Abnormal Pattern Of Brachial Plexus Formation: An Original Case Report

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Citation

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Abstract

We encountered a brachial plexus with two cords (Medial & Lateral) and three abnormal communications. The lateral cord sent an abnormal branch to the medial cord as the medial root of median nerve emerged from the latter. A branch from the posterior aspect of the medial cord divided into the radial and axillary nerves. The musculocutaneous nerve sent an abnormal branch to the Median nerve at the level of mid-arm. There was also an abnormal communication between the ulnar and radial nerve at the mid-arm region. Knowledge of these variations is important in nerve entrapment syndromes involving different branches of brachial plexus.

INTRODUCTION

We earlier on reported abnormal or variant communications between the musculocutaneous and Median nerves of Brachial Plexus among Nigerian population (Oluyemi et al, 2007). However, various patterns have also been encountered and reported in articles and conventional textbooks (Canter et al, 2005). Some of these variations are Types I-V reported by Le Minor (1990). In Type I, there are no connecting fibers between the Musculocutaneous and median nerve as described in classic textbooks. 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 arises 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 pierce the coracobrachialis muscle.

Venieratos and Anagnostopoulou also reported three types of communications between median and Musculocutaneous nerves considering the coracobrachialis muscle as the reference point. In type 1, the communication was proximal to the entrance of the Musculocutaneous nerve into coracobrachialis. In type 2; the communication was distal to the muscle and in type three; the nerve and the communicating branch did not pierce the muscle (Venieratos and Anagnostopoulou, 1998). Other abnormal variations include brachial plexus with two cords (Canter et al, 2005).

We aim therefore at reporting some abnormal communications between branches of brachial plexus encountered in an adult cadaver during our routine dissection class and to discuss their clinical importance.

CASE REPORT

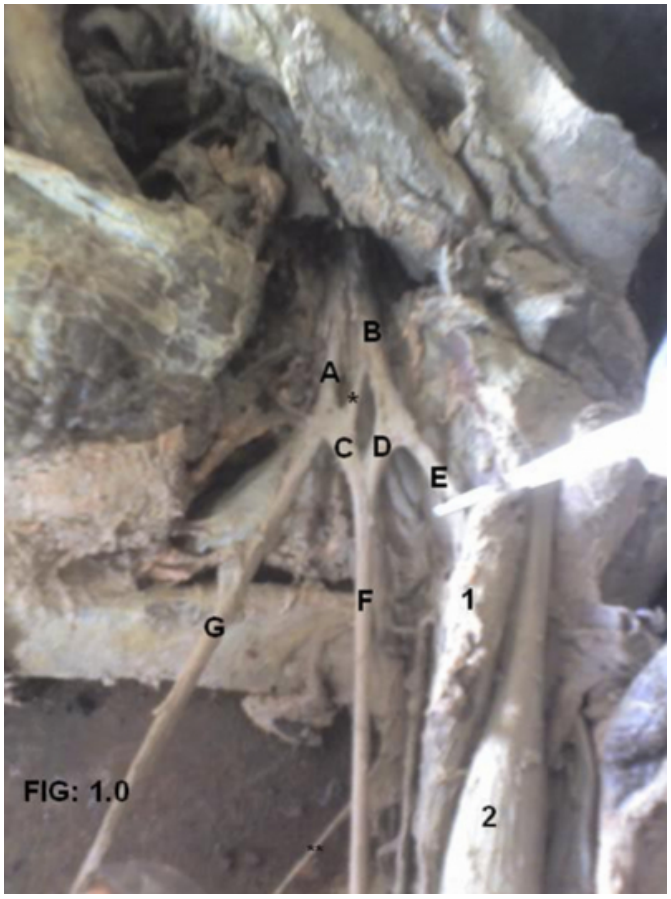
During a routine dissection of a formalin-fixed adult male cadaver for 300 level medical students training at Igbinedion University, Okada, a unilateral variation in the pattern of formation of brachial plexus was observed on the left arm. This Brachial plexus had only two cords (Medial & Lateral) with three abnormal communications. A branch was observed to originate from the posterior aspect of Medial cord. It runs for about 2cm before it divided into the Axillary and Radial nerves. The two branches followed normal courses. The Lateral cord sent an abnormal communication (* in Figures 1.0 & 1.1) to the Medial cord as the latter gave off the medial root of median nerve. This abnormal branch fused with the branch from Medial cord to form the medial

root of median nerve. The lateral cord also gave the lateral root of median nerve (D in Figure 1.0). An abnormal communication was observed between the Musculocutaneous and median nerves (# in Figures 1.1 & 1.2). The abnormal branch of the Musculocutaneous nerve was found originating at the junction of the superior and middle thirds of the left brachium. It coursed inferiorly between the accessory head of biceps brachii and brachialis muscles for about 9.2 cm and joined the median nerve 15.5 cm below its origin and 5.5cm above the base of the cubital fossa. Giving its accessory branch and the nerve to the biceps brachii and brachialis muscle, the Musculocutaneous nerve coursed normally as lateral cutaneous nerve of forearm.

Also, there was another communication between the radial and ulnar nerves at the level of upper third of arm. This branch originated from the Radial nerve and ran infero-medially to join with the ulnar nerve about 10.0cm below the origin of the ulnar nerve. This abnormal branch is about 15cm in length (** in Figure 1.1).

Figure 1

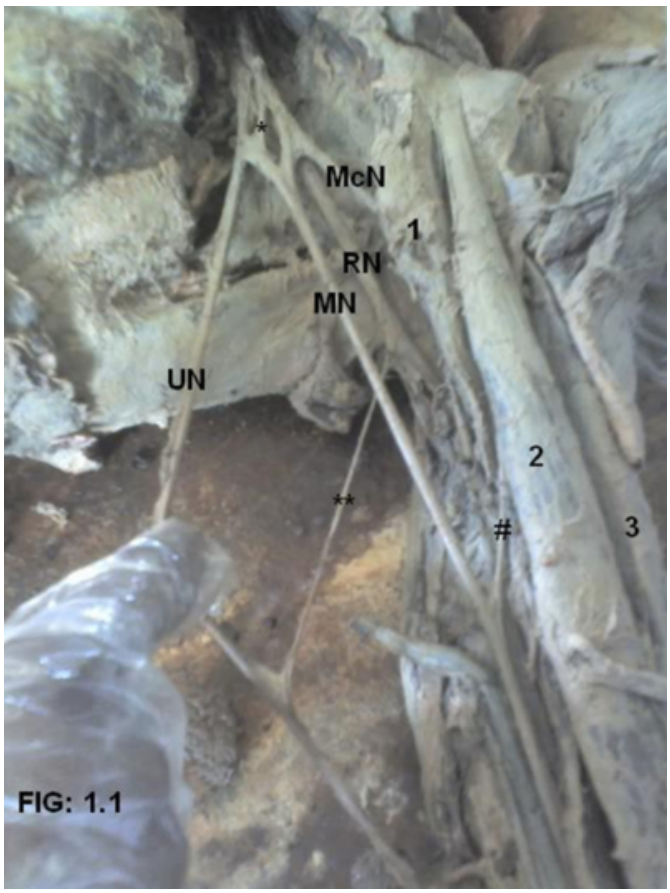
Figure 1.0: Photograph showing the Medial (A) and Lateral (B) cords with the abnormal communication between (*)



Keys: A: Medial cord; B: Lateral cord; C: Medial root of Median nerve; D: Lateral root of median nerve; E: Musculocutaneous nerve; F: Median nerve; G: Ulnar nerve; 1: Coracobrachialis; 2: Long head of Biceps brachii.

Figure 2

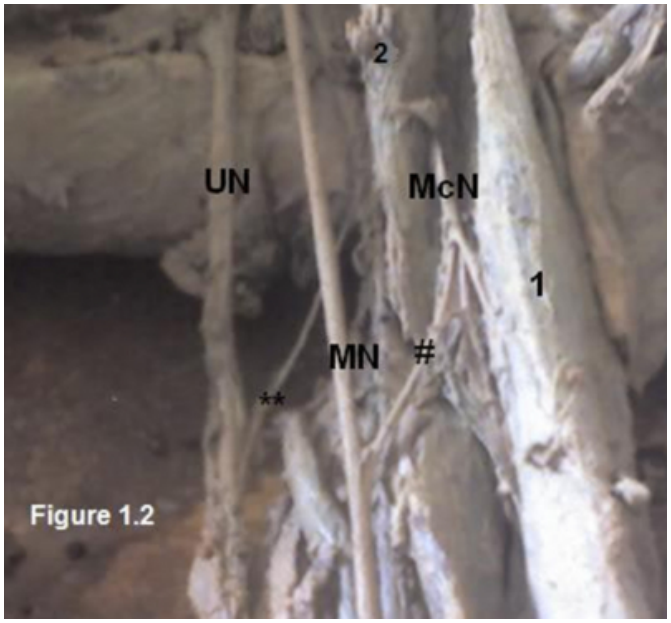
Figure 1.1: Photograph showing the three abnormal communications (*, # and **).



Keys: McN: Musculocutaneous nerve; MN: Median nerve; UN: Ulnar nerve; RN: Radial nerve; 1: Coracobrachialis; 2: Long head of Biceps brachii; 3: Short head of Biceps brachii.

Figure 3

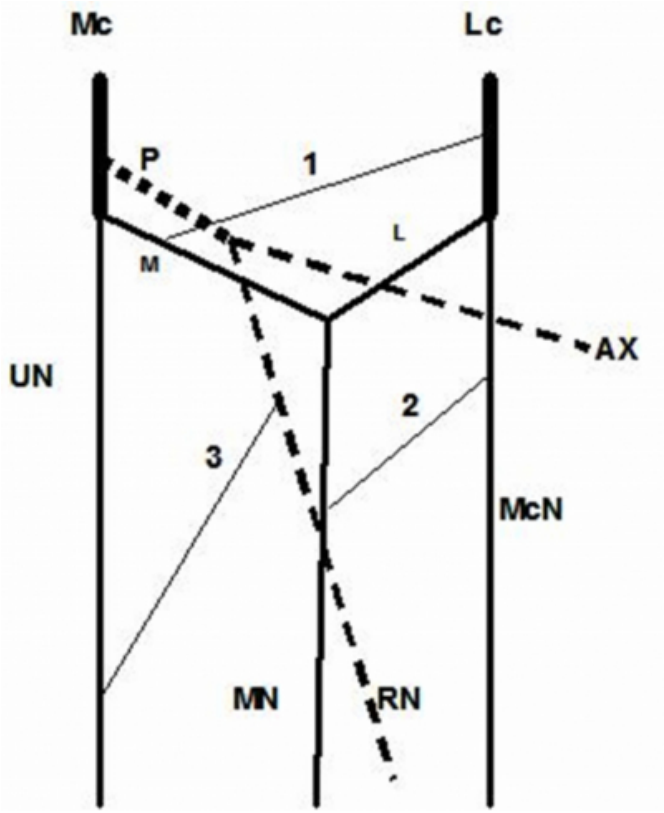
Figure 1.2: Photograph showing the abnormal communication between (a) Musculocutaneous and Median nerves (#); (b) Radial and Ulnar nerves (**).



Keys: McN: Musculocutaneous nerve; MN: Median nerve; UN: Ulnar nerve; 1: Long head of Biceps brachii; 2: Accessory head of Biceps brachii; 3: Coracobrachialis; 4: Brachioradialis

Figure 4

Figure 2.0: Schematic drawing showing the general pattern of formation encountered in this study.



Keys: Mc: Medial cord; Lc: Lateral cord; P: Posterior branch of medial cord; UN: Ulnar nerve; McN: Musculocutaneous nerve; M: Medial root of median nerve; L: Lateral root of median nerve; RN: Radial nerve; MN: Median nerve; AX: Axillary nerve; 1: communication between medial and lateral cords; 2: Communication between Median and Musculocutaneous nerves; 3: Communication between Radial and Ulnar nerves.

DISCUSSION

The distribution, course and the branching pattern of the brachial plexus's nerves is important from the clinical viewpoint. A more precise knowledge than that found in classical anatomical texts is necessary for clinical investigation and the surgical treatment of peripheral nerve injury (Linell, 1921). In Some individuals, trunk divisions or cord formations may be absent in one or other parts of the plexus; however, the makeup of the terminal branches may remain unchanged.

Figure 2.0 presents the pattern of brachial plexus formation we encountered in this study.

In this case, BP with two cords (Medial & Lateral) is in

consonance with other reports in articles (Moore & Dalley, 1999, Pandey & Shukla, 2006). Axillary and radial nerves originated from what seems like posterior cord from the posterior aspect of medial cord. This informs us that the three posterior divisions of upper, middle and lower trunks that were supposed to form the posterior cord were fused with the medial cord.

The communication between the medial and lateral cords is unusual. Moore & Dalley (1999) has reported a case in which there was an abnormal branch from the medial to lateral cord running laterally and not vice versa as seen in this case. This branch fused with the medial root of median nerve. This is probably due to some fibres of medial cord running in lateral cord leaving it later to join the medial cord.

Because each peripheral nerve is a collection of nerve fibres bound together by connective tissue, it is understandable that the median nerve, for instance, may have two medial roots instead of one (i.e, the nerve fibres are simply grouped differently). This results from the fibres of the medial cord of the brachial plexus dividing into three branches, 2 forming the median nerve and the third forming the ulnar nerve. In the present study though the median nerve has two medial roots, one of them came from the lateral cord and fused with the medial root from the medial cord.

In this study, our finding of communication between median and musculocutaneous nerves belongs to the Type III of Le Minor (1990). This variation was discussed in our previous work (Oluyemi et al, 2007). Connections from median nerve to musculocutaneous nerve in the opposite direction are rarely found (Venieratos & Anagnostopoulou, 1998) and the clinical implication of this could be that injury of musculocutaneous nerve proximal to the anastomotic branch between musculocutaneous and median nerve may lead to unexpected presentation of weakness of forearm flexors and thenar muscles (Sunderland, 1978). Different communications involving the Median nerve and musculocutaneous nerve are important in repairs for trauma to the shoulder and the understanding of the median nerve and the musculocutaneous nerve dysfunction (Chitra, 2007).

No accurate description of ulnar nerve receiving a branch from the radial nerve has been reported. Ulnar nerve is embryonically a flexor supply while radial nerve is an extensor supply (Moore & Persaud, 2003). The dorsal divisions of the trunks supply the extensor muscles and the extensor surface of the limbs; while the ventral divisions of the trunks supply the flexor muscles and the flexor surface. The communication between the two nerves is of most clinical importance because any injury to the ulnar nerve distal to the point of fusion will result in partial or total paralysis of the areas supplied by this component of radial nerve. This communication is most probably present due to the abnormal formation of the posterior cord.

In summary, anatomists and surgical practitioners should be aware of these variations so as to avoid unnecessary damage to this communications during dissection as well as surgery.

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