Systematic Review

The Outcomes and Surgical Techniques of the Latarjet Procedure

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Purpose: To determine the optimal position and orientation of the coracoid bone graft for the Latarjet procedure for recurrent instability in patients with recurrent anterior instability and high degrees of glenoid bone loss. **Methods:** A systematic review of the literature including the Cochrane Database of Systematic Reviews, the Cochrane Central Register of Controlled Trials, PubMed (1980-2012), and Medline (1980-2012) was conducted. The following search teams were used: glenoid bone graft, coracoid transfer, glenoid rim fracture, osseous glenoid defect, and Latarjet. Studies deemed appropriate for inclusion were then analyzed. Study data collected included level of evidence, patient demographic characteristics, preoperative variables, intraoperative findings, technique details, and postoperative recovery and complications where available. **Results:** The original search provided a total of 344 studies. A total of 334 studies were subsequently excluded because they were on an irrelevant topic, used an arthroscopic technique, or were not published in English or because they were review articles, leaving 10 studies eligible for inclusion. Given the different methods used in each of the studies included in the review, descriptive analysis was performed. The duration of follow-up ranged from 6 months to 14.3 years postoperatively. With the exception of 2 studies, all authors reported on recurrent shoulder instability after Latarjet reconstruction; the rate of recurrent anterior shoulder instability ranged from 0% to 8%. Overall patient satisfaction was listed in 4 studies, each of which reported good to excellent satisfaction rates of more than 90% at final follow-up. **Conclusions:** As noted in this review, the current literature on Latarjet outcomes consists mostly of retrospective Level IV case series. Although promising outcomes with regard to a low rate of recurrent instability have been seen with these reports, it should be noted that subtle variations in surgical technique, among other factors, may drastically impact the likelihood of glenohumeral degenerative changes arising in these patients. **Level of Evidence:** Level IV, systematic review of Level IV studies.

Recurrent anterior instability of the glenohumeral joint has long been an arduous problem to solve surgically, owing its difficulty to the need to restore both osseous and dynamic constraints in the unstable shoulder. First described in 1954 by Latarjet,[1] the procedure of transferring the coracoid process and its attached conjoined tendon to the anterior glenoid has undergone various modifications but still remains an effective method for tackling recurrent instability in patients with recurrent anterior instability and high degrees of glenoid bone loss. In addition, because the capsule is repaired with the arm in full external rotation, instability can be eliminated without loss of external rotation.

We present an overview on the evolution of the procedure and a systematic review of reported outcomes after the Latarjet procedure for recurrent anterior shoulder instability. The hypothesis was that the rate of recurrent instability after the Latarjet procedure would be less than 10% across all included studies. In addition, our preferred technique for coracoid transfer is presented.

Evolution of Latarjet Technique

Although Latarjet,[1] a French surgeon, was the first to describe the coracoid process transfer technique for recurrent anterior shoulder instability in 1954, in 1958

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Helfet[2] published his results using a similar procedure that he attributed to his mentor, Rowley Bristow; this technique became known as the Bristow operation in the English language. The original Bristow procedure is unique in that the coracoid process is sutured to the anterior part of the scapular neck through a transversely sectioned subscapularis muscle. Over the past several decades, the Bristow technique has undergone various modifications to improve its efficacy.[3-5] However, as noted by Hovelius et al.,[6] these modifications to the Bristow operation result in exactly the same procedure that was first described by Latarjet. Thus it seems appropriate to give credit to Latarjet in the naming of the operation.[1,6]

When one is performing the Latarjet technique, a coracoid autograft in the ipsilateral shoulder is positioned to become an extra-articular platform that acts as an extension of the glenoid's articular arc. Three processes work together to augment anterior shoulder instability, resulting in a "triple-blocking" effect. First, the bony coracoid block extends the glenoid rim, serving as a static restraint that improves the "safe arc" available for translation before dislocation (bony effect). Second, the conjoined tendon acts as a sling over the humerus, resisting anterior translation when the arm is abducted and externally rotated (belt or sling effect) and lowering the lower part of the subscapularis, creating a tenodesis effect that reinforces the weakened capsule anteroinferiorly.[7] Third, the labrum and anterior capsule are reattached to the glenoid rim and are reinforced with the coracoacromial ligament (bumper effect).

Over the years, a multitude of methods have been developed for bony reconstruction of the glenoid using the Latarjet technique. These have varied from using the coracoid as a free intra-articular graft to using the triple-blocking effect of the bone graft and conjoined tendon sling.[8] Although several variations have been developed, there is little consensus on the optimal position and orientation of the coracoid bone graft. Ghodadra et al.,[9] in 2010, used a biomechanical study to evaluate differences in contact pressure and area in a glenoid bone loss model in which the placement and orientation of a Latarjet graft were varied. They found optimal normalization of glenohumeral contact pressures when the coracoid graft was oriented with its inferior aspect congruent with the face of the glenoid—an orientation popularized by Burkhart et al.[10] In addition, Ghodadra et al. noted that grafts secured 2 mm medial to the glenoid face led to increased edge loading whereas grafts placed 2 mm lateral to the glenoid face produced an increased shift of contact pressure to the posterosuperior quadrant of the glenoid. Finally, glenoid bone augmentation with a Latarjet bone block with the inferior aspect of the coracoid placed flush with the glenoid surface resulted in complete restoration of the 30% anterior glenoid defect to the intact state. These findings led the authors to recommend using the inferior surface of the coracoid as the glenoid face for glenoid bone augmentation with a Latarjet graft.

Methods

A systematic review of outcomes after the Latarjet reconstruction was performed to help summarize patient prognosis. To identify studies, a literature search including the Cochrane Database of Systematic Reviews, the Cochrane Central Register of Controlled Trials, PubMed (1980-2012), and Medline (1980-2012) was conducted. Inclusion criteria for the search included a minimum of 6 months' follow-up, open procedure (not arthroscopic), English language, publication in 1980 or later, and isolated Latarjet procedure (no concomitant surgeries). The following search teams were used: glenoid bone graft, coracoid transfer, glenoid rim fracture, osseous glenoid defect, and Latarjet. The Cochrane Database of Systematic Reviews returned 6 results when we used the search term Latarjet; the other search terms yielded no results. The Cochrane Central Register of Controlled Trials showed no results for any of the search terms. The PubMed database produced 110 hits for Latarjet, 49 hits for osseous glenoid defect, 66 hits for glenoid rim fracture, 60 hits for coracoid transfer, and 123 hits for glenoid bone graft; a search merging all terms produced a total of 344 unique results. The Medline database produced 39 hits for Latarjet, 1 hit for osseous glenoid defect, 13 hits for glenoid rim fracture, 17 hits for coracoid transfer, and 3 hits for glenoid bone graft. Exclusion criteria included surgical techniques not reporting follow-up, use of the Bristow modification, use of open reduction—internal fixation, and biomechanical (or otherwise in vitro) studies. The title, abstract, and if necessary, full text of each of the 344 studies initially included after the search were reviewed for clinical relevance.

All studies were reviewed by 2 independent examiners. A total of 304 studies were subsequently excluded because they were on an irrelevant topic, used an arthroscopic technique, or were not published in English or because they were review articles. After this review, a total of 40 studies remained. All 40 studies were subsequently reviewed for appropriateness, and 24 studies were excluded (most of which included a Bristow technique modification), leaving a total of 16 studies for additional review. Of these 16 studies, 6 were excluded for various reasons: systematic review (2 studies), technical report (1 study), case report (1 study), commentary (1 study), and duplicate study cohort (1 study). Thus a total of 10 studies were deemed eligible for inclusion and underwent further systematic review. Study data collected included level of evidence, patient demographic characteristics, preoperative variables, intraoperative findings, technique details, and postoperative recovery and complications where available.

Results

A total of 10 studies[10-19] met the inclusion criteria and were included in the final analysis. A summary of the results is presented in Table 1. Given the different methods used in each of the studies included in the review, quantitative statistical analysis of the studies as a whole was not possible. Therefore descriptive analysis was performed. Overall, most studies were Level IV and retrospective in design. The duration of follow-up, as noted in Table 1, ranged from 6 months to 14.3 years postoperatively. The mechanism of injury was reported in 8 of 10 studies and was typically traumatic in nature. Most of the studies (9 of 10) reported on the sex of the patient cohort, and all studies included primarily male patients. Very few studies reported on smoking status or Workers' Compensation status. Most of the studies reported on surgical technique with regard to coracoid fixation (Table 1), but exact details on the type of screws and placement of screws were rarely provided.

With regard to functional outcomes, the studies were variable in their reports. With the exception of 2 studies, all authors reported on recurrent shoulder instability after Latarjet reconstruction (Table 1): the rate of recurrent anterior shoulder instability ranged from 0% to 8%. Overall patient satisfaction was listed in 4 studies: Di Giacomo et al.[12] reported good to excellent results in 92.3% of patients, Lafosse et al.[16] reported excellent results in 80% of patients and good results in 12% at 18 months postoperatively, and Maynou et al.[17] reported excellent results in 91% of patients and good results in 9% at 26 months postoperatively. Only a single study reported American Shoulder and Elbow Surgeons scores: Shah et al.[19] reported a mean postoperative American Shoulder and Elbow Surgeons score of 86.3 ± 19.3 in their cohort. Three studies reported postoperative Constant scores: Allain et al.[11] found mean scores of 83 in the operative group and 93 in the nonoperative group, Burkhart et al.[10] reported a mean score of 94.4 (range, 82 to 100), and Schmid et al.[18] reported a mean score of 84.6 (range, 40 to 100). A minority of studies reported postoperative range-of-motion scores (Allain et al.,[11] Burkhart et al.,[10] Di Giacomo et al.,[12] Schmid et al.,[18] and Shah et al.[19]), and the trend in all groups was for improved scores postoperatively when compared with preoperatively (with forward flexion, external rotation, internal rotation, and/or abduction).

Five of the studies reported on postoperative complications. Burkhart et al.[10] reported 5 total complications in the cohort of 102 patients, comprising hematoma in 2 (1 of which was drained), asymptomatic loose screws in 2, and asymptomatic fibrous nonunion in 1 (no revision required). Lafosse et al.[16] reported 2 postoperative hematomas, 1 intraoperative graft fracture, 1 transient musculocutaneous nerve palsy that fully recovered, 4 cases of nonunion, and 3 shoulders with osteolysis around screws. Schmid et al.[18] reported complications in 6 of their 49 patients (12%): 4 had delayed wound healing, 1 had a postoperative frozen shoulder, and 1 had malunion of the coracoid to the glenoid rim. Finally, Shah et al.[19] reported complications in 12 of their 48 patients (25% complication rate): infection in 3 (6%), recurrent instability in 4 (8%), and neurologic injury in 5 (10%).

Preferred Technique

Patient Positioning and Surgical-Site Preparation

Immediately after an interscalene block is placed and general anesthesia is induced, the patient is placed in a modified beach-chair position with the head of the bed elevated 40° (Fig 1).[20] Two folded towels are placed under the medial border of the ipsilateral scapula. The shoulder is shaved, prepared, and draped in the usual fashion. The arm should be draped free to allow for intraoperative manipulation of the upper extremity, particularly abduction and external rotation. A specialized arm holder or a padded Mayo stand should be used to prevent the arm from dangling.

Incision and Exposure

An oblique 3- to 5-cm incision is made, beginning from the tip of the coracoid process and extending inferiorly down the deltopectoral groove to the superior portion of the axillary fold (Fig 2).[21] A standard deltopectoral approach is used, with care being taken to maintain meticulous hemostasis. The cephalic vein, when identified, should be protected and gently retracted laterally. Any branches of the cephalic vein (typically, there is a large medial branch) that appear in the operative field may be carefully ligated. Self-retaining retractors should be placed between the pectoralis major and deltoid. Using a Hohmann retractor over the top of the coracoid and placing the arm in abduction and external rotation may further improve exposure.

Harvesting Coracoid Process

Before harvesting of the bony graft, proper exposure of the coracoid is paramount. The arm is abducted and externally rotated to best expose the coracoacromial (CA) ligament. Mayo scissors are also used to expose the coracoid from its tip all the way to the insertion of the coracoclavicular ligaments at the coracoid base. The CA ligament is identified and sharply transected 1 cm off of its coracoid insertion. It is advantageous to harvest a small cuff of this ligament attached to the coracoid because it can later be incorporated into the capsular repair. To free up the medial side of the coracoid, the surgeon should take down the pectoralis minor insertion while internally rotating and adducting the arm.

Table 1. Summary of Results From Systematic Review of Latarjet Reconstruction Outcomes

Study	Level of Evidence	N	Duration of Follow-up	Mean Age (yr)	Operative Approach	Orientation of Coracoid	Fixation of Coracoid	Results and Recurrence Rate
Allain et al.,[11] 1998	IV, retrospective	58	14.3 yr (range, 10-23 yr)	27.5 (range, 15-58)	Subscapularis transection at musculotendinous junction (complete transection in 38 between 1969-1980 and middle-third transection in 18 after 1980)	Horizontal position	2 screws	None (0% redislocation rate); 1 (2%) with feeling of persistent instability and 6 (10%) with subjective apprehension but no abnormal examination findings
Burkhart et al.,[10] 2007	IV, retrospective	47 (102 with recurrence data)	59 mo (range, 32-108 mo)	26.5 (range, 16-41)	Detachment (superior half); subscapularis splitting between superior and middle third in some cases	Medial surface of coracoid against glenoid neck (so inferior coracoid lined up with glenoid surface)	2 screws	Rate of 4.9% (5 of 102): 1 of 47 with subluxation (no dislocations) and 4 of 55 (non-examined patients) with dislocation (1 with grand mal seizure, 2 with premature return to sports at 3 mo postoperatively, and 1 who attempted to tackle a light-post while inebriated at 1 mo postoperatively)
Di Giacomo et al.,[12] 2011	IV, prospective	26	17.5 ± 6.7 mo	28.6 ± 12.5	Subscapularis splitting	Lengthwise	2 screws	None
Edouard et al.,[13] 2010	IV, prospective	20	21 mo	27 ± 8 (range, 19-45)	Incision “in line” with subscapularis	Not mentioned	2 screws	1 (5%) dislocation at 21 mo postoperatively and 1 (5%) with subjective apprehension
Elkousy et al.,[14] 2010	IV, prospective	30	13 mo (minimum, 6 mo)	23.3	Subscapularis splitting	Not mentioned	2 screws	None
Fontanesi et al.,[15] 1996	IV, retrospective	15	6-24 mo	Not reported	Latarjet with 1 screw	Not mentioned	1 screw	None
Lafosse and Boyle,[16] 2010	IV, prospective	98	26 mo (35);18 mo (62)	27.5 (range, 17-54)	All-arthroscopic Latarjet; subscapularis split performed	Lateral (standard)	2 screws in 93% and 1 screw in 7%	None
Maynou et al.,[17] 2005	III, retrospective	102	7.57 yr (range, 2-15 yr)	26.8 (range, 15-51)	Deltopectoral approach Subscapularis takedown with inverted L in 69 shoulders (65%) Subscapularis split in 37 (35%)	Not mentioned	1 *v* 2 screws	Unknown
Schmid et al.,[18] 2012	IV, retrospective	49	38 mo (range, 23-65 mo)	29 (range, 15-54)	Anterior deltopectoral approach; subscapularis split	Lateral (standard)	Unknown	Unknown
Shah et al.,[19] 2012	IV, prospective	48 (47 patients)	9.4 mo (range, 6-55 mo); 44 of 47 with final phone interview at 39.3 mo	30 (range, 16-60)	Anterior deltopectoral approach; subscapularis-splitting approach: fixation performed with two 3.5-mm screws in 43 shoulders, whereas cannulated 3.5-mm screws were used in 5 shoulders	Lateral (standard)	1 screw	8% (4 of 48)

Fig 1. Intraoperative photograph of a patient in the beach-chair position undergoing the Latarjet procedure on the left shoulder. Immediately after an interscalene block is placed and general anesthesia is induced, the patient is placed in a modified beach-chair position with the head of the bed elevated 40°. (Reprinted with permission.[20])

The undersurface of the coracoid should also be freed of excess soft tissue with a periosteal elevator because this will eventually have to conform to the anterior surface of the glenoid.

To harvest the coracoid bone graft, a 90° oscillating saw blade is used to perform osteotomy of the coracoid from a medial-to-lateral direction at a line just anterior to the coracoclavicular ligament insertion at the coracoid base (Fig 3).[21] A ruler should be used to ensure that the coracoid graft will be 22 to 27 mm in length from the tip. An angled saw is preferred over a half-inch osteotome for graft harvest because the saw is less likely to cause iatrogenic glenoid fracture. To protect vital neurovascular structures including the musculocutaneous nerve, axillary nerve and artery, and brachial plexus, Chandler elevators should be positioned inferior and medial to the coracoid. During osteotomy, care should be taken not to disturb the blood supply to the graft, which enters the coracoid at the medial aspect of the insertion of the conjoined tendon. After graft harvest, grasping forceps are used to hold the graft and the coracohumeral ligament is released, liberating the coracoid.

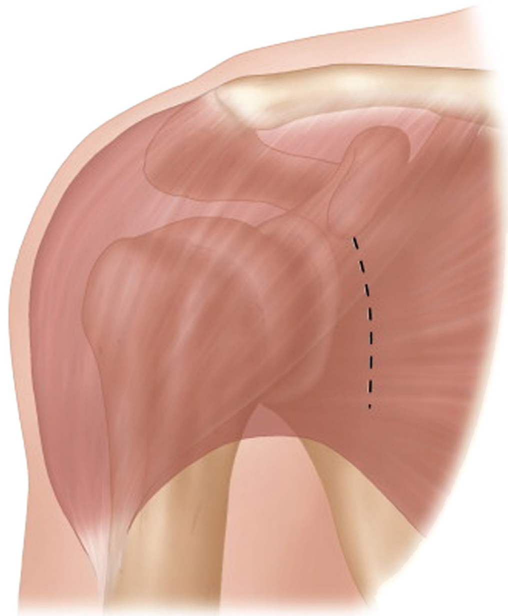

Fig 2. Schema of a right shoulder: An oblique 3- to 5-cm incision is made, beginning from the tip of the coracoid process and extending inferiorly down the deltopectoral groove to the superior portion of the axillary fold. A standard deltopectoral approach is used, with care being taken to maintain meticulous hemostasis. (Reprinted with permission.[21])

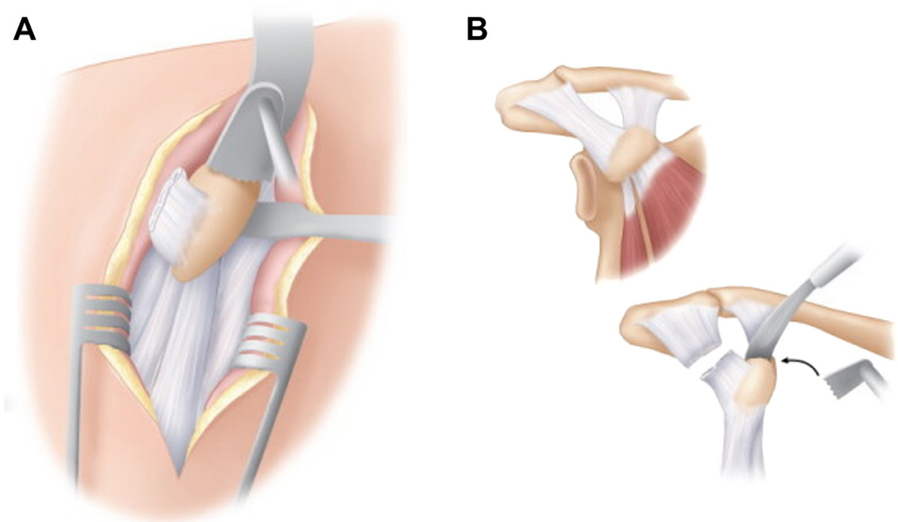

Fig 3. Schemas of a right shoulder: Graft takedown showing site of saw placement/cut. (A) To protect vital neurovascular structures including the musculocutaneous nerve, axillary nerve and artery, and brachial plexus, Chandler elevators should be positioned inferior and medial to the coracoid. (B) To harvest the coracoid bone graft, an angled saw blade is used to perform osteotomy of the coracoid just anterior to the coracoclavicular ligament insertion at the coracoid base. (Reprinted with permission.[21])

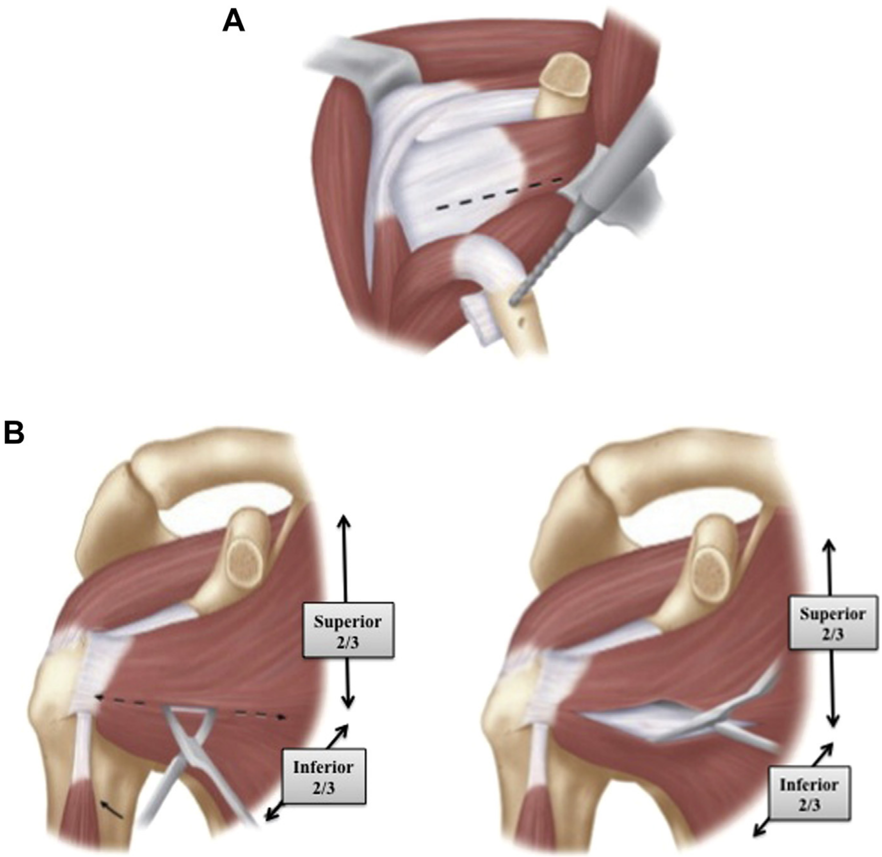

Fig 4. Schemas of a right shoulder: (A) The subscapularis is put on stretch by externally rotating the arm. (B) Once the muscle's superior two-thirds and inferior one-third margins are identified, Mayo scissors should be used to divide the muscle in line with its native fibers. Once the subscapularis has been split, the Mayo scissors can be oriented vertically to expose the underlying capsule. We prefer to split the subscapularis at the junction of the superior and middle thirds rather than detaching distally at the insertion, a technique described by Walch and Boileau.[22] (Modified and reprinted with permission.[21])

Preparation of Coracoid Graft

Any remaining soft tissue is sharply excised from the deep surfaces of the coracoid graft, with care taken not to destroy the blood supply or the CA ligament stump. Decortication of the coracoid's deep surface may be performed with a microsagittal saw. Ideally, to allow for optimal fit, the inferior surface should be a broad, flat cancellous surface when this step is completed to decrease the chance for nonunion. Finally, a 3.2-mm drill is used to place 2 bicortical drill holes along the longitudinal axis of the coracoid graft about 1 cm apart.

Glenoid Exposure and Preparation

After coracoid osteotomy, the anterior shoulder is more easily visualized and glenoid exposure may be undertaken. The subscapularis is put on stretch by externally rotating the arm. Once the muscle's superior and inferior margins are identified, Mayo scissors should be used to divide the muscle in line with its native fibers (Fig 4). The decision on how to manage and respect the subscapularis is critically important for optimal results. We prefer to split the subscapularis at the junction of the superior two-thirds and inferior one-third rather than detaching distally at the insertion, a technique described by Walch and Boileau.[22] Once the muscle has been split, Mayo scissors can be used to further develop the plane between the upper subscapularis and anterior capsule. Next, the surgeon should extend the lateral aspect of the split laterally to the level of the lesser tuberosity to expose the glenohumeral joint line and capsule.

A well-placed 2-cm-long vertical capsular incision is imperative for successful capsular reattachment. Capsulotomy should be performed 1 cm medial to the glenoid rim to preserve length. Electrocautery can then be used to elevate the anteroinferior labrum and periosteum off the glenoid neck in the region where the coracoid graft will sit. Once subperiosteal dissection is complete, the anterior glenoid neck should be lightly decorticated by use of a high-speed burr to create a flat, bleeding surface to receive the graft. Care should be taken to remove only minimal amounts of bone because osseous tissue in the glenoid may already be deficient.

Anchor Placement

Three suture anchors should be placed in the native glenoid to assist with capsular repair after Latarjet coracoid transfer. In right shoulders, these anchors should be positioned at the 3-, 4-, and 5-o'clock positions relative to the glenoid face. In left shoulders, they should be positioned at the 7-, 8-, and 9-o'clock positions.

Placement of Coracoid Process

Positioning of the coracoid graft is often regarded as the most critical aspect of the Latarjet procedure. As noted by Allain et al.,[11] excessive lateral placement of the coracoid may lead to a higher-than-expected rate of postoperative degenerative changes. However, an excessively medialized graft will fail to correct recurrent instability. The goal of coracoid positioning should be to allow the graft to function as an extension of the inherent articular arc of the glenoid. A Fukuda retractor is inserted inside the glenohumeral joint to retract the humeral head and control the articular surface of the glenoid during drilling.

We recommend that the long axis of the coracoid be positioned superoinferiorly on the glenoid with the coracoid's inferior surface opposing the anterior surface of the glenoid. The roughened inferior surface of the graft fits well with the anterior glenoid neck and provides a broad surface for bone-to-bone healing. K-wires may be used to temporarily hold the graft in the ideal position before definitive fixation. Once the ideal position is achieved, a 3.2-mm drill should be used to create 2 bicortical anteroposterior holes parallel to the glenoid articular surface at approximately the 5-o'clock position (right shoulder) or 7-o'clock position (left shoulder). The drill holes should be roughly 5 mm medial to the articular border of the glenoid. Fixation is achieved with two 4.5-mm malleolar screws, typically 30 to 40 mm in length (Fig 5). The screws should be snug, using the "2-finger" technique (described by Walch and Boileau[22]), but should not be overtightened because this could lead to coracoid fracture. Any lateral overhang of the coracoid may be smoothed over with a high-speed burr.

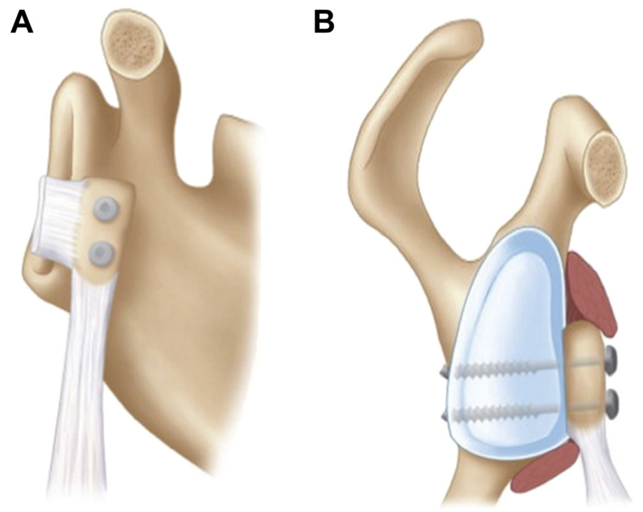

Fig 5. Schemas of a right shoulder: coracoid screw placement and flush placement of graft. (A) Anterior view showing no lateral overhang. (B) Lateral view. (Modified and reprinted with permission.[21])

Capsular and Subscapularis Repair

A good capsular repair should allow the newly transferred coracoid graft to function as an extra-articular platform and, at the same time, protect the humeral head articular cartilage from the bone block's abrasive effects (Fig 6).[23] By use of the previously placed suture anchors and with the arm in full external rotation (with the elbow at the side), the capsule is repaired to the native glenoid with knots lying extra-articularly. The CA ligament stump may then be sutured over the capsule for further augmentation. Finally, the subscapularis is repaired over the coracoid transfer, with the conjoined tendon exiting anteriorly through the previously split segments of the subscapularis (Fig 7).

Postoperative Management and Rehabilitation

After the placement of deep sutures, the skin is closed with Vicryl (Ethicon, Somerville, NJ) and Monocryl (Ethicon) to allow for improved cosmesis. Dermal skin glue may be used as well to reduce drainage. Typically, a drain is not necessary, but 1 dose of intravenous perioperative antibiotics is often given in the recovery room.

Postoperative rehabilitation is largely aimed at protecting the subscapularis repair construct and allowing osseous healing. After surgery, a sling is maintained for 2 to 3 weeks. Active motion of the fingers, hand, and elbow is encouraged, but shoulder range of motion is restricted to pendulum exercises. No resisted elbow flexion is allowed for at least 4 to 5 weeks to reduce the risk of nonunion. Serial radiographs are taken to assess osseous healing. Once radiographic healing of the coracoid graft is visualized, active strengthening is allowed. Return to contact sports or heavy labor activities is generally not allowed for 3 to 4 months.

Discussion

Large glenoid bone defects in patients with recurrent anterior shoulder instability often present as extremely challenging problems for even the most experienced shoulder surgeon. Patients frequently present with a history involving at least 1 failed arthroscopic shoulder stabilization procedure in addition to other comorbidities and high functional expectations. It is imperative that proper clinical decision making and lengthy preoperative counseling, as well as realistic patient expectations, be part of any treatment strategy involving complex glenoid reconstruction.

Latarjet reconstruction is an effective means to reconstitute the natural osseous arc of the glenoid using autogenous bone. As compared with the use of iliac crest bone graft for glenoid reconstruction, Latarjet reconstruction has the benefit of avoiding hip donor-site morbidity problems while creating a sling with the conjoined tendon that further resists anterior humeral translation in positions of arm abduction and external rotation. Unfortunately, at this time, there have been no randomized controlled trials comparing

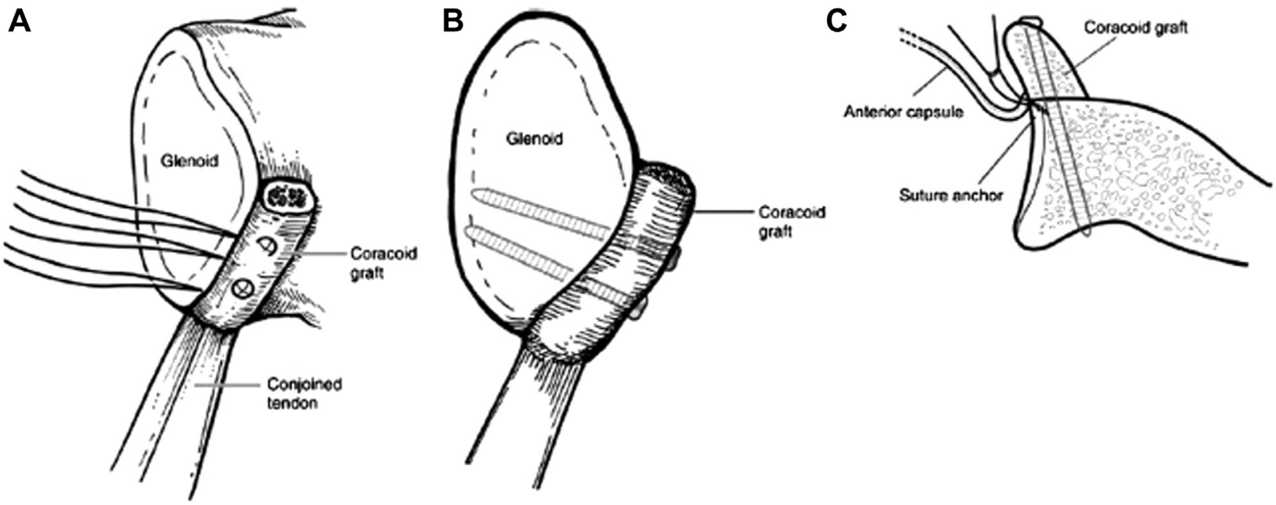

Fig 6. Drawings of a right shoulder: Placement of a Latarjet bone block is performed extra-articularly on the glenoid. (A, B) Before final fixation, suture anchors may be placed on the anteroinferior glenoid. (C) By closing the capsule down onto the suture anchors, the bone block is allowed to be extracapsular. (Reprinted with permission.[23])

glenoid reconstruction options. Thus the decision on how to proceed with glenoid reconstruction should be based on patient expectations and preferences, preoperative counseling, and surgeon experience and skill.

Several long-term follow-up studies of the Latarjet procedure have been performed and substantiate both its efficacy and lasting benefits in alleviating recurrent anterior instability. Allain et al.,[11] in a retrospective review of 58 patients undergoing the Latarjet procedure, found that 88% of shoulders had an "excellent" result and no recurrent dislocations at a mean follow-up time of 14.3 years. However, at the time of final follow-up, more than half of these shoulders had glenohumeral arthritis, most of which (25 shoulders) were characterized as having grade 1 changes. Other authors have also found similar outcomes but note that degenerative changes and instability cannot be eliminated completely. Hovelius et al.[24] prospectively examined a cohort of 118 shoulders being treated with a Bristow-Latarjet technique and reported that the group had an overall satisfaction rate of 98%. However, a follow-up radiographic study in the same cohort found moderate to severe dislocation arthropathy in 14% of these patients.[25] Schroder et al.,[26] in possibly the longest follow-up study in patients undergoing surgical correction for anterior shoulder instability (mean follow-up, 26.4 years), found a nearly 70% rate of good to excellent results in 49 patients who had undergone a modified Bristow procedure, but they noted recurrent instability in 15% of the shoulders.

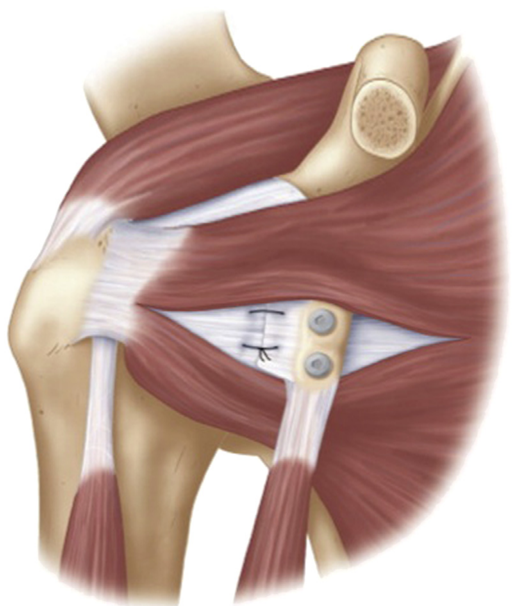

Fig 7. Schema of a right shoulder: The CA ligament remnant on the coracoid graft is repaired to the capsule for final stability. It is imperative that the arm be in full external rotation when this is performed to prevent iatrogenic range-of-motion loss. (Modified and Reprinted with permission.[21])

In this report we present our preferred surgical technique for Latarjet reconstruction. Key pearls that are believed to be important for efficacy include performing a subscapularis split, gently decorticating the inferior surface of the coracoid and anterior glenoid, using stable fixation, and using suture anchors to allow for extra-articular placement of the coracoid graft. Taking down the subscapularis insertion, whether partially or fully, requires protection of passive external rotation for at least 6 weeks in addition to a graduated internal rotation strengthening program.[26] A subscapularis split may result in significantly less morbidity while also allowing the subscapularis to function as a "sling" component of the Latarjet reconstruction.[26] Decortication allows for improved bony healing of the coracoid graft to the glenoid by producing cancellous surfaces for bony healing. Finally, by performing extracapsular placement of the coracoid graft, one may theoretically soften the contact pressures on the humerus during articulation, although this has not yet been shown to result in a reduced incidence of degenerative arthritis.

Limitations

As noted in this review, the current literature on Latarjet outcomes consists mostly of Level IV case series with little description of the variations in surgical technique used during glenoid reconstruction (intra-articular *v* extra-articular graft placement, coracoid positioning and orientation, rehabilitation protocols, and so on). Although promising outcomes with regard to a low rate of recurrent instability have been seen with these reports, it should be noted that subtle variations in surgical technique may drastically impact the likelihood of glenohumeral degenerative changes arising in these patients.

Conclusions

Low recurrent instability rates are reported after stabilization surgery with the Latarjet procedure; however, subtle variations in surgical technique, among other factors, may impact the development of glenohumeral degenerative changes and morbidity to the subscapularis.

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