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Recurrent Anterior Shoulder Dislocation Management; Arthroscopic Bankart Repair Versus Latarjet: Review Article

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ABSTRACT

Background: Collegiate athletes had a high incidence rate (0.12 per 1000 exposures) of anterior shoulder instability. While, many people choose not to undergo surgery after their initial dislocation, it is common to experience considerable delays in returning to sports and achieve lower functional outcomes. The Latarjet method, initially documented in 1954, includes transfer of coracoid procedure to glenoid margin.

Objectives: This study aimed to compare the outcomes of Latarjet procedure & Arthroscopic Bankart Repair in Recurrent Traumatic Anterior Shoulder Instability.

Methods: We searched Science Direct, Google Scholar, and PubMed for Recurrent traumatic anterior shoulder instability, Latarjet procedure and Bankart repair. The authors also reviewed references from pertinent literature, however only the most recent or comprehensive studies from 2001 to 2024 were included. Documents in languages other than English were disqualified due to lack of translation-related sources. Papers such as unpublished manuscripts, oral presentations, conference abstracts, and dissertations that were not part of larger scientific studies were excluded.

Conclusion: The Bankart impact involves surgical repair of capsulolabral complex to either stump or bone of coracoacromial ligament to capsule. Arthroscopic Bankart repair is presently the most often employed method for addressing recurrent anterior shoulder instability. This method was developed in 1993 and its popularity is increasing over decades**.** Studies showed similar clinical results in open & arthroscopic Bankart repair, thus, there is marked increase in usage of arthroscopic Bankart repair and even considered 1st line surgical management in anterior shoulder instability**.** Both methods were comparable in terms of Rowe score, need for revision, & postoperative hematoma formation.

Keywords: Recurrent traumatic anterior shoulder instability, Latarjet procedure, Bankart repair.

INTRODUCTION

Usage of non-surgical treatment has resulted in recurrence rates as high as 55%. Furthermore, patho-anatomy of recurrent dislocations has been linked to more severe Bankart lesions and bone abnormalities. Thus, surgical stabilisation is commonly advised for individuals, particularly young adult athletes, to address issues related to inadequate soft tissue support & bone abnormalities [(1)]**.**

Athletic trainers must comprehend the decision-making process involved in choosing surgical stabilisation methods and the ensuing ramifications for postoperative rehabilitation. Recurrent anterior shoulder instability is commonly associated with soft tissue injury to glenoid labrum, namely in form of Bankart lesion. The Bankart repair was an early surgical treatment designed to correct soft tissue insufficiency by utilising suture anchors. Nevertheless, the majority of surgeons concur that sportsmen, regardless of whether they engage in contact or noncontact sports activities that result in minimal bone loss and intact soft tissue are most suitable for the Bankart repair technique**.** Surgeons often favour the Latarjet treatment in cases of revision operation or bone loss. Latarjet method is also known as Latarjet-Patte, Bristow-Latarjet, & coracoid transfer. The main variations between these names lie in the amount of screws used and if the anterior capsule is repaired at the same time. It is proposed that this method has threefold impacts. The primary impact arises from the dynamic sling action exerted by conjoint tendon on subscapularis muscle & the capsule, particularly in specific arm postures. The skeletal impact of enlarging glenoid surface area [(2)].

The aim of the investigation was to compare the outcomes of Latarjet procedure & Arthroscopic Bankart Repair in recurrent traumatic anterior shoulder instability.

Anatomy of shoulder:

The shoulder joint, synovial, multiaxial, ball & socket joint, is formed between humerus head and scapula, providing mobility and stability through surrounding muscles and soft tissue.

Articulating surfaces:

Articular surfaces are curved & ovoid, with the humerus head's convexity surpassing the glenoid fossa's concavity, resulting in joint instability. Glenoid labrum, deepened fibrocartilaginous rim, enhances joint stability by deepening the glenoid fossa. Articular surfaces are enveloped by hyaline cartilage. It is thickest in the central part of humerus & thinner at periphery & reverse in glenoid cavity. In most positions, their curvatures aren't fully congruent. Full congruence is achieved in the position of abduction & lateral rotation [(2)] (Figure 1)**.**

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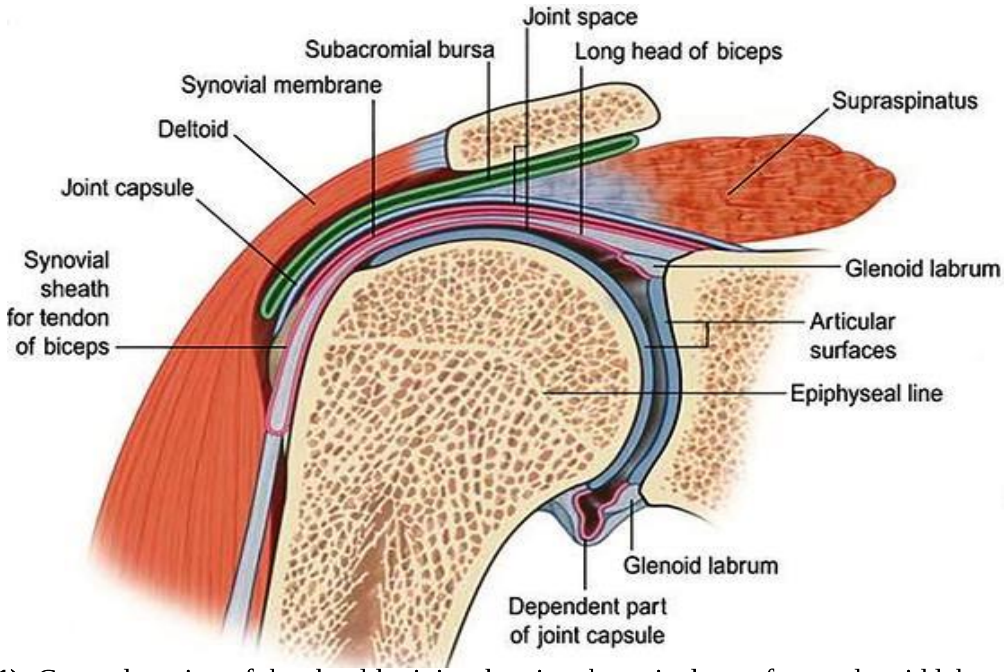

Figure (1): Coronal section of the shoulder joint showing the articular surfaces, glenoid labrum, fibrous capsule and synovial membrane [3].

Fibrous capsule:
The shoulder joint is enveloped by fibrous capsule, attached to glenoid neck, coracoid process, and scapula, & later to humeral neck near articular margin. The fibrous capsule is reinforced via various muscles, including infraspinatus, supraspinatus, subscapularis, teres minor, and long head of triceps. It has two or three openings: between humerus tubercles, below coracoid process, and behind subscapularis tendon [4].

Ligaments
Ligaments, including glenohumeral, coracohumeral, and transverse humeral, aid shoulder joint instability and resist humeral dislocation, with glenohumeral and transverse humeral being capsular ligaments:

The glenohumeral ligaments: Three ligaments, superior, middle, & inferior, act as tensile forces but become taut during external rotation, resist anterior dislocation, and tense during abduction, unlike traditional ligaments.

The coracohumeral ligament: It is attached to coracoid process, extends to the humerus tubercles, forms a tunnel for biceps tendon, reinforces rotator interval, & merges inferiorly with superior glenohumeral ligament.

The transverse humeral ligament: It is broad band passing among both humeral tubercles & is attached superiorly to epiphysial line. It transforms intertubercular sulcus into canal that houses long tendon of biceps [5].

Synovial membrane and bursae
Synovial membrane envelops capsule & overlays neck, whereas shoulder bursae are fluid-filled sacs that round shoulder joint, aiding in mobility & minimizing friction. The shoulder joint comprises five primary bursae: subscapular recess, SASD bursa, coracoclavicular bursa, subcoracoid bursa, & supra-acromial bursa, occasionally with addition of a medial extension [6].

Innervation
The shoulder joint is primarily innervated by posterior cord of brachial plexus, with capsule innervated via suprascapular, axillary, & lateral pectoral nerves [7].

Blood supply
Shoulder joint receives blood supply via branches from anterior & posterior circumflex humeral, suprascapular, & circumflex scapular blood vessels.

Biomechanics of shoulder
The shoulder joint's biomechanics are complex, with a unique stability despite few restraints. Static components include bony, cartilaginous, capsular, and ligamentous structures, while dynamic components involve surrounding muscular structures.

Basis of static stability
Capsular and ligamentous structures: Glenohumeral joint stability is achieved through capsulolabral structures & the bony anatomy of glenoid. The primary static stabilizers are glenohumeral ligaments, which thicken the joint capsule and become tight at end-ranges of motion, allowing high shoulder mobility. The superior glenohumeral ligament experiences increased tension during adduction, while the middle ligament experiences increased tension at an abduction angle of 45 degrees.

Inferior glenohumeral ligament is the most robust & crucial soft tissue stabilizer, reaching maximum tension at 90° angle of abduction in external rotation [8].

The glenoid: Soft tissues have minor role in mid-range motion stability. The bony glenoid is flat. Glenoid cartilage & labrum deepen the cavity & enhance contact with the humerus head. Complete loss of anterior labrum decreases contact area and increases contact pressure. Anteroinferior labrum is the weakest part, with average force needed for rupture. An intact labrum creates a negative intraarticular pressure, which becomes marginal when rotator cuff muscles are contracted [9].

Humeral bone: Malgaigne lesion, also recognized as Hill-Sachs lesion, is grooved defect in humeral head caused by shoulder dislocation and compression of the posterolateral head. This bone loss is linked to recurrent instability after shoulder stabilization.

Basis of dynamic stability: The shoulder joint's dynamic stability is achieved by surrounding musculature, particularly during mid-points of range of motion. Rotator cuff muscles are crucial for anterior stability, while deltoid & pectoralis muscles destabilize the joint. The subscapularis is less efficient at end range of motion, opposing long head of biceps. Latarjet technique & its variant Bristow combines ligamentous effects by enhancing coracoacromial ligament with inferior glenohumeral ligament, muscular effects by lowering inferior subscapularis, and sling effects by the conjoint tendon, primarily effective in mid-range of motion & end-range of motion [10].

Hammock & sling effects contribute to shoulder stability in mid-range & end-range of motion, with the Latarjet procedure having enhanced sling impact compared to Bristow technique because of conjoint tendon orientation & inferior graft position [11] (Figures 2 & 3).

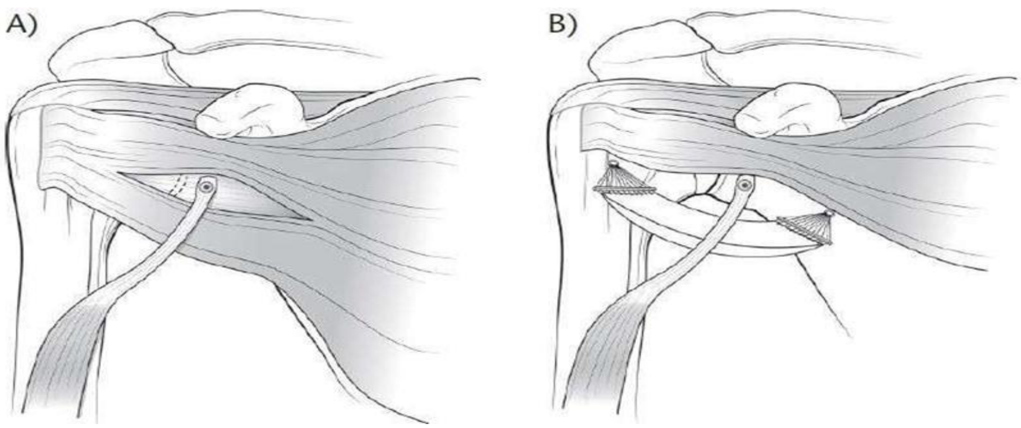

Figure (2): Anterior view of left shoulder following dynamic anterior stabilization (a). Lowering inferior part of subscapularis muscle performed by biceps tendon in low-range motion is called hammock effect (b). It represents muscular impact.

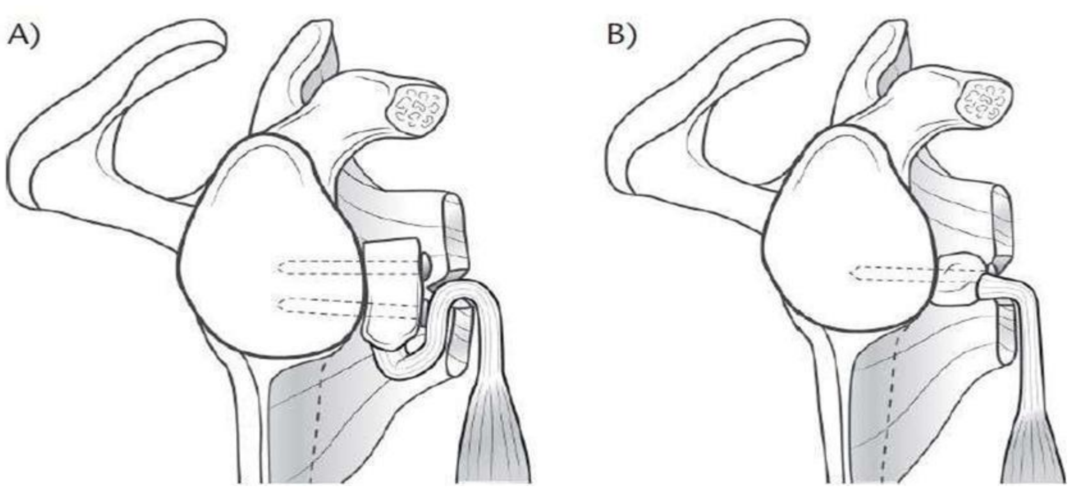

Figure (3): Sagittal illustration of right shoulder. Direction of conjoint tendon in (a) Latarjet & (b) Bristow technique. Note that conjoint tendon throughout Latarjet has to go around inferior subscapularis (a). Contrarily, conjoint tendon exits directly through split throughout Bristow technique (b) [11].

Anterior shoulder dislocation

Epidemiology: Anterior shoulder instability is prevalent issue in young athletes, with an occurrence in the US of 0.08 per 1000 population per year. High-risk males have a higher rate of 3% per year, while collision athletes like football have rates as high as 0.51 per 1000 person per year. Military personnel also have higher incidences.

Mechanism of injury: The primary cause of anterior shoulder dislocation is a forceful impact to arm that is abducted, externally rotated, & extended (e.g., blocking basketball shot). Other mechanisms involve fall on outstretched arm or blow to posterior humerus [12].

Clinical and radiological assessment

Related history: The initial clinical assessment involves obtaining a detailed history of the injury, including nature & direction of force. Cases with 1st-time shoulder dislocation may have a single traumatic event, while those with recurrent instability may have limitations or multiple dislocation events because of instability.

Clinical examination

General physical examination: The initial examination involves inspecting the shoulder girdle, both static and active, to identify asymmetry, muscle bulk/atrophy, scapular winging, & acromioclavicular position, as well as shoulder position during movement. The patient should palpate bony prominences for tenderness, involving acromioclavicular & sternoclavicular joints, and assess their active & passive range of motion. Patients with acute injuries may experience movement limitations because of underlying pain. Assessment of rotator cuff strength is then done utilizing champagne toast & spill tests for supraspinatus muscle resisted external rotation at side for infraspinatus muscle, resisted external rotation at abduction more than sixty degrees for teres minor, resisted internal rotation/belly press test for subscapularis muscle. Rotator cuff tear is common especially in age more than 40 years [13].

Provocative exam maneuvers: The anterior glenohumeral joint instability can be assessed using provocative exam maneuvers. The most important maneuvers include the anterior apprehension test, which involves bringing the case's shoulder into a 90° abduction & 90° external rotation position, and relocation test, which includes applying posteriorly directed force on humeral head in abduction & external rotation position. Positive test indicates relief of guarding or instability [14].

Figure (4): Relocation test. Examiner applies posteriorly-directed force with case's shoulder in abduction & external rotation. Relief of apprehension, guarding, or instability suggests anterior glenohumeral instability.

Load & shift test is technique used to evaluate degree of anterior laxity in a patient by applying anteriorly directed force to humeral head, with 0 indicating minimal displacement and grade 3 indicating no spontaneous reduction [15].

Radiological imaging

Plain radiographs: An anterior shoulder dislocation is diagnosed using a plain radiograph and a second x-ray after the reduction procedure. Associated fractures arise in 25% of patients, more common in first-time dislocations, traumatic dislocations, and those over 40 years old.

Magnetic resonance imaging: Magnetic resonance imaging, potentially with arthrogram (MRA) is utilized to detect glenoid or humeral head defects more accurately. Most common defects are Hill-Sachs deformities, Bankart lesions, & greater tuberosity fractures [16].

Computed tomography: CT is not done routinely in cases of anterior shoulder dislocation. However, it may be used if humeral head location cannot be assessed using plain radiographs or if CT angiogram is indicated if axillary artery injury is suspected [16].

Ultrasound: Ultrasound can be used to confirm diagnosis and successful reduction procedure. However, it is less accurate in noticing potential fractures related with anterior shoulder dislocation.

Reduction procedure: Patients should be informed about potential complications during procedures like anterior shoulder dislocation reduction, as fractures, rotator cuff tears, and axillary artery or nerve injury, which are minimally risky and usually require no analgesia. There are various approaches, with no evidence of superiority, depending on clinician preference and patient condition.

Successful reduction occurs through a "clunk" as the humeral head returns to normal shoulder contour [17].

Most common reduction techniques are:

Scapular manipulation: The first maneuver is easy, quick, and well-tolerated by patients, with a success rate of 80-100%. It involves rotating scapula to disengage humeral head from glenoid, typically done in an upright or prone position.

External rotation technique: The patient is instructed to perform a maneuver to alleviate spasm in the humerus' internal rotators and allow external rotators to move posteriorly. They lie supine with their elbow flexed 90°, slowly drop their arm to the side for 5-10 minutes, stopping if pain is felt [18].

Milch technique: This method can be added to the external rotation method if failed. Now fully externally rotated arm is abducted into overhead position. Success rate is 86-100% [18].

Stimson technique: It is used if the above techniques failed. The case lies in prone station with arm hanging from side of bed with 10-15 pounds of weight. Reduction occurs within 30 minutes [19].

Follow up and rehabilitation

After shoulder reduction, shoulder is immobilized & referred to orthopedic surgeon within a week. Recurrent dislocation is the most common problem, occurring in 50-90% of patients under 20 years and 5-10% over 40 years. To prevent recurrence, immobilization, physical therapy, and operative repair should be considered [19].

Treatment modalities for recurrent anterior shoulder dislocation:

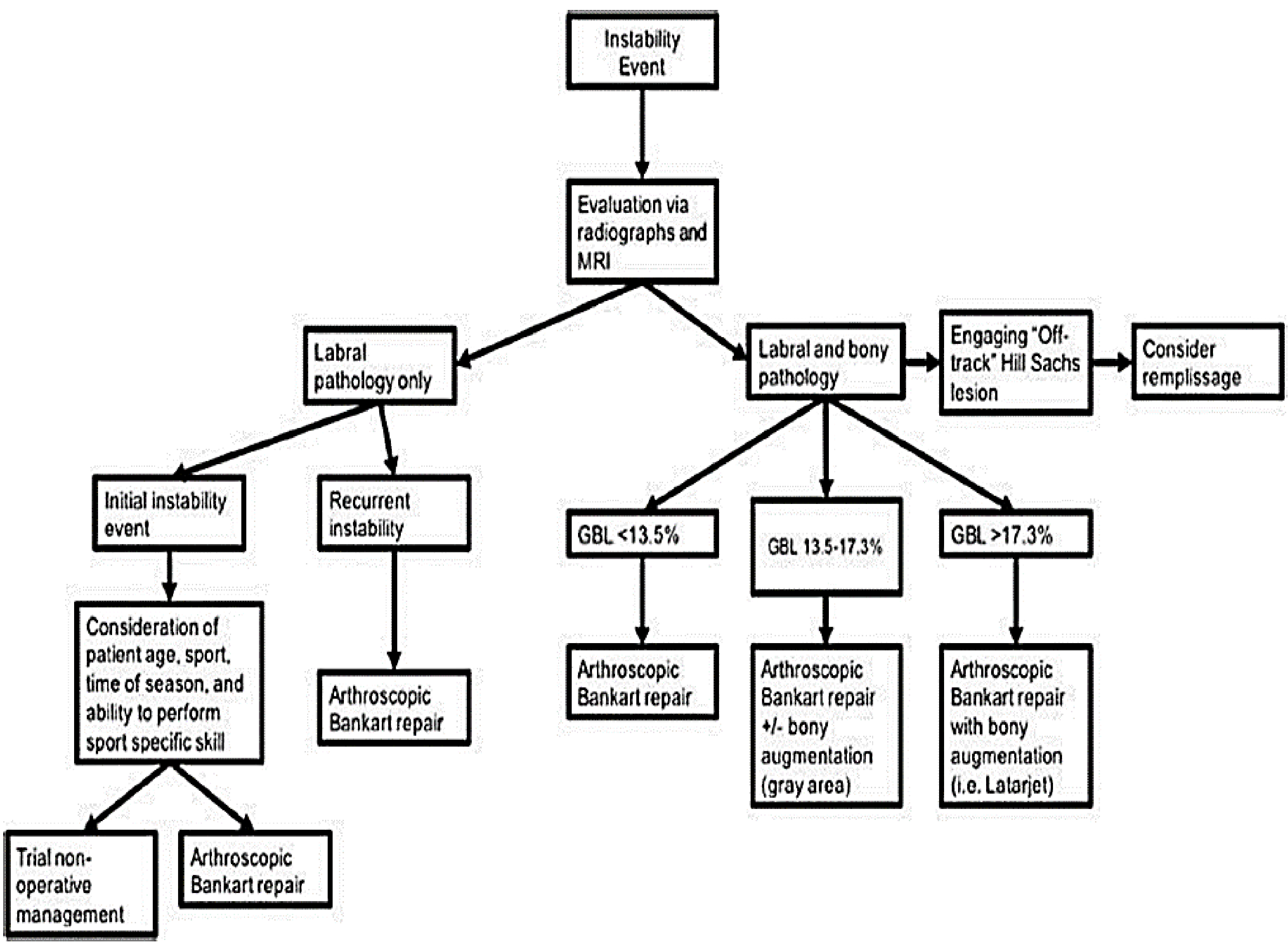

Figure (5): Algorithm for management of anterior shoulder instability according to case's pathology [20]

Arthroscopic Bankart repair

Indications/Contraindications: Arthroscopic Bankart repair is used in cases with great risk of recurrence or patients who failed non-operative management. It is used usually in cases with simple Bankart lesion with no significant glenoid bone loss (GBL). Cases with significant GBL is related with recurrent shoulder instability in 70% of cases [20].

Surgical techniques: This technique involves releasing, mobilizing, and tensioning capsulolabral complex at antero-inferior aspect of glenoid. Case is positioned in either beach chair or lateral decubitus position. Anatomic landmarks of shoulder are recognized, & posterior portal is created to confirm Bankart lesion and pathology. A low antero-inferior portal is created in deltopectoral interval to enter joint above subscapularis tendon, & antero-superior portal is created distal to acromion's antero-superior border.

Complications: Joint degenerative changes, such as chondrolysis and osteoarthritis, are common complications in this procedure, affecting up to 26% of cases. Risk factors for osteoarthritis include old age at 1st dislocation, longer time from injury to operation, raised number of used anchors, & degenerative state of labrum at surgery time [21].

Outcomes: Following arthroscopic Bankart procedure, clinical results can be evaluated regarding several aspects. These aspects are recurrence rate, range of motion, return to work or sport, complication rate, reoperation, & various patient reported outcome measures (PROMs) [20].

Recurrence of shoulder instability: Several studies have been conducted to assess recurrence rate of shoulder instability after arthroscopic Bankart repair with lifetime recurrence rate ranging from 3.4 to 33.3%. The risk is higher in athletes of contact sports [22].

Range of motion (ROM): Arthroscopic repair offers better ROM than open procedures, but external rotation range decreases by 3.5-9 degrees with arms at side and by 3.5-7 degrees with arms abducted to 90 degrees. Forward flexion loss of 1-3 degrees is also present. Stiffness is usually due to prolonged immobilization & can be managed with physical therapy & corticosteroid injections. Capsular release is considered in severe cases [23].

Return to work/sport: Return to previous level of work following arthroscopic Bankart repair range from 46-97%. Additionally, return to previous athletic level is about 49.5%. However, return to play is as high as 90% [23].

Latarjet procedure: This technique has several modifications regarding coracoacromial ligament repair to capsule, using 2 screws for stable fixation, and subscapularis horizontal splitting approach. This technique can be performed arthroscopically as well with comparable clinical outcomes. However, the open method remains the gold standard as it is time and cost effective.

Indications/Contraindications: The Latarjet method is employed to address cases of primary or recurrent anterior shoulder instability or subluxations, regardless of presence of glenoid bone loss or hyperlaxity. Nevertheless, it is imperative to carefully choose a patient with appropriate criteria and consider any contraindications. The first occurrence of a traumatic dislocation in elderly individuals with a significant fracture of the glenoid rim is considered a relative contraindication. Voluntary anterior subluxators or dislocators are considered total contraindications due to the challenging nature of surgical treatment. Prior to surgery, it is crucial to regulate epileptic patients in order to prevent fractures & deformation of screws [24].

Surgical techniques: Preoperative US-guided interscalene block is conducted to administer regional anaesthesia. This is followed by general anaesthesia and positioning case in beach-chair configuration. Shoulder is sterilised & covered with sterile drapes, while the arm is immobilised using pneumatic limb positioner. Diagnostic arthroscopy is often conducted to verify presence of glenohumeral bone loss, which suggests the need for a Latarjet operation. A 5-7 cm cut is created from tip of coracoid process to upper part of axillary fold, and the layer of tissue just beneath the skin is carefully separated. The cephalic vein is safeguarded and moved off to the side by the deltoid muscles. Self-retaining Kolbel retractors are used to preserve space among deltoid & pectoralis major muscles during the insertion of screws [25].

Coracoid graft harvest and preparation: Mayo scissors are utilized to expose coracoid process, revealing insertion of coracoclavicular ligaments. Coracoacromial ligament (CAL) is recognized using shoulder abduction and external rotation. CAL is transected about one cm from its insertion, leaving a soft tissue cuff for capsular repair [25].

Coracoid process transfer: Graft should be positioned flush with glenoid articular surface to extend glenoid arc. Excessive lateralization can lead to postoperative degenerative changes, while excessive medialization may cause enhanced absorption & lack of improvement in stability. Preoperative removal of the outer layers of opposing surfaces results in the creation of a wide area that promotes bone healing. The ideal placement is at 3- & 5-o'clock positions on glenoid. 2 Kirschner wires can be inserted into coracoid graft to aid in placement & then moved into glenoid neck for temporary fixation. Subsequently, a lag method is used to provide optimal stability and strength in the screw attachment [25].

Capsule and subcapsularis repair: Capsular repair is conducted by utilizing No. 2 FiberWires that are preloaded in suture washers from Arthrex, together with extra No. 2 sutures of high strength and the CAL. CAL residue on coracoid graft is assimilated to provide further durability. The subscapularis tear is surgically repaired using strong No. 2 stitch, & conjoint tendon passes through separated parts of subscapularis [25].

Postoperative management: Following surgery, cases are permitted to engage in cautious shoulder movement within the scapular plane, while avoiding any resistance to bending the elbow, for a minimum of 6 weeks. Avoidance of anti-inflammatory analgesics is recommended to enhance bone repair. Once the healing process is complete, individuals are allowed to engage in active strengthening exercises. Typically, they can resume participating in contact sports four months after the surgery. This allows for optimal osseous healing and protection of subscapularis repair [25].

COMPLICATIONS

Recurrence: The rate of recurrence following Latarjet operation is very low (1-3%) with appropriate case selection & operation method. The optimal placement of the graft should be aligned with articular surface in horizontal plane & positioned below midpoint of glenoid in vertical plane. Coracoid nonunion is the primary reason for unsuccessful Latarjet procedures [26].

Neurological complications: Extensive evaluations indicated a 1% incidence of neurovascular damage, however certain studies reported rates as high as 20%. To prevent this problem, it is advisable to refrain from doing extensive dissection around coracoid process without exposing medial border of conjoint tendon. Surgeon should remain on lateral side of this tendon. Nerve injuries are managed expectantly with appropriate investigations and referral if no improvement.

Hematoma: It is a rare complication representing 1-2%. It can be avoided by applying appropriate hemostasis during operation. Hematoma can be managed conservatively with ice packs and analgesics. Surgical drainage is needed if large or progressively enlarging.

Infection: The likelihood of infection following open or arthroscopic procedures Latarjet is an uncommon condition, occurring in just 1.5% of cases, and it is often treated with irrigation, debridement, and antibiotic medication. Severe infections necessitate an extended course of antibiotics and the removal of metals. Infection can lead to the failure of bone grafts & the return of instability. Following eradication of infection, revision Eden-Hybinette surgery might be carried out.

Stiffness & loss of external rotation: Stiffness is primarily caused by subscapularis tenotomy and repair, which involves a horizontal subscapularis-splitting approach, repair of CAL stump to capsule, immediate postoperative rehabilitation, and self-stretching exercises [27].

Bone block fracture: Iatrogenic bone block fractures have a prevalence of 1.5% within three months after surgery. These fractures are commonly caused by screws being tightened too much, older age, & extensive removal of the coracoid undersurface. The management of fractures is determined by the kind of fracture and the quality of the bone. This may involve using enhanced fixation with smaller screw, bioabsorbable anchor, a buttress plate, or performing an iliac crest bone transplant operation such as Eden-Hybinette technique.

Outcomes: Regarding recurrence of shoulder instability, one meta-analysis showed that redislocation rate was 2.7% with 14.8% of cases complaining of subjective instability signs. Another meta-analysis revealed that the rate of recurrence ranges from 0-8% with follow up period ranging from six months to 14.3 years. Regarding return to sport, review of 36 studies involving 2134 cases showed that the total percentage of resuming play was 88.8%, with 72.6% returning to the same level of play. Total percentage of resume play for collision athletes was 88.2%, with 69.5% returning to their previous level of play. Among athletes who participate in sports that involve overhead athletes, the total percentage of returning to play was 90.3%, with 80.6% of them able to resume playing at the same level as before. The average duration until resuming play was 5.8 months, with range of 3.2 to 8 months [28].

Regarding functional outcomes assessed by different scores, a study with mean follow-up of 14.3 (six to twenty-four) months showed average scores following operation were: 10 points in DASH, 1.6 in VAS, where 88% of cases experienced mild pain & 12% moderate pain and 89 in Rowe. Positioning of graft was correct in 96% of patients & was consolidated in 88%. Regarding range of motion, studies showed that Latarjet is related with less loss of motion especially external rotation in comparison to arthroscopic Bankart repair. Loss of external-rotation range of motion in the Latarjet was 11.5°, while in Bankart procedure was 20.9° [(29)].

Comparison between Latarjet method & arthroscopic Bankart repair: Systematic review on 8 studies involving 795 patients revealed that Latarjet method had less recurrence rate than Bankart repair (11.6% Vs 21.1% correspondingly), irrespective of whether Bankart was done open or arthroscopically. There are no variances noted in complications requiring reoperation (Latarjet: 5.0% & Bankart: 3. 1%). Patient-reported satisfaction and function measured by Rowe score in Latarjet procedure is better than Bankart repair (scores: 79.0 & 85.4 correspondingly). The Latarjet method resulted in a smaller decrease in external-rotation range of motion (11.5°) in comparison with Bankart method (20.9°). Cases who received Latarjet operation experience a quicker return to work & throwing activities in comparison with those who underwent Bankart repair [(29)]. The operational expenses were much more in arthroscopic Bankart repair compared to Latarjet operation. Bankart repair procedure had greater recurrence rate, but Latarjet surgery had a higher infection rate. All patients in the Bankart group reported complete satisfaction with their cosmetic outcomes, but only eighty percent of cases in Latarjet group reported the same level of satisfaction [(30)].

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- **Competing interests:** None.

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