Technical Note

Modified Dynamic Anterior Stabilization and Labroplasty for Anterior Shoulder Instability With Concomitant SLAP Lesion

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Abstract: Several arthroscopic techniques to treat anterior shoulder instability have been described. Bankart repair may be insufficient in cases with some degree of bone loss, and arthroscopic Latarjet is technically challenging. It is not rare to find at the time of surgery a more extensive labral tear (SLAP lesion) or an insufficient anterior capsulolabral tissue. We describe for those cases a dynamic anterior stabilization where using the long head of the biceps we are treating the SLAP lesion and at the same time it provides the "sling effect" of a Latarjet procedure for the anterior instability.

Anterior shoulder instability is a very common pathology.[1] Several arthroscopic techniques to treat anterior shoulder instability have been described.[2] It is imperative to consider the type of lesion (bone loss, Hill-Sachs track, and associated lesions) and the patient's activity and laxity to choose the appropriate surgical procedure. Optimal treatment continues to be debated.[2,3] The most popular treatment options are Bankart repair with or without Remplissage and Latarjet.[2,4]

The concept of dynamic anterior stabilization (DAS) was recently described as an indication for cases where it is not enough to perform an isolated Bankart repair.[5] This technique transfers the long head of the biceps to the anterior glenoid rim through a subscapularis split to create a sling effect.[5]

On the other hand, SLAP lesions have been reported to occur in up to 25% of patients with recurrent shoulder instability.[6] In the treatment of SLAP lesions there is also controversy between performing a labral repair, tenotomy, or tenodesis of the long head of the biceps.[6,7]

The present article shows a modified technique for DAS through an anterior approach that may be especially useful in cases of instability with subcritical bone loss and concomitant SLAP lesions or cases with severe capsulolabral deficiency.

Surgical Technique

Our surgical technique is demonstrated in Video 1. The indications and contraindications for this technique are the same as those for the classical arthroscopic treatment of anterior shoulder instability without significant glenoid bone loss. The pearls and pitfalls are summarized in Table 1. The advantages and disadvantages are listed in Table 2.

We carry out the surgery with the patient under general and locoregional anesthesia (interscalene block). We place the patient in the beach chair position with the arm in forward flexion parallel to the body; we do not use traction (Fig 1).

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Table 1. Pearls and Pitfalls

Pearls
An anterior approach removing the rotator interval gives a better visualization of the labrum and subscapularis tendon
Posteroinferior plication adds stability
Placing the anchor for the LHB tenodesis at the base of the coracoid it's easier and safer than at the labrum rim
Pitfalls
Subscapularis split should be done after direct visualization and taking care of the axillary nerve
Preparation of the LHB all arthroscopically may be challenging

LHB, long head of the biceps.

Fig 1. Patient in the beach chair position; no traction used.

Anterior Arthroscopic Shoulder Approach

We begin by placing 2 portals for the anterior approach as we have described in a previous publication.[8] These portals could be called lateral (vision) and anterosuperior portals (working portal) or C/D portal (vision) and anterosuperior or D/E portal (working portal), according to Lafosse's nomenclature because they are located halfway between the original portals described by Lafosse et al.[9] (Fig 2). We first access the subacromial space.

We identify the coracoacromial ligament, which will be our superior landmark (Fig 3A) to remove the rotator interval. We recommend following the coracoacromial ligament to its insertion in the coracoid process to start opening the rotator interval from medial to lateral (Fig 3B), removing the coracohumeral ligament and the superior glenohumeral ligament. As we go deeper, care should be taken not to injure the long head of the biceps. Subsequently, we should clean the entire rotator interval and expose the base of the coracoid (Fig 3C). We must expose the conjoint tendon and dissect the clavipectoralis fascia to facilitate work on the anterior part of the shoulder. Care should be taken to avoid damage to the supraspinatus, biceps, and subscapularis tendons when opening the rotator interval. We must avoid going more medial to the coracoid process to prevent lesions to the vessels and brachial plexus. We move to the intra-articular space with the camera between the long head of the biceps and supraspinatus and perform an exhaustive diagnostic arthroscopy to rule out other articular injuries.

Table 2. Advantages and Disadvantages

Advantages
This procedure reinforces the Bankart repair in cases of poor quality of anterior labrum and GH ligaments
It can be used in subcritical bone-loss lesions
It adds the "sling effect" stabilization
Easier than arthroscopic Latarjet
Fewer risks of neurologic damage than arthroscopic Latarjet
It can be used together with a bone block in case of instability revision
Disadvantages
It requires higher surgical skills than a simple Bankart repair
Potential weaker "sling effect" than the Latarjet procedure because the LHB is smaller than the conjoint tendon.
Risk of biceps pain
There are no long-term studies on this technique

GH, glenohumeral; LHB, long head of the biceps.

Posteroinferior Plication

Using a vision C/D portal (lateral) with the arm in retropulsion position we expose the posterior labrum. We perform a posteroinferior percutaneous portal that also can be described as an inferior A portal or posteroinferior portal and without using cannulas we place an Iconix 1.4 anchor (Stryker, Kalamazoo, MI) at the

Fig 2. Right shoulder. Beach chair position. Arthroscopic portals.

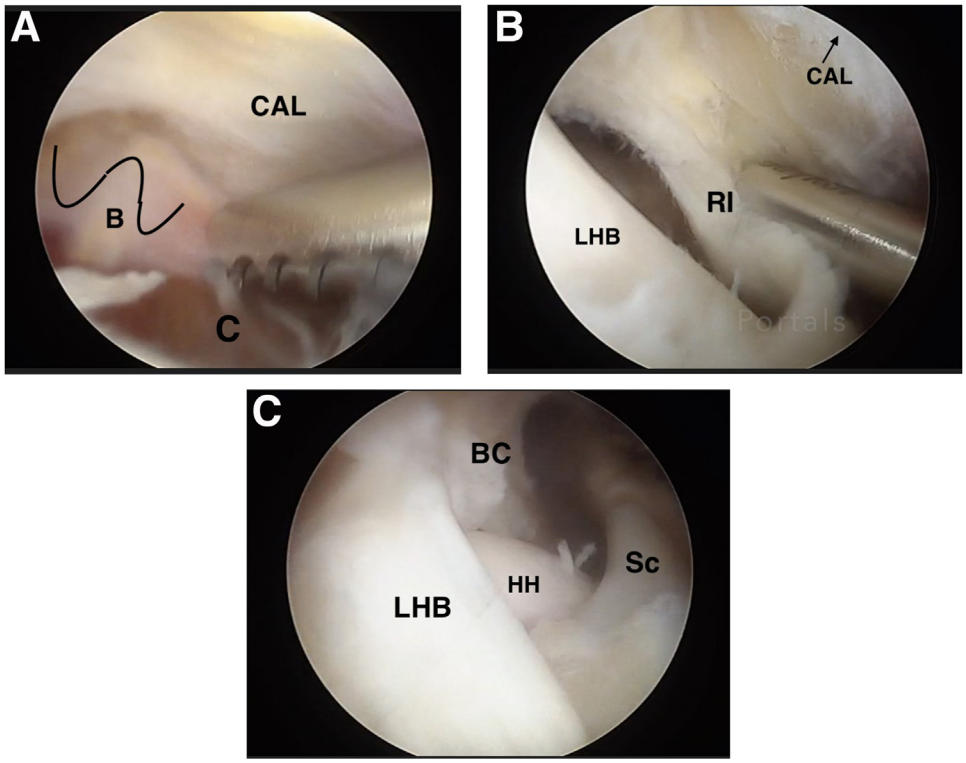

Fig 3. Right Shoulder. Camera in C/D portal (vision) and shaver in D/E portal (working portal). (A) CAL is our superior landmark, we remove the bursal tissue and follow the ligament to its insertion in the coracoid process. (B) Then we open the rotator interval, taking care not to damage the LHB. (C) We clean the entire rotator interval and expose the base of the coracoid and the subscapularis tendon. (B, bursal tissue; BC, base of the coracoid; C, coracoid process; CAL, coracoacromial ligament; HH, humeral head; LHB, long head of the biceps; RI, rotator interval; Sc, subscapularis tendon)

7 o'clock position (Fig 4A). A lasso-loop type suture is performed with a Sixter direct suture passer. To do this, we pass one of the strands with a lasso loop and the other one is directly retrieved (Fig 4B). We tie the knots at the end of the surgery, after the anterior repair.

Preparation of the Long Head of the Biceps

We create an anteroinferior portal (E portal) just lateral to the conjoint tendon, and we place the camera in the D/E portal (anterosuperior portal). The camera is held by the assistant, and the surgeon uses the suture loop grasper with a force fiber (Stryker) in portal E (anteroinferior) and a clever hook through the C/D portal (lateral) to perform a double lasso-loop on the long head of the biceps (Fig 5). To do this, the clever hook is passed through the tendon and grabs the force fiber, creating a first loop, and passes through the first loop and under the long head of the biceps (LHB), with one 1 creating a second loop (Fig 6A). The clever hook is passed again through the second loop and over the

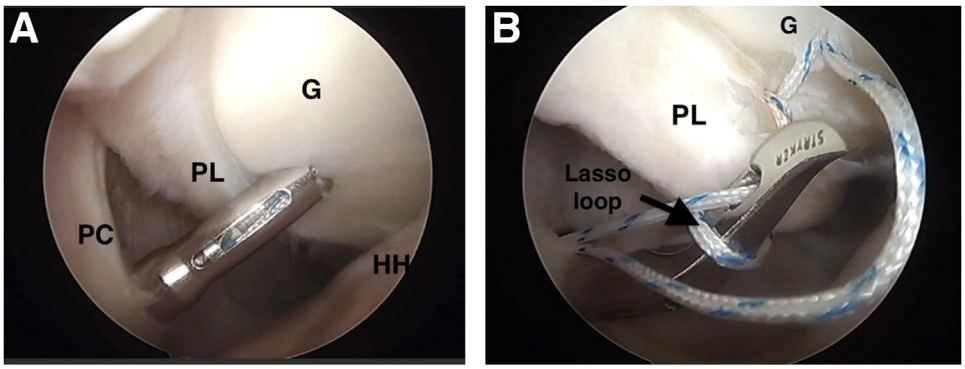

Fig 4. Right shoulder. Vision: C/D portal (lateral). Working portal: A' portal (posteroinferior). (A) We place an Iconix 1.4 anchor (Stryker) at the 7-o'clock position. (B) A lasso-loop type suture is performed with a Sixter direct suture passer. We pass one of the strands with a lasso loop, and the other one is directly retrieved. We tie the knots at the end of the surgery, after the anterior repair. (G, glenoid; HH, humeral head; PC, posterior capsule; PL, posterior labrum.)

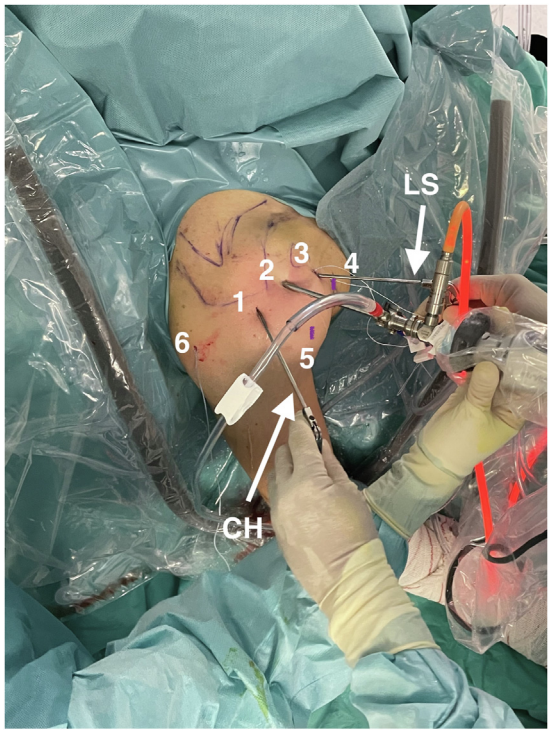

Fig 5. Right shoulder. Long head biceps preparation. We place the camera in the anterosuperior portal or D/E portal (2). We perform an anteroinferior portal, E portal (3) just lateral to the conjoint tendon. This and the lateral portal, C/D portal (1), will be our working portals. The camera is held by the assistant, and the surgeon uses the suture loop grasper with a force fiber (Stryker) in portal E (3) and a clever hook through C/D portal (1) to perform a double lasso-loop on the long head of the biceps (Fig. 5). (1 = portal C/D lateral; 2 = portal D/E anterosuperior; 3 = Portal E anteroinferior; 4 = portal M medial trans-pectoralis; 5 = subpectoral portal I; 6 = portal A posteroinferior with posteroinferior plication sutures; CH, clever hook passer; LS, Looped suture grasper.)

LHB and grabs the same strand, which is retrieved out of the C/D portal/lateral portal (Fig 6B). Both strands are retrieved out of the E portal (anteroinferior) with the suture loop grasper. Then, we proceed to perform the biceps tenotomy with the electrocautery device (Fig 6C).

Maintaining the camera in the D/E portal (anterosuperior), we slide it down the humerus to the pectoralis major insertion. We create a subpectoral I portal and an M portal (medial transpectoral portal) to retrieve the LHB out of its groove (Fig 7).

Subscapularis Split and LHB Tenodesis

Using an anterosuperior D/E portal for vision and an M portal as the working portal, we proceed to split the subscapularis tendon (Fig 8A). We pass the LHB through it, and we retrieve its sutures out of the E portal (Fig 8B). Then, we put the camera back to the lateral C/D portal, and we retrieve the LHB sutures through the anterosuperior D/E portal to use the anteroinferior E portal as the working portal. We tenodese the LHB at the base of the coracoid using an Omega anchor (Stryker), using the anteroinferior E portal to do the drilling and tapping. We therefore retrieve the LHB sutures at the E portal, and we use the Omega eyelet and screw (Fig 9).

Labroplasty

The LHB and the remaining anteroinferior labrum are sutured together with two Iconix 1.4 anchors (Stryker) at the 5- and 3-o'clock positions. A lasso-loop type suture is performed with a Sixter direct passer (Fig 10). Finally we knot the posteroinferior sutures.

Postoperative Management

The patient must wear a sling for 10 to 14 days, which can be removed for eating and grooming. Two weeks after surgery, the rehabilitation starts with passive and self-assisted exercises, followed by active exercises 4 weeks after surgery, and stretching and muscle strengthening after 3 months.

Discussion

To date, the effectiveness of concurrent Bankart and SLAP repair is still debatable in terms of the rate of postoperative recurrence of instability and consistency of functional outcomes.[10] Theoretically, the DAS technique offers a more effective option for these cases because we treat the instability by augmenting the Bankart repair and providing a sling effect, and, at the same time, we treat the SLAP lesion by tenodesing the LHB. This technique may also have better results than isolated Bankart repair in case of severe capsulolabral deficiency.[11]

Several biomechanics studies about DAS have been published. Lobao et al.[10] suggest that transferring the LHB has a similar sling effect to performing Latarjet so it may be effective in augmenting arthroscopic Bankart repair in cases of chronic instability with a labral tear but not in the presence of more than 20% anterior glenoid bone defect.[10]

Nicholson et al.[12] consider that DAS with Bankart repair may be ideally suited as a soft tissue procedure avoiding the increased complication profile of Latarjet procedures while offering increased stability for patients with 15% glenoid subcritical bone loss.[12] Similar results were previously found by Mehl et al.[13] Therefore the main benefit of the DAS procedure is that it achieves the "sling effect" similar to arthroscopic Latarjet, but it is an easier and safer technique because we are far from the brachial plexus.

Our technique differs from other DAS described in several steps. First, the anterior approach through the rotator interval provides a better view of the anterior labrum and better management of the subscapularis

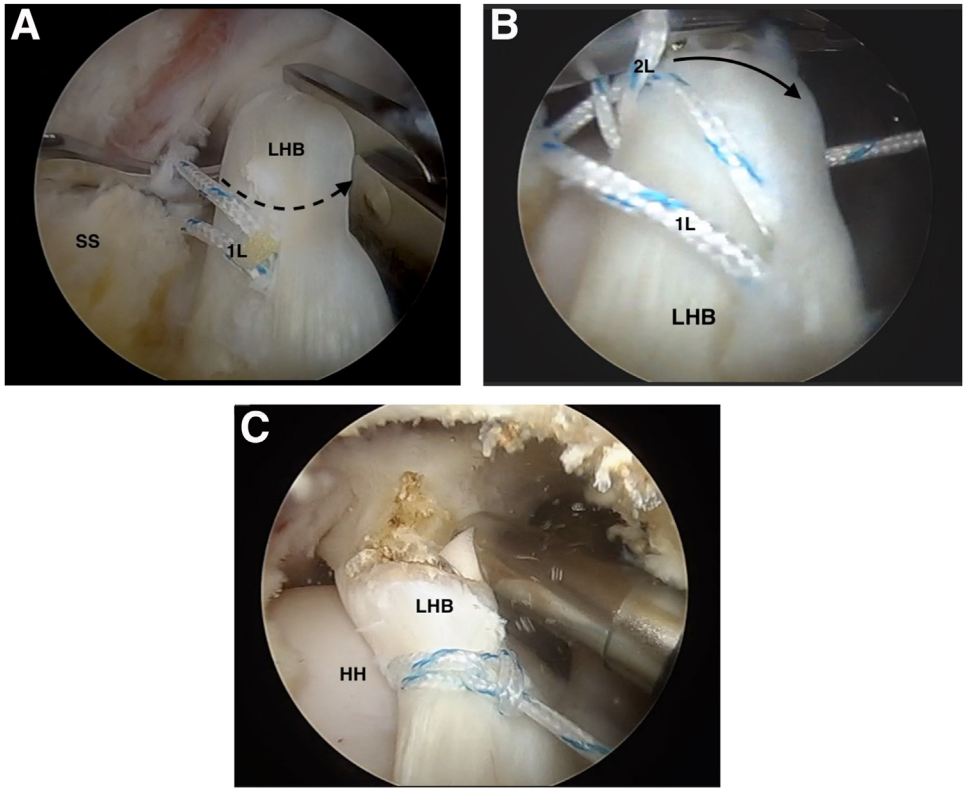

Fig 6. Right shoulder. Long head biceps preparation. (A) The clever hook passes through the tendon and grabs the force fiber, creating a first loop, and passes through the first loop and under the LHB and one strand, creating a second loop. (B) The clever hook passes again through the second loop and over the LHB and grabs the same strand, which is retrieved out of the C/D portal/lateral portal. (C) Both strands are retrieved out of the E portal (anteroinferior) with the suture loop grasper. Then, we proceed to perform the biceps tenotomy with the electrocautery device. (HH, humeral head; LHB, long head of the biceps; SS, supraspinatus tendon; 1L = first loop; 2L = second loop.)

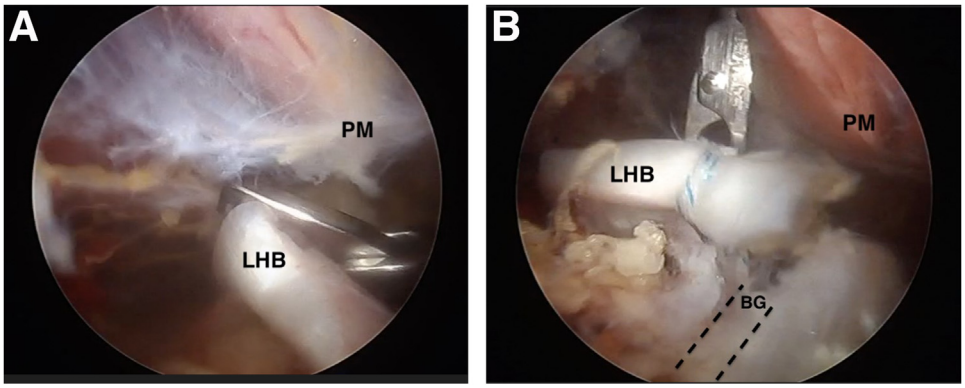

Fig 7. Right shoulder. Vision: D/E portal (anterosuperior). (6) We slide it down the humerus to the PM insertion. We create a subpectoral I portal and an M portal (medial transpectoral portal) (B) to retrieve the LHB out of its groove. (BG, bicipital groove; LHB, long head of the biceps; PM, pectoralis major.)

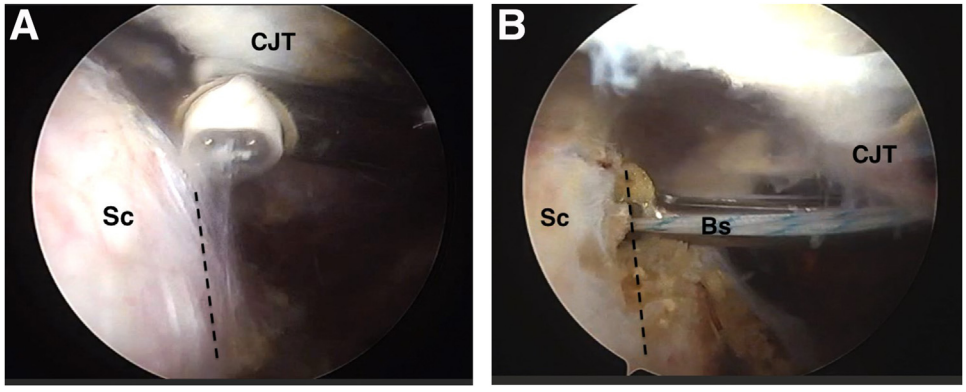

Fig 8. Right shoulder. Subscapularis split. Vision D/E portal (anterosuperior). (A) Using the M portal as the working portal, we proceed to split the subscapularis tendon. (B) We pass the LHB through it, and we will later retrieve the sutures out of the E portal (anteroinferior). (Bs, long head biceps sutures; CJT, conjoined tendon; Sc, subscapularis tendon.)

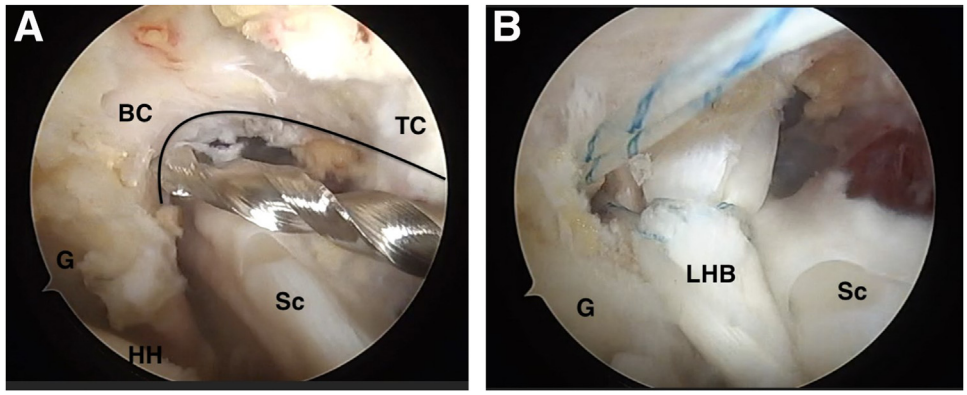

Fig 9. Right shoulder. LHB tenodesis. Camera at C/D portal. Working portal: Anteroinferior E Portal. (A) We use E Portal for drilling while LHB sutures are in the D/E portal. (B) We tenodese the LHB at the base of the coracoid using an Omega anchor (Stryker) Note: We must retrieve the sutures out of E portal after drilling and tapping to follow the same direction (where the LHB sutures are). (BC, base of the coracoid; G, glenoid; HH, humeral head; LHB, long head of the biceps; Sc, subscapularis tendon; TC, the tip of the coracoid.)

tendon split. Second, we perform the LHB suture preparation arthroscopically instead of exteriorizing the tendon as described by Collin and Läderman[5] and Milenin and Touissaint.[14] This may be an advantage in patients with thick soft tissue.

Another difference is the LHB tenodesis. We consider that placing the anchor at the base of the coracoid has less risk of damaging the glenoid cartilage compared to the classical position at the rim of the glenoid.[5,14] In addition, the present procedure also includes a posteroinferior plication that potentially could add more stability similar to remplissage but with less risk of losing range of motion as described by Werner et al.[15]

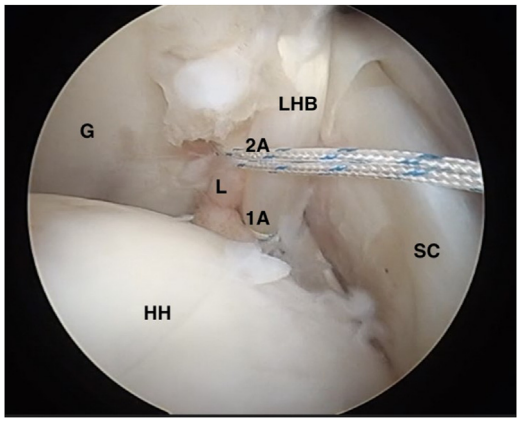

Fig 10. Right shoulder. Vision: lateral C/D portal. Working portal: Anterosuperior D/E portal. The LHB and the remaining anteroinferior labrum are joined together with two Iconix 1.4 anchors (Stryker) at the 5- and 3-o'clock positions. A lasso-loop type suture is created with a Sixter direct passer as we did at the posteroinferior plication. (G, glenoid; HH, humeral head; L, original labrum; LHB, long head of the biceps; SC, subscapularis tendon; 1A, first anchor at the 5 o'clock position; 2A, second anchor at the 3 o'clock position.)

In conclusion, the main stabilizing effect of our procedure is created by the synergy of the anterior labroplasty and the sling effect of dynamic tenodesis and secondarily by the posteroinferior plication. It is a good option for anterior instabilities with bone loss <15% with concomitant SLAP lesions or severe capsulolabral deficiency or hyperlaxity. Future research is necessary to study the incidence of recurrence, biceps pain, and range-of-motion restrictions of DAS and compare this technique with other treatment options such as Bankart repair with remplissage or Latarjet.

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