

The 360 Double Lasso Loop for Biceps Tenodesis: Tips and Tricks



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Abstract: The management of the intra-articular portion of the long head of the biceps tendon (LHB) is a recurring topic in every discussion about shoulder pain. In massive rotator cuff tears or in tears of the superior third of the subscapularis tendon, our approach is to systematically perform a tenodesis of the LHB. In this Technical Note, we present our arthroscopic technique for LHB tenodesis at the articular margin of the humeral head using a single anchor and a 360 double lasso loop. This technique guarantees a strong and efficient fixation of the biceps tendon and is reproducible when following the steps and tips and tricks outlined herein.

The management of the intra-articular portion of the long head of the biceps tendon (LHB) in arthroscopic rotator cuff repairs is an enigmatic concern raised in every discussion about postoperative shoulder pain.¹ Considered as a pain generator by many surgeons, most surgeons systematically perform a biceps tendon tenotomy or tenodesis with comparable outcomes² except for preventing Popeye's deformity, for which tenodesis is superior.³⁻⁵ In contrast, some prefer to respect the LHB and do not systematically disinsert it when repairing a rotator cuff tear or during other arthroscopic shoulder procedures involving the rotator cuff tendons and/or labrum. In our practice, a tenodesis of the LHB is systematically performed when managing a massive rotator cuff tear or a tear of the upper border of the subscapularis tendon

(SSc).⁶ To perform a biceps tenodesis, the simple Y-shaped tenotomy can be used.⁷ Thanks to the funnel shape of the LHB (which heals in the groove when it's intact), the occurrence of a Popeye sign can be prevented without the use of further hardware. Another option, outlined in this article, is to attach the LHB together with the anterior border of the supraspinatus tendon (SSp)^{8,9} on the most anteromedial anchor placed at the supraspinatus footprint. We use a double lasso loop (DLL) technique to improve the grasp on the biceps tendon: the 360° double lasso.¹⁰ The combined fixation with the anterior SSp provides a tendon-to-tendon suture between the LHB and the SSp. This technique also allows a neutralization of the pulling forces around the anchor, i.e. the LHB pulls laterally and downward, whereas the SSp pulls medially and upward. In this article, we describe the step-by-step technique to perform a 360 DLL around the LHB and to perform a tenodesis between the LHB and anterior border of the SSp in massive rotator cuff tears.

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The authors report that they have no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as [supplementary material](#).

Received February 17, 2021; accepted April 3, 2021.

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2212-6287/21284

<https://doi.org/10.1016/j.eats.2021.04.012>

Anatomy and Pathology Pattern

The procedure is always performed in the glenohumeral joint (GH); however, the visualization portal can be posterior or lateral, depending on the size of the rotator cuff tear. In summary, in massive rotator cuff tears with a complete SSp detachment, the visualizing portal should be lateral (C portal) and working portals anterolateral (D and E portals). In smaller rotator cuff tears, the visualizing portal must remain posterior (A portal) and the working one should go through the rotator interval (E portal). In this particular situation, a waiting portal can be made to retrieve the sutures to make the procedure less complex (posterolateral B

portal). The concept of the DLL is to increase the strength of the tissue grasp by wrapping the suture 360° around the biceps tendon. Its inconvenience is the loss of the ability to use a sliding knot, as the loops lock the suture around the tendon. Furthermore, the 2 strands behave differently as they pass through the anchor after 1 of the 2 strands is passed through the tendon performing a lasso, so care must be taken in their management:

- One strand pulls the lasso and the tendon towards the anchor: the post strand; and
- The other strand pulls the lasso and the tendon away from the anchor: the lasso strand.

The lasso strand does not slide through the tendon; therefore, pulling on it pulls the tendon away from the anchor, whereas pulling the post strand will compress the tendon onto the footprint where the anchor is placed.

Surgical Technique (With Video Illustration)

The surgery is performed with the patient under general anesthesia and locoregional anesthetics. The patient is positioned in a beach chair position with the affected arm in traction.

The following endoscopic portals are used (Fig 1):

- A: posterior portal (soft point).
- B: Posterolateral portal (through the infraspinatus at the level of the posterolateral angle of the acromion).
- C: Lateral portal, middle acromion, more distal than B and D portals. Describes an equilateral triangle with B and D.
- D: Lateral portal, underneath the anterolateral angle of the acromion and parallel to the upper border of the subscapularis.
- E: anterolateral portal through the rotator interval.

First Step: Working Portal Setup, GH Exploration

The surgery is always started through a classic posterior portal, providing access to the GH and enabling an assessment of the tear and the stability of the biceps tendon in its groove. The decision whether the biceps tenodesis is performed using the A or C portal as a viewing portal is made at this step. The E portal is created and used for debridement. In each case, the rotator interval is widely opened to ease the anterior access to the GH joint. Two different situations are possible after this first step.

Choosing the viewing portal to perform the DLL:

- If the rotator cuff tear is small, an anterolateral D portal is created, just above the biceps tendon, at the most anterior border of the SSp. As stated previously, a posterolateral B portal can be created to be used as a waiting portal for the unused strands.

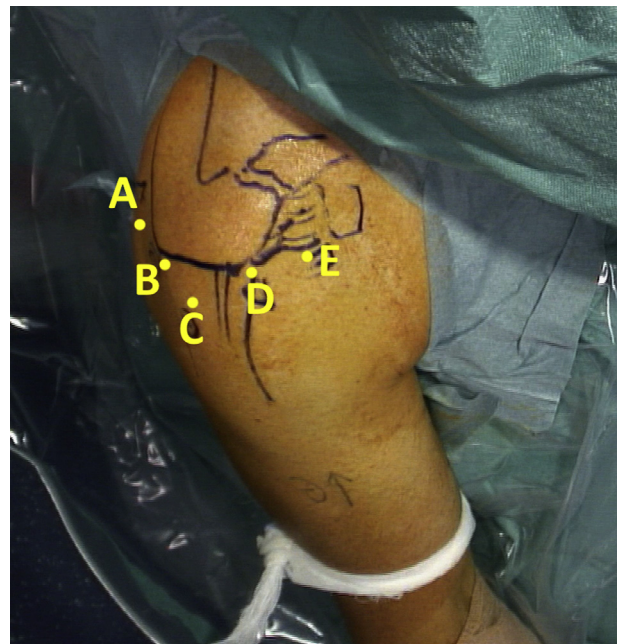


Fig 1. Position of arthroscopic portals (right shoulder). (A) Posterior portal (soft point). (B) Posterolateral. (C) Lateral portal, middle acromion. (D) Lateral portal, underneath the anterolateral angle of the acromion. (E) Anterolateral portal through the rotator interval.

- In case of a massive posterosuperior rotator cuff tear, the visualizing portal is switched to the C portal, enabling the surgeon to look at the biceps tendon from the lateral side. It is created under visual control. An important trick is to thoroughly debride the bursal tissue around the portal before switching the scope. In this case, anterior, anterolateral, and posterior portals are used as working portals around the cuff tear.

Second Step: Placement of the Anchor and Suture Management

The posterior view in the A portal, working portal anterolateral D, is shown in Figure 2A. The anchor (Iconix Speed; Stryker, Kalamazoo, MI) is placed at the upper part and posterior of the bicipital groove (Figs 2C and 3B, Video 1). If a repair of a small SSp tear is needed, it can be performed using the strands of this anchor after performing the biceps tenodesis. Placing the anchor immediately posterior to the biceps groove is a useful trick, enabling an easier suture management. A second trick, although not mandatory, is to create a posterolateral portal (B portal) to retrieve the sutures from the anchor, while the 360 lasso is performed. Through the B portal, 3 of the 4 strands are retrieved in this waiting portal. The remaining strand is therefore the only one left in the anterolateral D portal.

Posterior view in the A portal, working portals anterolateral E, and posterolateral B:

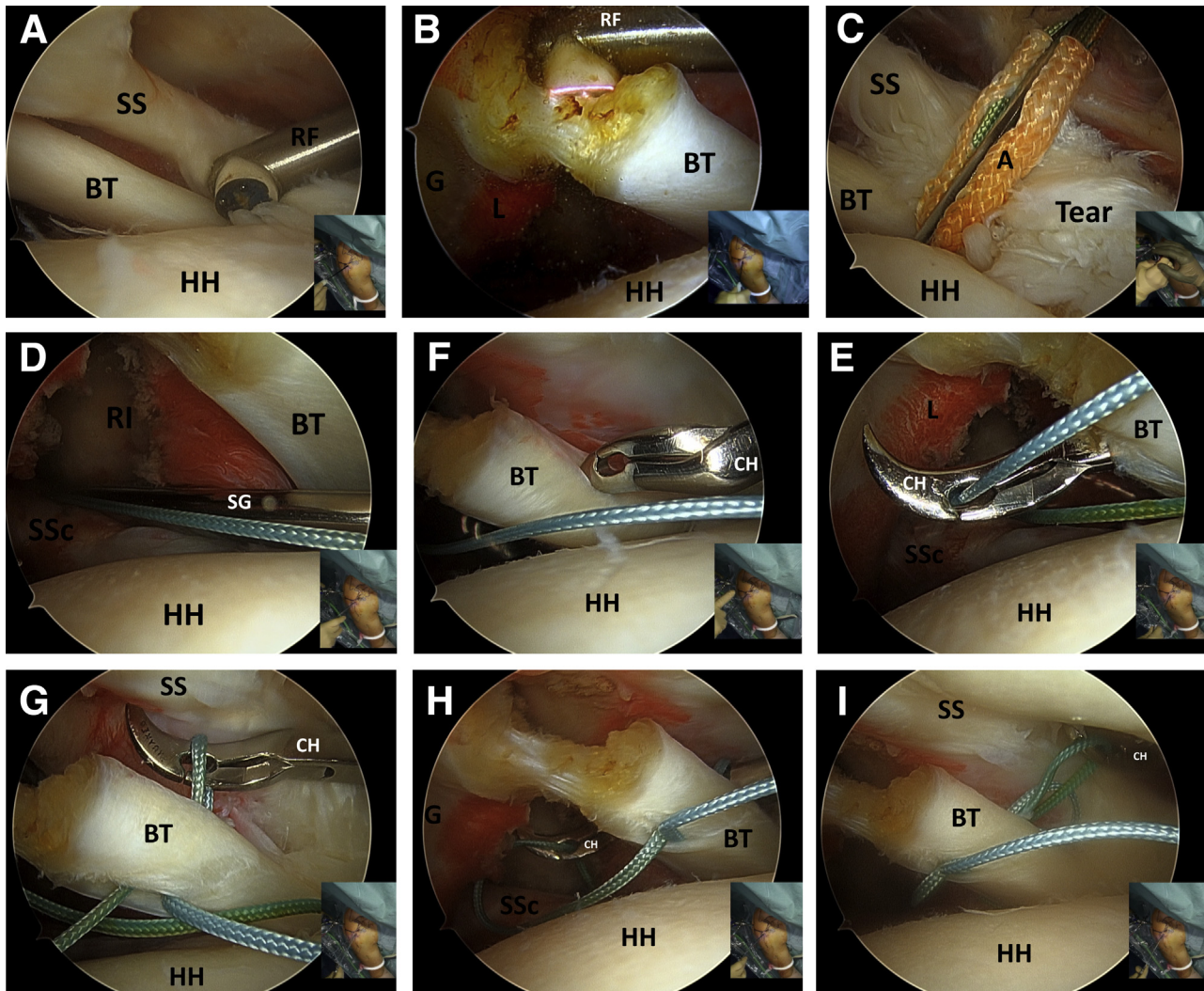


Fig 2. Intra-articular arthroscopic visualization of the right shoulder from the A portal (posterior) with the patient in the beach chair position. The D portal (lateral portal) serves as the working portal. (A) Initial assessment: a large crescent-shaped SS tear is visualized. (B): Marking the level of cut of the BT with a radiofrequency ablation probe (90-S Cruise, Serfas Energy; Stryker). (C) An all-suture anchor (Iconix Speed; Stryker) is placed posterior to the biceps tendon (D) Three of the four sutures are placed in a waiting portal; the remaining strand is pushed anteriorly and medially under the biceps using a suture grasper (E) A Cleverhook (DePuy Synthes) is passed through the BT. (F) The strand is caught by the Cleverhook. (G) The suture is retrieved through the tendon, making the first loop in which the Cleverhook is passed. (H) The Cleverhook is then passed anteriorly over the BT to catch the same strand. (I) The strand is retrieved through the loop, making a second loop. (J) The Cleverhook is passed through this second loop. (K) The free strand is caught posteriorly to the biceps. (L) The suture is retrieved through the loop and out of the shoulder. (M) The biceps cut is completed, and the suture is tightened: the 360 double lasso loop is done. (N) Then, the sutures can be passed through the SS before tying a nonsliding knot allowing a tendon-to-tendon suture between the SS and the BT. (A, anchor; BT, biceps tendon; CH, Cleverhook; G, glenoid; HH, humeral head; L, labrum; RF, radiofrequency ablation probe; RI, rotator interval; SG, suture grasper; SS, supraspinatus tendon; SSc, subscapularis tendon.)

In case of a massive posterolateral rotator cuff tear, we prefer to visualize the tear through the lateral portal. The biceps is therefore visualized from lateral to medial. The anchor is placed as described before at the upper part and directly posterior of the biceps groove. Three strands are retrieved posteriorly through the A or B portal, and the remaining strand is left alone in the anterolateral E portal.

Third Step: 360 Double Lasso

The key step when performing a 360 lasso is to correctly prepare and manage the lasso strand. It is important to keep in mind that the last strand that must be grabbed is the one exiting the shoulder through the anterolateral portal. This is the reason why pulling the other 3 strands out through the posterior or posterolateral portal makes the procedure

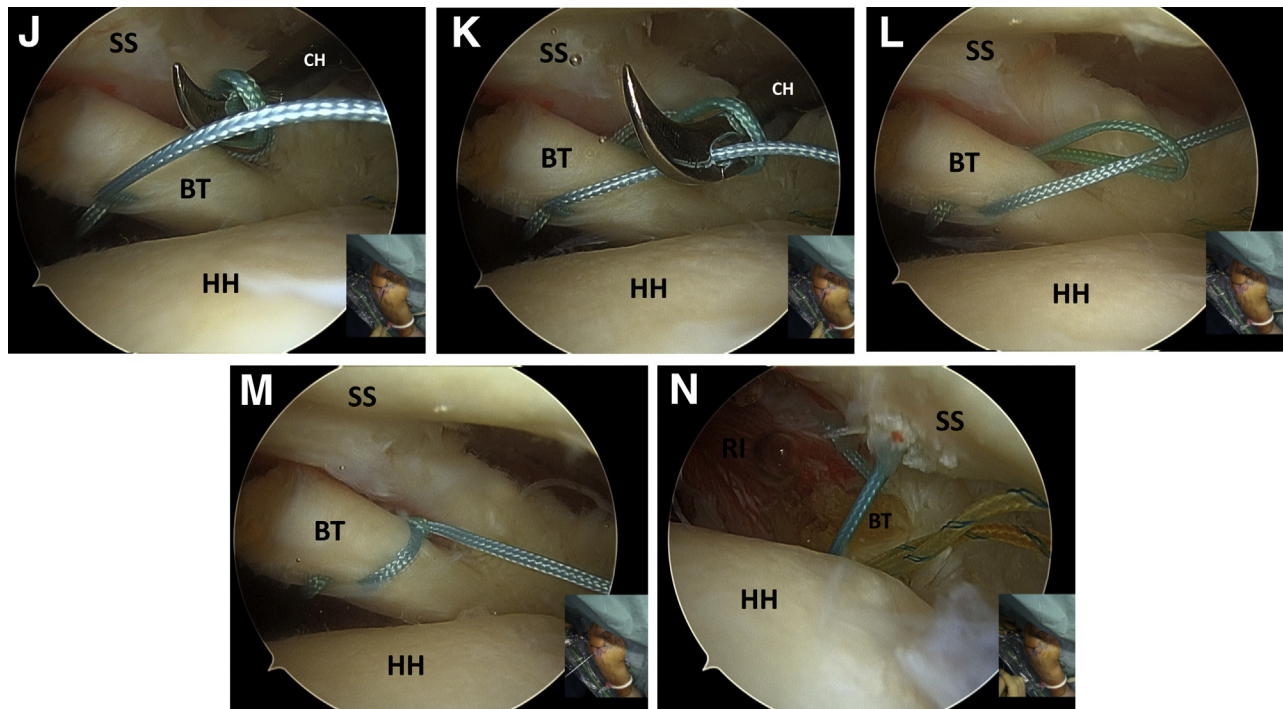


Fig 2. (continued).

easier. This step must be the same, regardless of the visualizing portal.

The lasso strand is pushed far medially with the help of a suture grasper (Figs 2D and 3C, Video 1), through the anterolateral portal D or E, along the superior border of the SSc tendon, passing from posterior and under the biceps tendon (remember the anchor was placed in a position enabling the strand to be behind the biceps). Once a substantial part of the suture is pushed anteromedially, superior to the SSc tendon, the Cleverhook (DePuy Synthes, Raynham, MA) is introduced in the anterolateral portal and passed through the biceps tendon (Fig 2E, Video 1). The gesture of passing the device through the tendon must always be an act of supination, regardless operating a right or left shoulder. In other words, in a right shoulder, a clockwise device must be used, whereas in a left shoulder it should be the counter-clockwise one.

Step 3 tips:

- Marking the level and performing half of the tenotomy of the biceps tendon with a radiofrequency ablation probe (90-S Cruise, Serfas Energy; Stryker) helps to localize the right spot to pass the suture through the tendon (Figs 2B and 3A).
- Placing the suture immediately under the biceps tendon (Figs 2C and 3B), where the Cleverhook device will exit the tendon, facilitates the gesture of grabbing the suture.

- Once the Cleverhook is passed through the tendon, the surgeon grabs the free strand (Figs 2F and 3D) and retrieves it through the tendon (Figs 2G and 3E, Video 1), by moving his instrument backward in pronation. A first loop is then created.¹¹ Care must be taken to smoothly pull the instrument out of the tendon, to keep the loop within the visualization area and avoiding pulling the strand out of the shoulder. The Cleverhook goes through the loop and is guided medially and anteriorly from the biceps tendon in order to grab the same strand of the suture again (Figs 2H and 3F). (Grabbing the suture anteriorly is eased by positioning the strand far medially above the superior border of the SSc tendon.) The suture is retrieved though the first loop, creating a second loop (Figs 2I and 3G). Again, care must be taken not to pull the suture too far out, to keep the second loop under visual control. The Cleverhook passes through the second loop (Fig 2J, Video 1), and grabs the free strand posterior to the biceps tendon (Figs 2K and 3H), exiting the shoulder through the anterolateral portal (Figs 2L and 3I). Grabbing the last strand is facilitated when the other 3 strands are previously positioned in a waiting portal. This prevents confusion and enhances suture management.

Fourth Step: Suture Tensioning and Biceps Final Cut

Once the 360 lasso loop is performed, the free strand that runs directly to the anchor is tensioned to tighten

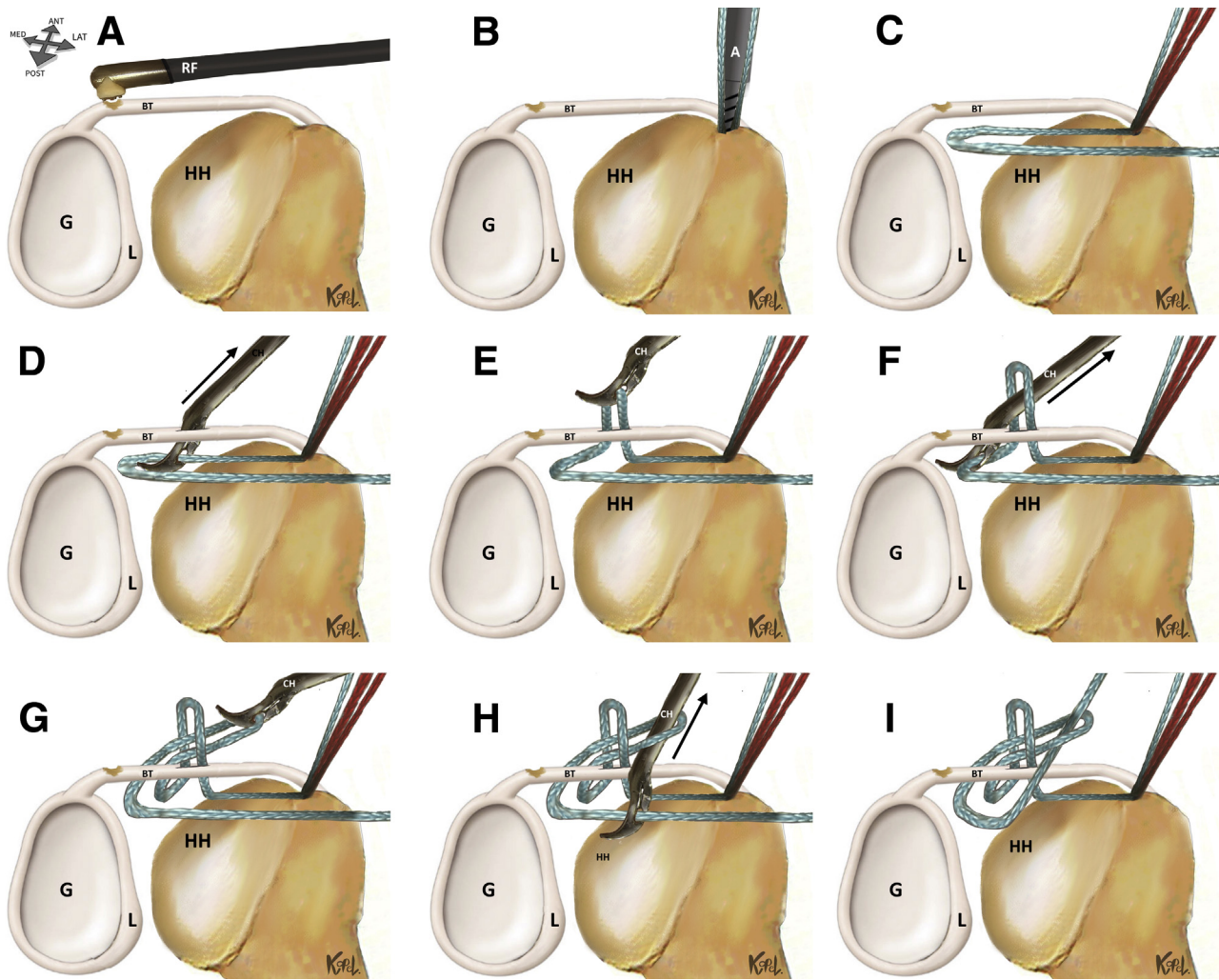


Fig 3. Illustrations summarizing the steps required to create the 360 double lasso-loop. Posterior view of a right shoulder. Letters correspond to those in the legend of [Figure 2](#). (B) Marking the level of cut of the biceps tendon with a radiofrequency ablation probe (90-S Cruise, Serfas Energy; Stryker). The cross in the upper left corner orients the illustration. (C) An all-suture anchor (Iconix Speed; Stryker) is placed posterior to the biceps tendon. (D) Three of the four sutures are placed in a waiting portal; the remaining strand is pushed anteriorly and medially under the biceps using a suture grasper. (E) A Cleverhook (DePuy Synthes) is passed through the biceps tendon to catch the strand. (F) The suture is retrieved through the tendon making the first loop. (G) The Cleverhook is passed through the loop and driven anteriorly over the biceps tendon to catch the same strand. (H) The strand is retrieved through the loop, making a second loop. (I) The Cleverhook is passed through this second before catching the free strand posteriorly to the biceps. (J) The suture is retrieved through the loop and out of the shoulder. (K) The biceps cut is completed and the suture is tightened: the 360 double lasso loop is done. (L) Then, the sutures can be passed through the SS before tying a nonsliding knot allowing a tendon-to-tendon suture between the SS and the biceps tendon. (A, Anchor; BT, biceps tendon; CH, Cleverhook; G, glenoid; HH, humeral head; L, labrum; RF, radiofrequency ablation probe; SS, supraspinatus tendon.)

the loops around the biceps ([Figs 2M and 3J, Video 1](#)). It is still easy to identify the lasso strand at this stage by pulling the biceps away from the anchor when tensioning it, so this strand should be marked by a knot at its extremity to prevent confusion after passing both strands through the SS. Tying a knot on the end of the lasso strand prevents it from going through a

knot pusher; this is the easiest way to remember to use the free strand as a post. The biceps is cut ([Figs 2M and 3J](#)). Pulling the post strand tightens the tendon on top of the anchor. The same strands can be passed through the anterior border of the supraspinatus tendon ([Figs 2N and 3K, Video 1](#)) when performing a rotator cuff repair, but always bear in mind that the

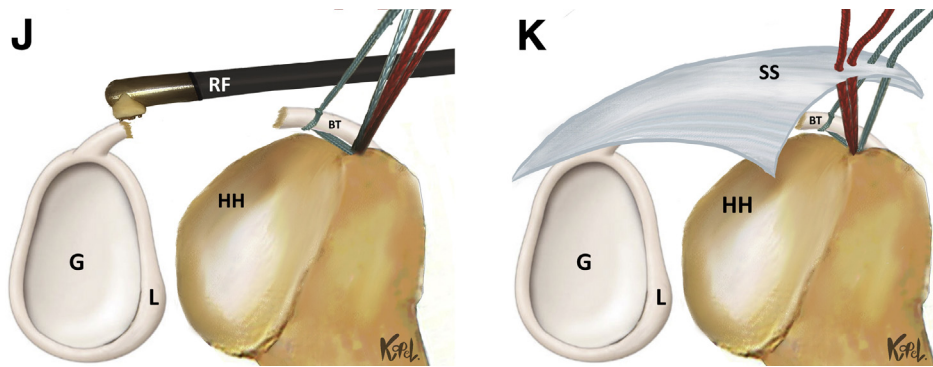


Fig 3. (continued).

free strand is the post strand. All tips and tricks are listed in Table 1.

Postoperative Care

The healing process requires the patient to prevent active mobilization of the shoulder. We recommend 6 weeks of immobilization using a shoulder brace supporting the elbow. Physiotherapy can be initiated at 6 weeks postoperatively.

Discussion

Considered as a pain generator, the LHB is often addressed by biceps tenotomy. In several situations, however, patients can benefit from a biceps tenodesis. In younger patients,¹² or for esthetical considerations,^{3,13} we prefer to perform a biceps tenodesis. The drawback from performing a tenodesis rather than a tenotomy is the risk of generating pain in the bicipital groove. Paying attention not to overtension the tendon should prevent postoperative pain. We have not encountered any complications using this technique, despite its regular use in our practice.

We believe this technique presents 2 main biomechanical advantages. The first one is the strong grasp that a double lasso¹⁰ wrapped around the whole tendon

in a 360° fashion provides, preventing longitudinal laceration of the tendinous fibers and secondary tearing of the biceps tendon. The second advantage is related to the tendon-to-tendon suture between the biceps and the anterior part of the supraspinatus tendon.⁸ The same anchor can be used to attach both tendons to the bone,¹⁴ which reduces the surgical cost and operative time. As demonstrated in hand surgery,¹⁵ the properties of a tendon-to-tendon suture enable better tendinous healing than tendon-to-bone. In addition, the forces applied on the anchor are neutralized by the opposite pull of both tendons. Indeed, the biceps pulls downward, laterally and anteriorly, whereas the supraspinatus pulls upward, medially and posteriorly. Advantages and limits of this technique are listed in Table 2. Further clinical and biomechanical studies are needed to evaluate the biomechanical properties of this technique and the clinical performance when used to augment supraspinatus tendon repair.

Table 2. Advantages and Limitations

Advantages	Limitations
<ul style="list-style-type: none"> • Simple and reproducible technique • Excellent visualization of tenodesis location and technique • No open incision needed, avoiding the related morbidity • Reduced cost, as the same implant is used for tenodesis and rotator cuff repair • Tendon-to-tendon suture with neutralization of opposite traction forces • This technique does not require special implants: any standard anchor can be used • No Popeye deformity and better cosmetic result 	<ul style="list-style-type: none"> • Risk of confusing the strands, which is limited by placing the 3 other strands in a waiting portal • Only nonsliding knots can be used to tie the tenodesis knots (as the 360 double lasso loop avoids the sliding capacity of the suture) • Unable to perform if the long head of the biceps tendon is scarred within the groove and immobile

Table 1. Tips and Tricks

- Debride the bursal tissue around the portal (before switching the scope).
- Place the anchor immediately posterior to the biceps groove.
- Create a posterolateral portal (B portal) to retrieve the sutures from the anchor.
- Marking the level by performing half of the tenotomy of the biceps tendon helps to localize the right spot to pass the suture through the tendon.
- Placing the suture immediately under the biceps tendon and anteriorly, where the Cleverhook device will exit the tendon, facilitates the gesture of grabbing the suture.
- Marking the lasso strand by a knot at its extremity prevents confusion after passing both strands through the supraspinatus tendon.

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