Review Article

Posterior shoulder instability in the contact athlete: a review of the diagnosis, management and outcomes

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Abstract: Posterior shoulder instability should be increasingly recognized in patients with acute shoulder dislocations or instability, while also warranting a high index of suspicion in contact athletes with insidious onset of shoulder pain. Athletes often present with vague symptoms, typically including deep-seated joint pain and frequently without a described acute traumatic event. The contact athlete will often complain of pain with push-ups and bench press, particularly provoked during blocking motions relevant to football linemen and linebackers. In addition to a patulous posterior capsule, bony morphology can contribute to increased risk of posterior shoulder instability, such as a reverse Hill-Sachs lesion, glenoid dysplasia, glenoid retroversion and posterior acromial height. Posterior bone defects occur in a predictable pattern within the posteroinferior quadrant of the glenoid face and 15% of posterior glenoid bone loss can lead to a 25 times higher failure rate of arthroscopic posterior shoulder stabilization alone. While arthroscopic posterior shoulder stabilization is the gold standard in the absence of substantial posterior glenoid bone loss, posterior bone block stabilization may be necessitated in patients with significant posterior glenoid bone loss or retroversion, or who have failed a previous arthroscopic soft tissue procedure. Free bone block augmentation for posterior glenoid reconstruction has demonstrated compelling short-term results, yet there are no long-term outcome data or comparative studies reporting on the outcomes of these relatively new techniques. Overall, arthroscopic posterior shoulder stabilization leads to high patient satisfaction and excellent clinical outcomes. Contact athletes generally demonstrate similar patient-reported and functional outcomes when compared to overhead throwing athletes. However, contact athletes generally return to sport and previous level of play at a higher rate compared to overhead throwing athletes, potentially due to the lower dynamic stressor applied across the glenohumeral joint, typically at mid-range of motion, compared to the overhead throwing athlete. Findings suggest that comprehensive evaluation and individualized treatment strategies are necessary for optimizing patient outcomes and return to sport among contact athletes.

Keywords: Posterior shoulder instability; posterior labrum; contact athlete; overhead throwing

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Introduction

Posterior instability of the glenohumeral joint is gaining increasing attention as a significant source of pain and recurrent injury in athletes that engage in high-risk sports, such as contact athletes (football, wrestling and rugby), overhead and throwing athletes and military servicemembers. While anterior shoulder instability is a much more commonly encountered pathology, posterior shoulder instability is often underdiagnosed, as patients frequently present with more vague symptoms of pain and without an acute traumatic injury. These vague symptoms often overlap with other common shoulder pathologies, which can lead to a delay in diagnosis and management. Posterior shoulder instability is typically the result of some combination of an acute traumatic injury, in addition to repetitive microtrauma and stress across the posterior capsule and glenohumeral ligaments. Timely diagnosis and appropriate treatment are crucial, especially for contact athletes, as recurrent instability and persistent pain can result in poor patient-reported outcomes, decreased shoulder function, limited rate of return-to-play, and, in some cases, premature retirement from sport (1-4). Comprehensive evaluation and individualized treatment strategies are necessary for optimizing patient outcomes and return to pre-injury level of activity in the contact athlete. Significant strides have been made in the last decade with an increasing body of literature focused on defining, treating and monitoring recurrence in patients with posterior shoulder instability. This clinical review describes the complex interplay between injury patterns, anatomical considerations and diagnostic criteria, as well as surgical and rehabilitation strategies to timely diagnosis and treat posterior shoulder instability in the contact athlete with the goal of optimizing patient-reported outcomes, functional performance and rates of return to sport.

Prevalence in contact athletes

Overall, past literature has reported posterior labral tears to account for only 2–5% of shoulder instability cases (1,2,5,6). However, this has been challenged more recently, specifically with the higher rates of posterior shoulder instability reported in the United States (US) military population, which is a high-risk population often engaging in combat arms, weapons training, parachuting, heavy load carrying and weightlifting. A 2021 review of the incidence of posterior shoulder instability in the US military population found the total incidence of all shoulder instability to be 1.84 per 1,000 person-years, with posterior instability accounting for 5.2% of total cases (3). This overall incidence is higher than previously reported, which is likely reflective of the young, active population and due to increased awareness of posterior instability as a concern in shoulder pain in the contact athlete. Furthermore, the overall unadjusted incidence was 0.032 per 1,000 person-years for posterior dislocation, 0.064 per 1,000 person-years for posterior subluxations, and 0.096 per 1,000 person-years for all cases of posterior shoulder instability (3).

Mannava *et al.* (4) reported on the prevalence of posterior labral tears in collegiate football players competing in the National Football League (NFL) Combine. The authors found that linebackers and linemen were most likely to demonstrate labral pathology. Magnetic resonance imaging (MRI) demonstrated that 34% of patients with labral tears had posterior labral pathology compared to 30% with an anterior labral tear, 34% with combined anterior and posterior labral tears and 31% with a superior labral anterior-posterior (SLAP) tear. They also demonstrated that 53% of shoulders with an identified labral tear also demonstrated evidence of prior shoulder surgery in this contact athlete population. Offensive lineman, tight ends and long snappers, all positions that are commonly involved in blocking maneuvers, demonstrated the highest rate of posterior labral tears. Similarly, a retrospective review of military service members who underwent shoulder stabilization procedures found that 24% had isolated posterior labral tears, while 43% had combined anterior and posterior labral tears (7). This higher than previously reported rate of posterior shoulder instability in the contact athlete is further supported by a United Kingdom study focusing on a cohort of predominantly young, male patients among the general population undergoing arthroscopic labral repair (8). In this study, Javed *et al.* (8) found a 17% rate of posterior labral tears and 34% rate of combined anteroposterior labral tears in the athletic population, predominantly comprised of rugby players, which was significantly higher compared to the non-athletic population (12% rate of posterior labral tear and 18% rate of combined anteroposterior labral tear) (8).

Injury mechanism and pathoanatomy

Posterior glenohumeral instability can result from two general mechanisms. In the overhead throwing athlete, SLAP tears can propagate in a posteroinferior direction,

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classified as a SLAP type VIII tear. In the contact athlete, posteroinferior tears in the labrum generally occur due to repetitive microtrauma resulting from a posteriorly directed axial force. Posterior loading typically occurs in the provocative position of forward-flexion, adduction and internal rotation of the shoulder. Chronic repetitive microtrauma leads to attenuation of the posterior capsule and associated posterior labral tear. Although much more common in anterior shoulder instability, acute traumatic posterior subluxation or dislocation can also occur, which results in posterior capsulolabral detachment.

The glenohumeral joint is inherently the most unstable joint in the body due to the small osseous static restraint. The labrum increases the depth of the glenoid socket and functions as a static stabilizer. The posterior inferior capsule and inferior glenohumeral ligament (IGHL) provide the primary restraint to posterior instability with the shoulder in 90 degrees of abduction. A balance between dynamic and static stabilizers is critical to maintain posterior shoulder stability. In the setting of posterior instability, the static and dynamic stabilizers include the posterior labrum and capsule, glenoid and humeral head morphology, rotator cuff and rotator interval, deltoid function, and coordinated scapulothoracic motion (2).

Only one third of the humeral head articulates with the glenoid fossa throughout the arc of shoulder motion. Therefore, abnormalities in bony morphology such as posterior acromial height, glenoid hypoplasia, posterior glenoid rim erosion, and excessive glenoid or humeral retroversion can predispose patients to posterior instability (9-11). Insidious-onset patulous posterior capsule is also a common phenomenon in posterior instability and has been reported in up to 20% of shoulder patients with posterior instability (12). Additional concomitant pathology in the setting of posterior shoulder instability may include a reverse Hill-Sachs lesion or impaction fracture of the humeral head (9%), bony glenoid abnormalities (2%), such as posterior glenoid fracture or glenoid dysplasia, and excessive glenoid or humeral retroversion (12). A cadaveric study by Imhoff *et al.* (13) suggested that the labrum contributed more significantly to stability at higher degrees of glenoid retroversion, specifically in retroversion greater than 10 degrees. Furthermore, with every additional 1 degree of glenoid retroversion, the risk of posterior instability increased by 17% (14).These anatomic variations must be considered when combining the patient's clinical presentation and ultimately determining a treatment plan, especially when considering retroversion in the setting of posterior glenoid bone loss. Wolfe and colleagues (15) reported posterior shoulder instability with moderate glenoid bone loss, defined as greater than 13.5%, was associated with higher rates of increased glenoid retroversion.

Clinical presentation

A thorough patient history, comprehensive physical exam and imaging modalities are key in timely and accurate diagnosis, in addition to optimization of the treatment plan. As compared to anterior shoulder instability, posterior instability is less common in the contact athlete and harder to diagnose as patients often have variable clinical presentation with vague symptoms. Typically, there is not a classically described event of a traumatic dislocation event. The most common presenting symptom of posterior shoulder instability is shoulder pain located deep and posterior within the joint, often lacking accompanying mechanical symptoms. In a comparative study by Bernhardson *et al.* (16), the primary presenting complaint of posterior shoulder instability was pain alone (90.7%) without an identifiable mechanism of injury versus joint instability (80%) with an identifiable mechanism of injury for anterior shoulder instability. Contact athletes will often complain of difficulty with push-up and bench press positioning. Football lineman and linebackers often describe the provocative shoulder position to be during blocking motion (4). On the other hand, overhead throwing athletes may describe a decline in pitch accuracy and decreased pitch velocity in posterior shoulder instability (17).

Physical exam findings are often subtle, and both active and passive range-of-motion (ROM) of the shoulder are typically normal. However, overhead throwing athletes with posterior instability commonly demonstrate increased physiologic external rotation and posterior capsular laxity at the expense of decreased internal rotation and compensatory scapular winging to antevert the glenoid (18). Physical exam maneuvers specific for posterior instability include the Kim test, jerk test, posterior load and shift test, and the dynamic posterior instability test (DPIT), which are defined in *Table 1* (19-21). The Kim test has been shown to be more sensitive in detecting predominantly inferior labral lesions, while the jerk test has been shown to be more sensitive in detecting predominantly posterior labral lesions (22). When combining both the Kim and Jerk tests as part of the physical exam, there is 97% sensitivity in detecting posteroinferior labral pathology (22). The DPIT has been

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Table 1 Common provocative physical exam maneuvers for diagnosing posterior shoulder instability

Test	Position	Positive test	Sensitivity/specificity (%)
Kim test (19)	Arm held in 90° abduction and elbow at 90° flexion; arm is elevated 45° diagonally with a posteroinferior load applied	Provoked onset of posterior based shoulder pain	80/94
Jerk test (19)	Arm held in 90° abduction and 90° internal rotation; axial load applied along humerus at the elbow with arm moved across body into horizontal adduction	Click/clunk as humeral head moves posteriorly in relation to the glenoid	73/98
Posterior load and shift test (20)	Arm held at 20° abduction in scapular plane (supine); axial load applied to center humeral head on glenoid followed by posterior directed force	Amount of posterior translation of humeral head and apprehension noted (compared to contralateral side) 0: normal 1: excessive translation, no subluxation 2: subluxation, not over glenoid rim 3: dislocation of humeral head beyond glenoid rim	14/100
Dynamic posterior instability test (21)	Forearm grasped with elbow held in extension; shoulder is flexed to 140°; patient actively flexes shoulder with elbow extended, simulating throwing motion	Sudden onset of posterior based shoulder pain (similar to the presenting symptoms)	94.4/95

described by Arner *et al.* (21) as an adjunct to diagnosing posterior instability with the patient simulating an overhead throwing position while the examiner holds the forearm and forward flexes the shoulder to 140 degrees. A positive test, in which the patient's symptoms of pain are recreated, or instability is felt, demonstrated a sensitivity and specificity of 94% and 95%, respectively.

A comprehensive physical examination and evaluation for anterior and superior labral tears, as well as concomitant rotator cuff pathology is required, as these conditions can often coexist (23). Arner *et al.* (23) found 43% of overhead throwing athletes had concomitant rotator cuff tears in addition to posterior capsulolabral pathology. Further comprehensive physical examination techniques of the biceps-labrum complex include the crank test, shear test and resisted throwing maneuver (24). The crank test is performed with forward elevation of the shoulder to 160 degrees with application of axial load through the shoulder with internal and external rotation of the humerus. This maneuver can be performed in the supine or seated position, with pain indicating a positive test, suggestive of labral pathology. The dynamic labral shear test is performed with the patient standing upright and the examiner positioned behind. The patient's arm is placed in external rotation and elevation in the plane of the body. The examiner supports the patient's wrist with one hand and applies an anterior force to the proximal humerus at the level of the glenohumeral joint with the other. The arm is then abducted from 90 to 120 degrees. A positive test is indicated by pain or a palpable click in the posterior shoulder. In the resisted throwing test, the shoulder is abducted to 90 degrees and the elbow flexed to 90 degrees, with the arm placed in maximal external rotation. The examiner, standing behind the patient, applies resistance as the patient mimics the late cocking phase of throwing. The patient then steps forward with the opposite leg, simulating the early acceleration phase. Pain reproduced during this maneuver is most specific for pathology at the biceps-labrum junction.

Imaging

Plain radiographs—Grashey, anteroposterior, scapular Y and axillary views—aid with identification of significant glenoid bone loss, glenoid rim fracture or reverse Hill-Sachs lesion. Optimal advanced imaging studies include MRI and magnetic resonance arthrograms (MRA). MRI is essential for the diagnosis of posterior inferior capsulolabral

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Figure 1 Pre-operative imaging of a left shoulder including (A) Grashey and (B) axillary lateral plain films demonstrating an irregular contour of the posterior glenoid rim (arrow), as well as magnetic resonance imaging T2-weighted (C) axillary and (D) sagittal cuts confirming posterior capsulolabral pathology (arrow) with posterior glenoid bone loss of 30% measured by the best-fit circle technique.

injuries with a sensitivity that is increased with intra-articular gadolinium contrast. MRA will increase the sensitivity of MRI in identification of a purely soft tissue injury of the posterior labrum and capsule. In the acute setting, the labrum may be well visualized without intra-articular contrast due to hemarthrosis. As compared to the anterior labrum, the posterior labrum tends to be more homogenous with less variable anatomy in the population. Preoperative MRI/MRA has a lower sensitivity when identifying posterior labral pathology, highlighting the importance of clinical suspicion and physical exam findings (25,26). A Kim lesion presents a variant of posterior shoulder instability in which an incomplete avulsion of the posterior inferior labrum occurs from the glenoid articular cartilage with an intact superficial portion of the labrum. Though rare, Kim lesions are more frequently seen in young, active individuals, particularly overhead or contact athletes, and require careful evaluation on MRI as failure to identify and treat them may lead to persistent shoulder instability (27). Typical treatment in the setting of a Kim lesion includes converting the partial tear into a complete tear and incorporating the posterior band of the IGHL into the repair (28).

A high clinical suspicion for posterior glenoid bone loss should be considered in instances of recurrent instability or traumatic dislocation (*Figure 1*). Computed tomography (CT) of the shoulder is the modality of choice for evaluation of bony morphology to include glenoid retroversion or dysplasia, as well as bone loss. CT is also utilized for quantifying the location and degree of attritional posterior glenoid bone loss. Although the well-established threshold that guides treatment for anterior bone loss has not been established for posterior bone loss, irregularities in bony morphology may further dictate the surgical approach.

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Posterior glenoid bone loss

There are several structural differences characteristic of posterior instability compared to anterior instability. Bone loss occurs 30 degrees from the long axis of the glenoid, as compared to 90 degrees to the long axis of the glenoid, as is seen in anterior glenoid bone loss. In a review of three-dimensional reconstructed computed tomography (3D-CT) scans of patients with recurrent posterior shoulder instability, Dekker *et al.* (29) identified a predictable pattern of posterior bone defect localized to the posteroinferior quadrant extending from 6:44 to 9:28 on the clockface, which corresponded to an average of 81 total degrees of bone loss arc. Sequelae of posterior instability include loss of glenoid concavity and changes in slope leading to acquired glenoid retroversion, which is associated with failure of nonoperative therapy and posterior shoulder stabilization.

Nearly 25% of posterior shoulder instability may be associated with posterior glenoid bone loss, and noticeable bone loss can be demonstrated in as few as one traumatic dislocation event (12). Bedrin *et al.* (30) showed that the average single posterior shoulder instability event was associated with 5% of glenoid bone loss, and greater than 10 degrees of glenoid retroversion increased the amount of posterior inferior bone loss after a posterior instability event. A clearly established critical or subcritical threshold for posterior glenoid bone loss has not been defined, similar to the ongoing lack of consensus in the anterior shoulder instability literature. However, a cadaveric study with greater than 20% bone loss suggests a high risk of failure of arthroscopic posterior shoulder stabilization alone (31). Similarly, in a retrospective case-control study, Arner *et al.* (32) suggested that even a small threshold of 11% posterior glenoid bone loss led to a tenfold higher failure rate, while 15% bone loss resulted in a 25-fold higher failure rate following arthroscopic posterior shoulder stabilization alone.

Treatment strategies

There is no gold standard treatment algorithm for posterior shoulder instability, and treatment overall is highly individualized based on patient-specific and morphology-specific factors. First-line management is centered around nonsurgical treatment with activity modification and physical therapy including proprioceptive training, dynamic stabilization and strengthening of the posterior shoulder musculature. Physical therapy further focuses on strengthening the dynamic stabilizers of the shoulder including the rotator cuff and deltoid, as well as scapulothoracic mechanics. Orthobiologics, such as platelet-rich plasma (PRP) injection therapy, may be considered for use in the nonoperative treatment of posterior shoulder instability. However, sparse literature exists to support the use of PRP in the treatment of labral pathology, with data extrapolated from anecdotal experience and existing data from other uses in the shoulder (33,34). Arthroscopic posterior labral repair with or without capsular plication is a reliable treatment option in patients who fail nonoperative management. A comprehensive assessment of all anatomical considerations for instability should be addressed at the index procedure to decrease recurrence, as failure to address combined pathology, excessive glenoid retroversion or posterior glenoid bone loss increases the risk of recurrence after arthroscopic stabilization (1). Subsequently, posterior osseous glenoid augmentation is considered in the setting of a failed arthroscopic posterior stabilization or in the setting of abnormal posterior glenoid morphology (increased glenoid retroversion or significant glenoid bone loss). Treatment plans are highly individualized, especially in the contact athlete, and care should be taken to consider factors such as age, severity of symptoms, level of competition, in-season versus off-season play, position, and desired longevity in sport in the shared decision making. The authors' preferred treatment algorithm for posterior shoulder instability in the contact athlete, adapted from Trivellas *et al.* (35), is outlined in *Figure 2*.

Arthroscopic all-soft tissue stabilization

Arthroscopic posterior shoulder stabilization is the gold standard in the absence of substantial posterior glenoid bone loss (*Figure 3*), with generally excellent clinical outcomes reported. Arthroscopic repair can be performed in either the lateral or beach chair position based on the surgeon's preference. In addition to soft tissue labral repair with fixation at the chondrolabral junction, tensioning of the IGHL is an important consideration. Capsular plication can also be performed at the time of labral repair to reduce capsular volume and further limit glenohumeral translation.

In the early 1990s, thermal capsulorrhaphy was popularized as an alternative to the traditional open capsular shift pioneered by Neer and Foster (36). Despite early success, higher than expected long term failure rates and recurrent instability led to a shift to all-arthroscopic

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Figure 2 Preferred treatment algorithm for posterior shoulder instability in the contact athlete. pGBL, posterior glenoid bone loss.

Figure 3 Arthroscopic images of a posterior shoulder stabilization of a left shoulder in the lateral decubitus position viewing from the anterior portal, beginning with (A) identification of the isolated posteroinferior capsulolabral lesion (*), and followed by (B,C) preparation and elevation of the capsulolabral disruption with the combination of a labral elevator, rasp and arthroscopic shaver in preparation of the bone-labrum interface for repair. (C) A posterolateral portal placed under spinal-needle direct visualization is key to the success of the (D) inferior anchor placement at the 6 o'clock position on the glenoid face. (E,F) Soft anchors are spaced approximately 10–15 mm apart in the inferior to superior direction to complete the posterior labral repair with capsular shift. G, glenoid; HH, humeral head.

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labral repair with posterior capsular shift in the setting of traumatic unidirectional recurrent posterior instability of the shoulder. The lateral decubitus position is typically the position of choice for instability; however, the beach chair position can also be employed. Standard posterior, anterior and anterosuperior portals are created with the addition of a 7 o'clock percutaneous portal placed under spinal needle localization for an appropriate angle to access the posteroinferior glenoid rim. Complete elevation and preparation of the posterior labrum from the glenoid is a critical step in facilitating a superior capsular shift combined with a posterior labral repair. A posterior-based repair typically starts with an anchor placed at the 6 o'clock position as a critical step in anatomic repair with a minimum of 3–4 anchors spaced 10–15 mm apart on the face of the glenoid, as Bradley *et al.* have demonstrated that too few suture anchors as a potential risk factor for arthroscopic failure (37). Additionally, arthroscopic failure may be the result of poor quality capsular tissue, underestimation of capsular laxity and the inability to recognize associated pathology at the index procedure, compromising the outcome of the arthroscopic posterior stabilization procedure (38).

A systematic review and meta-analysis of patients undergoing arthroscopic treatment for unidirectional posterior glenohumeral instability demonstrated superior clinical outcomes when treated arthroscopically (27 studies) versus treatment with open stabilization procedures (26 studies) with respect to shoulder stability, clinical recurrence of instability, patient satisfaction, return to sport and return to previous level of play (39). This finding is also supported by Bottoni *et al.* (5), who reported statistically significant higher outcome scores in the arthroscopic versus open group, although similar recurrence rates, in the setting of posterior shoulder stabilization among a retrospective comparison of 30 military servicemembers. Additionally, arthroscopic stabilization procedures utilizing suture anchors resulted in fewer recurrences and revision procedures than anchorless repairs in the young contact and overhead throwing athletes (39). There is strong evidence to support the use of modern-day suture anchors in the setting of arthroscopic repair versus anchorless repair to establish more reliable outcomes, specifically in terms of lower failure and quicker return to sport rates. Several studies have reported higher rates of recurrent instability in posterior shoulder repairs performed with capsulolabral plication alone compared to techniques that use suture anchors (39-41). In the largest study to date of contact and overhead throwing athletes undergoing arthroscopic posterior shoulder stabilization with an average of 36 month follow-up, capsulolabral plication with suture-anchors showed significantly greater improvement in American Shoulder and Elbow Surgeons (ASES) scores ($P<0.001$) and a higher rate of return to play ($P<0.05$) when compared with anchorless capsulolabral plications (40).

Posterior glenoid reconstruction

Glenoid bone loss is a known significant risk factor for recurrent posterior shoulder instability and failure after posterior labral repair, which has led to the development of intracapsular posterior bone block reconstruction. As compared to anterior instability, posterior shoulder instability with large glenoid bone loss is a rare entity. While there is no consensus on the amount of bone loss necessitating posterior glenoid reconstruction, stability of the glenohumeral joint is compromised with bone loss exceeding 20–25% (32). The current literature suggests bone block reconstruction for glenoid defects involving more than 25% bone loss of the inferior glenoid, with possible consideration of an even lower threshold in contact athletes and in revision settings (42). Free bone block augmentation for posterior glenoid reconstruction most commonly includes iliac crest autograft and distal tibial allograft options. Techniques either include an open procedure or arthroscopic delivery of the graft traditionally described through the infraspinatus using a 3 cm incision parallel to the posterior glenoid rim (*Figure 4*). It is important to consider the technical challenges of the bone block procedure, with an overall high complication rate reported in early-to-mid-term follow-up, including residual instability and post-traumatic osteoarthritis. Similarly, biomechanical data suggested that a posterior bone block could overconstrain the posterior glenohumeral joint and lead to joint incongruity, particularly when using an extracapsular bone block technique (43).

Short-to-mid-term results are mixed in the setting of a bicortical iliac crest autograft bone block. In one study, Servien *et al.* (44) demonstrated improved subjective patient-reported outcomes at a 6-year follow-up, with 71% (15/21) of patients returning to sport at their preinjury level and only three reported clinical failures. Meuffels *et al.* (45) demonstrated a high rate of progression to post-traumatic osteoarthritis and inconsistent patient reported outcomes at 18-year follow-up, with all patients demonstrating radiographic glenohumeral joint osteoarthritis and overall worse clinical outcomes at 18-year compared to 6-year

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Figure 4 Arthroscopic images of a left shoulder with 30% posterior glenoid bone loss demonstrating (A) a distal tibial allograft bone block after fixation to the posterior glenoid rim with solid screws, followed by (B) final fixation of the bone block in an extra-articular fashion (*) with a 6 o'clock and 11 o'clock anchor. Immediate post-operative (C) Grashey and (D) scapular Y plain films of a left shoulder demonstrate fixation after undergoing open posterior glenoid bone augmentation. G, glenoid; HH, humeral head.

follow-up after iliac crest autograft. More contemporary techniques focus on contouring the iliac crest autograft to match the arc of motion of the glenohumeral joint, optimizing contact forces between the humeral head and the bone graft, positioning the graft flush or slightly overhanging the glenoid rim at the posteroinferior quadrant, and creating an extra-articular bone block by repairing the native capsular interface (46,47). In a more recent multicenter review of 66 cases with 3.7-year follow-up, iliac crest autograft led to improved functional and satisfaction scores with a 12% recurrence rate and 18% occurrence of persistent post-operative pain with one-third of patients experiencing major lysis of the bone block (48).

The osteochondral distal tibial allograft was first described in 2013 by Millett *et al.* (42) as an intracapsular or extracapsular technique for anatomic reconstruction of the posterior glenoid. Advantages of distal tibial allograft include eradication of donor site morbidity and similar matched congruity of the glenohumeral arc of motion. Frank *et al.* (49) have demonstrated that iliac crest bone autograft and fresh distal tibial allograft offer similar joint contact pressures and joint peak forces in cadaveric specimens, with distal tibial allograft demonstrating the potential advantage of restoring joint congruity of the glenoid articular surface due to the geometry of its articulation with the humeral head. While both open and arthroscopic techniques have been reported, long-term results are lacking and access to distal tibial allograft may not be readily available in all practice settings. In a study involving a cohort of 10 patients undergoing distal tibial allograft for posterior glenoid reconstruction, Gilat *et al.* (50) reported that 7 patients had previously undergone stabilization procedures, with an average preoperative bony Bankart lesion involving 26% of the glenoid diameter. At 1-year follow-up, 1 patient

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reported recurrent instability, and 2 patients underwent revision for hardware-related issues.

Outcomes and recurrence

Generally, clinical outcomes are excellent after arthroscopic posterior stabilization. Overall, arthroscopic posterior shoulder stabilization has been shown to be effective in restoring stability and function in symptomatic, unidirectional posterior instability. Bradley *et al.* (40) showed no significant differences in ASES scores, shoulder stability, strength, or ROM among contact athletes when compared to the entire cohort of athletes undergoing arthroscopic posterior shoulder stabilization, which included both contact and non-contact athletes. On further comparison of overhead throwing athletes versus contact athletes, excellent results were achieved in 89% of overhead throwing athletes and 93% of contact athletes (51). While there was no difference reported in ASES scores, stability, ROM, strength, pain or function between both groups, overhead throwing athletes were less likely to return to their preinjury level of sport (55%) compared with contact athletes (71%). The lower dynamic glenohumeral demands of the contact athlete compared to the overhead throwing athlete may allow for a higher rate of return to sport and previous level of play among contact athletes.

In a meta-analysis of posterior shoulder instability, the overall rate of recurrent instability after the index procedure among the athletic population (513 shoulders) was 8.58% (SD, 64.82%) (39). Among these athletes, a recurrence rate of 5.06% (SD, 62.35%) was noted in contact athletes, with a two-fold higher recurrence rate of 12.12% (SD, 61.53%) in overhead throwing athletes. Additionally, a revision rate of 6.82% (SD, 63.98%) was reported in the athletic population, 6.18% (SD, 62.86%) among contact athletes. At a minimum of 1 year follow-up, athletes returned to sport at any level at a rate of 91.81% (SD, 645.43%). Among contact athletes, 89.33% (SD, 642.39%) and 71.91% (SD, 632.56%) returned to any level of sport and previous level of play, respectively, after index procedure. This was noticeably lower in overhead throwing athletes, who returned to any level of sport and previous level of play at a rate of 83.87% (SD, 612.50%) and 58.06% (SD, 67.94%), respectively, after index procedure. In this same study, overall patient satisfaction was 93.17% (SD, 660.38%), with 92.35% (SD, 652.52%) of contact athletes reporting satisfaction with their procedure and considering it worthwhile.

Bradley *et al.* (37) identified significant risk factors for contact athletes requiring revision arthroscopic posterior labral repair which included female sex, dominant shoulder, concomitant rotator cuff injury, fewer than four anchors used and smaller glenoid bone width. The authors also demonstrated that while all patients showed improvement in patient-reported and functional outcome scores, those undergoing revision surgery demonstrated significantly less improvement in outcome scores, shoulder stability scores and return to sport rates. In this athletic cohort, 64% of contact athletes returned to sport at the same level in the non-revision group versus 15% of contact athletes in the revision group, while 78% of the non-revision group and 61% of the revision group returned to sport at some level. At short and mid-term follow-up of active-duty servicemembers, often compared to contact athletes, treated arthroscopically for posterior shoulder instability, a 17.2% failure rate was reported at 5-year follow-up with only a 1.5% rate of revision surgery and an 83% rate of return to military duty. In this cohort, there was no statistically significant risk factor for recurrence identified, including age, tear size, insidious onset, male sex, anchor position or intraoperative positioning (52).

The current literature reporting on outcomes of posterior glenoid bone block stabilization demonstrates improved patient reported outcomes in the short-term follow-up but still reports a moderate rate of recurrent instability requiring revision surgery and complications (48,53,54). A systematic review of 11 studies by Mojica *et al.* (54) reported 9.8% recurrent instability after posterior glenoid bone block with a 13.8% complication rate, led by hardware complications (11.1%) and 11.6% of patients with residual, persistent pain. Furthermore, Wolfe and colleagues reported a higher rate of clinical failure requiring reoperation in 44.4% of patients with moderate posterior glenoid bone deficiency, compared to only 10.5% in those with minimal bone loss. The authors demonstrated a higher clinical failure requiring reoperation in 44.4% of patients with moderate posterior bone deficiency versus 10.5% of patients with minimal posterior bone deficiency. As a relatively new technique, posterior glenoid augmentation with free bone block procedures have not been around long enough for long-term data or comparative studies.

Outcomes following posterior shoulder stabilization can be challenging to compare and interpret, which is attributed to the high heterogeneity among the population studies, lack of consistency on the definition of failed stabilization procedures and recurrence, as well as the subtle differences

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among surgical techniques. Furthermore, rates of return to sport are inconsistent throughout the literature, especially in the throwing athlete.

Conclusions

While posterior shoulder instability has traditionally been a less common diagnosis, especially compared to anterior shoulder instability, prevalence in contact athletes is likely underdiagnosed, and can be challenging to treat. Contact athletes are at high risk for this injury due to position requirements, young age and high activity demand. Overall, arthroscopic labral repair with suture anchors for the treatment of unidirectional traumatic posterior shoulder instability has demonstrated excellent results, high patient satisfaction and low recurrent rates in eliminating symptoms of pain and instability in contact athletes. Further advantage of the arthroscopic approach allows tailoring for pathology-specific treatment and can allow the surgeon to address all encountered intra-articular pathology in the same setting. While research over the last decade has demonstrated overall good success following arthroscopic posterior stabilization, ongoing research is required to optimize treatment, standardize the definition of clinical failure and recurrence, and improve return to sport, especially for the high-risk contact athlete. Posterior bone block stabilization techniques should generally be reserved for patients with significant posterior glenoid bone loss or retroversion, or who have failed previous arthroscopic soft tissue procedure.

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References

1. Robinson CM, Aderinto J. Recurrent posterior shoulder instability. J Bone Joint Surg Am 2005;87:883-92.
2. Provencher MT, LeClere LE, King S, et al. Posterior instability of the shoulder: diagnosis and management. Am J Sports Med 2011;39:874-86.
3. Bokshan SL, Kotchman HM, Li LT, et al. Incidence of Posterior Shoulder Instability in the United States Military: Demographic Considerations From a High-Risk

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Population. Am J Sports Med 2021;49:340-5.
4. Mannava S, Frangiamore SJ, Murphy CP, et al. Prevalence of Shoulder Labral Injury in Collegiate Football Players at the National Football League Scouting Combine. Orthop J Sports Med 2018;6:2325967118783982.
5. Bottoni CR, Franks BR, Moore JH, et al. Operative stabilization of posterior shoulder instability. Am J Sports Med 2005;33:996-1002.
6. Kaplan LD, Flanigan DC, Norwig J, et al. Prevalence and variance of shoulder injuries in elite collegiate football players. Am J Sports Med 2005;33:1142-6.
7. Swan ER, Lynch TB, Sheean AJ, et al. High Incidence of Combined and Posterior Labral Tears in Military Patients With Operative Shoulder Instability. Am J Sports Med 2022;50:1529-33.
8. Javed S, Gheorghiu D, Torrance E, et al. The Incidence of Traumatic Posterior and Combined Labral Tears in Patients Undergoing Arthroscopic Shoulder Stabilization. Am J Sports Med 2019;47:2686-90.
9. Meyer DC, Ernstbrunner L, Boyce G, et al. Posterior Acromial Morphology Is Significantly Associated with Posterior Shoulder Instability. J Bone Joint Surg Am 2019;101:1253-60.
10. Provencher, M, Beaulieu-Jones B, Arner J, et al. Posterior Shoulder Instability with Glenoid Bone Loss: Morphology of Posterior Bone Defects. Arthroscopy 2017;33:e28.
11. Beeler S, Leoty L, Hochreiter B, et al. Similar scapular morphology in patients with dynamic and static posterior shoulder instability. JSES Int 2021;5:181-9.
12. Longo UG, Ciuffreda M, Locher J, et al. Posterior shoulder instability: a systematic review. Br Med Bull 2020;134:34-53.
13. Imhoff FB, Camenzind RS, Obopilwe E, et al. Glenoid retroversion is an important factor for humeral head centration and the biomechanics of posterior shoulder stability. Knee Surg Sports Traumatol Arthrosc 2019;27:3952-61.
14. Owens BD, Campbell SE, Cameron KL. Risk factors for posterior shoulder instability in young athletes. Am J Sports Med 2013;41:2645-9.
15. Wolfe JA, Elsenbeck M, Nappo K, et al. Effect of Posterior Glenoid Bone Loss and Retroversion on Arthroscopic Posterior Glenohumeral Stabilization. Am J Sports Med 2020;48:2621-7.
16. Bernhardson AS, Murphy CP, Aman ZS, et al. A Prospective Analysis of Patients With Anterior Versus Posterior Shoulder Instability: A Matched Cohort Examination and Surgical Outcome Analysis of 200 Patients. Am J Sports Med 2019;47:682-7.
17. Rothrauff BB, Arner JW, Talentino SE, et al. Minimum 10-Year Clinical Outcomes After Arthroscopic Capsulolabral Repair for Isolated Posterior Shoulder Instability. Am J Sports Med 2023;51:1571-80.
18. Chang ES, Greco NJ, McClincy MP, et al. Posterior Shoulder Instability in Overhead Athletes. Orthop Clin North Am 2016;47:179-87.
19. Dhir J, Willis M, Watson L, et al. Evidence-Based Review of Clinical Diagnostic Tests and Predictive Clinical Tests That Evaluate Response to Conservative Rehabilitation for Posterior Glenohumeral Instability: A Systematic Review. Sports Health 2018;10:141-5.
20. Tzannes A, Murrell GA. Clinical examination of the unstable shoulder. Sports Med 2002;32:447-57.
21. Arner JW, Nickoli MS, Lawyer TJ, et al. Dynamic Posterior Instability Test: A New Test for Posterior Glenohumeral Instability. Indian J Orthop 2022;56:2022-7.
22. Kim SH, Park JS, Jeong WK, et al. The Kim test: a novel test for posteroinferior labral lesion of the shoulder--a comparison to the jerk test. Am J Sports Med 2005;33:1188-92.
23. Arner JW, McClincy MP, Bradley JP. In Throwers With Posterior Instability, Rotator Cuff Tears Are Common but Do Not Affect Surgical Outcomes. Am J Orthop (Belle Mead NJ) 2018.
24. Bryan MR, White AE, Inclan PM, et al. A Comprehensive Review of the Physical Examination for the Biceps-Labrum Complex of the Shoulder. Arthrosc Tech 2024;13:103136.
25. Alexeev M, Kercher JS, Levina Y, et al. Variability of glenoid labral tear patterns: a study of 280 sequential surgical cases. J Shoulder Elbow Surg 2021;30:2762-6.
26. Saqib R, Harris J, Funk L. Comparison of magnetic resonance arthrography with arthroscopy for imaging of shoulder injuries: retrospective study. Ann R Coll Surg Engl 2017;99:271-4.
27. Smark CT, Barlow BT, Vachon TA, et al. Arthroscopic and magnetic resonance arthrogram features of Kim's lesion in posterior shoulder instability. Arthroscopy 2014;30:781-4.
28. Kim SH, Ha KI, Yoo JC, et al. Kim's lesion: an incomplete and concealed avulsion of the posteroinferior labrum in posterior or multidirectional posteroinferior instability of the shoulder. Arthroscopy 2004;20:712-20.
29. Dekker TJ, Peebles LA, Goldenberg BT, et al. Location of the Glenoid Defect in Shoulders With Recurrent Posterior Glenohumeral Instability. Am J Sports Med 2019;47:3051-6.
30. Bedrin MD, Owens BD, Slaven SE, et al. Prospective Evaluation of Posterior Glenoid Bone Loss After First-

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time and Recurrent Posterior Glenohumeral Instability Events. Am J Sports Med 2022;50:3028-35.
31. Nacca C, Gil JA, Badida R, et al. Critical Glenoid Bone Loss in Posterior Shoulder Instability. Am J Sports Med 2018;46:1058-63.
32. Arner JW, Ruzbarsky JJ, Midtgaard K, et al. Defining Critical Glenoid Bone Loss in Posterior Shoulder Capsulolabral Repair. Am J Sports Med 2021;49:2013-9.
33. Sheean AJ, Kibler WB, Conway J, et al. Posterior Labral Injury and Glenohumeral Instability in Overhead Athletes: Current Concepts for Diagnosis and Management. J Am Acad Orthop Surg 2020;28:628-37.
34. Schneider A, Burr R, Garbis N, et al. Platelet-rich plasma and the shoulder: clinical indications and outcomes. Curr Rev Musculoskelet Med 2018;11:593-7.
35. Trivellas M, Hoyt B, Bokshan S, et al. Evolving concepts in the treatment of posterior shoulder instability with glenohumeral bone loss. Ann Jt 2024;9:28.
36. DiMaria S, Bokshan SL, Nacca C, et al. History of surgical stabilization for posterior shoulder instability. JSES Open Access 2019;3:350-6.
37. Bradley JP, Arner JW, Jayakumar S, et al. Risk Factors and Outcomes of Revision Arthroscopic Posterior Shoulder Capsulolabral Repair. Am J Sports Med 2018;46:2457-65.
38. Ralph JE, Hurley ET, Lunn K, et al. Outcomes of arthroscopic stabilization for posterior shoulder instability: a systematic review. J Shoulder Elbow Surg 2024;33:2530-8.
39. DeLong JM, Jiang K, Bradley JP. Posterior Instability of the Shoulder: A Systematic Review and Meta-analysis of Clinical Outcomes. Am J Sports Med 2015;43:1805-17.
40. Bradley JP, McClincy MP, Arner JW, et al. Arthroscopic capsulolabral reconstruction for posterior instability of the shoulder: a prospective study of 200 shoulders. Am J Sports Med 2013;41:2005-14.
41. Provencher MT, Bell SJ, Menzel KA, et al. Arthroscopic treatment of posterior shoulder instability: results in 33 patients. Am J Sports Med 2005;33:1463-71.
42. Millett PJ, Schoenahl JY, Register B, et al. Reconstruction of posterior glenoid deficiency using distal tibial osteoarticular allograft. Knee Surg Sports Traumatol Arthrosc 2013;21:445-9.
43. Wellmann M, Bobrowitsch E, Khan N, et al. Biomechanical effectiveness of an arthroscopic posterior bankart repair versus an open bone block procedure for posterior shoulder instability. Am J Sports Med 2011;39:796-803.
44. Servien E, Walch G, Cortes ZE, et al. Posterior bone block procedure for posterior shoulder instability. Knee Surg Sports Traumatol Arthrosc 2007;15:1130-6.
45. Meuffels DE, Schuit H, van Biezen FC, et al. The posterior bone block procedure in posterior shoulder instability: a long-term follow-up study. J Bone Joint Surg Br 2010;92:651-5.
46. Smith WR, Edwards TB. Posterior Shoulder Instability and Glenoid Bone Loss: A Review and a Free Bone Graft Technique. J Clin Med 2024;13:2016.
47. Jeong JY, Yoo YS, Kim T. Arthroscopic Iliac Bone Block Augmentation for Glenoid Reconstruction: Transglenoid Fixation Technique Using an All-Suture Anchor. Arthrosc Tech 2020;9:e351-6.
48. Clavert P, Furioli E, Andieu K, et al. Clinical outcomes of posterior bone block procedures for posterior shoulder instability: Multicenter retrospective study of 66 cases. Orthop Traumatol Surg Res 2017;103:S193-7.
49. Frank RM, Shin J, Saccomanno MF, et al. Comparison of glenohumeral contact pressures and contact areas after posterior glenoid reconstruction with an iliac crest bone graft or distal tibial osteochondral allograft. Am J Sports Med 2014;42:2574-82.
50. Gilat R, Haunschild ED, Tauro T, et al. Distal Tibial Allograft Augmentation for Posterior Shoulder Instability Associated With Glenoid Bony Deficiency: A Case Series. Arthrosc Sports Med Rehabil 2020;2:e743-52.
51. Radkowski CA, Chhabra A, Baker CL 3rd, et al. Arthroscopic capsulolabral repair for posterior shoulder instability in throwing athletes compared with nonthrowing athletes. Am J Sports Med 2008;36:693-9.
52. Chan S, O'Brien LK, Waterman BR, et al. Low Risk of Recurrence After Posterior Labral Repair of the Shoulder in a High-Risk United States Military Population. Arthrosc Sports Med Rehabil 2020;2:e47-52.
53. Schwartz DG, Goebel S, Piper K, et al. Arthroscopic posterior bone block augmentation in posterior shoulder instability. J Shoulder Elbow Surg 2013;22:1092-101.
54. Mojica ES, Schwartz LB, Hurley ET, et al. Posterior glenoid bone block transfer for posterior shoulder instability: a systematic review. J Shoulder Elbow Surg 2021;30:2904-9.

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