Technical Note

The Combined Arthroscopic Revision Technique After the Latarjet Procedure

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Abstract: The Latarjet procedure is very popular and is the method of choice in cases of glenoid bone loss and anterior-inferior instability or revision procedures. However, recurrence is common after this procedure. One of the methods of revision after the Latarjet procedure is the Eden-Hybinette technique. However, recurrence occurs after this bone grafting procedure as well. The primary reasons for recurrence are graft resorption and capsular deficiency. To improve these outcomes, transfer of the long head of the biceps for capsular reinforcement has been recommended by several authors. We describe an all-arthroscopic procedure, performed after the Latarjet technique, that combines bone block transfer, trans-subscapular transposition of the long head of the biceps, and anterior labroplasty. This technique can significantly reinforce the deficient capsule through the sling effect and cover the graft for prophylaxis against bone resorption.

Coracoid graft transfer, as described by Latarjet and Bristow, is a very popular method of treating anterior-inferior shoulder instability in cases of glenoid bone deficits and revision surgery.[1] However, recurrence after this procedure is common; it occurs as a result of bone graft resorption, bone block nonunion, and fixation screw failure.[2,3]

Several techniques are available to remedy recurrence. The bone block technique, wherein the graft is fixed with screws or buttons, is quite popular.[4-7] The problem with this technique is the potential risk of recurrent bone graft resorption, as well as deficits with the capsule and ligaments, with no possibility of solid fixation. To solve this problem, we proposed combining this technique with soft-tissue reinforcement and a simultaneous dynamic stabilization technique. A repair technique using the long head of the biceps (LHB) with trans-subscapular tenodesis to the scapular neck has been described by several authors.[8,9] This technique can significantly reinforce the capsular

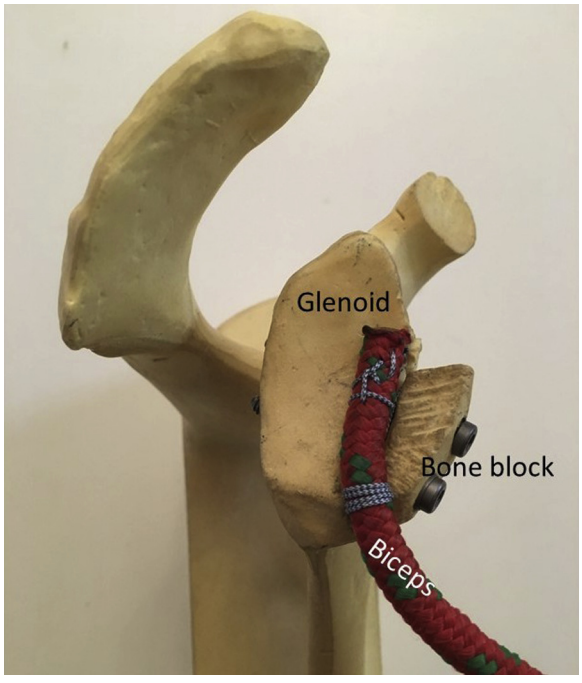

Fig 1. Model of the procedure in a right shoulder. The long head of the biceps tendon is transferred through the split subscapularis and fixed parallel to the glenoid rim using 2 suture anchors in front of the bone block.

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Fig 2. Iliac crest graft fixed to the double cannula (DePuy Synthes, Raynham, MA) after harvesting.

deficit. We therefore combined the 2 aforementioned techniques (i.e., bone block and LHB tendon transfer) to create a "composite graft" consisting of coracoid bone block and LHB tendon as an analogue of the initial Latarjet procedure (Video 1). Our procedure can be performed using an open or arthroscopic surgical technique. We recommend performing it arthroscopically because it is easy to combine with other techniques such as remplissage, posterior labral refixation, or cuff lesion repair if necessary (Fig 1).

Surgical Technique

The procedure can be performed with the patient in the beach-chair position and with a portal system as described by Lafosse et al.[10] We use the standard posterior and anterior-superior portal (portal D) for visualization and portal E for anchor placement and glenoid preparation. Portal J is used for subdeltoid space preparation, scar removal, and capturing and suturing the LHB. Portal M is used for the subscapularis split and use of the double cannula. Portal I can sometimes additionally be used for the subscapularis split or switching the stick placement, as an elevator.

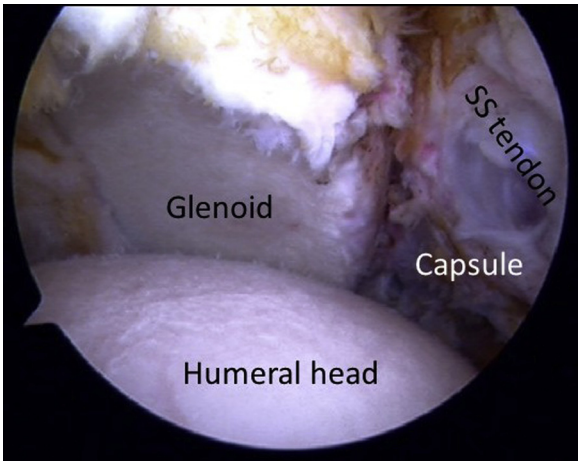

Fig 3. Intra-articular view of the right shoulder before the procedure. The anterior glenoid deficit and deficient capsule are seen. (SS, subscapularis.)

Fig 4. View of the right shoulder. The end of the tendon of the long head of the biceps is sewn with nonabsorbable sutures.

In the first step, an iliac crest bone graft is harvested using the standard technique[6] (Fig 2). After revision of the shoulder through the posterior portal (portal A), we create the anterior-superior portal (portal D) (Fig 3). The superior border of the subscapularis tendon and the rotator interval are identified. Scar tissue in the rotator interval space is completely removed with a shaver and ablator. Portal E is created with a spinal needle for direct visualization control in a suitable position. During this step, the arthroscope is transferred to the anterior-superior portal (portal D). In the case of a significant Hill-Sachs lesion, a standard remplissage technique is performed during this step. During the remplissage procedure, all the sutures are passed through the posterior capsule with a suture grasper, but they are not

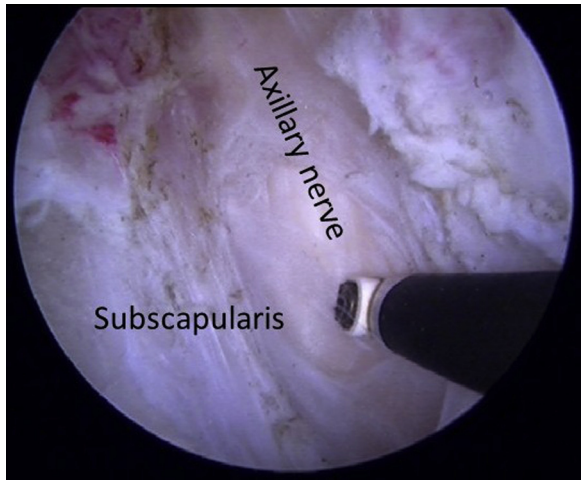

Fig 5. Extra-articular view of the subdeltoid space of the right shoulder from the anterior-superior portal after dissection of the fibrotic tissue in the subdeltoid space. The axillary nerve and plexus structures are identified.

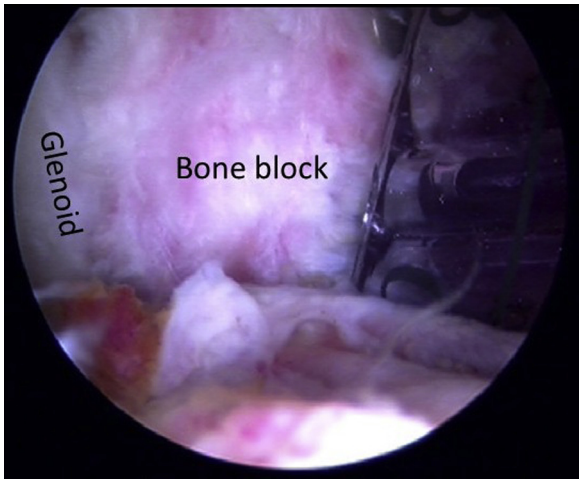

Fig 6. Extra-articular view of the subdeltoid space of the right shoulder from the anterior-superior portal. Bone block repositioning and fixation are performed with a double cannula (DePuy Synthes).

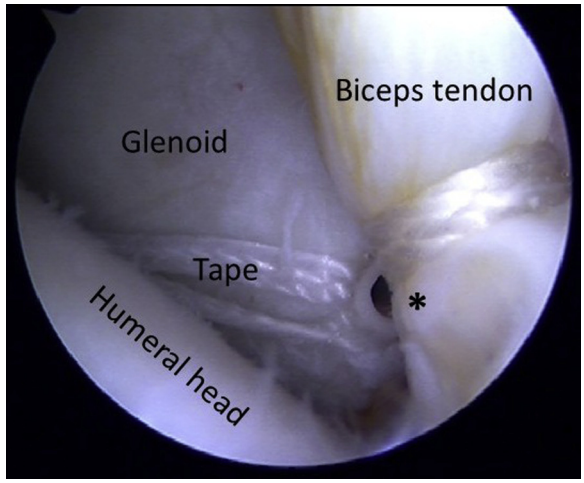

Fig 8. Intra-articular view of the right shoulder from the anterior-superior portal. The biceps tendon graft is fixed with labral tape in the 5-o'clock position above the bone block. The asterisk indicates the inferior anchor.

fixed until the end of the procedure because this makes manipulation during the other steps easier.

After biceps tenotomy, the arthroscope is transferred to the subdeltoid space and portal J is created. The anterior surface of the subscapularis muscle and tendon is released from the scar. The biceps groove and insertion of the pectoralis muscle are identified and captured through portal J. The biceps tendon is sutured with strong nonabsorbable No. 2 suture (Fig 4). After dissection of the plexus and identification of the axillary nerve, portal M is created (Fig 5). The subscapularis muscle is divided into the upper two-thirds and lower one-third; it is split with an ablator through portals M and I. The switching stick from the posterior portal elevates the upper part of the subscapularis; another switching stick, placed through portal I, pushes the lower part of the subscapularis downward. After preparation of the glenoid neck, the screws and hardware remnants can be removed through portal M. After abrasion of the glenoid neck with a bore, the bone graft is fixed to a double cannula (DePuy Synthes, Raynham, MA), placed through portal M, and fixed with 2 regular cannulated screws to the glenoid neck in a suitable position (Fig 6). After fixation, the congruence is checked using a rod inserted through the posterior portal.

Next, a suture fixed to the tip of the biceps is transported through the split to the posterior portal using graspers. Subsequently, the switching sticks are pulled out, and the arthroscope is transferred into the joint. In

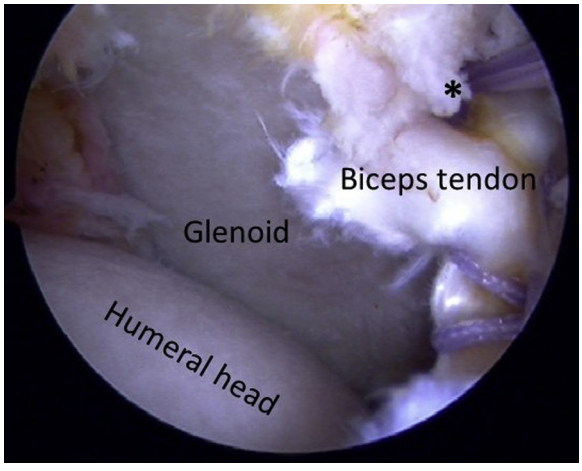

Fig 7. Intra-articular view of the right shoulder from the anterior-superior portal. The biceps tendon graft is passed through the subscapularis split and initially fixed with a superior knotless anchor (asterisk) in the 1-o'clock position.

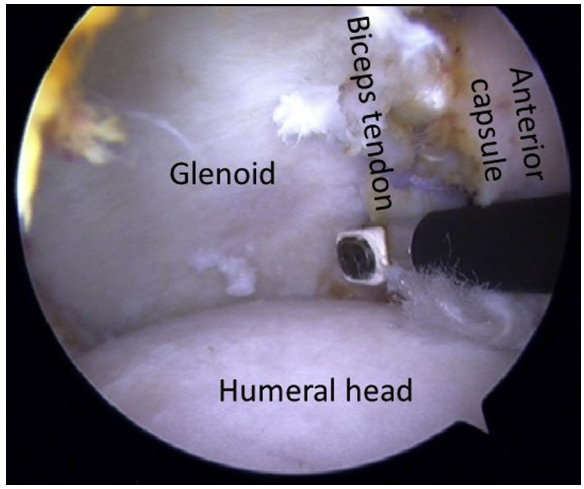

Fig 9. Final intra-articular view of the right shoulder from the anterior-superior portal. The biceps tendon is fixed parallel to the glenoid rim, the remnants of the capsule are fixed to the same anchor, and the bone block is located behind and totally covered with the biceps tendon and capsule.

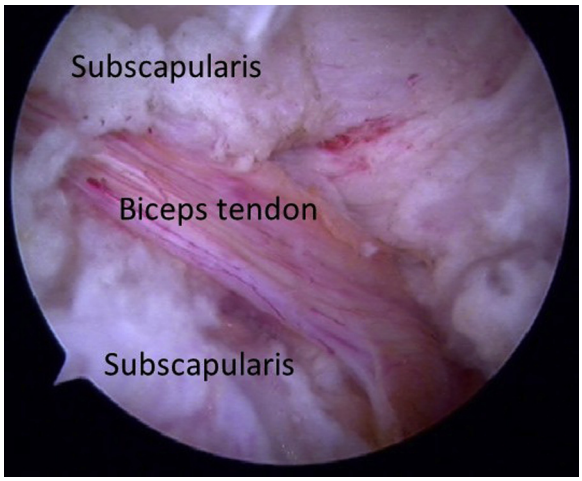

Fig 10. Final extra-articular view of the right shoulder from the anterior-superior portal. The biceps tendon graft is transferred through the split of the subscapularis tendon. The sling effect is shown.

the next step, 2 holes for knotless anchors are created in the 1- and 5-o'clock positions in the glenoid rim in front of the superior and inferior ridges of the bone block. Then, the tip of the biceps tendon is attached to the rim of the glenoid in the 1-o'clock position with a knotless anchor (Fig 7). After fixation, the thread is transferred to the posterior portal.

Then, one suture manipulator is placed through the posterior portal and another is placed through the anteromedial portal to enable passing the labral tape (Arthrex, Naples, FL) around the LHB tendon. Both ends of the tape are grasped through the anteromedial portal. Through the same portal, the second knotless anchor fixes the graft with labral tape in the 5-o'clock position. The ends of the labral tape are not cut so that they can be grasped through the posterior portal (Fig 8).

Finally, the remnants of the capsule are fixed to the glenoid using the same anchors with nonsliding sutures. Both the intra- and extra-articular parts of the joint are inspected (Figs 9 and 10). Table 1 summarizes the steps of our procedure.

Table 2. Advantages and Disadvantages

Advantages
Our procedure can significantly reinforce the Eden-Hybinette procedure in revision cases after the Latarjet procedure by creating the sling effect with the LHB.
Placement of the LHB above the bone block diminishes direct contact of the bone block and humeral head for osteoarthritis prophylaxis.
Placement of the LHB above the bone block can diminish bone block resorption.
The bumper effect of the LHB can increase anterior stability.
Arthroscopic inside-out visualization of the subscapularis muscle allows the surgeon to make a split precisely at the same position as in the previous failed surgical procedure.
Disadvantages
Our procedure requires significant surgical skills.
Arthroscopic release of the plexus can be technically demanding and dangerous.
A special instrumentation set is required.

LHB, long head of biceps.

Discussion

The Eden-Hybinette technique, is one of the most popular methods of revision after coracoid transfer procedures, first described by Bristow and Latarjet.[4-7] The aim of our study was to improve the results of this technique because recurrence can also occur after this procedure. In such cases, the third revision is extremely problematic. One of the reasons for revision is graft resorption and poor capsule quality. There are several techniques to reinforce and re-create the capsule. One such technique uses allograft tendon to re-create the capsule; this is theoretically possible but is very difficult to perform arthroscopically and requires many anchors.[11] Another option is the Maiotti technique,[12] which involves tenodesis of the scapular muscle and tendon; it

Table 1. Steps of Procedure

Step	Description
1	Iliac crest bone graft is harvested with the standard technique.
2	After revision of the shoulder through the posterior portal (portal A), we create the anterior-superior portal (portal D). Scar tissue in the rotator interval space is completely removed with a shaver and ablator. Portal E is created with a spinal needle for direct visualization control in a suitable position.
3	In the case of a significant Hill-Sachs lesion, a standard remplissage technique is performed.
4	After biceps tenotomy, the arthroscope is transferred to the subdeltoid space. Portal J is created.
5	The biceps groove and insertion of the pectoralis muscle are identified and captured through portal J. The biceps tendon is sutured with strong nonabsorbable No. 2 suture.
6	After dissection of the plexus and identification of the axillary nerve, portal M is created. The subscapularis muscle is divided into the upper two-thirds and lower one-third and split with the ablator through portals M and I.
7	After abrasion of the glenoid neck with a bore, the bone graft is fixed to a double cannula placed through portal M and fixed with 2 regular cannulated screws in a suitable position relative to the glenoid neck.
8	The long head of the biceps with a suture in the end is transported through the split with graspers to the posterior portal.
9	Two holes for knotless anchors are created in the 1- and 5-o'clock positions in the glenoid rim in front of the superior and inferior ridges of the bone block.
10	The tip of the biceps tendon is attached to the rim of the glenoid in the 1-o'clock position with a knotless anchor. Through the anteromedial portal, a second knotless anchor fixes the graft with labral tape in the 5-o'clock position.
11	The remnants of the capsule are fixed to the glenoid using the same anchors with nonsliding sutures.

Table 3. Pearls and Pitfalls

Pearls
Arthroscopic preparation of the glenoid neck is critical for good healing of the bone block.
If the remplissage technique is needed, it should be performed as a first step.
The long head of the biceps tendon graft should be placed from the anterior to superior part of the bone block to achieve maximal coverage of the bone block and mimic the initial Latarjet procedure.
Pitfalls
The subscapularis split and creation of portal M should be performed under direct visualization control for axillary nerve injury prophylaxis.
Mobilization of the biceps tendon should be far from the area under the pectoralis major muscle because it is critical for postoperative biceps pain prophylaxis.

solves the problem of capsular deficiency while biomechanically isolating the upper third of the subscapularis tendon, which is most important for normal function. Technically, it is very difficult to combine this technique with a bone block. LHB transfer for capsular reinforcement has been described by several authors, and it improves results.[8,9] Our idea was to create a technique that combines the advantages of 2 techniques—iliac crest bone grafting and transposition of the LHB parallel to the bone block through the subscapular split. In our opinion, this technique can significantly reinforce the bone block procedure through the bumper and sling effect of the LHB, which mimics the initial Latarjet procedure. Some studies have stated that the sling effect is the most important stabilization part of the Latarjet procedure.[13] Thus, the procedure mimicking the initial Latarjet procedure, which consists of a bone block and trans-subscapular transposition of the LHB, can be a prospective technique for revision after coracoid transfer failure. If there are any indications for Hill-Sachs lesion treatment, our technique can be easily combined with remplissage.[14] Table 2 summarizes the advantages and disadvantages of our technique, and Table 3 summarizes the pearls and pitfalls.

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