Introduction

The variant patterns in the formation and branching of brachial plexus innervating the upper limb has been reported by several authors. The musculocutaneous nerve is a branch arising from the lateral cord of brachial plexus, whereas the median nerve is formed by two nerve roots arising from the medial and lateral cords of brachial plexus [1]. Connections between the musculocutaneous and median nerves at the level of arm have been reported by many authors. The most frequent of these variations consists of the presence of a communicating branch that bifurcates from the musculocutaneous nerve and joins distally the median nerve [2]. The brachialis being a muscle of the flexor compartment of the arm is supplied by the musculocutaneous nerve, whereas a small lateral part of the muscle is supplied by the radial nerve. In the absence of musculocutaneous nerve the median nerve supplies the brachialis [3].

The biceps brachii is a large fusiform muscle in the flexor compartment of the arm; the long head of biceps has an intracapsular course over the humeral head and is 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 anteriorly 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 [1]. The biceps brachii muscle is described as one of the muscles with frequent anatomical variations [4]. It is estimated that 9–22% of the people have a supernumerary head [5]. The supernumerary heads might cause confusion to a surgeon or they might cause compression of neurovascular structures in upper limb [6].

Case Report

During routine anatomical dissection in the Department of Anatomy, Sri Venkateshwara Medical College & Research Centre, Pondicherry, we found multiple variations in the right upper limb of middle-aged embalmed male cadaver. There were communicating branches seen between the musculocutaneous nerve and the median nerve. The first communicating branch was about 7.2 cm, which was given off from the musculocutaneous nerve to the median nerve; it had an oblique course between the two nerves (Figure 1). Another communication was seen between the two nerves beneath the biceps brachii muscle. The muscular branch after supplying brachialis joined with the fibers of musculocutaneous nerve which thereafter pierced the deep fascia and continued as the
lateral cutaneous nerve of forearm (Figure 2). Hence brachialis in addition to dual nerve supply from the musculocutaneous nerve and the median nerve also got an additional supply from the median nerve, which is usually not known to give any muscular branches in the arm.

In the same arm a third head of biceps was found (Figure 3). Most of the fibers of the additional third head originated from the anteromedial surface of humerus at the point where the coracobrachialis was inserted. The long and short heads had usual origins, but formed a common belly just proximal to the neck of the radius. The third head descended medial to the other heads and merged with the common belly, which got inserted into the radial tuberosity after forming a tendon. The bicipital aponeurosis was given off from the medial side of the tendon. The third head before uniting gave an additional extension of bicipital aponeurosis. All the heads of biceps brachii were supplied by the musculocutaneous nerve.

The brachial artery entered into the cubital fossa after passing between the common belly and muscular fibers of the third head, whereas the median nerve, after giving a muscular branch to the brachialis, passed in between the aponeurotic fibers of the third head and the muscular fibers of brachialis and reached the cubital fossa. On the left side, there were no nervous variations, but a third head of biceps brachii was seen similar to that of the right side.

Discussion

Median nerve is reported to be associated with several variations, which included unusual communications with other nerves such as musculocutaneous and ulnar nerves, splitting of the median nerve and unusual innervations of flexor muscles of the arm by the median nerve [7, 8]. The most frequent variation is the presence of a communicating branch that bifurcates from the musculocutaneous nerve and goes distally to join the median nerve, which is observed usually in the lower third of arm [2].

Williams et al. mentioned that if lateral root of median nerve is small then a communication is formed between musculocutaneous nerve and median nerve. This results from the fact that majority of median nerve fibers from lateral cord pass into musculocutaneous nerve and then rejoining the

![Figure 1. The right upper limb showing first communicating branch. (MCN: musculocutaneous nerve; MN: median nerve; CB: communicating branch between musculocutaneous and median nerves; UN: ulnar nerve; AA: axillary artery)](image1)

![Figure 2. The right upper limb showing muscular branch of median nerve supplying brachialis. (MN: median nerve; MB: muscular branch from median nerve supplying brachialis muscle and joining beneath the biceps brachii with the fibers of musculocutaneous nerve; MCN: musculocutaneous nerve; SHBB: short head of biceps brachii muscle; LHBB: long head of biceps brachii muscle; BM: brachialis muscle)](image2)

![Figure 3. The right upper limb showing three heads of biceps brachii. (SHBB: short head of biceps brachii muscle; LHBB: long head of biceps brachii muscle; THBB: third head of biceps brachii muscle; CT: common tendon of biceps formed by the short and long head; BAP: bicipital aponeurosis; BA: brachial artery; MN: median nerve)](image3)
Unilateral multiple variations in upper limb 

median nerve at lower level [1]. The same may be the cause of communication in our case, where the communicating branch must have transferred the fibers from the musculocutaneous nerve to the median nerve. Such communication may help in interpretation of unexplained clinical symptoms.

Brachialis is known to be supplied by the median nerve, but in some cases where the musculocutaneous nerve is absent, all the muscles in the front of arm are supplied by the median nerve [3]. In the present case in addition to supply from the musculocutaneous and radial nerves, brachialis got an additional muscular branch from the median nerve. Such type of innervation has not been reported so far as to the author’s knowledge.

It is of the opinion that the limb muscles develop from the mesenchyme of local origin, while axons of spinal nerves grow distally to reach the muscles or skin. They blamed the lack of coordination between the formation of the limb muscles and their innervations for appearance of a communicating branch [9].

Biceps brachii muscle is described as one of the muscles with most frequent anatomical variations [6]. These variations may present as a group of accessory fascicles arising from the coracoid process, the pectoralis major tendon, head of the humerus, articular capsule of the humerus or from the shaft of the humerus itself [10]. In the present case the third head was seen arising from the shaft of humerus.

Variations in the head of biceps brachii muscle have been reported to cause neurovascular compression which can lead to erroneous interpretation [6], as noticed in our case where the brachial artery and median nerve passed between the heads of biceps and brachialis muscle before entering the cubital fossa.

Hence such variations should be considered during surgical procedures owing to their clinical significance.

References