

Open Latarjet: A Reliable, Successful Method to Prevent Recurrence in the Presence of Bony Defects

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Glenoid bone loss may dictate the success of procedures to restore anterior shoulder instability. The Latarjet procedure addresses bony defects to minimize the risk of recurrence in this subset of patients with bone loss in both athletes and non-athletes alike. This article describes a modified, open Latarjet procedure using a subscapularis splitting technique that provides stability through the triple-blocking effect previously described by Patte et al. The “sling effect”, a dynamic effect created by the transfer of the conjoint tendon, provides stabilization in abducted and externally rotated arm positions particularly at mid and end ranges of motion. Augmentation of the anteroinferior glenoid increases or restores the glenoid diameter to provide stability through a “bone blocking effect”. Lastly, stability is achieved by repairing the capsule to the coracoacromial ligament stump. This open procedure has been utilized successfully when a physician is confronted by this difficult clinical scenario. *Oper Tech Sports Med* 21:238-245 © 2013 Elsevier Inc. All rights reserved.

KEYWORDS shoulder, open Latarjet, anterior instability, bony defect

The success of arthroscopic Bankart repair is dependent on the amount of glenoid boss loss. Studies have demonstrated that in the presence of a significant bone loss, defined as a bone loss of greater than 25%, recurrence rates are as high as 67% when failing to address this defect intraoperatively.¹ We believe that the Latarjet procedure in patients with this significant bone loss can effectively restore shoulder stability without additional procedures.

The Latarjet procedure, introduced in 1954, was described as a coracoid bone block technique to prevent anterior dislocation.² It was suggested that the horizontal limb of the coracoid process be fixed to the anteroinferior portion of the glenoid margin with a screw. The advantage of this procedure in cases with glenoid bone loss is the obvious augmentation of the anteroinferior glenoid. Patte et al³ describe a triple-blocking effect to describe the stabilizing mechanism (Fig. 1). First, the conjoined tendon

acts as a sling on the inferior subscapularis and anteroinferior capsule when the arm is abducted and externally rotated. Second, the “bone blocking effect” by augmentation of the anteroinferior glenoid increases or restores, the glenoid diameter in the anteroposterior direction. Third, stabilization is provided by repairing the capsule to the coracoacromial ligament stump.

The primary indications for the Latarjet procedure include recurrent anterior shoulder subluxations or dislocations with or without hyperlaxity and glenoid bone loss. This procedure is appropriate for traumatic and atraumatic episodes alike. We advise against the Latarjet procedure in patients with voluntary anterior instability or anterior instability without a concomitant Bankart lesion (e.g., painful throwing shoulder). If a concomitant fracture of the anterior glenoid involves more than one-third of the articular surface, then the fracture should be fixed when possible or an additional iliac crest bone graft reconstruction should be undertaken. A Latarjet should also not be performed when the lesions is located on the humeral side as in a humeral avulsion of the glenohumeral ligament (HAGL) lesion. In these cases, suturing the inferior glenohumeral ligament back to the anatomical neck of the humerus using suture anchors is recommended.

The purpose of this article is to describe our modified Latarjet procedure that involves 2 screws to provide stable coracoid fixation and the utilization of a subscapularis splitting

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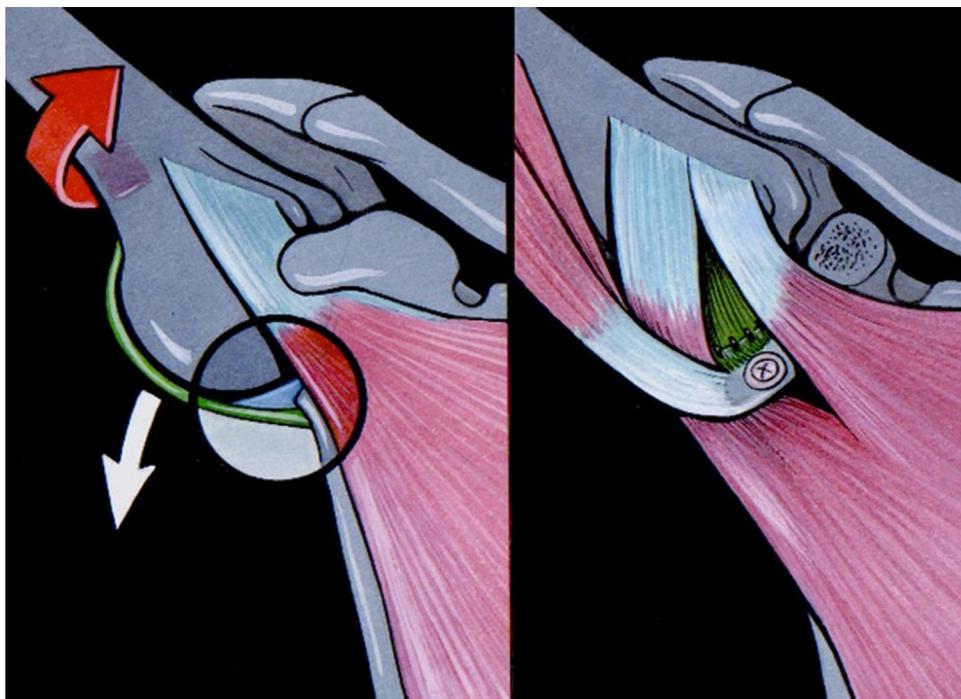


Figure 1 The triple-blocking stabilizing effect described by Patte. (Data from Patte et al.³).

technique to preserve the muscle fibers and allow for immediate postoperative range-of-motion excises to minimize loss of external rotation motion.

Physical Examination

The physical examination should begin with a thorough history of the shoulder and exploration of subluxation and dislocation events. Key points that should be discerned during the interview include mechanism of dislocation (often difficult for patients to clearly describe), direction of dislocation, whether a reduction was required, history of recurrence of subluxation or dislocation events, location and duration of pain, and any associated injuries.

Axillary nerve injuries are not uncommon with anterior instability events. The axillary nerve should always be evaluated on clinical examination by assessing strength of the deltoids and sensation to the skin over the inferior portion of the deltoid (e.g., “regimental badge area”). Positive anterior apprehension and relocation test results are suggestive of anterior shoulder instability. A positive sulcus sign, greater than 90° of external rotation with the arm at the side, and a positive anterior drawer and posterior drawer are suggestive of hyperligamentous laxity of the shoulder and other procedures should be explored. Distension of the inferior glenohumeral ligament (IGHL) should also be assessed. The Gagey sign, a sign of IGHL distension, is positive if the patient has greater than 105° of motion in abduction and internal rotation. Additionally, asymmetry in abduction of more than 20° implies IGHL distension.

The clinician should be cautioned when there is a large, painless anterior drawer or a positive sulcus sign as these are findings more consistent with constitutional laxity not instability. Hyperligamentous laxity is generally bilateral, so

comparisons should always be made to the contralateral shoulder to differentiate from pathologic laxity associated with true instability.

Radiographic Examination

Radiographic evaluation should include multiple views of the shoulder including anteroposterior (AP) views in neutral, internal rotation, and external rotation. We also conduct bilateral profile views of the glenoid, which has previously been described by Bernageau et al⁴ for comparative purposes (Fig. 2). We also find that radiographs under fluoroscopy are also extremely useful in identifying lesions of the glenoid rim. The incidence of glenoid rim lesions has been reported as high as 85% in cases with anterior instability and the incidence of Hill-Sachs lesions has been reported to be as high as 75% of cases with anterior instability when fluoroscopy is used.^{5,6} Osseous lesions of the anterior glenoid can be observed including rim fractures and the “blunted angle” and “cliff” signs with a glenoid profile view.⁷

We do not routinely use computed tomography (CT) or magnetic resonance imaging in preoperative planning unless we have a concern of a significant bony glenoid lesion. CT or magnetic resonance arthrogram is also only recommended if a concomitant rotator cuff lesion is suspected or if there is doubt of instability from normal diagnostic workup result.

Surgical Technique

Patient Positioning

Patients are positioned in the beach chair position for the Latarjet procedure. The operated arm is draped free to allow for

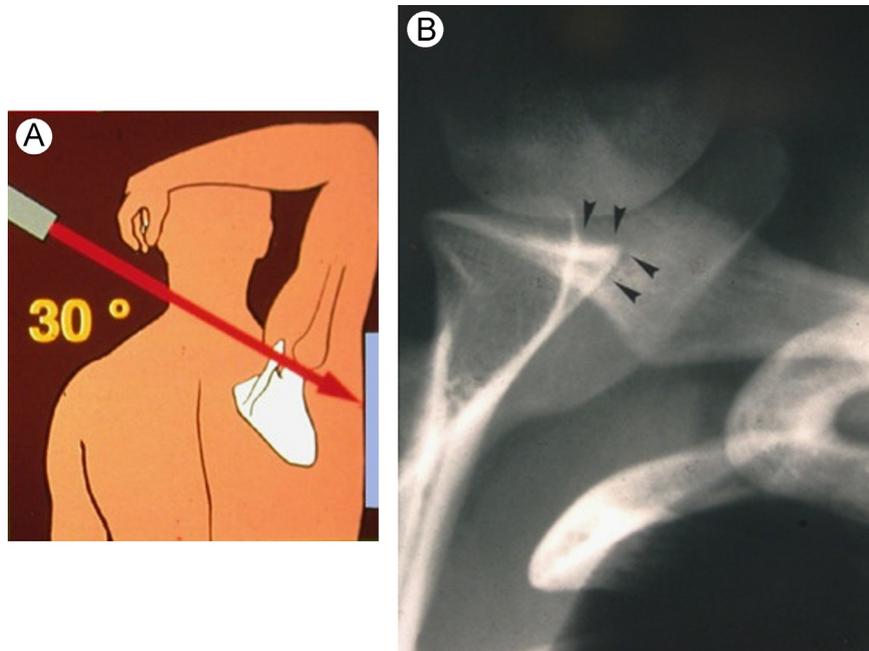


Figure 2 Bernageau View. Patient seated or standing with the arm abducted 135° and hand resting on head in an anterior oblique position. The beam with a 30° caudal tilt is directed on the posterior shoulder.

abduction and external rotation of the arm during the procedure. A small towel is placed under the scapula for stabilization.

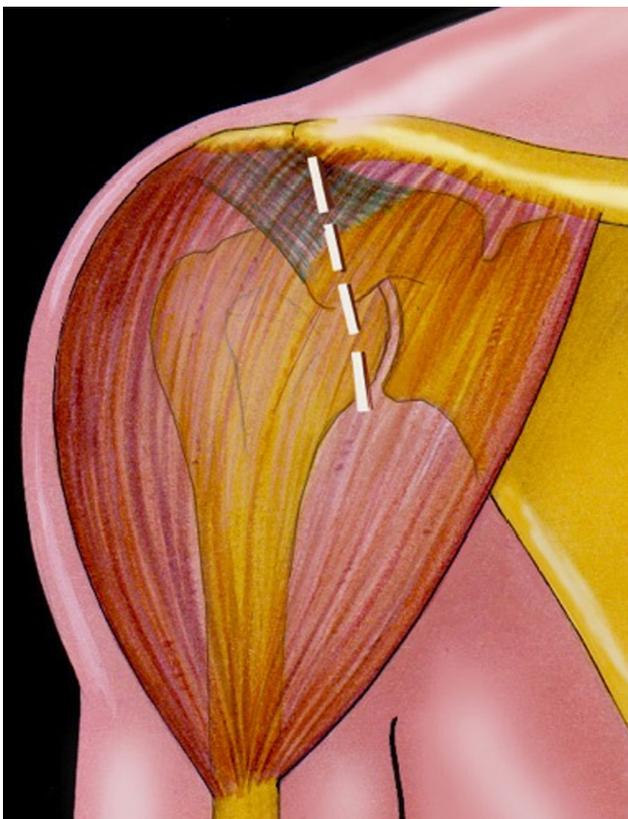


Figure 3 Vertical skin incision from coracoid tip 4-5 cm to the axillary fold.

Surgical Approach

We use a limited deltopectoral approach. The skin incision is made vertically from the tip of the coracoid 4-5 cm toward the axillary fold (Fig. 3). A smaller 3-cm incision can be used when cosmesis is of concern, particularly in young, female patients. The cephalic vein is taken laterally, and the medial branches are ligated. To maintain exposure, a self-retaining retractor is placed between the deltoid and the pectoralis major (Fig. 4). The arm is positioned in abduction and external rotation and a Hohmann retractor is placed over top the coracoid process.

Coracoid Preparation

The coracoacromial ligament is exposed and incised 1 cm from the coracoid attachment with electrocautery while the arm is in abduction and external rotation. The coracohumeral ligament which is located under the coracoacromial ligament is then released. The arm is then moved into adduction and internal rotation to expose the medial side of the coracoid and to release the pectoralis minor from the coracoid with electrocautery. Caution should be used to avoid a release past the tip of the coracoid which would compromise the blood supply to the coracoid graft. A periosteal elevator is used to remove any soft tissue from the undersurface of the coracoid. The site of the osteotomy (e.g., the “knee” of the coracoid at the junction of the horizontal and vertical components) should now be visible.

The osteotomy is made from medial to lateral using a 90° oscillating saw harvesting a graft of 2.5-3 cm (Fig. 5). The osteotomy should be performed in a perpendicular fashion to avoid extension into the glenoid surface. An osteotome can be used, if needed, to lever the fragment. The arm is then placed

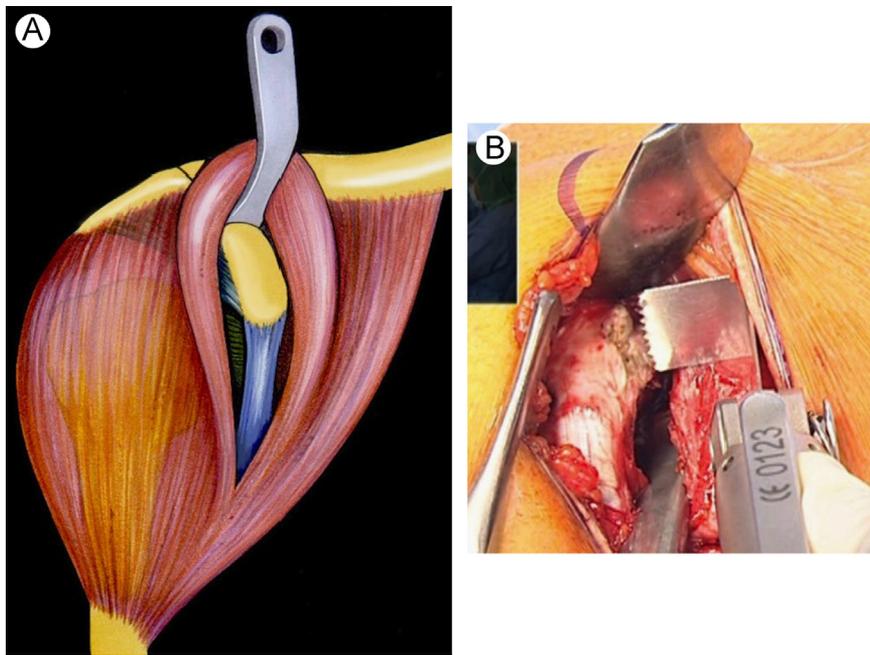


Figure 4 Self-retaining retractor in place between the deltoid and pectoralis major.

back into abduction and external rotation to grasp the coracoid fragment. At this point, the remaining coracohumeral ligament attachments are released.

The arm is returned to the neutral position and the coracoid is delivered onto a swab protecting the skin at the inferior aspect of the wound. While preserving the coracoacromial stump, the soft tissue is removed from the inferior surface of the coracoid using a scalpel. An oscillating saw is then used to decorticate the inferior coracoid surface and expose a broad, flat, cancellous bed to optimize graft healing. Often, there is a spike of bone from the vertical portion of the coracoid at the osteotomised end of the

graft, which requires removal. An osteotome is placed beneath the coracoid to protect the skin. Two drill holes are made approximately 1 cm apart in the central axis of the coracoid using a 3.2-mm drill bit (Fig. 6). Electrocautery is used to clear any soft tissue from the holes, and drilling is repeated in the opposite direction to complete the tunnels. The swab protecting the skin is removed and the arm externally rotated with the elbow at the side. The upper lateral border of the conjoint tendon is released approximately 5 cm under visualization using Mayo scissors. The coracoid is then pushed beneath the pectoralis major until required later in the procedure.

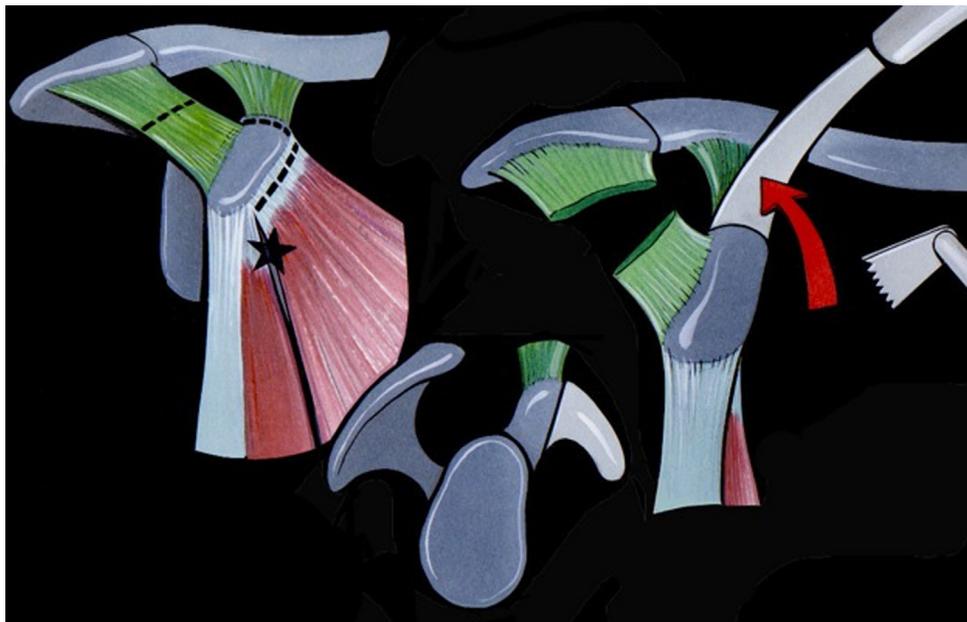


Figure 5 Harvesting of the coracoid process.

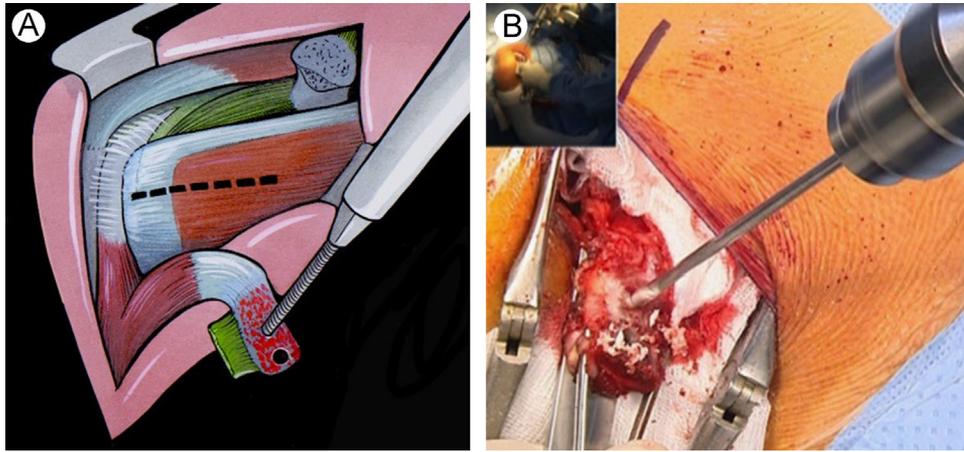


Figure 6 Two drill holes made with a 3.2-mm drill bit in the coracoid approximately 1 cm apart in the central axis.

Glenoid Exposure

The subscapularis is exposed, and the superior and inferior borders are identified with the arm positioned in external rotation by the side. The subscapularis split will be made at the junction of the superior two-thirds and inferior one-third of the muscle (Fig. 7). If hyperlaxity is evident from preoperative evaluation, a modification in the subscapularis split is performed to maximize the sling effect of the conjoint tendon. In these cases, the subscapularis will be split in the middle. The split of the subscapularis muscle is made in line with the muscle fibers using Mayo scissors. The scissors are pushed between the fibers to the capsule and then opened perpendicularly to the direction of the muscle fibers. To improve exposure and free up the subscapularis from the underlying capsule, a swab is pushed superiorly and medially into the subscapular fossa while maintaining the scissors in an open position to allow visualization of the capsule.

A Hohmann retractor is then placed over the swab in the subscapularis fossa. The lateral aspect of the split is then extended to the lesser tuberosity with a scalpel while using a curved retractor such as a Bennett retractor on the inferior portion of the subscapularis. This should allow for improved visualization of the underlying joint capsule and joint line.

A vertical incision of 1-2 cm is made at the level of the joint line to allow placement of a retractor in the glenohumeral joint. The incision can be turned medially to the glenoid margin at the upper end to widen the capsulotomy and assist with entering a retractor. We prefer using a Trillat retractor (Axone Medical, Lyon, France) owing to its low profile; however, a Fukuda-type retractor can also be used. Superior exposure is improved by placing a 4-mm Steinman pin into the superior scapular neck as high as possible. The medial Hohmann retractor is exchanged for a link retractor placed medially on the scapular neck. The Hohmann retractor is then placed inferiorly between the capsule and the inferior neck and the inferior part of the subscapularis allowing for exposure of the 6-o'clock position on the glenoid. The anteroinferior portion of the glenoid should now be completely exposed.

Glenoid Preparation and Coracoid Fixation

Commencing at the 5-o'clock position in a right shoulder (or the 7-o'clock position in a left shoulder) and continuing medially on the glenoid for approximately 2 cm, the anteroinferior labrum and periosteum are excised with electrocautery. Then the incision is directed superiorly for

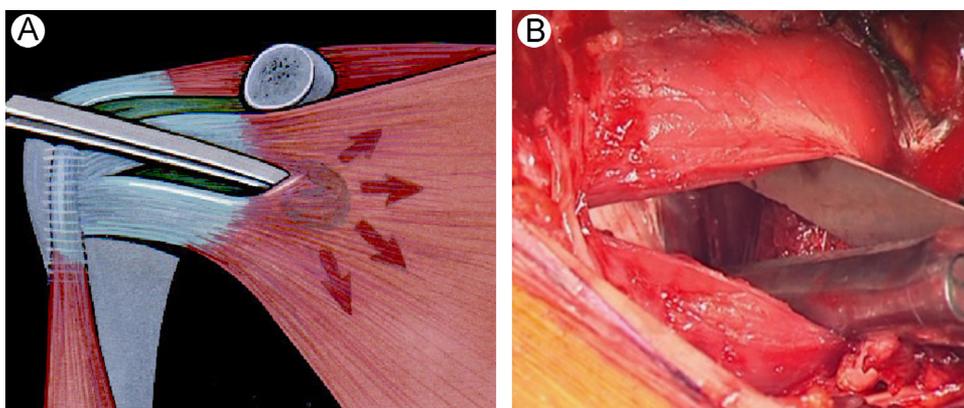


Figure 7 Subscapularis split at superior two-thirds and inferior one-third of the muscle.

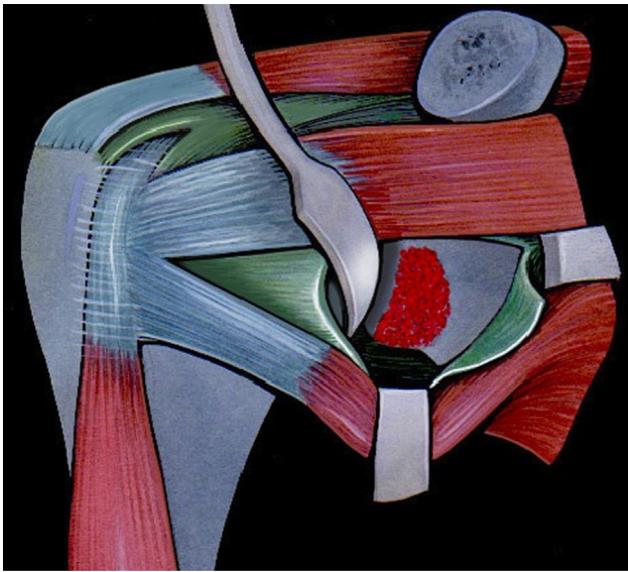


Figure 8 Arthroscopy decortication of the scapular neck.

approximately 2-3 cm before moving laterally to complete the incision by dividing the labrum again at the 2-o'clock position (the 10-o'clock position in a left shoulder). Facilitated by the frequent presence of a Bankart lesion, an osteotome is used to elevate this labral-periosteal flap from the glenoid in a lateral to medial direction. An osteotome is used to decorticate the anterior surface of the glenoid to create a flat surface with bleeding cancellous bone exposed on which to place the coracoid graft (Fig. 8). Using the 3.2-mm drill, the inferior hole created between 4- and 5-o'clock in a right shoulder (7- and 8-o'clock position in a left shoulder) is drilled first into the glenoid. It is important to avoid placing the graft too inferiorly, which can result in recurrent dislocation over the top of the graft. The hole must also be placed sufficiently medial, approximately 7 mm and dependent on coracoid size, so that the coracoid would not overhang on the glenoid. The drill is directed parallel to the glenoid articular surface and drilling continued until passing through the posterior glenoid cortex.

The coracoid is now retrieved from its position under the pectoralis major, and any soft tissue debris is removed from the cancellous surface. A 35-mm long 4.5-mm partially threaded malleolar screw is fully inserted into the inferior hole in the coracoid graft (i.e., conjoint tendon end). Although this is typically the correct length of the inferior screw, it can be exchanged later if required following placement of the second screw. The screw is then placed into the already drilled hole in the glenoid and tightened into position, ensuring that the coracoid comes to lie parallel to the articular margin of the glenoid with no overhang. Ideally, the graft is positioned flush; however, a slightly medial position (1-2 mm) is acceptable. One should never accept a lateral overhanging of the coracoid, which may lead to rapid degenerative joint disease.

When the position of the coracoid is parallel to the glenoid, the second hole is drilled with a 3.2-mm drill using the already made hole in the coracoid. Again, drilling is directed parallel to the glenoid surface and continued through the posterior cortex. A depth gauge is used to determine the appropriate length of malleolar screw. Again, this is typically 35 mm in length (range 30-40 mm). A "two-finger" technique is used to tighten both screws. Aggressive overtightening can lead to a potential coracoid fracture and so should be avoided.

Finally, the position of the coracoid is checked. At this point if there is any lateral overhang of the coracoid, it should be removed with bone rongeurs or a high-speed burr. Alternatively, the graft can be rotated after removing one screw and loosening the other. The glenoid can then be drilled in a slightly different direction.

The capsule is repaired to the coracoacromial ligament stump using an absorbable suture with the arm positioned in full external rotation with the elbow by the side to allow for immediate postoperative range-of-motion exercises in external rotation, without risking failure of the repair. The capsule is repaired in a direct medial to lateral position using 2 sutures (Fig. 9). We have not found any benefit to combining a capsular shift with this repair.

The swab is removed from the subscapular fossa, and all retractors are removed. We do not repair the split in the

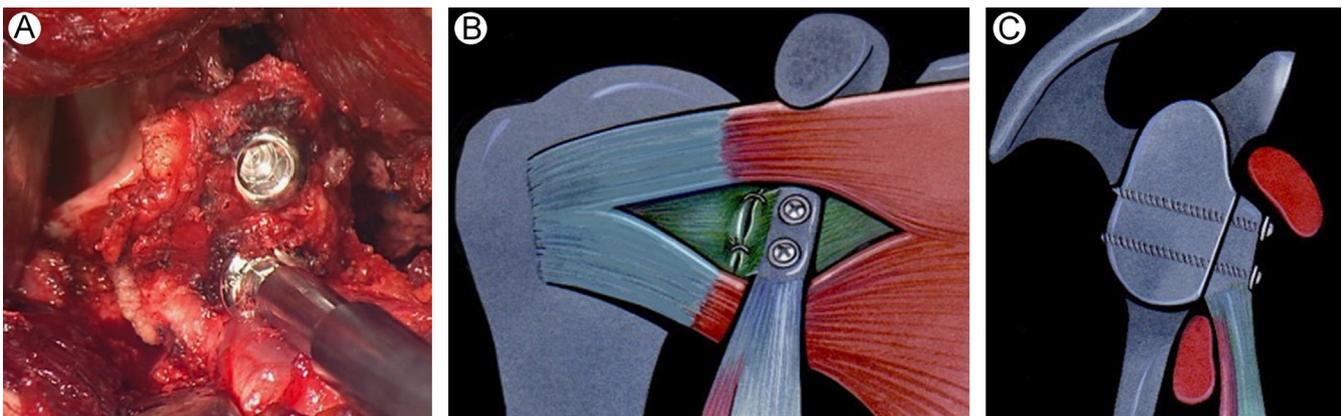


Figure 9 (A) In vivo, (B) anteroposterior, and (C) lateral illustration of the final Latarjet-Patte procedure. (Data from Neyton L, Young A, Dawidziak B, et al: Surgical treatment of anterior instability in rugby union players: clinical and radiographic results of the Latarjet-Patte procedure with minimum 5-year follow-up. *J Shoulder Elbow Surg* 21(12):1721-1727, 2012.)

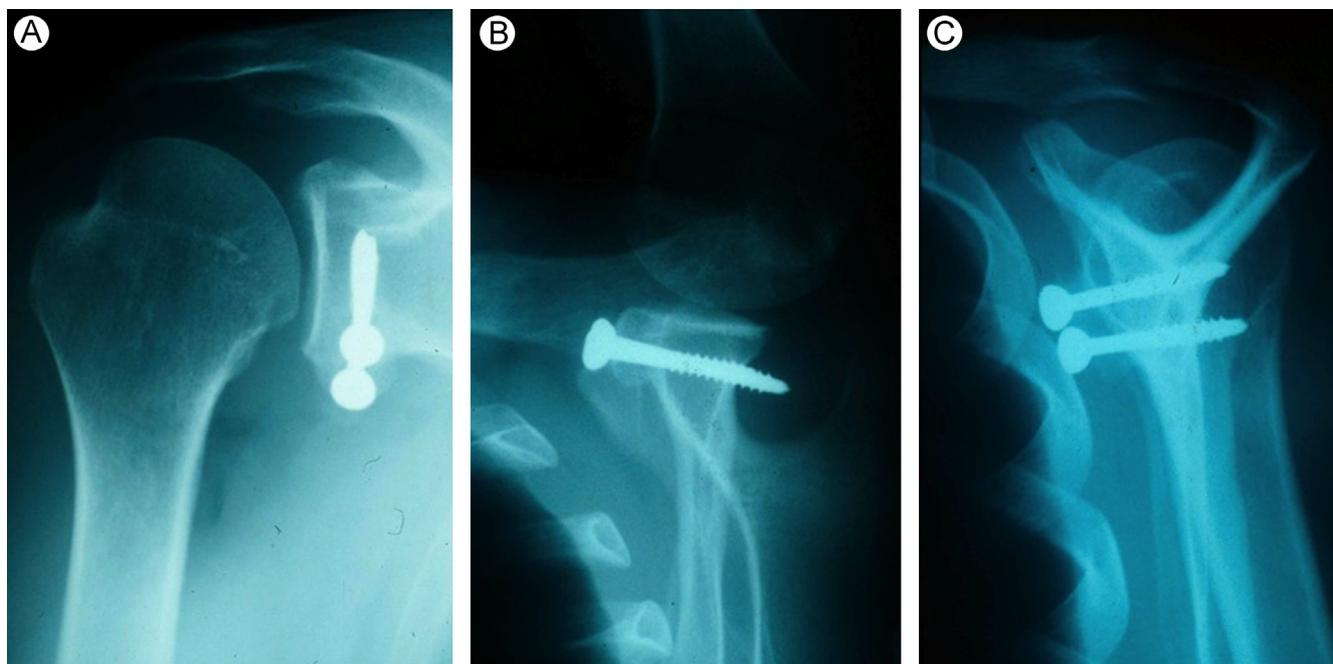


Figure 10 Three-month postoperative radiographs: (A) anteroposterior view, (B) lateral view, and (C) Bernageau view. Demonstrates graft healing and good graft positioning.

subscapularis muscle. The wound is closed. A drain is typically not used, unless excessive bleeding is noted.

Postoperative Management

We use a sling for the first 2 weeks after the operation to encourage rest of the shoulder. Rehabilitation is initiated on postoperative day 1 to maintain distal mobility and strength of the elbow, wrist, and hand with active range-of-motion exercises. In addition, passive range of motion is also commenced on postoperative day 1. Activities of daily living with the use of the operated shoulder are permitted at 2 weeks when the sling is discontinued. We allow return to conditioning activities without upper extremity strengthening including jogging and cycling at 1 month. We permit return to contact sports at 3 months postoperatively following radiographic confirmation of coracoid graft healing (Fig. 10).

Outcomes

To date, we have performed this procedure in more than 2000 cases with a recurrence rate of only 1%, with 98% of the patients reporting their result to be excellent or good⁸; 83% of our patients returned to their preoperative level of sports without complication.

Similarly, Burkhart and De Beer,⁹ using a modified Latarjet in 102 patients with anterior instability and significant bone loss, demonstrated a low recurrence rate of 4%. Their recurrences occurred in the early postoperative period; 2 patients returned to contact sports in less than 3 months, 1 following a grand mal seizure and 1 following a light tackle in an inebriated state 1 month postoperatively.

We have recently used two 4.5-mm bioabsorbable compression screws composed of l-lactic-co-glycolic acid copolymer (PLGA 85 L/15 G) in 11 consecutive patients. We had no intraoperative complications including no screw breakage at the time of insertion, and all screws were placed flush with the glenoid. In all cases, bone graft healing was evident on plain film and CT postoperatively. At this time, we cannot strongly recommend the use of bioabsorbable screws owing to the small sample size, and long-term follow-up is still needed in this series.

Complications

Infections are extremely rare following this procedure. We also find stiffness and loss of external rotation range of motion to be a rare occurrence with the use of the subscapularis splitting approach, contrary to that reported by others.⁹⁻¹¹ In addition, we repair the capsule to the coracoacromial ligament stump with the arm by the side and the shoulder in external rotation to avoid loss of motion. Furthermore, immediate postoperative rehabilitation with passive range of motion promotes early motion and therefore minimizes the risk of stiffness in these patients. Although fatty infiltration of the subscapularis has been associated with dividing the subscapularis, if a horizontal subscapularis splitting approach is used, this can be avoided.

In our experience, recurrence of instability is approximately 1%. Recurrences that we have observed were in voluntary subluxators or patients that have epileptic seizures whose neurologic treatment was not efficient or stable.

Successful union of the coracoid transfer is critical to avoid complication. We believe that the combination of exposing the cancellous bone and preparing flat surfaces of the coracoid and

glenoid, using a relatively long piece of coracoid, 2.5-3 cm in size, placing the coracoid graft in the “lying position” and using the inferior surface to increase the surface area for union, and establishing stable fixation with 2 biocortical compression screws is essential to avoid nonunion. We have found pseudoarthrosis of the coracoid process in 2.4% of patients, fractures of the coracoid in 2.4% of cases, which was often related to overtightening of the screws intraoperatively, and partial resorption of the coracoid in 9% of patients. As mentioned previously, the “two-finger” technique is recommended when tightening the screws to avoid overtightening and prevent said complication.

Graft lysis can be prevented by avoiding complete devascularization of the coracoid graft. This is accomplished by limiting the release of the pectoralis minor to the tip of the coracoid process.

Arthritis has been associated with shoulder dislocation and poor surgical technique. Studies have failed to show a difference in postoperative arthritis following coracoid transfers and open anterior soft tissue procedures.¹² Hovelius et al¹¹ in 2006 reported a 14% incidence rate of moderate to severe OA following Latarjet which is similar to other surgical procedures addressing Bankart lesions. To date, we have had no evidence of glenohumeral joint space narrowing and an 11.6% incidence of inferior humeral osteophytes (<7 mm). The presence of an osteophyte correlated with a laterally overhanging coracoid process.^{10,13} Therefore, it is imperative to avoid lateral overhang of the coracoid. In addition, we also recommend against the intraarticular placement of screws and against the use of washers to minimize the risk of developing osteoarthritis of the joint.

Summary

In conclusion, we believe the Latarjet procedure is a safe, reliable procedure for the management of recurrent anterior shoulder instability and can successfully return contact and noncontact athletes alike back to sports without complication. We also believe that our technique, which includes splitting the subscapularis, repairing the capsule to the coracoacromial ligament stump with the arm in external rotation, and avoiding immediate postoperative range-of-motion exercises, preserves

external rotation range of motion and promotes excellent outcomes.

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