Incidence of the third head of biceps brachii in population of Andhra Pradesh

1Vishal Manohar Rao Salve, 2Chandaka Swathi Poornima, 3Mandava Prabhakar Rao
1Associate Professor, 2Assistant Professor and 3Professor & Head, Dept. of Anatomy, Dr. Pinnamaneni Siddhartha
Institute of Medical Sciences & Research Foundation, Chinnaoutpalli, Andhra Pradesh.

Abstract

Background and aims: The biceps brachii is a large fusiform muscle in the flexor compartment of the arm. In terms of the number and morphology of its head, the biceps brachii muscle is one of the most variable muscles in human body. The present study explores the importance of such variations. Materials and methods: The upper limbs of embalmed human cadavers (fixed in 10% formaldehyde solution) were included in present study. Total 36 (72 upper limbs) cadavers were studied by dissection. Results: Among the 72 superior extremities studied, six (8.33%) arms were found to have a three-headed biceps brachii muscles. The variation was present in the left arm of four males and one female. The variation was present in the right arm of one male. Conclusion: Presence of third head of biceps brachii muscle might increase its kinematics. Supernumerary heads of biceps brachii muscle may become significant in pre-operative procedure and during surgery of upper limb.

Key words: variations, flexor compartment, arm, upper limb, kinematics.

Introduction

The biceps brachii is a large fusiform muscle in the flexor compartment of the arm. It is the only flexor of the arm crossing the shoulder joint as well as the elbow joint. Thus it acts on the both joints. Among the two classical heads, the long head runs in the intracapsular course over the humeral head and attached to the supraglenoid tubercle and adjacent portion of glenoid labrum. The short head arises from the tip of the coracoid process of scapula. The two heads soon fuse in the upper half of the arm to form the bulk of the biceps brachii muscle. The flattened tendon of biceps brachii crosses the elbow ventrally at the lower end, turns backwards and laterally to get inserted into the posterior rough part of radial tuberosity. Bicipital aponeurosis gets merged with deep fascia of forearm.

In terms of the number and morphology of its head, the biceps brachii muscle is one of the most variable muscles in human body. The most common variation is a third head, but four, five or even seven heads have been reported. It has been reported that in 10% cases the third head of biceps brachii may arise from the supero-medial part of the brachialis and is attached to the bicipital aponeurosis and medial side of tendon insertion. Depending on origin and location, supernumerary heads of biceps brachii have been classified as superior, inferomedial and inferolateral humeral heads. Among all, inferomedial humeral head is the most common variation. The presence of the third head is important for academic and clinical purpose. The present study explores the importance of such variations.

Materials and methods

The upper limbs of embalmed human cadavers (fixed in 10% formaldehyde solution) were included in present study. Total 36 (72 upper limbs) cadavers were studied during academic year 2009/10 to 2011/12 at Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation, Chinnaoutpalli, Andhra Pradesh. Out of these 36 cadavers, 30 were males and six females. As very less number of female cadavers were available, it was difficult to do a comparative study between the males and females. Each cadaver was observed for variations in the origin and insertion of the biceps brachii muscle bilaterally during routine dissection. The dissection of both upper extremities
(right and left) of the body was carried out according to the Cunningham’s Manual of practical Anatomy. Each upper limb was dissected by longitudinal incision at the anterior aspect of arm from the level of the acromion to the elbow junction. The skin, subcutaneous fat, and fascia were removed to expose the biceps brachii muscle. The nerve and blood supply of each head was carefully examined. The findings were photographed.

**Observation and Results**

Among the 72 upper extremities studied, six (8.33%) arms were found to have a three-headed biceps brachii muscle. The variation was present in the left arm of four males and one female and right arm of one male. Bilateral variation was present in one male cadaver. The variation was found in the left arm of one male cadaver and in the left arm of one female and bilaterally in one male. This bilateral variation was associated with higher bifurcation of brachial artery at the middle of arm. The variation was found in the left arm of two males. Except one arm, all five three headed biceps brachii are the classical third head described in Gray’s text book of Anatomy. In these arms the third head was arising from the anteromedial aspect of the mid-shaft of the humerus below the insertion of coracobrachialis and above the origin of brachialis muscle. All these thirds heads can be classified as inferomedial humeral heads. In these arms the third head was 2-3 cm wide muscle belly. These third heads descended and merged with other two heads to form common tendon and was inserted into radial tuberosity (fig. no 1-5). In one left arm, soon after origin, third head bifurcated into two parts. Medial part of third head joined with apponeurosis of biceps brachii muscles. The lateral part of third head merged with other two heads to form common tendon and was inserted into radial tuberosity (Fig. 6). The innervations and blood supply of all these third heads were from the musculo cutaneous nerve and the brachial artery.

Fig. 1 : Showing third head of biceps brachii in left arm.

Fig. 2 : Showing third head of biceps brachii in left arm associated with higher bifurcation of brachial artery.
Fig. 3: Showing third head of biceps brachii in right arm associated with higher bifurcation of brachial artery.

Fig. 4: Showing third head of biceps brachii in left arm.

Fig. 5: Showing third head of biceps brachii in left arm.

Fig. 6: Showing third head of biceps brachii in left arm.

Abbreviations:
TH-Third head of biceps brachii muscle; B- biceps brachii muscle; SH- Short head of biceps brachii muscle; LH- Long head of biceps brachii muscle; T- Tendon of biceps brachii muscle; AP - Aponeurosis of biceps brachii muscle; BRA- Brachial artery.
Discussion

Biceps brachii muscle presents wide range of variations. They can manifest as a cluster of accessory fascicles arising from coracoid process, pectoralis minor tendon or articular capsule of humerus\(^7\). The most common variation is the muscle arising from proximal humerus. This variation is also known as the humeral head or third head of the biceps brachii muscle. The incidence varies in different populations, Chinese 8%, European White 10%, African Black 12%, Japanese 18%, South African blacks 20.55%, South African whites 8.35% and Colombian 37.5%\(^8\). It suggests that the incidence varies among ethnic groups. The incidence of third head of biceps brachii in 9.37% cases was reported by Varlekar et al in Western Indian population\(^9\).

The incidence of third head of biceps brachii in 7.1% cases was reported from southern coast of India\(^9\). In our study the incidence of third head of biceps brachii was 8.33%. This incidence of third head of biceps brachii was almost similar to the studies of Rai and Ranade\(^9\) and Varlekar et al\(^9\) and also incidence mentioned in Gray's text book of Anatomy\(^1\).

Incidence of variations of biceps brachii is more in males comparative to females\(^3,10\). The most common variation is the third head, but four, five or seven heads have been reported. The accessory heads of biceps brachii are classified according to their location as superior, inferomedial and inferolateral humeral heads. Most of the accessories head of biceps brachii belong to these three groups. Rare variation has also been reported\(^3\). Different studies on the variations on biceps brachii and its association with the variable neurovascular structures have also been reported. Four-headed biceps brachii muscle and double piercing of one supernumerary head by the musculocutaneous nerve have been reported by Vazquez et al\(^11\). Embryological observation described this variation of the third head of biceps brachii 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\(^3\).

A variation in the heads of the biceps brachii muscle has already been reported to cause compression of surrounding neurovascular structures. It leads to erroneous interpretation during routine surgeries\(^12\). The third head of the biceps brachii muscle originating at the level of the lesser tuberosity of the humerus should be dissected for proper visualization of the underlying articular capsule, during a standard arthotomy with T-plasty capsulorrhaphy, in case of chronic shoulder dislocation. It may affect the strength of elbow flexion \(^3,12\). Variant biceps brachii muscle may confuse a surgeon who performs procedures on the arm and may lead to iatrogenic injuries\(^13\). Presence of third head of biceps brachii muscle might increase its kinematics. This third head of biceps brachii muscle may increase the power of flexion and the supination component\(^6\).

Conclusion

The third head of the biceps brachii muscle may be an incidental finding at autopsy or during routine anatomical dissection. Unless symptomatic, the third head of the biceps brachii muscle may not be detected in clinical studies. Supernumerary heads of biceps brachii muscle may become significant in pre-operative procedure and during surgery of upper limb. The surgeons and traumatologists have to keep such muscular variations in mind.

References


Address for communication:

**Dr. Vishal M. Salve**  
Associate Professor of Anatomy,  
Dr. Pinnamaneni Siddhartha Institute Of Medical Sciences & Research Foundation, Chinnaoutpalli, Gannavaram Mandal, Krishna District- 521 286, Andhra Pradesh.  
e-mail ID: vishalsalve2000@gmail.com  
Mobile: 09866379916