

# The All-Inside Arthroscopic Loop Tenodesis Procedure to Treat Long Head of Biceps Tendon Pathologies



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**Abstract:** A variety of techniques are available to treat pathologies of the long head of the biceps tendon. Next to a simple tenotomy and different tenodesis techniques, the loop tenodesis procedure was recently introduced. This technique represents an arthroscopically assisted surgical method for the treatment of biceps tendon disease. This procedure is based on an enlargement of the proximal tenotomized tendon to create a stable fixed tendon without foreign material to prevent distalization of the biceps muscle. This article describes an all-inside arthroscopic loop tenodesis procedure. By use of a special stitch configuration, the long head of the biceps tendon loop can be created in an all-arthroscopic manner, resulting in a stable fixed tendon at the entrance to the bicipital groove (autotenodesis). No foreign materials and only 2 arthroscopic portals are necessary for this biceps tenodesis procedure.

Lesions of the long head of the biceps (LHB) are a common cause of anterior shoulder pain. Although distalization of the biceps muscle can often be observed after simple LHB tenotomy,<sup>1-3</sup> implant-associated complications can occur with bony tenodesis techniques using an anchor or interference screw.<sup>4-6</sup>

Recently, the loop tenodesis procedure was presented—an arthroscopically assisted technique that enlarges the tenotomized proximal LHB diameter by creating a tendon loop and supports the self-locking mechanism with a subsequent stable “autotenodesis” at the entrance to the bicipital groove.<sup>1</sup> This article describes a further development of this technique called the “all-inside arthroscopic loop tenodesis procedure.” By use of a special stitch configuration, the LHB loop can be created in an all-arthroscopic manner without

foreign material and with only 2 arthroscopic portals (Video 1).

## Surgical Technique

### Preoperative Planning

Next to full functional assessment and clinical examination, magnetic resonance imaging is required to determine the type of LHB lesion and concomitant pathologies.

### Patient Positioning

All procedures are performed with the patient under general anesthesia and with perioperative antibiotics. The patient is placed in the beach-chair position. The affected arm is fixed in a supporting device. The bony landmarks are identified and marked.

### Portal Placement and Diagnostic Arthroscopy

The arthroscopic procedure requires 2 portals: a standard posterior viewing portal for diagnostic arthroscopy and bursoscopy and an anteroinferior working portal. Diagnostic arthroscopy through the posterior portal is used to identify structural lesions of the LHB complex and concomitant pathologies. The next step is to create an anteroinferior working portal for dynamic and palpatory examination of the SLAP complex, as well as the intra-articular portion of the biceps and the pulley complex. Using a cannula is

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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 June 20, 2019; accepted August 15, 2019.

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2212-6287/19801

<https://doi.org/10.1016/j.eats.2019.08.005>

recommended to create a stable anteroinferior working portal.

### LHB Stitch Configuration

A special stitch configuration is necessary to prepare the LHB for the later loop (Figs 1 and 2). The use of a self-retrieving suture passer is recommended for this purpose. First, a No. 2 FiberWire (Arthrex, Naples, FL) is passed through the LHB about 2.5 cm distal to the SLAP complex (Fig 2A). Next, the tendon is penetrated close to its base in a caudocranial manner (Fig 2B) to create a horizontal mattress stitch configuration. The tendon is now provided with a second horizontal stitch configuration. Therefore, the tendon is penetrated in a craniocaudal manner close to its base (Fig 2C) and 2.5 cm further distally in a caudocranial direction (Fig 2 C and D). The LHB is now prepared with a double-mattress stitch configuration (Fig 1).

### LHB Tenotomy and LHB Loop

After finalization of the double-mattress stitch configuration, the LHB is tenotomized close its base using an electrothermal instrument (Fig 3A). By tensioning and knotting the sutures using a knot pusher, the LHB loop is created automatically (Fig 3B). After the sutures are cut, the LHB loop is released and blocks itself stable at the entrance of the bicipital groove

(Fig 3C). According to the presence of additional pathologies, any concomitant procedures are performed after finalization of the all-inside arthroscopic loop tenodesis procedure.

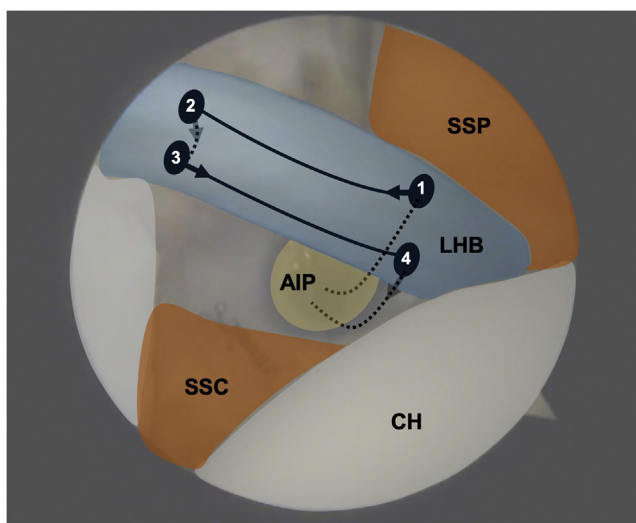
### Postoperative Rehabilitation and Treatment

The postoperative rehabilitation protocol follows recommendations for arthroscopic tenodesis procedures. All patients undergo a supervised physical therapy program. The protocol includes use of a sling that protects the LHB with the elbow flexed 90 and in a neutral rotation position for 4 weeks. Passive range of motion is initiated from day 2 after surgery until 6 weeks. Patients are informed to avoid any elbow flexion and supination maneuvers against resistance for 6 weeks. In addition, an upper-arm bandage has to be worn for 6 weeks after surgery. Depending on the presence of additionally performed procedures, alterations of the postoperative rehabilitation protocol can be required.

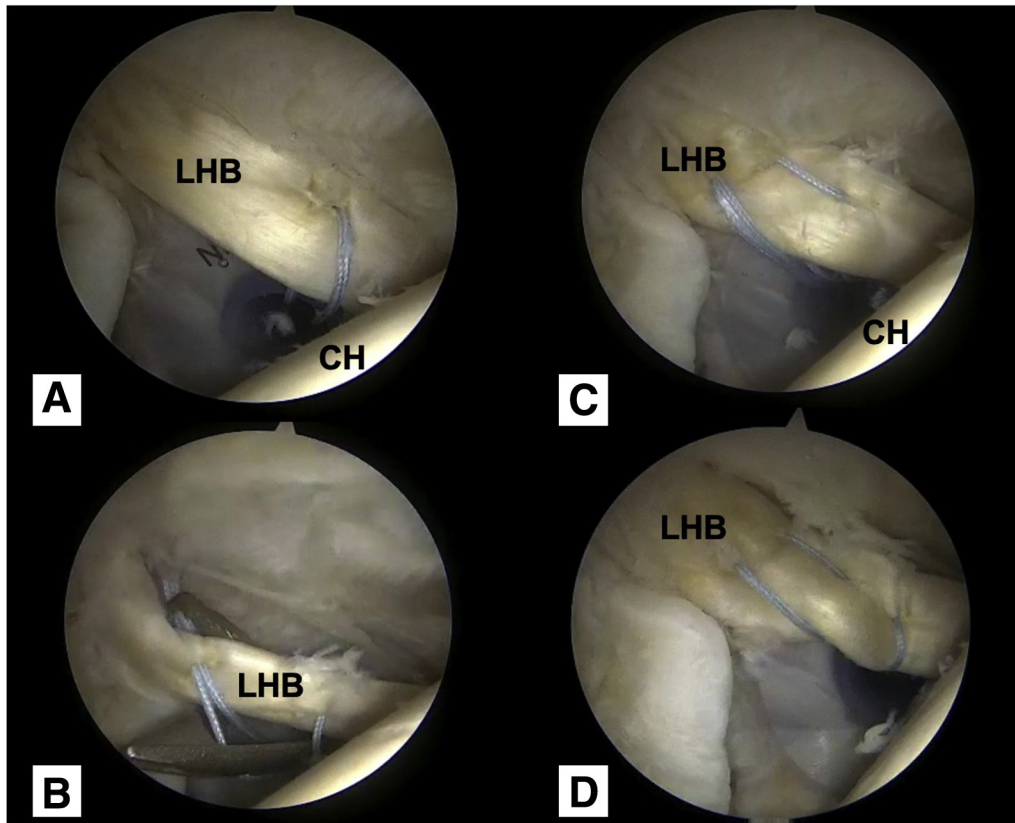
### Discussion

Next to a simple tenotomy of the LHB, different tenodesis techniques are available to treat LHB tendon pathologies.<sup>7</sup> In particular, bony fixation techniques are recommended to reduce complications caused by distalization of the biceps muscle, observed after simple tenotomy.<sup>2,3,8</sup> Recently, the loop tenodesis procedure has been introduced.<sup>1</sup> This technique is based on the self-locking potential of the tenotomized LHB at the bicipital groove.<sup>8</sup> Enlarging the proximal diameter of the tendon by creating a loop results in a stable autotenodesis of the LHB at the entrance to the bicipital groove without any implant.<sup>1</sup> After tenotomy, the LHB is pulled in an extracorporeal manner through an anterolateral portal, and the loop is created outside the shoulder. This article describes a further development of this technique: the all-inside arthroscopic loop tenodesis procedure. By use of a special stitch configuration, the LHB loop can be created in an all-arthroscopic manner with only 2 arthroscopic portals. This technique combines the advantages of both simple tenotomy and tenodesis. The similarity to a simple tenotomy makes this technique quickly feasible, resulting in a stable fixed tendon without an anchor or other foreign materials. The new stitch configuration allows all-arthroscopic loop creation without the need to pull the tendon in an extracorporeal manner through an additional portal.

In case of high-grade pulley lesions, limited primary stability of the LHB loop with subsequent distalization of the biceps muscle could be a limitation of the described technique. Furthermore, the occurrence of anterior shoulder pain caused by the tendon loop could be conceivable. Compared with the



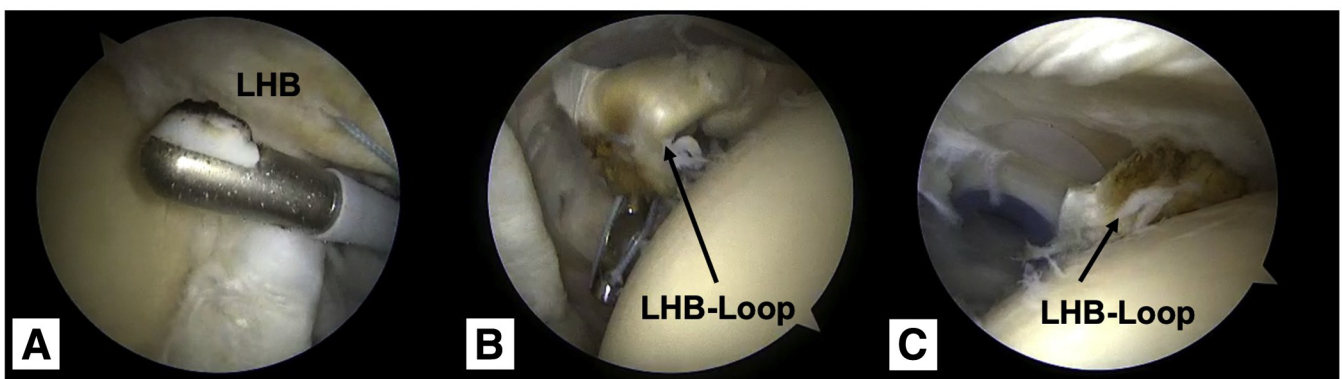
**Fig 1.** Long head of biceps (LHB) tendon stitch configuration: arthroscopic visualization of the right LHB from the posterior portal with the patient placed in the beach-chair position, showing stitch 1 about 2.5 cm distal to the SLAP complex (1); stitch 2 in a caudocranial direction close to the tendon's base (2); stitch 3 in a craniocaudal direction close to the tendon's base (3); and stitch 4 in a caudocranial direction about 2.5 cm distal to the SLAP complex (4). (AIP, anteroinferior portal; CH, caput humeri; SSC, subscapularis tendon; SSP, supraspinatus tendon.).



**Fig 2.** Arthroscopic visualization of the right long head of the biceps (LHB) from the posterior portal with the patient placed in the beach-chair position. (A) First stitch about 2.5 cm distal to the SLAP complex. (B) Second stitch close to the tendon's base in a caudocranial manner. (C) Third stitch in a craniocaudal manner close to the tendon's base. (D) Fourth stitch about 2.5 cm distal to the SLAP complex, next to the first stitch, in a caudocranial direction. (CH, caput humeri.)

arthroscopy-assisted technique,<sup>1</sup> folding of the tendon loop can be impaired in the all-inside loop tenodesis procedure because of an unfavorable stitch configuration. As a result, the self-blocking potential of the tendon cannot be fully achieved and tendon slippage is possible.

**Table 1** summarizes the advantages and limitations of our technique. Because of its properties, all-inside loop tenodesis is a smart all-arthroscopic procedure and can close the gap between simple tenotomy and tenodesis; it might be suitable for both young and old patients with biceps tendon pathologies.



**Fig 3.** Arthroscopic view of a right shoulder from the posterior portal with the patient placed in the beach-chair position. (A) Tenotomy of the long head of the biceps (LHB) tendon close to its base using an electrothermal instrument. (B) Tensioning and knotting of the sutures using a knot pusher. (C) The released LHB loop blocks itself stable at the entrance of the bicipital groove.

**Table 1.** Advantages and Limitations of All-Inside Arthroscopic Loop Tenodesis Procedure

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Advantages
All-arthroscopic technique
Relatively easy to perform
Short duration of surgery
Low risk of intraoperative complications
No anchor or screw necessary
Low risk of infection
Stable fixed tendon
Only 2 arthroscopic portals necessary
Limitations
Limited primary stability in case of high-grade pulley lesion
Disturbed folding of loop due to unfavorable stitch configuration
Lack of clinical data

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