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Review

Shoulder instability: a brief review

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Abstract

Shoulder instability is a condition in which the humeral head partially or completely dislocates from the glenoid fossa. This can occur due to a traumatic injury (traumatic instability), repetitive strain on the joint, or generalized ligamentous laxity (atraumatic instability). In the majority of cases, glenohumeral instability is associated by a labral tear which prevents the humeral head from fitting properly into the glenoid fossa, causing it to shift out of place. Anterior shoulder dislocations comprise the majority of cases of glenohumeral instability.

Symptoms of shoulder instability may include a feeling of looseness or instability in the joint, pain or discomfort in the shoulder, weakness or loss of strength, and a sensation of the shoulder "popping out" or "slipping." In severe cases, the humeral head may completely dislocate from the glenoid fossa, causing intense pain and disability. Diagnosis of shoulder instability usually involves a thorough physical exam and imaging studies such as x-rays, computed tomography (CT) and magnetic resonance imaging (MRI).

Treatment of shoulder instability depends on the severity of the instability and the underlying cause. Conservative treatment for shoulder instability may include rest, ice, physical therapy, and anti-inflammatory medication. Physical therapy is especially important in cases of multidirectional instability, as strengthening exercises can help improve stability in the joint. If conservative treatment fails to relieve symptoms, surgery may be necessary. Absolute indications of surgical management are contradictory. Operative treatment is reserved after failed conservative management, recurrent dislocation at a young age, irreducible dislocation, open dislocation, post-reduction instability of the shoulder and first-time dislocation in young elite athletes. Surgical options for shoulder instability include arthroscopic procedures and open surgeries. Arthroscopic procedures are less invasive and may have fewer complications, but may not be appropriate for all types of instability. The choice of surgery depends on the underlying cause of the instability, the patient's age and activity level, and other factors. For traumatic instability, the most common surgical procedure is an arthroscopic Bankart repair, where the torn labrum is reattached to the glenoid fossa using sutures or anchors. In cases of atraumatic instability, surgery may involve tightening the capsule and ligaments around the joint, or transferring a portion of the coracoid process to the anterior aspect of the glenoid (Latarjet procedure).

Recovery from shoulder stabilization may take several months, and may involve a period of immobilization, followed by physical therapy to regain strength and range of motion in the joint. Patients should avoid activities that put stress on the shoulder, such as lifting heavy weights or participating in contact sports. Overall, shoulder instability can be a debilitating condition that affects many people, especially those involved in sports or other activities.

Keywords: Shoulder, glenohumeral, instability.

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Normal glenohumeral stability

The glenohumeral joint, also known as the shoulder joint, is a ball-and-socket joint that is formed between the humeral head and the glenoid fossa of the scapula. The glenoid fossa is a shallow depression on the lateral side of the scapula, surrounded by a rim of fibrocartilage called the glenoid labrum, which helps to deepen the socket and stabilize the joint. Joint capsule is a thick, fibrous sheath that surrounds the joint. The humeral head is a rounded structure that fits into the glenoid fossa. It is held in place by a group of muscles and tendons, known as the rotator cuff, which attach to the humerus and scapula. Together, the articular surfaces of the head of the humerus and the glenoid fossa, along with the surrounding ligaments and muscles, form the glenohumeral joint [1, 2].

The glenohumeral joint is a highly mobile joint that provides the upper extremity with a wide range of motion. This flexibility enables the shoulder to move the upper limb at multiple positions in space, acting as a stable fulcrum. However, this mobility also makes the glenohumeral joint inherently unstable, and its stability relies heavily on the surrounding muscles, tendons, ligaments, and bones. The normal glenohumeral stability is maintained through a combination of factors that work together to provide both static and dynamic stability to the joint [3].

Static stability is provided by glenoid labrum, joint capsule, glenohumeral ligaments, articular congruity and version and negative intraarticular pressure. The joint capsule and labrum help to hold the humeral head in place within the glenoid fossa. The labrum adds more than 50% to the glenoid depth. Superior, middle and inferior glenohumeral ligament provide static restraint. The bony anatomy of the glenohumeral joint, including the shape of the glenoid and the size and orientation of the humeral head, provides some stability to the joint. The shallow glenoid fossa is deepened by the glenoid labrum, which helps to create a more stable socket for the humeral head [4].

Dynamic stability is provided by rotator cuff muscles, rotator interval, long head of the biceps and periscapular muscles. The rotator cuff muscles help to control the position of the humeral head within the glenoid fossa during movement and provide a compressive force that stabilizes the joint, by compressing the humeral head into the glenoid fossa during shoulder movement. Long head of the biceps acts as humeral head depressor. Periscapular muscles that control scapular movement, such as the serratus anterior and trapezius, help to position the glenoid fossa for optimal contact with the humeral head. Neuromuscular control is important in maintaining the stability of the glenohumeral joint. The proprioceptive feedback from the joint and surrounding muscles allows for fine-tuning of the muscle activity around the joint [5, 6].

Overall, the normal glenohumeral stability is a complex interaction between several factors that work together to provide adequate stability while allowing for the mobility required for shoulder function. The maintenance of normal glenohumeral stability requires a complex interplay between these various factors. Any disruption to this balance can result in instability and potentially lead to injury or dysfunction of the shoulder joint.

Shoulder Instability

Definition and Classification

Shoulder instability refers to the condition where humerus and scapula lose their normal relationship, resulting in excessive translation of the humeral head within the glenohumeral joint. Glenohumeral subluxation is a partial dislocation, defined as "translation of the humeral head against the glenoid fossa without a complete loss of contact between the articular surfaces" [7]. Generally, glenohumeral instability may be categorized according to mechanism, duration, occurrence, and direction.

According to the mechanism, shoulder instability can be classified as either traumatic or atraumatic. Traumatic shoulder instability typically occurs as a result of a sudden injury or dislocation of the shoulder joint. Atraumatic shoulder instability, on the other hand, can develop gradually over time due to repetitive overhead motions or general wear and tear on the shoulder joint. According to duration, acute glenohumeral instability is defined in case the dislocation has taken place within 24 to 36 hours after trauma. After 4 weeks, glenohumeral instability is classified as chronic. According to the direction of dislocation, instability may be defined as anterior, posterior or inferior. In anterior dislocations, the humeral head moves forwardly in relation to the anterior glenoid rim and is usually found below the coracoid process. Multiligamentous laxity leads to multidirectional instability which is as-

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sociated with generalized instability of the glenohumeral joint in at least 2 planes of motion (anterior, posterior, or inferior). Multidirectional instability is also referred as atraumatic multidirectional bilateral rehabilitation inferior capsular shift (AMBRI) [8]. Recurrent or habitual dislocation is a condition where the shoulder is vulnerable to repeated dislocations by slight force, offering a subnormal resistance to redislocation [9].

Epidemiology

Anterior dislocation is one of the most common shoulder injuries, with a reported 2% annual rate in general population. Military and contact athlete patients have a higher incidence for anterior traumatic instability [10]. Posterior shoulder dislocations are rare and comprise up to 10% of unstable shoulders [11]. Multidirectional shoulder instability is more often in 2nd and 3rd decade of life.

Pathogenesis

The most common mechanism of shoulder instability includes the application of direct or indirect force to the shoulder, in a susceptible position. A sudden load to the arm with the shoulder in extension, abduction and external rotation may result in anterior shoulder dislocation. Axial load with the shoulder in flexion, adduction, and internal rotation may cause posterior dislocation [11]. Acute glenohumeral instability or dislocation may be caused by other less usual mechanisms, such as electrocution and epileptic seizures. In cases with co-existing generalized ligamentous laxity, glenohumeral instability may be associated with minor or overuse trauma, [6].

Shoulder instability can be combined with bone or soft tissue injuries, usually occurring at the initial episode of dislocation, including fractures of the humeral head, ligamentous injuries, rotator cuff injuries, fractures of the greater or lesser tuberosity, fractures of the glenoid, vascular damage, and nerve injuries. These concomitant injuries are rare in cases with nontraumatic instability. The majority of patients with traumatic anterior instability suffer from an avulsion of the anterior labrum and the inferior glenohumeral ligament from the anteroinferior glenoid (Bankart lesion). At the time of dislocation, the humeral head may impact upon the glenoid rim, causing a compression fracture. In most anterior shoulder dislocations, this compression fracture may be created on the posterosuperior aspect of the humeral head (Hill-Sachs lesion) [12]. The co-existence of rotator cuff injuries along with shoulder dislocation increases with age, reaching 80% in patients older than 60 [13]. Other concomitant injuries include humeral avulsion of the glenohumeral ligament (HAGL), glenoid labral articular defects (GLAD), and anterior labral periosteal sleeve avulsion (ALPSA). In posterior shoulder dislocations, compression fractures may be created on the anteromedial aspect of the humeral head (reverse Hill-Sachs lesions). Other co-existing disorders combined with posterior instability include posterior Bankart lesions, posterior labral cysts and posterior glenoid fractures. The rate of axillary nerve injury at the time of dislocation has been reported at 5% - 25%, increasing with age [14]. Identification of these injuries is of vital importance, as they can define direction of instability affecting patient management [15].

Clinical presentation

The diagnosis of acute shoulder instability is primarily based on history and clinical examination. The patient usually recounts shoulder trauma and the mechanism of the applied force. Sometimes, there is a history of previous shoulder trauma or dislocation. Posterior inspection of the shoulder in a sitting position reveals gross deformity. Following a shoulder dislocation, the head of the humerus may be easily palpated beneath the skin. Pain and muscle contraction limits dramatically the shoulder motion. Anterior dislocation reduces abduction and internal rotation while posterior dislocation reduces external rotation. A rare form of shoulder dislocation is luxatio erecta (inferior glenohumeral dislocation), where the arm is locked in full abduction [16]. It is important to perform a complete neurovascular examination of the upper limb, as anterior shoulder dislocation is associated with axillary nerve injury [14].

In case of non-acute shoulder instability, patients may complain for a recent exacerbation of a recurrent instability, or a chronic vague pain without any previous diagnosis of instability. Sometimes, they mention avoiding the placement of their shoulder in a position prone to dislocations. Inspection may reveal shoulder asymmetry, muscular atrophy, localized edema, or ecchymoses. Palpation may reveal positions of localized tenderness and bony defects. Active and passive

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range of motion and muscular strength should be compared with the contralateral shoulder [17]. Further clinical examination may reveal signs of generalized ligamentous laxity, which is assessed by Beighton's criteria, where a score more than 4 suggests joint hypermobility [18]. Special clinical tests of shoulder instability are usually performed at the end of the clinical examination. These include the drawer test, the sulcus test, the jerk test, the "load and shift" test, the apprehension test and its variations and the relocation sign [19]. If the diagnosis of instability is unclear in some patients, clinical examination under general anesthesia could be considered.

Radiographic Studies

Anteroposterior (AP) shoulder x-ray will easily reveal acute anterior shoulder dislocation. Axillary views display the location of the humeral head in relation to the glenoid. In case of inability of arm abduction, modified views (trauma axillary lateral view, Velpeau axillary lateral view) may be performed.. A scapular lateral view x-ray is taken at an oblique angle, with the patient's arm raised and the X-ray machine positioned at an angle to visualize the scapula and the humeral head. Transthoracic view is not useful for the evaluation of shoulder instability. The West Point axillary view and the apical oblique view reveal glenoid bony defects [20].

Computed tomography (CT) may sufficiently depict glenoid defects. CT with 3D reconstructions can describe in detail the osseous anatomy and calculate glenoid bone loss [21, 22]. Magnetic resonance imaging (MRI) is the gold standard for the evaluation of soft tissue injuries, especially rotator cuff injuries and labral defects, with a sensitivity exceeding 90%. MRI arthrogram has an increased sensitivity and specificity in the diagnosis of soft tissue injuries [23].

Management

The management of glenohumeral instability depends on a multitude of factors, depending on the type and severity of the instability. Generally, the principles of management can be divided into non-operative and operative approaches. The decision is based on the equilibrium between failure of conservative treatment and risk of complications of surgical treatment [24].

The risk of recurrent instability is a major factor for the choice of management. After the first episode of glenohumeral dislocation, the incidence of recurrent instability has been calculated to be 14% to 100% [25]. Factors affecting the possibility of the development of recurrent instability include age, gender, the number of previous dislocations, participation in sports, structural glenohumeral abnormalities and associated injuries. The younger the patient's age at first shoulder dislocation, the greater the likelihood of recurrent instability. Anterior dislocation in a patient aged less than 20 years results in a 90% rate of recurrent dislocation. Risk of recurrent instability is significantly higher in athletes compared to non-athletic patients [26].

The Instability Severity Score (ISS) is a scoring system used to assess the severity of shoulder instability. It takes into account various factors, including the patient's age, degree of sports participation, participation in contact or overhead sports, shoulder hyperlaxity and the presence of associated injuries, such as Hill-Sachs lesion and loss of glenoid contour. The ISS is scored on a scale of 0 - 10, with higher scores indicating greater severity of instability. A score less than 6 suggests an acceptable risk of recurrent instability, below 10%. The ISS can be used to guide treatment decisions, with more severe cases often requiring surgical intervention to restore stability to the shoulder joint [27].

Acute Management

After an acute shoulder dislocation, the glenohumeral joint should be reduced as soon as possible. The reduction may be facilitated with the use of muscle relaxants and analgesics. The faster a closed reduction is attempted after initial trauma, the greater the chances of success. The most widely used techniques for closed reduction of the glenohumeral joint include the Hippocrates technique, the Stimson method, the Kocher method and the Milch method [28]. If closed reduction at the emergency department is not successful, general anesthesia should be applied. After the radiographic confirmation of a successful reduction of anterior dislocation, the arm should be immobilized in a sling for 1 week. There is no benefit for a more prolonged immobilization. In case of posterior dislocation, after reduction, the shoulder should be immobilized in external rotation for 4 – 6 weeks [29].

Conservative Treatment

Conservative management includes physical therapy,

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rest, and activity modification and it is generally indicated for patients with mild instability, who can respond successfully to rehabilitation and are less prone to develop recurrent instability. After a first episode of dislocation, initial conservative management may be attempted for patients regardless of age with minimal damage on x-rays, low demand patients who are less likely to engage in high-risk activities, and patients with atraumatic multidirectional glenohumeral instability, without trauma history and with signs of general ligamentous laxity [8, 30].

Initial immobilization in a sling for a brief period allows for the recovery of the static stabilizers. By limiting range of motion and avoiding positions of increased vulnerability for dislocation, the shoulder is protected from recurrence of instability. Rehabilitation includes strengthening of dynamic stabilizers, especially rotator cuff muscles, deltoid and peri-scapular muscles, to provide additional stability for the injured shoulder. Return to sport may be allowed after 3 weeks [30].

Surgical Treatment

After the first episode of anterior or posterior shoulder dislocation, indications for surgical treatment include failed conservative management, multiple dislocations in young patients, irreducible dislocations, open dislocations, post-reduction instability of the shoulder and first-time dislocation in young elite athletes. American Shoulder and Elbow Surgeons suggest that the first episode of dislocation should be treated surgically in athletes aged 14 to 30 at the end of their competitive season if they have positive apprehension testing and bone loss [31]. Plenty of studies suggest that young and active patients with a first episode of shoulder dislocation should be operated as the rate of recurrent instability is relatively high. Moreover, surgical treatment is indicated for patients suffering from Traumatic Unilateral dislocations with a Bankart lesion requiring Surgery (TUBS) [32].

Operative management typically involves surgical repair of the injured structures. The specific surgical approach depends on the type and severity of the instability, but may include open or arthroscopic techniques, as well as various types of surgical anchors or sutures. Regardless of the approach, the ultimate goal of management is to restore stability to the shoulder joint, while minimizing the risk of complications and optimizing the patient's functional outcome. Patients may also benefit from post-operative rehabilitation to restore range of motion, strength, and function [33].

Surgical options include arthroscopic procedures, open procedures with soft tissue repair or augmentation, and open procedures with bony augmentation. While, in the past, open anterior shoulder stabilization methods were the gold standard, after the invention of modern instrumentation and surgical methods, the outcome of arthroscopic procedures are nearly equivalent if not superior to those after an open stabilization [34]. If studies published after 2000 are taken into consideration, arthroscopic shoulder stabilization has better results than open repair [35]. Moreover, arthroscopic procedures are associated with less postoperative pain, preservation of shoulder motion, shorter hospitalization and decreased morbidity and rate of complications [36]. However, there are few situations where open techniques are preferred, especially in cases of large bony fragment fixation in either the glenoid or the humeral head.

In case of a Hill-Sachs defect, its position may affect the choice of type of surgical treatment. An "on-track" Hill-Sachs lesion is located in a more central or superior position on the humeral head, and it does not extend beyond the glenoid. This means that the humeral head stays "on-track" with the glenoid during shoulder movement, and there is less risk of instability. In this case, the primary focus of surgical management is usually the repair of the labrum and the supportive ligaments. This can typically be achieved using arthroscopic Bankart repair or open Latarjet procedure. On the contrary, an "off-track" Hill-Sachs lesion is located more laterally or inferiorly on the humeral head, and it extends beyond the usual confines of the glenoid. This means that the humeral head can engage with the glenoid during shoulder movement, leading to instability and a higher risk of recurrent dislocations. In these cases, treatment includes the remplissage procedure or the Latarjet procedure [37, 38].

Arthroscopic Procedures

Arthroscopic procedures usually start with an inspection of the glenohumeral joint to identify the injuries of the glenoid, the humeral head, the rotator interval and the labrum. If a Bankart lesion is identified after a first episode of dislocation in athletes younger than 25 years, it should be repaired, through an arthroscopic Bankart repair, as it results in a 7-fold lower rate of

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recurrence [39, 40]. The procedure is relatively indicated in elite athletes, in recurrent dislocations, after a failed course of physical therapy, provided there is less than 25% glenoid bone loss. After the full mobilization of labrum, it is fixed on the anterior glenoid rim, with the use of 3 or more suture anchors. The reported results of this technique are excellent and the rate of recurrent instability is below 7%. In case of large Hill-Sachs lesions, the method can be combined with remplissage, where posterior capsule and infraspinatus tendon are sutured into the humeral head defect. In these patients, combined Bankart repair with remplissage has better outcome than isolated Bankart repair [41].

If there is a posterior capsulolabral detachment, it should be mobilized with a periosteal elevator and stabilized on the posterior glenoid rim. The reattachment of the labrum was initially attempted with the use of metallic staples or transglenoid sutures with a more than 10% incidence of complications and a 33% rate of recurrent instability [42-44]. Nowadays, suture anchors are used for the capulolabral repair in arthroscopic posterior stabilization and capsular plication. In the past, thermal capsulorrhaphy has been applied with the aim to increase glenohumeral stability by contracting capsular tissue, with a high rate of chondrolysis, leading to the abandonment of the method [45, 46].

In case of multidirectional instability, anterior or posterior arthroscopic capsulorrhaphy with suture-tying techniques has good to excellent short-term results in 95% of cases, with a 2 – 5% rate of recurrent instability [47]. Arthroscopic thermal capsulorrhaphy has produced mixed results, with increased rate of complications such as axillary nerve neuropraxias and glenoid chondrolysis [48].

Open Procedures

Open procedures usually start with a deltopectoral approach and include soft tissue or bony techniques. The most widely performed soft tissue technique is the open Bankart procedure, where the labrum is mobilized with a periosteal elevator and then stabilized to the anterior inferior glenoid rim, using screws or suture anchors [49]. The method is indicated for Bankart lesions with less than 25% glenoid bone loss, for co-existing glenoid fractures and after failure of arthroscopic Bankart repair. The results of the technique are excellent; however equivalent to arthroscopic repair, with a 8 – 12% rate of recurrent dislocation [50, 51]. More than 80% of athletes may return to the previous level of sport; however, the rate of osteoarthritis reaches 70% [51, 52]. Another used technique is the capsulolabral reconstruction, which reattaches the torn or damaged labrum and capsule to the shoulder socket, typically using sutures or anchors. The reported results are excellent in 95% of patients with an up to 4% incidence of recurrent dislocation [53].

At the beginning of the 20th century, the shortening of subscapularis tendon (Putti-Platt procedure) was used to treat anterior instability with significantly inferior results [54, 55]. In the early 1940s, the Magnuson-Stack procedure was popularized. During the procedure, a portion of the subscapularis tendon was taken and attached to the glenoid using sutures. Then the tendon was passed through a drill hole in the humerus and attached to the bone using sutures. Even though early results were excellent, the method fell into disfavor, as it modified the normal biomechanics of the glenohumeral joint [9].

Posterior instability may be addressed through a posterior or a deltoid-splitting approach. In patients with posterior instability, surgical release and anterior advancement of the capsule through an anterior approach, has been described with satisfactory results [56]. In case of a reverse Hill-Sachs lesion less than 40%, through the McLaughlin procedure, damaged bone is removed and the remaining humeral head is reshaped to create a smooth surface. Then through a drilled hole, a button-like implant is inserted, acting as a new "ball" for the glenohumeral joint, preventing the humeral head to engage the posterior glenoid rim [57]. Posterior capsulorrhaphy may be conducted in a manner similar to anterior capsulorrhaphy. Good to excellent results have been reported in about 90% of patients, with an up to 23% rate of recurrent instability [58]. However, only 68% of athletes return to the preinjury level of sport [59].

Additionally, anterior glenohumeral instability may be managed with several bony techniques. These bony procedures are indicated in chronic bony deficiencies with a more than 25% bone loss of glenoid. In these cases, where part of glenoid bone is absent, excessive stress is transferred to anterior labrum, increasing the risk of failure of isolated labral repair. Relative indications also include recurrent anterior instability with subcritical (>13.5%) glenoid bone loss. The basic concept of the methods is the

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placement of a bony fragment on the glenoid neck, providing the native glenoid with additional surface, preventing anterior dislocation. Two common procedures have used the adjacent coracoids process: the Bristow procedure and the Latarjet procedure. In the Bristow procedure, the tip of the coracoid process is osteotomized, with the attachment of the conjoined tendons and the coracoacromial ligament and stabilized onto the anterior inferior glenoid rim [60]. Even though the technique has been associated with increased patient satisfaction, and a low rate of recurrent dislocations, severe complications have been reported including loss of external rotation, residual pain, and graft nonunion [61-66]. In the more commonly performed Latarjet procedure, a larger fragment of the coracoid process is osteotomized and stabilized to the neck of the glenoid with screws. The results of the technique are excellent and the reported rate of recurrent instability is less than 10%. However, the method has been associated with a 30 – 70% rate of glenohumeral arthritis [67-69]. A recent meta-analysis reported an overall complication rate of 16% and a 2.6% risk of re-operation [70]. Few recent studies have shown that Latarjet procedure yields a superior outcome in comparison to Bankart repairs, with reduced risk of recurrence and redislocation [71, 72]. In patients older than 40 years, pain relief and satisfaction is similar with either arthroscopic Bankart repair or Latarjet procedure [73]. For the aforementioned reasons, there are surgeons, especially in Europe, who prefer a direct Latarjet procedure after a first anterior dislocation, instead of a Bankart repair.

In the 1970s, the subscapularis tendon was repositioned to the back of the humeral head, increasing the distance of dislocation (Eden-Hybbinette procedure). The outcome was good or excellent in 80% of patients with a 4 – 33% rate of recurrent dislocation. Long-term incidence of glenohumeral osteoarthritis reached 90% leading to the abandonment of the method [74-77].

In patients with bone loss in glenoid more than 25% and after failure of Bristow/Latarjet procedures, the glenoid defect may be filled with autografts or allografts, usually tricortical iliac crest or distal clavicle autograft. Grafts are placed at the site of glenoid defect after the capsulolabral reconstruction, and are fixed with multiple cortical screws or buttons. A 90% healing rate has been reported after a 1.5 years follow-up [78-81]. Mid-term results are satisfactory [82]. According to a recent meta-analysis, free bone block procedures yield equivalent results with Latarjet procedures, for anterior instability [83]. In case of large Hill-Sachs lesion (>40%), shoulder arthroplasty or rotational osteotomies may be applied [84].

In case of recurrent posterior dislocations, excessive glenoid retroversion may be the cause of posterior instability [85]. A posterior glenoid osteotomy can restore glenoid version with good to excellent results in 82% of the patients and a 12 – 17% rate of recurrent dislocation. However, the method has a high rate of complications, such as anterior instability, glenoid fracture, coracoid impingement and shoulder osteoarthritis. For the aforementioned reasons, glenoid osteotomy is reserved for cases of glenoid retroversion more than 30 degrees and after failed posterior capsulorrhaphy [86-88]. Posterior bone block augmentation does not yield improved patient-reported outcomes and is associated with more than 13% rate of complications [89, 90]. If posterior dislocation is more than 6 months or there is a reverse Hill-Sachs defect more than 40%, hemiarthroplasty or total shoulder arthroplasty may be considered [91, 92].

Patients with multidirectional instability may be managed with an anterior capsulolabral reconstruction, focusing on the inferior aspect of the shoulder capsule, which should be released and advanced anteriorly and superiorly. Good to excellent outcome has been reported to 90% of cases and the rate of recurrent instability is more than 26% [93]. In case, patients complain mostly for posterior instability, a posterior capsular shift procedure may be performed.

Postoperative Rehabilitation

The goal of rehabilitation after arthroscopic or open shoulder stabilization is the protection of the surgical repair and the progressive reestablishment of full range of motion. After a Bankart or Latarjet procedure, the operated shoulder is immobilized in a sling for approximately 4 to 6 weeks. Passive range of motion exercises in the supine position may be initiated 1 to 2 weeks after surgery. Careful active assisted external rotation is recommended for the first 4 weeks. Resistive strengthening exercises can be initiated 3 months postoperatively once full, painless, active forward flexion has been recovered; however external rotation should be limited to half the range of motion of the contralateral shoulder. Full use of the shoulder and

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return to contact sports is typically allowed 6 months after surgery [41]. The return to overhead sports after an arthroscopic Bankart repair may be delayed until 13 months postoperatively [94].

Complications

Infection is a rare complication after a shoulder stabilization procedure with in incidence less than 0.25%. In case of a diagnosis of a postoperative deep infection, immediate open or arthroscopic irrigation and surgical debridement is indicated, followed by intravenous antibiotics [95]. The incidence of nerve injuries is significantly decreased in arthroscopic procedures compared to open surgeries [96]. The musculocutaneous nerve and the axillary nerve are mostly susceptible to injury. Risk factors for nerve injuries include lateral traction, compression because of fluid extravasation, and a tourniquet effect after an over tightened wrapping of the upper extremity. Most axillary nerve injuries are transient neuropraxias that progress to full recovery [97].

Osteolysis, chondrolysis and synovitis are established complications of arthroscopic Bankart repair [98]. Stiffness is another established complication after shoulder stabilization, especially after Latarjet procedure. Risk factors include excessive capsular tightening, non-anatomic techniques of reconstruction, prolonged postoperative immobilization and low compliance with the rehabilitation regime [70]. Treatment of stiffness includes manipulation under anesthesia and arthroscopic debridement of scar tissue [99]. Persistent postoperative shoulder pain may be attributed to overtightening during labral repair.

Conflict of interest

The authors declare no conflicts of interest.

References

1. Bakhsh W, Nicandri G. Anatomy and Physical Examination of the Shoulder. Sports Med Arthrosc Rev. 2018 Sep;26(3):e10-e22.
2. Chang LR, Anand P, Varacallo M. Anatomy, Shoulder and Upper Limb, Glenohumeral Joint. 2022 Jan.
3. Kadi R, Milants A, Shahabpour M. Shoulder Anatomy and Normal Variants. J Belg Soc Radiol. 2017 Dec 16;101(Suppl 2):3.
4. Curl LA, Warren RF. Glenohumeral joint stability. Selective cutting studies on the static capsular restraints. Clin Orthop Relat Res. 1996 Sep(330):54-65.
5. Klungsøyr JA, Vagstad T, Klungsøyr PJ, Hellevik AI, Drogset JO. Dynamic and Static Stabilization of Anterior Shoulder Instability With the Subscapular Sling Procedure. Arthrosc Tech. 2021 Jul;10(7):e1773-e81.
6. Omoumi P, Teixeira P, Lecouvet F, Chung CB. Glenohumeral joint instability. J Magn Reson Imaging. 2011 Jan;33(1):2-16.
7. Eljabu W, Klinger HM, von Knoch M. The natural course of shoulder instability and treatment trends: a systematic review. J Orthop Traumatol. 2017 Mar;18(1):1-8.
8. Neer CS, 2nd. Involuntary inferior and multidirectional instability of the shoulder: etiology, recognition, and treatment. Instr Course Lect. 1985;34:232-8.
9. Karadimas JE. Recurrent traumatic anterior dislocation of the shoulder. 218 consecutive cases treated by a modified Magnuson-Stack procedure and follow for 2-18 years. Acta Orthop Scand Suppl. 1997 Oct;275:69-71.
10. Krøner K, Lind T, Jensen J. The epidemiology of shoulder dislocations. Arch Orthop Trauma Surg. 1989;108(5):288-90.
11. Brelin A, Dickens JF. Posterior Shoulder Instability. Sports Med Arthrosc Rev. 2017 Sep;25(3):136-43.
12. Hill HA, Sachs MD. The Grooved Defect of the Humeral Head. Radiology. 1940;35(6):690-700.
13. Itoi E, Tabata S. Rotator cuff tears in anterior dislocation of the shoulder. Int Orthop. 1992;16(3):240-4.
14. Hardie CM, Jordan R, Forker O, Fort-Schaale A, Wade RG, Jones J, et al. Prevalence and risk factors for nerve injury following shoulder dislocation. Musculoskelet Surg. 2022 Nov 29.
15. Tokish JM. Shoulder Instability. Sports Med Arthrosc Rev. 2020 Dec;28(4):121.
16. Yamamoto T, Yoshiya S, Kurosaka M, Nagira K, Nabeshima Y. Luxatio erecta (inferior dislocation of the shoulder): a report of 5 cases and a review of the literature. Am

J Orthop (Belle Mead NJ). 2003 Dec;32(12):601-3.

17. Callanan M, Tzannes A, Hayes K, Paxinos A, Walton J, Murrell GA. Shoulder instability. Diagnosis and management. Aust Fam Physician. 2001 Jul;30(7):655-61.
18. Malek S, Reinhold EJ, Pearce GS. The Beighton Score as a measure of generalised joint hypermobility. Rheumatol Int. 2021 Oct;41(10):1707-16.
19. Lizzio VA, Meta F, Fidai M, Makhni EC. Clinical Evaluation and Physical Exam Findings in Patients with Anterior Shoulder Instability. Curr Rev Musculoskelet Med. 2017 Dec;10(4):434-41.
20. Goud A, Segal D, Hedayati P, Pan JJ, Weissman BN. Radiographic evaluation of the shoulder. Eur J Radiol. 2008 Oct;68(1):2-15.
21. Ruiz Santiago F, Martínez Martínez A, Tomás Muñoz P, Pozo Sánchez J, Zarza Pérez A. Imaging of shoulder instability. Quant Imaging Med Surg. 2017 Aug;7(4):422-33.
22. Makhni EC, Tramer JS, Anderson MJJ, Levine WN. Evaluating Bone Loss in Anterior Shoulder Instability. J Am Acad Orthop Surg. 2022 Jun 15;30(12):563-72.
23. Steinbach LS. MRI of shoulder instability. Eur J Radiol. 2008 Oct;68(1):57-71.
24. Provencher MT, Midtgaard KS, Owens BD, Tokish JM. Diagnosis and Management of Traumatic Anterior Shoulder Instability. J Am Acad Orthop Surg. 2021 Jan 15;29(2):e51-e61.
25. Polyzois I, Dattani R, Gupta R, Levy O, Narvani AA. Traumatic First Time Shoulder Dislocation: Surgery vs Non-Operative Treatment. Arch Bone Jt Surg. 2016 Apr;4(2):104-8.
26. Olds M, Ellis R, Donaldson K, Parmar P, Kersten P. Risk factors which predispose first-time traumatic anterior shoulder dislocations to recurrent instability in adults: a systematic review and meta-analysis. British Journal of Sports Medicine. 2015;49(14):913-22.
27. Balg F, Boileau P. The instability severity index score. A simple pre-operative score to select patients for arthroscopic or open shoulder stabilisation. J Bone Joint Surg Br. 2007 Nov;89(11):1470-7.
28. Hussein MK. Kocher's method is 3,000 years old. J Bone Joint Surg Br. 1968 Aug;50(3):669-71.
29. Paterson WH, Throckmorton TW, Koester M, Azar FM, Kuhn JE. Position and duration of immobilization after primary anterior shoulder dislocation: a systematic review and meta-analysis of the literature. J Bone Joint Surg Am. 2010 Dec 15;92(18):2924-33.
30. Dang V. The nonoperative management of shoulder instability. JAAPA. 2007 Mar;20(3):32-8.
31. Lemme NJ, Kuczmarski AS, Goodman AD, Ready LV, Dickens JF, Owens BD. Management and Outcomes of In-Season Anterior Shoulder Instability in Athletes. JBJS Reviews. 2019;7(11):e2.
32. Farrar NG, Malal JJ, Fischer J, Waseem M. An overview of shoulder instability and its management. Open Orthop J. 2013;7:338-46.
33. Rossy WH, Cieslak K, Uquillas CA, Rokito A. Current trends in the management of recurrent anterior shoulder instability. Bull Hosp Jt Dis (2013). 2014;72(3):210-6.
34. Rashid MS, Arner JW, Millett PJ, Sugaya H, Emery R. The Bankart repair: past, present, and future. J Shoulder Elbow Surg. 2020 Dec;29(12):e491-e8.
35. Gao B, DeFroda S, Bokshan S, Ready LV, Sullivan K, Etzel C, et al. Arthroscopic Versus Open Bankart Repairs in Recurrent Anterior Shoulder Instability: A Systematic Review of the Association Between Publication Date and Postoperative Recurrent Instability in Systematic Reviews. Arthroscopy. 2020 Mar;36(3):862-71.
36. Fabbriciani C, Milano G, Demontis A, Fadda S, Ziranu F, Mulas PD. Arthroscopic versus open treatment of Bankart lesion of the shoulder: a prospective randomized study. Arthroscopy. 2004 May;20(5):456-62.
37. Calvo E, Delgado C. Management of off-track Hill-Sachs lesions in anterior glenohumeral instability. J Exp Orthop. 2023 Mar 21;10(1):30.
38. Hatta T, Yamamoto N, Shinagawa K, Kawakami J, Itoi E. Surgical decision making based on the on-track/off-track concept for anterior shoulder instability: a case-control study. JSES Open Access. 2019 Mar;3(1):25-8.
39. Murphy AI, Hurley ET, Hurley DJ, Pauzenberger L, Mullett H. Long-term outcomes of the arthroscopic Bankart repair: a systematic review of studies at 10-year follow-up. J Shoulder Elbow Surg. 2019 Nov;28(11):2084-9.
40. Hurley ET, Manjunath AK, Bloom DA, Pauzenberger L, Mullett H, Alaia MJ, et al. Arthroscopic Bankart Repair Versus Conservative Management for First-Time Traumatic Anterior Shoulder Instability: A Systematic Review and Meta-analysis. Arthroscopy. 2020 Sep;36(9):2526-32.
41. DeFroda SF, Mehta N, Owens BD. Physical therapy

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protocols for arthroscopic Bankart repair. Sports health. 2018;10(3):250-8.
42. Detrisac DA, Johnson LL. Arthroscopic shoulder capsulorrhaphy using metal staples. Orthop Clin North Am. 1993 Jan;24(1):71-88.
43. McIntyre LF, Caspari RB. The rationale and technique for arthroscopic reconstruction of anterior shoulder instability using multiple sutures. Orthop Clin North Am. 1993 Jan;24(1):55-8.
44. Morgan CD, Bodenstab AB. Arthroscopic Bankart suture repair: technique and early results. Arthroscopy. 1987;3(2):111-22.
45. Hawkins RJ, Krishnan SG, Karas SG, Noonan TJ, Horan MP. Electrothermal arthroscopic shoulder capsulorrhaphy: a minimum 2-year follow-up. Am J Sports Med. 2007 Sep;35(9):1484-8.
46. Mohtadi NG, Kirkley A, Hollinshead RM, McCormack R, MacDonald PB, Chan DS, et al. Electrothermal arthroscopic capsulorrhaphy: old technology, new evidence. A multicenter randomized clinical trial. J Shoulder Elbow Surg. 2014 Aug;23(8):1171-80.
47. Chen D, Goldberg J, Herald J, Critchley I, Barmare A. Effects of surgical management on multidirectional instability of the shoulder: a meta-analysis. Knee Surg Sports Traumatol Arthrosc. 2016 Feb;24(2):630-9.
48. Miniaci A, McBirnie J. Thermal capsular shrinkage for treatment of multidirectional instability of the shoulder. J Bone Joint Surg Am. 2003 Dec;85(12):2283-7.
49. Bankart ASB. The pathology and treatment of recurrent dislocation of the shoulder-joint. British Journal of Surgery. 2005;26(101):23-9.
50. Jolles BM, Pelet S, Farron A. Traumatic recurrent anterior dislocation of the shoulder: two- to four-year follow-up of an anatomic open procedure. J Shoulder Elbow Surg. 2004 Jan-Feb;13(1):30-4.
51. Fabre T, Abi-Chahla ML, Billaud A, Geneste M, Durandeau A. Long-term results with Bankart procedure: a 26-year follow-up study of 50 cases. J Shoulder Elbow Surg. 2010 Mar;19(2):318-23.
52. Monk AP, Crua E, Gatenby GC, Walsh AJ, Stanley JC, Rosenfeldt MP, et al. Clinical outcomes following open anterior shoulder stabilization for glenohumeral instability in the young collision athlete. J Shoulder Elbow Surg. 2022 Jul;31(7):1474-8.
53. Jobe FW, Giangarra CE, Kvitne RS, Glousman RE. Anterior capsulolabral reconstruction of the shoulder in athletes in overhand sports. Am J Sports Med. 1991 Sep-Oct;19(5):428-34.
54. Fredriksson AS, Tegner Y. Results of the Putti-Platt operation for recurrent anterior dislocation of the shoulder. Int Orthop. 1991;15(3):185-8.
55. Inui H, Nobuhara K. Modified Putti-Platt procedure for recurrent anterior shoulder instability. Int Orthop. 2020 Jun;44(6):1123-9.
56. Wirth MA, Groh GI, Rockwood CA, Jr. Capsulorrhaphy through an anterior approach for the treatment of atraumatic posterior glenohumeral instability with multidirectional laxity of the shoulder. J Bone Joint Surg Am. 1998 Nov;80(11):1570-8.
57. Besnard M, Audebert S, Godenèche A. Arthroscopic McLaughlin Procedure for Treatment of Posterior Instability of the Shoulder With an Engaging Reverse Hill-Sachs Lesion. Arthrosc Tech. 2019 Dec;8(12):e1491-e4.
58. Fuchs B, Jost B, Gerber C. Posterior-inferior capsular shift for the treatment of recurrent, voluntary posterior subluxation of the shoulder. J Bone Joint Surg Am. 2000 Jan;82(1):16-25.
59. Gouveia K, Kay J, Memon M, Simunovic N, Bedi A, Ayeni OR. Return to Sport After Surgical Management of Posterior Shoulder Instability: A Systematic Review and Meta-analysis. Am J Sports Med. 2022 Mar;50(3):845-57.
60. Cowling PD, Akhtar MA, Liow RY. What is a Bristow-Latarjet procedure? A review of the described operative techniques and outcomes. Bone Joint J. 2016 Sep;98-B(9):1208-14.
61. Khawaja K, Mohib Y, Khan Durrani MY, Juman NM, Habib AA, Hashmi P. Functional outcomes of modified Bristow procedure in recurrent shoulder dislocation. J Pak Med Assoc. 2021 Oct;71(10):2448-50.
62. Shao Z, Song Q, Cheng X, Luo H, Lin L, Zhao Y, et al. An Arthroscopic "Inlay" Bristow Procedure With Suture Button Fixation for the Treatment of Recurrent Anterior Glenohumeral Instability: 3-Year Follow-up. Am J Sports Med. 2020 Sep;48(11):2638-49.
63. Zarezade A, Dehghani M, Rozati AR, Banadaki HS, Shekarchizade N. Comparison of Bristow procedure and Bankart arthroscopic method as the treatment of recurrent shoulder instability. Adv Biomed Res. 2014;3:256.
64. Banas MP, Dalldorf PG, Sebastianelli WJ, DeHaven KE. Long-term followup of the modified Bristow procedure.

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Am J Sports Med. 1993 Sep-Oct;21(5):666-71.
65. Ferlic DC, DiGiovine NM. A long-term retrospective study of the modified Bristow procedure. Am J Sports Med. 1988 Sep-Oct;16(5):469-74.
66. Spoor AB, de Waal Malefijt J. Long-term results and arthropathy following the modified Bristow-Latarjet procedure. Int Orthop. 2005 Oct;29(5):265-7.
67. Chillemi C, Guerrisi M, Paglialunga C, Salate Santone F, Osimani M. Latarjet procedure for anterior shoulder instability: a 24-year follow-up study. Arch Orthop Trauma Surg. 2021 Feb;141(2):189-96.
68. Ernstbrunner L, Wartmann L, Zimmermann SM, Schenk P, Gerber C, Wieser K. Long-term Results of the Open Latarjet Procedure for Recurrent Anterior Shoulder Instability in Patients Older Than 40 Years. Am J Sports Med. 2019 Nov;47(13):3057-64.
69. Hurley ET, Jamal MS, Ali ZS, Montgomery C, Pauzenberger L, Mullett H. Long-term outcomes of the Latarjet procedure for anterior shoulder instability: a systematic review of studies at 10-year follow-up. J Shoulder Elbow Surg. 2019 Feb;28(2):e33-e9.
70. Cho CH, Na SS, Choi BC, Kim DH. Complications Related to Latarjet Shoulder Stabilization: A Systematic Review. Am J Sports Med. 2023 Jan;51(1):263-70.
71. Bliven KCH, Parr GP. Outcomes of the Latarjet procedure compared with Bankart repair for recurrent traumatic anterior shoulder instability. Journal of athletic training. 2018;53(2):181-3.
72. Imam MA, Shehata MSA, Martin A, Attia H, Sinokrot M, Bahbah EI, et al. Bankart Repair Versus Latarjet Procedure for Recurrent Anterior Shoulder Instability: A Systematic Review and Meta-analysis of 3275 Shoulders. Am J Sports Med. 2021 Jun;49(7):1945-53.
73. Ernstbrunner L, De Nard B, Olthof M, Beeler S, Bouaicha S, Gerber C, et al. Long-term Results of the Arthroscopic Bankart Repair for Recurrent Anterior Shoulder Instability in Patients Older Than 40 Years: A Comparison With the Open Latarjet Procedure. Am J Sports Med. 2020 Jul;48(9):2090-6.
74. Rachbauer F, Ogon M, Wimmer C, Sterzinger W, Huter B. Glenohumeral osteoarthrosis after the Eden-Hybbinette procedure. Clin Orthop Relat Res. 2000 Apr(373):135-40.
75. Rahme H, Wikblad L, Nowak J, Larsson S. Long-term clinical and radiologic results after Eden-Hybbinette operation for anterior instability of the shoulder. J Shoulder Elbow Surg. 2003 Jan-Feb;12(1):15-9.
76. Villatte G, Spurr S, Broden C, Martins A, Emery R, Reilly P. The Eden-Hybbinette procedure is one hundred years old! A historical view of the concept and its evolutions. Int Orthop. 2018 Oct;42(10):2491-5.
77. Wildner M, Wimmer B, Reichelt A. Osteoarthritis after the Eden-Hybbinette-Lange procedure for anterior dislocation of the shoulder. A 15 year follow up. Int Orthop. 1994 Oct;18(5):280-3.
78. Longo UG, Loppini M, Rizzello G, Ciuffreda M, Berton A, Maffulli N, et al. Remplissage, humeral osteochondral grafts, weber osteotomy, and shoulder arthroplasty for the management of humeral bone defects in shoulder instability: systematic review and quantitative synthesis of the literature. Arthroscopy. 2014 Dec;30(12):1650-66.
79. Boehm E, Gerhardt C, Kraus N, Scheibel M. Arthroscopic Glenoid Reconstruction for Chronic Anteroinferior Shoulder Instability Using a Tricortical Iliac Crest Bone Graft. JBJS Essent Surg Tech. 2016 Dec 28;6(4):e39.
80. Ranalletta M, Tanoira I, Bertona A, Maignon G, Bongiovanni S, Rossi LA. Autologous Tricortical Iliac Bone Graft for Failed Latarjet Procedures. Arthrosc Tech. 2019 Mar;8(3):e283-e9.
81. Warner JJ, Gill TJ, O'Hollerhan J D, Pathare N, Millett PJ. Anatomical glenoid reconstruction for recurrent anterior glenohumeral instability with glenoid deficiency using an autogenous tricortical iliac crest bone graft. Am J Sports Med. 2006 Feb;34(2):205-12.
82. Ueda Y, Sugaya H, Takahashi N, Matsuki K, Tokai M, Morioka T, et al. Arthroscopic Iliac Bone Grafting for Traumatic Anterior Shoulder Instability With Significant Glenoid Bone Loss Yields Low Recurrence and Good Outcome at a Minimum of Five-Year Follow-Up. Arthroscopy. 2021 Aug;37(8):2399-408.
83. Gilat R, Haunschild ED, Lavoie-Gagne OZ, Tauro TM, Knapik DM, Fu MC, et al. Outcomes of the Latarjet Procedure Versus Free Bone Block Procedures for Anterior Shoulder Instability: A Systematic Review and Meta-analysis. Am J Sports Med. 2021 Mar;49(3):805-16.
84. Hasler A, Fornaciari P, Jungwirth-Weinberger A, Jentzsch T, Wieser K, Gerber C. Reverse shoulder arthroplasty in the treatment of glenohumeral instability. J Shoulder Elbow Surg. 2019 Aug;28(8):1587-94.
85. Brewer BJ, Wubben RC, Carrera GF. Excessive retroversion of the glenoid cavity. A cause of non-traumatic pos-

terior instability of the shoulder. J Bone Joint Surg Am. 1986 Jun;68(5):724-31.

86. Lacheta L, Singh TSP, Hovsepian JM, Braun S, Imhoff AB, Pogorzelski J. Posterior open wedge glenoid osteotomy provides reliable results in young patients with increased glenoid retroversion and posterior shoulder instability. Knee Surg Sports Traumatol Arthrosc. 2019 Jan;27(1):299-304.
87. Malik SS, Jordan RW, Tahir M, MacDonald PB. Does the posterior glenoid osteotomy reduce the rate of recurrence in patients with posterior shoulder instability - A systematic review. Orthop Traumatol Surg Res. 2021 Feb;107(1):102760.
88. Waltenspül M, Häller T, Ernstbrunner L, Wyss S, Wieser K, Gerber C. Long-term results after posterior open glenoid wedge osteotomy for posterior shoulder instability associated with excessive glenoid retroversion. J Shoulder Elbow Surg. 2022 Jan;31(1):81-9.
89. Cognetti DJ, Hughes JD, Kay J, Chasteen J, Fox MA, Hartzler RU, et al. Bone Block Augmentation of the Posterior Glenoid for Recurrent Posterior Shoulder Instability Is Associated With High Rates of Clinical Failure: A Systematic Review. Arthroscopy. 2022 Feb;38(2):551-63 e5.
90. Mojica ES, Schwartz LB, Hurley ET, Gonzalez-Lomas G, Campbell KA, Jazrawi LM. Posterior glenoid bone block transfer for posterior shoulder instability: a systematic review. J Shoulder Elbow Surg. 2021 Dec;30(12):2904-9.
91. Aydin N, Enes Kayaalp M, Asansu M, Karaismailoglu B. Treatment options for locked posterior shoulder dislocations and clinical outcomes. EFORT Open Rev. 2019 May;4(5):194-200.
92. Seppel G, Braun S, Imhoff AB. Neglected Posterior Dislocations and Treatment Modalities. In: Doral MN, Karlsson J, editors. Sports Injuries: Prevention, Diagnosis, Treatment and Rehabilitation. Berlin, Heidelberg: Springer Berlin Heidelberg; 2015. p. 193-204.
93. Mitchell BC, Siow MY, Carroll AN, Pennock AT, Edmonds EW. Clinical Outcomes, Survivorship, and Return to Sport After Arthroscopic Capsular Repair With Suture Anchors for Adolescent Multidirectional Shoulder Instability: Results at 6-Year Follow-up. Orthop J Sports Med. 2021 Feb;9(2):2325967121993879.
94. Harada Y, Iwahori Y, Kajita Y, Takahashi R, Yokoya S, Sumimoto Y, et al. Return to sports after arthroscopic bankart repair on the dominant shoulder in overhead athletes. J Orthop Sci. 2022 Nov;27(6):1240-5.
95. Williams HLM, Evans JP, Furness ND, Smith CD. It's Not All About Redislocation: A Systematic Review of Complications After Anterior Shoulder Stabilization Surgery. Am J Sports Med. 2019 Nov;47(13):3277-83.
96. Hamada H, Sugaya H, Takahashi N, Matsuki K, Tokai M, Ueda Y, et al. Incidence of Axillary Nerve Injury After Arthroscopic Shoulder Stabilization. Arthroscopy. 2020 Jun;36(6):1555-64.
97. Rodeo SA, Forster RA, Weiland AJ. Neurological complications due to arthroscopy. J Bone Joint Surg Am. 1993 Jun;75(6):917-26.
98. Owens BD, Harrast JJ, Hurwitz SR, Thompson TL, Wolf JM. Surgical trends in Bankart repair: an analysis of data from the American Board of Orthopaedic Surgery certification examination. The American journal of sports medicine. 2011;39(9):1865-9.
99. Griesser MJ, Harris JD, McCoy BW, Hussain WM, Jones MH, Bishop JY, et al. Complications and re-operations after Bristow-Latarjet shoulder stabilization: a systematic review. J Shoulder Elbow Surg. 2013 Feb;22(2):286-92.

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