

Painful Biceps Vincula: An Unrecognized Cause of Anterior Shoulder Pain

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Learning Point of the Article:

Patients presenting with anterior shoulder pain should be assessed for the presence of a biceps vinculum intraoperatively, which can become thickened and tether the long head of the biceps tendon in cases of partial or complete rupture of long head of the biceps tendon.

Abstract

Introduction: Vincula of the long head of the biceps tendon are an underrecognized entity. Very few studies have described the characteristics of symptomatic vincula following long head of biceps tendon auto-rupture or tenotomy.

Materials and Methods: A retrospective case series was performed at a single institution. All patients who underwent shoulder arthroscopy and were noted to have a painful vinculum of the long head of the biceps tendon with partial or complete long head of the biceps tendon rupture between January 01, 2016, and December 31, 2020, were included. Patients were excluded if they underwent shoulder arthroplasty, open reduction internal fixation, or a glenohumeral joint stabilization procedure.

Results: Eighteen consecutive patients with a long head of biceps tendon vincula noted during arthroscopy were identified. Ten patients were female (55%), with a mean age of 53 years (standard deviation [SD] 24.1). Of those with pre-operative magnetic resonance imaging available (n = 15), none reported the presence of a vinculum. Thirteen patients (72%) were found to have pathological vincula. Of these, seven patients were found to have a thickened vinculum tethering the long head of the biceps tendon. The most common reported pre-operative physical examination findings were bicipital tunnel tenderness to palpation (75%) and a positive O'Brien sign (50%). No patients experienced intraoperative or post-operative complications.

Conclusion: The clinical significance of the long head of the biceps tendon vincula has not been previously described. In a subset of patients with anterior shoulder pain in the setting of long head of biceps tendon auto-rupture or prior tenotomy, a thickened long head of biceps tendon vincula can produce clinically significant symptoms of pain.

Keywords: Biceps tendon, vincula, arthroscopy.

Level of evidence: IV, Case series, Biceps tendon, Vincula, Arthroscopy

Introduction

Vincula of the long head of the biceps tendon (LHBT) have been scarcely reported in the literature, and their clinical significance has not been described. Vincula have most frequently been described in the hand and flexor tendons, where they serve a biomechanical and nutrient role [1]. Very few studies, however,

have described vincula of the biceps tendon in the glenohumeral (GH) joint and bicipital tunnel [2,3]. Johnson et al. cite a prevalence of LHBT vincula in 24.3% of patients undergoing shoulder arthroscopy [2], whereas Taylor et al. note a 3% prevalence of symptomatic hypertrophied vincula in patients who underwent arthroscopic subdeltoid LHBT transfer for

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Author's Photo Gallery



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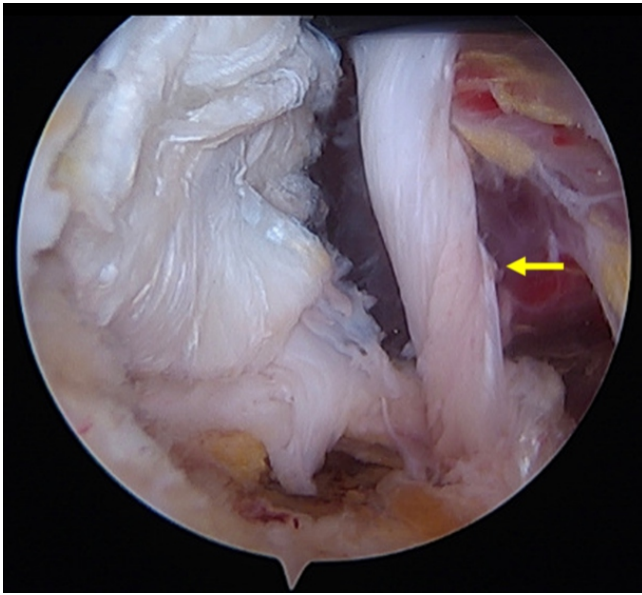


Figure 1: Arthroscopic image demonstrating a hypertrophied long head of the biceps tendon (LHBT) vincula (yellow arrows) suspending a torn LHBT.

biceps labral pathology [3]. Vincula in the GH joint and bicipital tunnel are similar to the hand in their gross and microscopic structure; however, no established biomechanical role has been described in the shoulder. In fact, vincula of the LHBT have more recently been described for their role in biceps-labral pathology [3]. For instance, a ruptured LHBT as a result of chronic biceps tendinopathy may continue to be suspended or tethered either intra-articular or within the bicipital tunnel by a vinculum or multiple vincula, leading to persistent pain. Vincula in themselves may also become hypertrophic and inflamed and contribute to primary biceps-labral pathology as hidden extra tendinous lesions [3]. No study

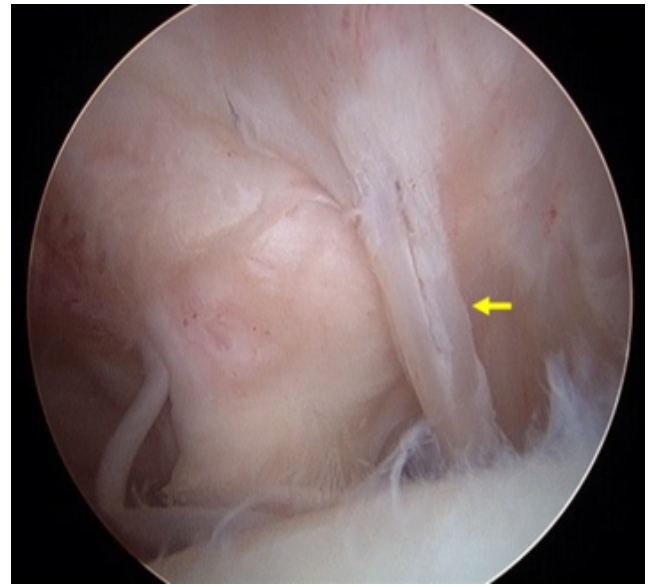


Figure 2: Arthroscopic image of a long head of the biceps tendon (LHBT) vincula (yellow arrow) demonstrating its clear derivative from the synovium and shown entering the bicipital tunnel, where it suspends a LHBT that was previously detached in a LHBT tenotomy procedure.

o date has specifically described the clinical significance of LHBT vincula.

The objective of this study is to describe the clinical presentation, arthroscopic appearance, and subsequent management of symptomatic LHBT vincula.

Materials and Methods

A retrospective case series was performed, reviewing all patients over the age of 18 who underwent shoulder arthroscopy and were noted on their operative report to have an LHBT vinculum

intraoperatively between January 01, 2016, and December 31, 2020, at a single institution. Patients were excluded if they underwent shoulder arthroplasty, open reduction internal fixation, or a GH joint stabilization procedure. A subgroup analysis was performed for patients who were noted to have a partial or complete rupture of the LHBT intraoperatively. Operative notes, advanced imaging reports, intraoperative photographs, and both pre- and post-operative clinical notes were reviewed for each patient. In addition, baseline demographic data were recorded for each patient. Through retrospective chart review, data were collected pertaining to each

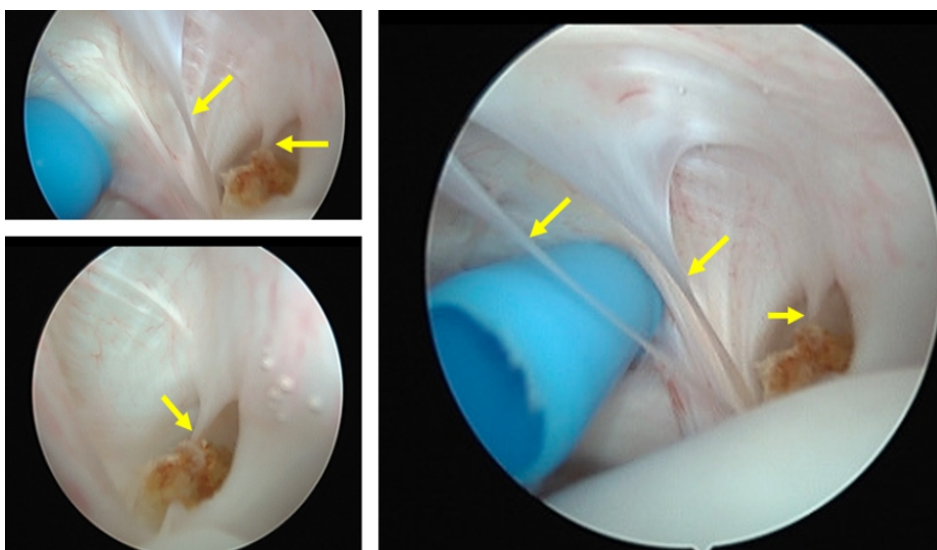


Figure 3: Arthroscopic images after a long head of the biceps tendon (LHBT) tenotomy have been performed, demonstrating biceps vincula (yellow arrows) suspending the LHBT as it enters the bicipital tunnel.

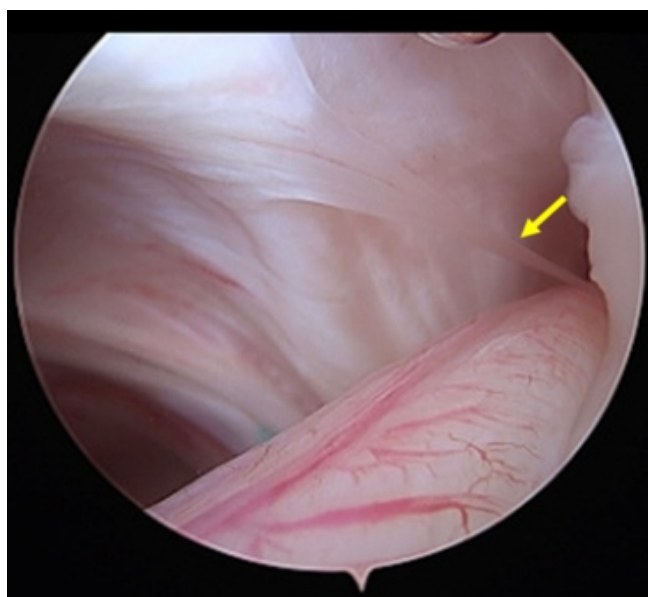


Figure 4: Arthroscopic image demonstrating long head of the biceps tendon (LHBT) vincula (yellow arrows) before significant hypertrophic changes suspending an inflamed LHBT as it enters the bicipital tunnel.

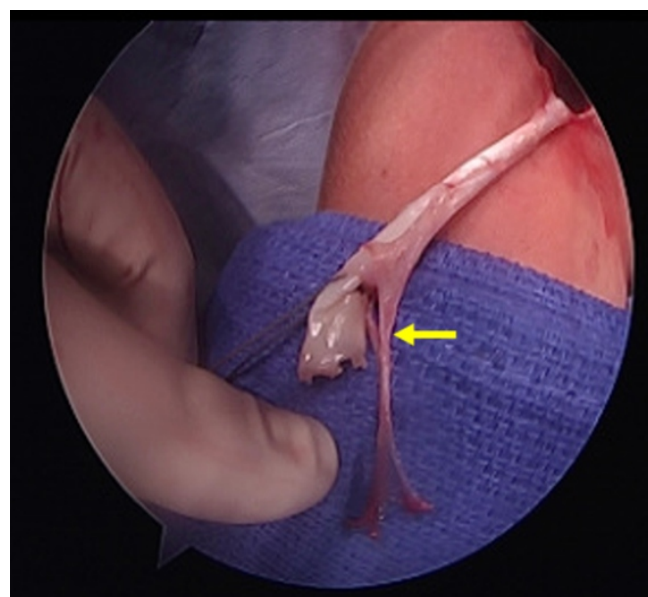


Figure 5: Intraoperative image during a biceps tendon transfer procedure demonstrating an inflamed long head of the biceps tendon (LHBT) vincula (yellow arrow) with its synovial-like attachment to the LHBT.

patient's pre-operative symptoms, physical examination findings, imaging studies, intraoperative findings, and post-operative clinical symptoms. Complications and revision surgeries were also noted if present. Approval was obtained from the hospital's Institutional Review Board.

Shoulder arthroscopy was performed with the patient in the beach chair position, with the patient's arm held in a mechanical arm holder. Diagnostic arthroscopy was performed in the standard fashion, and intra-articular pathology was assessed and addressed. Following this, the arm was positioned in a "90°-90°-15°" position to access the subdeltoid space as described previously by the senior author [4,5]. A standard 30° arthroscope was used to visualize this extra-articular space and zone 2 of the bicipital tunnel to check for a vinculum of the LHBT [6]. If a vinculum was found, it was characterized as pathological if thickened (thick, white appearance), suspensory (thin, white appearance), or inflamed (pink, red appearance).

Results

Eighteen consecutive patients with LHBT vincula noted during arthroscopy were identified between January 01, 2016, and December 31, 2020, at a single institution. Ten of 18 patients (55%) were female with a mean age of 53 years (SD 24.1, range 18–82 years). The most common pre-operative diagnoses included biceps tendinitis (78%), rotator cuff tear (28%), biceps tear or rupture (22%), impingement (22%), and labral tear (17%). Of the 15 patients with pre-operative magnetic resonance imaging (MRI) of the operative shoulder available,

none of the radiology reports mentioned biceps vincula. Vincula were found to be pathological in 13 patients (72%), with thickened vincula seen in 7 patients (39%) (Fig. 1 and 2), suspensory vincula in 4 patients (22%) (Fig. 3 and 4), and inflamed vincula in 2 patients (11%) (Fig. 5).

Thickened vincula of LHBT

Seven patients were found to have a thickened vinculum tethering the LHBT. Of these seven patients, five patients (71%) were female and had an average age of 70.9 years (SD 9.3, range 54–81 years). Six of the seven patients (86%) had complete rupture of the LHBT, whereas one patient had partial rupture of the LHBT. Concomitant clinical diagnoses in addition to a thickened vinculum and LHBT tearing included biceps tendinitis (86%), rotator cuff tear (43%), impingement (28%), and degenerative joint disease (14%). All seven patients underwent LHBT vincula release and bicipital tunnel decompression, whereas 5 patients (71%) had additional subacromial decompression, and 3 patients (43%) underwent rotator cuff debridement. Of these seven patients, six patients had a pre-operative MRI available; none mentioned the presence of vincula, including in those who were noted to have a biceps tendon rupture ($n = 3$). The most common reported physical examination findings in this cohort were bicipital tunnel tenderness to palpation (75%) and a positive O'Brien sign (active compression test) (50%). No patient experienced intraoperative or post-operative complications.

Discussion

Historically, LHBT vincula have not been considered clinically significant and thus are underreported in the orthopedic literature. In a large observational study from 1992, Johnson et al. noted the presence of LHBT vincula in 24.3% of patients undergoing GH joint arthroscopy [2]. However, since then, very few studies have further investigated its enigmatic role in the biceps–labrum complex and shoulder pathology. In addition, none of the patients in the present series with pre-operative MRI had vincula mentioned in the radiology report, despite a recent study demonstrating the ability to visualize biceps vincula on MRI [7]. In addition, the role of the biceps vincula in shoulder pain is not fully understood. Akin to the fat pad or plica of the knee, biceps vincula likely exist in a large portion of shoulders without producing symptoms. In select cases, however, an LHBT vinculum may serve as a hidden lesion and produce or contribute to shoulder pain [3].

Anecdotally, the primary author's practice has demonstrated that vincula can play an intimate role in producing shoulder pain. In particular, as evidenced by this case series, LHBT vincula can become thickened after LHBT rupture and leave the tendon suspended intra-articular or within the bicipital tunnel. Similarly, in cases of prior LHBT tenotomy where there was inadequate bicipital tunnel decompression, vincula can hypertrophy as an adaptation to stress and suspend the detached LHBT, ultimately becoming a source of shoulder pain. Intra-operative descriptions of these fibrous attachments revealed characteristics that implicate them in shoulder pathology. Clinically significant vincula are most commonly described as thick and inflamed, suggesting that they can be a source of pain in and of themselves. In addition, tethering of a degenerative and previously ruptured or detached LHBT within a closed space can produce or exacerbate shoulder pain. In this case series, MRI did not report a single LHBT vincula. However, the majority of these patients did have pain with direct palpation of the bicipital groove – demonstrating the excellent reliability of the three-pack examination in identifying lesions of the biceps-labrum complex [8].

Biologically, the role of the LHBT vincula is unclear. Gross and

histologic analysis of cadaveric vinculum in the study by Johnson et al. demonstrated their composition to be mostly fibrous tissue with a thin synovial layer and minimal vascularity [2]. In an anatomic study by Gothelf et al., histologic examination of vincula found it to be loosely attached to the biceps tendon. It is more intimately attached to the periosteum/bone side [9]. Given that approximately one quarter of patients undergoing shoulder arthroscopy were identified to have LHBT vincula in the study by Johnson et al., the biologic and biomechanical role is likely inconsequential [2]. Despite their similarity in name, the authors of this study propose that LHBT vincula of the shoulder are unlikely to share the important biomechanical and nutrient role of flexor tendon vincula in the hand [10]. Instead, the LHBT vincula is more likely an anatomic derivative of the LHBT synovium that can thicken or hypertrophy under stress, become inflamed, and produce anterior shoulder pain.

Conclusion

This case series is the first to present the appearance and clinical significance of LHBT vincula in the orthopedic literature. Despite the passage of 30 years since the first anatomic description of LHBT vincula, there has been little progression in our understanding of their role in shoulder biomechanics, biology, and pathology. This case series is intended to point attention to the LHBT vincula of the shoulder and highlight its potential implications in biceps-labral shoulder pathology. Further research should be performed to evaluate the biomechanical, biological, and pathological role of LHBT vincula and delve deeper into the association of biceps vincula with biceps tendinitis.

Clinical Message

Biceps vincula are an underrecognized entity and a possible cause of anterior shoulder pain. In patients where a complete or partial long head of biceps tendon (LHBT) rupture has occurred, patients should be assessed intraoperatively for the presence of a thickened vinculum that may be suspending the LHBT.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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