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Case Report

# A rare case of an anatomical variation of bilateral long head of the biceps brachii tendons identified within the substance of bifid subscapularis tendons☆

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ABSTRACT

The long head of the biceps tendon is stabilized in the intertubercular groove by several anatomical structures. Dislocation or identification of the biceps tendon into or within the subscapularis tendon is very rarely mentioned in the literature. This is the first reported case of bilateral identification of the long head of the biceps tendons within the lateral subscapularis tendon.

This report presents the case of a 51-year-old male patient who presented for bilateral shoulder pain. After failure of conservative treatment, MRIs were done which identified bilateral biceps tendons within the subscapularis tendons, with a concomitant supraspinatus tear on the right side. He underwent right shoulder arthroscopic biceps tenotomy, with supraspinatus repair. The symptoms of the left shoulder diminished as a result of the continuation of conservative treatment.

The long head of the biceps tendon normally travels through the intertubercular groove and is stabilized by soft tissue and bony structures. Medial dislocation of the tendon is affected by the medial wall angle and by the integrity of the soft tissue stabilizers; most importantly the coracohumeral ligament in the proximal part of the groove. Dislocation of the biceps tendon into the substance of the subscapularis has been rarely mentioned in the literature; and as far as we know, bilateral occurrence without any identifiable subscapularis tears has never been previously mentioned. The bilateral occurrence with the absence of subscapularis lesions indicates that this is a congenital anomaly.



## 1. Introduction

The biceps brachii typically has two heads, with the long head of the biceps brachii (LHB) arising from the supraglenoid tubercle, passing through the intertubercular groove, and then joining with the short head.[1] Generally, the LHB tendon is stabilized in the intertubercular groove by the insertional fibers of the superior glenohumeral ligament (SGHL), coracohumeral ligament (CHL) as well as the superior part of the subscapularis tendon.[2] The key ligament that prevents medial dislocation of the LHB form the groove is the CHL.[3] Cases of dislocation of the LHB into the substance of the subscapularis, are to our knowledge, a very rare occurrence that has scarcely been mentioned in the literature and never previously identified bilaterally in the same patient. Cervilla et al., in 1991, in a radiological study reported one case of a medially dislocated LHB tendon appearing to be lying between the partially disrupted subscapularis fibers.[4] Similarly, Walch et al., in 1998 reported in their retrospective study, the identification of LHB tendons that gave the impression of being dislocated into the substance of the subscapularis muscle.[2] The purpose of reporting this case is to report the MRI and arthroscopic findings of a patient with documented bilateral LHB tendons located within the subscapularis tendon.

### 1.1. Case presentation

A 51-year-old, right-handed male and house painter by occupation, presented to the clinic with bilateral shoulder pain for a

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period of more than 5 years duration. Pain was progressive in nature, and heightened by overhead activities. The patient reported a fall on his outstretched right hand around 10 months prior to presentation after which he had a limited painful range of motion that didn't fully subside. Clinical examination revealed tenderness over the bicipital groove with a positive Speed test bilaterally, and a positive empty can test on the right. Range of motion was normal on the left side, whereas active motion was limited to 130° in forward flexion and abduction on the right side. Jobe's test was also positive on the right side. Lift-off and belly-press tests were normal bilaterally. No relief was noticed after 6 months of conservative treatment, so bilateral shoulder MRIs were conducted for further assessment. The MRIs revealed identification of the bilateral biceps tendons (red arrow) located within lateral third of the subscapularis tendon, bilateral tendinosis of the subscapularis insertional fibers (white star), as well as bilateral degenerative fibrocystic changes of the bicipital empty groove (white arrow) [Figs. 1–4]. The grooves were not found to be dysplastic. The MRI of the right shoulder also showed a full thickness supraspinatus tear. Given a suggestive clinical exam and the available MRI findings, the patient was taken to surgery. The symptoms were more severe on the right side, which also had a concomitant supraspinatus tear, so the decision was taken to proceed with right shoulder arthroscopy.

Under combined general and loco-regional (nerve block) anesthesia, the patient was placed in the beach chair position, and a traction of 2 kgs was applied to the right shoulder. Subsequently, the patient was secured and strapped. The right shoulder was scrubbed and draped in a standard fashion. First, a posterior viewing portal was established, followed by an anterior rotator interval portal using the outside-in spinal needle technique. During the arthroscopy, the LHB tendon was identified to be located inside the substance of the lateral subscapularis tendon, it also was partially torn and severely degenerated. The subscapularis tendon was found to be bifid, which is a very rare anatomical variation (3%) that; as per our knowledge; was only once mentioned in the literature.[5] The subscapularis was seen to be frayed around the biceps tendon, however it was continuous, and no tears were identified. The decision to proceed with biceps tenotomy was taken. The full thickness supraspinatus tear was then identified and was properly treated by a double sutured anchor, along with a bursectomy and an acromioplasty. The decision to perform biceps tenotomy was taken. There is no consensus in the literature whether tenotomy or tenodesis yields better outcomes, with variable results between multiple studies.[6,7] Although various studies advocate for the use of tenodesis for better supination strength and better elbow function,[8] plenty of data in the literature show no significant difference in the outcome between tenotomy and tenodesis in terms of pain and function.[9–13] In our institution we perform tenotomy in biceps pathologies when indicated, and preserve tenodesis for selected cases of athletes and thin patients with esthetic concerns. In this patient, the absence of these criteria guided us towards biceps tenotomy,[14] as he is an overweight 51 years-old male carpenter not involved in any demanding sports activities and no major esthetic concern. Tenotomy can yield satisfactory results in pain relief[15] without the need for the extra cost and surgical time implied by tenodesis.

Postoperatively, the patient had a shoulder immobilizer sling placed for 4 weeks, after which progressive physiotherapy for his rotator cuff tear was started. Patient is now 4 months postoperatively, he recovered from his symptoms and regained full ROM of his right shoulder. The patient reported that the symptoms of his contralateral left shoulder decreased, so we opted for conservative treatment.

## 2. Discussion

The LHB tendon when traveling through the intertubercular groove is stabilized by soft tissue as well as bony structures. Hitchcock and Bechtol found that the bicipital groove is shallow with a medial wall angle less than 45° in 8% of patients, and they believed that this corresponded with Meyer's observation of a medial LHB tendon dislocation in 8% of his cadavers.[16,17] This finding was also supported by Lafosse et al. who stated that a decreased lesser tuberosity angle can facilitate medial subluxation or dislocation of the LHB tendon.[14] In a normal shoulder, the soft tissue stabilizers to the proximal part of the biceps tendon include the CHL, the SGHL, and the superior aspect of the subscapularis tendon, with the most important restraint to medial dislocation

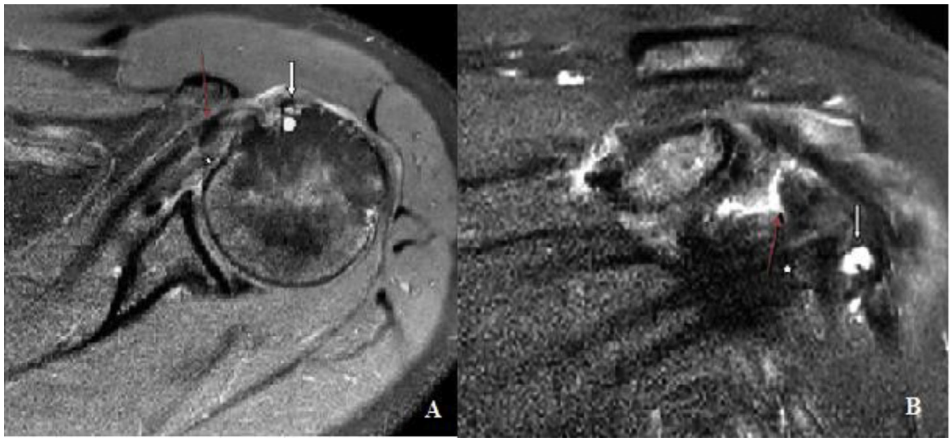


**Fig. 1. (A)** Axial PD fat sat (PDW- SPAIR AX) image of the left shoulder showing the biceps tendon (red arrow) that is located within lateral third of the subscapularis tendon, tendinosis of the subscapularis insertional fibers (white star), as well as degenerative fibrocystic changes of the bicipital empty groove (white arrow). **(B)** Coronal PD fat sat (PDW-SPAIR COR) image of the left shoulder showing the biceps tendon (red arrow) that is located within lateral third of the subscapularis tendon, tendinosis of the subscapularis insertional fibers (white star), as well as degenerative fibrocystic changes of the bicipital empty groove (white arrow). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

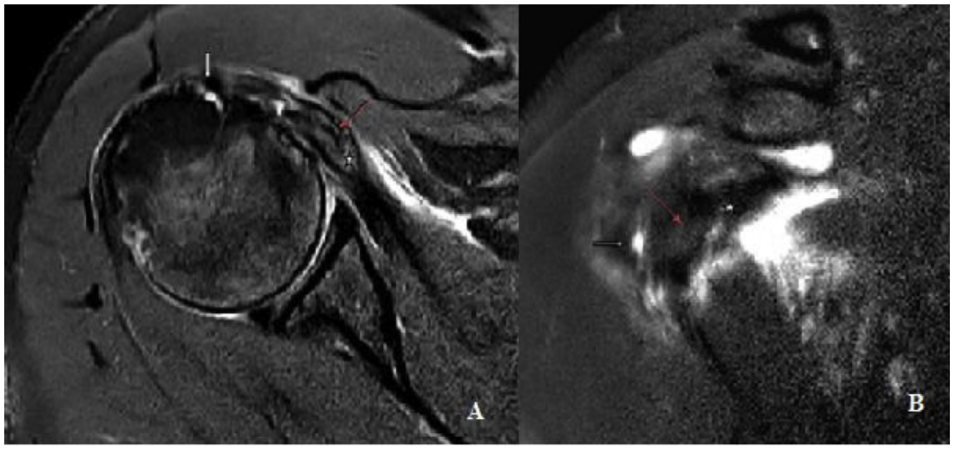


**Fig. 2.** **(A)** Axial PD fat sat (PDW- SPAIR AX) image of the right shoulder showing the biceps tendon (red arrow) that is located within lateral third of a bifid subscapularis tendon, tendinosis of the subscapularis insertional fibers (white star), as well as degenerative fibrocystic changes of the bicipital empty groove (white arrow). **(B)** Coronal PD fat sat (PDW-SPAIR COR) image of the right shoulder showing the biceps tendon (red arrow) that is located within lateral third of the subscapularis tendon, tendinosis of the subscapularis insertional fibers (white star), as well as degenerative fibrocystic changes of the bicipital empty groove (white arrow). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

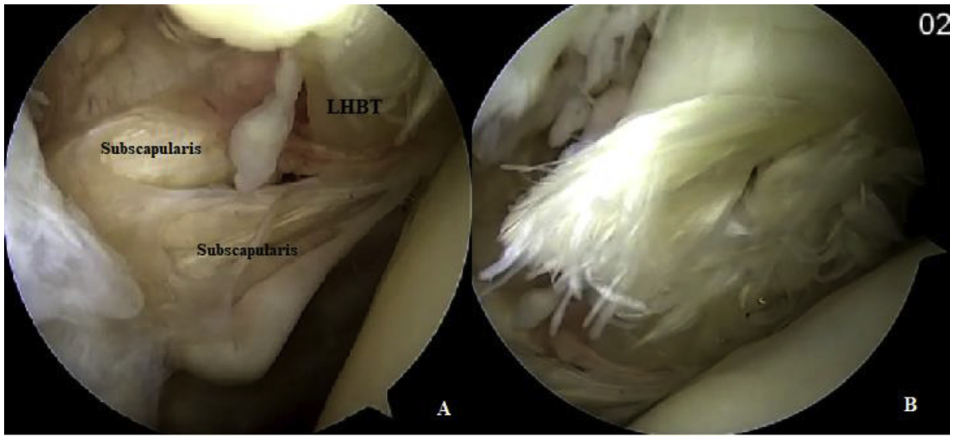


**Fig. 3.** **(A)** Arthroscopic view of the dislocated long head of the biceps brachii into an apparently bifid subscapularis tendon. **(B)** Degenerated and partially torn biceps tendon.

**Fig. 4.** Intraoperative arthroscopic view of the bifid subscapularis tendon, which was more evident after tenotomy was done.

being the CHL which blends with subscapularis close to their insertions.[2,3] Whereas, within the distal part of the groove the chief stabilizer is the insertion of the pectoralis major that largely attaches into the lateral part of the groove.[3,18,19] The biceps tendon has been documented to subluxate or dislocate medially out of the intertubercular groove, with the LHB tendon found dorsal to the subscapularis when the latter is torn, or ventral when the subscapularis remains intact.[2,20]

As per our literature review, there are no previous references in the literature of the LHB tendon being identified within the tendon of the subscapularis without the identification of any subscapularis tears.

Cervilla et al., in 1991, in their radiological study of medially dislocated LHB tendons, described one case of a medially displaced tendon that was identified to be lying between the partially torn fibers of the subscapularis, so it was not found to be within the substance of the subscapularis tendon properly speaking.[4] The only other comparable mention in the literature was in 1998 by Walch et al. who described the LHB giving the impression of being dislocated into the substance of the subscapularis.[2] This impression occurred due to the fact that dorsal fibers of the subscapularis remained inserted to the lesser tuberosity, with the simultaneous presence of an intact fascia covering the torn ventral surface of the subscapularis muscle and which attaches to the greater tuberosity,

hence giving the false impression of a continuous subscapularis.[2]

In our case, the radiological findings showed bilateral subscapularis tendinosis without any findings indicative of tears. Moreover, the arthroscopic inspection of the right shoulder revealed a continuous subscapularis insertion with no grossly evident tears. Bifid subscapularis tendons, as per our knowledge, were only mentioned by Snyder et al. and it was found to be present in 3% of their cases.[5] Mention of an accessory subscapularis muscle was recently reported by Zielinska et al., however it is a finding of an accessory tendon and not a bifurcation of a single subscapularis tendon, which does not resemble our case.[21] The fact that the subscapularis insertions were intact, confirms that the unusual presence of the bilateral biceps tendons inside the substance of the subscapularis is a bilateral congenital anomaly and not the result of a traumatic process with a subsequent dislocation.

The bilateral shoulder symptoms can be explained by the atypical location of the LHB which can result in an abnormal function, mechanics and wear of the intra-articular components of these shoulders as demonstrated by the arthroscopic identification of the degeneration of the LHBT and of the surrounding subscapularis. This anatomical anomaly caused bilateral shoulder pain in our patient long before the fall on the right shoulder and the resulting supraspinatus tear. The left shoulder's symptoms subsided after physical therapy, which indicates that conservative treatment of this condition was successful.

This anomaly should be suspected clinically when identification of a biceps within the subscapularis tendon is made, because conservative treatment of this isolated finding seems to be sufficient. Diagnosis can be achieved via MRI or ultrasound. In a prospective study made by Fischer et al., the accuracy of ultrasound when using MRI as the reference for identification of pathologies of the rotator cuff is found to be the least accurate for the subscapularis (77.8%), compared to the supraspinatus tendon where ultrasound showed the highest accuracy (91.1%).[22] Thus, for this type of pathology, MRI is a superior diagnostic modality when compared to ultrasound.

As a conclusion, in this case report we have presented the first reported case of a bilateral anatomical variation of the LHBT that was identified within bifid subscapularis tendons instead of the usual anatomical finding of traveling within the intertubercular groove. The fact that the left shoulder in which no other abnormalities were identified on MRI, was successfully treated by physical therapy, indicates that this anatomical variation when encountered needs no surgical treatment and conservative treatment is sufficient. Concomitant pathologies should be addressed and treated independently.

## Financial Disclosure

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## Consent

Written informed consents were obtained from each patient for the purpose of this study.

## Declaration of competing interest

The authors declare no conflict of interest regarding the publication of this article.

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