Level V Evidence

Identification and Treatment of Existing Copathology in Anterior Shoulder Instability Repair

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Abstract: Recurrent anterior instability is a common finding after traumatic glenohumeral dislocation in the young, athletic patient population. A variety of concomitant pathologies may be present in addition to the classic Bankart lesion, including glenoid bone loss; humeral head bone loss; rotator interval pathology; complex/large capsular injuries including humeral avulsions of the glenohumeral ligaments (HAGL lesions), SLAP tears, near circumferential labral tears, and anterior labral periosteal sleeve avulsions (ALPSA lesions); and rotator cuff tears. Normal anatomic variations masquerading as pathology also may be present. Recognition and treatment of these associated pathologies are necessary to improve function and symptoms of pain and to confer anterior shoulder stability. This review will focus on the history, physical examination findings, imaging findings, and recommended treatment options for common sources of copathology in anterior shoulder instability repair.

In a young active population, instability is the most common shoulder affliction. Patients can have a variety of pathologies concomitant with or in lieu of a traditional Bankart lesion. If all pathology is not recognized or treated appropriately, the patients' shoulder instability, pain, and diminished function may persist. Treating patients with multiple foci of pathology thus represents a diagnostic and therapeutic dilemma. The objective of this report is to facilitate the recognition and treatment of several types of potentially confounding concomitant shoulder pathologies in otherwise active patients with instability.

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Recurrent anterior instability is a common finding after traumatic glenohumeral dislocation in the active population.[1-5] The basis for treatment of shoulder instability begins with a thorough preoperative history and physical examination, followed by careful evaluation, interpretation, and clinical correlation of imaging studies. Once the etiologic factors contributing to instability are identified, it is imperative to determine the presence or absence of copathologies. This is especially important preoperatively (to plan for specific repair strategies) and intraoperatively to prevent otherwise avoidable postoperative complications.[6]

Surgical intervention is of course guided by the underlying pathology. However, patient demographic characteristics, activity level, and expectations must also be taken into consideration. For instance, throwers and overhead workers subject the rotator cuff, superior glenoid, and subacromial soft tissues to repeated strains. These patients often present with multiple foci of chronic, cumulative pathology,[7-9] whereas contact athletes may subject the anteroinferior labrum, capsule, and glenoid to repeated trauma, placing them at higher risk of recurrent instability after surgery.

A variety of concomitant pathology may be present in addition to the classic Bankart lesion, including glenoid bone loss; humeral head bone loss; rotator interval pathology; complex/large capsular injuries including humeral avulsions of the glenohumeral ligaments (HAGL lesions), SLAP tears, near circumferential labral

tears, and anterior labral periosteal sleeve avulsions (ALPSA lesions); and rotator cuff tears (RCTs). Normal anatomic variations masquerading as pathology also may be present. Recognition and treatment of these associated pathologies are necessary to improve function and symptoms of pain and to confer anterior shoulder stability.

History

When a patient presents to the clinic after an anterior shoulder dislocation or subluxation event, the history and examination need to be closely scrutinized. It is important, first and foremost, to ensure that the correct diagnosis is made. Patients with recurrent anterior instability typically complain of instability during the midranges of motion (especially if associated with glenoid and/or humeral head bone loss), pain with the arm in the provocative position of abduction and external rotation, and an increasingly progressive ease of instability events. In contrast, the most frequent complaint in patients with primary multidirectional instability (MDI) is generalized or deep posterior shoulder pain, which is often accompanied by decreased athletic performance, as well as loss of strength.[10-13] Activities commonly associated with MDI include overhead throwing, tennis, butterfly and freestyle swimming, weight lifting, and football in a lineman position. Primary MDI is suspected in a young patient with multiple nonspecific complaints of activity-related shoulder pain, weakness, or paresthesias rather than symptoms of instability. Finally, symptoms in patients with primary posterior instability occur or intensify with the arm in the provocative position of forward flexion, adduction, and internal rotation. In throwers, symptoms typically occur during follow-through, whereas in swimmers, symptoms typically occur during the pull-through phase.

For all patients, the clinician should ask about generalized ligamentous laxity, history of instability events, mechanisms of injury, prior treatment, and overall activity goals and expectations. These historical facts are pertinent to determining the eventual surgical stabilization plan and can be extremely helpful in evaluating for other pathologies coexisting with the capsulolabral disruptions associated with instability.

Physical Examination

On examination, both shoulders should be evaluated, with observation of any obvious asymmetry, abnormal motion, muscle atrophy, swelling, scapular winging, and tracking. The asymptomatic shoulder may be examined first to gain patient confidence and relaxation.[14-16] Wide scars may suggest a collagen disorder.[17] Scapulothoracic dyskinesis should be carefully evaluated.[18-20] A shoulder examination to document instability is performed in the office and should be confirmed by an examination under anesthesia.[21]

In posterior instability,[22] the location of pain may be variable and occur along the posterior joint line,[19,23] biceps tendon, or the superior aspect of the rotator cuff. Subjective apprehension in posterior instability is uncommon.[13] The posterior apprehension or stress test may reproduce symptoms.[19,23,24] Range-of-motion testing in patients with posterior instability usually yields normal and symmetrical findings,[19,25,26] although an increase in external rotation and mild loss of internal rotation may be observed. Additional posterior instability tests include the jerk test,[27,28] the posterior stress test,[29] the Kim test,[30] and the load-and-shift test.[15] It is important to note that patients with a painful jerk test have shown a higher failure rate with nonoperative treatment.[30] Combining the Kim and jerk tests has been shown to have 97% sensitivity for posterior instability.[30] Neurologic and vascular symptoms are generally absent in posterior instability.

MDI is associated with apprehension during range of motion,[17] and patients have tenderness along the medial angle of the scapula and anterior rotator cuff. Internal rotation strength is decreased up to 30% in MDI[20] and serves to emphasize the dynamic muscular dysfunction in this condition. Anterior impingement may also be present in failed MDI repair cases because of increased excursion of the humeral head into the cuff tendons. Moreover, recurrent MDI may present with multiple nonspecific shoulder complaints of pain, paresthesias, and problems while carrying a weight at the side.[31,32] Subluxation events during sleep may be common. Excessive inferior translation of the humerus on the glenoid is often associated with posterior subluxation[10,23,33] and may indicate bidirectional instability or MDI if the inferior sulcus test reproduces the patient's symptoms. MDI should have a clearly symptomatic sulcus component (Fig 1).[32-35] This may be reproduced with the arm in 90° of abduction while applying a downward force on the proximal humerus to cause inferior displacement.[32] Finally, generalized ligamentous laxity has been associated with glenohumeral instability and should be assessed in patients with recurrent instability.[10,36] Generalized ligamentous laxity has been documented in 40% to 75% of patients who underwent surgery for MDI[20,37] and has been associated with decreased surgical success rates.

Imaging Studies

For initial evaluation of the shoulder, a standard shoulder radiograph series (Fig 2) is the preferred modality. Several additional views that are helpful in evaluating bony causes of instability include the serendipity view, Grashey view, West Point axillary view, Stryker notch view, scapular Y view, Garth view (apical-oblique view), and Didiee view (Table 1).

Advanced imaging modalities with magnetic resonance imaging (MRI) and computed tomography are

Fig 1. Physical examination of a right shoulder showing the sulcus sign in (A) external rotation and (B) a neutral position.

extremely helpful in evaluating copathology associated with recurrent anterior instability. MRI is useful in evaluating the rotator cuff, labrum, glenohumeral ligaments, cartilage, and capsule. When performed with the administration of intra-articular gadolinium, subtle intra-articular pathology is better appreciated. Indirect MRI arthrography, in which intravenous gadopentetate dimeglumine is administered, is less invasive and is often better tolerated than direct arthrography. It can be valuable in displaying inflammatory conditions and is indicated in diagnosing chronic Bankart lesions and their variants, in diagnosing SLAP lesions, and in performing postoperative evaluation of the shoulder. Direct MRI arthrography is the diagnostic tool of choice for evaluation of the rotator cuff and labrum in young athletes and is indicated in diagnosing rotator interval

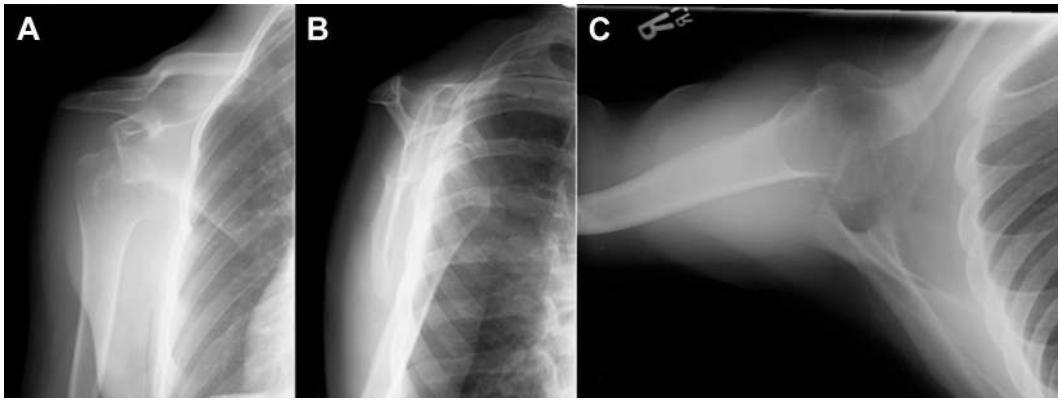

Fig 2. (A) Anteroposterior, (B) scapular Y, and (C) axillary radiographs of a right shoulder showing anteroinferior glenohumeral dislocation.

Table 1. Summary of Specialized Radiographic Studies Used in Evaluation of Patient With Shoulder Instability

View	Technique
Serendipity view	The serendipity view is a 40° cephalic tilt view of the SC joint and the medial one-third of the clavicle. It is indicated in SC joint separations and fractures of the clavicle.
Grashey view	The Grashey view lines up the glenoid so that it is perpendicular to the plane of the x-ray beam, allowing for evaluation of the glenohumeral joint space.
West Point axillary view	The West Point axillary view is a tangential view of the anteroinferior rim of the glenoid. This view is useful in identifying bony Bankart lesions or attritional bone loss of the anteroinferior glenoid.
Stryker notch view	In the Stryker notch view, a cassette is placed under the affected shoulder and the palm of the hand of the affected extremity is placed on the forehead with the fingers pointing toward the back of the head. The x-ray beam tilts 10° toward the head, centered over the coracoid process.
Scapular Y view	The scapular Y view helps to confirm the diagnosis of a posterior shoulder dislocation. The anterior portion of the affected shoulder is placed against the x-ray plate while the other shoulder is rotated out approximately 40°, and the x-ray tube is then placed posteriorly along the spine of the scapula.
Garth view (apical-oblique view)	The Garth view, also known as the apical-oblique view, is used in patients with shoulder instability. It helps to evaluate the anterior and inferior glenoid rim for calcification and fractures subsequent to dislocation. In this technique the x-ray beam is directed at a 45° angle through the glenohumeral joint toward the cassette, which is placed posterior and parallel to the scapular spine.
Didiee view	To allow for visualization of the glenohumeral alignment while also detecting fractures, loose bodies, calcification, and degenerative changes, the Didiee view is preferred. The patient lies prone with the arm abducted and slightly flexed at the elbow. The back of the patient's hand on the affected extremity should lie on the iliac crest. The film cassette is positioned under the shoulder, and the radiograph is taken from a lateral standpoint directed toward the humerus at 45°.

SC, sternoclavicular.

lesions, SLAP tears, ALPSA lesions, and Bankart lesions and their variants. Computed tomography (Fig 3) is useful in patients with a history of instability surgery and patients with midrange-of-motion instability because it can nicely show anterior or posterior glenoid insufficiency, engaging Hill-Sachs lesions, and reverse Hill-Sachs lesions. Finally, ultrasonography has become an important diagnostic tool in orthopaedics, especially for tendon pathology of the shoulder. It is cost-effective and portable and has a high rate of acceptance from patients. In patients for whom MRI is not an option, ultrasonography is the diagnostic tool of choice when evaluating the rotator cuff. It also has been shown to have satisfactory sensitivities and specificities in the assessment of postoperative rotator cuffs. Moreover, ultrasonography is useful in imaging-guided shoulder interventions, such as the aspiration and injection of paralabral cysts.

Treatment

In the young patient population, the treatment options for primary traumatic shoulder anterior shoulder instability include either nonoperative or surgical management. The age and activity level of the patient are critical factors, with younger patients at substantially higher risk of recurrent instability if undergoing initial nonoperative management.[1] With advances in arthroscopic approaches and instrumentation, arthroscopic techniques have evolved to become the gold standard for treating most cases of primary and recurrent anterior shoulder instability. Recent studies have shown that the results of arthroscopic repair for

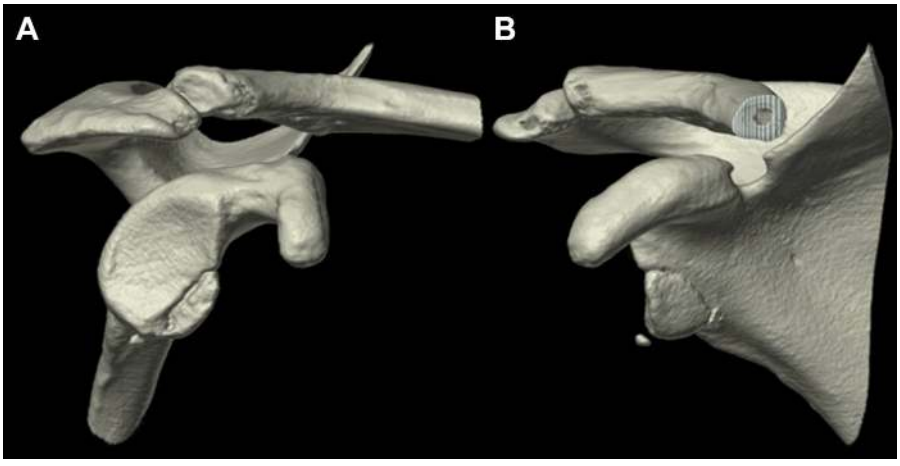

Fig 3. Three-dimensional CT reconstruction images of a right shoulder showing an anteroinferior glenoid bony Bankart lesion of approximately 20% to 25% of the glenoid width (A, viewed laterally; B, coronal cut, viewed from anterior aspect).

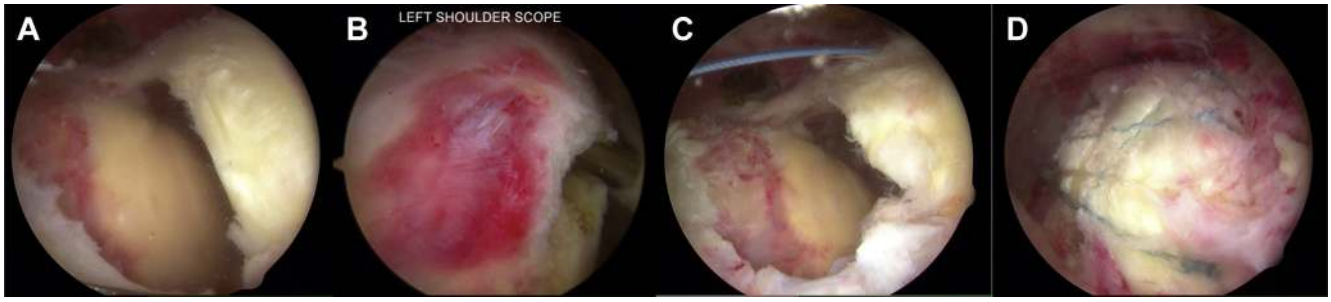

Fig 4. Arthroscopic images of a left shoulder in the beach-chair position, viewed from the posterior portal, showing (A, B) a full-thickness RCT and (C, D) subsequent repair.

primary shoulder instability are comparable with those of open techniques and yield fewer complications.[38-45] Arthroscopic revision stabilization, when indicated, has also produced reasonably acceptable results.[46-51]

Pathology associated with anterior capsule or labral pathology—including rotator cuff lesions[52-62] (Fig 4); SLAP lesions[63-70] (Fig 5); extensive labral tears, including circumferential labral tears,[71,72] 270° labral tears,[73] and posterior labral tears[22] (Fig 6); ALPSA lesions[74,75] (Fig 7); small cartilage lesions; and rotator interval lesions[76-81]—can typically be managed arthroscopically. Of note is the recent awareness of the long head of the biceps tendon (LHBT) (Fig 8) as a pain generator, such as with entrapment of the LHBT and instability of the LHBT.[82,83] Pathology of the LHBT can be managed with arthroscopic tenotomy, arthroscopic tenodesis, or open tenodesis techniques.[84-86] HAGL (Fig 9) and reverse HAGL lesions may be treated by arthroscopic or open techniques, depending on the extent of the pathology and the surgeon's experience level. In particular, poor capsular quality may require open reconstruction of the deficient capsule with allograft or autograft in an effort to improve the static restraint of the glenohumeral ligaments. Alternatively, a bone augmentation procedure such as the Latarjet procedure may be considered to provide an anterior restraint to the humerus with the attached conjoined tendon.

Glenoid bone loss[43,47,87-91] (Fig 10) and large Hill-Sachs lesions[92,93] (Fig 11) may require open surgical approaches, depending on the size of the lesions. The recommended treatment strategies for glenoid bone loss include soft tissue–only repair in cases with less than 15% loss and open bony augmentation with iliac crest autograft,[94] coracoid transfer (Bristow, Latarjet),[2,95-97] or distal tibial allograft reconstruction[98-100] in cases with greater than 25% loss. Treatment of patients with 15% to 25% glenoid loss is somewhat controversial, with several authors reporting success with arthroscopic capsulolabral repair (with or without incorporation of the fragment)[4,46,49,101] but other authors reporting unacceptable failure rates when performed without bony augmentation.[47] In patients with Hill-Sachs lesions of the humeral head that engage with the anterior glenoid, surgical options include bone grafting with allograft or autograft; treatment with synthetic plugs; or filling of the bony lesions with transfer of the infraspinatus tendon, known as remplissage. Humeroplasty or disimpaction of the defect and, in severe cases, humeral head resurfacing have also been described.

Authors' Recommendations

The following sections provide a summary of our recommendations for treatment of copathology (Fig 12, Table 2). Of note, several of the treatment strategies are

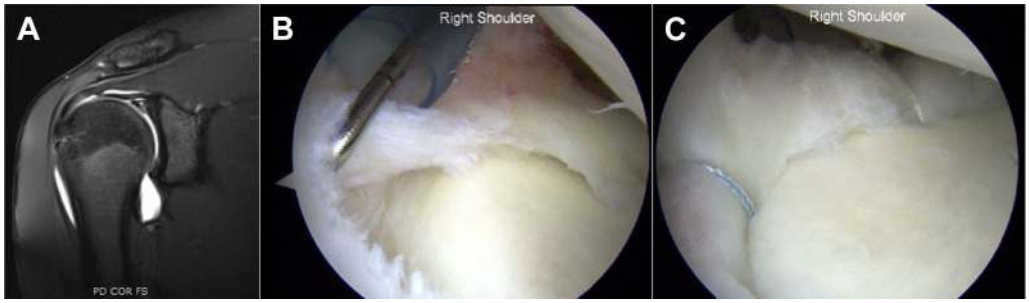

Fig 5. (A) MRI scan (right shoulder, proton-density fat-saturated coronal view) of a type II SLAP tear and (B, C) arthroscopic images of a right shoulder in the lateral decubitus position, viewed from the posterior portal, showing (B) the SLAP lesion and (C) subsequent repair.

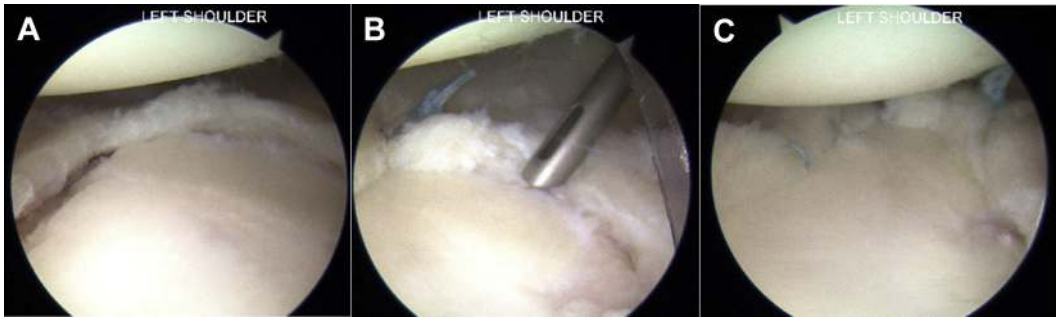

Fig 6. Arthroscopic images of a left shoulder in the lateral decubitus position, viewed from the accessory anterosuperolateral portal, showing (A) a posteroinferior labral tear and (B, C) subsequent repair.

controversial, and surgeons should make treatment decisions on a patient-specific basis. Recently, there has been an exponential increase in the number of publications discussing both classic and novel treatment approaches for many of the copathologies associated with anterior glenohumeral instability. It can be difficult to apply the available literature to an individual patient because there is significant variability both among different studies and even sometimes within the same study (i.e., if data are collected over a longer period and the author changes his or her surgical technique). Nevertheless, although there certainly is no gold standard for the management of the various copathologies in these challenging cases of recurrent anterior instability, we offer a summary of our recommended approaches for each of these conditions.

Glenoid Bone Loss. We recommend attempting to restore the native glenohumeral anatomy whenever possible, and in high-level athletes, bony augmentation procedures are often preferred in cases of 15% bone loss or greater. For lesions of less than 10% to 15%, our arthroscopic procedure of choice involves anatomic labral repair with or without capsular plication, incorporating the

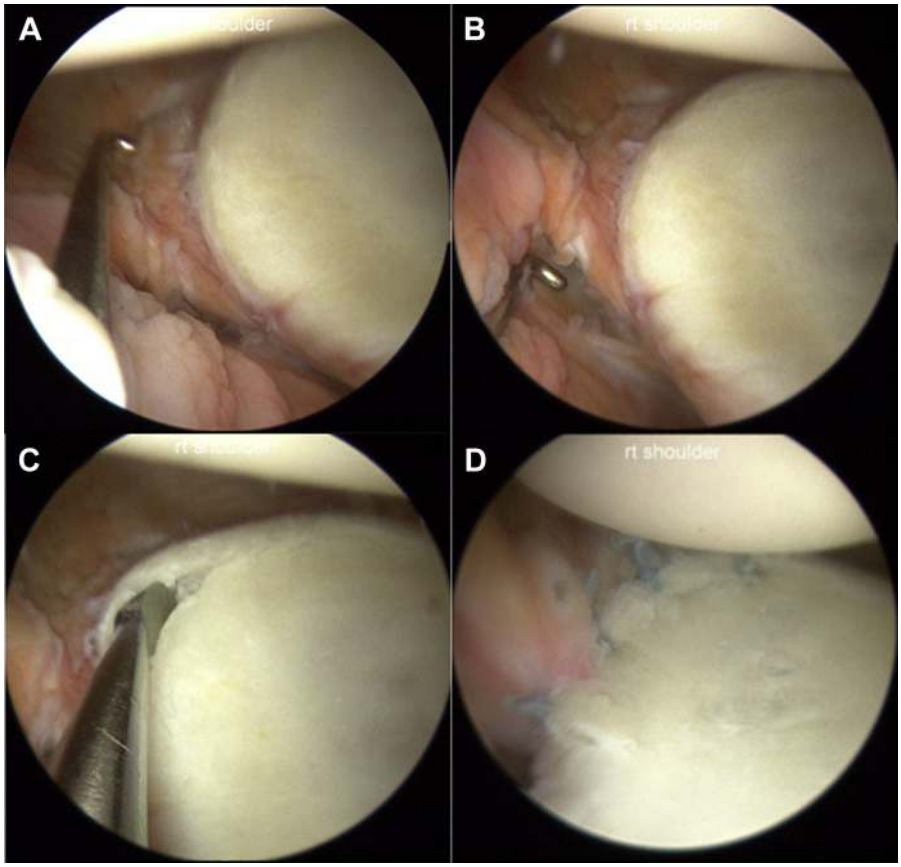

Fig 7. Arthroscopic images of a right shoulder in the lateral decubitus position, viewed from the accessory anterosuperolateral portal, showing (A, B) an ALPSA lesion and (C, D) subsequent repair.

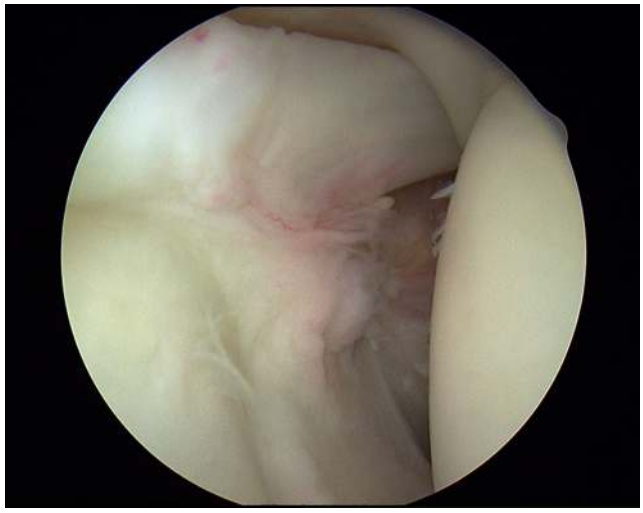

Fig 8. Arthroscopic image of a right shoulder in the beach-chair position, viewed from the posterior portal, showing the LHBT as it inserts onto the superior labrum/supraglenoid tubercle.

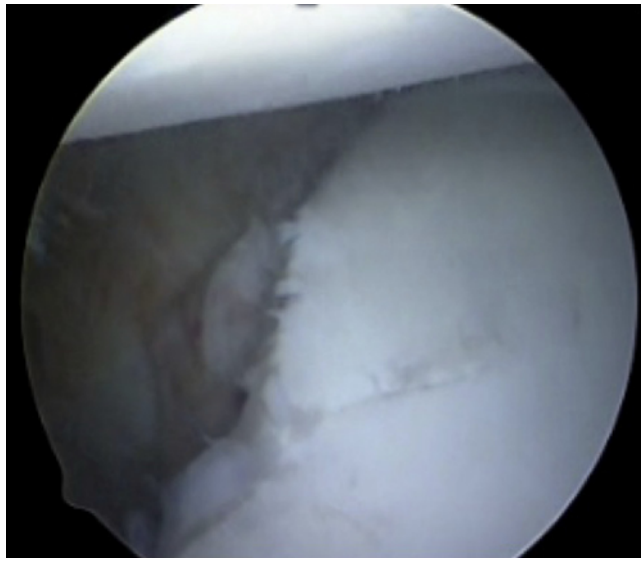

Fig 10. Arthroscopic image of a left shoulder in the lateral decubitus position, viewed from the accessory anterosuperolateral portal, showing anteroinferior glenoid bone loss in the setting of chronic anteroinferior instability.

bony fragment with suture anchors whenever feasible. Removing cartilage from a detached, osteochondral Bankart fragment will facilitate its healing against the glenoid rim, enabling it to function as a buttress beneath capsular tissue that is advanced and repaired to the intact glenoid rim. We recommend using 2 double-loaded suture anchors at the superior (3-o'clock position) and inferior (5- or 6-o'clock position) borders of a bony Bankart lesion to facilitate simultaneous capsular plication and bony fragment incorporation. All sutures are passed before suture knot tying to facilitate suture passage around the fragment. Our procedure of choice for patients with 15% or greater bone loss is the congruent-arc Latarjet procedure,[102,103] with repair of the labrum when possible. Although coracoid transfer procedures have been shown to yield favorable outcomes with respect to recurrence rates, the associated risks of arthrosis, motion loss, and subscapularis dysfunction remain a concern with long-term follow-up.[104,105] Recently, we have used fresh distal tibial osteochondral allograft[100,106,107] in an attempt to restore both the osseous and cartilaginous anatomy. Although this procedure has proved successful in the short-term (A.A.R., M.T.P., unpublished data, July 2014), further evaluation of long-term outcomes, including the possibility of graft resorption, is warranted before this technique can be universally recommended. For open anteroinferior glenoid reconstruction procedures, we use a longitudinal split of the subscapularis tendon[108] in an effort to avoid long-term complications of atrophy, tendon rupture, and weakness.

Humeral Head Bone Loss. After one performs anterior glenoid reconstruction and before one decides on humeral head reconstruction, we recommend re-evaluating the overall glenohumeral congruency and tracking with the shoulder in maximum abduction and external rotation. Once the glenoid arc has been restored, even large Hill-Sachs lesions (i.e., over 30% to 40% of the surface area of the humeral head) may

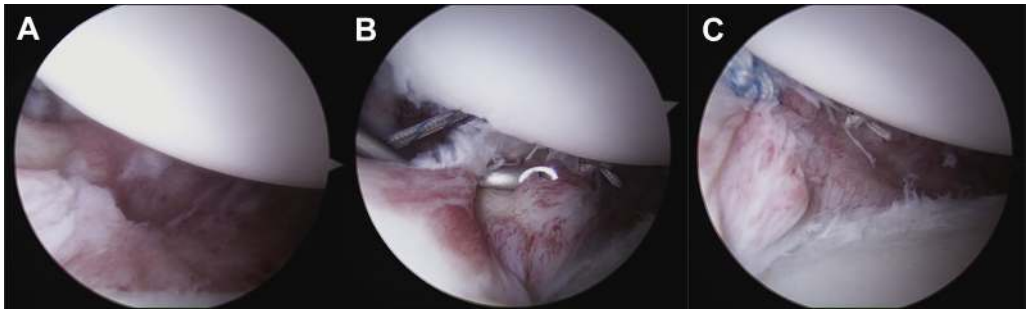

Fig 9. Arthroscopic photographs of a right shoulder in the lateral decubitus position, viewed from the accessory anterosuperolateral portal, showing (A) an anterior HAGL lesion and (B, C) repair.

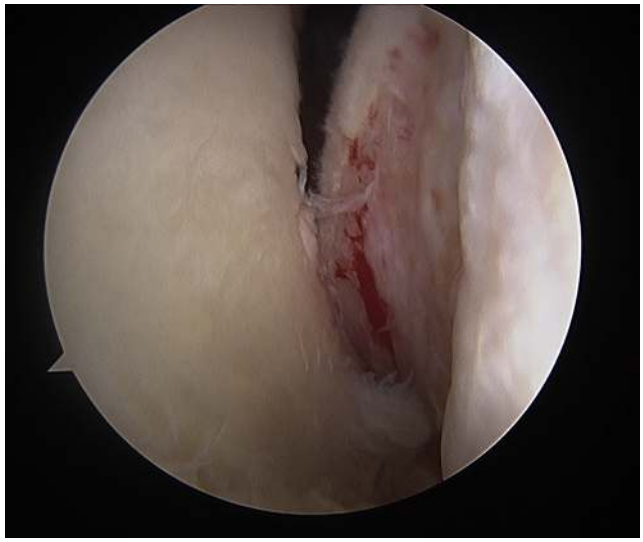

Fig 11. Arthroscopic image of a left shoulder in the beach-chair position, viewed from the posterior portal, showing an engaging Hill-Sachs lesion.

no longer engage the anterior glenoid rim (i.e., the tire no longer falls into the pothole). If, however, the humeral head defect continues to engage and therefore contributes to residual instability, despite adequate restoration of the glenoid arc, augmentation with fresh osteochondral allograft (from the humeral head or femoral head) is our preferred approach.[92,107] Arthroscopic remplissage, especially for defects comprising between 20% and 40% of the humeral head, is a viable option, particularly in cases of unipolar humeral head defects (i.e., no significant glenoid bone loss) in the setting of glenohumeral instability.[109] As noted by Boileau et al.,[109] this procedure yields a high return-to-sport rate with a low recurrence rate (2%) at a mean of 2 years after surgery in appropriately indicated patients.

Rotator Interval Lesions. We caution against routine rotator interval closure in cases of recurrent glenohumeral instability. In specific cases anterior instability may be improved but at the cost of postoperative stiffness in external rotation. The associated loss of external rotation must be weighed against the patients' specific functional demands, particularly in athletes and overhead throwers. We do not typically recommend rotator interval closure in cases of MDI or posterior or isolated inferior instability. For treatment of rotator interval lesions associated with arthroscopic Bankart repair, our preferred approach[110] is a variation of the well-described technique of Calvo et al.[111] A suture passer is used to capture the upper or lower margin of the rotator interval capsule through a slightly recessed cannula placed in the anterosuperior portal. A No. 0 polydioxanone suture is then retrieved from the joint, through the recessed anterior cannula, with a bird-beak or crochet hook, after penetration of the opposite (upper or lower) margin of the rotator interval capsule. The suture is tied through the anterosuperior cannula to close the anterior capsule with a sliding knot. The degree of tightening is observed and titrated under direct visualization, and the knot or knots remain extracapsular.

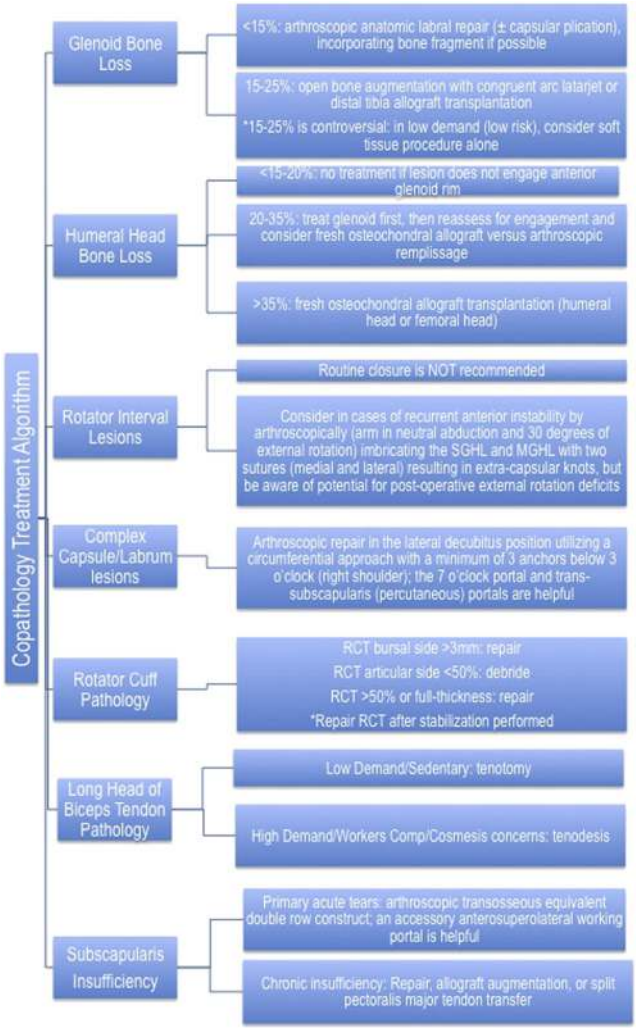

Fig 12. Treatment algorithm for management of copathology associated with anterior glenohumeral instability. MGHL, middle glenohumeral ligament; SGHL, superior glenohumeral ligament.

Table 2. Summary of Copathologies Associated With Anterior Instability

Glenoid bone loss
Humeral head bone loss (Hill-Sachs lesions)
Rotator interval lesion
Complex capsule/labrum pathology and management
SLAP tear
Extensive labral tear
ALPSA lesion
RCT
Subscapularis insufficiency

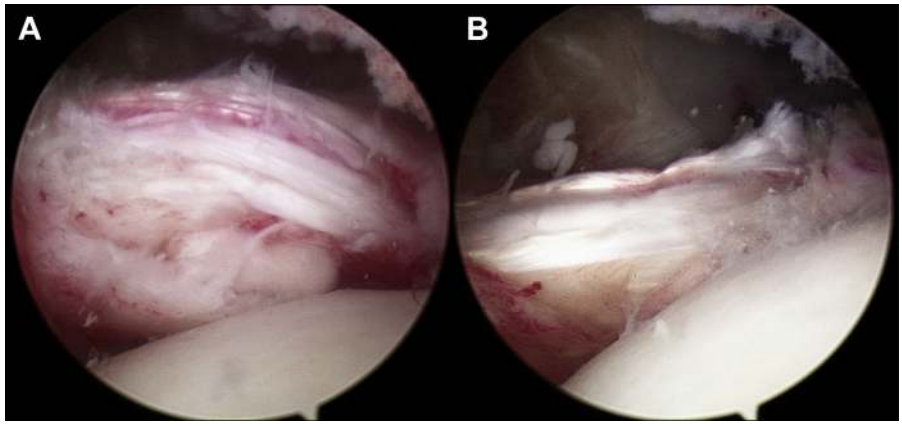

Fig 13. Arthroscopic images of a right shoulder in the beach-chair position, viewed from the posterior portal, showing a subscapularis tendon tear (A) before and (B) after intra-articular repair to the lesser tuberosity footprint with suture anchors, with an approach through anterior and accessory anterosuperolateral portal cannulae.

Complex Capsule/Labrum Pathology and Management. We advocate strongly for a circumferential approach to capsule and labrum repair[71,72] so long as the patient's complaints and findings on examination under anesthesia warrant repair. Particular attention should be paid in patients who require capsular plication in addition to labrum repair.[112,113] We advocate for a minimum of 3 anchors below the equator (3-o'clock position for a right shoulder). We approach these repairs from the lateral decubitus position, aided by the use of a 7-o'clock portal.[114] The use of a curved drill guide or trans-subscapularis portal for inferior anchor placement can significantly improve the trajectory and position of the anchor sites; however, a biomechanical study has not found these strategies to be superior biomechanically when compared with standard approaches.[115] With respect to the sequencing of pan-labral repairs and optimization of arthroscopic visualization, we recommend starting posteriorly (below the 9-o'clock position) and then progressing inferiorly (to the 6-o'clock position) and then anteriorly (to the 3-o'clock position). Arthroscopic treatment of a pan-labral injury should conclude with SLAP lesion repair (between the 10- and 1-o'clock positions).

Rotator Cuff Pathology. The relation between RCTs and labral tears near the biceps anchor was first established by Andrews et al.[116] in throwers. The literature, however, does not provide clear treatment guidelines. Concomitant repair of RCTs and labral lesions (including SLAP lesions) remains controversial, especially in middle-aged patients who are thought to be prone to stiffness.[117-120] An alternative option includes concomitant RCT repair and combined LHBT treatment with either tenotomy or tenodesis; the outcomes of these techniques remain controversial as well, with some authors showing superior results when compared with RCT repair with SLAP repair.[121] We recommend mini-open subpectoral biceps tenodesis with concomitant RCT repair for high-demand laborers and Workers' Compensation patients to preserve supination strength and to minimize the chances of a Popeye deformity. More sedentary patients may be treated with biceps tenotomy alone.

Subscapularis Insufficiency. Subscapularis tendon tears are associated with severe posterior or anterior instability events,[11] generally in patients older than 40 years. Insufficiency or dysfunction of the subscapularis has also been reported to occur in 4% to 54% of open instability operations.[104,122] Clinically significant subscapularis dysfunction may affect as many as 70% of patients after an open instability repair.[104] This complication must be considered in patients undergoing revision instability repair after a failed open procedure. Preoperative planning in patients with suspected subscapularis dysfunction includes an MRI scan to evaluate the integrity and quality of the tendon insertion on the less tuberosity. More importantly, however, a sagittal oblique MRI scan may be used to evaluate the subscapularis muscle belly for atrophy and fatty infiltration. Surgical management (Fig 13) may include subscapularis repair, allograft reconstruction/augmentation, or split pectoralis major tendon transfer. For primary subscapularis tendon repairs that occur as a result of instability, our preference is an arthroscopic transosseous-equivalent double-row construct. This repair is facilitated by use of an accessory anterosuperolateral working portal.

Conclusions

In patients with shoulder instability, there may be a wide array of concomitant pathologies present beyond just the classic Bankart lesion. These copathologies consist of glenoid and humeral bone loss, rotator interval pathology, HAGL lesions, RCTs, SLAP tears, near circumferential labral tears, MDI, and ALPSA lesions. Non-pathologic normal anatomic variants may also be present. It is essential that these associated pathologies are recognized and subsequently treated. Failure to do so may result in an inability to improve function and

anterior shoulder stability and to alleviate symptoms of pain.

Unrecognized labral injuries, such as extensive labral tears, are more easily treated arthroscopically with predictable results. Patients with anterior glenoid bone loss can be adequately treated with revision stabilization procedures; however, open procedures are often indicated for patients with severe glenoid bone loss requiring bony reconstruction. Open approaches are also indicated in patients with subscapularis deficiency or engaging Hill-Sachs lesions, which are believed to play a role in the recurrent instability. Regardless of the method of revision stabilization, the results of surgical repair and stabilization are typically not as good as those of the primary intervention, and patients should be counseled appropriately before undergoing any surgical intervention.

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