

Modified Dynamic Anterior Stabilization with Labral Augmentation: Hanging Biceps Technique

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Abstract: Anteroinferior glenohumeral instability can be treated by variants of the Bankart repair, remplissage, and the Latarjet procedure, although all options remain associated with complications, including recurrence, stiffness, persistent pain, apprehension, and dislocation arthropathy. The authors therefore thought of a concept of dynamic anterior stabilization to treat anteroinferior glenohumeral instability by transferring the long head of the biceps within a subscapularis split to the anterior glenoid margin, thereby creating a “sling effect” by using a conservative technique. A standard Bankart repair is then to re-establish the labral damper effect. The main benefit of the dynamic anterior stabilization procedure is that it grants the “sling effect,” but is easier and safer than arthroscopic Latarjet. It does not require screws nor traction of the coracoid process, and should therefore reduce the risks of neurologic damage. Furthermore, the procedure can be performed with only 3 small incisions, because it does not require coracoid transfer, which eliminates risks of nerve dissection, graft overhang, and cortical resorption, hence reducing the probability for dislocation arthroplasty. Lastly, the pectoralis minor remains intact, which would avoid scapular dyskinesis.

Keywords: sling effect, long head of biceps, glenohumeral instability

1. Introduction

Anteroinferior glenohumeral instability can be treated by various surgical techniques, depending on whether the underlying etiology is labral tear (Bankart), humeral head lesion (Malgaigne or HillSachs), or glenoid bone defect. The treatment options include variants of the Bankart repair, which may be combined with remplissage, as well as the Latarjet procedure, all of which are associated with complications.

The Bankart repair reattaches the torn labrum to the glenoid rim, and is usually combined with a capsular shift in the inferosuperior direction that Neer and Foster described for multidirectional instability. The outcomes isolated Bankart repairs have been mediocre, with recurrence rates up to 67%, leading surgeons to supplement them with other protective procedures.

Remplissage is performed in the presence of humeral head lesions, by tightening the infraspinatus tendon and/or the teres minor muscle and posterior capsule within the defect, rendering it extra-articular. Common complications of remplissage include shoulder stiffness, persistent pain and failure of tendon healing.

When traditional arthroscopic Bankart repair is not possible due to severe capsulolabral deficiency, different types of open or arthroscopic subscapularis tendon augmentation or capsular reconstruction have been described.

The Latarjet procedure transfers the coracoid process to the anterior portion of the glenoid creating a “triple effect”: (1) osseous, extending the glenoid articular surface; (2) ligamentous, by coracoacromial ligament reinforcement of the inferior glenohumeral ligament; and (3) muscular, through conjoined tendon transfer that lowers the inferior portion of the subscapularis and acts as a sling on the inferior subscapularis and the anteroinferior capsule with the arm abducted and externally rotated.

The procedure is arthroscopically challenging, however, due to difficulties of screw positing, risks of nerve damage, and the need to fuse cortical bone to the glenoid. The Latarjet procedure is also associated with complications due to bone overhang, superior graft resorption, persistent apprehension, and recurrent dislocation.

The purpose of this Technical Note is therefore to present a dynamic anterior stabilization (DAS) to treat anteroinferior glenohumeral instability, by transferring the long head of the biceps (LHB) to the anterior glenoid margin, thereby creating a “sling effect” by using a conservative technique (Fig 1). Indications for DAS are anteroinferior glenohumeral instability with limited bone defects, associated with SLAP, or in overhead athletes and throwers. Conversely, contraindication for DAS would include the following: greater bone defects, presence of LHB lesions or spontaneous rupture, associated subscapularis lesion, and previous LHB tenotomy or tenodesis.

2. Surgical Technique

Preoperative Patient Positioning:

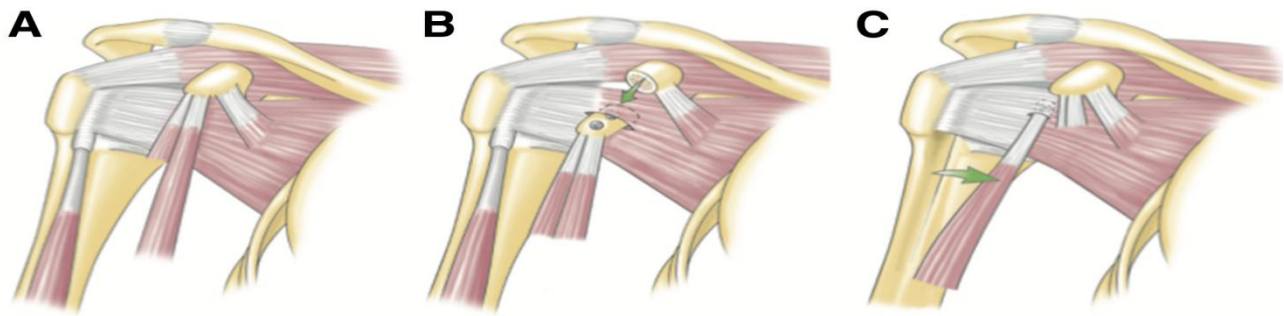
The operation, is performed in the semi-beach chair position under general anesthesia with an interscalene block. An examination under anesthesia is performed before prepping and draping the arm.

Pearls

- 1) Bicipital groove is opened laterally and distally to avoid detaching the subscapularis.
- 2) Use a switching stick through a posterior approach to retract the subscapularis during the split.

Pitfalls

- 1) Positioning of the drill on the anterior glenoid.
- 2) Difficulty of the subscapularis split.



(A) Native shoulder. (B) Latarjet procedure. The coracoid graft including the conjoint tendon is secured to the anterior glenoid by means of two 4.5-mm screws. (C) Dynamic anterior stabilization. The long head of the biceps is transferred to the anterior glenoid margin(B)

Initial Exposure and Portal Placement

An intra-articular approach is used through a standard posterior portal (soft spot); a standard diagnostic arthroscopy is performed with a 30 arthroscope and a pump maintaining pressure at 60 mm Hg. Anterolateral and anterior portals are then established by an outside in technique using a spinal needle as a guide. The rotator interval is opened, and the internal structures (glenoid defects, humeral defects) are further assessed with the probe (VAPR, DePuy Mitek, Raynham, MA).

Anterior Glenoid Preparation

From a lateral viewing portal, the labrum, if necessary, is detached from the glenoid, and a suture is passed around the labrum and pulled through the posterior portal to increase access for preparation of the anterior glenoid (Fig 2). The glenoid neck is cleaned from soft tissues at around 3 o'clock with a burr (Omnicut, DePuy Mitek).

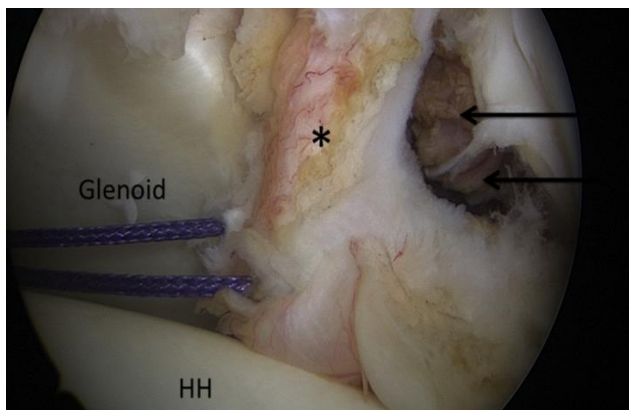


Figure 2: Intra-articular view of a right shoulder, anterolateral viewing portal. A suture is passed around the detached labrum and pulled through the posterior portal to increase access for preparation of the anterior glenoid. * indicates the labrum, the black arrows the access to the glenoid neck, and HH the humeral head.

Addressing the LHB and Subscapularis Split

The LHB is then tenotomized and the bicipital groove is opened laterally and distally to avoid detaching the subscapularis. The biceps is then exteriorized, secured using a SpeedWhip technique with No. 2 FiberLoop 20 mm from the proximal tendon. From a lateral viewing portal the subscapularis is exposed on 3 sides, together with the lateral margin of the conjoint tendon. Two options exist to create a split in the middle of the subscapularis above the junction of the superior two-thirds used in the standard Latarjet procedure:

From a lateral viewing portal, either a switching stick (Wissinger Rod) can be passed across the glenohumeral joint through a posterior approach at the level of the inferior glenoid (Fig 3), or an outside-in approach can be used. The switching stick is now found in the retrocoracoid space and maintained lateral to the conjoint tendon to avoid damaging the nerve plexus. The probe is then introduced through the anterior portal to complete the split.

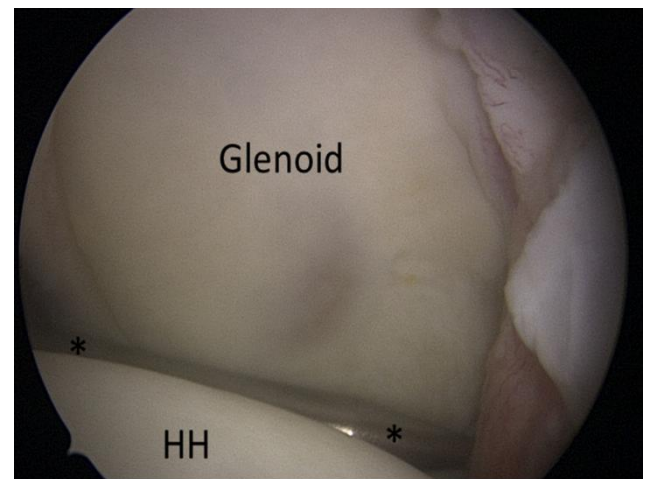


Figure 3: Intraoperative view of a right shoulder with passage of the switching stick (*) across the glenohumeral joint at the level of the inferior glenoid to the subscapularis. (HH, humeral head.)

LHB Tenodesis to Anterior Glenoid

A drill is then used to prepare a hole at 3 o'clock from anterior to posterior within the neck of the glenoid, 1.5 to 2.0 cm deep, depending on the length of the interference screw. The LHB tendon is then passed through the subscapularis split into the predrilled hole, to establish the "sling effect," and fixed using a SwiveLock Tenodesis screw (Arthrex) (Fig 4).

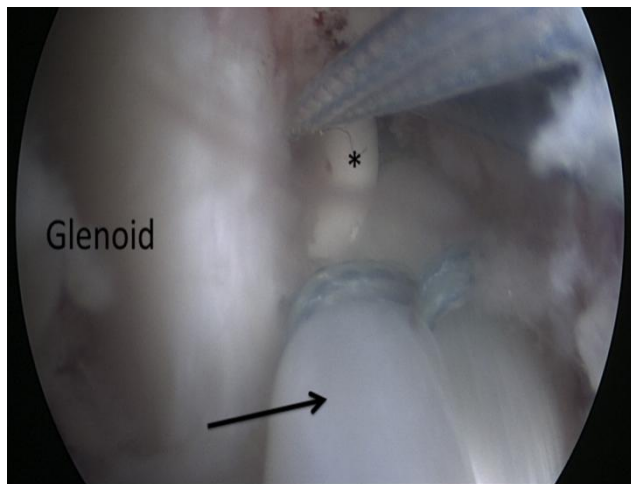


Figure 4: Intraoperative view of a right shoulder through the subscapularis split. The LHB tendon (black arrow) is fixed using a tenodesis screw (*) to establish the “sling effect.”.

Labral Repair

With the arthroscope through the posterior portal, a standard Bankart repair is performed using 2 to 3 suture anchors. The anchors are placed on the glenoid rim at 3, 4, and 5 o'clock to enable the retention of the capsuloligamentous structures and to re-establish the labral damper effect.

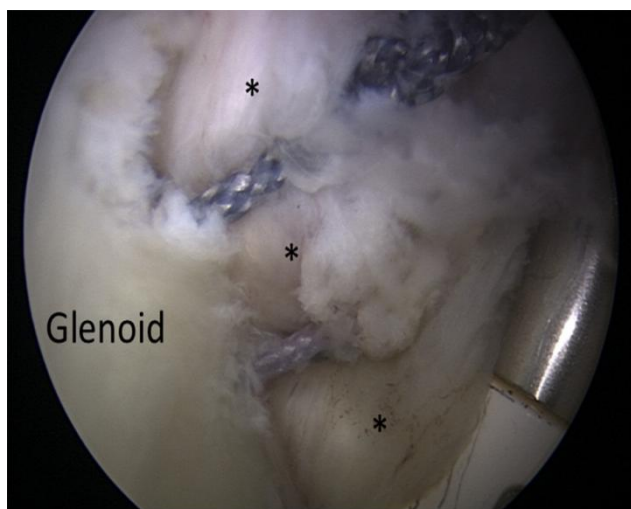


Figure 5: Intra-articular view through the posterior portal.

Associated capsulolabral repair using 2 to 3 anchors recreates normal articular concavity (bumper effect). The anchors are placed on the glenoid rim between 3 and 6 o'clock, depending on the lesion. * indicates the labrum.

Postoperative Rehabilitation

Patients are instructed to wear a simple sling for 10 days encouraging rest and reducing the risk of post-operative hematoma formation. Rehabilitation with self-mobilization in elevation and external rotation is allowed from day 0.

At 10 days, activities of daily living are allowed and self-mobilization in elevation and external rotation continued. Return to low-risk sports (e.g., jogging, cycling, and swimming) is allowed at 6 weeks, and high-risk (throwing and collision) sports at 3 months only after satisfactory clinical

and radiographic evaluations confirm satisfactory healing of the coracoid graft. Initially, no physiotherapy is recommended.

Nevertheless, if persistent apprehension is observed, a multidisciplinary approach can be recommended. This can include (1) a “reafferentation” of the shoulder based on a neuromuscular and proprioceptive work, (2) neurofeedback therapy, (3) a cognitive behavioural approach to decondition the pathological residual apprehension by highlighting to the patients that residual micromotion does not necessarily lead to recurrent instability, and finally with (4) a rotator cuff reinforcement to avoid further dysfunction due to muscle fatigue.

3. Discussion

Bankart, remplissage, and Latarjet procedures are proven treatments for anteroinferior glenohumeral instability. Each procedure has its set of limitations related to technical difficulties, recurrence of dislocation, and/or complications, which is why the authors sought other concepts for simplified techniques.

Furthermore, Giles et al. demonstrated in a biomechanical study that the “sling effect” is unlikely to limit internal-external rotation ROM beyond the native physiologic level. Therefore, the main benefit of the DAS procedure is that it not only grants the “sling effect,” but is also easier and safer than arthroscopic Latarjet. Moreover, it does not require screws nor traction of the coracoid process, and should consequently reduce the risks of neurologic damage. Furthermore, the procedure can be performed with only 3 small incisions, because it does not require coracoid transfer, which eliminates risks of nerve dissection, graft overhang, and cortical resorption, hence reducing the probability for dislocation arthroplasty. Lastly, the pectoralis minor remains intact, which would avoid scapular dyskinesis.

The potential drawbacks of DAS are that it relies on the LHB tendon, which has smaller diameter than the conjoint tendon, and could therefore have a weaker “sling effect” than that of the standard Latarjet. Also, like in the Latarjet procedure, the risks of biceps pain. Furthermore, it does not involve bony reconstruction, and may therefore be inadequate for cases with massive bone loss. We believe that the indications and limitations are yet to be defined and it is recommended that future studies are carried out with a more long-term follow-up. In view of the aforementioned pros and cons, the most suitable indications for DAS would be anteroinferior glenohumeral instability with limited bone defects (<20%). Conversely, contraindication for DAS would include the following: greater bone defects, presence of biceps lesions or spontaneous rupture, and previous LHB tenotomy or tenodesis.

Encouraged by the successes of previous techniques, it is believed that DAS presented here will provide a promising alternative to the surgical treatments for anteroinferior glenohumeral instability.