

Labral Repair Augmentation by Labroplasty and Simultaneous Trans-Subscapular Transposition of the Long Head of the Biceps

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Abstract: Chronic traumatic anteroinferior instability is a common pathology of the shoulder joint. In case of glenoid bone defects, the Latarjet or bone block technique is the method of choice. The arthroscopic Bankart procedure and its modifications remain the preferred methods of treating patients without substantial bone damage of the glenoid and humeral head; however, there is a high recurrence of instability after the Bankart procedure, even for optimal indications. One of the main causes of recurrence is poor quality and weakness of the glenohumeral ligaments and labrum. We describe an alternative technique that provides triple mechanisms of stabilization like the Latarjet procedure. In our procedure, the long head of the biceps tendon is used for a sling effect, dynamic stabilization is achieved by trans-subscapular tenodesis with simultaneous plasty of the anterior segment of the labrum, and subsequent resuspension of the glenohumeral ligaments is performed using the same anchors. In patients without substantial bone loss, this procedure has numerous advantages over the arthroscopic Latarjet procedure. By creating triple mechanisms of stability like the Latarjet procedure (the bumper effect, reinforcement of ligaments, and sling effect), our procedure can significantly reinforce the Bankart procedure in cases of poor-quality glenohumeral ligaments.

Traumatic chronic anterior instability is a common pathology of the shoulder joint. The frequency of recurrence reaches 75% in patients aged 20 to 30 years.¹ For bone defects of the glenoid, the Latarjet procedure or bone block technique is the method of choice.²⁻⁴ The arthroscopic Bankart procedure and its modifications remain preferred for patients without substantial bone loss in the glenoid and humeral head⁵; nevertheless, even when the Bankart procedure is performed for optimal indications, the postoperative recurrences of

instability can reach 20%.⁶ One of the main reasons for recurrence is poor quality and weakness of the glenohumeral ligaments and labrum.^{7,8}

To prevent recurrence, numerous methods have been proposed, such as the application of allografts and

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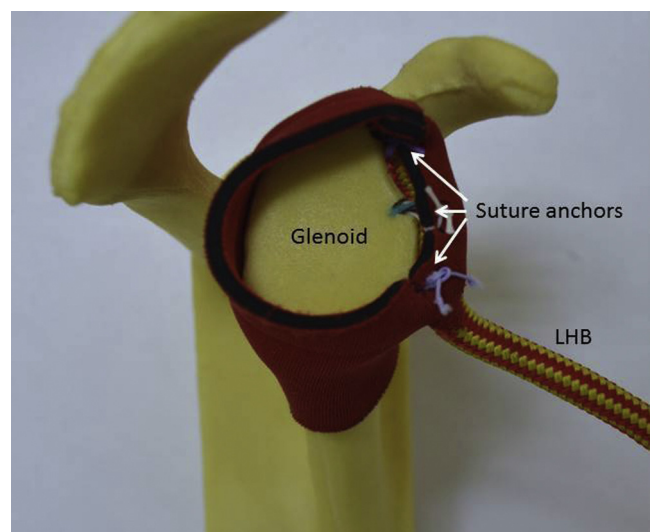


Fig 1. The long head of the biceps tendon is transferred through the split subscapularis and fixed parallel to the glenoid rim using 3 suture anchors. Remnants of the capsule are fixed to the same anchors. (LHB, long head of the biceps.)

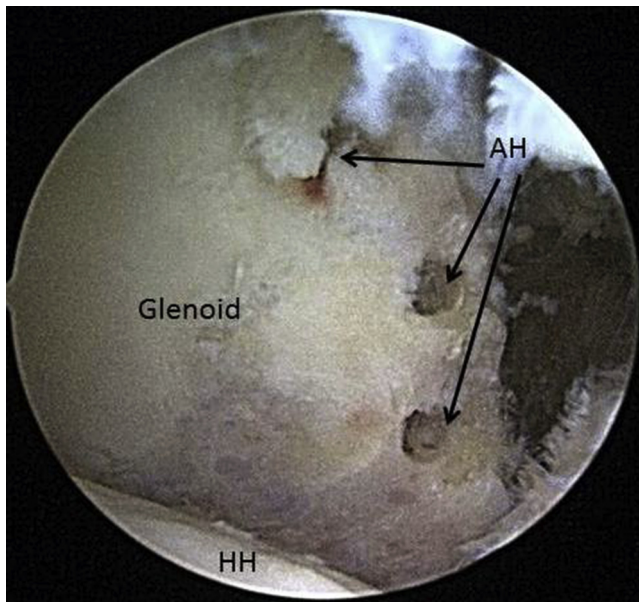


Fig 2. Right shoulder after preparing 3 holes for subsequent placement of the anchors. (AH, anchor holes HH, humeral head.)

augmentation by part of the tendon of the subscapular muscle.⁹⁻¹¹ Boytchev,¹² in 1951, described transposition of the conjoint tendon with the tip of the coracoid process through the subscapularis and fixation of the tendon to its original anatomic position. Latarjet,¹³ in 1954, described transposition of the conjoint tendon with the coracoid



Fig 4. Right shoulder. The end of the tendon of the long head of the biceps is sewn with FiberWire thread (Arthrex). (LHB, long head of the biceps.)

process through splitting of the subscapularis and fixation of the coracoid process to the scapular neck with a screw for shoulder stabilization. Some authors suggested using the tendon of the short head of the biceps without the bone block.⁷ The frequency of instability after this procedure is high; therefore, many authors recommend the Latarjet procedure for these patients.¹⁴

Several authors proposed the use of dynamic stabilization by transposition of the long biceps head tendon for additional stabilization in the repair of Bankart injury and fixation in the bone channel with the suture button or Bio-Tenodesis anchor.^{15,16} Other authors showed the



Fig 3. Subdeltoid space of the right shoulder from the anterosuperior portal. The long head of the biceps tendon is grasped from the additional suprapectoral portal. (BG, bicipital groove; LHB, long head of the biceps; PM, pectoralis major.)

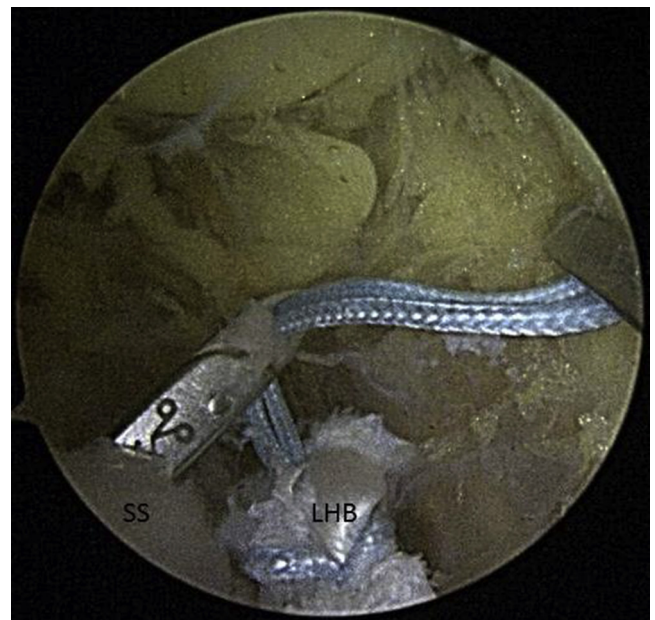


Fig 5. Subdeltoid space of the right shoulder from the anterosuperior portal. The suture manipulator, inserted from the posterior portal, perforates the subscapularis muscle in the 5 o'clock position of the glenoid and captures the sutures attached to the tip of long head of the biceps tendon. (LHB, long head of the biceps; SS, subscapularis.)

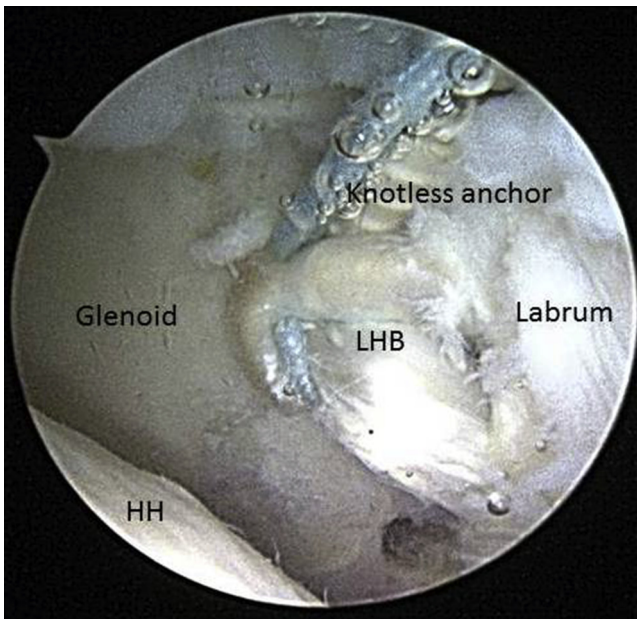


Fig 6. Right shoulder. The tip of the long head of the biceps tendon is fixed in the 1 o'clock position with the 3.5 PushLock anchor (Arthrex). (HH, humeral head; LHB, long head of the biceps.)

effectiveness of a labroplasty with an allograft or autograft.¹⁷ Nicola¹⁸ described transposition using the long head of the biceps through the bone tunnel in the humeral head for shoulder stabilization. Historically, in the Union of Soviet Socialist Republics, the Vainstein procedure, which consists of superficial medial

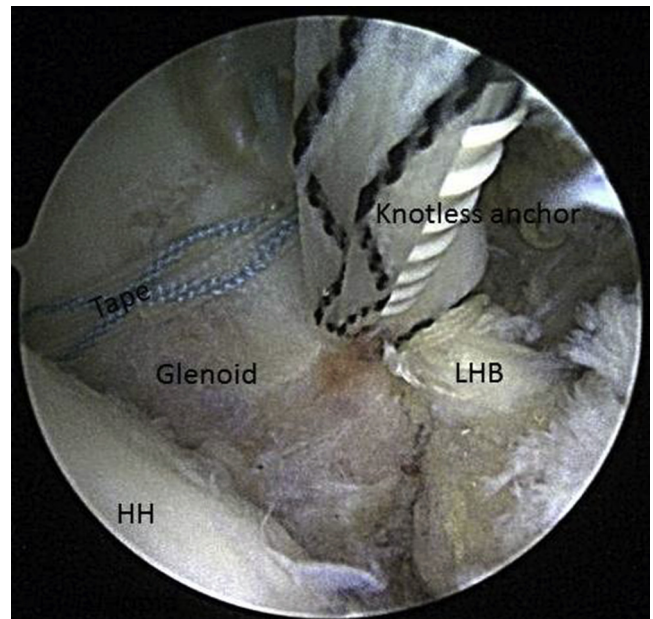


Fig 8. Right shoulder. The third anchor is used to fix the graft with SutureTape (Arthrex) in the 5 o'clock position. (HH, humeral head; LHB, long head of the biceps.)

transposition of the tendon of the long biceps head under the tendon of the subscapularis, has been very popular.¹⁹ This procedure serves as the basis for the technique we developed.

We describe here an alternative technique that has the same triple stabilization mechanisms as the Latarjet procedure. The idea of the procedure is based on using

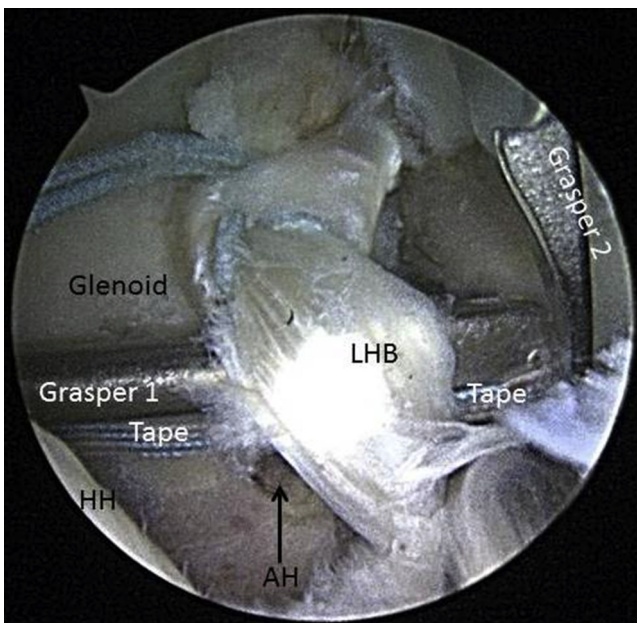


Fig 7. Right shoulder. The SutureTape (Arthrex) is placed around the graft and grasped through the anteromedial portal. (AH, anchor hole; HH, humeral head; LHB, long head of the biceps.)

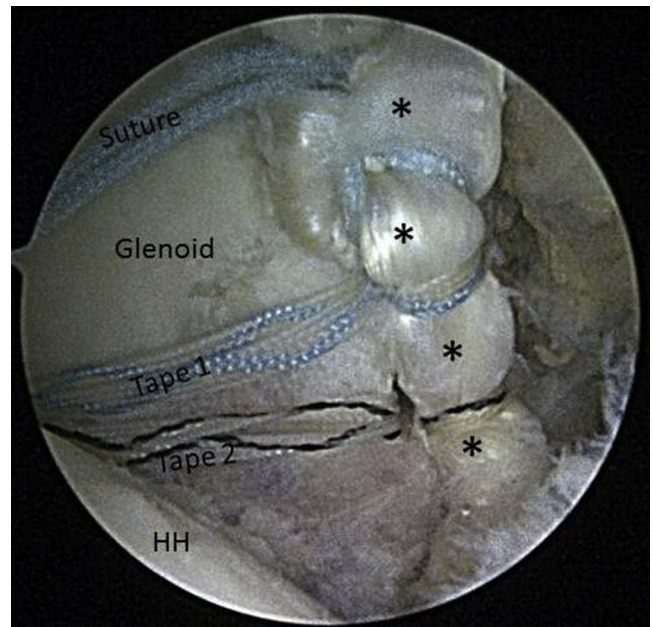


Fig 9. Final view from the anterosuperior portal of the anterior labroplasty before closure of the capsular ligaments in the right shoulder. *Long head of the biceps. (HH, humeral head.)

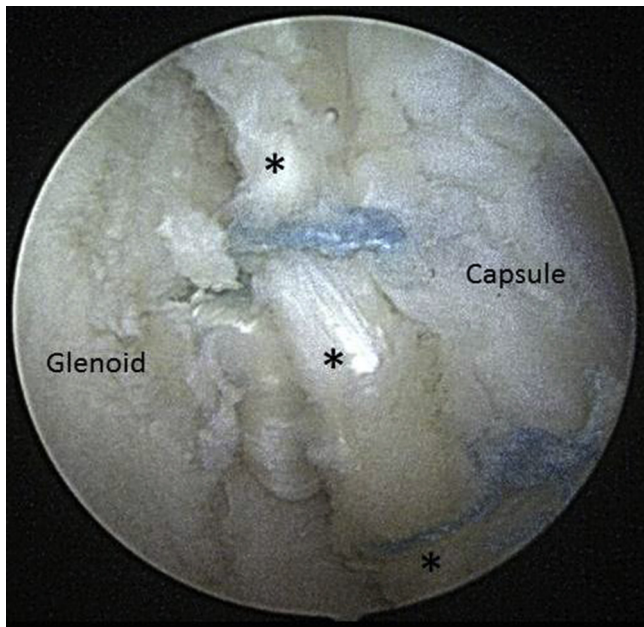


Fig 10. Final view from the posterior portal after closure of the capsule in the right shoulder. *Labrum.

the tendon of the long biceps head as a static and dynamic stabilizer by trans-subscapular transposition of the tendon with simultaneous plasty of the anterior segment of the labrum and subsequent refixation of the glenohumeral ligaments to the same anchors (Fig 1).

Surgical Technique

The operation is performed with the patient in the beach chair position and the injured arm (here, right arm) in a traction of 1.5 kg (Video 1). We use 3 standard portals,²⁰ the posterior portal, anterosuperior and anteromedial portal, and an additional suprapectoral portal, which is located 3 to 4 cm inferior from the standard anterosuperior portal in the projection of the

cross-section of the biceps groove at the insertion site of the superior edge of the pectoralis muscle tendon.

After diagnostic arthroscopy and mobilization of the capsule and labrum, the arthroscope is transferred to the anterior-superior portal and then to the front edge of the glenoid. We prepare 3 anchor holes with a drill guide for the 3.5 mm PushLock anchor (Arthrex, Naples, FL) at the 1, 3, and 5 o'clock positions (Fig 2).

After tenotomy of the long biceps head, the arthroscope is moved into the subdeltoid space. The tendon of the long head is mobilized, captured (Fig 3), pushed through an additional lateral portal, and sutured with FiberWire thread (Arthrex) (Fig 4).

After dissecting the space between the tendon of the short biceps head and subscapularis, we inspect the axillary nerve. The subscapularis is perforated on the side opposite the lower anchor under the capsule using the suture manipulator, which is inserted through the posterior portal so it can grasp and manipulate the threads attached to the tip of the long head of the biceps through the subscapularis into the joint (Fig 5).

Sutures are passed through the anterior medial portal. Then the tip of the biceps tendon is attached to the rim of the glenoid in the 1 o'clock position with the PushLock anchor (Fig. 6). After fixation, the thread is transferred to the posterior portal.

Next, one suture manipulator is placed through the posterior portal, and another suture manipulator is placed through the anteromedial portal to pass the SutureTape (Arthrex) around the tendon of the long head of the biceps (Fig 7). Both ends of the tape are grasped through the anteromedial portal.

Through the anteromedial portal, the second PushLock anchor fixes the graft with SutureTape in the 3 o'clock position. The ends of the SutureTape are not cut so they can be grasped through the posterior portal. The

Table 1. Advantages and Disadvantages

Advantages	Disadvantages
Our procedure can significantly reinforce the Bankart procedure in cases of poor-quality glenohumeral ligaments by the synergy of the anterior labroplasty and sling effect of dynamic tenodesis.	Our procedure requires significant surgical skills.
Our procedure is less traumatic and technically demanding than the arthroscopic Latarjet procedure.	There is a risk of axillary nerve injury during the perforation of subscapularis muscle perforation from the inside-outward direction.
Our procedure can be performed in "beach chair" or lateral decubitus position.	Theoretically, there is a possibility of biceps pain after the procedure.
Our procedure can be performed in cases of subcritical glenoid bone loss if there are any doubts in choosing soft-tissue or bone reconstruction procedure.	It is not recommended in cases of poor quality of the biceps tendon or previous procedures with biceps tenodesis or tenotomy.
Our procedure can be performed together with bone block or remplissage techniques.	In cases of glenoid bone loss >20% or significant Hill-Sachs lesions, it is not recommended to perform our technique as a single procedure without additional techniques.
In case of superior labral lesion from anterior to posterior tears, our procedure simultaneously treats this pathology.	It is not recommended in case of total absence of the capsule structure.

Table 2. Pearls and Pitfalls

Pearls	Pitfalls
Preparation of glenoid bed is critical for strong graft healing to the glenoid.	Perforation of the subscapularis should always be performed under visualization because of a very high risk of vascular injuries.
Use of a switching stick as an elevator from an additional portal creates more space, improves the view, and protects neurovascular structures during the perforation of the subscapularis muscle.	Mobilization of the biceps tendon should be far from the under pectoralis major muscle because it is critical for prophylaxis of postoperative biceps pain.
A strong placement of the inferior anchor is critical because it is loaded by maximal force.	

same steps are repeated, and the graft is finally fixed in the 5 o'clock position of the glenoid (Fig 8).

Finally, the glenohumeral ligaments and labrum are fixed to the glenoid in their original anatomical position using the ends of the SutureTape (Fig 9). The capsule is fixed above the graft with nonsliding sutures (Fig 10).

Discussion

The Bankart procedure is the preferred method for acute uncomplicated cases and good-quality glenohumeral ligaments.^{2,14,21} After anterior dislocation of the shoulder joint, the circular structure of the labrum fibers becomes disrupted and impossible to repair completely; therefore, the treatment option is plasty of the joint labrum with autograft and allograft, which is effective.¹⁷ The disadvantage of this technique is that it requires a large number of anchor fixators and sutures, which can damage the cartilage. The procedure is also technically demanding, complicated, and requires allograft or autograft harvesting. Additionally, the presence of strong glenohumeral ligaments and absence of their plastic deformation make this procedure ineffective for capsular deficit.

The Maiotti technique,^{22,23} which involves tenodesis of the tendon of the scapular muscle, solves the problem of capsular deficiency while biomechanically isolating the upper third of the tendon of the subscapularis, which is most important for normal function. Boileau et al.'s⁷ "belt-and-suspenders" technique involves transposition of the conjoint tendon through splitting the scapular muscle and fixating the tendon with a bone block in the bone tunnel with an interferential screw. This technique had considerable recurrences of instability in the long term.⁷ The arthroscopic Latarjet procedure is technically complicated and requires release of the pectoralis minor, which can cause scapulothoracic dyskinesia²⁴ and is potentially more dangerous in terms of damaging the nerve trunks.²⁵ Lysis of the coracoid process and incorrect positioning of the screws are frequent complications.²⁶

A substantial bone defect on the anterior edge of the glenoid is the main indication for performing the Latarjet procedure.² In case of instability of the soft-tissue component, it is necessary to create good bone

contact by removing a part of the healthy glenoid bone. Revision after the Latarjet procedure is also extremely difficult and problematic.^{27,28}

Our technique can be used in patients with weakened capsular ligaments and a glenoid bone loss of 20%. In patients without substantial bone loss, our procedure has numerous advantages over the arthroscopic Latarjet procedure. In the presence of superior labrum from anteroposterior tears, our technique enables us to simultaneously treat this pathology with tenodesis of the long head of the biceps. By creating triple mechanisms of stability as with the Latarjet procedure (the bumper effect, reinforcement of ligaments, and sling effect), our procedure can significantly reinforce the Bankart procedure in cases of poor-quality glenohumeral ligaments.

Our procedure is also less traumatic, easier, and faster to perform, and revision can be easily achieved using the standard Latarjet procedure. Moreover, our procedure can be used together with the bone block in revision after the Latarjet procedure.

The main difference between our technique and Collin et al.¹⁶ and Tang and Zhao's¹⁵ is the transposition of the tendon. The graft is placed and fixed perpendicular to the glenoid rim to create a mostly dynamic stabilization effect as in the Bristow procedure. In our procedure, we fix the graft parallel to the glenoid rim, creating a neolabrum and anterior bumper effect as a soft-tissue block that is analogous to the bone block in the Latarjet procedure. Further, the grasping and passing of the long head of the biceps tendon are performed from the inside-outward direction by perforation with a suture grasper, causing less damage to the subscapularis than standard arthroscopic subscapular splitting with an ablator.

There are several limitations in our technique. It is not recommended for cases of glenoid bone loss >20% and significant Hill-Sachs lesions, but can be performed in combination with bone block or remplissage techniques. Poor quality of the biceps tendon, significant tendinitis, partial or total tear, or previous procedures with biceps tenodesis or tenotomy make our procedure absolutely impossible. Total absence of the capsule structure is not recommended because stabilization

effect of our procedure reinforces but does not replace the ligament totally. There is a risk of axillary nerve injury during subscapularis muscle perforation from the inside-outward direction. Using a switching stick as an elevator from an additional portal creates more space, improves the view, and protects neurovascular structures during subscapularis muscle perforation. This perforation should be always performed under visualization because of a very high risk of neurovascular injuries. Tables 1 and 2 summarize the advantages and disadvantages and pearls and pitfalls, respectively, of our technique.

In conclusion, the main stabilizing effect of our procedure is created by the synergy of the anterior labroplasty resulting from the soft-tissue block, sling effect of dynamic tenodesis, and refixation of the poor-quality glenohumeral ligaments. Future research is necessary to study incidents of recurrence, bicep pain, range of motion restrictions, and the possibility of using this technique for professional athletes.

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