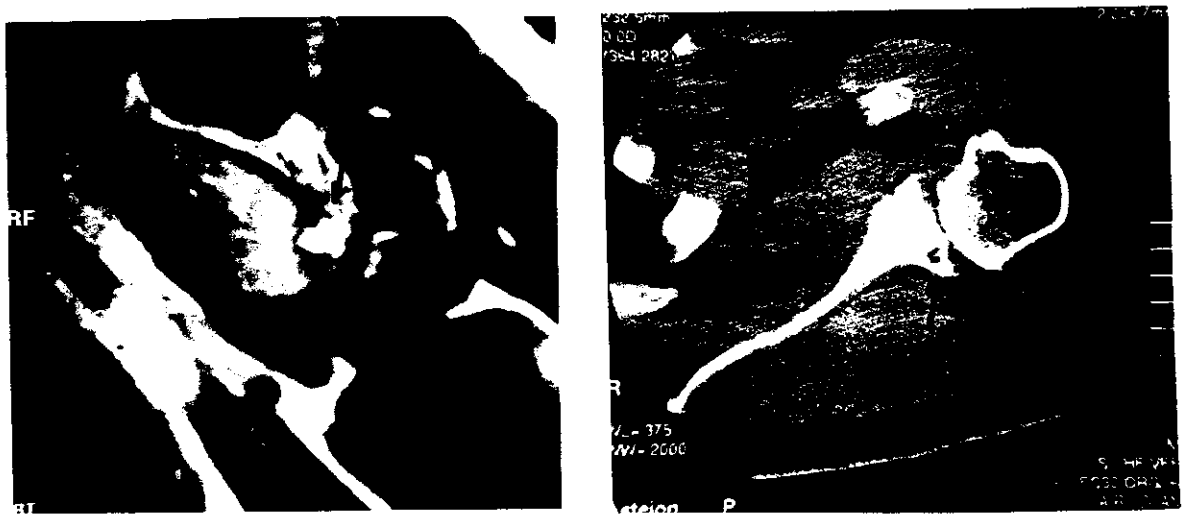
*Joint fluid collection mostly **haemoarthrosis**.*

Case (4)

A 40 years old, male patient, suffers from long standing instability with a past history of trauma.

Standard conventional MR examination was performed for this patient and showed **reverse Bankart's lesion** with non identified posterior labrum. The osseous changes depicted at the glenoid margin in the form of pseudocyst formation compelled us to do CT examination in axial sections to clarify the osseous pathology (Fig. 38A-C).

Fig. (38A) *Conventional MR in axial MPGR/T_2WI.*



(B) Sagittal T_2WI (C) Axial CT in bone window

Fig. (38) (B) Conventional MR in sagittal T_2WI and (C) axial CT image in bone window.
Posterior dislocation of the humeral head is seen with inconspicuous posterior labrum.
The posterior part of the glenoid margin appears irregular with subchondral pseudocyst formation and loss of its normal congruity.
*Findings are those of old **reverse Bankart's lesion.***

Case (5)

A 30 years old, male patient, with a history of trauma since one month and difficult shoulder movement.

Conventional MR examination using the standard pulse sequence was performed for this patient and revealed fracture surgical neck of the humerus as well as **HAGL** lesion (Fig. 39A-C).

Fig. (39) (A) Conventional MR in sagittal T_2WI, showing fracture surgical neck of the humerus (arrows).

Fig. (39) (B) Conventional MR in coronal PDWI.

Fig. (39) (C) Conventional MR in coronal PDWI.
Torn anterior inferior glenohumeral ligament from its humeral attachment HAGL lesion (long arrows).

Case (6)

A 25 years old, male patient, suffers from recurrent shoulder instability with a past-history of trauma.

This patient was initially examined by the conventional MR using the standard pulse sequence and it had revealed the **ALPSA** lesion, yet further examination by direct MR arthrography using fat saturation technique in T_1WI was performed (Fig. 40A-C).

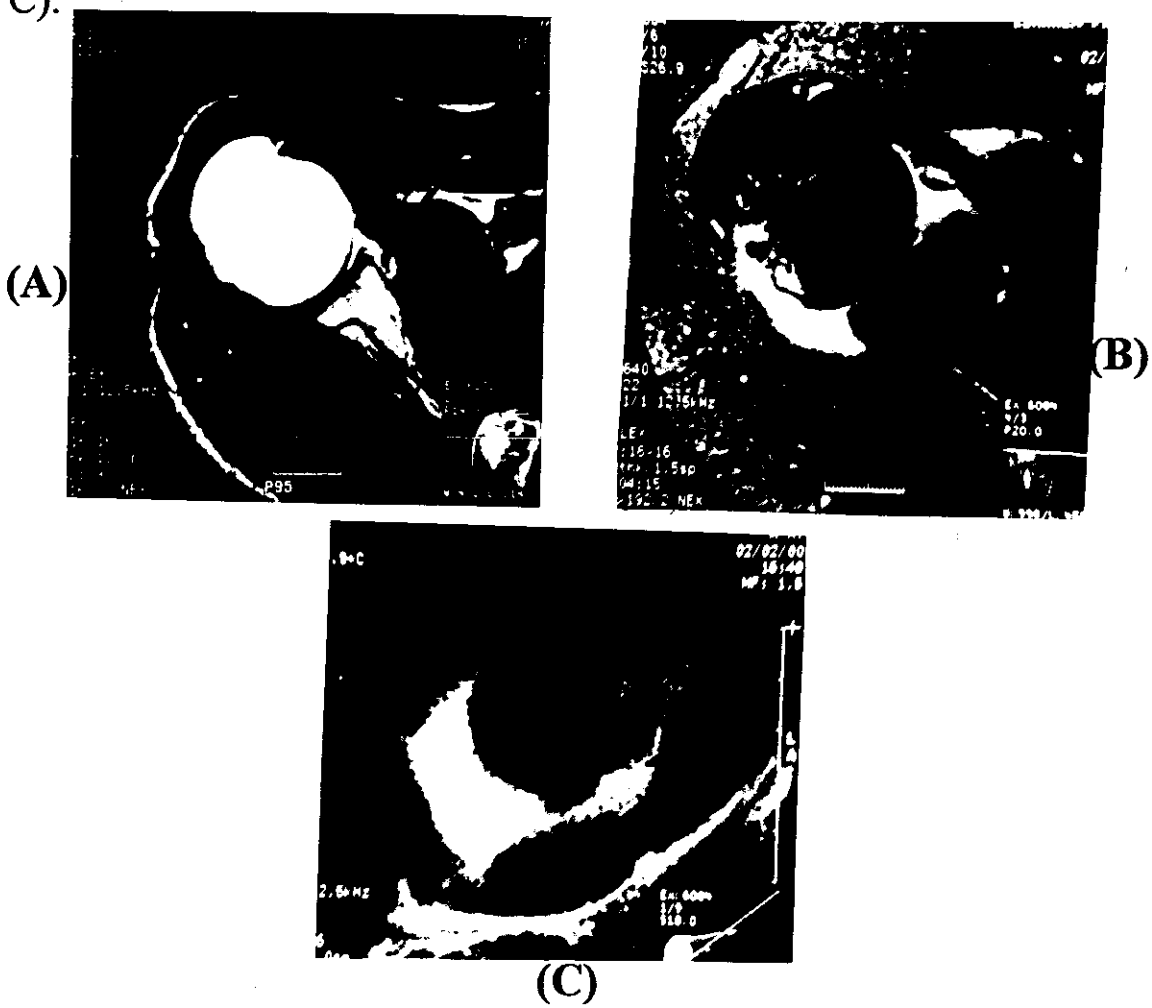


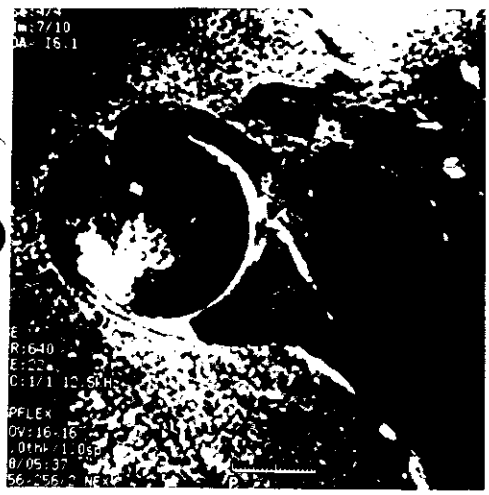
Fig. (40)(A) Non contrast MR fat saturated axial T_2WI. (B,C) Post direct MR arthrography in axial and sagittal T_1WI with fat saturation.
***ALPSA lesion** is clearly demonstrated where we can see the anterior inferior labrum is displaced medially and inferiorly rotated along the scapular neck (arrows).*

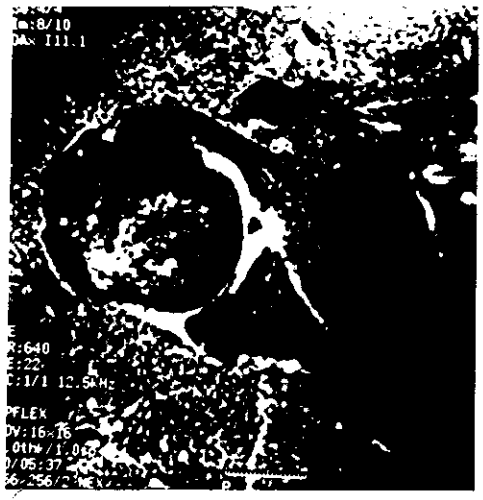
Case (7)

Young patient, 20 years old, with a history of trauma and shoulder pain.

Conventional MR examination using the standard pulse sequence was performed and it had revealed the bright signal intensity of the anterior inferior glenoid which appears anteriorly detached from the underlying articular cartilage denoting **GLAD** lesion. Further examination using direct MR arthrography with fat saturation was performed to clearly demonstrate the pathology (Fig. 41A-B).

(A)





(B)

Fig. (40A-B) *Direct MR arthrography in axial T_1WI with fat saturation revealing **GLAD lesion** where there is superficial tear of the anterior inferior glenoid labrum disruption and anterior detachment from the underlying articular cartilage (arrows).*

Case (8)

Male patient, 70 years old, with past-history of trauma suffering from shoulder pain and sensation of instability.

This patient had undergone conventional MR study using the standard pulse sequences which demonstrated SLAP lesion (type I), partial tear of the supraspinatous tendon, subacromial bursitis and minimal joint effusion (Fig. 42A-C).

(A)

(B)

(C)

Fig. (42) Conventional MR in coronal oblique images in (A) T_1WI; (B-C) T_2WI showing:

*(a) **SLAP lesion** with bright signal intensity of the superior labrum in both T_1 and T_2 WI. It is not detached from the underlying glenoid (type I, arrows),*

(b) partial tear of the supraspinatous tendon with subacromial bursitis and minimal joint effusion (long arrow).

Case (9)

A 47 years old, female patient, with sense of shoulder instability. No recallable history of trauma.

Conventional MR study with the usual pulse sequence was performed in this patient and revealed degenerative osteoarthritic changes of the GH joint with hardly identified posterior labrum and degenerated anterior labrum (Fig. 43A-B).

(A)

(B)

Fig. (43A-B) *Non contrast MR in axial MPGR/T_2WI showing advanced degenerative changes of the glenohumeral articulation and the glenoid articular surface with hardly identified posterior labrum and torn degenerated anterior labrum, loss of its normal configuration eliciting bright signal intensity on T_2WI (arrows).*

Case (10)

An elderly male patient, 56 years of age, suffered from acute trauma to the shoulder with subsequent loss of normal shoulder movement.

The pathological findings was clearly demonstrated in this patient using the standard MRI which revealed complete tear of supraspinatus as well as the subscapularis tendons and minimal joint effusion (Fig. 44A-D).

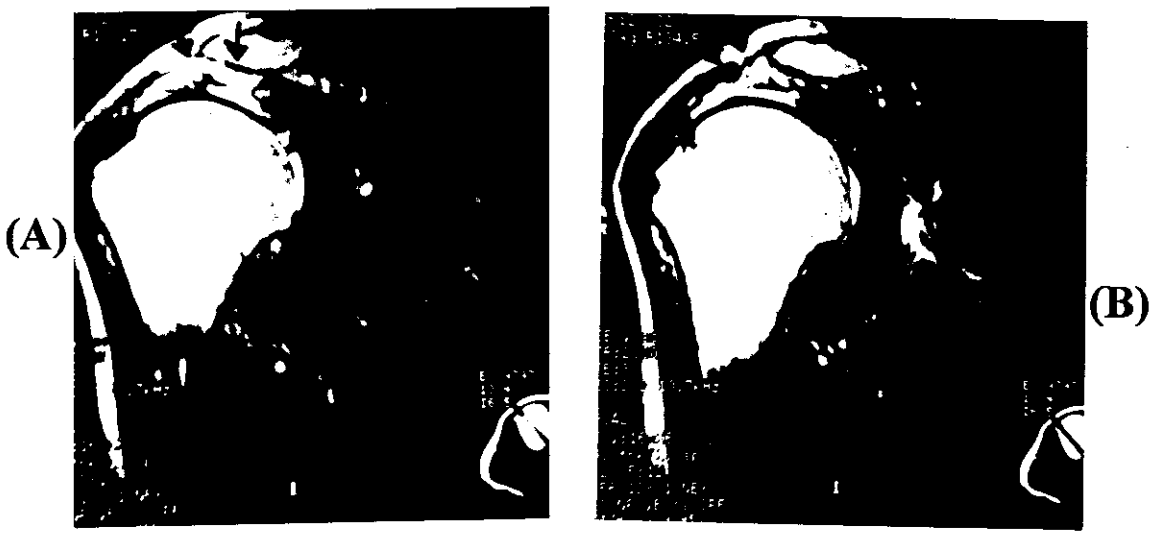


Fig. (44) (A,B) MR in coronal T_2WI eliciting complete tear of the supraspinatus tendon with a fluid filled gap in its site is seen (arrows).

(C)

(D)

Fig. (44) (C,D) MR in axial MPGR T_2WI revealed completely torn subscapularis tendon exhibiting bright signal intensity and is retracted medially (arrows). The anterior inferior glenoid labrum shows bright signal on T_2WI indicating its tear with minimal joint effusion.