

## A CADAVERIC STUDY OF ADDITIONAL HEAD OF BICEPS BRACHII MUSCLE IN SOUTH INDIAN POPULATION

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### ABSTRACT

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#### BACKGROUND

Biceps brachii muscle is present in the anterior aspect of the arm. Variations are common in the number of heads, their origin, insertion and nerve supply. Morphological variations of biceps have great clinical significance for surgeons, orthopaedicians, anaesthetists, neurologists and anatomists. Additional head of the biceps brachii (AHBB) has been reported with a frequency of 1-25% in different population group. Aim of the present study is to know the incidence and morphology of AHBB.

#### METHODS

Fifty upper limb specimens were looked for biceps brachii during routine dissection in Department of Anatomy, Bangalore Medical College and Research Institute for a period of 3 years.

#### RESULTS

In a 56-year-old male cadaver, two heads of biceps arose from its usual position along with which an additional head arose from anteromedial surface of shaft of the humerus in common with and distal to insertion of the coracobrachialis. The additional head fused with the common belly of the muscle, before the bicipital tendon and its aponeurosis. Bilaterally this additional head was supplied by a twig of the musculocutaneous nerve.

#### CONCLUSION

In the present study, 3-headed biceps brachii muscle was noticed in 4%. Knowledge of the morphological variations of biceps muscle provides better preoperative evaluation, safe surgical intervention within the arm and better postoperative outcomes.

#### KEYWORDS

Biceps Brachii, Additional Head, Variation, Musculocutaneous Nerve.

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**INTRODUCTION:** Biceps brachii muscle is a flexor of elbow joint and also a powerful supinator of the forearm present in the anterior compartment of arm. It takes origin from the scapula by two heads. The long head arises from the supraglenoid tubercle of scapula and the short head from the tip of coracoid process of the scapula. The long head has intracapsular origin. It is covered by the synovial membrane of the shoulder joint. It arches over the humeral head and emerges from the joint behind the transverse humeral ligament and descends in the intertubercular sulcus of the humerus. The short head takes its origin from the coracoid process of the scapula along with coracobrachialis. The two heads of biceps brachii descend separately up to 7 cm above the elbow joint where they fuse together to form a common tendon and insert into the posterior part of the tuberosity of radius and also forms a fibrous expansion called bicipital aponeurosis, which is inserted in to the subcutaneous posterior border of ulna through the deep fascia of the forearm.

Biceps brachii receives its innervation from the musculocutaneous nerve. The long head keeps the head of the humerus in contact with the glenoid cavity in abduction.<sup>1</sup> Biceps brachii is one of the well-documented structures with frequent anatomical variations in terms of number and morphology of its head in the human body. Most common variation is third head, but four, five or even seven heads have been reported.<sup>2</sup> Origin of third head is highly variable. It may arise either from the intertubercular sulcus of the humerus or from the shaft of the humerus near the insertion of coracobrachialis or deltoid fascia and the insertion area of this muscle.

**AIMS AND OBJECTIVES:** Evaluate the incidence of additional head of biceps brachii in South Indian population.

**MATERIAL & METHODS:** Both extremities of 25 formalin fixed cadavers (n=50) of 20 males and 5 females were studied during dissection in Department of Anatomy, Bangalore Medical College and Research Institute, for a period of 3 years. Prior approval of institutional ethics committee was taken. The flexor compartment of the arm was dissected and looked for additional heads of biceps brachii muscle. The incidence, origin, insertion and innervation of the additional head of biceps brachii were studied in detail. Appropriate photographs were taken.

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**RESULTS:** Among fifty upper limbs studied, we observed three heads of biceps on both sides of a male cadaver aged 56 yrs. (4%). The two heads of the biceps arose from its usual position; the long head from the supraglenoid tubercle and short head from the coracoid process of the scapula, but the anomalous third head arose from the anteromedial surface of shaft of the humerus distal to the insertion of the coracobrachialis as shown in Fig 1 & Fig 2. The additional head was found to fuse with the common belly of the muscle just before the bicipital tendon and its aponeurosis which was supplied by a twig of musculocutaneous nerve bilaterally. The other 48 upper limbs did not have any abnormality relating to biceps. In present study, 3-headed biceps brachii muscle was noticed in 4%.



**Fig. 1: Biceps brachii Muscle from its Origin to its Insertion**



**Fig. 2: Long, Short & Extra Head of Biceps brachii. (A-Long head of Biceps Brachii; B-Short Head of Biceps brachii; C-Extra head of biceps brachii; CB-Common Belly of Biceps Brachii)**

**DISCUSSION:** The frequency of Additional Head of Biceps Brachii is 1-25% among different population groups. In terms of number and morphology of its head, it is one of the most variable muscles in the human body. Most common variation is third head (10%), but four, five or even seven heads have been reported. This anomaly varies among populations such as Chinese, 8%; European white, 10%; African black, 12%; Japanese, 18%; South African blacks, 21%; South African whites, 8%; and 38% in Colombians.<sup>3</sup> Ballesteros LE conducted an exploration on 106 arms of unclaimed corpses autopsied at Institute of Legal and Forensic Medicine of Bucaramanga, Colombia. One AHBB was observed in 21(19.8%) of the arms evaluated, 11(52.4%) cases on the right side and 10(47.6%) on the left side. The incidence of AHBB in this study is located at the upper segment of what has been reported in the literature and could be a morphologic trait of the Colombian population; in agreement with prior studies, the origin was the inferomedial surface of the humerus.<sup>4</sup>

Kumar et al reported the presence of third head biceps brachii muscle in 3.33% cases. In their study, they observed a bilateral presence of additional heads and their varied pattern of origin, their insertion was to the tendon of biceps brachii muscle or to its aponeurosis.<sup>5</sup> In 2009, Poudel PP et al studied 32 arms from 16 Nepalese cadavers where supernumerary heads of biceps brachii were observed in 12.5%. Among these, three-headed biceps brachii was presented on 6.2% and the four headed was on 6.2%. All the variations were in the right-sided arms of males. Third head of all cases originated from the medial border and adjoining anteromedial surface of humerus distal to the insertion of coracobrachialis. Fourth head of the four-headed biceps brachii originated from the anterior border of humerus near by the insertion of deltoid muscle.<sup>2</sup>

Nasr AY et al observed 100 upper limbs obtained from the Anatomy Department, Faculty of Medicine, King Abdul-Aziz University. The incidence of anatomical variations of biceps muscle was equal in both male and female cadavers (10%) with predominance of the left side (7%). The 3-headed biceps brachii muscle was noticed in 7% (4% male and 3% female), while the 4-headed biceps was seen in 2 (2%) left limbs, 1 male and 1 female. The third head of the biceps muscle arose from the anteromedial aspect of humerus between the coracobrachialis insertion and the brachialis origin in 6% and from middle of the medial border of humerus in 3%. While the fourth head originated from the articular capsule of shoulder joint in 1 (1%) limb and from the coracoid process of scapula in the other limb. The biceps common tendon of insertion received the supernumerary heads in 7% of the limbs. However, the extra-head fused with the long head in 2 (2%) limbs and united with the short head in 1 (1%) limb.<sup>6</sup>

Kosugi, Shibata and Yamashita studied 546 upper limbs of 273 cadavers and found that supernumerary head of biceps brachii were present in 75 limbs (13.7%) of 58 cadavers. He stated that there was no clear gender and racial differences in occurrence of supernumerary heads of biceps brachii muscle.<sup>7</sup> Mamatha et al studied 40 arms of adult cadavers. They observed the presence of supernumerary head of biceps brachii muscle in 6 (15%) cases. In 5 cases (12.5%), they observed three heads and in one case (2.5%), they observed four heads. In one case, they noticed bilateral incidence with three heads on left side and four heads on right side.<sup>8</sup> Rai et al stated that the occurrence of a third head of biceps brachii muscle is relatively rare in Indian population. They have observed the origin of third head of biceps brachii muscle from anteromedial aspect of lower part of the humeral shaft with incidence of 7.1%.<sup>9</sup> Tountas and Bergman found the supernumerary heads in 10.2% of 1453 arms. In about 12.0% of arms, a humeral head was found in addition to those that usually arise from the scapula.<sup>10</sup>

The Following Table Depicts Its Incidence Which Varies Among Different Ethnic Groups.

Author	Year	Place	No. of Heads	%
Kosugi	1992	Japan	3	12
Tountas	1993	New York	3	10.2
Rai	2007	India	3	7.1
Kumar	2008	India	3	3.3
Poudel	2009	Nepal	3	6.2
Nasr	2013	Turkey	3, 4	7, 2
Mamatha	2013	India	3	12.5
Ballesteros LE	2014	Columbia	3	19.8

**Table 1: Incidence of Extra Head of Biceps Brachii in Different Ethnic Groups**

The results obtained from the present study correlates with results of other authors (Table 1). The third head can be a cluster of accessory fascicles arising from coracoid process, pectoralis minor tendon, head of humerus or articular capsule of the humerus.<sup>11</sup> The presence of a supernumerary head of the biceps brachii muscle might increase its kinematics. The biceps is known for its powerful elbow flexion action (Secondary to brachialis) when the forearm is supinated. It also acts as powerful supinator in flexed elbow. Anatomists consider that additional biceps heads may increase the power of flexion and the supination component of the elbow. Embryologically, this type of variation with the third head of the biceps brachii is described as a portion of the brachialis muscle supplied by the musculocutaneous nerve, in which its distal insertion has been translocated from the ulna to the radius.<sup>10</sup> However, in the present case, additional heads of both sides originated from the anteromedial surface of the humerus distal to the insertion site of the coracobrachialis muscle. Therefore, considering their origin they may be remnants of the long head of the coracobrachialis muscle, an ancestral hominoid muscle.<sup>12</sup> Association of the third head with unusual bone displacement subsequent to fracture has relevance in surgical procedures. They may cause compression of neurovascular structures because of their close relationship to brachial artery and median nerve.

**Surgical and Embryological Importance:** Association of the third head with unusual bone displacement subsequent to fracture has relevance in surgical procedures. They may cause compression of neurovascular structures because of their close relationship to brachial artery and median nerve. Embryologically, this type of variation with the third head of the biceps brachii is described as a portion of the brachialis muscle supplied by the musculocutaneous nerve, in which its distal insertion has been translocated from the ulna to the radius. Therefore, considering their origin they may be remnants of the long head of the coracobrachialis muscle, an ancestral hominoid muscle.

**CONCLUSION:** The site of origin of extra head is shaft of humerus and its insertion is with other two heads of the biceps brachii muscle, on the radial tuberosity and also in aponeurotic form in the fascia of upper part of forearm on its medial side. The nerve supply to all the three heads of muscle was by musculocutaneous nerve. Surgeons and traumatologists have to keep in mind variant biceps brachii as it confuses surgical procedures on arm and prevent iatrogenic injuries.

#### REFERENCES

1. Johnson D. Upper arm. In: Standring S, Borley N, Collin P, eds. Gray's anatomy: the anatomical basis of clinical practice. 40<sup>th</sup> edn. Edinburgh: Churchill Livingstone-Elsevier 2008:825-826.
2. Poudel PP, Bhattarai C. Study on the supernumerary heads of biceps brachii muscle in Nepalese. Nepal Med College Journal 2009;11(2):96-98.
3. Bergman RA, Thompson SA, Afifi AK. Catalog of human variation. Baltimore and Munich: Urban & Schwarzenberg 1984:27-30.
4. Ballesteros LE, Forero PL, Buitrago ER. Evaluation of additional head of biceps brachii: a study with autopsy material. Folia Morphol (Warsz) 2014;73(2):193-198.
5. Kumar H, Das S, Rath G. An anatomical insight into the third head of biceps brachii muscle. Bratisl Lek Listy 2008;109(2):76-78.
6. Nasr AY, Hussein AM. Morphology and clinical implication of the extra-head of biceps brachii muscle. Folia Morphol (Warsz) 2013;72(4):349-356.
7. Kosugi K, Shibata S, Yamashita H. Supernumerary head of the biceps brachii and branching pattern of the musculocutaneous nerve in Japanese. Surgical and Radiological Anat 1992;14(2):175-185.
8. Suhani S, Mamatha H, Rao L, et al. Supernumerary heads of biceps brachii muscle in South Indian Cadavers. Anat J Africa 2013;2(1):108-113.
9. Rai R, Ranade AV, Prabhu LV, et al. Third head of biceps brachii muscle in an Indian population. Singapore Med J 2007;48(10):929-931.
10. Tountas CP, Bergman RA. Anatomical variations of the upper extremity. 6<sup>th</sup> edn. New York: Churchill Livingstone 1993:97-99.
11. Sargon MF, Tuncali D, Celik HH. An unusual origin for the accessory head of biceps brachii muscle. Clinical Anat 1996;9(3):160-162.
12. 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. Clinical Anat 1998;11(3):209-212.