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Musculocutaneous nerve as a branch from median nerve: A case report

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ABSTRACT

The brachial plexus is the most variable part of the peripheral nervous system. The Musculocutaneous nerve is a terminal branch of the lateral cord of the brachial plexus in a normal individual. It is not uncommon for variations in the origin, branching termination, and connection patterns. During routine dissection in the Anatomy Department, College of Medicine, King Saud University, we found the lateral cord after giving a small branch to the coracobrachialis muscle join the medial root of the medial cord to form the median nerve. Knowledge of these variations is essential for anatomists, orthopedics, neurologists, and anesthesiologists.

1. Introduction

The brachial plexus is a network of nerve fibers formed by intercommunications among the anterior rami of the four lower cervical nerves (C5-C8) and also the first thoracic nerve, T1 (Standring, 2016). This plexus could be a feature of variable contribution from C4 and T2 spinal nerves, prefix (10%) and postfix (10%) respectively (Standring, 2016). Anatomically, this plexus is split into roots, divisions, cords, and branches (Standring, 2016). Consequently, at the base of the neck, the roots of the plexus utmost converge and develop three trunks which include the superior, middle, and inferior (Standring, 2016; Snell, 2003). Within the posterior triangle of the neck, each trunk is separated into two branches, the anterior and posterior divisions. These divisions leave the posterior triangle and pass through the axilla region. Because of that, within the axilla, the posterior branches of all the trunks formed the posterior cord while the anterior branches of the superior and middle trunks form the lateral cord. The anterior branch of the inferior trunk continues as the medial cord; meanwhile, these cords were often named in respect to the second part of the axillary artery (Standring, 2016; Snell, 2003).

The brachial plexus variations and other variant innervation of the upper limb were reported continuously since the 9th century (Linell, 1921). More importantly. It has been reported that the brachial plexus is the most variable portion of the peripheral system (Azimi et al., 2015). The anatomical variations of the peripheral nerves are important to orthopedic surgeons, neuro physicians, physiotherapists, and radiologists. They are immensely useful in nerve grafting and neurophysiological evaluation for diagnosing peripheral neuropathies (Wiberg et al., 2003).

The musculocutaneous nerve is one of all the terminal branches of the lateral cord (C5–C7) within the axilla. It passes through the coracobrachialis muscle just to innervate it and to the biceps brachii muscle. Thereafter, it supplies the brachialis muscle and continues as the lateral cutaneous nerve of the forearm (Standring, 2016). The anatomical knowledge of the musculocutaneous nerve and its variations is that many surgical procedures within the upper limb involve mobilization or displacement of the muscles of the anterior arm compartment and one in each of the complications of those procedures is musculocutaneous nerve lesions (Rebouças et al., 2010). On the other hand, variations of the musculocutaneous nerve may occur in 6.25% of cases (Bhattarai and Poudel, 2009) and of course, its absence has been reported with a prevalence ranging between1.7–15% (Rodríguez-Niedenführ et al., 2003).

2. Case report

In the present case, a bilateral variation of musculocutaneous nerves in an 80 years old male cadaver was found during routine dissection in the Anatomy Department, College of Medicine, King Saud University. The lateral cord after giving a small branch to the coracobrachialis muscle joins the

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medial root of the medial cord to form the median nerve. The median nerve at the level of the latissimus dorsi muscle gives a branch that forms its lateral side that passes downward between the biceps and brachialis muscles. This branch supplies both these muscles, which emerge from the lateral border of the biceps tendon and continues in the forearm as the lateral cutaneous nerve of the forearm (Fig. 1 and Fig. 2).

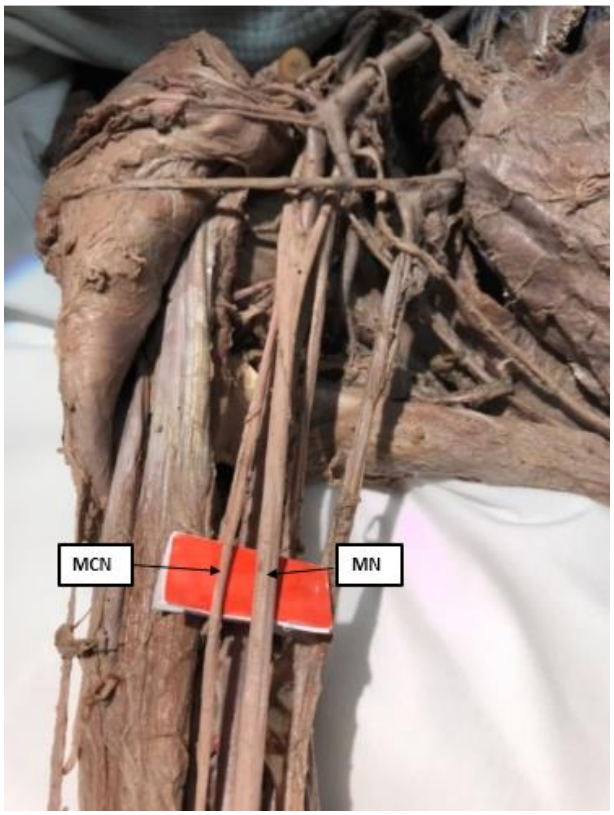

Fig. 1: The musculocutaneous nerve [MCN] branching from the median nerve [MN]

3. Discussion

Regarding CBM, Venieratos and Anagnostopoulou (1998) have reported only three kinds of communications between the musculocutaneous nerve and median nerve. In Type I, the communication was proximal to the entrance of the musculocutaneous nerve into the coracobrachialis, however in Type II, the communication was distal to the muscle, and in Type III, neither the nerve nor its communicating branch pierced the muscle. Furthermore, another study by Choi et al. reported that communications between the median nerve and musculocutaneous nerve are classified into three types (Choi et al., 2002). In type I, the musculocutaneous nerve and median nerve were fused, in type II, there was one connecting branch between the musculocutaneous nerve MCN and MN, and in type III, there have been two connecting branches between the musculocutaneous nerve and median nerve. Interestingly, according to Shukla et al. (2010); communications between median nerve and musculocutaneous nerve were observed.

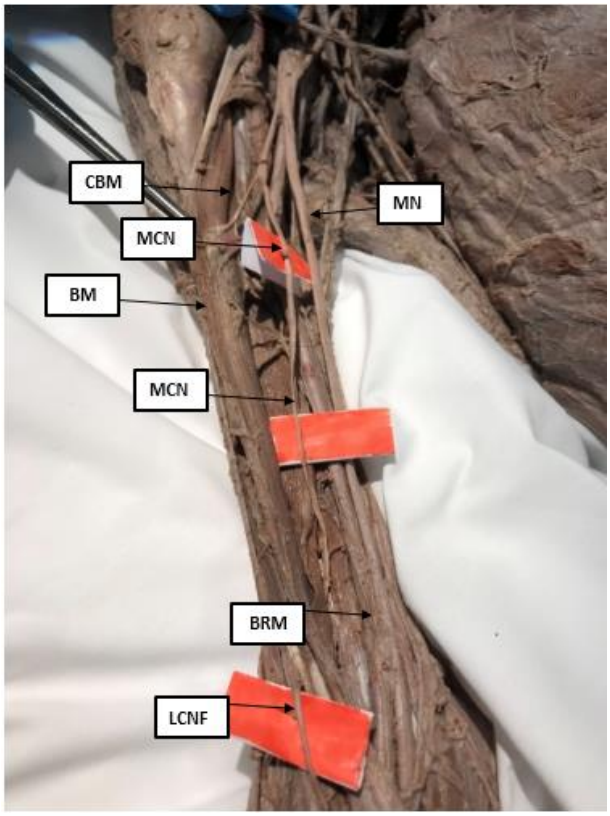

Fig. 2: The musculocutaneous nerve [MCN] branching from the median nerve [MN] and supplying by a small branch to coracobrachialis[CBM] and continue by itself to supply the biceps [BM] and brachialis [BRM] muscles and continuing as the lateral cutaneous nerve of the forearm [LCNF]

Our present case doesn't fall under any of the four mentioned categories. Nevertheless, recently, Leng et al. (2016) reported five groups regarding communications between median nerve and musculocutaneous nerve:

- Group 1, the conventional type: The musculocutaneous nerve is that the continuation of the lateral cord of the brachial plexus.
- Group 2, The Multi-branch type: Two or three branches that were separated from the lateral cord of the brachial plexus formed the musculocutaneous nerve and innervated the corresponding muscles.
- Group 3, The Mixed type: The lateral cord and median nerve sent branches to constitute musculocutaneous nerve respectively. In other words, the MCN originated from this plexus and median nerve.
- Group 4, The Absence type: The musculocutaneous nerve originated from the median nerve directly, which implies that it is a branch of the median nerve. And it is referred to as the absence of musculocutaneous nerve.
- Group 5, The Combining type: The musculocutaneous nerve originated from the lateral cord of the brachial plexus, which therefore gave branches to the corresponding muscles, and in the end connect with the median nerve.

Therefore, regarding this classification, our present case is often suggestively placed in group 4 The Absence type: the musculocutaneous nerve originated from the median nerve directly, which suggests that it is a branch of the median nerve. We called it the absence of musculocutaneous nerve.

In the course of embryonic life, an existence-communication between median nerve and musculocutaneous nerve nerves anomaly is also attributed to random factors influencing the mechanism of formation of forelimb muscles and peripheral nerves (Schoenwolf et al., 2020). The development of forelimb muscles by regional expression of 5 Hox D genes occurs from the mesenchyme of paraxial mesoderm within the fifth week of the intrauterine life (Keith et al., 2018; Morgan and Tabin, 1994). The expansion cones of the motor axons attain the bottom of the limb bud to make the plexus and continue within the limb bud (Keith et al., 2018). The Brachial Plexus is developed at 5 weeks of gestation and appears as one radicular cone of axons of spinal nerves (Schoenwolf et al., 2020; Keith et al., 2018). The axons of spinal nerves grow distally to succeed in the limb bud mesenchyme and thereafter split to make ventral and dorsal divisions (Schoenwolf et al., 2020; Keith et al., 2018). The ventral divisions make to the median and ulnar nerves. Therefore, the MCN comes later from the median nerve (Keith et al., 2018). Because the guidance of the developing axons is regulated through a sophisticated signaling interaction between organizers as well as the host muscle (Sannes et al., 2000). Therefore, any disruptions during interaction can result in significant variations. Interestingly, it has been reported that developmental abnormalities for axonal within the coracobrachialis muscles can cause a rare situation during which the musculocutaneous nerve does not taste coracobrachialis muscles (Choi et al., 2002).

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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