

## An anatomical study of the third head of biceps brachii muscle and its innervations

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### Abstract

**Introduction:** Biceps brachii muscle is the double headed flexor muscle of anterior compartment of arm, showing most common anatomical variation.

**Objective:** To study the morphological variation of biceps brachii muscle along with its innervations.

**Method:** 42 upper extremities of 21 formalin fixed cadavers used during routine dissection in anatomy department of LMC were studied. Biceps brachii muscles were examined for their attachments, number of heads of origin, level of fusion of muscle bellies and innervations. Appropriate photographs were taken.

**Result:** Out of 42 upper extremities of 21 cadavers third head of biceps brachii muscle was found in two right upper extremities (9.52%). One of the specimens had dual nerve supply from musculocutaneous and median nerve where as in another specimen third head was innervated only by musculocutaneous nerve.

**Conclusion:** Knowledge of additional head of biceps brachii is important for surgery of the fracture of shaft of humerus.

**Keywords:** biceps brachii, third head of biceps brachii, musculocutaneous nerve, median nerve.

### 1. Introduction

Biceps brachii muscle is flexor muscle of the anterior compartment of arm. It takes origin proximally by two heads, long head from the supraglenoid tubercle and short head from the tip of the coracoid process of scapula. Two heads fuse distally in the middle of the arm in front of elbow and form tendon, which is inserted distally on the posterior rough part of the radial tuberosity. It also forms aponeurosis that fuse with the deep fascia of the forearm and gets attached to the posterior border of ulna.[1] It is the only flexor of the arm crossing both shoulder and elbow joint. It also crosses the superior radioulnar joint and acts as a powerful supinator. It is innervated by the musculocutaneous nerve. It is vascularized by branches from brachial and anterior circumflex humeral arteries and brachial vein.[1] Biceps brachii is the most common muscle showing the variations. A frequently encountered variation is 3<sup>rd</sup> head, but 4<sup>th</sup>, 5<sup>th</sup> and up to 7<sup>th</sup> head has been reported.[2, 3]

### 2. Materials and Method

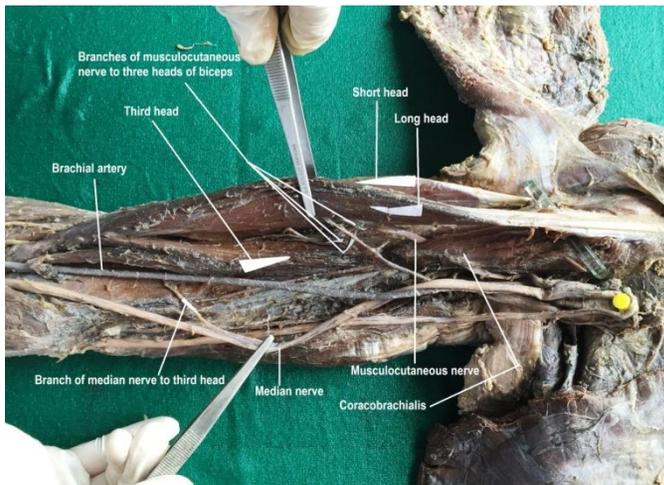
Both the upper extremities of the 21 formalin fixed cadavers used for routine dissection from 2009 to 2013 in the department of anatomy of Lumbini Medical College, Nepal IJBAR (2016) 07 (05)

were observed for nerve supply and morphology of biceps brachii. A vertical incision was made from the level of acromian process of scapula to the mid of the forearm and two small horizontal incisions were made at the two ends of the vertical incision. Skin flaps along with superficial and deep fascia were reflected to uncover the biceps brachii muscle. Proximal and distal attachments of the muscle were exposed. Nerve and vessels of anterior compartment of arm and cubita fossa were carefully traced. The biceps brachii muscle was observed for additional head, shape and size of the long and short head were recorded. The innervations of additional head and whole muscle were recorded. The appropriate photographs were taken.

### 3. Results

Out of 42 upper extremities of 21 cadavers third head of biceps brachii muscle was found in two (9.52 %) right upper extremities. In both the cases third head of biceps brachii took origin from the middle of anteromedial surface of shaft of humerus just below the insertion of coracobrachialis and this additional head of biceps brachii got fused with the common bulk of muscle. Distally the muscle was inserted on radial tuberosity and bicipital

aponeurosis. In one specimen the third head had dual nerve supply by branch from musculocutaneous nerve proximally and median nerve distally (Fig: 1) In the same specimen musculocutaneous nerve pierces the coracobrachialis muscle.



**Figure: 1**



**Figure: 2**

#### 4. Discussions

Biceps brachii is the common muscle showing morphological variation in the origin of its head. Presence of third head is the most common form of the morphological variation of biceps muscle.[4] There have also been reported cases of even more heads up to seven.[3] Standard documented text shows third head of biceps originating from superomedial part of brachialis in 10 % of cases.[1] According to the site of origin, the third head can be classified as superior humeral head, inferomedial and inferolateral head.[4] There has also been a reported case of acromial, labial and pectoral heads of biceps brachii.[3] In present study the additional head of biceps brachii are of Inferomedial type originating from the anteromedial surface of the shaft of the humerus just below the insertion of the coracobrachialis and this is the most common variation of the pattern of the third head of the biceps brachii.[4] There are several reported cases of third head of biceps with male predominance in right arm, this may be due to functional adaptation of the right hand.[2,6,7] The result of the present study is also similar to the results of the previous authors, as both cases are from right upper limb. In Our study third head of biceps is present in right side which is the most common site in agreement with the study of the Kosugi *et al* [8], Santo-Neto *et al* [9] and Poudel and Bhattarai [10].

Biceps brachii shows geographical and racial variation. There are very few reported cases of this variation in Nepalese population. In present study third head of biceps brachii is present unilaterally in right upper limb in 9.52 % of Nepalese population which is similar to the study of Poudel and Bhattarai [10]. According to the previous studies prevalence rate of supernumerary head of biceps brachii is 37.5 % Colombians, 20.55% in south African blacks, 18 % Japanese, 15 % white Europeans, 12.5 % Nepalese, 8% IJBAR (2016) 07 (05)

In the second specimen the third head was supplied only by musculocutaneous nerve which was passing in front of coracobrachialis muscle.

Chinese 7.1 % Indian, 3.7 % Srilankan.[2,6,8,10,11,13,14] The muscles of front of the arm are supplied by the musculocutaneous nerve.[1] The presence of additional head of biceps brachii muscle affects the branching pattern of the musculocutaneous nerve.[15] The variation in branching pattern of this nerve may be clinically important for surgeons operating on the arm and diagnosis of the nerve impairment.[16]

Some authors reported that the third head of biceps which arises from the insertion area of the coracobrachialis represents the ancestral hominoid condition.[17-19] Embryological studies shows that third head of biceps brachii muscle arises from brachialis muscle in which distal insertion has been shifted from ulna to radius.[3] The innervation and vascularization of the biceps brachii in the present study is by the musculocutaneous nerve and brachial artery in accordance with the embryological development of related dermatomes and myotomes.[2]

Third head of biceps muscle may provide an additional force for supination and flexion of the forearm or it may cause unusual displacement of the fragments of humerus after fracture.[20] It would allow the flexion of the elbow joint irrespective of the position of the shoulder joint.[21] In most of the cases additional heads are asymptomatic and present an incidental findings encountered during imaging and surgery.[22] The presence of additional muscle may cause compression of the neurovascular structure and may lead to variation of normal mechanical action.[23]

#### 5. Conclusion

Knowledge of additional head of the biceps in Nepalese population may become useful in treating fracture of shaft of humerus and nerve entrapment syndromes.

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