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Case Report

Communication between median and musculocutaneous nerve at the level of cubital fossa - A case report

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ABSTRACT

The anatomical variations of the brachial plexus are important to be reported, in order to avoid their damage during the upper-limb surgical procedures. Despite of the frequent documented abnormalities in the pathway of the musculocutaneous and the median nerves, the anatomical variation accurately described in the present case is unusual to see: it does not perfectly come under any of the classifications proposed in literature. During the dissection of the right brachial plexus in an old male Caucasian cadaver a communicating branch between the musculocutaneous nerve and the median nerve was observed. Proximally It originated by the musculocutaneous nerve, after its perforation of the coracobrachialis muscle; distally it joined the median nerve only at the level of the cubital fossa. The musculocutaneous nerve and the median nerve maintained their normal courses, supplying all the collateral and terminal branches. In the same limb an atrophied short head of the biceps brachii muscle was also seen.

1. Introduction

The brachial plexus is formed by the anterior rami of the lower four cervical nerves and the first thoracic one (C5-T1). They arrange the medial, the lateral and the posterior cords, respectively related with the second part of the axillary artery. The cords give rise to the terminal branches at the level of the axilla base, which supply the innervation of upper limb. The musculocutaneous nerve (C5-C7) directly emerges from the lateral cord, while the median nerve (C5-T1) is given by the union of the lateral and the medial contributions, which respectively arise from the lateral and the medial cords. The musculocutaneous nerve supplies branches for the muscles of the anterior compartment of the arm and it gives rise to the lateral cutaneous nerve of the forearm, for the sensory innervation. The median nerve innervates the major part of the flexor muscles in the anterior compartment of the forearm and those in the lateral part of the hand; it gives rise to the palmar cutaneous and the digital cutaneous nerves, which supply the sensory innervation. The anatomical variations of the brachial plexus have been documented since the nineteenth and early twentieth century [1]; those between the musculocutaneous nerve and the median nerve are the most common, but even so they have not yet been completely categorised. The anatomical knowledge of the brachial plexus variations is necessary for understanding the clinical correlation of these nerves dysfunctions, for the interpretation of their clinical neurophysiology and to avoid injuries of they fibers during surgical procedures in the regions of axilla, neck of the homerus and elbow.

2. Method

The cadaver of an adult Caucasian male was embalmed following the routine procedure at New York University. An incision was made at the left of the anterolateral neck to expose the common carotid artery

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for the cannulation, using two silicon tubes: one toward the head, the other one toward the heart. The silicon tubes were connected to the pressure pump that gradually injected with a pressure between 2 and 10 PSI 12–16 L of the embalming fluid, which consisted of 1.83% formalin, 9.26% phenol, 20% methanol, 20% glycerine and water for diluting.

After 24 hours of embalming the cadaver was placed into cold storage for five weeks, to allow the fixation of the tissues.

The dissection of the axilla and arm regions of the right upper limb was made through an incision along the anterior axillary line of upper limb; the skin, the superficial fascia and the deep fascia were carefully retracted, the pectoralis major and minor muscles were reflected to expose the vascular and nervous structures.

The pathway of the median and the musculocutaneous nerves was isolated with probe, forceps and scissors to evidence the anatomical variation. The pictures were taken with Canon PowerShot SX60 HS.

3. Results

During the right upper limb dissection at the Gross Anatomy Course a communicating branch between the musculocutaneous nerve (C5-7) and median nerve (C5-T1) was exposed.

The musculocutaneous nerve and the lateral contribution of the median nerve correctly originated from the lateral cord of brachial plexus. The musculocutaneous nerve pierced the coracobrachialis muscle and continued its normal pathway; it ended as the cutaneous lateral nerve of forearm. It normally supplied branches to the muscles of the anterior part of arm. The anastomotic branch originated from the musculocutaneous nerve, after its coracobrachialis perforation. It went down in median position and it joined the median nerve, after 24.7cm from its origin, over the cubital fossa, just under the coephalic vein (Figs. 1 and 4). The fibres of the communicating branch and the median nerve were perfectly fused together to form a unique nervous structure in the forearm and hand (Fig.3). It maintained the correct pathway of the median nerve (Fig.2)

In the same arm an atrophied short head of biceps brachii muscle was also found, despite this its musculocutaneous nerve's branch was discovered during the dissection.

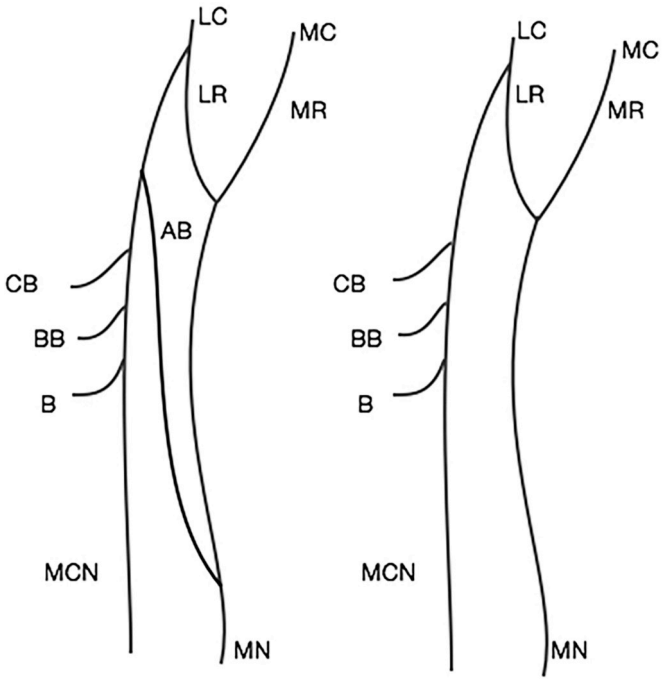

Fig. 2. Comparison between the anatomical variation and the normal course; **LC**-lateral cord of brachial plexus;**MC**-medial cord of brachial plexus; **LR**-lateral root of median nerve; **MR**-medial root of median nerve; **MN**-median nerve; **MCN**-musculocutaneous nerve; **CB**-coracobrachial muscle branch; **BB**-biceps brachii muscle branch; **B**-brachial muscle branch **AB**-anastomotic branch.

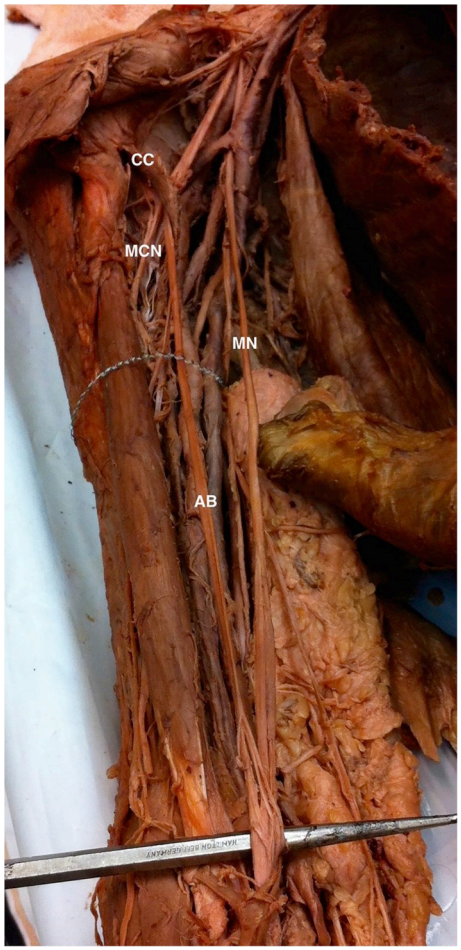

Fig. 1. Communication between median **(MN)** and musculocutaneous nerve **(MCN)**; **CC**-coracobrachialis muscle; **AB**-anastomotic branch.

Fig. 3. The nervous structure formed at the height of cubital fossa.

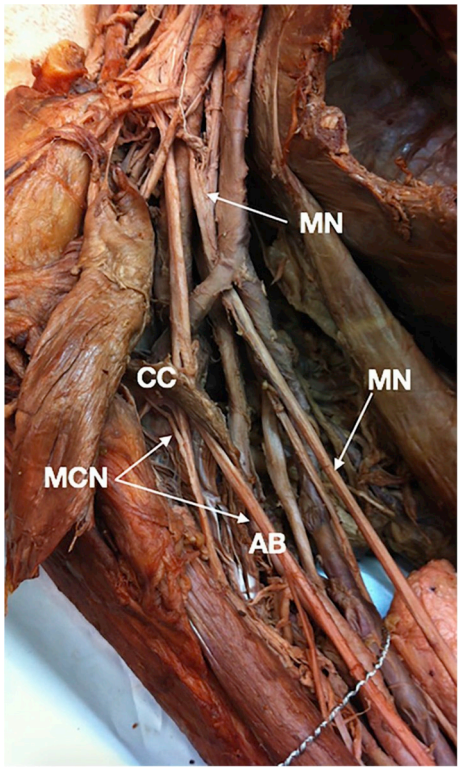

Fig. 4. Superior view of the components of the anatomical variation; **LC**-lateral cord of brachial plexus**;MC**-medial cord of brachial plexus; **LR**-lateral root of median nerve; **MR**-medial root of median nerve; **MN**-median nerve; **MCN**-musculocutaneous nerve; **CB**-coracobrachial muscle branch; **BB**-biceps brachii muscle branch; **B**-brachial muscle branch **AB**-anastomotic branch; **CC**-coracobrachialis muscle.

4. Discussion

The anatomical variations between the musculocutaneous nerve and the median nerve are not uncommon: in the last classification 130 upper limbs are dissected and the 23.8% has communicating branch between these two nerves. There are several communications between the musculocutaneous nerve and the median nerve, each one with a different frequency. According to the last classification the anatomical variation documented in this case report results one of the rarer: only 3.1% of 130 upper limbs has a communicating branch, which arises between the coracobrachialis and biceps brachii muscles [2].

In the literature other three main classification systems catalogue the different types of anatomical variations between the musculocutaneous and the median nerves: [3, 13,14]. Because of the singular position of the junction fibers between the comunicating branch and the median nerve, above the cubital fossa, none of the three classifications perfectly describes this case.

According to Le Minor's classification (1992) this communicating branch could belong to the type II because it emerges from the muscolocutaneous nerve, but the junction with the median nerve is not in the middle of the arm [3]. conversely consider three types of anastomosis, in relation to coracobrachialis muscle; this anatomical variation could belong to the type II because the junction is at the level of the cubital fossa, distal to the coracobrachialis muscle.

The last classification by Choi et al. (2002) reports three patterns, in this case only the pattern 2a represents this anatomical variation because there is one supplementary branch between the musculocutaneous and the median nerve. It's important to classify this anatomical variation to understand its frequency for the clinical and the surgical aspects.

5. Conclusion

This communication between median nerve (C5-T1) and musculocutaneous nerve (C5-C7) above the cubital fossa is probably caused by the passage of some fibers of the lateral cord of the median nerve, through the musculocutaneous nerve, that supplies the anastomotic branch which rejoins the median nerve. It could be a consequence of an overlapping of C6-C7 fibers, but this is not macroscopically seen during the dissection.

This anatomical variation assumes a considerable importance for neurophysiological studies and for surgical practice. Appropriate neurophysiological examinations through electroneurography of this communicating branch allow us to identify the specific functions of its fibers, to be useful during surgical procedures. In neurosurgery this specific anatomical variation is important in those cases of lesions or pathologies of the median nerve which require surgery (for example neurofibromatosis), because it can supply the innervation of those structures which are normally innervated by median nerve. Thanks to the length and the distal position of this anatomical variation it can also be used for the neurotization procedure, when a proximal lesion at the brachial plexus afflicts the muscolocutaneous nerve functionality. Finally orthopedic, general surgeons and neurosurgeons must consider the possible presence of this comunicating branch to avoid damages during surgeries of elbow's region and proximal forearm, which could cause alteration of the motility and the sensibility of forearm and hand.

Ethical statement

Not applicable for this article.

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Disclosure

Detailed disclosures: authors inform there are not detailed disclosures.

Conflicts of interest

None.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.tria.2018.04.001.

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