MRI imaging features of normal post operative and complications of cuff and labral repair shoulder surgery.

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**Learning objectives**

1. Brief description of common surgical procedures for labral and rotator cuff tears.
2. Illustrate imaging findings of post operative cuff and labral repair shoulder surgery.
3. Review the common post operative complications of cuff and labral repair shoulder surgery.

**Background**

Common surgical procedures performed on the shoulder include subacromial decompression, rotator cuff repair and labral repair.

Some patients may complain of recurrent pain after surgery. Clinical assessment of the post operative shoulder is often difficult and challenging due to a variety of possible causes ranging from re-tear of the cuff tendons or labrum and concomitant cuff/labral pathology.

Various imaging modalities can be used for evaluation of the post operative shoulder CT and radiography while superb for assessment of bony structures, is often limited in assessment of soft tissues.

Ultrasound despite the ability to visualize cuff tendons well, is subjected to operator dependency with limited assessment of the deep structures like labrum.

Magnetic resonance (MR) imaging with its excellent soft tissue contrast is extremely useful in detection of complications in the repaired soft tissues. Therefore it is the modality of choice in our study.

**Findings and procedure details**

Surgical procedure details and expected post operative imaging findings
Subacromial decompression

- Surgical procedure of choice for patient with subacromial impingement and intact rotator cuff
- Consists of diagnostic arthroscopy, anterior and posterior acromion resection, resection of acromioclavicular joint osteophytes and bursectomy
- Certain cases may require arthroscopic resection of the acromioclavicular joint (ARAC) or resection of the distal clavicle (Mumford procedure)
- Morphologic changes in the acromion associated with marrow oedema or abnormal marrow signal due to fibrosis or sclerosis. These can be subtle and comparison with prior imaging is important.
- Widening of AC distance if Mumford procedure performed
- Granulation or scar tissue at subacromial space post bursectomy
- Geyser sign

Rotator cuff repair

- The type of surgery performed is dependent on multiple factors, including the patient's age and activity, extend of rotator tear and other co-existence shoulder pathology
- Common surgery performed include simple debridement of granulation tissue, tendon to tendon suturing, tendon to bone repair
- Exuberant post operative reaction and scar formation
- Intact cuff repair with anchors/drill holes and adjacent marrow oedema is normal post operative findings as shown in Figure 1
- Subacromial bursitis (small amount of fluid) and mild superior subluxation of the humeral head
- Studies have found that intact tendon repairs are thinner than normal tendon and contain increased T2 signal. Improvement generally develops between 3 and 12 months (Figure 2). The repaired tendons may have variable signal abnormality due to healing process. MRI findings in early postoperative period should be interpreted with caution. The tendon appearance often become more like normal tendon by 1 year after surgery
- Foot print coverage may be poor at 6 weeks or 3 months after surgery but may improve by end of first post operative year
- Osteolysis and cyst formation after the use of bioabsorbable anchors in rotator cuff repairs are common complication (Figure 3)
- Acromioplasty findings
- Limited deltoid splitting approach. If deltoid muscle is dissected to gain access, there may be dehiscence post surgery

Labral repair

- Debridement or repair using sutures anchors (Figure 8)
- Bankart procedure - anteroinferior labral repair with reattachment of anterior capsule to glenoid (Figure 12, 14)
• Inferior capsular shift for anterior capsular laxity with multidirectional instability
• Suturing of isolated capsular lesions
• Paramagnetic artefacts or anchor tract
• Osteolytic changes around the suture anchor (Figure 11)
• Capsular thickening directly associated with the procedure performed or caused by scar tissue in the area of surgical incision
• Thickening of the subscapularis tendon at its attachment into the lesser tuberosity in post Putti-Platt procedure (shortening of the anterior capsule and subscapularis muscle)
• Alterations in the coracoid process and anterior glenoid margin are seen on follow up imaging of post Bristow-Helfet procedure
• Diminutive or truncated labrum may be due to surgical debridement

Post shoulder surgery complications

• Complications of arthroscopic subacromial decompression include post operative defect of the deltoid muscle, heterotopic calcifications and acromial fracture
• Persistent symptoms can also be due to incomplete decompression or overlooked surgery
• Short term post operative complications - haematoma, infection and septic arthritis
• Recurrent cuff tear - diagnosis can be confidently made only when there is complete discontinuity of fibers and fluid signal traversing the entire tendon (unequivocal full thickness tear) with tendon or muscle retraction (Figure 5,6)
• Foci of tendon hyperintensity is seen in partial retear of supraspinatus tendon accompanied by abnormal tendon morphology and thinning
• Chronic retear can result in muscle atrophy (Figure 7)
• Recurrent labral tear (Figure 9, 10, 13)
• Axillary nerve (denervation of the deltoid and teres minor) and subscapularis muscle injury

Images for this section:
**Fig. 1:** 68 yr old patient with cuff repair performed 6 weeks prior and complains of shoulder pain after a fall. Suture anchor are in place. Recent post-surgical marrow edema around the sutures anchors. The repaired cuff tendon is intact without any discrete areas of discontinuity and covers over the suture anchors (arrowheads). No rotator cuff re-tear is present.

**Fig. 2:** 41 yr old patient with rotator cuff repair performed 6 months prior. The repaired cuff tendon (arrowheads) remains in continuity with intact margins and is adherent to the suture anchors. No rotator cuff re-tear is present. The repaired tendon demonstrates increased signal intensity. In this early post-operative MRI, it is difficult to differentiate normal healing response from intra-substance degeneration, both of which can have similar appearances.
Fig. 3: 68 yr old lady with rotator cuff repair performed 3 years ago using bio-absorbable suture anchor. A large fluid-filled cavity is seen along the entire length of the anchor with diameter larger than twice the diameter of the anchor within the humeral head representing osteolysis (arrowheads). The repaired cuff tendon (open arrow) remains intact.
Fig. 4: 69 yr old patient with cuff repair 3 months ago but still has recurrent shoulder pain. Full-thickness fissure (open arrow) is seen within the repaired tendon. This represents dehiscence at the site of suture bridging; note the presence of low signal foci (arrows) representing suture material. The repaired cuff tendon remains intact and is seen extending to both suture anchors (arrowheads).
**Fig. 5:** 35 yr old patient with cuff repair 3 months ago presented with shoulder pain after fall on outstretched hand. Full-thickness re-tear of supraspinatus anterior fibers (open arrow). The rest of the repaired cuff remains intact (arrow) and adherent to the suture anchor (arrowhead). This would be in keeping with a partial re-tear of the repaired cuff.

**Fig. 6:** 73 yr old patient with cuff repair performed 1 year ago. No discernible tendon within the subacromial space (open arrows) or at the site of suture anchors (arrowheads). A torn and retracted tendon (arrow) is also present. Findings in keeping with complete re-tear of the cuff repair.
Fig. 7: 75 yr old patient with cuff repair 4 years ago presenting with shoulder pain. No discernible tendon is seen within the narrowed subacromial space (open arrows) with fluid present representing complete re-tear of cuff repair. Fatty infiltration and atrophy of the supraspinatus and infraspinatus muscle also present in this patient (arrowheads).
Fig. 8: 30 yr old pt with SLAP repair performed. MRI scans performed for recurrent shoulder pain at two intervals after surgery. (A) Initial post-operative MRI shows intact labrum at site of repair (arrowheads). (B) MRI performed 2 yrs later demonstrates degeneration and fraying of the repaired labrum although no discrete fluid cleft or displaced labral tear is detected. A comparison MRI is useful in this case to demonstrate interval change.

Fig. 9: 24 yr old patient with SLAP repair done and complains of recurrent shoulder pain. Suture anchor noted at the direct superior labrum (open arrow). Re-tear of the repaired labrum with fluid tracking into the tear across the biceps anchor (arrowheads).
**Fig. 10:** 49 yr old patient with SLAP repair 3 years ago presented with shoulder pain. Large fluid-filled cleft at the site of the labral repair which extends beyond the biceps anchor representing a re-tear (arrows). Suture material is seen within the tear.

**Fig. 11:** Patient with SLAP repair performed. Cystic changes are seen around the suture anchor representing osteolytic changes (arrowheads). There is mal-position of the suture anchor (arrow) across the suprascapular and spinoglenoid notch. No suprascapular nerve injury as evidenced by absence of denervation changes or atrophy of the supraspinatus and infraspinatus muscles.
**Fig. 12:** 42 yr old with right shoulder pain and prior Bankart repair 1 year ago. Repaired labrum adjacent to the suture anchors (arrowheads) demonstrate preserved labral volume with mild scarring in the anterior capsule. This is in keeping with expected postsurgical appearance and the repair is intact.

**Fig. 13:** 19 Male left shoulder Bankart repair 5 months prior with re-injury. Scarred and frayed anterior-inferior labrum with loss of labrum volume (arrow) with more extensive loss of labral volume more superiorly, adjacent to the suture anchor (arrowheads). Findings are compatible with re-tear.
Fig. 14: 27 yr old patient with SLAP and Bankart repair 1 year ago, present with shoulder pain post recent fall. Increased signal intensity within the repaired superior labrum (arrows) around suture material with intact margins represents labral degeneration. Intact Bankart repair with preserved volume and triangular appearance of the repaired labrum (arrowheads).
Conclusion

In conclusion, it is important for the radiologist to have an understanding of the surgical techniques involved in commonly performed shoulder surgeries such as rotator cuff and labral repair to have an increased awareness of potential post-surgical complications. Awareness of the normal post-operative MR imaging appearances, especially when performed within a year of surgery, can aid the radiologist in interpreting these images more accurately and with increased confidence.

Personal information

References