

Variation in origin of the long head of the biceps brachii tendon in a cadaver

A case report

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Abstract

Introduction: In general, the long head of the biceps brachii (LHB) tendon arises from the supraglenoid tubercle in the shoulder joint, and it has an important stabilizing mechanism for the humeral head in the shoulder joint. This case demonstrates that even if the LHB tendon can be palpated outside of the shoulder joint, it may disappear in the intertubercular sulcus (IS) and in the glenohumeral (GH) joint because of abnormal articulation.

Patient concerns: This case involved the cadaver of an 82-year-old Japanese man (number 1936, cause of death: hepatocellular tumor), who was selected from the bodies used for gross anatomy practice at the Tokai University School of Medicine in 2017.

Intervention: We removed the fat and skin around the shoulder joint for observational purposes and carefully examined the gross anatomy of the structures.

Diagnosis: We suspected that the long head of the biceps brachii tendon arose from the lesser tubercle (LT) in the cadaver. In our case, it was found that the upper part of the subscapularis (SSC) tendon was torn first, and the succeeding degenerative changes and rupture of the LHB tendon were intra-articular.

Outcomes: The long head of the biceps brachii tendon was found to be ruptured in the GH joint, and scar tissue developed between the distal stump of the tendon and the articular capsule, resulting in fusion with the LT.

Conclusions: This case necessitates confirmation that the LHB tendon is present in the IS and in the GH joint to treat cases wherein failure of the dynamic stabilizing mechanism for the humeral head occurs.

Abbreviations: GH = glenohumeral, IS = intertubercular sulcus, LHB = long head of biceps brachii, LT = lesser tubercle, SHB = short head of biceps brachii, SLAP = superior labrum anterior and posterior, SSC = subscapularis.

Keywords: cadaver, glenohumeral joint, gross anatomy, lesser tubercle, long head of the biceps brachii

1. Introduction

In general, the biceps brachii has a long head and a short head. The long head of the biceps brachii (LHB) tendon arises from the

supraglenoid tubercle in the shoulder joint, passes through the IS, and joins with the short head.^[1] The LHB attaches to the superior glenoid labrum and the neck of the scapula in the shoulder joint. The LHB muscle attachments vary widely from the upper side to the rear side of the glenoid cavity.^[2] Thus, the LHB tendon-superior glenoid labrum complex has a stabilizing mechanism for the humeral head in the shoulder joint.^[3-6] Many anatomical studies of the biceps brachii have reported on its extra heads^[7-10] and the musculocutaneous nerves related to the heads.^[11,12] The origins of the extra heads of the biceps brachii may be the body of the humerus, the tendon of insertion of the pectoralis major, or the coracobrachialis muscle. However, there are scant reports of the origins of LHB. Cheema and Singla^[13] reported that LHB arises from the capsule of the shoulder joint. We identified an LHB tendon in a human cadaver that appeared to arise from the LT, combined with scar tissue. However, we believe that there was an LHB tendon rupture in the glenohumeral (GH) joint, and the distal stump of the tendon formed an agglutination with the articular capsule, resulting in scarring, with the resultant scar expanding into the LT. Thus, we discuss this case from both gross anatomical and physiotherapeutic perspectives.

2. Methods

This case involved the cadaver of an 82-year-old Japanese man (number 1936, cause of death: hepatocellular tumor) was selected

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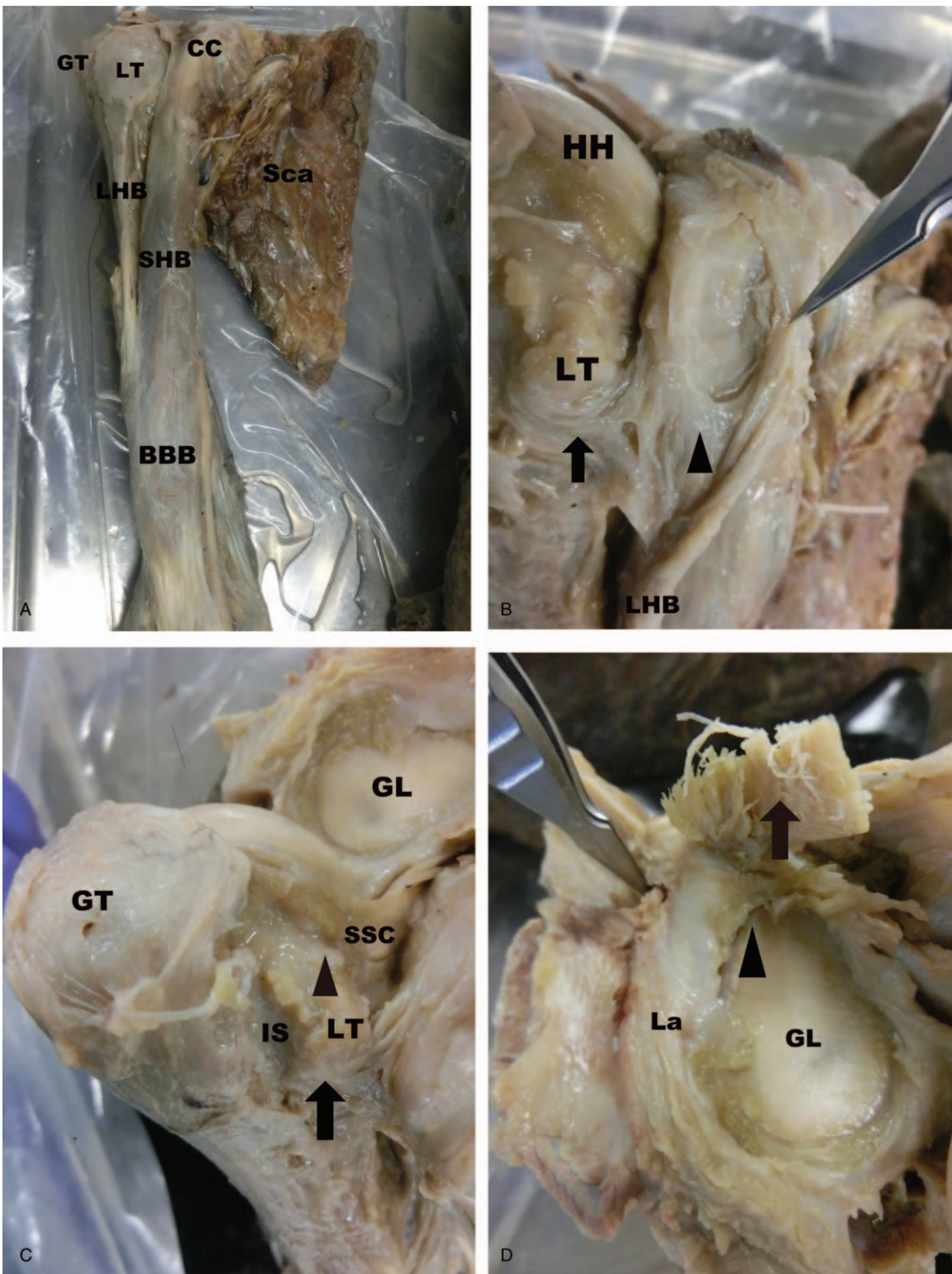


Figure 1. Anatomical view of biceps brachii and shoulder joint. (A) LHB tendon seemingly rises to the LT with the connective tissue, and it was difficult to manually separate the LHB tendon from the LT. (B) The connective tissue of the LHB tendon was combined with the articular capsule (▲), and partially adhered to the LT(†). Also, the LHB tendon could not be confirmed in the IS and the intra-articular space. (C) The partial connective tissue of the LHB tendon adhered to the LT(†). The upper fiber of the SSC tendon disappeared and there were degenerative changes in the humeral head in this section (▲). (D) The proximal stump of the LHB tendon was confirmed near the supraglenoid tubercle(†). The proximal stump ruptured 2.5 cm from the supraglenoid tubercle and was significantly widened and flattened. Also, a SLAP lesion was evident (▲). BBB=belly of biceps brachii, CC=coracoid, GL=glenoid, GT=greater tubercle, IS=intertubercular sulcus, La=labrum, LHB=long head of biceps brachii, LT=lesser tubercle, Sca=scapular, SHB=short head of biceps brachii, SLAP=superior labrum anterior and posterior, SSC=subscapularis.

among other cadavers for gross anatomy practice at the Tokai University School of Medicine in 2017. The cadaver was fixed using 10% formaldehyde. Gross dissection was performed using customary procedures. The anatomical relationship between the LHB and the shoulder joint was specifically observed. We removed the fat and skin around the shoulder joint for observational purposes and carefully examined the structures.

This case report complies with the research guidelines of the Japanese Association of Anatomists. Cadaveric donors designated (Tokai Daigaku Kentai No Kai) for education or research participated in this study. Informed consent is obtained by the Tokai Daigaku Kentai No Kai.

3. Results

The musculoskeletal nerve was normal. It branched from the lateral cord of the brachial plexus and pierced the coracobrachialis. In addition, the musculoskeletal nerve ran from the abdominal side of the biceps brachii.

The LHB tendon was visibly elongated and the belly of the tendon was pulled distally. The LHB tendon arose from the LT with accompanying connective tissues (Fig. 1A). The connective tissues were separated from the IS on the side of the LT. These were integrated with the joint capsule, with parts adhering to the LT. The LHB tendon could not be identified within the IS and the GH joint (Fig. 1B). The attachment part of the upper fiber of the SSC tendon disappeared, and there were degenerative changes in the humeral head (Fig. 1C). Furthermore, the proximal stump of the LHB tendon could be seen near the supraglenoid tubercle in the joint. The proximal stump ruptured at a distance of 2.5 cm from the supraglenoid tubercle and was significantly widened and flattened. In addition, the glenoid labrum had a superior labrum anterior and posterior (SLAP) lesion (Fig. 1D).

4. Discussion

We identified the LHB tendon that appeared to arise from the LT, combined with scar tissue, during a routine dissection of a human cadaver. As a result, we think that there was a rupture of the LHB tendon in the GH joint, and the distal stump of the tendon formed an agglutination and scarring with the articular capsule and the resulting scar expanded to the LT.

There are many reports regarding injuries of the LHB tendon accompanied by rotator cuff tears.^[14–18] Takahashi^[17] reported a number of LHB tendon ruptures accompanied by SSC tears. As a result, the cross-sectional area of the damaged LHB tendon in the IS is significantly wider and flatter when associated with SSC tears. In our case, there was a rupture of the LHB tendon resulting in significant widening and flattening of the proximal stump, consistent with Takahashi's report. Moreover, there was a SLAP lesion of the glenoid labrum surrounding the joint, with disappearance of the attachment part of the SSC muscle and deformation of the bone in the associated area. Therefore, it is conceivable that the upper part of the SSC tendon was torn first, and the succeeding degenerative changes and rupture of the LHB tendon were intra-articular.

Generally, when there is an LHB tendon rupture in and out of the joint, the tendon is pulled distally and the belly of the tendon is displaced.^[14] However, Khazzam et al^[19] reported that the thickened LHB tendon cannot pass through the IS in the distal posterior direction. Moreover, Nakagawa^[15] reported that all ruptured intra-articular LHB tendons

identified in cadavers (3/100 shoulders) were conglutinated with the IS. In the present case, it was considered that the distal stump of the thickened intra-articular LHB tendon could not pass through the IS. Moreover, it was thought that the distal stump adhered, via scarring, to the joint capsule and part of it adhered to the LT over time.

The biceps brachii initially looked normal in this case, and it seemed as if the shoulder joint in which an LHB tendon arose from the LT functioned normally. However, it was determined that the stabilizing function of the humeral head by the LHB tendon was lost due to LHB tendon rupture in the GH joint. Thus, even if the LHB tendon could be palpated out of the GH joint, the intra-articular LHB tendon disappears, in some cases, into the IS and in the GH joint, combining with scar tissues. Therefore, since the dynamic stabilizing mechanism for the humeral head by the LHB tendon does not occur, extreme caution is necessary when performing physiotherapy. In order to treat such cases, it is necessary to confirm that the LHB tendon is present in the IS and in the GH joint using echocardiography or magnetic resonance imaging.

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Author contributions

SK, HT, and KS designed the study, and wrote the initial draft of the manuscript. SK, HT, and RT contributed to the analysis and interpretation of data, and assisted in the preparation of the manuscript. KU contributed to the creation of the revised manuscript. All other authors have contributed to data collection and interpretation, and critically reviewed the manuscript. All authors approved the final version of the manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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