ORIGINAL ARTICLE

A Cadaveric Study: Incidence of Third Head of Biceps Brachii from Pune Region of Western Maharashtra

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Abstract:

Background: The biceps brachii is a powerful muscle in the anterior compartment of the upper limb. It is recognized for its function in arm flexion, shoulder stabilization and forearm supination. Anatomical variations, including accessory heads and a third head, are relatively uncommon and their functional significance is unclear. Aim: To evaluate the variations in the origin and incidence of the biceps brachii muscle heads, with a particular focus on the presence of a third head. Materials and Methods: A total of 100 arms from 50 adult cadavers were dissected to detect the presence of the third head of the muscle. The presence or absence of the third head of the biceps brachii muscle was noted on each cadaver and recorded. Results: Out of 50 cadavers evaluated, only one had a third head of the biceps brachii muscle, which was present bilaterally. Therefore, the incidence of the third head was found to be 2% (2 in 100 arms or 1 in 50 cadavers). These findings provide important insights into the anatomical variations of the biceps brachii muscle, which may have clinical implications for certain medical procedures or treatments.

Key words: Biceps brachii, third head, cadaver

Introduction:

The biceps brachii is one of the muscles of the anterior compartment of the upper limb. [1,2] It is commonly recognized for its function in arm flexion, but it also plays a crucial role in shoulder stabilization and forearm supination. The most frequent variation of the biceps brachii muscle, which is exhibited in other mammals too, is said to be the presence of one or more accessory heads. [1,3,4]. Investigation is required to fully comprehend its anatomy, function, and clinical significance. The present study is aimed to assess the incidence and origin of biceps brachii muscle heads.

Material and Methods:

The present study was conducted over a period of 10 years (from 2011 to 2021) at Department of Anatomy, Bharati Vidyapeeth Deemed University Medical College, Pune. The sample size of the study consisted of 100 upper limbs of 50 adult cadavers of unknown age & gender. The cadavers were of both male and female gender and were in a state of preservation. A detailed dissection of the biceps brachii muscle was performed on all 100 upper limbs of 50 cadavers to detect the presence of the third head of the muscle. The dissection was performed in a systematic manner, starting from the distal end of the muscle, to the insertion point at the coracoid process of the scapula. The dissection was done under magnified visualization. The presence or absence of the third head of the bicep brachii muscle was noted on each cadaver. The collected data was analysed using descriptive statistics. The presence or absence of the third head of the biceps brachii muscle was expressed as a percentage of the total number of upper limbs/cadavers. The study was approved by the Institutional Ethical Committee (BVDU/MC/12 Dated: 28/11/2011) and was conducted in accordance with the ethical guidelines of the Declaration of Helsinki. The cadavers were handled with due respect and care during the dissection process.

Results:

As seen in Figure 1, Biceps brachii muscle had three heads- Short head, Long head and Third (Inferomedial) head. Third (Inferomedial) head originated from anteromedial surface of humerus just beyond the insertion of Coracobrachialis & was inserted in the conjoint tendon

Table No. 1: Region wise incidence in the World

Country	Percentage %
China[4,7]	8
European White[4,7]	10
African Black[4,7]	12
Japan [4,7]	18
Korea [11]	6.1

Figure 1: Third heads of biceps brachii muscle



of Biceps brachii muscle. All the three heads were supplied by Musculocutaneous nerve. Unilaterally (right sided) Median nerve was observed to lie posterior to

Table No. 2	: Region	wise	Incidence	in India

Researchers	Percentage %
Rai, Ranade et al[1]	7.14
Gupta et al[9]	12.5
Avdhani et al[10]	16.67
Priya et al[6]	6.5
Cheema et al[11]	2.3
Present study	2

Brachial artery instead of anterior. In the figure1, following are 1:Third head of biceps brachii, 2: Short head of biceps brachii, 3: Long head of biceps brachii, 4: Brachial artery, 5: Median nerve, 6: Musculocutaneous nerve, 7: Medial epicondyle. In present study out of 50 cadaverswere evaluated for the presence of third head of biceps brachii, only 1 reported to have third head which was present bilaterally. So, giving the incidence of 2 in 100 upperlimbs (2%) or 1 in 50 cadavers (2%).

Discussion:

The biceps brachii is made up of parallel bundles of

Multinucleate cells, just like all skeletal muscle. Skeletal muscle has a unique structural configuration that allows it to generate a significant amount of power-up to 100 W/kg, according to estimates. [3] With its wide range of motion across the shoulder and elbow, the biceps brachii develops into the anterior brachial region's most potent muscle. [5] The biceps brachii muscle is known for its variability, and it is considered to be one of the most variable muscles in the human body. As a result, a thorough understanding of the variant origin and accessory head of the biceps is of utmost importance for anaesthetists when administering regional nerve blocks, as the biceps brachii is closely related to the median nerve. [6] In particular, the third head of the biceps brachii is a muscle that is sometimes referred to as the "accessory head" of the biceps brachii. There have been numerous studies conducted to examine the anatomy and function of the third head of the biceps brachii, but its functional significance remains unclear. The presence of a third head in humans has been reported in different frequencies based on the population sampled, such as Chinese (8%), European white (10%), African black (12%) and Japanese (18%). [4, 7] Lee JH [8] reported third head biceps brachii in 14 of the 214 upper extremities, with incidence of variation being 6.5 % (Table 1), in another study which is higher than the current study; this may be because their study used a larger sample size. In a study from Manipal, Karnataka, Gupta C [9] et al. evaluated 24 cadaveric upper limbs and found that 3 of the cadavers had unilateral third head of biceps brachii in 3 of the upper limbs, two were on the right side and one was on the left.(Table 2)Avadhani R [10] et al. reported several findings regarding the biceps brachii muscle's anatomy in their study. In particular, they discovered that the biceps brachii had three heads in 16.67% of instances. In 2.08 percent of cases, they also discovered a rare four-headed biceps brachii, as well as an unusual pair of unconnected two-headed biceps brachii. Finally, they noticed the bicipital aponeurosis fusing with the brachioradialis muscle in 2.08 percent of cases. (Table 2) In a recent study, Priva A [6] et al dissected 35 upper limbs of adult human cadavers. Three of the upper limbs had an accessory head of the biceps brachii (8.57 percent) (Table 2) Cheema P, Singla R.[11] reports a low incidence of 2.3% of the third head of

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biceps brachii in the north Indian population. (Table 2) There are different aspects or perspectives which describe the likely causes of third head of biceps brachii .Testut describes an embryological base that the third head of biceps as a part of brachialis muscle which has musculocutaneous nerve supply, its distal attachment has changed to radius instead of Ulna bone. According to Nayak cause of additional heads of biceps brachii could be due to circulation components during brachial plexus genesis. On basis of evolution in humans, biceps third head could be a remains of coracobrachialis long head as seen in few primates [12] These findings offer crucial information about the biceps brachii's anatomical variations, which may have clinical repercussions for particular medical procedures or treatments. Accessory head of biceps could be wrongly diagnosed as a tumor of soft tissues. Accessory heads could cause pressure on median nerve and brachial artery. Third head of biceps important role could be in reconstructive flap surgeries, regional nerve blocks. [12] The third head of biceps could have a relevance in clinical practice to many diseases related and located around branchial area and shoulder girdle. Its role in functions requires more research [3] In some studies, the anatomy of the third head has been depicted and described using imaging techniques like ultrasound, MRI, or CT scans. Electromyography (EMG) has been used in other studies to quantify the activity of the muscles during various motions. These kinds of studies can shed light on how

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the third head affects arm movements and armstrength. [13-15] Additionally, studies have looked into frequency of third head in various populations. These studies have identified the presence and location of the accessory head using anatomical dissection or imaging methods. These studies findings have been inconsistent, with some claiming that the third head is more common in particular populations while others claim that its incidence is low or variable. Depending on the ethnic group, the prevalence of supernumerary head ranges from 9.1 percent to 22.9 percent. The Asian population experiences it more frequently, whereas the white population does not. [16, 17]. It's crucial to remember that the third head of the biceps brachii is regarded as a typical anatomical variation and that its presence does not imply pathology or dysfunction. Although this anatomical variation is not very common, its functional significance is still unknown Numerous studies have noted the existence of a third head of the biceps brachii, but the results have been conflicting, and more investigation is required to fully comprehend its anatomy, function, and clinical significance. In conclusion, numerous investigations into the structure, use, and prevalence of the third head of the biceps brachii have been made. In our study, 50 cadavers' upper limbs from 100 of them were dissected, and we found a 2% incidence.

Conflicts of Interest: Nil **Source of Support:** Nil

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