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Unilateral absence of short head of the biceps brachii in human cadaver: A case study

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Abstract:

Anatomical variation in the head of biceps brachii is well documented in various studies in the past. As for our best knowledge with the previous publication, there are so many journals reported with multiple variation including accessory heads of biceps brachii muscle (BBM), but the absence of one head of BBM in unilateral arm is very rare. The proximal tendons of the biceps brachii are commonly involved in pathological processes and are a frequent cause of anterior shoulder pain. Disorders of the distal biceps brachii tendon typically result from partial and complete tears of the muscle. Partial tears are usually characterized by enlargement and abnormal contour of the tendon. The purpose of this study was to find some rare kind of variations in the head of biceps brachii with future enlightenment in its potential effects in the normal functioning of upper limb. In the present study, we found that absence of one head of BBM in unilateral arm of one cadaver during anatomical dissection at Windsor University School of Medicine, Brightons Estate, Cayon, P. O. Box-1621, St. Kitts and Nevis, West Indies. Strong evidence of the absence of one head of BBM may be suggestive of developmental anomaly or physical degeneration of the muscle which may lead to complete or partial dysfunction of the region (Szpinda, *et al.* 2013). However, further studies can reveal the real case of it.

Keywords:

Absence, biceps brachii muscle, embryology, short head, variation

Introduction

The long fusiform muscle of the upper limb is present in the upper arm (BRACHIUM) on the anterior surface of the humerus, arising from the scapula (Gray, *et al.* 1995). Biceps brachii muscle (BBM) is a strong supinator of the forearm; when elbow is flexed, it is a powerful flexor of the forearm, and when elbow is extended, it is also a weak flexor of the shoulder joint (Singh, 2014). The BBM is innervated by the musculocutaneous nerve and supplied by brachial and anterior circumflex humeral arteries (Gray, *et al.* 1995). A number of previous publications on the morphological variations of biceps brachii are reported (Pakhale Sandeep, *et al.* 2012).

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The supernumerary heads might be significant in the production of strong flexion and supination of forearm. They may cause compression of neurovascular structures because of their close relation to the brachial artery and median nerve. Variants of biceps brachii may confuse a surgeon and may cause iatrogenic injuries. The surgeons and traumatologists have to be aware of such variations (Jayanthi and Elezy, 2012).

In the present case report, it is shown that one of the heads of biceps brachii is completely absent (mostly the fibers are degenerated). The current case report was found during routine dissection by the 1st year medical students-1 of Windsor University School of Medicine, St. Kitts and Nevis, during the month of May–June, 2016.

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Case Report

During routine dissection of formalin-fixed 65-year-old male cadaver in the Department of Anatomy at Windsor University School of Medicine, St. Kitts and Nevis, we did perform a dissection of the anterior compartment of right and left arms by reflection of the anterior part of the deep fascia; then the relative positions of its contents are examined, following the instructions of Cunningham's Manual of Practical Anatomy together with Grant's Atlas of Anatomy (Romanes, 2000; Agur and Dalley, 2009) We found morphological variation of left arm of BBM, and we noticed that, in spite of two heads of BBM, there was only one, which was significantly smaller in size compared to the other arm of the same cadaver.

Results

In the right arm, all the structures were found anatomically normal without any major significant differences.

In the left arm, we observed a major significant variation in the morphological pattern of the BBM, and we noticed that, in spite of two heads of BBM, there was only one, which was significantly smaller in size compared to the other arms of the same cadaver. Total length of the muscle was measured using a measuring scale, from bicipital aponeurosis to supraglenoid tubercle of scapula. Total length of the BBM was measured about 31.0 cm, tendon of BBM was measured 18.0 cm, and the maximum breadth of the BBM was about 3.5 cm (with standard measuring scale measurements were taken from supraglenoid tubercle to radial tuberosity). The muscle shows single tendon originating from the radial tuberosity to the supraglenoid tubercle of scapula, inserted to the fascia of bicipital aponeurosis to the medial side of the forearm. However, there was no variation in the nerve supply of the same muscle (i.e., musculocutaneous nerve).

Discussion

Several resources have reported the incidence of third head of BBM (Vollal, *et al.*, 2008; Biloidi, *et al.*, 1919; Arora and Dhingra, 2005; Poornima and Satyaprasad, 2006; Londhe, *et al.*, 2011; Jayanthi and Elezy, 2012; Ashiq, *et al.*, 2012; Al-Kushi, 2013; Gheno, *et al.* 2010).

According to Cunningham, the third head arising at the insertion of coracobrachialis passes into the bicipital aponeurosis on the medial side of the median belly of this muscle (Romanes, 2000).

As according to Henry Gray, the third head of biceps occurs in 10% of cases arising on the upper and medial parts of brachialis with which it is blended and attached

to bicipital aponeurosis and medial side of the tendon of the muscle in some cases, there are two slips, one passing in front of brachial artery and other behind the brachial artery. Very rarely, slips may arise from the lateral aspect of humerus or intertuberosus sulcus (Gray, *et al.* 1995).

The presence of bilateral accessory head of BBM in the same cadaver has been reported (Biloidi, *et al.*, 1919).

In relation to the right upper limb, an accessory head of BBM was noted, along with the median nerve innervated to the arm muscles, i.e., BBM and coracobrachialis, and musculocutaneous nerve was absent (Arora and Dhingra, 2005).

Absence of musculocutaneous nerve bilaterally and presence of third head of BBM in the left arm and the branches of median nerve innervate all the flexors in both the arms (Poornima and Satyaprasad, 2006).

The third head of BBM, an accessory belly of coracobrachialis muscle crossing the median nerve and brachial vessels and continuing with medial head of triceps brachii muscle to be inserted to the olecranon process (coracoulnaris), a persistent median artery, and an additional muscle in the anterior compartment of forearm were found in the left upper limb. However, the right upper limb showed no abnormality (Vollal, *et al.*, 2008).

Ten cadavers were observed during which the third head of BBM arose from the upper third of humerus at the "V-" shaped insertion of deltoid muscle, all these heads of BBM were supplied by musculocutaneous nerve (Gheno, *et al.*, 2010).

The male and female ratio is 80:40. The study revealed that 10.8% of biceps cases showed three heads of origin. Bilateral triple heads were observed in one case; 6.7% had anomaly on the left side and 5% on the right side (Beser, *et al.*, 2013). There was no statistically significant difference in the side in unilateral case ($P = 0.581$). Accessory head was found to be more in males (15.2%) than in females (2.5%) (Beser, *et al.*, 2013). Biceps received its innervations from musculocutaneous nerves in 80% of cases. In 20.8% of cases, musculocutaneous nerve was found to be variable, absent or showed deviations in its course, or was connected to median nerve in the arm (Londhe Shashikala and Jadhav Ashwini, 2011).

The BBM also reported two supernumerary heads, and coracobrachialis muscle consisted of two heads in the same person (Jayanthi and Elezy, 2012).

Combination of six variations was reported, the biceps brachii showed an accessory head that originated

from the tendons of pectoralis major, ran downward superficial to the long head, and joined the distal 1/3rd of the muscle mass (Beser, et al., 2013).

Considering these above studies, although there are individual reports about these variations, the combination of variations related to the musculature of the upper limb with or without change in the pattern of neurovascular variation was observed.

Conclusion

As for our knowledge of previous publication, there are so many journals reported with multiple variation and accessory heads of BBM, but the absent of one head of BBM in unilateral arm is reported rarely. In conclusion, these variations are interesting not only to the anatomists, but also to the orthopedic surgeons, plastic surgeons, traumatologists, physiotherapists, and doctors dealing with sports medicine and also to radiologists.

Strong evidence of the absence of one head of BBM may be suggestive of developmental anomaly or physical degeneration of the muscle which may lead to complete or partial dysfunction of the region. However, further studies can show the real case of it.

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Conflicts of interest

There are no conflicts of interest.

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