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A variation of Musculocutaneous nerve without piercing the coracobrachialis muscle while communicating to the median nerve: A case report and literature review

Hamid Tayefi Nasrabadi, Ali Abedelahi, Hamed Shoorei*, Majid Shokoohi, Ramin Salimnejad, Mohammad Amin Dolatkhah, Abbas Majdi Seghinsara*

Department of Anatomical Sciences, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

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ABSTRACT

INTRODUCTION: Anatomical variations of the peripheral nervous system may have not any clinical signs and symptoms. One of these variations belongs to the Musculocutaneous nerve. However, a good knowledge of nerve pathways and their variations is very important for surgeons in post-traumatic evaluations, exploratory interventions, and/or administration of neuromuscular blocks in axillary region in order to surgical therapies.

PRESENTATION OF CASE: This report describes a case of variation of the musculocutaneous nerve which was observed in an old Iranian male cadaver during routine educational dissection (Fig. 1).

DISCUSSION AND CONCLUSION: Anatomically, in the axilla region, the Musculocutaneous nerve is originated of the lateral cord of brachial plexus, then, by piercing the coracobrachialis muscle arrives enters to anterior compartment of the arm. But, in the present report, we observed that the Musculocutaneous nerve without piercing the coracobrachialis muscle has arrived in the left arm, then communicated to the Median nerve. To exploratory interventions of the arms for peripheral nerve repair and surgical therapies, a good knowledge of nerve pathways helps to surgeons for preventing possible mistakes during surgery.

1. Introduction

The brachial plexus (BP) is a network of nerve fibers formed by intercommunications among the ventral (anterior) rami (roots) of the four lower cervical nerves (C5-C8) and the first thoracic root, T1 [1]. This plexus maybe has a variable contribution from C4 and T2 of spinal nerves [1]. Anatomically, the brachial plexus is divided into five sections; roots which are formed by the spinal nerves C5, C6, C7, C8 and T1, trunks, divisions, cords, and branches (a good abbreviation in order to learn easily is Read That Damn Cadaver Book) [1]. At the base of the neck, the roots of the brachial plexus converge and forming three trunks—the superior, middle, and inferior [1,2]. Then, in the posterior triangle of the neck, each trunk divides into two branches, the anterior and the posterior. These branches leave the posterior triangle and pass into the axilla region. In this region, the posterior branches of all trunks make posterior cord while the anterior branches of superior and middle trunks make lateral cord and the anterior branch of inferior trunk singly makes medial cord; these are named according to the axillary artery [1,2]. The Musculocutaneous nerve (MCN) is one of the terminal branches of the lateral cord (C5–C7) in the axilla that runs downward by piercing the coracobrachialis muscle (CBM), then enters to anterior compartment of the arm [1]. It is responsible for innervation of the coracobrachialis muscle and the muscles which are involved elbow flexion—Brachialis and Biceps brachii muscles [1]. In close to the cubital fossa, it lies lateral to the biceps tendon and anteriorly to the brachialis muscle that becomes known as the lateral antebrachial cutaneous nerve (or the lateral cutaneous nerve of forearm) which supplies common sense of the skin in anterolateral region of the forearms as far distally as the base of the thenar eminence [1]. It has been reported that the brachial plexus is the most variable portion of the peripheral nervous system [3]. On the other hand, variations of the MCN may occur in 6.25% cases [4] and its absence has been reported with a prevalence ranging between 1.7–15% [5]. In this case, we observed a variation of the MCN nerve which had not pierced the CBM and also communicated with the Median nerve (MN). The MN is one of the three major nerves of the forearm and hand (colloquially known as the eye of the hand) which is derived from the medial and lateral cords of the brachial plexus in the axillary region that has not any branch in the arm excep-

* Corresponding authors at: Gholgasht Ave, Tabriz University of Medical Sciences, Faculty of Medicine, East Azerbaijan, Tabriz, Iran.
E-mail addresses: abedelahia@yahoo.com (A. Abedelahi), h.shoorei@gmail.com (H. Shoorei), a.shokoohy@yahoo.com (M. Shokoohi), r.salimnegad67@gmail.com (R. Salimnejad), m.amin.dolatkhah@gmail.com (M.A. Dolatkhah), abbas.majdi@yahoo.com (A.M. Seghinsara).

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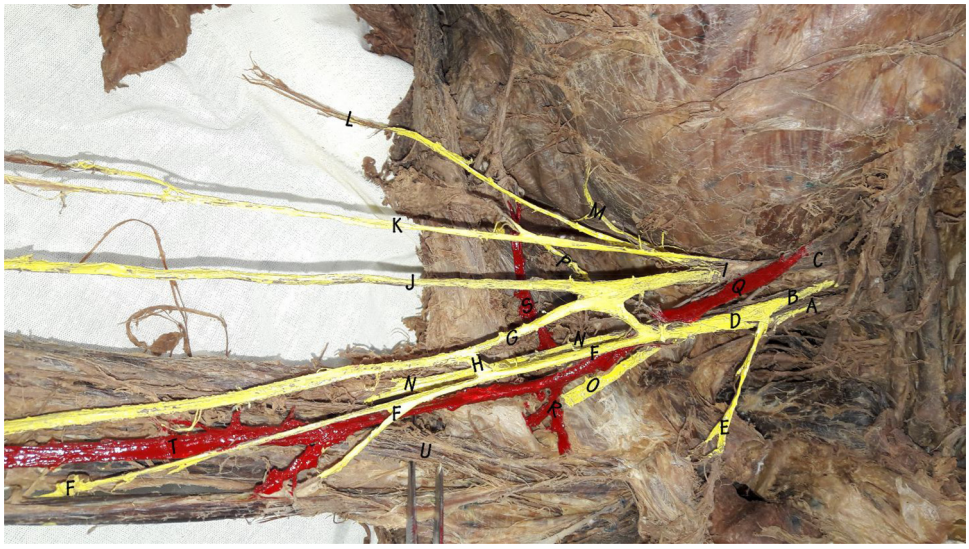

Fig. 1. Dissection of the left arm (A: Superior Trunk of Brachial Plexus; B: Middle Trunk of Brachial Plexus; C: Inferior Trunk of Brachial Plexus; D: lateral Cord of Brachial Plexus; E: Lateral Pectoral Nerve; F: Musculocutaneous Nerve; G: Median Nerve; H: Communication between Median and Musculocutaneous Nerves; I: Medial Cord of Brachial Plexus; J: Ulnar Nerve; K: Medial Cutaneous Nerve of Forearm; L: Medial Cutaneous Nerve of Arm; M: Long Thoracic Nerve; N: Radial Nerve; O: Axillary Nerve; P: Thoracodorsal Nerve; Q: Axillary Artery; R: Common Trunk of Posterior and Anterior Humeral Circumflex Arteries; S: Thoracodorsal Artery; T: Brachial Artery; U: Coracobrachialis Muscle).

tionally in some cases may has a communication branch with MCN [1,2]. However, in post-traumatic evaluations, a good knowledge of nerve pathways and their variations is very important in order to an exploratory intervention of the arms for repairing peripheral nerves and surgical therapies.

2. Case presentation

During a routine dissection of the left upper limb of an old Iranian male cadaver that belongs to the Department of Anatomical Sciences, Faculty of Medicine, Tabriz, Iran, the present variation was observed (Fig. 1). Before dissection for six months, the corpse was preserved in a solution of formaldehyde and glycerin, which has been described by Giacomini apud Rodrigues [6]. The dissections of upper limbs were carried out according to the instructions by Cunningham's manual of practical anatomy [7]. This paper reports a variation of the MCN which not pierce the CBM and also having a communication with the MN. The lateral cord of brachial plexus gave off a thin and small MCN which was immediately emerged from the anterior surface of CBM (without piercing the coracobrachialis muscle).

3. Discussion

Communications between MN and MCN have been described to the five types [8]. In Type I, there is no communication between the MN and the MCN as described in classic textbooks. The MCN pierces the CBM and innervates it and two other muscles of anterior compartment of the arm, as well as anterolateral region of the antebrachial skin. In Type II, some fibers of the medial root of the MN pass through the MCN and join to the MN in the middle of the arm to form the main trunk of MN. In Type III, the lateral root fibers of the MN from the lateral cord pass along the MCN and leaves it after some distance to form the lateral root of the MN (or to join the main trunk of MN). In Type IV, the fibers of the MCN join the lateral root of the MN and after some distance, the MCN arises from the MN. In Type IV, the MCN is absent and the entire fibers of the MCN run within the MN along its course; in this type, the MCN does not pierce the CBM. In type V, the 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. According to these classifications, our case is classified in type III. On the other hand, Venieratos and Anangnostopoulou have reported only three types of communications between the MCN and MN in relation to the CBM [9]. In Type I, the communication was proximal to the entrance of the MCN into the CBM whereas in Type II, the communication was distal to the muscle and in Type III, neither the nerve nor its communicating branch pierced the muscle. Therefore, according to this classification, our present case can be placed in type III as the MCN did not pass through the coracobrachialis muscle (Fig. 1). In another study, Choi et al. reported that communications between MN and MCN have been classified into three types [10]. In type I, the MCN and MN were fused, in type II, there was one connecting branch between the MCN and MN, and in type III, there were two connecting branches between the MCN and MN. Also, Shukla et al. have been observed four communications between median and musculocutaneous nerves [11]. Thus, based on the mentioned reports, our present case does not fall into any of the above-mediated categories. On the other hand, during embryonic life, an existence-communication between MN and MCN nerves anomaly may be attributed to random factors influencing the mechanism of formation of forelimb muscles and peripheral nerves [12]. In man, during the fifth week of embryonic life, the forelimb muscles develop from the myotome (mesenchyme of the *para*-axial mesoderm) [12]. The BP is developed at 5 weeks of gestation and appears as a single radicular cone of axons of spinal nerves [12]. The axons of spinal nerves grow distally to reach the limb bud mesenchyme then divide to form ventral and dorsal divisions [12]. The ventral divisions give rise to the median and ulnar nerves and the musculocutaneous nerve is derived later from the median nerve [12]. As the guidance of the developing axons is regulated by a complicated signaling interaction between organizers and the host muscle [13]. Therefore, any disruptions during interaction can lead to significant variations. Moreover, it has been reported that developmental abnormalities for axonal guidance in the CBM can lead to a rare situation in which the MCN does not pass through the coracobrachialis muscle [9].

Conflicts of interest

There is no Conflicts of Interest to report.

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Ethical approval

The case report was approved by the local ethic committee of the University.

Guarantor

A M accepts full responsibility for this work.

Consent

Written informed consent was obtained from Department of Anatomical Sciences.

Abbas Majdi accept full responsibility for this work.

Author contribution

Data collection: By all authors. Analysis and case management: H T N, A Writing: H S.

Registration of research studies

No research in present work

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