



Absence of the Right Musculocutaneous Nerve: a rare cadaveric report

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ABSTRACT

Aims: The MusculoCutaneous Nerve (MCN) is a branch that originates from the lateral cord and descends along the lateral side of the distal part of the axillary artery. Since the MCN is the only nerve for the innervation of the anterior compartment muscles of the arm, any variation in this nerve may be clinically important.

Case presentation: During a routine dissection of the upper limb of a 48-year-old male cadaver in the Department of Anatomical Sciences at Tarbiat Modares University, Iran, a unilateral absence of the MCN was observed.

Conclusion: In compensation, the anterior compartment muscles of the arm receive a supplementary branch from the Median Nerve (MN). Clinically, if this surrogate nerve's origin is injured, it could lead to palsy in the coracobrachialis, biceps brachii, and brachialis muscles. Consequently, the individual may experience difficulty flexing the arm and may lose skin sensation. Therefore, the absence of the MCN is vital information to consider during arm surgeries.

Keywords: Brachial Plexus, Musculo Cutaneous Nerve, Median Nerve, Cadaver, Case report

Introduction

The brachial plexus is a complex somatic neural network that includes nerve roots from the fifth cervical segment to the first thoracic spinal cord segment (C5-T1). The brachial plexus innervates the arm muscles and consists of the lateral, anterior, and posterior cords, from which various peripheral nerves originate [1]. The Musculo Cutaneous Nerve (MCN) is one of its terminal branches that typically originates from the lateral cord of the brachial plexus, and it contains C5 to C7 nerve fibers [2]. It runs beside the lateral aspect of the distal part of the axillary artery [1]. The motor innervation of the coracobrachialis, biceps brachii, and brachialis muscles is from the MCN. The MCN nerve terminates as the lateral cutaneous nerve of the forearm, which provides sensory innervation for the lateral side of the forearm. The MCN plays a role in shoulder and elbow flexion, arm adduction, and supination of the forearm [3]. MCN variations were categorized into five types,

according to Le Minor [1, 4, 5]. In minor classification regarding MCN variations [4], we included the frequency of each type of these variations according to the previous studies (Table 1) [1, 5, 6]. Furthermore, it had been reported that the absence of MCN occurred in males more than females, and it generally appeared in the left limb [3]. Innervation of the muscles of the anterior compartment of the arm by a new branch from the lateral cord of the brachial plexus, or Median Nerve (MN), may occur as a consequence of MCN absence. However, unilateral or bilateral absence of the MCN is a rare variation that could potentially be considered a significant finding [5, 6]. For example, in orthopedic surgeries, especially in the case of humerus fractures, the MN injuries could be assumed to be the MCN injuries unintentionally [6, 7]. Based on the reported results, the lack of MCN is a rare and important variation in the brachial plexus [8], and in the current study, we report this variation of MCN.

Table 1) MusculoCutaneous Nerve variations along with the frequency of each type of variation

Type	Information	Frequency (%)
I	There is no communication between the MN & the MCN	83.4-89.3
II	A communicating branch is between the MN & the MCN	4-20.7
III	The lateral root of the MN leaves the MCN after the origin of its muscular branches	0-8.3
IV	The MCN originates from the MN	0-6.7
V	The MCN is absent Branches to the elbow flexor muscles are from the MN	0.3-2

Case presentation

During the dissection of the upper limb of a 48-year-old male cadaver in the Department of Anatomical Sciences at the Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran, a rare MCN variation was found in the brachial plexus. The cadaver's right arm lacked MCN. To compensate for the innervation of MCN, atypical MN branches provided innervation to the coracobrachialis, brachialis, and biceps brachial muscles, as displayed in Figure 1.

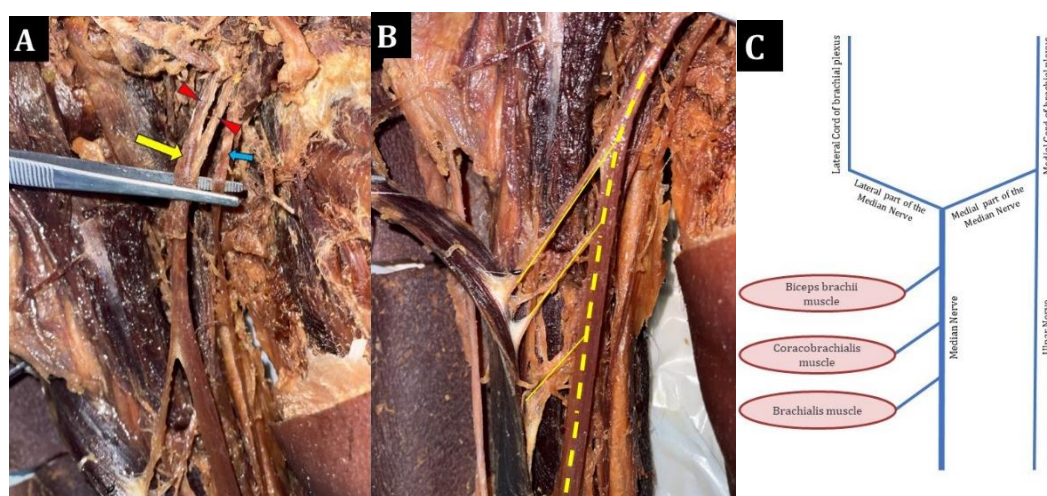


Figure 1) Absence of MCN in the brachial plexus of the right arm of an adult male cadaver. A) The lateral and medial parts (red arrowheads) of the median nerve (yellow arrow), as well as the ulnar nerve (blue arrow) are indicated. B) The compensatory branches (continuous yellow lines) from MN (yellow dashed line) to innervate the anterior compartments of the arm are shown. C) Schematic diagram of the MCN lack in the current case report.

Discussion

The MusculoCutaneous Nerve is one of the main terminal branches of the brachial plexus. In addition to the innervation of the anterior compartment muscles and acting as flexion and supination, the terminal branch of the MCN is involved in the limb cutaneous innervation [3]. Several types of MCN variation could occur in the brachial plexus. In both types of MCN absence, including unilateral and bilateral types, subsequent variations in the distribution of the other brachial plexus branches have been reported [6, 8, 9]. In another case report, the biceps brachii muscle receives a branch from MN in the absence of MCN [10]. These data are in agreement with our findings. In this cadaveric report, these muscles had been innervated by the MN. The previous studies declare that MCN absence almost occurs in males, and it is seen

mostly in the left limb [3]. Similarly, in our study, this variation was detected in an adult man. However, observation of the MCN's lack on the right side, like what is seen in this study, indicates that the current case report is quite infrequent.

Moreover, it has been reported that in the case of MCN lack, MN had penetrated the coracobrachialis muscle, like what the MCN typically performs [5]. In comparison, our study reveals that the MN didn't pierce the coracobrachialis muscle. Furthermore, in most cases, as seen in our case, the skin of the lateral forearm was innervated by the terminal fibers of the MN [3]. In a report, it is observed that a bilateral four-headed brachialis muscle, which in turn is a quite uncommon variation, in a male cadaver is innervated by MN due to the absence of the MCN [11]. However, in the absence of the MCN,

occasionally an extra head or more has been reported for the biceps brachialis muscle [3], which is not seen in our case report.

It is noteworthy that previous investigations in the field of human development revealed that MCN is a derivation of MN in the embryonic period [12, 13]. When the MCN is absent, this derivation fails to form the MN. Hereon, the anterior compartment of the arm innervates a surrogate nerve, which mostly comes from the MN [3]. Regarding this issue, in some cases, coracobrachialis muscle innervation is negligibly different from other flexor muscles of the arm; for example, coracobrachialis muscle is innervated by a branch of the lateral cord, and arm flexor muscles receive a branch from the lateral root of MN [6, 14]. However, knowing about the MCN variation is crucial for clinical staff, particularly physiotherapists and anesthetists, as well as general and orthopedic surgeons, especially regarding brachial plexus injury operations [6, 7].

Conclusion

We present a rare variation in which the right MCN was absent in the brachial plexus of an adult male cadaver. This case report highlighted the importance of awareness regarding the absence of the MCN, particularly in the surgical management of upper limb injuries.

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Ethical issues

The ethical guidelines of the Faculty of Medical Sciences of Tarbiat Modares University regarding cadaver dissection have been followed in all aspects of this investigation.

Authors' Contribution

AZ: Dissection, investigation, writing; AS: Investigation, writing draft preparation; AO: Supervision, Dissection, reviewing and editing the manuscript.

Conflict of Interests

The authors declare no conflict of interest.

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