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Case Report

Multiple bilateral neuroanatomical variations of the nerves of the arm

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ABSTRACT

Variations in the formation of median and musculocutaneous nerves are common but this is an interesting case report of the variant formation and position of median nerve and musculocutaneous nerve and different types of communications between the musculocutaneous and median nerves in both arms of the same cadaver.

During educational dissection for the undergraduate students in our college, in a male cadaver of approximately 50 years of Asian origin, in the region of axilla and arm, the variations of the median nerve and musculocutaneous nerves are observed.

On the left side, the median nerve was formed medial to the third part of the axillary artery. The musculocutaneous nerve did not pierce the coracobrachialis muscle and it gave a communicating branch to the median nerve in the distal third of the arm.

On the right side, the musculocutaneous and median nerves were fused for 2 cms and then musculoctaneous and median nerves separated. The musculocutaneous nerve did not pierce the coracobrachialis and the median nerve was medial to the axillary artery this side also. ***Neuroanatomy; 2007; 6: 43–45.***

Key words [musculocutaneous nerve] [median nerve] [coracobrachialis muscle] [anatomy] [variation]

Introduction

The median nerve is formed by the two roots of the brachial plexus - the lateral root from the lateral cord and the medial root from the medial cord. The medial cord crosses the third part of the axillary artery and joins with the lateral root to form the median nerve lateral to the artery. The median nerve crosses the brachial artery in the middle of the arm from lateral to medial side. It does not receive any communicating branch from the musculocutaneous nerve normally.

The musculocutaneous nerve is the branch of the lateral cord of the brachial plexus. It gives a muscular branch to the coracobrachialis and then pierces the same muscle and then comes out of the lateral border of the muscle and descends between biceps and brachialis and supplies them and then continues as the lateral cutaneous nerve of the forearm.

Case Report

During educational dissection of the region of the 'Axilla and Arm' in our department this year, we encountered neuroanatomic variations in both upper limbs in a male cadaver of 50 years.

On the left side, there were two roots of the median nerve, a thin lateral root and a medial root. The thin lateral root crossed the third part of axillary artery and joined the medial root, thus the median nerve was formed medial to the third part of the axillary artery and it continued medial to the brachial artery and anterior to the ulnar nerve. On the same side, the musculocutaneous nerve was not piercing the coracobrachialis muscle. After supplying the coracobrachialis muscle, the musculocutaneous nerve descended lateral to the brachial artery without piercing the coracobrachialis muscle. At 12 cm from the coracoid process, the musculocutaneous nerve communicated with the median nerve and then supplied the remaining muscles-biceps brachii and the brachialis muscle and then continued as lateral cuaneous nerve of forearm (Fig. 1).

On the right side (Fig. 2), a thin lateral root crossing the third part of axillary artery joined with the medial root of the median nerve. The musculocutaneous nerve gave a branch to coracobrachialis and then fused with the median nerve for 2 cm after that, it separated from the median nerve and without piercing the coracobrachialis muscle, it descended and supplied the muscles of the arm and continued as the lateral cutaneous nerve of forearm. The median nerve was medial to the brachial artery this side also.

Discussion

Although communications between the nerves in the arm are rare, the communication between the median nerve and the musculocutaneous nerves were described from nineteenth century [1-3].

The communications between the musculocutaneous nerve and the median nerve have been classified by earlier workers [4-6]. The variations of the musculocutaneous

and median nerve may be classified into five types by Le minor [4].

In type Type I, there are no connecting fibers between the musculocutaneous and median nerve as described in classic textbooks. The musculocutaneous nerve pierces the coracobrachialis muscle and innervates the coracobrachialis, the biceps brachii and brachialis muscle.

In Type II, although some fibers of the medial root of the median nerve unite with the lateral root of the median nerve and form the main trunk of median nerve, remaining medial root fibers run in the musculocutaneous nerve leaving it after a distance to join the main trunk of median nerve.

In Type III, the lateral root of the median nerve from the lateral cord runs in the musculocutaneous nerve and leaves it after a distance to join the main trunk of median nerve.

In Type IV, the fibers of the musculocutaneous nerve unite with the lateral root of the median nerve. After some distance, the musculocutaneous nerve arise from the median nerve.

In Type V, the musculocutaneous nerve is absent. The fibers of the musculocutaneous nerve run within the median nerve along its course. In this type the musculocutaneous nerve does not pierces the coracobrachialis muscle.

Our observation on the right side belongs to the Type IV of Le Minor. In the most recent observations recorded by, Choi et al, such communications have been broadly classified into 3 patterns. In pattern 1, the two two nerves are fused. In pattern 2, there was one communicating branch between the musculocutaneous nerve and the median nerve. In pattern 3, two connecting branches are between the two nerves. Our observation of fusion of the nerves on right side come under the pattern 1 accoding to [6].

Venieratos and Anagnostopoulou [5] found 22 communications between the musculocutaneous and median nerves in 16 out of 79 cadavers. In six subjects they were present bilaterally. Nine of these 22 communications were proximal to the entrance of the musculocutaneous nerve into the coracobrachialis. Ten of these are distal to the entry of the musculocutaneous nerve into the corcobrachialis muscle. In 3 of these, the musculocutaneous or the communicating branch did not pierce the corcobrachialis. According to them, the bilateral communications need not be of the same type. They reported three types of communications between median and musculocutaneous nerves considering the coracobrachialis muscle as the reference point. In Type I the communication was proximal to the entrance of the musculocutaneous nerve into coracobrachialis, in Type II the communication was distal to the muscle and in Type III the nerve and the communicating branch did not pierce the muscle. Our observation of the communication in the left arm belongs to the Type III of this classification.

A number of variations in the course and distribution of the musculocutaneous nerve have been reported. Instead of piercing the coracobrachialis muscle, the nerve may adhere to the median nerve for some distance down the arm and then, either as a single trunk or as several branches, pass between the biceps and brachialis muscles to supply all three muscles (about 22% of arms). Sometimes only a part of the nerve follows this course; this part then rejoins the main trunk after it transits through and supplies coracobrachialis. In some cases, instead of the whole trunk of the nerve piercing coracobrachialis,

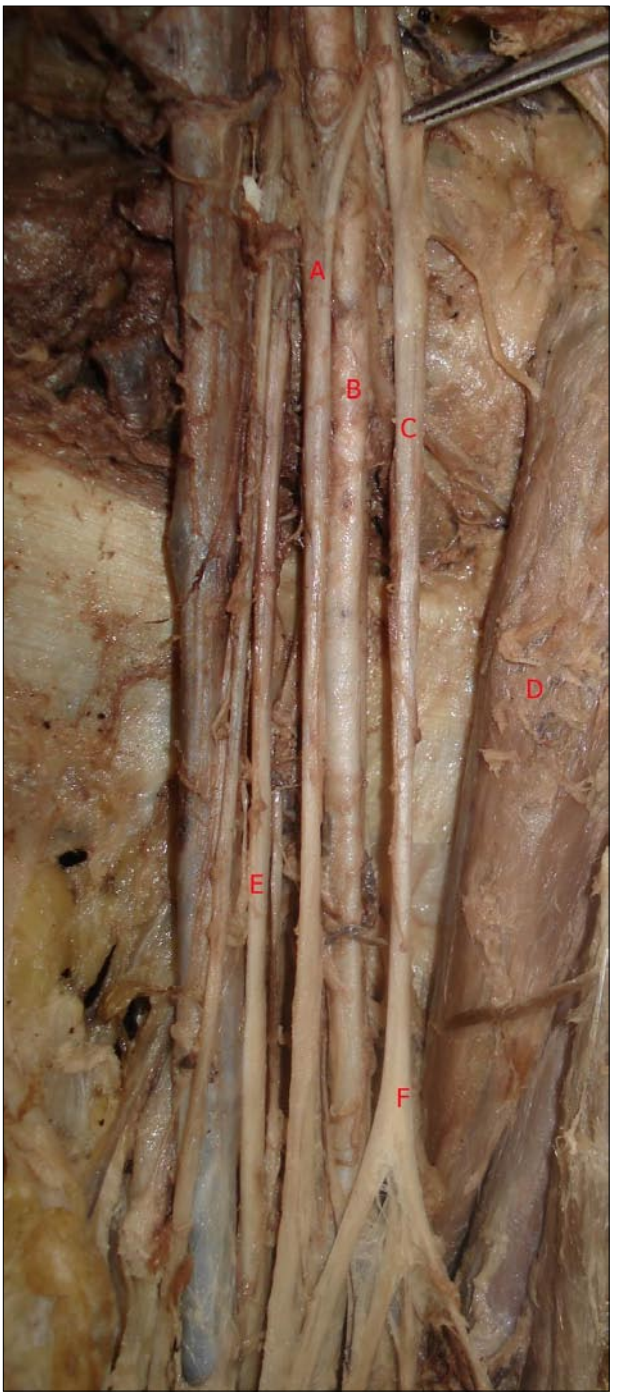

Figure 1. The neurovascular variations on the left side. Color version of figure is available online. *(**A:** median nerve; **B:** brachial artery; **C:** musculocutaneous nerve; **D:** coracobrachialis muscle; **E:** ulnar nerve)*

only its muscular branch or only its cutaneous branch pierces the muscle. The musculocutaneous nerve may be accompanied by fibers from the median nerve as its transits coracobrachialis; a communicating branch passes from the musculocutaneous to the median nerve. Instead of penetrating coracobrachialis, the nerve may pass behind it or between it and the short head of the biceps muscle. Occasionally, the nerve perforates, not only coracobrachialis, but also the brachialis or the short head of the biceps muscles. Very rarely the lateral cord may pierce coracobrachialis and then divide into the musculocutaneous and lateral branch of the median nerve [7]. The median nerve lying medial to the brachial artery has been reported by Das and Paul [8].

These are errors in the pathway (course) of some, inappropriately placed nerve fibers. In order for these nerve fibers to get to their proper end-point, the bundle of nerves fibers leave the inappropriate trunk and join the proper nerve trunk. Certainly a mystery, these 'anastomoses'. Significant variations in nerve patterns may be a result of altered signalling between mesenchymal cells and neuronal growth cones [9] or circulatory factors at the time of fusion of brachial plexus cords [10]. Studies of comparative anatomy have observed the existence of such connections in monkeys and in some apes; the connections may represent the primitive nerve supply of the anterior arm muscles [11].

The communications between the musculocutaneous nerve and the median nerve are not rare but the combination of different types of communications on both sides with the different medial relation of the median nerve on both sides and both musculocutaneous nerves not piercing the coracobrachialis in a singular cadaver is a rarity.

Such variations have clinical importance especially in post traumatic evaluations and exploratory innervations of the arm for peripheral nerve repair. The knowledge of the variations of this communication between the musculocutaneous and median nerves in the distal third of the arm is important in the anterior approach for the fracture of the humerus. This knowledge is also important for the clinicians to avoid unnecessary release of the carpal tunnel by them.

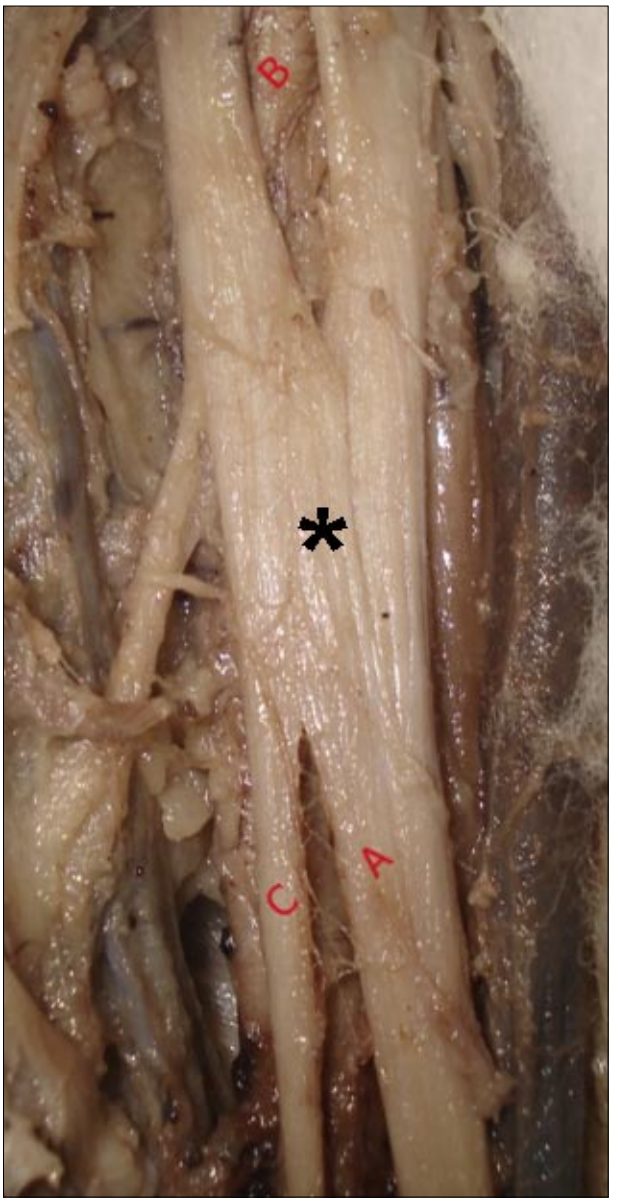

Figure 2. The neurovascular variations on the right side. Color version of figure is available online. *(**A:** median nerve; **B:** brachial artery; **C:** musculocutaneous nerve; **D:** coracobrachialis muscle; **E:** ulnar nerve; **asterisk:** the fused part of median and musculocutaneous nerves)*

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