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Case Report

Bilateral presence of third root of median nerve: a case report

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Abstract

During routine dissection of a 70-year-old male cadaver, a variation of the brachial plexus was observed on both the upper limbs. Median nerve was formed by the union of three roots. One root is from lateral cord, one from medial cord of brachial plexus. The additional root was coming from the musculocutaneous nerve. However, the distribution of the variant median nerve was as usual in arm, forearm and palm. The arterial pattern in the arm was also as usual. Different types of variations of median nerve formation are documented but the one found in present study is bilateral variation and is very rare. Knowledge of this variation might be some importance to anatomist, surgeon, anesthesiologist and radiologist.

Key words [musculocutaneous nerve] [median nerve] [brachial plexus] [axillary artery]

Introduction

The brachial plexus is formed by the union of the ventral rami of the inferior four cervical (C5–C8) and first thoracic (T1) nerves. The brachial plexus supplies cutaneous and muscular innervation to the upper limb and any injury at this level can lead to significant disability. The brachial plexus has supraclavicular and infraclavicular part. The supraclavicular part includes roots, trunks and divisions. The infraclavicular part includes cords and their branches. From the cords arise the terminal branches of the brachial plexus including the musculocutaneous (MCN), median (MN), ulnar, axillary, and radial nerves [1]. Variations of the cords and their terminal branches of the brachial plexus are relatively common and have been well documented. It is important for the anatomist, surgeon, anesthesiologist, and radiologist to be aware of anatomical variations that deviate from the classic anatomy.

Variations of the brachial plexus regarding its origin, level of junction or separation of cords, composition of fiber bundle, pre-fixation, post-fixation, relations with subclavian and axillary artery and absence or communication between its branches are common and are being reported by several authors.

Amongst the several variations noted, the communication of the MN with the MCN has been noted to be the commonest. We observed bilateral third root of MN that has not been reported in large clinical series or cadaveric studies. Our aim is to describe the exact topography of this variation and to discuss its morphological and clinical significance.

Case Report

During routine dissection of a 70-year-old embalmed male cadaver, in Rajashree Chatrapati Shahu Maharaj Govt. Medical College, Kolhapur, the present variation was observed in both the upper limbs. The pectoral region, axilla and arm were dissected. The axillary artery and the cords of the brachial plexus and the branches of the cords were identified. We studied the origin and course of the MCN and MN and their relationship with the surrounding structures.

In the right upper limb the MN had three roots; one each coming from the lateral cord, medial cord and the MCN. A lateral root originated from the lateral cord and joined the medial root to form the main trunk of the MN on the medial side of the axillary artery, 2.5 cm distal to the tip of the coracoids process. A third root of the median nerve emerged from the MCN before the latter pierced the coracobrachialis muscle. The third root run downward along the lateral side of third part of axillary artery and brachial artery and joined the main trunk of MN about 13.2 cm distal to the tip of the coracoid process (Figure 1). Total length of third root was 10.7 cm and the thickness was about 3 mm. It was larger than the

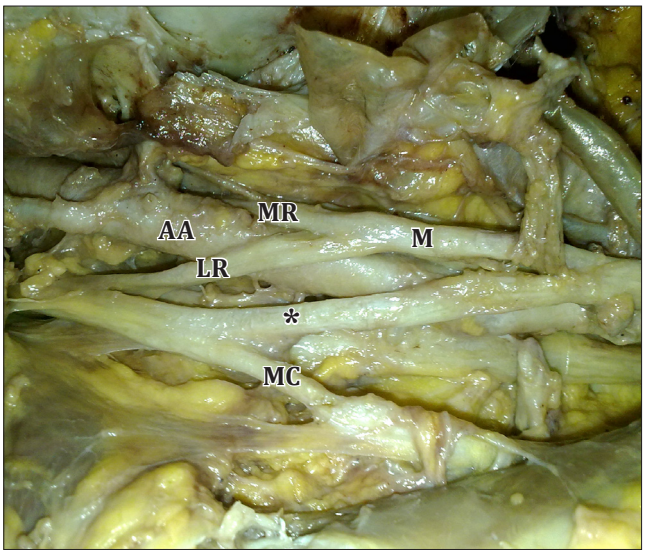

Figure 1. Photograph of the dissected right arm. *(**AA**: axillary artery; **MC**: musculocutaneous nerve; **MR**: medial root of median nerve; **LR**: lateral root of median nerve; **M**: median nerve; **asterisk**: third root of median nerve)*

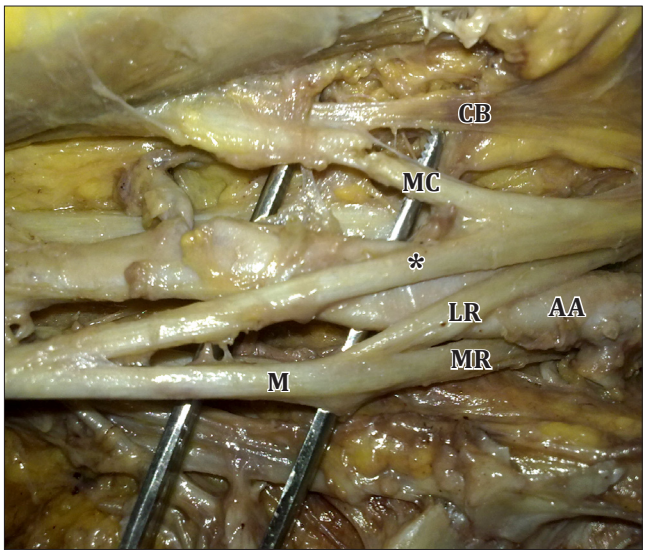

Figure 2. Photograph of the dissected left arm. *(**AA**: axillary artery; **MC**: musculocutaneous nerve; **MR**: medial root of median nerve; **LR**: lateral root of median nerve; **M**: median nerve; **asterisk**: third root of median nerve; **CB**: coracobrachialis)*

lateral root. The distribution of musculocutaneous nerve was normal. It supplied the coracobrachialis, biceps brachii and brachilis muscles and just below the elbow it continued as cutaneous nerve supplying the lateral aspect of forearm. No branch was given by the median nerve in the arm.

Also, on the left upper limb the MN had three roots; one each coming from the lateral cord, medial cord and the MCN. A lateral root originated from the lateral cord and joined the medial root to form the main trunk of the MN on the medial side of the axillary artery, 2.6 cm distal to the tip of the coracoids process. A third root of the median nerve emerged from the MCN before the latter pierced the coracobrachialis muscle. The third root run downward along the lateral side of third part of axillary artery and brachial artery and joined the main trunk of MN about 12.8 cm distal to the tip of the coracoid process (Figure 2). Total length of third root was 10.2 cm and the thickness was about 3 mm. It was larger than the lateral root. The distribution of musculocutaneous nerve was normal. No branch was given by median nerve in the arm.

Remaining course of median nerve in front of elbow and in the forearm was as usual on either side.

The arterial branching pattern of axillary and brachial arteries was found normal on both the sides.

Discussion

Variations of the arrangement and distribution of the cords and its branches in the infraclavicular part of the brachial plexus are common. Variations in the formation of MN were noted by some earlier workers. However, most of the variations as presented by them were related to variant relationship between median and musculocutaneous nerves. Chauhan and Roy reported formation of MN by two lateral and one medial roots [2]. Same observation was reported by Saeed and Rufai [3]. Satyanarayana and Guha reported formation of MN by four roots (three lateral and one medial root) [4]. In above studies the variation was observed on one side only but in our study we found the bilateral variation in the formation of MN. We found that the MN was formed by three roots one each from medial root, lateral root and from the MCN.

The most frequent variation is the presence of a communicating branch that bifurcates from the MCN and goes distally to join the MN, an anastomosis observed in the lower third of arm reported by Venieratos and Anangnostopoulou [5]; Bergman et al. [6]. If this branch is given off in upper third of the arm, it is generally considered as third root of the median nerve. The upper limb dissected in the present case, revealed that a branch of the MCN appeared in upper third of the arm, passed medially downwards and joined the MN in the lower third of the arm. This branch was of the same diameter as the lateral root. Therefore, this is considered as the third root of median nerve or second lateral root.

The communications between MN and MCN have been classified into five types by Le Minor [7].

- Type I - No communication between the MN and the MCN.
- Type II - The fibers of the medial root of the MN pass through the MCN nerve and join the MN in the middle of the arm.
- Type III - The lateral root fibers of the MN pass along the MCN and later leave it to form the lateral root of the MN.

- Type IV - The MCN fibers join the lateral root of the MN and later the MCN arises from the MN.
- Type V - MCN is absent and the entire fibers of the MCN pass through the lateral root and fibers to the muscles supplied by MCN branch out directly from the MN.

Connection between the MCN and MN in the present study could not be incorporated into any of the types described by Le Minor [7], as it showed communication, which was not included in his description.

These variations are apparently not rare, and it is possible that the combined lesion of the MCN and part of MN would occur in injury of the lateral cord of the brachial plexus. Lesions of the communicating nerve may give rise to patterns of weakness that may impose difficulty in diagnosis. Clinically injury to MCN proximal to the anastomotic branch between MCN and MN may lead to unexpected presentation of weakness of forearm flexors and thenar muscles [8].

During embryo development, the number of changes that exist during formation of branching pattern of brachial plexus seem to be responsible for variation. Variations that were observed in the present study involving MN and MCN might be of some importance to the surgeons, anatomist, anesthesiologist, and radiologist. Knowledge of this variation may prove valuable in traumatology of the shoulder joint, as well as in relation to repair operations.

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