International Journal of
Case Reports & Short Reviews

Case Report

Hypoplastic Long Head of Biceps Brachii Muscle: Three Case Reports with Clinical Implications and Literature Review -

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Submitted: 20 December, 2016; **Approved:** 17 February, 2017; **Published:** 20 February, 2017

Citation this article: Iliev A, Kotov G, Landzhov B, Dimitrova IN, Georgiev GP. Hypoplastic Long Head of Biceps Brachii Muscle: Three Case Reports with Clinical Implications and Literature Review. Int J Case Rep Short Rev. 2017;3(1): 013-015.

ABSTRACT

Biceps brachii is one of the most variable muscles in the human body and multiple variations have been described of its origin, number and morphology of the heads. In the present study, we describe three cases of hypoplasia of the long head of biceps brachii, one observed bilaterally and one observed in only one arm. We also make a brief literature review of other reported variations. Hypoplasia of the long head of biceps brachii can present with swelling in the anterolateral aspect of the lower part of the brachium during flexion of the elbow, thus simulating a muscle rupture. It can also increase the risk of shoulder instability and cause difficulties during arthroscopy of the shoulder joint. Due to the fact that routinely used imaging modalities, such as ultrasound, MRI and MR arthrograms cannot always distinguish the presence of biceps brachii variations, their incidence, appearance and clinical significance should be borne in mind by orthopaedicians and surgeons in order to avoid misdiagnosis and unnecessary surgical interventions.

Keywords: Biceps brachii muscle; Long head; Hypoplasia; Clinical significance

INTRODUCTION

Biceps Brachii (BB) is one of the most variable muscles in the human body in terms of number and morphology of its heads [1]. According to classical descriptions, this muscle has two heads - one short head originating from the coracoid process of the humerus and one long head originating from the supraglenoid tubercle of the scapula [2]. In distal direction, the two heads unite and insert through a common tendon into the radial tuberosity and the antebrachial fascia [2]. The most common variation is the presence of a supernumerary third head originating from the humerus, but a total of four to seven heads have also been reported [3,4]. In contrast, the absence of the long head of the biceps (LHB) [5] and variations in its insertions are quite rare [3]. Variations of the tendon of the LHB, namely hypoplasia of the intra-articular segment of the tendon have also been described [6], as well as bilateral absence of the tendons combined with subacromial impingement [7]. Literature data regarding hypoplasia of the muscle body of the LHB, however, are rare [8,9]. Even though these variations are not frequently encountered, they could create difficulties on MRI scans during the diagnostic process [5]. Therefore, clinical awareness of the anatomical variants of the LHB will allow the establishment of a correct prospective MRI diagnosis and thus potentially help avoid unnecessary surgery [5,8].

Herein, we present three cases of LHB hypoplasia, which was observed bilaterally in one of the cases and unilaterally in the other. We also discuss the clinical significance of these variations and make a brief literature review of biceps brachii variations.

CASE REPORTS

Case 1

During a routine anatomical dissection of a 64-year-old Caucasian female cadaver from the autopsy material available at the Department of Anatomy, Histology and Embryology at the Medical University of Sofia, approved by the Medical Legal Office and the Local Ethics Committee, we observed an intriguing finding. In both arms, the long heads (Figure 1a,b) of the biceps had abnormally long proximal tendons and small, hypoplastic muscular bellies located in the lower third of the brachium. The two tendons had different length (right: 19 cm, left 18.3 cm) and width – the right tendon (4 mm) was wider than the left one (3 mm). Proximally, both tendons originated from the supraglenoid tubercle and the glenoid labrum in a usual way and passed through the joint cavity and the intertubercular sulcus (bicipital groove). Distally, the tendons continued in hypoplastic fusiform muscular bellies with different size (right: length 8.5 cm, width 2.5 cm; left: length 11 cm, width 2.5 cm). The short heads of BB in both arms had a normal development. They originated in a usual way through a thick flat tendon attached to the coracoid process. In distal direction, the long and the short heads of both BB fused and inserted into the radial tuberosities. The BB was innervated by the musculocutaneous nerve. We did not observe any other variations in the two upper limbs.

Case 2

During a routine anatomical dissection of a 72-year-old Caucasian male cadaver from the autopsy material available at the Department of Anatomy, Histology and Embryology at the Medical University of Sofia, approved by the Medical Legal Office and the Local Ethics Committee, a partial hypoplasia of the LHB was observed in the right upper arm. The muscle body of the LHB (Figure 1c) was well developed. It prolonged proximally into a long, thick tendon which resembled a cord. This tendon originated from the greater tubercle of the humerus and passed through the intertubercular sulcus of the humerus. The length of the tendon was 9 cm, and its width –0.7 cm. The measurements of the muscle belly were the following: length 17.8 cm, width 4.2 cm. No anomaly was observed in the origin, development and course of the short head. In distal direction, the long and the short head of the BB fused and inserted into the radial tuberosity. The BB was innervated by the musculocutaneous nerve. No other abnormalities whatsoever were observed in the right arm. The left arm showed no peculiarities.

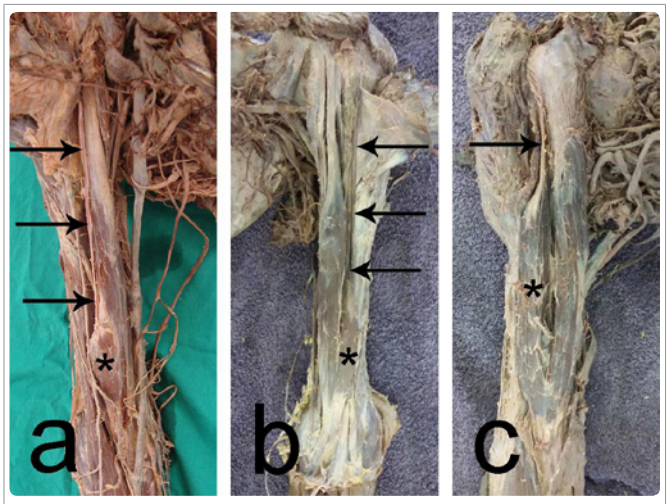

Figure 1: Photographs of the variant findings. a, b) bilateral hypoplastic LHB (arrows - tendon; asterisk - muscle body); c) partial hypoplasia of the LHB. (arrow - tendon; asterisk - muscle body).

DISCUSSION

Anomalies of the long head of the BB include absence, hypoplasia, duplication and various origins (from the capsular ligaments, the bicipital groove, the insertion of the coracobrachialis, the tendon of the pectoralis major and the greater tuberosity of humerus) [1,8]. Absence of the tendon of the LHB can be congenital and is associated with other anomalies such as the VATER association, which includes vertebral defects, anal atresia, tracheo-esophageal fistula with esophageal atresia, radial anomalies and renal anomalies [10]. Variations, with the exception of congenitally absent long heads are classified in terms of their relationship, or extent of fusion, with the supraspinatus tendon [11]. Wahl and McGillivray classified the anatomical variants of the intra-articular segment of the tendon of the LHB on the basis of arthroscopy into 4 types; incomplete proximal mesenteric, incomplete distal mesenteric, complete mesenteric, and congenitally absent [12]. Dierickx, et al. [13] analyzed 2,976 shoulder pathologies and classified the 57 shoulders (1.91%) that had an anatomic variation into 4 types: mesotenon, adherent, bifurcated, and congenitally absent. These attempts to classify the many variations of the BB demonstrate the great variety of anatomical anomalies that are associated with this muscle.

Variations in the proximal part of the LHB are rarely encountered in clinical practice [14]. The hypoplasia of the LHB which was described in the presented cases can present with swelling in the anterolateral aspect of the lower part of the brachium during flexion of the elbow, thus simulating a muscle rupture [8,15]. Yeh, et al. [16] reported the intracapsular origin of the LHB from a cadaveric shoulder after anatomical dissection and histological assessment. These authors rejected the previous theory that the LHB develops outside the capsule of the shoulder joint and then migrates through the capsule during later foetal development. Under arthroscopy guidance, Gaskin, et al. [5] observed a hypoplastic LHB originating from cord-shaped capsular thickening along the expected course of the LHB and headed towards the bicipital groove. The fact that the hypoplastic LHB and the joint capsule are not fully separated could also support the theory suggested by Yeh, et al. [16].

Variations of the LHB could be found accidentally during the treatment of various shoulder disorders including cuff degeneration, shoulder impingement, acromioclavicular joint arthritis [8,14]. LHB anomalies have been reported as a possible mechanism for development of shoulder instability [5]. These variations cannot be easily detected through the routinely used non-invasive radiological methods, such as ultrasound, MRI or MR arthograms [11]. In the clinical setting, most of the anatomical variations of the LHB are not diagnosed during radiological assessments, but rather during arthroscopic inspection [11]. This underlines the need for surgical awareness during arthroscopic surgery due to possible unexpected anatomical variations or lesions of the LHB [11]. Diagnostic difficulties at the time of shoulder arthroscopy also arise from the fact that the tendon of the LHB is used as a landmark and may confuse even experienced surgeons [5,8].

In conclusion, the presented case reports describe a rare anomaly of the BB. Although rarely encountered, it can cause swelling in the lower aspect of the brachium and create diagnostic difficulties, as it is not easily discovered through routinely used imaging modalities. Thus, clinical awareness of their existence and MRI appearance can help prevent misdiagnosis and avoid unnecessary surgery.

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