Original Article

Anatomy

Low Incidence of the Third Head of the Biceps Brachii in the North Indian Population

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ABSTRACT

Background: The biceps brachii is one of the most variable muscles in the body with regards to the number and morphology of its heads of origin. This aspect requires studies and evaluation in different populations because of its important functional and clinical implications.

Objective: To study the incidence of the third head of the biceps brachii in the north Indian population and its comparison with other population groups.

Methods: 126 upper limbs of 63 embalmed adult human cadavers were dissected as per the standard methods to note the origin, insertion and the nerve supply of the biceps brachii. Any additional head was particularly looked for.

Result: The three headed biceps brachii was detected unilaterally in three male cadavers, all belonging to the left side. While the short and long head had a normal origin, the third head originated near the insertion of the coracobrachialis and at the origin of the brachialis. It inserted into the muscle belly in two cases and into the bicipital aponeurosis in one case. In all the three cadavers, the third head was supplied by a branch from the musculocutaneous nerve.

Conclusion: The supernumerary heads of the biceps brachii is a frequently encountered anomaly and it has got large variations in its incidence in different population groups. This fact should be kept in mind by the anatomists as well as the clinicians, particularly in populations with a high incidence of it.

Key Words: Biceps brachii, Muscle, Supernumerary heads, Variation

KEY MESSAGE

- The supernumerary heads of the biceps brachii - a common variation with variable incidence in different population groups.
- This study reports the low incidence of the third head of the biceps brachii in the north Indian population.

INTRODUCTION

The biceps brachii is the commonest muscle in the body to show variations in the form of supernumerary heads. Normally, the biceps brachii has two heads, the short head originating from the coracoid process and the long head from the supraglenoid tubercle. The two heads join distally to form a common tendon which gets inserted onto the posterior aspect of the radial tuberosity, thus contributing to the flexion and the supination of the forearm. Some aponeurotic and tendinous fibres gain insertion into the bicipital aponeurosis. However, as many as seven heads of the biceps brachii have been reported, the most common one being the third head [1]. Some authors [2] have tried to trace the functional aspect of these extra heads by the abnormal movements which they can produce and others [1-3] have tried to draw clinical implications like the head being mistaken for a tumour or suspecting that it produces compression symptoms. In the present study, the occurrence as well as the morphology of these supernumerary heads have been studied. Further, their phylogeny and functional/clinical implications have been discussed.

MATERIAL AND METHODS

The material for the present study comprised of 126 superior extremities which belonged to 63 embalmed adult human cadavers (M:F::48:15). The cadavers were labeled from 1 to 63 with the suffix R or L for the Right or Left extremity and with M or F for the male or female sex respectively. These were dissected as per the standard methods to expose the origin, insertion and the nerve supply of the different heads of the biceps brachii. Any additional head was specifically looked for.

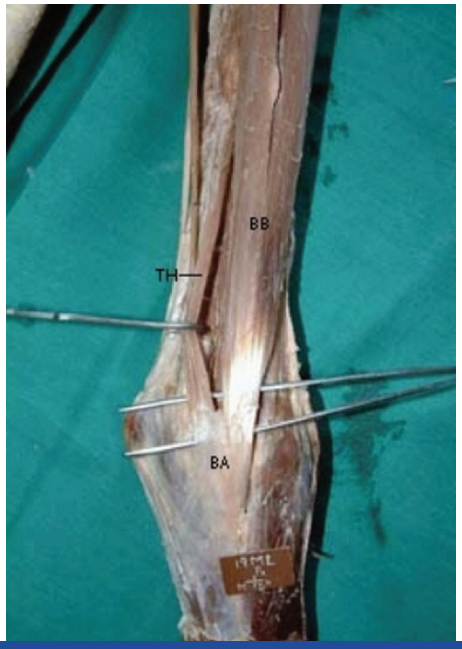
RESULTS

The supernumerary heads of the biceps brachii were found in three out of the 126 limbs. The incidence of the variant was merely 2.3%, which was relatively less in comparison to other populations. All the limbs belonged to the left side and the male sex. In all, the supernumerary head originated from the area between the insertion of the coracobrachialis and the origin of the brachialis. However, in one, it originated by two parts, one which was tendinous and attached to the bone and the other which was musculotendinous and which continued with the coracobrachialis [Table/Fig 1]. In the other two, the musculotendinous origin of the supernumerary head was from the bone only [Tables/Figs 2 and 3]. The insertion was seen in the main muscle belly in two limbs [Tables/Figs-1 and 3], whereas one had its insertion into the bicipital aponeurosis [Table/Fig 4]. The average length of the third head was found to be 12.9 cm. It was a twig from the musculocutaneous nerve which supplied

[Table/Fig-1]: Third head (TH) of biceps brachii (BB) arising from antero-medial surface of humerus, near insertion of coracobrachialis (CB) by two parts – one tendinous (T) attached to bone and other musculotendinous (MT) continuing with coracobrachialis (CB). It is seen blending with common muscle belly

[Table/Fig-2]: Third head (TH) of biceps brachii (BB) arising from antero-medial surface of humerus near insertion of coracobrachialis (CB). [SH-short head of biceps brachii; LH-long head of biceps brachii; BR-brachialis; MCN-musculocutaneous nerve]

[Table/Fig-3]: Third head (TH) of biceps brachii (BB) arising from antero-medial surface of humerus near insertion of coracobrachialis (CB) and blending with common muscle belly of biceps brachii (BB). [LH and SH-long and short heads of biceps brachii respectively]



[Table/Fig-4]: Third head (TH) of biceps brachii (BB) getting inserted into the bicipital aponeurosis (BA)

the additional head in all the three limbs and the arterial supply was from a branch of the brachial artery, thus suggesting that the third head was a muscle of the anterior compartment of the arm.

The remaining 123 limbs showed the normal origin, insertion and the nerve supply of the biceps brachii.

DISCUSSION

The biceps brachii originates by two heads, the long head from the supraglenoid tubercle and the short one from the coracoid process of the scapula. However, one of the variations of the biceps brachii which has made this muscle one of the most variable muscle in terms of the number and morphology of its heads, is a multiheaded biceps. It was encountered in three limbs (2.3%) in the present study.

Various authors [1, 4-17] have reported the incidence of the accessory heads of the biceps brachii to be between 0.18% to 21.5% in different populations [Table/Fig 5].

As far as the side preference for the third head of the biceps is concerned, Sweiter and Carmichael [2] emphasized that the incidence of such heads is more on the right side, thus reflecting the fact that there were more right handed than left handed people and that the muscle fibres developed with use. However, contrary to it, in the present study, all the three cases of the third head were found in the left upper limbs. This can be attributed to our

S. No.	Author	Incidence of third head of biceps brachii
1.	Greig et al. [4] South African blacks	 21.5%
2.	Bergman et al. [5] Chinese European white African black Japanese	 8% 10% 12% 18%
3.	Khaledpour [6]	0.18%
4.	Higashi and Sone [7]	18.3%
5.	Kosugi et al. [8]	12.5%
6.	Asvat et al. [9] South African black South African white	 20.5% 8.3%
7.	Williams et al. [10]	10%
8.	Nakatani et al. [1]	8%
9.	Neto et al. [11] Brazilian white Brazilian black	 20% 9%
10.	Kopuz et al. [12] Turkish	 15%
11.	Rincon et al. [13] Colombian population	12.5%
12.	Ravindranath et al. [14]	1.8%
13.	Rai et al. [15]	7.1%
14.	Kumar et al. [16]	3.33%
15.	Poudel and Bhattarai [17] Nepalese	12.5%
16.	Present Study	2.3%

[Table/Fig-5]: Comparison of incidence of third head of biceps brachii

relatively small sample size in comparison to those of the other studies which have been mentioned above. Also, Asvat et al [9] encountered the third head of the biceps brachii more frequently in males, which corroborated the findings of the present study.

The observed origin of the third head of the biceps brachii did not differ from that in the previously reported cases i.e. from the antero-medial surface of the humerus, near the insertion of the coracobrachialis and closely related to the medial intermuscular septum [1, 9].

The average length of the third head in the present study was 12.9 cm, which was virtually same as that which was described by Kosugi et al [8] in their study i.e. 13 cm.

In two limbs in our study, its insertion was into the belly of the muscle. However, in the third limb, it was inserted into the bicipital aponeurosis, which is said to be a very rare finding by El-Naggar and Zahir [18].

The accessory heads in all the three limbs of the present study were supplied by the musculocutaneous nerve i.e. same as the one which supplied the biceps brachii muscle. This observation was in agreement with all the previous reports [1, 8, 9].

Phylogenetically, the variations of the biceps brachii muscle were explained as a remnant of a "tuberculoseptale" head, that together with the short and long heads, is present in hylobates, but is a product of regression in humans and anthropoids [19]. Sonntag [20] described the third head of the biceps brachii as a remnant of the long head of the coracobrachialis, an ancestral hominoid condition, particularly in those cases where the third head arose from the insertional area of the coracobrachialis, as has been the case in the present study.

The presence of a third head of the biceps brachii muscle has its functional and clinical implications. From a functional viewpoint, the humeral origin of the third head of the biceps brachii muscle may contribute to the pronation of the forearm, irrespective of the position of the shoulder joint [5]. Moreover, if the supernumerary heads are relatively large, they may provide additional strength to the biceps tendon. The clinical significance of the third head is its association with the unusual bone displacement which comes subsequent to fracture [2]. Moreover, the supernumerary heads may confuse a surgeon during shoulder operations and such variations, if unilateral, can be a cause of asymmetry between the two arms and hence, can be confused with pathological conditions such as tumours [3].

CONCLUSION

The accessory heads of the biceps brachii are important to surgeons who perform procedures on the arm and although the variation of this type is of interest to anatomists, clinicians too should be aware of them.

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