

Arthroscopic Identification and Management of Hourglass Biceps



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Abstract: The hourglass biceps is a condition in which the intra-articular portion of the biceps tendon becomes inflamed and hypertrophies relative to the remaining tendon. This condition can be seen in association with rotator cuff and labral pathology and may lead to anterior shoulder pain. Diagnosis requires careful visualization and inspection of the biceps tendon during shoulder arthroscopy, as the presentation may be subtle. Surgical treatment includes tenotomy or tenodesis, depending on patient factors and surgeon preference.

The long head of the biceps tendon (LHBT) originates from the supraglenoid tubercle and superior labrum, traveling through the glenohumeral joint and coming out distally through the bicipital groove.¹ The intra-articular portion of the LHBT is stabilized by a pulley system comprising the coracohumeral ligament, superior glenohumeral ligament, and portions of the subscapularis and supraspinatus tendons.¹ As it travels distally into the bicipital groove, the LHBT is stabilized by the transverse humeral ligament.¹ While the function of the LHBT in the shoulder remains controversial, it is thought to play a role in glenohumeral joint stabilization and humeral head depression.^{1,2}

LHBT pathology is a common source of anterior shoulder pain and is associated with many shoulder conditions, including labral tears, rotator cuff tears, and glenohumeral arthritis.¹⁻³ The hourglass biceps, first described by Boileau et al.³ in 2004, is defined as when the intra-articular portion of the LHBT becomes

inflamed and subsequently hypertrophies. While the exact cause is unknown, and likely multifactorial in nature, it is thought to result from (1) a compensatory mechanism for a rotator cuff tear, (2) repetitive friction of the tendon in a narrow bicipital groove, and (3) impingement against the coracoacromial arch.³ As a result, the size difference between the LHBT and the bicipital groove prevents normal gliding during shoulder motion, leading to incarceration of the tendon in the joint.^{3,4} This entrapment of the LHBT can potentially lead to pain and dysfunction.^{3,4}

Conservative treatment of LHBT pathology include activity modification, physical therapy directed at any associated shoulder pathology as well as strengthening the periscapular musculature, nonsteroidal anti-inflammatory medications, and a steroid injection in either the glenohumeral joint or the biceps tendon directly.² Nonoperative treatment occasionally leads to spontaneous rupture of the LHBT, which may relieve the pain, but can lead to a Popeye deformity as well as decreased elbow flexion and supination strength.²

Surgical management of the symptomatic hourglass biceps includes biceps tenotomy or tenodesis. While both are acceptable options, the ultimate decision depends on patient factors including age, occupation, activity level, and patient expectations. Assessing these factors necessitates an informed conversation between patient and surgeon.

Surgical Technique (With Video Illustration)

The assessment and treatment of an hourglass biceps tendon can be performed with the patient in either the lateral decubitus or beach-chair position. After the induction of anesthesia, both shoulders are thoroughly

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examined for passive range of motion and stability. The procedure begins with standard posterior and anterior glenohumeral joint portals. A 30° arthroscope is used to perform a standard diagnostic arthroscopy, evaluating the intra-articular structures, including the LHBT. The identification and management of 3 different hourglass biceps pathologies are demonstrated in [Video 1](#).

In the first example, the biceps tendon is initially evaluated in its resting position in the glenohumeral joint, with thickening of the tendon noted ([Fig 1](#)). This thickened and diseased segment of the biceps becomes more apparent as the extra-articular portion of the biceps is pulled into the glenohumeral joint. In this case, a tenotomy was performed with arthroscopic scissors (Smith & Nephew, Memphis TN). The thickening at the hourglass portion of the biceps prevents it from translating distally with simple motion of the shoulder ([Fig 2](#)), thus negating the need for tenodesis.

In the second example, the biceps tendon is once again evaluated in its resting position in the glenohumeral joint, with some thickening of the tendon noted ([Fig 3](#)). However, it is not until the extra-articular portion of the biceps is pulled into the glenohumeral joint that the difference in diameter is fully appreciated ([Fig 4](#)). In this example, a tenotomy was performed with arthroscopic scissors (Smith & Nephew) as well. Once again, the thickening at the hourglass portion of the biceps prevents it from translating distally and causing a Popeye deformity.

In the final example, a thickening of the intra-articular portion of the biceps is noted once again.

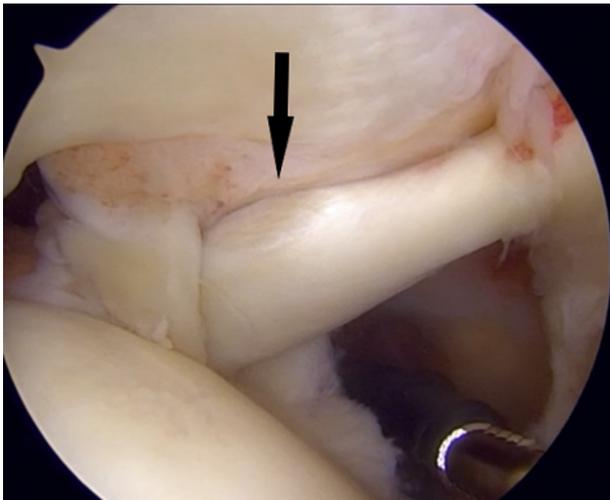


Fig 1. Arthroscopic view of a left shoulder from a posterior portal in the beach-chair position demonstrating a thickened intra-articular portion of the biceps tendon, as indicated by arrow, consistent with a hourglass biceps.

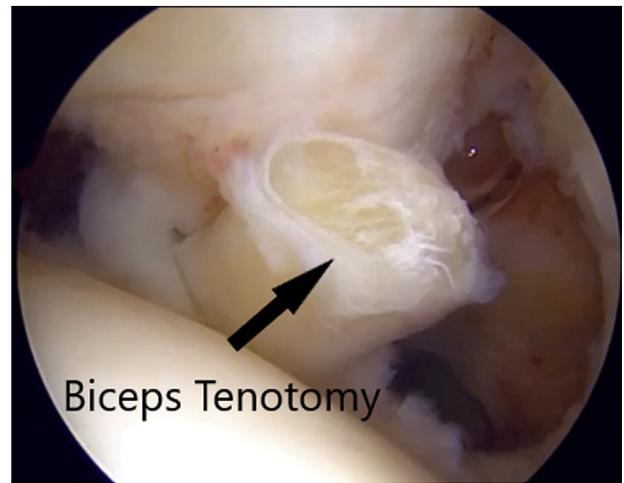


Fig 2. Arthroscopic view of a left shoulder from a posterior portal in the beach-chair position demonstrating a tenotomy of the hourglass biceps.

This thickening prevents distal translation of the biceps, which can lead to increased motion and wear at the superior labrum leading to subsequent fraying ([Fig 5](#)). Additionally, a metal probe (Smith & Nephew) can be easily pushed into and through the thickened portion of the biceps, confirming the diseased nature of the tendon ([Fig 6](#)). In this example, a soft-tissue tenodesis, using a luggage-tag suture configuration, was performed with permanent suture to the supraspinatus ([Fig 7](#)). Suggested technique steps and precautions are listed within [Table 1](#).

Discussion

The hourglass biceps is a pathologic condition that may lead to shoulder pain and impairment. Careful evaluation of the LHBT must be performed during

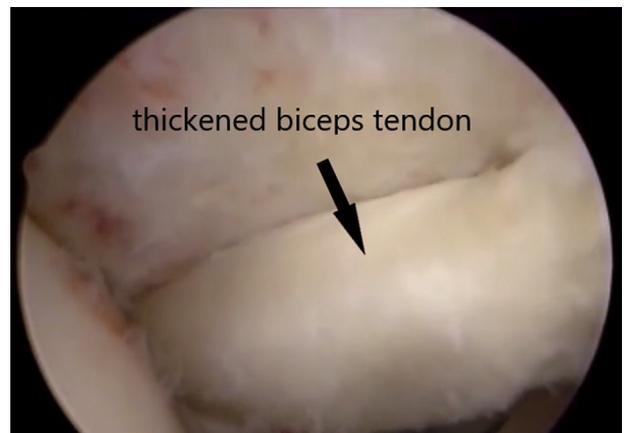


Fig 3. Arthroscopic view of a left shoulder from a posterior portal in the beach-chair position demonstrating a thickened intra-articular portion of the biceps tendon.

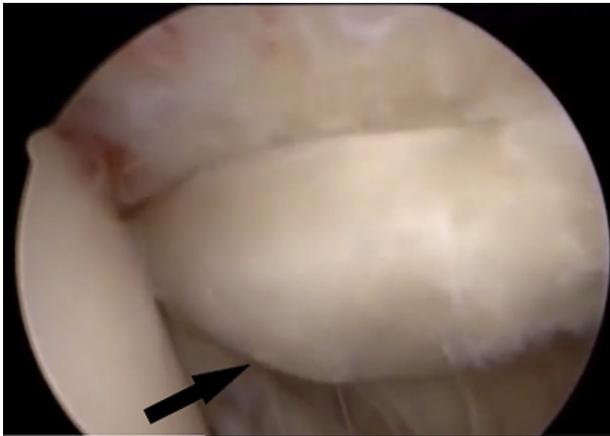


Fig 4. Arthroscopic view of a left shoulder from a posterior portal in the beach-chair position demonstrating an hourglass biceps, as indicated by arrow.

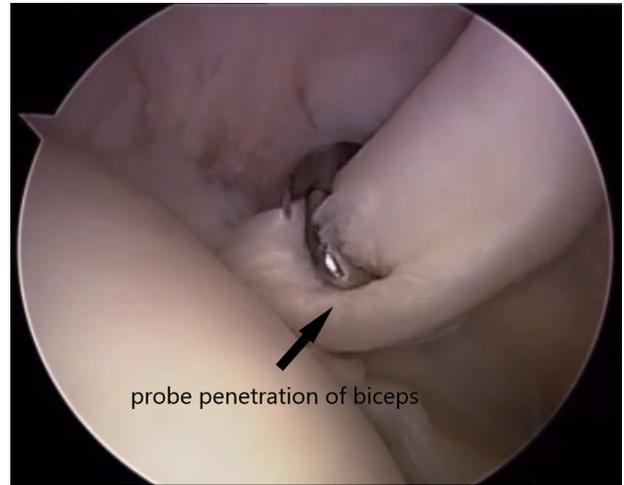


Fig 6. Arthroscopic view of a left shoulder from a posterior portal in the beach-chair position demonstrating a probe easily inserting into and through the diseased biceps tendon.

diagnostic arthroscopy, as a pathologic appearance of the tendon may be subtle. It is helpful to pull the extra-articular portion of the LHBT into the glenohumeral joint during evaluation not only to evaluate the potential difference in size of the tendon, but to also ensure the tendon glides smoothly in the bicipital groove. Additionally, taking the shoulder through a range of motion intraoperatively, while visualizing the LHBT, will allow for identification of pathological motion of both the biceps and the superior labrum.

Once the hourglass biceps is identified, surgical options include tenotomy or tenodesis. Biceps tenotomy is typically indicated for older, lower demand patients, or those that are less concerned about cosmesis.¹ Biceps tenodesis is generally reserved for younger,

higher demand patients, or those with cosmetic concerns.¹ The LHBT can be tenodesed to the rotator cuff or conjoint tendon with suture, or at various locations within the bicipital groove with an interference screw, suture anchor, or cortical button fixation.¹ Regardless of tenodesis location or fixation technique, it is critical to preserve the length-tension relationship of the LHBT for optimal outcomes.¹

In their original article describing the hourglass biceps, Boileau et al.³ performed a biceps tenotomy in 2 patients and a tenodesis in 19 patients. They found a full-thickness rotator cuff tear in all cases except for one, which had a partial-thickness tear.³ While the authors did not mention their rationale for performing a biceps tenotomy versus a tenodesis, they found that



Fig 5. Arthroscopic view of a left shoulder from a posterior portal in the beach-chair position demonstrating an hourglass biceps, as indicated by arrow, with fraying of the superior labrum.

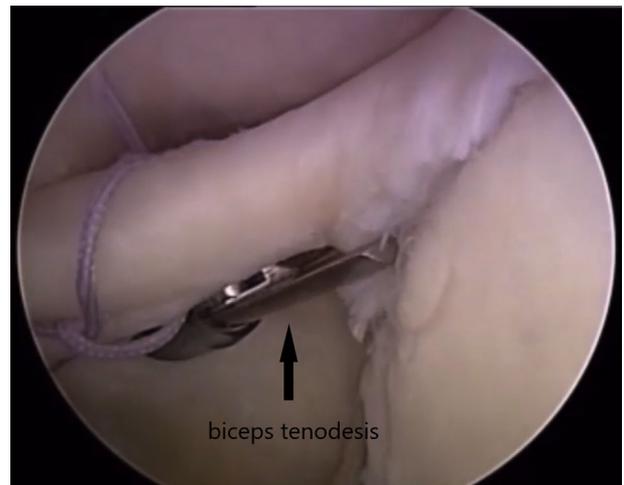


Fig 7. Arthroscopic view of a left shoulder from a posterior portal in the beach-chair position demonstrating a soft-tissue tenodesis of the biceps tendon to the supraspinatus using permanent suture.

Table 1. Pearls and Pitfalls of Arthroscopic Treatment of Hourglass Biceps

Pearls	Pitfalls
Pulling the extra-articular portion of the biceps into the glenohumeral joint with a probe to fully evaluate the tendon allows for a more complete inspection of tendon diameter and consistency.	Not fully evaluating the biceps tendon and missing an hourglass biceps may lead to continued pain and dysfunction.
Taking the shoulder through a range of motion intraoperatively while visualizing the biceps tendon will allow for identification of pathological motion of both the biceps and the superior labrum.	

shoulder motion, functional scores and pain scores all improved at final follow-up.³

Numerous meta-analyses and randomized control trials have shown no functional differences between tenotomy versus tenodesis.⁵⁻⁸ Advantages of tenodesis include a lower incidence of Popeye deformity and potentially greater supination strength and endurance.^{5,6,9} Advantages of tenotomy include quicker surgical time, potential faster pain relief and return to activity, and no implant-related costs or complications.^{6,7,9} A comparison of both procedures can be found in [Table 2](#). The ultimate decision depends on concurrent pathology, patient factors, as well as surgeon preference.

In conclusion, accurate diagnosis and treatment of the hourglass biceps tendon is essential, given the relatively common occurrence of this shoulder pathology. Arthroscopic visualization and manipulation of the affected tissue allows for rapid and accurate identification of the hourglass biceps pathology. Concurrent arthroscopic treatment, via tenodesis or tenotomy, allows for definitive repair and resolution and/or prevention of associated symptoms due to limitation of distal translation. The diagnostic and treatment methods discussed provide for a concise repair with a short recovery period.

Table 2. Advantages of Biceps Tenotomy Versus Tenodesis

Biceps Tenotomy	Biceps Tenodesis
Quicker surgical time	Lower incidence of Popeye deformity
Quicker recovery time	Greater supination strength and endurance
No implant related complications	
Lower cost	

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