Case Report

Access this article online

Quick Response Code:

Website: jecajournal.com

DOI: 10.4103/jeca.jeca_10_18

A unique variation of musculocutaneous nerve and median nerve and its clinical significance

Sumathilatha Sakthi-Velavan

Abstract:

The musculocutaneous nerve (MCN) and median nerve (MN) are branches of the brachial plexus that innervates the anterior compartment of the upper limb. Although the nerves have different course and distribution, communication between median and MCNs may result from an altered course of the nerve fibers during their development. Rare patterns of communication were found bilaterally in a male cadaver. The right MCN was fused with the MN for a length of 3 cm. The fused intermediate segment supplied biceps brachii, while the unfused segments supplied the other anterior arm muscles. The variation is a unique type of transposed nerve fibers supplying the brachial flexors and is a deviant of the defined patterns of communications. On the left side, a communication twig coursed anteriorly to the axillary artery from MCN to the MN. The surgical, neurophysiological, and embryological relevance of such variations is of great clinical significance.

Keywords:

Communication, median nerve, musculocutaneous nerve, transposed

Introduction

The musculocutaneous nerve (MCN), a branch of the lateral cord of brachial plexus, innervates the anterior arm muscles. The median nerve (MN) is derived from the lateral and medial cords and supplies the front of forearm and hand. The importance of variations in the branching pattern of the brachial plexus has been stressed upon in various studies (Arey, 1924; Budhiraja *et al.*, 2011; and Choi *et al.*, 2002). An unusual combination of rare pattern of fusion and the rare transposed fibers are detailed in this report. This variation is of clinical significance since surgical procedures of the arm might lead to inadvertent injury to the variant nerves resulting in unusual clinical presentations (Denk *et al.*, 2003).

Case Report

During dissection of an 84-year-old male cadaver, both the upper limbs revealed variations of brachial plexus. There were no gross deformities or surgical scar. The MCN and MN were dissected out to expose the formation, course, communications, and their branches. The brachial artery, arm muscles, and other branches of the brachial plexus were also dissected to note any associated variations.

On the right side [Figures 1, 2 and Line Diagram 1], the MCN originated from the lateral cord and the MN from the union of the two roots of lateral and medial cords. The upper segment of MCN was thicker than the MN, coursed distally, and supplied a branch to coracobrachialis without piercing it. The intermediate segment was fused to the MN (4 cm distal to the formation of MN) for a length of 3 cm where some

Department of Anatomy, Touro College of Osteopathic Medicine, New York, NY, USA

Address for correspondence:
Dr. Sumathilatha Sakthi-Velavan, Department of Biomedical Sciences, Marian University College of Osteopathic Medicine, 3200 Cold Spring Rd., Indianapolis, IN 46222, USA.
E-mail: sumathilathads@gmail.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

How to cite this article: Sakthi-Velavan S. A unique variation of musculocutaneous nerve and median nerve and its clinical significance. J Exp Clin Anat 2018;17(1):41-44.

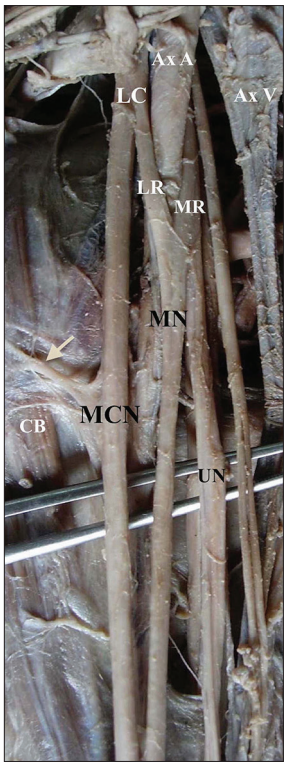


Figure 1: Right axilla and upper arm: median nerve; medial root; lateral root; musculocutaneous nerve; coracobrachialis; arrow nerve to coracobrachialis from musculocutaneous nerve; third part of axillary artery; axillary vein; ulnar nerve

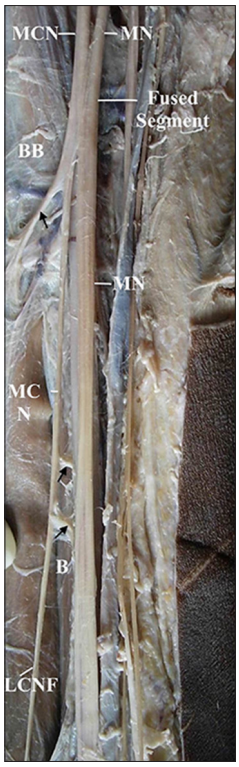


Figure 2: Right arm showing fused segment of musculocutaneous nerve and median nerve: arrow nerve to biceps brachii from fused segment; two arrows – branches to brachialis (B) from the distal part of musculocutaneous nerve; lateral cutaneous nerve of the forearm

fibers of the MCN transferred to the MN. A branch to biceps brachii was given off from this fused segment. Distally, the two nerves separated, a branch to brachialis was given off from MCN and MN was found thicker than at its origin.

On the left side [Figures 3, 4 and Line Diagram 2], the formation of MCN and MN was similar to the right. A communication twig branched out from MCN just distal to its origin, coursed anterior to the third part of axillary artery, and joined the MN 1.5 cm distal to its formation. Beyond this communication, the MCN supplied and pierced through coracobrachialis and supplied biceps brachii and brachialis. The remaining course of the nerves was normal on both sides.

Discussion

The presence of a communicating branch from MCN to MN has been reported in 8.1% to 36.19% (Gelmi *et al*., 2018). The variations have been classified into different types by (Le Minor *et al*., 1990; Arey 1924; and Choi *et al*., 2002). The communicating twig is also described the "third root" of the MN (Hayashi *et al*., 2017). According to a novel classification of by Hayashi *et al*., the variations of MCN were grouped as Type 0: the MCN and MN fused; Type I: communicating trunk (Com) arising between the lateral root and branch to coracobrachialis; Type II: Com arising between branch to coracobrachialis and biceps brachii; Type III: Com arising between branch to biceps brachii and brachialis; and Type IV: Com arising distal to branch to brachialis (Herath *et al*., 2014).

Although this case had a fused nerve segment on the right side, proximal, and distal to this segment, the MCN and MN were separate and distinct. Hence, this pattern warrants its grouping into a unique or an additional pattern of the existing classifications. Although the variations do not exactly fit into any of these types, the left-sided variation overlaps with Type 2 and the right with Type 4 of Le Minor classification. The variation on the left side belongs to Type I and the right could possibly be considered as a modified Type 0 or as an additional type under Hayashi's classification. The study reported Type 0 in 1.5% and Type I in 2.3%, pointing at the rarity of the variations being reported in this case.

Apart from the Com, Hayashi *et al*. classified transposed innervation (Trans) of brachial flexors from MCN and the relative origin of muscular branches to the Com (Herath *et al*., 2014**)**. In this case, on the right side, two unique findings of Trans that were not reported earlier were present – the branch to biceps brachii arose from the fused segment and the branch to brachialis arose distal

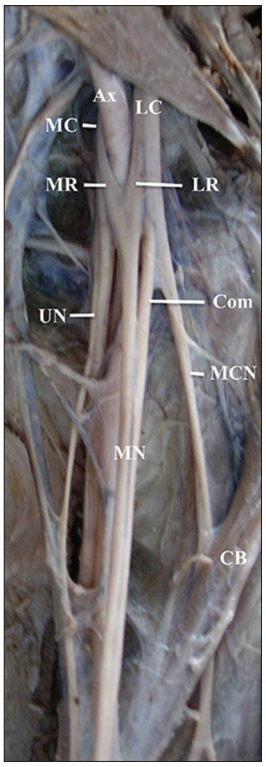


Figure 3: Left axilla and upper arm: median nerve; medial root; lateral root; musculocutaneous nerve; coracobrachialis; communicating branch (Com) from musculocutaneous nerve joins median nerve just distal to its origin; axillary artery; ulnar nerve

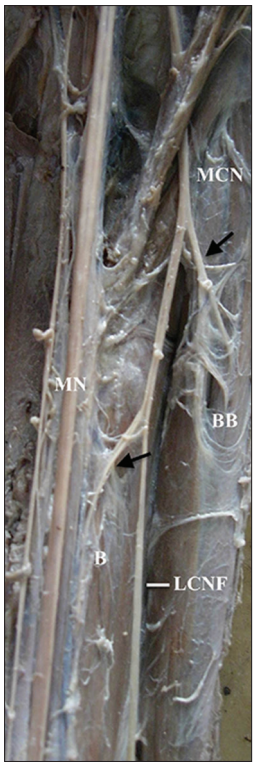
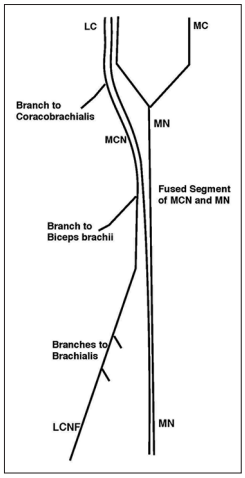
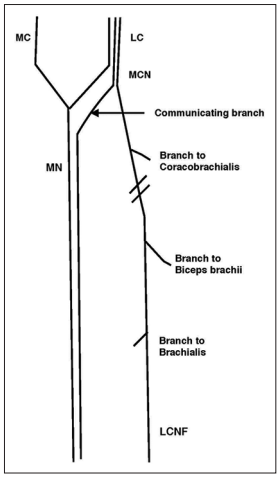


Figure 4: Left arm showing musculocutaneous nerve and median nerve: arrows show the nerve to biceps brachii and nerve to brachialis (B) arising from musculocutaneous nerve; musculocutaneous nerve continues as the lateral cutaneous nerve of the forearm



Line Diagram 1: Right side: median nerve; medial root; lateral root; musculocutaneous nerve; lateral cutaneous nerve of the forearm



Line Diagram 2: Left side: median nerve; medial root; lateral root; musculocutaneous nerve; lateral cutaneous nerve of the forearm

to Trans from MCN. An almost similar variation was reported in a study in which a communicating branch existed between the coracobrachialis and biceps brachii muscles (Hollinshead 1958).

The interlacing of fibers of the plexus represents a physiological adaptation and does not arise from compression. Embryologically, each muscle is formed by the fusion of one or more segments, and therefore, its nerve also arises from the corresponding segments (Kerr 1918). Studies have shown the existence of connections between MN and MCN in monkeys and some apes. The connection represents the primitive MN supply of the anterior arm muscles (Choi *et al*., 2002). The communicating fibers noted in this case are probably some of the fibers of lateral cord that have entered the MCN instead of the lateral root of MN. After a short distance, these fibers have left the MCN and joined the

MN. This is a nature's correction of nerve fibers located in inappropriate pathways (Le Minor 1990).

In surgical repair of MN injuries, the surgeon should have adequate knowledge of the possibility of the third root or the communicating twig from the MCN. If these fibers are missed out, a residual paralysis might persist after surgical correction (Le Minor 1990). In surgeries involving the shoulder joint, if an anterior approach is followed, the surgeon should anticipate a possible communication twig between MCN and MN to avoid its inadvertent damage (Choi *et al*., 2002). After trauma to the arm, when the MCN seems to be surgically intact, the fibers coursing in the MCN may be damaged and MCN injury signs may be observed in such patients (Budhiraja *et al*., 2011).

Electrophysiological studies play an important role in the assessment of nerve conduction in neuromuscular disorders. If the MN lacks some of its component fibers proximal to the communication, its stimulation might cause a weaker response than expected. The physician should be trained to recognize that the response is due to normal variation (Choi *et al*., 2002). Fusion of the midsegment of MCN to MN is a rare variation. The unique pattern of nerve supply of brachial flexors associated with this communication may result in misinterpretation of electrophysiological study. Awareness of such variations is of great importance given the significance of the associated surgical and diagnostic implications.

Acknowledgment
The author would like to thank the donor and his family for their contributions.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1. Arey L.B. (1924). The peripheral nervous system. In: Developmental Anatomy – A Textbook and Laboratory Manual of Embryology. 7th ed. W.B. Saunders, Philadelphia. p. 274-91.
2. Budhiraja V., Rastogi R., Asthana A.K., Sinha P., Krishna A., Trivedi V. (2011). Concurrent variations of median and musculocutaneous nerves and their clinical correlation-a cadaveric study. Ital J Anat Embryol 116:67-72.
3. Choi D., Marc R.N., Teresa V., Parkin I., José R.S. (2002). Patterns of connections between the musculocutaneous and median nerves in the axilla and arm. Clin Anat 15:11-7.
4. Denk C.C., Canter H.I., Erdem A. (2003). A rare variation between the median nerve and musculocutaneous nerve: A cadaveric study. Gazi Med J 14:41-3.
5. Gelmi C.A., Pedrini F.A., Fermi M., Mariani G.A., Cocco L.I., Billi A.M. (2018). Communication between median and mulculocutaneous nerve at the level of cubital fossa – A case report. Transl Res Anat 11:1-4.
6. Hayashi M., Shinoya K., Hayashi S., Hatayama N., Kawata S., Qu N., Hirai S., Miyaso H., Itoh M. (2017). A novel classification of musculocutaneous nerve variations: The relationship between the communicating branch and transposed innervation of the brachial flexors to the median nerve. Ann Anat 209:45-50.
7. Herath H.M., Raayiz R.M., Rathnayake R.M., Sandamali S.P., Amaratunga H.A., Adikari S.B. (2014). Median nerve arising from three roots. Austin J Anat 1 (3):1011.
8. Hollinshead W.H. (1958). General survey of the upper limb – The back and limbs. In: Anatomy for Surgeons. 1st ed., Vol. 2. Hoeber Harper, New York. p. 225-45.
9. Kerr A.T. (1918). The brachial plexus of nerves in man, the variations in its formation and branches. Am J Anat 23:285-395.
10. Le Minor J.M. (1990). A rare variant of the median and musculocutaneous nerves in Man. Arch Anat Histol Embryol 73:33-42.