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In Focus

# Treatment of Anterior Shoulder Instability: A Comprehensive Review

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Anterior shoulder instability is a complex spectrum of pathology characterized by excessive translation of the humeral head across the glenoid, leading to apprehension, subluxation, and dislocation. Diagnosis and classification require a thorough clinical history, physical examination, and imaging to appropriately determine the severity of instability. Depending on the individual patient anatomy and severity of instability, there exist many management options that are well-positioned to successfully treat this pathology and allow patients to return to prior functional levels. Treatment options available are conservative management, arthroscopic or open Bankart repair, remplissage, open or arthroscopic Latarjet, and glenoid bone grafting. Each of these options provides unique advantages for the surgeon in treating a subset of patients along the spectrum of disease. Selection of treatment modality depends upon the number of instability events, appropriate quantification, classification bone loss, presence of associated soft tissue injuries, and patient-specific goals regarding return of function. The purpose of this review was to present an evidence-based approach to the investigation, treatment selection, and follow-up of anterior shoulder instability. Individualized patient care is required to optimally address intra-articular pathology, restore stability and function, and preserve joint health for all.



Anterior shoulder instability (ASI) represents a spectrum of pathology characterized by excessive translation of the humeral head across the glenoid, leading to apprehension, subluxation, and dislocation. The prevalence of ASI is around 1% to 2% in the general population, although the prevalence is much greater in high-risk populations such as collision athletes and military personnel.[1] Appropriate management for this pathology remains controversial due to both a lack of high-level evidence and regional variation in treatment.[2] There is a wide range of possible surgical and conservative management options, and decisions should be made in conjunction with the patient assessing the risk of recurrence and functional demands.[2] The purpose of this review was to explore an evidence-based approach to the investigation, treatment, and follow-up of ASI.

## Diagnosis

There are currently no standardized guidelines regarding the assessment of ASI, although consensus studies have recommended a thorough clinical history and examination.[2] Relevant components of patient history to assess are patient age, mechanisms of injury, psychological state, occupation, sport played and position, level of sport, whether reduction was required, and if hyperlaxity is present.[2,3] The key elements of the physical examination include rotator cuff strength, neurological examination, anterior/posterior and abduction/external rotation apprehension, load and shift, sulcus sign, Beighton hypermobility score, and Gagey test.[2]

Imaging is an additional critical component of diagnosis. When possible, radiographs should be performed both prior to and after reduction. However, when necessary, closed reduction can be performed prior to imaging.[2] Initial imaging should include a complete radiographic series with true anterior–posterior and axillary radiographs. The axillary lateral view provides key insight into the position of the humeral head relative to the glenoid as well as the presence of glenoid erosion or dysplasia. Magnetic resonance imaging is the preferred imaging modality to describe labral injuries and other associated soft tissue injuries such as a rotator cuff injury or biceps pathology.[1,2] Computed tomography imaging is the preferred imaging modality to assess glenohumeral bone loss, although it is associated with ionizing radiation. Bone loss may be quantified via the best-fit circle method using enface view of a

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three-dimensional computed tomography, among many other validated techniques. It is also critical to assess for Hill-Sachs lesions that are impaction injuries to the posterior–superolateral humeral head and are nearly ubiquitous in recurrent instability. In the setting of glenohumeral bone loss, it is essential to assess for off-track Hill-Sachs lesions using the methods described by Di Giacomo et al.[4]

## Nonsurgical Management

Patients with a lower risk profile or a preference to avoid surgery can be effectively treated nonoperatively. These patients classically are first-time dislocators, without glenohumeral bone lesions, who are not engaged in high-risk activities for recurrence.[2] Athletes who desire to return to sport (RTS) in season may also be treated nonoperatively, after counseling regarding the risk of recurrence. There is no robust evidence to support the use of corticosteroids and orthobiologics in nonsurgical management for ASI. Nonsurgical management consists of a period of immobilization followed by progressive range of motion (ROM) and strength exercises. There remains conflicting evidence and a lack of consensus regarding the length and position of immobilization (neutral, internally, or externally rotated).[2] After 1–2 weeks of immobilization once the patient is comfortable, ROM exercises can be initiated, although prolonged immobilization is practiced by some surgeons. Resistance training should begin only after the full ROM has been restored. Following the progression of resistance training and restoration of strength, sport-specific exercises may then be reincorporated. An area of great promise is objective sports-specific performance testing, although there remains limited published evidence to date.

Outcomes after nonsurgical management remain inconsistent. Long-term studies have shown that 37.5% of patients experience recurrent instability, 58.4% recurrent pain, and 12.2% develop symptomatic osteoarthritis.[5] When compared with arthroscopic stabilization, conservative management is associated with significantly higher rates of recurrent instability and a lower rate of RTS.[6] Risk factors for poor outcomes after conservative treatment include higher initial levels of pain, recurrent instability, seizure disorders, smokers, severe glenoid bone loss, low-energy mechanism of injury, concomitant soft tissue injuries, collision, and competitive athletes.[5]

## Bankart Repair

The arthroscopic Bankart repair (ABR) is the most commonly used surgical procedure for ASI.[7] It is indicated in patients with primary or recurrent instability with an anterior labral tear, minimal (<13.5%) glenoid bone loss, and/or an on-track Hill-Sachs lesion. This procedure aims to repair the labrum to restore the stabilizing effects of the glenohumeral soft tissue. Large systematic reviews have demonstrated a 7-fold lower recurrence rate as well as higher RTS when first-time dislocated patients received ABR over conservative management.[7] Additionally, ABR has been shown to be more cost effective than nonsurgical management for first-time anterior shoulder dislocation, which is an important metric in value-based health care.[8] These data suggest that ABR is an appropriate initial management for first-time shoulder dislocation and should be offered when discussing options with patients.[7]

Open Bankart repair may be indicated over the arthroscopic approach in patients with a higher risk for recurrence. Studies investigating the efficacy of open Bankart repair in young collision athletes have demonstrated an excellent RTS and high patient satisfaction levels; however, the recurrence rate in these high-risk patients was concerningly high.[9] It remains a viable option in the treatment of adolescent instability especially if there is concern about performing a bony procedure in skeletally immature patients. Open Bankart repair should be performed in a manner to facilitate the potential need for open stabilization in the future. The presence of severe glenohumeral bone loss or an elevated risk for recurrence may necessitate remplissage augmentation or a Latarjet procedure.[7]

## Remplissage

The primary indication for the addition of remplissage is the presence on preoperative imaging of moderate-to-large Hill-Sachs lesions or off-track lesions or an engaging lesion at the time of surgery.[10] The remplissage procedure involves capsulo-tenodesis of the infraspinatus tendon and posterior aspect of the capsule to fill the Hill-Sachs lesion rendering it extra-articular to prevent engagement with the glenoid.[11] The addition of remplissage to ABR substantially lowers the rate of recurrent instability and revision surgery, whereas it is associated with greater RTS, although there are some concerns in throwing athletes.[11,12] Arthroscopic Bankart repair with remplissage produces similar recurrence rates, with less morbidity and fewer complications compared with Latarjet procedure.[11] The addition of remplissage to a Latarjet procedure has been described, although there is no evidence to support its use. The biomechanics of the Latarjet procedure may eliminate the need for concomitant remplissage.[13]

## Latarjet Procedure

The Latarjet procedure can be performed arthroscopically or open. The Latarjet procedure involves harvesting the coracoid and conjoint tendon, and fixing the bone block to the anterior glenoid with screws or sutures.[14] The Latarjet provides stability via three mechanisms. First, it corrects glenoid bone loss and widens the diameter of the glenoid. Second, the conjoined tendon which is brought through the subscapularis creates a “sling effect” to resist anterior humeral translation. Finally, the transferred coracoacromial ligament augments the anterior capsule.[15]

Multiple scoring systems exist to identify patients who may benefit from this more invasive procedure. The Instability Severity Index Score was the most widely used score and has since been modified to Glenoid Track Instability Management Score, which incorporates advanced imaging findings.[15] The primary indications for Latarjet are those with recurrent instability, failed prior stabilization, glenoid bone loss >15% to 20%, off-track lesions, and high-risk patients such as collision athletes.[10] When comparing primary Latarjet stabilization with Latarjet as a revision stabilization, previous meta-analyses have demonstrated superior recurrence, complication, and RTS rates after primary Latarjet, which supports a growing trend for earlier bony stabilization.[16] There has been historic controversy surrounding what threshold constitutes a critical glenoid bone loss. It has been consistently revised downward from 25%, with current estimates as low as 13.5% glenoid bone loss, indicating a Latarjet over ABR.[15] However, most studies have considered either glenoid or humeral bone loss cutoffs in isolation, the complex interplay of these factors is not fully understood, and the critical level of glenohumeral bone loss remains unknown.[15]

High rates of RTS in both collision and overhead athletes are widely reported as well as lower rates of recurrence in the order of 5% to 10% of long-term follow-up, which outperforms soft tissue procedures.[17] Despite these successes, the complication rate is also greater and has been reported to be as high as 30%.[15] The risk of injury to the musculocutaneous or axillary nerves is of particular concern, particularly during the preparation of the coracoid graft and passage through the subscapularis split. However, the suprascapular nerve is at risk during fixation of the graft to the glenoid.[15] These complications are rare, although they remain a concern, particularly for centers with lower operating volumes.[14] The open approach for a Latarjet affords surgeons good visualization of the anatomic structures, whereas the arthroscopic procedure remains technically challenging and is not as widely performed.[15,18] A recent meta-analysis found equivalent functional results, complication rates, and recurrence between open and arthroscopic approaches, highlighting both approaches are viable.[14]

## Glenoid Bone Grafting

Glenoid bone grafting is primarily used as a salvage procedure after failed Latarjet, for patients with massive glenoid bone loss, or those without a suitable coracoid graft. Despite this, level-1 evidence suggests when used as a primary bony stabilization procedure, outcomes are equivalent to the Latarjet. Grafts may be autologous, usually taken from the iliac crest, or allogenic, most commonly from the distal tibia. Advantages of this procedure include the potential to harvest grafts that are larger than possible from the coracoid and contain articular cartilage.[10] Additionally, the lack of soft tissue attachment may be a benefit in certain populations such as in epilepsy, reducing the risk of convulsion-related graft failure.[10] Systematic reviews have reported similar rates of recurrence, complications, progression of osteoarthritis, functional scores, and RTS between Latarjet and bone grafting procedures.[19] Hence, surgeon preference is acceptable as a relative indication for Latarjet versus bone grafting.[10]

## Revision Surgery

Revision surgery is indicated in patients with primary treatment failure manifesting as symptomatic apprehension, subluxation, dislocation, functional limitations, further intra-articular injury, or symptomatic hardware failure. The initial stabilization procedure impacts the choice of revision stabilization procedure. Considerations such as subscapularis integrity, which may be affected secondary to damage from the split approach or the presence of hardware after open stabilization, are critical.[20] Specifically following a failed ABR, a revision repair may be appropriate depending on the nature of the injury and risk of recurrence, and in modern practice, this is frequently augmented by remplissage. Commonly, however, bony procedures are used for revision cases and may be more appropriate depending on the risk factors for recurrence. After a failed Latarjet, glenoid bone grafting procedures are frequently performed to address bone defects. However, if the original graft remains intact, it may be sufficient to perform remplissage to address humeral-sided bone loss or persistently off-track lesions.[10] After a failed glenoid bone grafting procedure, Latarjet should be performed. Although concomitant glenoid-sided procedures and remplissage have been described and have a strong rationale for their use, there is no evidence to date to support this practice. There exist many options for revision stabilization, and the choice should be made to help patients' return to function, avoid recurrence, and preserve the long-term health of their joints.

## Rehabilitation and Return to Play

There is no consensus in the literature regarding the duration of immobilization, rehabilitation timelines, or criteria for RTS. After surgical stabilization, immobilization in a sling is suggested for between 4 and 6 weeks depending on surgeon preference and the exact procedure. After this period of immobilization, passive and active ROM exercises are reincorporated aiming to establish full ROM by 8 weeks post-op. Resistance and strength training should then be gradually introduced, followed by RTS-specific training and a graded return to play.

Return to sport is arguably the most meaningful metric of success for athletes. Overhead and throwing athletes typically take longer to regain the ROM and end-range power to return to performance, whereas collision athletes need to regain strength and proprioceptive control. There are many further considerations in elite athletes including greater access to advanced care, acceptance of risk, speed of RTS, and implications of recurrent instability on their career. Return to sport after ABR typically takes 6 months, with the addition of remplissage adding a further month. Although RTS has been reported as 8 months after open Bankart repair and 5 months after Latarjet.[3] This is a complex issue known to be affected by patient motivation, external life factors, psychology, and sport-specific demands.[20] A majority of athletes who do not RTS cite psychological reasons most commonly fear of re-injury, loss of confidence, anxiety, depression, and lack of motivation. The most widely used tool to assess psychological readiness for RTS is the validated Shoulder Instability Return to Sport after Injury Scale, which should be used to assist patients throughout this process.[3,20]

## Clinical Follow-Up

There is broad agreement that follow-up should be continued until the patient has a stable, pain-free shoulder with a return to full preinjury function. This is both patient- and surgeon-dependent; however, most surgeons report a minimum duration of 12 months of follow-up or return to preinjury function, whichever occurs later. These follow-up visits should assess patient-reported outcome measures such as function, impact on activities of daily living, RTS, instability symptoms, confidence, and satisfaction.[20] Imaging at follow-up is indicated after bone grafting procedures to assess for graft union, positioning, and resorption.[20]

Anterior shoulder instability is a complex spectrum of pathology, which requires individualized patient care to address intra-articular pathology, restore stability and function, and preserve joint health for patients. This is a rapidly evolving area of study, and further study will be required to improve outcomes.

## Conflicts of Interest

Oke Anakwenze receives research support and consultant payments from Exactech, LIMA, Responsive Arthroscopy, Suture Tech, and Smith & Nephew. Christopher S. Klifto receives research support and consultant payments from Acumed, LLC, Restore3d, GE Healthcare, J&J, Merck, Pfizer, and Smith & Nephew. Yaw Boachie-Adjei has partnerships with DJO/Enovis Medical and restor3D. Johnathan Dickens has relationships with Asante, Blue Bio, Quadvantage, restor3D, Revbio, Sparta Biomedical, and Sparta Biopharma. None of these relationships are directly related to or may have added bias to this article. The other authors, their immediate families, and any research foundations with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

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