

**CASE REPORT**

# **Anomalous Third Head of Biceps Brachii Muscle and its Variant Insertion Compresses Surrounding Neurovascular Structure: A Rare Case Report**

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## **ABSTRAK**

*Bisep brachii (BB) adalah salah satu otot yang mempunyai pelbagai variasi. Terkini, kebanyakan maklumat adalah berkenaan variasi asal otot, namun terdapat beberapa kes yang melaporkan variasi dalam sisipan BB. Dibentangkan di sini kes BB otot yang mempunyai kedua-dua varian asal dan sisipan dalam otot yang sama. Varian asal BB adalah panjang dan besar di kepala ketiga (10.2 cm lebar dan 4.9 cm tebal) yang timbul dari pertengahan badan humerus. Lebih signifikan lagi, bahagian tengah kepala meliputi dan menyembunyikan bahagian bawah saraf median dan arteri brachial sebagai gerbang yang berterusan medially untuk disisipkan ke epicondyle medial humerus. Dalam laporan ini, kami membincangkan mekanisma yang mungkin untuk pemampatan neurovaskular oleh kepala ketiga otot BB yang tidak normal dan perubahan BB dari asal dan sisipan. Memahami perubahan ini adalah sangat penting dalam prosedur pembedahan di sekeliling sendi siku dan lengan atas dan ia juga memberi ruang untuk diagnosis pembezaan sindrom perangkap saraf.*

*Kata kunci: bisep brachii, sisipan, pemampatan neurovascular, asal, anomali*

## **ABSTRACT**

Biceps brachii (BB) is one of the muscles which are subjected to many variations. Recently, there is a lot of information about variations in origin but also some cases are reported on variations in insertion of BB. Presented herein was a case of BB muscle having both variant origin and insertion in the same muscle. The variant origin of BB was long and large at its third head (10.2 cm width and 4.9 cm breadth) which arises from mid-shaft of the humerus. More significantly, the medial

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portion of the head covers and conceals the lower portion of median nerve and brachial artery as an arch which continues medially to be inserted to the medial epicondyle of the humerus. We discuss in this report, the possible mechanism for neurovascular compression by this abnormal third head of BB muscle and the variation of BB from its origin and insertion. Understanding these variations is highly significant in surgical procedures around elbow joint and upper arm and it also pave the way for the differential diagnosis in nerve entrapment syndrome.

**Keywords:** biceps brachii, insertion, neurovascular compression, origin, anomaly

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## INTRODUCTION

The variation of the head of biceps brachii muscle was previously described. The proximal attachment of the long head is at the supraglenoid tubercle and short head from the coracoid process of the scapula. The distal insertion is at the posterior aspect of the radial tuberosity (Nayak et al. 2008; Gray 1973). Its function is mainly in contributing to the flexion and supination of the forearm. Various anomalies of BB muscle were reported whether to cause changes in the number of muscle or its morphology (Nakatani et al. 1998). The common variations reported were supernumerary humeral heads (Kosugi et al. 1992), absence of short or long heads (Bergman et al. 1988) and variation in its insertions (Rodriguez-Niedenfuhr et al. 2003; Kopuz et al. 1999). Among the variation of supernumerary humeral heads, 7.5 to 18.3% has been reported as the third head of BB (Lee et al. 2011; Emeka & Emmanuel 2009). The third head most commonly present and arises from the proximal of the humerus (Asvat et al. 1993; O'rahilly 1986). The accessory

head is usually small and it commonly arises from the middle third of the humerus, close to the insertion of the coracobrachialis. In some reports, the variation is above from the humerus or derived from the pectoralis major muscle (Hollindshead 1967).

## CASE REPORT

During routine dissection for medical students, we found a large third head of BB in the right upper limb of a cadaver (Figure 1). The head was prominently large with ribbon like flat strip of muscle and measured from 10.2 cm width and 4.9 cm breadth. The upper portion of the head was not seen easily as it was located deeply between the main BB and brachialis muscles. It originated from the middle of the antero-medial surface of the shaft of humerus just close to and distal to the insertion of the coracobrachialis and deltoid muscles. From this upper attachment, the muscle fibres passed vertically between the main BB and the brachialis muscles (Figure 2). In the lower part of the arm, around and above the elbow joint, the fleshy part of the third head was divided into two portions,

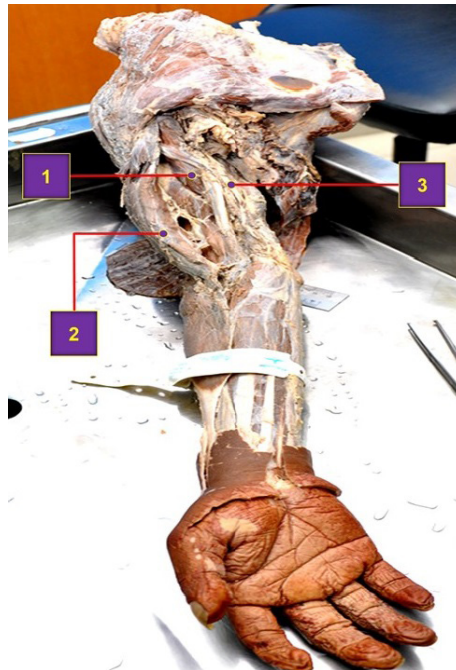


Figure 1: Anterior view of a dissected right upper limb showing 3rd head of biceps brachii. 1 = 3rd head of biceps brachii; 2 = Main biceps brachii; 3 = Median nerve.

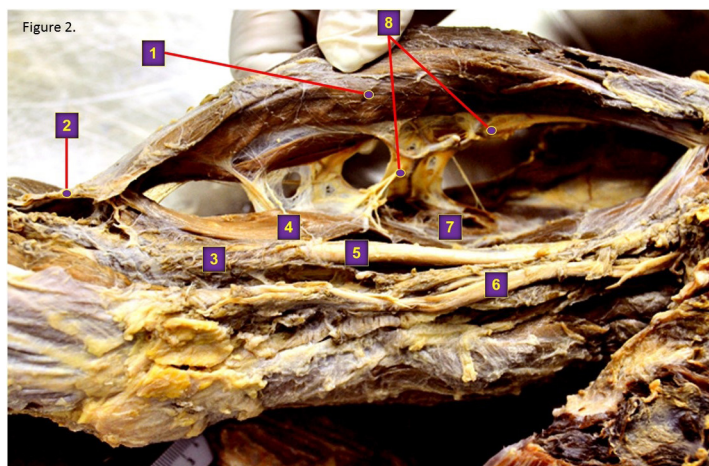


Figure 2: Anterior view of a dissected right arm showing 3rd head of biceps brachii. 1 = Main biceps brachii; 2 = Biceps brachii tendon & aponeurosis; 3 = 3rd head of biceps brachii arch; 4 = 3rd head of biceps brachii; 5 = Median nerve & brachial artery; 6 = Cutaneous nerve; 7 = 3rd head of biceps brachii covering median nerve & brachial artery; 8 = Musculocutaneous nerve & its branch to 3rd head of biceps brachii.

lateral and medial. The lateral portion passed forward and downward to be continuous with biceps tendon and

bicipital aponeurosis. The medial fibres of the head coursed downward and medially. It overlies the distal portion of

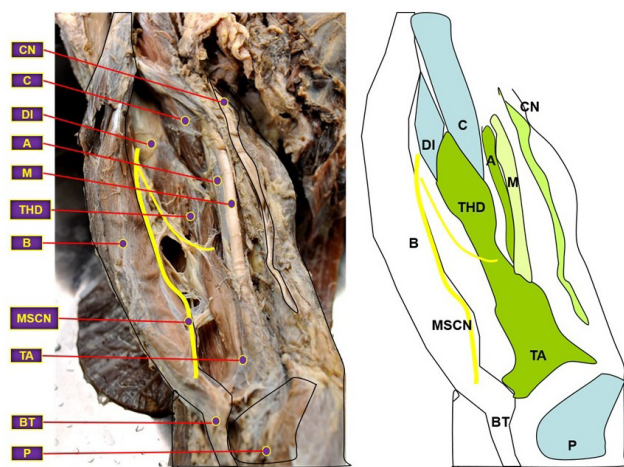


Figure 3: Anterior view of a photograph & corresponding schematic diagram of a dissected right arm showing the 3rd head of biceps brachii covering the brachial artery. CN = Cutaneous nerve of arm; C = Distal attachment of coracobrachialis; DI = Distal attachment of Deltoid; A = Brachial artery; M = Median nerve; THD = 3rd head of biceps brachii; B = Main biceps brachii; MSCN = Musculocutaneous nerve; TA = Tendinous arch; BT = Biceps tendon; P = Pronator teres.

the median nerve and brachial artery anterior and superior to the elbow joint to be continuous with deep fascia of the arm and medial epicondyle of the humerus. As a result, the lower part of the median nerve and brachial artery in the arm could not be seen because of the third head concealing these two structures (Figure 3). The covering structure was identified with its attachments traced. We discovered a relatively large and abnormal third head of BB muscle. Furthermore, the median nerve together with brachial artery were tightly covered and not easily moveable unlike other normal limbs. Musculocutaneous nerve that pierce the coracobrachialis muscle is originated from the lateral cord of the brachial plexus, and passed to the deep surface of BB giving branches to it. Finally, it adopted normal course between the biceps brachii and brachialis muscles and

continued as the lateral cutaneous nerve of the forearm. Nerve to the third head was found to arise from the musculocutaneous nerve in its deep surface at the middle of the muscle to the superficial surface of the head. Blood vessels to the accessory head came from vessels lying deep surface of original BB muscles (Figure 4).

## DISCUSSION

A number of literature reported a common variations in third head of biceps brachii muscle (Tountas & Bergman 1993; Gupta & D'Souza 2014; Kumar et al. 2008; Santo Neto et al. 1998; Sargon et al. 1996; Asvat et al. 1993). Standring (2005) described that in 10% of cases, a third head originates from the superomedial part of the brachialis muscle. In the year 1988, it was reported that the Caucasians have higher incidence of

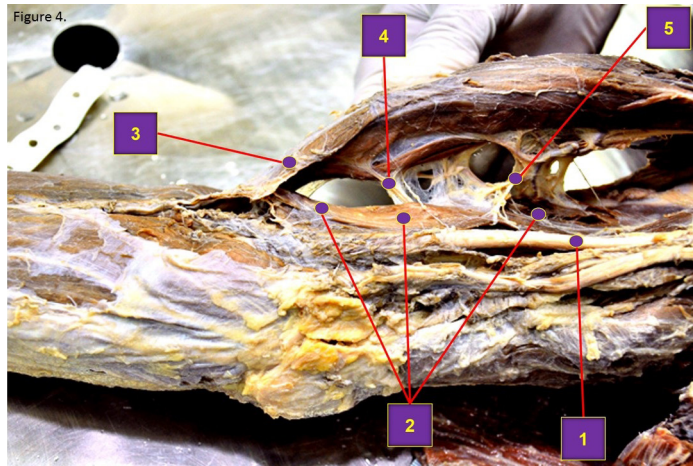


Figure 4: Antero-medial view of a dissected right arm showing 3rd head of biceps brachii compresses neurovascular structures. 1 = Median nerve; 2 = 3rd head of biceps brachii; 3 = Parts of main biceps brachii; 4 = Blood vessels to 3rd head of biceps brachii; 5 = Musculocutaneous nerve.

biceps brachii variation compared to the Negroes (Santo Neto et al. 1988). Later, it was agreed upon by other group of anatomists who found that the variation is more common in female, unilaterally on the left side (Rodriguez-Vazquez et al. 1999). In contrast, South African populations showed higher incidence in males with bilateral variation (Asvat et al. 1993). However, the side of the variation was not reported in the findings. Therefore, it is difficult to discuss the embryological explanation of the above variations in biceps brachii muscle.

In addition, the muscle attached to the bicipital aponeurosis and medial side of the tendon of insertion, but it may consist of two slips, which descend anterior and posterior to the artery. According to Emeka and Emmanuel (2009), unilateral occurrence of third head of biceps brachii muscle together with its abnormal origin of short head from the acromion and from the supraglenoid tubercle. Recent findings

from Fraser et al. (2015) also observe the clinical importance of supernumerary head of biceps brachii inserted at pectoralis major muscle. While Kopuz and co-workers (1999) observed that the third head of BB commonly begin from the anterior surface of the humerus distal to the insertion of the coracobrachialis muscle. Furthermore, recent finding reported the presence of third head which arise from the midshaft of the humerus. It is inserted at the bicipital aponeurosis lying superficially to the median nerve and brachial artery (Saralaya et al. 2009) which is similar to our findings. This additional large humeral third head at its position may boost the strength of biceps brachii during flexion at the elbow and supination at the forearm over the basic power given by the two scapular heads.

An important finding in this report is that it is a rare case of biceps brachii coexisting with a large third head forming a passageway for the median



nerve and brachial artery. In addition, it also has two variant insertions; one being inserted to the main biceps tendon and the other to the brachial fascia and medial epicondyle of the humerus. However, small anomalous muscles usually do not cause any symptom but when these muscles are considerably large enough; they might produce compression to surrounding neurovascular structures. Several clinical and anatomy conditions may develop due to the median nerve compression (Bilge et al.1990) force from pronator teres, carpal tunnel syndrome (Gessini et al. 1983), tight or thickened Lacertous fibrosus (Laha et al. 1978) and tendinous origin of flexor digitorum superficialis (Suranyi 1983). As high median nerve compression being uncommon and having a difficult diagnosis (Nayak et al. 2008), occurrence of a large third head encroaching over the median nerve and brachial artery, should be kept in mind as one of the possible differential diagnosis of proximal median nerve entrapment (Seyffarth 1951).

Moreover, presence of an accessory large muscle in the arm might lead to confusion during surgeries and evaluation of neurovascular compression syndromes. To avoid clinical complications during imaging analysis such as ultrasound scanning, CT and MR imaging or surgical access to these regions, awareness of such variation must be borne in mind. The present case report is important not only to anatomists but also to radiologists, manual therapists, physiotherapists, and orthopedic surgeons.

## CONCLUSION

This case report revealed the anomalous variation in the origin and insertion of the biceps brachii muscle. The large accessory head of this BB muscle found in right upper limb of the cadaver received blood supply and innervation from main biceps brachii muscle. This large muscular tissue might be considered in the use of free distant flap type which is physically detached from its native blood supply and reattached to the vessel in the recipient site. The anastomosis might be performed by microsurgical technique. This kind of variations may result in unanticipated clinical symptoms. Knowledge on such variations is relatively important for clinical diagnosis and surgical procedures.

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