

Loop Biceps Tenotomy: An Arthroscopic Technique for Long Head of Biceps Tenotomy

Jean-Noel Goubier, M.D., Ph.D., Thomas Bihel, M.D., Elodie Dubois, M.D., and Frédéric Teboul, M.D., M.S.

Abstract: The long head of the biceps tendon is frequently involved in shoulder pathologies, often in relation to inflammatory or degenerative damage to the rotator cuff. Biceps tenodesis in the bicipital groove and tenotomy are the main treatment options. Tenotomy of the long head of the biceps tendon is a simpler and quicker procedure than tenodesis, and it does not require the use of implants. However, retraction of the biceps tendon, leading to Popeye deformity, and biceps muscle cramps are common complications after tenotomy. Therefore we propose an arthroscopic technique for tenotomy that limits the risk of Popeye deformity. This procedure consists of creating a loop at the severed end of the biceps tendon, which prevents the tendon from retracting into the bicipital groove.

Tenotomy of the long head of the biceps (LHB) is a frequently performed procedure during shoulder arthroscopy in the treatment of traumatic, degenerative, and inflammatory lesions of the LHB tendon, as well as in the treatment of entrapment of the tendon. Some surgeons routinely perform LHB tenotomy before acromioplasty or shoulder rotator cuff repairs. When indicated, tenotomy appears to be a simpler and quicker technique than biceps tenodesis. However, a common complication of this procedure is retraction of the LHB tendon (“Popeye deformity”). We propose a technique for biceps tenotomy that can prevent this complication (Tables 1-4).

Technique

While under general anesthesia, the patient is placed in the beach-chair position. A posterior approach is used to explore the glenohumeral joint and to locate the biceps tendon. Next, an anterosuperior-instrument approach is performed, and a sharp instrument

(BirdBeak; Arthrex, Naples, FL) is introduced through this portal. The tendon is penetrated by the tip of the instrument, immediately above the entrance to the bicipital groove (Figs 1A and 2 and Video 1). The length of the incision should be slightly shorter than the width of the biceps tendon to stabilize the finished structure. When the incision has been made, the sharp instrument is removed and replaced by a grasper (Pitbull Jr; Smith & Nephew Endoscopy, Andover, MA) (Fig 1B and Video 1). The grasper grabs the biceps tendon close to its insertion (Figs 1C and 3 and Video 1). A bipolar electrode is introduced through a second anterosuperior portal, and the biceps tendon is severed at its insertion on the supraglenoid tubercle (Figs 1C and 1D and Video 1). The cut must be located where the LHB tendon is at its largest and made without damaging the superior labral complex. Because the grasper is still attached to the biceps tendon, it prevents retraction of the tendon. By use of the grasper, the proximal end of the biceps tendon is forcefully pulled through the hole created by the first incision, thus forming a loop (Fig 1D and Video 1). The loop cannot come undone because the end of the LHB tendon is wider than the hole in the tendon. Given the diameter of the loop, the tendon will remain in its position at the entrance to the bicipital groove (Figs 1E and 4). If the remainder of the biceps tendon in the joint remains too long, it may be resected by a bipolar electrode.

In the absence of coexisting pathologies or repairs, postoperative rehabilitation begins 24 hours after the operation. Active and passive shoulder mobilization is carried out under the guidance of a physiotherapist.

From the International Center of Hand and Shoulder Surgery, Paris, France.

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Address correspondence to Jean-Noel Goubier, M.D., Ph.D., International Center of Hand and Shoulder Surgery, 92 Boulevard de Courcelles, 75017, Paris, France. E-mail: jngoubier@gmail.com

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Table 1. Key Points

LHB tendon tenotomy is a quicker and simpler technique than tenodesis; however, it may lead to Popeye deformity. Our loop biceps tenotomy technique decreases the risk of Popeye deformity and associated biceps cramps.

Table 2. Summary of Loop Biceps Tenotomy

The biceps tendon is penetrated by a small, sharp grasper at the entrance of the bicipital groove.
 The grasper grabs the LHB.
 A bipolar electrode severs the insertion of the LHB without injuring the labrum.
 The biceps tendon is pulled inside itself, creating a loop.

However, weightlifting is not permitted for the first 6 weeks after surgery.

We have performed this technique in 10 patients. At 3 months after surgery, all patients showed good pain relief in the bicipital groove and none had Popeye deformity development.

Discussion

The LHB tendon is frequently involved in shoulder pathologies due to inflammatory, degenerative, or traumatic lesions of the biceps tendon. Two surgical techniques currently exist for the treatment of this pathology: tenotomy and tenodesis of the LHB tendon.

Tenotomy of the biceps tendon is a simpler and quicker technique than tenodesis. Postoperative rehabilitation is also faster after tenotomy. In the tenodesis technique, implant complications may occur and additional approaches to the bicipital groove are often required. However, the difference in improvement, in terms of strength of elbow flexion, between the 2 techniques is not yet fully established.¹ In simple tenotomy the biceps tendon may slip in the bicipital groove, leading to a Popeye deformity. Both Popeye

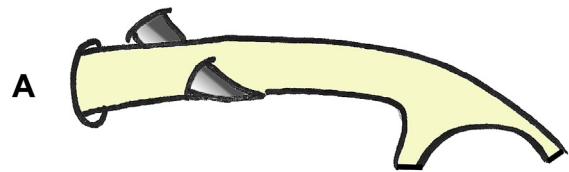
Table 3. Benefits and Risks

Benefits	Risks
Quick	Theoretical supination weakness
Simple	Theoretical pain in bicipital groove
Avoids Popeye deformity	
Avoids muscle cramp	
No implant complications	

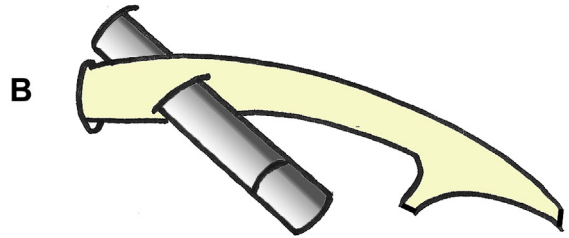
Table 4. Tips and Pitfalls

Tips	Pitfalls (if Tips Are Not Followed)
The hole in the LHB tendon must be small.	The loop may untie itself.
The hole in the LHB tendon needs to be close to the bicipital groove.	The grasper is too close to the proximal attachment of the LHB. Grabbing may be difficult.

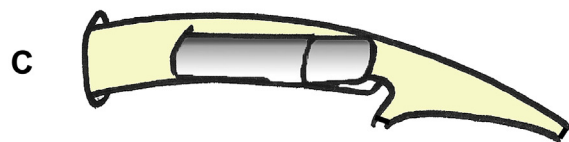
The biceps tendon is penetrated by a sharp instrument, creating a hole



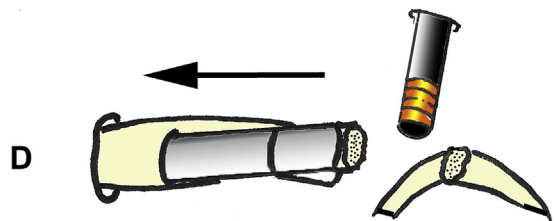
The sharp instrument is replaced by a grasper



The grasper holds the insertion of the biceps close to the labrum



The biceps tendon is cut using a bipolar electrode



The grasper is used to forcefully pull the proximal end of the tendon, creating a loop



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Fig 1. Loop biceps tenotomy technique.

deformity and fatigue cramping of the biceps are common, with a reported prevalence of 3% to 70%.²⁻⁵ As a result, several tenotomy techniques have been developed to prevent these complications. Bradbury et al.⁶ proposed cutting the biceps tendon so that a part of the superior labrum remains attached to the tendon, thereby increasing the size of the end of the tendon. However, this technique damages the labrum complex, and the resulting shape does not always prevent slipping of the tendon in the bicipital groove. Narvani et al.⁷

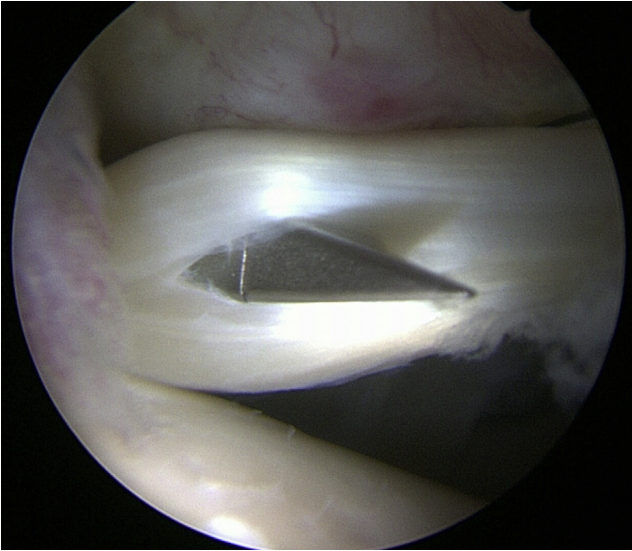


Fig 2. The biceps tendon is penetrated by a sharp instrument, creating a hole (Fig 1A). The width of this hole should be slightly less than the diameter of the biceps tendon.

proposed an anchor-shaped technique for biceps tenotomy, in which the end of the biceps tendon is split longitudinally, thus creating an anchor that maintains the tendon's position at the entrance to the groove. However, this technique is not always suitable for pathologies that include degenerative damage to the biceps tendon. In this article we propose the straightforward

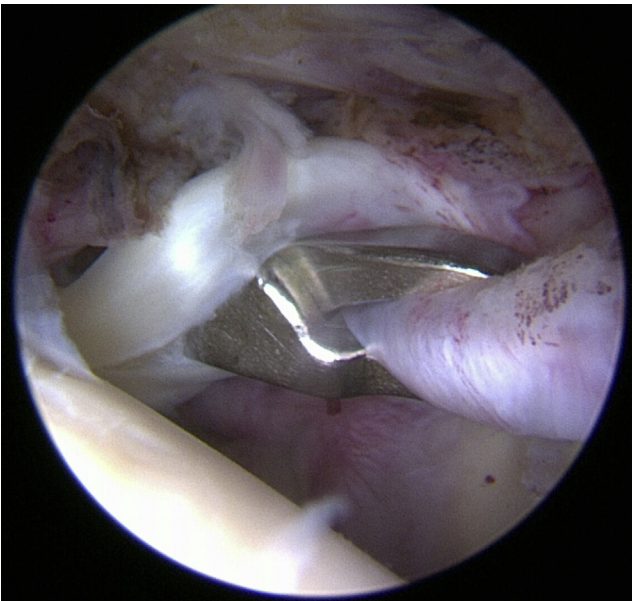


Fig 3. The sharp instrument is replaced by a grasper (Fig 1B), which holds the insertion of the biceps close to the labrum (Fig 1C). The biceps tendon is then cut with a bipolar electrode (Fig 1D). The section of the LHB tendon must be performed at the point at which the width of the LHB tendon begins to increase, without injuring the superior labral complex.



Fig 4. After the biceps tendon has been severed, the grasper is used to forcefully pull the proximal end of the tendon into the newly created hole, thereby creating a loop. The diameter of the hole is slightly smaller than the end of the severed tendon, thus securing the loop (Fig 1E).

technique of tenotomy in which a loop is created on the biceps tendon, without the use of implants. This technique is even suitable in cases of partial damage to the tendon. A prerulepture situation, however, may be a limitation of this technique because the biceps tendon is thin and the loop may become untied.

A theoretical risk of the described technique is pain in the bicipital groove as a consequence of the residual biceps tendon being present. None of our patients, however, had pain after the recovery period. However, this series is short, and for these results to be confirmed, it needs to be extended.

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