

# Unusual Variation of the Biceps Brachii with Possible Median Nerve Entrapment

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Received March 24, 2015; Accepted June 1, 2015.

**Key words:** Biceps brachii – Third head – Entrapment syndrome – Median nerve – Brachial artery

**Abstract:** The biceps brachii is one of three muscles of the anterior compartment of arm. Variations of the biceps brachii are not rare. The most frequent is the existence of a third head called the humeral head by Le Double (1897) (Rodríguez-Vázquez et al., 1999). Our article is based on the unexpected result of a routine dissection class held for medical students. Dissection was performed according to the guidelines accepted by the anatomy department (Seichert, 1999). We describe a third (accessory) head of the biceps brachii. In addition of two regular heads, the third head originated together with the short head from the coracoid process and had three insertions on the humerus after enfolding the median nerve and the brachial artery. This particular variation is important from a clinical perspective as the third head may cause entrapment syndrome of the median nerve and hypoperfusion of the upper limb due to compression of the brachial artery.

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## Introduction

The biceps brachii is one of three muscles of the anterior compartment of arm. It consists of a short head, which originates from the apex of the coracoid process and a long head, which originates intraarticular from the supraglenoid tubercle of the scapula. Both heads join in the medial part of the arm and insert with its main tendon on the radial tuberosity and with bicipital aponeurosis into the antebrachial fascia (Darke et al., 2010). Variations of the biceps brachii are not rare (Ozan et al., 1997; Paval and Mathew, 2006; Kumar et al., 2008; Lee et al., 2011; Sunitha and Narasingarao, 2011; Nasr and Hussein, 2013; Swamy et al., 2013). This particular variation is important from a clinical perspective as the accessory head in our case may cause entrapment syndrome of the median nerve (Lubahn and Cermak, 1998; Nakatani et al., 1998; Paval, 2006; Paraskevas et al., 2008; Mahato, 2010; Piyawinijwong et al., 2011; Avadhani and Chakravarthi, 2012; Ongeti et al., 2012; Sawant, 2013).

## Material and Methods

Our article is based on the unexpected result of a routine dissection class held for medical students. The biceps brachii variation was found in the right arm of a 76-year-old male cadaver. Body length was 182 cm and upper limbs length was 74 cm. Overall cadaver status was without obesity or muscle atrophy. Dissection was performed according to the guidelines accepted by the anatomy department (Seichert, 1999).

## Results

During a routine dissection class held for medical students, we found an unusual unilateral variation of the biceps brachii. An accessory (third) head of the right biceps brachii had a common origin with the short head from the coracoid process laterally to the coracobrachialis. The third head split from the short head and had three different insertions on the humerus. The additional muscular head was 1.5 cm wide and 22 cm long, measured from the coracoid process to the division into tendons (Figure 1, an arrow). The common origin part of the third and short head was 10 cm long. The course of the tendons was described as follows:

1. Thin and wide lateral tendon inserted into the anterior aspect of the humerus, 13 cm below the insertion of the latissimus dorsi on the crest of lesser tubercle and 9 cm above the interepicondylar line. The insertion point was 3 cm long and ran parallel to the humeral shaft.
2. The thick proximal medial tendon was 3 cm long and inserted into the humerus in continuation to the insertion of the coracobrachialis muscle.
3. The cord-like distal medial tendon was 10.9 cm long and inserted on the medial epicondyle (Figures 1 and 2).

In its course the third head enfolded the median nerve, 0.5 cm in diameter, together with the brachial artery, 0.6 cm in diameter, and brachial veins.

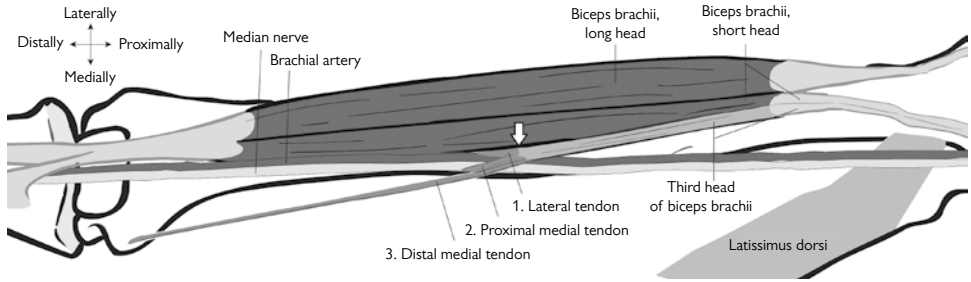


Figure 1 – Scheme of the biceps brachii third head variation on right arm.

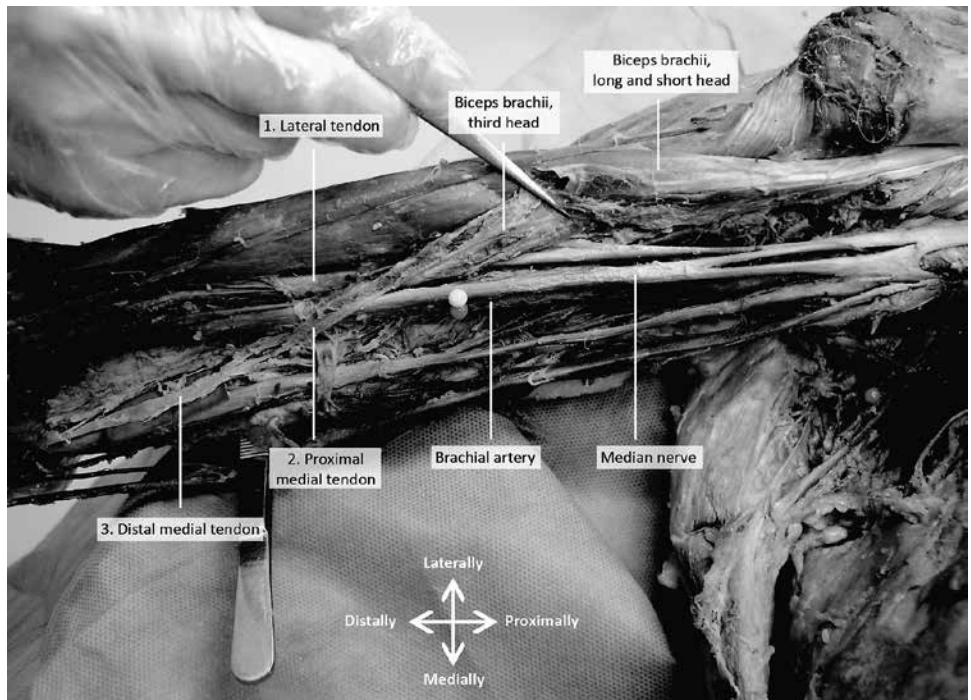


Figure 2 – Photo of the biceps brachii third head variation on right arm.

Interestingly the musculocutaneous nerve passed through the third belly of the biceps as oppose to the coracobrachialis muscle as is seen in most cases.

We did not observe any other variations of the muscles of arm and forearm, including variation of coracobrachialis.

### Discussion

Biceps brachii is very variable. Variations may be divided into several groups (Bergman et al., 2014):

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1. The muscle may be entirely suppressed
2. The muscle may be composed of 1 to 5 heads
3. There may be variations in the origin of the long head (from the capsule of the shoulder joint or the intertubercular groove)
4. One of the insertions may be absent
5. The muscle may insert to an unusual structure (the brachioradialis muscle, supinator muscle, coronoid process etc.).

The most frequent is the existence of a third head called the humeral head by Le Double (1897) (Rodríguez-Vázquez et al., 1999). A few articles have been published on this topic. The third head with a “V” shaped origin in the deltoid muscle was described (Kumar et al., 2008). In another case, a third head with the origin on the anteromedial surface of the humerus, slightly above the middle portion, and the insertion into the bicipital aponeurosis was reported (Ongeti et al., 2012). A case of a bilateral supernumerary head taking its origin from the site of origin of the coracobrachialis and its insertion into the common tendon was published (Sunitha and Narasingarao, 2011). As well as additional heads, the tendinous slips emerging from the medial side of the right biceps brachii and blending with the upper part of the medial intermuscular septum (Swamy et al., 2013) or originating from the medial side below the level of the middle of the arm and inserting on the medial supra-condylar ridge of the humerus and the fascial covering of the flexor carpi ulnaris have been reported (Kumar et al., 2008).

Other articles describe the possible median nerve entrapment in the arm caused by biceps brachii variations. Nakatani et al. (1998) report bilateral four-headed biceps brachii muscles with median nerve and brachial artery passing through a tunnel formed by a muscle slip from the accessory head. The study performed on 24 human cadavers also concluded the possibility of median nerve entrapment caused by variations of the arm muscles (Avadhani and Chakravarthi, 2012). The supernumerary head of biceps brachii creating a tunnel for median nerve and brachial artery was also reported (Mahato, 2010). Reports describing the neurovascular compression of median nerve and brachial artery by the third head of biceps brachii originating on the shaft of humerus were recently published (Sawant et al., 2012; Sawant, 2013).

In this case we describe a third head of the biceps brachii, which occurs just in 1% of cases (Nasr and Hussein, 2013). Most of the extraneural heads of the biceps brachii have a different origin but eventually join the course of the main muscle belly. In this case the third heads originated on the coracoid process and inserted on three different parts of humerus. This particular variation is also of clinical significance as three tendons of the third head enfolded the median nerve together with the brachial artery and brachial veins, which could cause symptoms of median nerve entrapment syndrome.

Symptoms of the median nerve entrapment syndrome caused by the third head of the biceps brachii can be very similar to pronator syndrome. Pronator

syndrome is much less common than carpal tunnel syndrome. In both syndromes patients complain of pain in the wrist and forearm regions, weakness of the thenar muscles and paresthesias of the radial three and a half digits. But no nocturnal pain in pronator syndrome was described. Also Tinel's sign is negative at the wrist in pronator syndrome. The differential diagnosis of the pronator syndrome (and probably the biceps brachii variation like in this case) is important because this entity is relatively uncommon compared with carpal tunnel syndrome.

Other important differential diagnoses include thoracic outlet syndrome, proximal brachial plexus neuropathies, cervical radiculopathy and polyneuropathy. The diagnosis of these conditions is assisted by the use of electrophysiological investigations. Considering the entire length of the median nerve, there are numerous locations that median nerve entrapment may occur. It is very much essential to thoroughly evaluate the problem before coming to a conclusion about the presence of the popular compressive neuropathies.

## Conclusion

This case report may be of relevance in clinical practice when treating entrapment syndromes of the median nerve, which is relatively common, and ischemia of the upper limb, which is considerably rarer.

An accessory head of the biceps brachii might be of practical use in surgical procedures.

## References

- Avadhani, R., Chakravarthi, K. (2012) A study on morphology of the biceps brachii muscle. *NUJHS* **2(3)**, 2–5.
- Bergman, R., Afifi, A., Miyauchi, R. (2014) *Biceps Brachii. Illustrated Encyclopedia of Human Anatomic Variation*. Available at: <http://www.anatomyatlases.org/AnatomicVariants/MuscularSystem/Text/B/02Biceps.shtml> (accessed December 2014).
- Darke, R., Vogl, W., Adam, M. (2010) *Gray's Anatomy*, 39<sup>th</sup> Edition. Churchill Livingstone/Elsevier, Philadelphia.
- Kumar, H., Das, S., Rath, G. (2008) An anatomical insight into the third head of biceps brachii muscle. *Bratisl. Lek. Listy* **109(2)**, 76–78.
- Lee, S., Jung, C., Ahn, K., Nam, K. (2011) Bilateral asymmetric supernumerary heads of biceps brachii. *Anat. Cell Biol.* **44(3)**, 238–240.
- Lubahn, J., Cermak, M. (1998) Uncommon nerve compression syndromes of the upper extremity. *J. Am. Acad. Orthop. Surg.* **6**, 378–386.
- Mahato, N. (2010) Entrapment of the median nerves and brachial arteries in the lower arm bilaterally and additional origin of biceps brachii muscle. Case report. *Int. J. Morphol.* **28(4)**, 1241–1244.
- Nakatani, T., Tanaka, S., Mizukami, S. (1998) Bilateral four-headed biceps brachii muscles: The median nerve and brachial artery passing through a tunnel formed by a muscle slip from the accessory head. *Clin. Anat.* **11(3)**, 209–212.
- Nasr, A. Y., Hussein, A. M. (2013) Morphology and clinical implication of the extra-head of biceps brachii muscle. *Folia Morphol. (Warsz.)* **72(4)**, 349–356.
- Ongeti, K., Pulei, A., Ogeng'o, J., Saidi, H. (2012) Unusual formation of the median nerve associated with the third head of biceps brachii. *Clin. Anat.* **25**, 961–962.

- Ozan, H., Atasever, A., Sinav, A., Simsek, C., Basar, R. (1997) An unusual insertion of accessory biceps brachii muscle. *Kaibogaku Zasshi* **72(6)**, 515–519.
- Paraskevas, G., Natsis, K., Ioannidis, O., Papaziogas, B., Kitsoulis, P., Spanidou, S. (2008) Accessory muscles in the lower part of the anterior compartment of the arm that may entrap neurovascular elements. *Clin. Anat.* **21(3)**, 246–251.
- Paval, J. (2006) A rare case of possible median nerve entrapment. *Neuroanatomy* **5**, 35–36.
- Paval, J., Mathew, J. (2006) A rare variation of the biceps brachii muscle. *Indian J. Plast. Surg.* **39**, 65–67.
- Piyawinijwong, S., Khampremsri, N., Ongsiriporn, M., Roongruangchai, J. (2011) Cadaveric study of median nerve entrapment in the arm: report of two anatomical cases. *J. Med. Assoc. Thai.* **94(11)**, 1405–1409.
- Rodríguez-Vázquez, J., Mérida-Velasco, J., Jiménez-Collado, J. (1999) Unusual variation of a third head of the biceps brachii muscle. *Ann. Anat.* **181**, 573–575.
- Sawant, S. P. (2013) The neurovascular compression due to the third head of biceps brachii in the right arm – a case report. *IJAPBS* **2(1)**, 56–60.
- Sawant, S. P., Shaikh, S. T., More, R. M. (2012) A case report on the median nerve passing through the supernumerary head of the biceps brachii muscle. *IJAPBS* **1(2)**, 1–4.
- Seichert, V. (1999) *Topografická Pitva*. ISV, Prague.
- Sunitha, V., Narasingarao, B. (2011) Bilateral three headed biceps brachii – A case report. *PJSR* **4(2)**, 53–54.
- Swamy, R., Nayak, S., Rao, M., Rao, R., Sirasanagandla, S., Kumar, N., Patil, J., Abhinitha, P., Guru, A. (2013) Clinically important unilateral accessory tendinous slip from short head of biceps brachii muscle merged with medial intermuscular septum: a case report. *OA Anatomy* **1(2)**, 16.