



AN ANATOMICAL INSIGHT ON THE SUPERNUMERARY HEAD OF BICEPS BRACHII AND ITS CLINICAL RELEVANCE – CADAVERIC STUDY

Ishwar B. Bagoji^{1*}, Gavishiddappa A. Hadimani¹, Balappa M. Bannur¹, B. G. Patil¹, Ambadasu Bharata², M. A. Doshi³, B S Patil¹

¹Dept. of Anatomy, Sri B M Patil Medical College, BLDE University Bijapur, Karnataka, India

²Dept of Pharmacology, Sri B M Patil Medical College, BLDE University Bijapur, Karnataka, India

³Dept of Anatomy, Krishna Institute of Medical Sciences University Karad, Maharashtra, India.

*Corresponding author: ishwarbagoji@gmail.com

ABSTRACT

The biceps brachii is as one of the most variable muscle in the human body in terms of number and morphology of its heads. The most frequent variation is the presence of a third head, which has been reported by several authors in different populations. We studied 80 arms of adult formalin fixed cadavers in the Department of Anatomy, B.L.D.E University's Sri B M Patil Medical College & research centre Bijapur India. The presence of, number of additional heads and their details of attachments were studied. We observed presence of supernumerary heads of biceps brachii in 3 (3.75%) cases, in which one was having unilateral three heads (1.25%) In another case we encountered bilateral incidence (2.50%). Knowledge of occurrence of supernumerary third head of Biceps brachii muscle may become significant for the orthopedic surgeons, traumatologists, plastic surgeons, radiologist, and physiotherapists.

Keywords: Biceps Brachii, Supernumerary Head, Variations.

1. INTRODUCTION

The term biceps brachii is Latin phrase meaning two headed (muscle) of the arm. Biceps brachii is triarticular in nature and brings powerful supination and fine flexion. As Biceps brachii muscle has classical two heads, short head and long head. The short head takes origin from the tip of the coracoid process together with coracobrachialis (CB) and the long head arises from the supraglenoid tubercle of the scapula. Since the long head is intracapsular, it also takes origin from glenoidal labrum. Both heads, after their separate origin, distally unite to form a common tendon inserting into the posterior rough part of the radial tuberosity of the radial bone. At its site of insertion, it gives off an extension called bicipital aponeurosis (Lacertus fibrosus). Biceps brachii is innervated by musculocutaneous nerve (MCN). It is a strong supinator when the forearm is flexed, in addition to flexion of the elbow [1].

The most frequent variation of biceps brachii is the presence of a third head, which has been reported in several articles. The supernumerary head of biceps brachii variations may present as a group of accessory muscle fascicles arising from the coracoid process of scapula, the tendon of the pectoralis major, the head of the humerus, and the articular capsule of the shoulder joint [2-5]. Biceps brachii has been stated as one of the muscles that shows frequent anatomical variations. Among those variations, an accessory head

originating from the shaft of the humerus is known to be the most common anomaly [6].

Existence of additional heads of biceps brachii may lead to certain clinical complications, clinicians should be aware of the accessory heads of the biceps brachii as they may be confusing for a surgeon performing procedures on the arm and may lead to iatrogenic injuries. Consequently, knowledge of such variations may become significant in preoperative diagnosis and during surgery. Additionally, they may cause compression of important neurovascular structures in the upper limb [7-9].

2. MATERIAL AND METHODS

The present study was carried out in the Department of Anatomy, B.L.D.E.U^s Shri B M Patil Medical College and Research Centre Bijapur Karnataka. Eighty upper limbs formalin fixed adult cadavers were studied. The flexor compartments of the arm of all limbs (Both right and left) were dissected for the detailed study of origin, insertion and presence of supernumerary heads of biceps brachii muscle. The biceps muscle was carefully displayed to its full length by removing the subcutaneous fat and the fascia. The muscle was exposed up to its insertion and the accessory heads were examined for their origin and courses at the lower end. Careful isolation of variant heads of biceps brachii was done in order to note the separate or fused origins of aberrant heads of the muscle. Detailed observations of their proximal and distal

attachment in addition to their pattern of innervations were also noted.

3. RESULTS AND DISCUSSIONS

In most of the study subjects, the classical long and short heads of biceps brachii muscles had their normal origin

insertions innervations, and relations. Out of 80 dissected upper limbs, we observed supernumerary heads in three arms (3.75%) unilateral presence of head in one arm (1.25%) and bilateral supernumerary head presence in one body (2.50%).

Table: 1 Profile of incidence of supernumerary heads of biceps brachii (BB) muscle

Number of heads		No. of cases (n=80)	Percentage incidences	of Right arm (n=47)	Left arm (n= 30)
Two heads		77	96.25%	47	30
Three heads	Unilateral	01	1.25%	01	-
	Bilateral	02	2.50%	01	01



Figure 1: Right upper limb of biceps brachii shows *Accessory head, short& long head, Musculo Cutaneous Nerve (MCN), Median Nerve (MN).

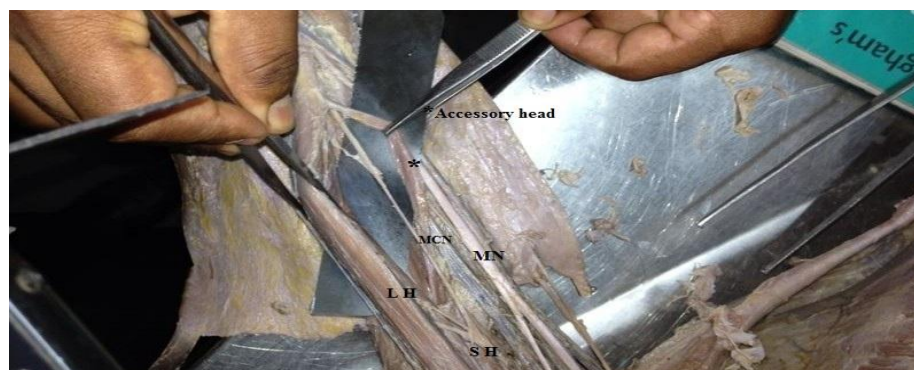


Figure2: Left upper limb of biceps brachii shows *Accessory head, short& long head, Musculo Cutaneous Nerve (MCN), Median Nerve (MN).



Figure3: Right upper limb shows **Accessory head, Long head(L H), Short head(SH), Coracobrachialis (C B) and brachial vessels.

Table 2: Presence of supernumerary heads of biceps brachii (BB) in different populations

S. no	Authors	Population	Percentage (per arm)	Arm with supernumerary head of BB/total arm
1	Rincon et al	Columbia	25	8/32
2	Asvat et al	South Africa (Black)	16.4	24/146
3	Kosugi et al	Japanese	13.7	75/546
4	Khaledpour	Europeans	0.65	1/52
5	Asvat et al	South African (white)	4.16	1/24
6	Paraskevas et al	Greeks	1.6	1/62
7	Poudel and Bhattarai	Nepalese	6.25	2/32
8	Nayak et al	Indians	2.8	2/92
9	P. Kervancioglu	Turkey	8.3	2/24
10	Present study	Indians (North Karnataka Region)	3.75	3/80

4. DISCUSSION

The biceps brachii is known as one of the muscles with the most frequent anatomical variations in the human body in terms of origin, number, and morphology of its heads [10]. The origins of the multiple heads were varied. A study conducted in Japan reported varied sources of origins of additional heads, which were from humerus, medial intermuscular septum, tendon of pectoralis major or the deltoid and even from articular capsule or from the crest of greater tubercle [11]. Hence in our study we observed an additional head arising in common with brachialis muscle in the middle of the shaft of the humerus. The most common variation is having accessory heads. Presence of three heads in contrast to its normal two heads is the most common incidence [12-14]. High median nerve compression around the elbow joint has been described as resulting from a number of clinical and anatomical entities. The existence of an anomalous muscle in and around the elbow region may cause high median nerve palsy and compression of the brachial artery. Further, knowledge of the incidence of humeral head of biceps brachii will facilitate preoperative diagnosis as well as the surgical procedures of the upper limb [15, 16]. According to presented studies this anomaly varies in different population, with respect to different geographical regions [17].

There is racial variation in the presence of biceps brachii with three heads also been documented by comparative studies between Brazilian whites and black subject's conducted [18], and between South African whites and blacks [2]. Study conducted on Srilankan population also noticed a racial difference [6]. Another study reported the presence of third head of biceps in 3.33% cases [13] in their study; they observed a bilateral presence of three heads. Few studies showed presence of supernumerary three heads on left side and 4 heads on right side [19]. Regardless of number of additional heads and their varied pattern of origin, their insertion was to the tendon of the biceps and or to its aponeurosis. Some study

reported the origin of 3rd head from anterior surface of the humerus and distal to the insertion of the coracobrachialis in majority of cases [14], as we observed in our study. Developmentally, the third head of biceps brachii originates from the brachialis muscle and its insertion has translocated from ulna to the radius thus the nerve supply by musculocutaneous nerve as most studies reported in the literature. However, when the third head presents dual origin, partial innervation from the axillary nerve is also possible as the fibers of the third head intermingle with those of the deltoid muscle [20]. Functionally, presence of a third head originating from the midshaft of the humerus may confer a mechanical advantage in pronation of the forearm and may enhance the strength of elbow flexion as well as exaggerate its kinematics [21].

5. CONCLUSION

Knowledge of occurrence of supernumerary third head of Biceps brachii muscle may become significant for the anatomist orthopedic surgeons, traumatologists, plastic surgeons, radiologists, and physiotherapists. A lack of awareness of these variations might complicate surgical repair, flap surgery and may cause ineffective nerve blockade. Also, these muscles should not be mistaken for tumors on magnetic resonance imaging of the arm.

6. REFERENCES

- Williams PL, Bannister LH, Berry MM, Collins P, et al., Gray's Anatomy: 38th Ed. 443-445.
- Asvat R, Chandler P, Sarmiento E. *J Anat*, 1993; **182**:101-104.
- Bergman RA, Thompson SA, Afifi AK. Baltimore, urban & schwarzenberg, 1984; 27-30.
- Lee JH, Choi IJ, Kim DK. *Korean J Anat*, 2008; **41**:231-232.
- Sargon M, Tuncali D, Celik H. *Clin Anat*, 1996; **9**:160-162.
- Ilayperuma I, Nanayakkara G, Palahepitiya N. *Int. J. Morphol*, 2011; **29**:221-225.

7. Nakatani T, Tanaka S, Mizukami S. *Clin Anat*, 1998; **11**:209-212.
8. Poudel PP, Bhattarai C. *Nepal Med Coll J*, 2009; **11**:96-98.
9. Warner JJP, Paletta GA, Warren RF. *Clin Orthop Rel Res*, 1992; **280**:179-181.
10. Macalister A. *Trans R Irish Acad*, 1875; **25**:1-134.
11. Kosugi K, Shiata S, Yamashita H. *Surg and Radiol anatomy*, 1992; **14**:175-185.
12. El-Naggar MM, Zahir FI. *Clin Anat*, 2001; **14**:379-382.
13. Kumar H, Das S, Rath G. *Bratisl Lek Listy*, 2008; **109**:76-78.
14. Mehmet Mutlu catli, et al. *Anat cell Biol*.2012June; **45(2)**:136-139
15. Kopuz C, Sancak B, Ozbenli S. *Kaibogaku Zasshi*, 1999; **74**:301-5.
16. Nayak SR, Ashwin K, Madhan KSJ, Latha VP, et al., *Anat. Sci. Intl.*, 2008; **83**:107-111.
17. Kervancioglu P, Orhan M. *Folia Morphol.*, 2011; Vol. 70.
18. Santo NH, Camilli JA, Andrade JC, Meciano FJ et al., *Anat. Anz.*, 1998; **180**:69-71.
19. Mamatha H, Suhani S, Lakshmeesha Rao, Aruna Shree, et al., *Anatomy Journal of Africa*, 2013; 2(1):108-113.
20. Testut L, Latarjet A. *Compendio de anatomia descriptive*.22nd ed. Buenos aires. Salvat: 1981.
21. Swieter MG and Carmichael SW. *Anat. Anz*, 1980; **148**:346-349.