

# Third Head of Biceps Brachii (Caput Accessorium)

Gupta Shalini<sup>1</sup>, Mittal Anupama<sup>2</sup>

<sup>1</sup>Department of Anatomy, Mayo Medical College, Gadia, Barabanki, Lucknow, India

<sup>2</sup>Department of Anatomy, Subharti Medical College, Subharti University, Meerut, India

**Abstract:** *Biceps brachii* is stated as one of the muscles that shows most frequent anatomical variations. Its most commonly reported anomaly is the presence of a third head arising from the humerus which is termed as *Caput Accessorium*, therefore, detailed knowledge of this variation in different populations is important for surgical interventions of the arm, nerve compression syndromes and in unexplained pain syndromes in the arm or shoulder region. The goal of this study was to elucidate the incidence of this muscle in an adult U.P west population. Upper extremities of the total of 50 cadavers were dissected and studied for the presence of accessory heads of the biceps brachii muscle. The incidence of humeral head of biceps brachii was found to be 6%. In all cases, it was found unilaterally and only in male subjects. Knowledge of the occurrence of humeral head of biceps brachii may facilitate preoperative diagnosis as well as the surgical procedures of the upper limb thus avoiding iatrogenic injuries.

**Keywords:** Biceps brachii, caput accessorium

## 1. Introduction

The biceps brachii, a muscle of the anterior compartment of the upper limb, has been characteristically described as having a long head originated from the supraglenoid tubercle and glenoid labrum and a short head from the coracoid process of the scapula. Distally these two heads unite to form a common tendon that inserts into the posterior rough part of the radial tuberosity and bicipital aponeurosis which merges with the deep fascia of the forearm [1]. This mode of insertion makes it an efficient and important supinator of the forearm. It is the only flexor of the arm that crosses the shoulder as well as the elbow joint thereby acting on both joints. It is innervated by the musculocutaneous nerve and vascularized by brachial and anterior circumflex humeral arteries and brachial vein [1].



**Figure 1:** Photograph showing normal anatomy of biceps brachii

MN-median nerve; D-Deltoid; SH-short head; LH-long head; CT-common tendon. Biceps brachii has been stated as one of the muscles that shows frequent anatomical variations [3], [4], [5]. Some of its reported anomalies have been manifested as third head that originate from the coracoid process, articular capsule, tendon of pectoralis major or from humerus itself [6]. Among those variations, the presence of third head arising from the shaft of the humerus, which is known as *caput accessorium* is known to be the most common anomaly [7],[3],[8].

A large body of evidence suggests a wide range of racial variations in the occurrence of third head of biceps brachii

muscle. It was shown to have an incidence of 7.1% in Indians, 8% in Chinese, 10% in European whites, 12% in African Blacks, 15% in Turkish, 18% in Japanese [3], [8-16]. The existence of an anomalous muscle in and around the elbow region may cause high median nerve palsy and compression of the brachial artery [5].

## 2. Material and Method

This study was carried out on a total of 50 apparently healthy human cadavers (40 males and 10 females) during routine gross anatomy dissections in the Department of Anatomy, Subharti medical college Meerut. The cadavers were preserved in 10% formalin. The age group of the cadavers varied between 48-67 years. The presence of accessory heads, their origins and insertions were recorded.

A longitudinal incision was made on the anterior aspect of the arm extending from the level of acromian process to a point 2.5 cm below the elbow joint. Then horizontal incisions were made bilaterally on both proximal and distal ends of the longitudinal incision. The skin, subcutaneous fat and fascia of the arms were dissected carefully to expose the full length of the biceps brachii muscle from its proximal to distal attachment.

## 3. Results and Discussion

Out of 100 upper limbs of 50 cadavers third heads of the biceps brachii were present in 3 upper limbs of the study subjects. Supernumerary heads of biceps brachii muscle were absent bilaterally in 45 cadavers and unilaterally on 5 cadavers. The incidence of humeral head of biceps brachii in the present study was found to be 6%. In all cases, when present, it was found unilaterally and only in male subjects.

In all the study subjects, the humeral head of biceps brachii originated from the antero-medial aspect of the middle & lower third of the humeral shaft. It descended with the other two heads to form a common tendon which inserted into the radial tuberosity and bicipital aponeurosis. The long and short heads of biceps brachii muscles had their normal attachments and relations.



**Figure 2:** Photograph showing third head of biceps brachii

I-insertion; O-origin; TH-third head; SH-short head; LH - long head. The third head received its innervations from the musculocutaneous nerve, as do the other two heads of biceps brachii. The vascularization of the accessory head was from the brachial artery and vein.



**Figure 3:** Photograph showing nerve supply of third head of biceps brachii

#### MCN-musculocutaneous nerve; TH-Third head

The present study documents the incidence of humeral heads of biceps brachii in an adult U.P west population. The standard Anatomy text states the incidence of this variation as 10% [1]. The incidence third head of biceps brachii in blacks was found to be significantly lower than in whites [17]. The present study shows the incidence of 6% among Meerut population, a result that further highlights the racial differences in the incidence of third head of biceps brachii observed among different populations.

It was also interesting to note the gender differences of the occurrence of accessory heads of this muscle. Gender comparison of the incidence implies that third head of the biceps brachii is a predominantly male condition [10], [3]. The results of the present study are in agreement with the above statement.

#### 4. Conclusion

It is presumed that the development of the biceps brachii muscle is likely to influence the course and the branching pattern of musculocutaneous nerve [18],[13]. This may have clinical implication as the musculocutaneous nerve is subjected to compression by the bulky third head. Therefore, knowledge on such variations will be important during surgical manipulations of the arm as well as in diagnosing the nerve impairments. Furthermore, it has been mentioned that any variant nerve with an abnormal origin, course and distribution is prone to accidental injuries and impairments [19]. This is further proved by the fact that supernumerary

heads of the biceps brachii muscle have been reported to compress the surrounding neurovascular structures leading to erroneous interpretations during surgical procedures [18].

#### 5. Future Aspect

The biceps brachii is known for its powerful elbow flexion and supination of the forearm. It can be argued that the presence of supernumerary heads of biceps brachii muscle increase its kinematics. Therefore, from anatomical standpoint of view it can be presumed that the presence of a third head may increase the power of flexion and supination of the forearm [13]. In addition to allowing the elbow flexion irrespective of the shoulder joint position, the third head of biceps brachii may enhance the strength of elbow flexion [16].

#### References

- [1] Williams, P. L.; Bannister, L. H.; Berry, M. M.; Collins, P.; Dyson, M. & Dussek, J. E. Gray's Anatomy: The anatomical basis of medicine and surgery. 38th Ed. New York, Churchill Livingstone, 2000.
- [2] Testut, L. & Latarjet, A. Compendio de anatomia descriptiva. 22nd Ed. Buenos Aires, Salvat, 1981.
- [3] Asvat, R.; Candler, P. & Sarmiento, E. E. High incidence of the third head of biceps brachii in South African populations. *J. Anat.*, 182:101-4, 1993.
- [4] Nakatani, T.; Tanaka, S. & Mizukami, S. 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.*, 11:209-12, 1998
- [5] Nayak, S. R.; Ashwin, K.; Madhan, K. S. J.; Latha, V. P.; Vasudha, S. & Merin, M. T. Four-headed biceps and triceps brachii muscles with neurovascular variation. *Anat. Sci. Intl.*, 83:107-11, 2008.
- [6] Sargon, M. F.; Tuncali, D. & Celik, H. H. An unusual origin for the accessory head of biceps brachii muscle. *Clin. Anat.*, 9:160-2, 1996.
- [7] Khaledpour, C. Anomalies of the biceps muscle of the arm. *Anat. Anz.*, 158:79-85, 1985.
- [8] Kopuz, C.; Sancack, B. & Ozbenli, S. On the incidence of the third head of biceps brachii in Turkish neonates and adults. *Acta. Anat. Nippon.*, 74:301-5, 1999.
- [9] Rai, R.; Ranade, A. V.; Prabhu, L. V. & Prakash, M. M. P. Third head of Biceps brachii: A study in Indian population. *Singapore Med. J.*, 48:929-31, 2007.
- [10] Bergman, R. A.; Thompson, S. A.; Afifi, A. K. & Saadeh, F.A. Compendium of human anatomic variation. 1st Ed. Baltimore, Urban and Schwarzenberg, 1988.
- [11] Torre, F. R. L.; Cegarra, J. N. & Berruezo, J. P. Biceps brachii muscle attached to the extensor carpi radialis brevis muscle: an unreported anatomical variation in humans. *Anat. Anz.*, 176:319-21, 1994.
- [12] Kosugi, K.; Shibata, S. & Yamashita, H. Supernumerary head of biceps brachii and branching pattern of the musculocutaneous nerve in Japanese. *Surg. Rad. Anat.*, 14:175-85, 1992.
- [13] Kumar, H.; Das, S. & Rath, G. An anatomical insight into the third head of biceps brachii muscle. *Bratisl. Lek. Listy.*, 109:76-8, 2008.

- [14] Tountas, C. P. & Bergman, R. A. Anatomic variations of the upper extremity. New York, Churchill Livingstone, 1993.
- [15] Rincon, F.; Rodriquez, I. Z. & Sanchez A. The anatomic characteristics of the third head of biceps brachii muscle in Colombian population. Rev. Chil. Anat., 20:197-200, 2002.
- [16] Swieter, M. G. & Carmichael, S. W. Bilateral three-headed biceps brachii muscles. Anat. Anz., 148:346-9, 1980.
- [17] Santo Neto, H.; Camilli, J. A.; Andrade, J. C.; Meciano, F. J. & Marques, M. J. On the incidence of the biceps brachii third head in Brazilian white and blacks. Anat. Anz., 180:69-71, 1998.
- [18] Warner, J. P.; Palleta, G. A. & Warren, R. F. Accessory Head of the Biceps brachii, Case report demonstrating clinical relevance. Clin. Ortho. Res., 280:179-81, 1992.
- [19] Roberts, W. H. Anomalous course of the median nerve medial to the trochlea and anterior to the medial epicondyle of the humans. Anat. Anz., 174:309-11, 1992.

### Authors Profile



**Dr. Shalini Gupta** did her B. D.S from Saraswati Dental College, Lucknow in 2010. She did her M. Sc (Medical Anatomy) from Subharti medical college, Meerut in 2013. Presently she is working as tutor in Mayo Medical College,

lucknow.



**Dr. Anupama Mittal** did her MBBS from JLN Medical College in 1989. Presently she is final year post graduate student in Subharti Medical College.