Absence of the Musculocutaneous Nerve and Associated Compensation by the Median Nerve

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ABSTRACT

The musculocutaneous and median nerves frequently show variations from their normal course. The purpose of this paper is to report a rare variation, in which the right musculocutaneous nerve was absent. Consequently, the median nerve supplied motor innervation to the flexor compartment of the arm and sensory innervation to the lateral aspect of the forearm. The primary targets of this paper are orthopedic surgeons, anesthesiologists and radiologists. In cases of injuries to the upper limb, knowledge of these variations can assist them in avoiding misdiagnoses.

KEY WORDS

Brachial plexus, Lateral cutaneous nerve of the forearm, Median nerve, Musculocutaneous nerve, Variation

INTRODUCTION

The musculocutaneous and median nerves originate from the brachial plexus, and they may show variations in their origin, course, termination, and distribution patterns in the upper limb. The musculocutaneous nerve may pierce the coracobrachialis muscle or may be absent.[1,2] When the musculocutaneous nerve is absent, it is usually compensated by the median nerve.[3] Variations of these nerves can present as isolated or combined occurrences, and can be associated with additional variations in the muscles and vasculature of the upper limb. Ignorance of such variations can result in misdiagnoses and surgical errors. The objective of the current study is to report a rare variation of the musculocutaneous and median nerves, and to compare and contrast this variation with additional reported variations through a thorough literature review.

CASE REPORT

During a cadaveric dissection, an adult male cadaver aged approximately 60 years, was found to have unique variations in the median and musculocutaneous nerves. Those variations were observed unilaterally in the right upper limb and included the complete absence of the musculocutaneous nerve. The median nerve was found to supply the muscular branches to the coracobrachialis, biceps, and brachialis muscles in the arm. In addition, the lateral cutaneous nerve of the forearm was found to originate from the median nerve in the upper part of the arm, and continued downward and laterally between the biceps and brachialis muscles until the elbow. At the elbow, the nerve emerged on the lateral border of the biceps and brachialis muscles and entered the forearm. No additional variations in the origin, course, or distribution of the median nerve were observed in the forearm or hand.

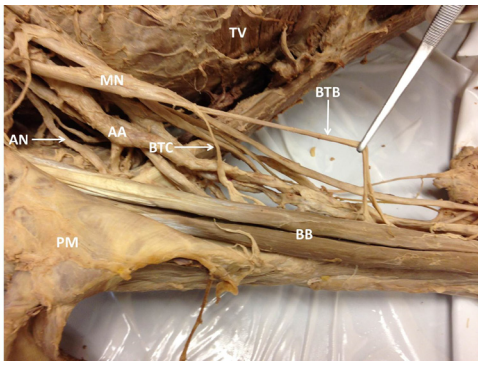

Figure 1. Photograph of dissection of right axilla.

(TV – thoracic wall; PM – pectoralis major; AN – axillary nerve; AA – axillary artery; MN – median nerve; BTC – branch to coracobrachialis; BTB – branch to brachialis; BB – biceps brachii)

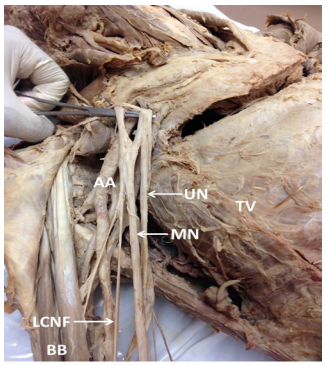

Figure 2. Photograph of dissection of right axilla.

(TV – thoracic wall; AA – axillary artery; MN – median nerve; UN – ulnar nerve; LCNF – lateral cutaneous nerve of forearm; BB – biceps brachii)

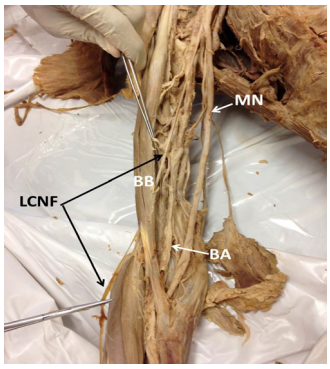

Figure 3. Photograph of dissection of right upper limb.

(MN – median nerve; BA – brachial artery; LCNF – lateral cutaneous nerve of forearm; BB – biceps brachii)

DISCUSSION

The musculocutaneous nerve supplies the anterior compartment of the arm. It arises from the lateral cord of the brachial plexus and pierces the coracobrachialis to enter the arm, where it supplies the biceps, brachialis, and coracobrachialis muscles. It then continues to the forearm as the lateral cutaneous nerve. The median nerve is the chief nerve that supplies the front of the forearm and the hand. It is formed by the lateral and medial roots that arise from the lateral and medial cords of the brachial plexus respectively. The nerve passes through the anterior aspect of the arm, crosses the elbow, and travels through the anterior compartment of the forearm. It then passes through the carpal tunnel to enter the palm.[4]

Findings about variations in the origin, course, and distribution of the musculocutaneous and median nerves have been reported. These findings include the absence of the musculocutaneous nerve, which can present unilaterally or bilaterally. In a report by Nayak, unilateral variation of the musculocutaneous nerve and associated variations in the origin, course, and distribution of the median nerve were observed.[5] A study by Sarkar and Saha reported bilateral absence of musculocutaneous nerve associated with variations of median nerve.[7] In another study, the musculocutaneous nerve was found to be absent bilaterally in a female cadaver, and the median nerve supplied the flexor muscles of the arm except the coracobrachialis. The coracobrachialis muscle in this case was supplied by a direct branch coming from the lateral cord of the brachial plexus.[6] A rare duplication of the musculocutaneous nerve has been reported as well.[8] The musculocutaneous nerve can also give rise to branches that communicate with the median nerve at different levels. Many cases of such communication between the two nerves have been reported in the literature.[9-12]

Variations of the musculocutaneous and median nerves can be associated with additional variations in the muscles and vasculature of the upper limb. In a report by Abuel-Makarem et al., the musculocutaneous nerve was absent and the presence of an accessory head of the biceps as well as entrapment of the ulnar nerve were observed.[13] Other variations of the biceps brachii and musculocutaneous nerve have been reported by other researchers as well.[14-17]

In a study by Budhiraja et al., it was found that in 11.2% of the cases the median nerve was supplying the muscles of the anterior compartment of the arm, as the musculocutaneous nerve was absent.[19] In addition, splitting of the median nerve into the median nerve proper and musculocutaneous nerve was observed in 5.12% of the cases and communication between the median and musculocutaneous nerve was found in 20.7% of the cases.[19] A case of bifid median nerve was reported recently as well.[20] A reported case by Tomar and Wadhwa demonstrated the absence of the musculocutaneous nerve unilaterally, while on the other arm the nerve contributed to the formation of the median nerve. Furthermore, this finding was associated with high branching of the brachial artery.[18] Finally, there are reports about further variations of the median nerve. These include variations in its sub-brachialis course, its entrapment in the brachialis muscle along with the brachial artery, and its formation with three roots.[21-24] Cases of the nerve becoming entrapped in the third head of the biceps, its compression by the brachial fascia or bicipital aponeurosis, its entrapment in the pronator teres muscle, and its compression in the carpal tunnel have been reported. The clinical symptoms produced by compression of the median nerve are dependent on the site and level of the compression, while entrapment of the musculocutaneous nerve can produce neurovascular symptoms that are of clinically significance.[25-30]

The current case presents findings that include the complete absence of the musculocutaneous nerve, with the median nerve supplying the areas that are normally

supplied by the musculocutaneous nerve. In this case, variations of the nerves can result in misdiagnoses.

Several cases with observations that are similar to this case have been reported in the past as well.[31-33] In cases of bone fractures in the upper limb, such as the humerus, the resulting injuries to the median nerve can be mistaken for injuries of the musculocutaneous nerve. Therefore, it can be concluded that knowledge of such variations is of clinical significance to orthopedic surgeons, general surgeons, sport medicine experts, physiotherapists and anesthesiologists.

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