Technical Note

Alternative Management of the Capsule in the Bristow-Latarjet Procedure

Travis J. Dekker, M.D., Liam A. Peebles, B.A., W. Jeffrey Grantham, M.D., Ramesses A. Akamefula, B.S., and Thomas R. Hackett, M.D.

Abstract: The Bristow-Latarjet procedure is considered the current gold standard for the management of anterior glenohumeral joint instability in which significant glenoid bone loss is present, and numerous techniques have been proposed for capsular management after the bony augmentation component of the procedure. These techniques for capsular management include excision of the capsule and labrum, 2-flap elevation, T-capsulotomy, or an L-shaped incision into the capsule. Capsular management during open shoulder procedures may vary among surgeons and may or may not include capsulolabral repair after the Bristow-Latarjet procedure. The purpose of this Technical Note was to illustrate an alternative approach to capsular management, focusing on the elevation of the capsulolabral complex as a sleeve along with augmentation using the coracoacromial ligament during the Bristow-Latarjet procedure in patients with anterior glenohumeral instability. The proposed technique provides the benefit of improvement in visualization to more reliably identify the ideal location for bone block placement and allows for the surgeon to perform a large inferior-to-superior capsular shift to prevent inferior subluxation or instability.

Anterior glenohumeral instability is a common condition and is the most frequent form of shoulder instability, and it is significantly greater in younger, active, contact or collision sport, and military populations.[1-6] In the case of significant glenoid bone loss, high recurrence rates have been noted with arthroscopic Bankart repair, Hill-Sachs lesions, and bipolar lesions.[7] Most surgeons prefer bony reconstruction procedures to manage these injuries. The Bristow-Latarjet procedure is a popular surgical technique that involves transferring the coracoid process to the area of anterior glenoid bone loss to re-establish the glenoid face. Studies have shown good glenohumeral stability and clinical outcomes, resulting in restoration of native shoulder biomechanics.[7-10]

From The Steadman Clinic (T.J.D., W.J.G., T.R.H.) and Steadman Philippon Research Institute (L.A.P., R.A.A., T.R.H.), Vail, Colorado, U.S.A.

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Address correspondence to Thomas R. Hackett, M.D., Steadman Philippon Research Institute, The Steadman Clinic, 181 W Meadow Dr, Ste 400, Vail, CO 81657, U.S.A. E-mail: drhackett@thesteadmanclinic.com

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Most discussions and studies of the Bristow-Latarjet procedure focus on the coracoid transfer; however, many forms of capsulotomy have been reported to uncover the glenohumeral joint. These techniques for capsular management include excision of the capsule and labrum, 2-flap elevation, T-capsulotomy, or an L-shaped incision into the capsule.[11-13] Capsular management during open shoulder procedures may vary among surgeons and may or may not include capsulolabral repair after the Bristow-Latarjet procedure.[14,15] Regardless of the method of capsular management, with bone loss greater than 20% to 30%, the Latarjet procedure is considered the treatment of choice for recurrent anterior glenohumeral instability and may even be considered a viable option in primary cases in contact athletes who are at higher risk of recurrent instability even with smaller amounts of glenoid bone loss.[16] The purpose of this surgical technique was to illustrate an alternative approach to capsular management, focusing on the elevation of the capsulolabral complex as a sleeve along with augmentation using the coracoacromial (CA) ligament during the Bristow-Latarjet procedure in patients with anterior glenohumeral instability (Video 1).

Surgical Technique

After the patient is met in the preoperative holding area and formal consent is reviewed, preoperative

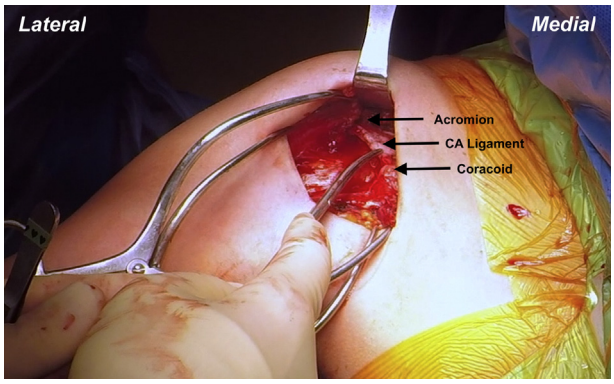

Fig 1. Right shoulder in reclined beach-chair position. The coracoacromial (CA) ligament can be clearly identified and subsequently released after a standard deltopectoral approach.

anesthetic regional blocks (interscalene and superficial upper thoracic wall of the upper 2 intercostal nerves or pecs) are administered under ultrasound guidance. General anesthesia is then administered, and the patient is placed in the beach-chair position with the chest situated 60° from the plane of the floor. All bony prominences are well padded, with specific attention paid to the nonoperative arm and bilateral lower extremities to prevent postoperative nerve palsies. A thorough preoperative examination including full passive range of motion, as well as assessment of anterior, inferior, and posterior instability with a load-and-shift test, is performed, along with a sulcus test. The operative extremity is then prepared and draped free to allow for full intraoperative manipulation and full maneuverability. The senior author (T.R.H.) has used a padded Mayo stand or, alternatively, a pneumatic limb holder (Smith & Nephew, Andover, MA) for limb support throughout the operation.

Approach

On the basis of thorough preoperative planning (computed tomography and magnetic resonance imaging) along with patient history, the decision to perform the Latarjet procedure is made preoperatively; therefore, the senior author rarely performs a diagnostic arthroscopy for confirmation of bone loss. An axillary incision is made from just lateral to the tip of the coracoid toward the axillary fold, measuring between 5 and 7 cm. A standard deltopectoral approach is used, and the cephalic vein is mobilized to the medial aspect of the exposure. Two Gelpi retractors are placed deep in the exposure to facilitate visualization. The conjoint tendon and the origin of the pectoralis minor are easily identified at this time (Fig 1). With the arm placed in adduction and internal rotation, the pectoralis minor tendon is released from the coracoid with Bovie cautery (Bovie Medical, Clearwater, FL). The arm is then placed in external rotation and 90° of abduction to facilitate visualization of the CA ligament. By use of Metzenbaum scissors, this is released as far lateral off the acromion as possible.

Attention is first paid to the coracoid osteotomy. The periosteum of the medial, superior, and inferior coracoid is elevated with a key elevator. A freer is used to ensure complete soft-tissue removal as well as estimate the total length of the coracoid back to the scapular body. A ruler is then used to measure from the tip of the coracoid to the planned osteotomy between the CA and coracoclavicular ligaments of the coracoid, ensuring that no more than 22 mm is taken in female patients and no more than 28 mm is taken in male patients.[17] The osteotomy is performed from medial to lateral with a 90° oscillating saw (ConMed, Utica, NY) and then completed with a 0.5-inch straight osteotome. Bone wax is applied to the osteotomy donor site on the scapular body. Of note, the bone block is handled with

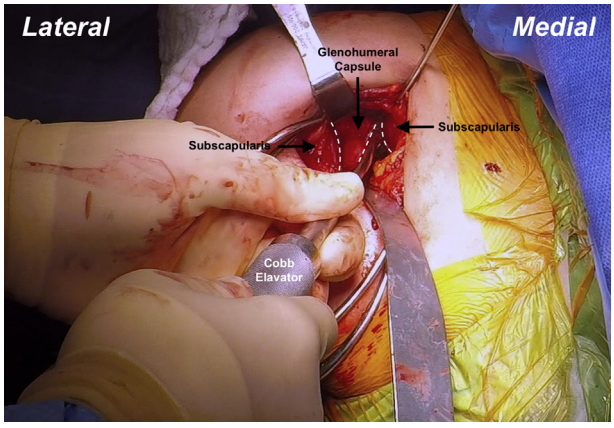

Fig 2. Right shoulder in reclined beach-chair position. A vertical capsulotomy is performed with a Cobb elevator moving from medial to lateral across the glenohumeral capsule.

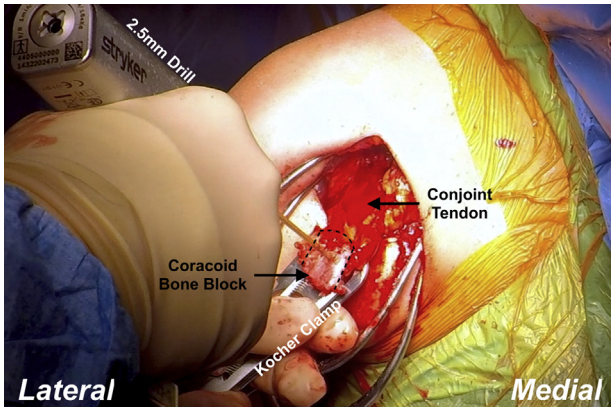

Fig 3. Right shoulder in reclined beach-chair position. Pilot holes are predrilled in the harvested coracoid bone block using a lag-by-design technique. A Kocher clamp may be used to securely grasp the bone block while not crushing it.

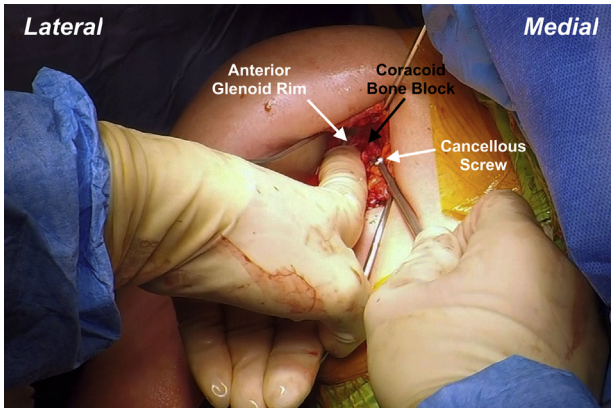

Fig 4. Right shoulder in reclined beach-chair position. Coracoid bone block fixation to the anterior aspect of the glenoid is performed with 2 cancellous screws. Tactile reduction may be used by the surgeon to ensure a flush fit between the bone block and the glenoid articular surface.

extreme care, ensuring it is not placed outside of the surgical wound to prevent tension neurapraxia of the musculocutaneous nerve. The senior author prefers the use of an extended ratcheted Kocher clamp because it provides secure holding while not crushing the bone block. The inferior surface of the coracoid is leveled and lightly decorticated to create a healthy bleeding bed of tissue to facilitate primary bone-to-bone healing. The bone block is further prepared by identifying the central aspect of the block and placing two 2.5-mm drill holes equidistant from the apex and the base; the superior aspect of the coracoid is then over-drilled through both cortices with a 3.5-mm drill bit, which will facilitate compression of the bone block on final fixation.

The glenoid exposure ensues by performing a subscapularis split at the border of the lower one-third and upper two-thirds junction sharply with a No. 15 blade, ensuring not to violate the glenohumeral capsule. Starting slightly medial to the subscapularis insertion, the underlying capsule is elevated from the subscapularis to fully expose the anterior glenohumeral capsule. A Ray-Tec sponge (Johnson & Johnson, New Brunswick, NJ) pre-tied with a heavy suture for lateral extraction (i.e., No. 1 Vicryl [Ethicon, Somerville, NJ] or No. 5 FiberWire [Arthrex, Naples, FL]) is placed medially along the glenoid neck to fully expose the medial extent of the glenohumeral capsule along the glenoid neck. Starting with a No. 15 blade along the medial border of the capsule, followed by the use of a Cobb elevator, the capsulolabral complex is elevated en bloc off the medial aspect of the glenoid neck (Fig 2). The extent of the elevation occurs from the 1- to 6-o'clock position on the glenoid face. A Fukuda retractor is easily introduced into the glenohumeral joint at this time to retract the humeral head, and a malleable Steinmann pin located 5 mm medial to the glenoid face is placed into the superior glenoid neck in a unicortical fashion to facilitate retraction of the upper subscapularis. The anterior border of the glenoid neck from the 3- to 5-o'clock position is lightly decorticated with a 4.0-mm burr to a healthy and flat bleeding bed of tissue. The bone block is retrieved and placed in standard Bristow-Latarjet fashion so that it is flush with the face of the glenoid based on both palpation and visualization. The glenoid face is then measured with a depth gauge, and the screw length can be determined by adding 4 mm to this measurement. Through the predrilled coracoid holes, 2 parallel 2.5-mm pilot holes aimed less than 10° away from the face of the glenoid are placed into the glenoid neck (Fig 3). The superior hole is drilled first to allow for preliminary fixation with loose approximation of the first screw. By use of digital palpation, the bone block is placed flush with the glenoid face, and the second glenoid hole is drilled through the inferior predrilled coracoid hole. The bone block is fixated with 2 partially threaded 4.0-mm cancellous screws—this allows for a lag-by-design technique to provide excellent compression of the inferior surface of the coracoid to the anterior neck of the glenoid (Fig 4).

Two 2.4-mm SutureTak anchors (Arthrex) are placed inferior and superior to the bone block 1 mm lateral to the glenoid rim (Fig 5). Because the capsulolabral complex remains completely intact, the capsule can be plicated at the surgeon's discretion based on the preoperative examination. In the setting of inferior laxity, the capsule can be imbricated or superiorly shifted to reinforce tissue at the inferior aspect of the bone block. This can be achieved by using an arthroscopic lasso suture passer or a free needle through the capsulolabral complex both inferior and superior to the bone block with the sutures from the anchors. These anchors are placed in a traditional horizontal mattress fashion to firmly secure the labral repair. A secondary benefit of

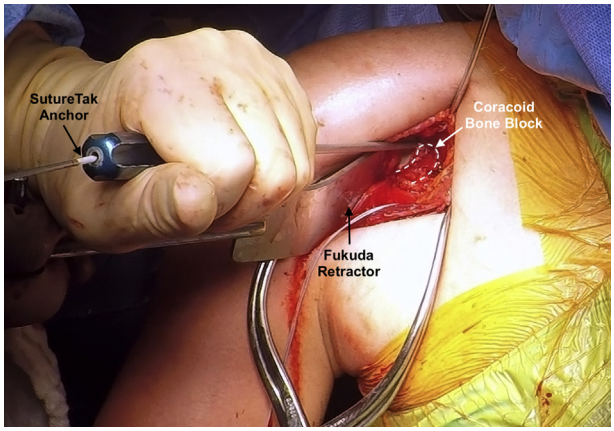

Fig 5. Right shoulder in reclined beach-chair position. Two SutureTak anchors (2.4 mm) are placed inferior and superior to the bone block 1 mm lateral to the glenoid rim. The attached sutures will be used for capsular repair at the conclusion of the procedure.

Table 1. Pearls and Pitfalls

Pearls
Place the arm in abduction and ER when releasing the CA ligament off the acromion.
Use bone wax on the coracoid osteotomy donor site to minimize blood in the field.
Place a unicortical Steinmann pin for superior subscapularis retraction.
Use a Ray-Tec sponge to develop the plane between the subscapularis and capsule.
Aim the suture anchors away from the coracoid screws.
Place the arm in 30° of ER when repairing the capsule.
Pitfalls
Poor capsular tissue can make elevation as a sleeve difficult.

CA, coracoacromial; ER, external rotation.

the placement of these anchors is that it ensures the bone block remains extra-articular, preventing the bone-to-bone healing interface from interacting with synovial fluid. The CA ligament is then imbricated laterally into the capsule to further reinforce the repair. The tagged Ray-Tec sponge is removed from the medial border of the glenoid neck at this time. The lateral split of the subscapularis is repaired with No. 2 FiberWire sutures in a figure-of-8 fashion. The surgical field is thoroughly irrigated, and a standard layered closure ensues at this time. Pearls and pitfalls of the complete surgical technique are summarized in Table 1, and advantages and disadvantages are summarized in Table 2.

Postoperative Plan

Passive range of motion is permitted on postoperative day 1 with a limitation of 30° of external rotation. Active range of motion can begin 3 weeks after the day of surgery. Standard radiographs are obtained at the first postoperative visit 2 weeks from the day of surgery.

Discussion

There are 3 described mechanisms for increased glenohumeral stability created with the Bristow-Latarjet procedure: (1) increased anterior bone stock, (2) a sling effect created by the subscapularis and conjoint tendon, and (3) capsular plication. Biomechanical studies have shown that the main effect of capsular repair is a limitation of external rotation with uncertain benefits regarding increased stability.[15] However, repair of the capsule back to the glenoid has shown improvement in midrange stability and, as such, can yield the maximum benefit of giving a patient global shoulder stability.[18] In the largest clinical series, Hovelius et al.[19] showed a statistically significant decrease (18% vs 4%) in instability events (dislocation or subluxation) when simply adding a horizontal superior capsular imbrication shift to the Bristow-Latarjet procedure.

Table 2. Advantages and Disadvantages

Advantages
Excellent glenoid neck exposure for block placement
Extra-articular bone block for improved osteotomy healing
Option for capsular imbrication
Option for capsular shift
Reinforcement of compromised capsular tissue by CA ligament
Disadvantages
5-10 min added to end of case
Additional hardware in glenoid neck with use of suture anchors

CA, coracoacromial.

The surgical technique presented in our article pays particular attention to the management and repair of the capsule with imbrication of the CA ligament. A vertical capsulotomy off the glenoid neck with medial-to-lateral elevation of the capsulolabral sleeve provides excellent visualization of the glenoid neck. This aids in humeral head retractor placement (e.g. a Fukuda retractor in this technique), glenoid preparation, and coracoid block placement. With a laterally based sleeve, the capsular tissue that has been stretched and damaged through dislocation events can be folded and translated to add increasing stability to the glenohumeral joint. The CA ligament adds increasing integrity to the capsular tissue in an overlapping medial-to-lateral direction.

Although the described technique is deliberate in its repair of the capsulotomy and provides appropriate glenohumeral instability, it has not been directly compared with other capsular management techniques either biomechanically or clinically. Moreover, although this technique allows for the option of capsular imbrication and excellent exposure of the glenoid neck for bone block placement, it should be noted that it requires extra hardware to be placed in the glenoid neck compared with the standard Latarjet technique. Further investigation is needed to determine the long-term results of this technique to imbricate the anterior capsule.

Numerous techniques have been proposed for capsular repair after the bony augmentation component of the Bristow-Latarjet procedure. The capsular management technique described in this Technical Note is unique in that it focuses on the elevation of the capsulolabral complex as a sleeve along with augmentation using the CA ligament to further reinforce the final capsular construct. This offers the benefit of improvement in visualization to more reliably identify the ideal location for bone block placement, keeps the bone block extra-articular to avoid synovial fluid from interfacing between the coracoid and glenoid neck, and gives the surgeon the flexibility of performing a large inferior-to-superior capsular shift to prevent inferior subluxation or instability.

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