

## CLINICAL STUDY

# An anatomical insight into the third head of biceps brachii muscle

Hitendra Kumar<sup>1</sup>, Srijit Das<sup>2</sup>, Gayatri Rath<sup>3</sup>

Department of Anatomy, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi-110029, India. [drhitendra3@yahoo.com](mailto:drhitendra3@yahoo.com)

**Abstract:** *Background:* The biceps brachii muscle is known to show variations in the number of heads. This study was performed to evaluate the variations in the origin of the biceps brachii muscle heads.

*Materials and methods:* Both extremities of 48 formalin fixed cadavers (n=96) were studied for abnormal heads of biceps brachii muscle. The flexor compartment of the arm was dissected and the attachments of the biceps brachii muscle were studied in detail. Appropriate photographs were taken.

*Results:* Among ninety six upper limbs studied, we observed three heads of biceps on both sides of a male cadaver aged 56 yrs (3.33 %). The two heads of the biceps arose from its usual position but the anomalous third head arose from the anterior limb of the 'V' shaped insertion of the deltoid muscle on the humerus. The third head was found to fuse with the common belly of the muscle well before the bicipital tendon and its aponeurosis. Bilaterally this third head was supplied by a twig of the musculocutaneous nerve. No other abnormalities relating to the biceps were observed in any of the sides of the other 47 cadavers (n=94).

*Conclusion:* Our study revealed that the incidence of third head of biceps brachii may be approximately 3.33 % but larger studies are needed to confirm this fact. The third head of biceps brachii may be an incidental finding at autopsy or during routine anatomical dissections. Unless symptomatic, the third head of biceps brachii may not be detected in clinical studies (Fig. 3, Ref. 15). Full Text (Free, PDF) [www.bmj.sk](http://www.bmj.sk).

**Key words:** biceps, third head, anomaly, musculocutaneous, variation.

The biceps brachii muscle belongs to the flexor group of muscles in the arm. It is the only flexor of the arm crossing the shoulder joint as well as the elbow joint, thereby acting on both the joints. Among the two classical heads, the long head runs in intracapsular course over the humeral head and attaches to the supraglenoid tubercle and adjacent portion of the glenoid labrum. The short head arises from the tip of the coracoid process of scapula (1, 2). The two heads soon fuse in the upper half of the arm to form the bulk of the biceps muscle. At the lower end the flattened tendon of biceps crosses the elbow ventrally, turns backwards and laterally to get inserted into the posterior rough part of radial tuberosity. This mode of insertion makes biceps an efficient and important supinator of the forearm. The biceps brachii muscle is innervated by the musculocutaneous nerve and supplied by the brachial and the anterior circumflex humeral arteries (1).

It has been reported that in 10 % cases the third head of biceps may arise from the superomedial part of the brachialis and

is attached to bicipital aponeurosis and medial side of tendon insertion (1). In the present case, we report a peculiar origin of the third head of the biceps from the anterior limb of 'V' shaped insertion of deltoid muscle in the humerus. The muscle was innervated by the musculocutaneous nerve and supplied by the brachial artery and the anterior circumflex humeral artery.

The presence of the three biceps heads may be important for academic and clinical purpose. The presented study explores the importance of such variations.

## Material and methods

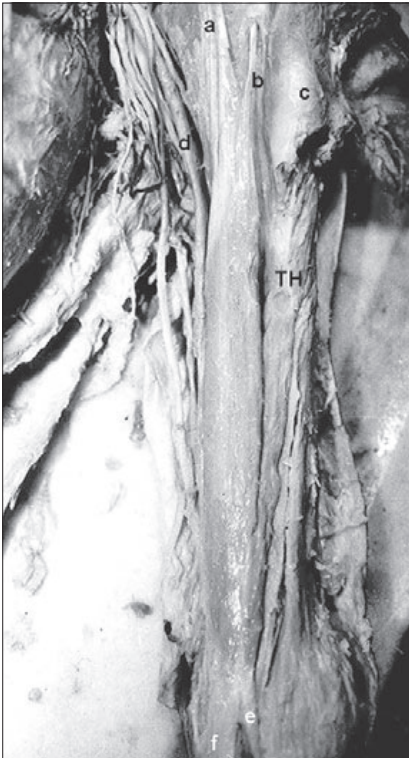
Both extremities of 48 formalin fixed cadavers (n=96) irrespective of age and sex were dissected for the study. The arm was dissected carefully to display the full length of the biceps muscle from proximal attachment to the distal attachment. All other related structures were also exposed. The additional heads were examined for the origin and course at lower end. Appropriate photographs were taken (Figs 1, 2 and 3).

## Results

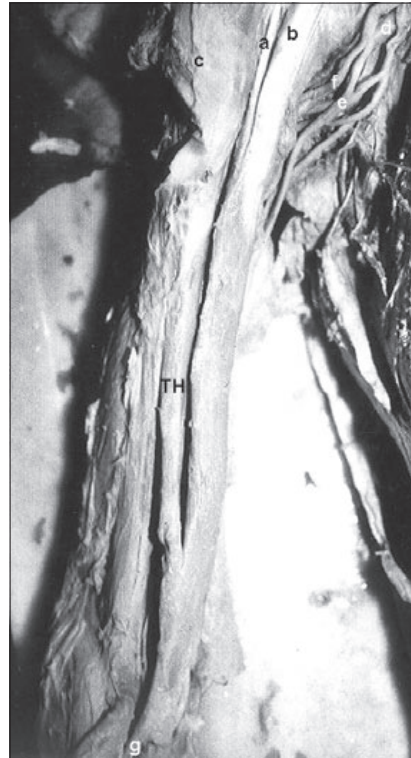
Among 48 cadavers studied (n=96), the third head of biceps was observed on both sides of a one male cadaver (3.3 %). None of the rest 47 cadavers (n=94) had any anomalous third head of the biceps brachii muscle.

<sup>1</sup>Department of Anatomy, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India, <sup>2</sup>Department of Anatomy, National University of Malaysia, Kuala Lumpur, Malaysia, and <sup>3</sup>Department of Anatomy, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India

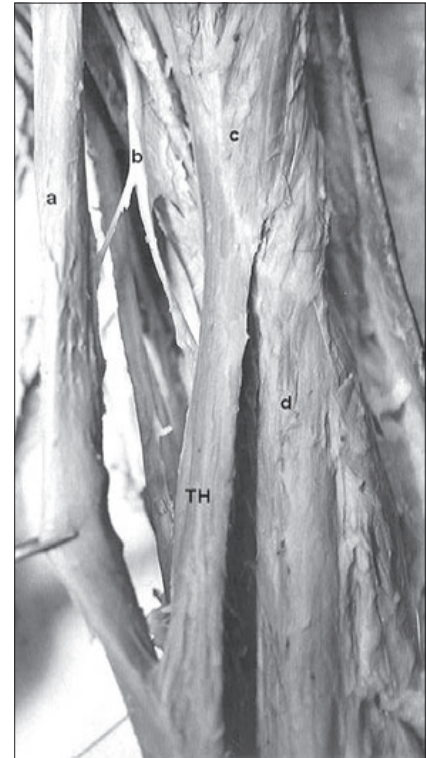
**Address for correspondence:** Hitendra Kumar, MD, MBBS, MS, J-974, Ansals Palam Vihar, Gurgaon, Haryana, India 122017. Phone: +91.9350809434



**Fig. 1.** Photograph of dissected specimen (left side) showing: a – long head of biceps brachii muscle, b – short head of biceps brachii muscle, c – pectoralis major, d – axillary artery, e – tendon of biceps, f – bicipital aponeurosis, TH – third head of biceps brachii muscle.



**Fig. 2.** Photograph of dissected specimen (right side) showing: a – long head of biceps brachii muscle, b – short head of biceps brachii muscle, c – deltoid, d – axillary artery, e – median nerve, f – medial cutaneous nerve of arm, g – tendon of biceps, TH – third head of biceps brachii muscle.



**Fig. 3.** Photograph of dissected specimen (left side) showing: a – belly of long and short head of biceps, b – musculocutaneous nerve innervating the main belly and the third head, c – deltoid, d – brachialis muscle.

The anomalous third head of the biceps brachii muscle was observed on both sides of a 56 year old male cadaver (Figs 1, 2 and 3). The third head originated from the anterior limb of the ‘V’ shaped insertion of the deltoid muscle on the humerus. The third head was found to fuse with the common bulk of the muscle, well before the bicipital tendon and its aponeurosis. This additional head was supplied by a branch of the musculocutaneous nerve (Fig. 3). No other abnormalities were observed.

### Discussion

In the literature, biceps brachii muscle presents a wide range of variations. They can manifest as a cluster of accessory fascicles arising from coracoid process, pectoralis minor tendon proximal head of humerus, or articular capsule of humerus (3). The most common variation is the muscle arising from proximal humerus also known as the humeral head or the third head of the biceps brachii muscle (4, 5, 6, 8). According to presented studies, this anomaly varies in different population, Chinese 8 %, European White 10 %, African Black 12 % and Japanese 18 %, South African blacks 20.55 %, South African whites 8.35 % and 37.5 % in Colombians (6, 9, 10, 11).

Standard textbooks mention the fact that in 10 % cases the third head arises from the superomedial part of brachialis (1). Interestingly, we observed a well defined third head (Figs 1 and 2) to arise from the anterior limb of the ‘V’ shaped insertion of the deltoid muscle, unlike any past report and the incidence was 3.33 % in our study, very low compared to the other studies. In majority of the past studies the third head has been described to arise from the region between the insertion of the coracobrachialis muscle and the origin of the brachialis muscle (2, 8).

There is lack of literature on the third head of biceps study in Indian population. A past study had defined it as an incidental case in Indian population (14). A larger study needs to be conducted to bring a final conclusion.

The additional head of the biceps brachii muscle, as seen in the present case, may not be uncommon but its peculiar origin from the anterior limb of the ‘V’ shaped insertion of the deltoid is very rare. It is presumed that the development of the third head of the biceps brachii may influence the course or branching pattern of the musculocutaneous nerve (15). In the present study, we also observed the musculocutaneous nerve to have a characteristic branching pattern in between the long head and the third head.

The branching pattern of the musculocutaneous nerve while innervating the long head and the third head (as seen in Fig. 3) may be clinically important as the nerve is subjected to compression by the bulky third head. The knowledge of such variations may be important for surgeons operating on the arm and clinicians diagnosing the nerve impairment. It is considered that any variant nerve having an abnormal origin, course and distribution may be prone to accidental injuries and impairment (14). Variations in the heads of the biceps brachii muscle has already been reported to cause compression of surrounding neurovascular structures and lead to erroneous interpretation during routine surgeries (15).

Presence of any supernumerary head of the biceps brachii muscle might increase its kinematics. The biceps is known for its powerful action of elbow flexion (secondary to brachialis) with supinated forearm. It also acts when a rapid supination is required. We, anatomists, think that an additional biceps head, as observed in this case, may increase the power of flexion and the supination component.

## Conclusion

The present cadaver study was an attempt to highlight the anomalous third head of the biceps brachii muscle and to discuss its clinical importance which might be helpful from academic, surgical and clinical points of view.

## References

1. **Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, Ferguson MWJ (Eds).** Gray's Anatomy. The Anatomical Basis of Medicine and Surgery. Churchill Livingstone, 1995: 842–843.
2. **Rodriguez-Vazquez JF, Merida-Velasco JR, Jimenez-Collado J.** Unusual variation of a third head of the biceps brachii muscle. *Ann Anat* 1999; 181: 573–575.
3. **Sargon MF, Tuncali D, Celik HH.** An unusual origin for the accessory head of biceps brachii muscle. *Clin Anat* 1996; 9: 160–162.
4. **Greig HW, Anson BJ, Budinger JM.** Variations in the form and attachments of the biceps brachii muscle. *Quart Bull Northw Univ Med Sch* 1952; 26: 241–244.
5. **Khaledpour C.** Anomalies of the biceps muscle of the arm. *Ant Anz* 1985; 158: 79–85.
6. **Asvat R, Candler P, Sarmiento EE.** High incidence of the third head of biceps brachii in South African populations. *J Anat* 1993; 182: 101–104.
7. **Neto HS, Camilli JA, Andrade JCT, Filbo JM, Marques MJ.** On the incidence of the biceps brachii third head in Brazilian whites and blacks. *Ann Anat* 1998; 180: 69–71.
8. **Kopuz C, Sancak B, Ozbenli S.** On the incidence of third head of biceps brachii in Turkish neonates and adults. *Kaibogaku Zasshi* 1999; 74: 301–305.
9. **Bergman RA, Thompson SA, Afifi AK.** Catalogue of Human Variation. Baltimore, Urban & Schwarzenberg 1984; 27–30.
10. **Rincon F, Rodriguez IZ, Sanchez A.** The anatomic characteristics of the third head of biceps brachii muscle in Colombian population. *Rev Chil Anat* 2002; 20: 197–200.
11. **Swieter MG, Carmichael SW.** Bilateral three-headed biceps brachii muscles. *Anat Anz* 1980; 148: 346–349.
12. **Nayak S, Samuel VP, Somayaji N.** Concurrent variations of median nerve, musculocutaneous nerve and biceps brachii muscle. *Neuroanatomy* 2006; 5: 30–32.
13. **Abu-Hijleh MF.** Three Headed Biceps Brachii Muscle Associated With Duplicated Musculocutaneous nerve. *Clin Anat* 2005; 18: 376–379.
14. **Roberts WH.** Anomalous course of the median nerve medial to the trochlea and anterior to the medial epicondyle of the humerus. *Anat Anz* 1992; 174: 309–311.
15. **Warner JJP, Paletta GA, Warren RF.** Accessory head of the biceps brachii: a case report demonstrating clinical relevance. *Clin Orthop Rel Res* 1992; 280: 179–181.

Received June 15, 2007.  
Accepted December 19, 2007.