

# Four cases of anastomosis between the musculocutaneous and median nerves

J.J. Pozo Kreilinger, C. de la Cuadra-Blanco, J.F. Rodríguez-Vázquez  
and J.R. Mérida-Velasco

*Instituto de Ciencias Morfo-funcionales y del Deporte, Departamento de Anatomía y Embriología Humana II, Facultad de Medicina, Universidad Complutense, Madrid, Spain*

## SUMMARY

During routine bilateral dissection of 16 human cadavers (32 upper limbs), four cases of anastomosis between the musculocutaneous and median nerves were observed. In addition, one case presented a biceps brachii with an accessory head. Embryological considerations and possible clinical consequences are discussed.

**Key words:** Median nerve – Musculocutaneous nerve – Anatomical variation – Brachial plexus

## INTRODUCTION

There is abundant literature on variations in the makeup of the brachial plexus and its terminal branches (Bergman et al., 2000). Similarly, many authors have reported anastomoses between the musculocutaneous and median nerves (Le Minor, 1990; Venieratos and Anagnostopoulou, 1998; Goyal et al., 2005; Salopek et al., 2007). Choi et al. (2002) recently examined 138 cadavers for anastomoses between the musculocutaneous and median nerves and found them in 73 cases out of a total of 276. Those authors classified these variations in three patterns.

This paper describes four cases of anastomosis between the musculocutaneous and median nerves in four cadavers that were observed during the course of routine dissection.

Anatomical variations in the peripheral nerves and anastomoses of these are clinically important. Hence, an understanding of the nerve variations in the branches of the brachial plexus is of particular interest in routine surgery of the upper limb, and also for a proper interpretation of clinical neurophysiology. Owing to this importance, work is currently under way to try and identify the variations in the components of the brachial plexus using Magnetic Resonance Imaging (Van Hoof et al., 2005).

## MATERIAL AND METHODS

During the last two academic years (2005-07) 16 cadavers were routinely dissected by medical students at the Department of Anatomy and Human Embryology II of the Medical Faculty of the Universidad Complutense de Madrid. Anastomosis was identified unilaterally between the musculocutaneous and median nerves in four cases. The cadavers (6 male

and 10 female) were fixed in formol at 10%. The ages of the cadavers ranged from 71 to 95.

RESULTS

The results are summarized in Table 1. In all four cases, the musculocutaneous nerve traversed the coracobrachialis muscle.

*Cases 1 and 2* (Female aged 76, right side; Female aged 73, left side)

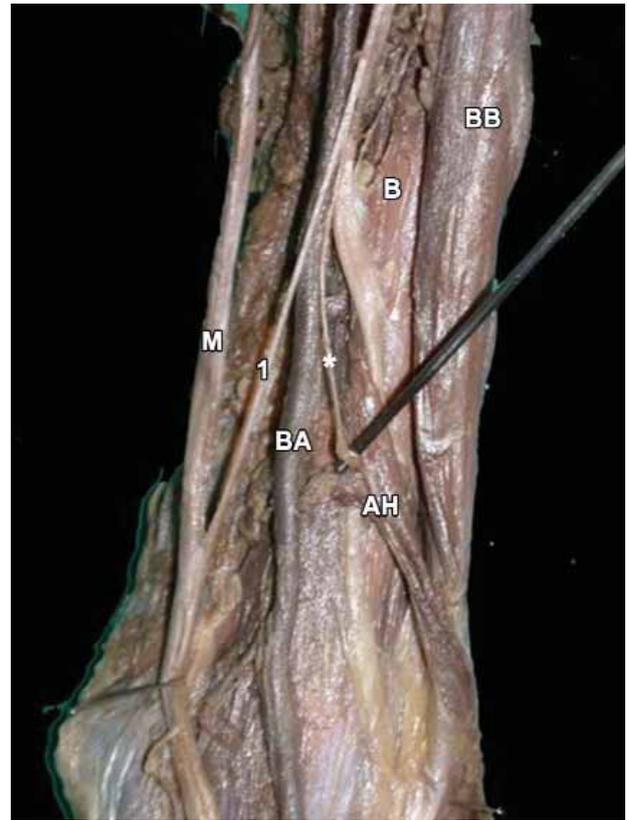
In the arm, an anastomotic branch was observed running from the musculocutaneous nerve towards the median nerve. The musculocutaneous nerve innervated the coracobrachialis, anterior brachialis and biceps brachii.

*Case 3* (Male aged 79, left side)

In the arm, an anastomotic branch was observed running from the musculocutaneous nerve to the median nerve. In addition, it presented an accessory head on the biceps brachii running from the anteroinferior third of the humerus into the inferoexternal part of the biceps brachii. This third head was innervated by an offshoot from the anastomotic branch between the two nerves (Fig. 1).

*Case 4* (Male aged 74, right side)

There was a variation in the formation of the median nerve in the axillary region in the form of an anastomotic branch between the lateral cord and the medial root of the median nerve. In addition, a branch from the medial cord ran to this anastomotic branch (Fig. 2). The disposition of the axillary artery was most common.

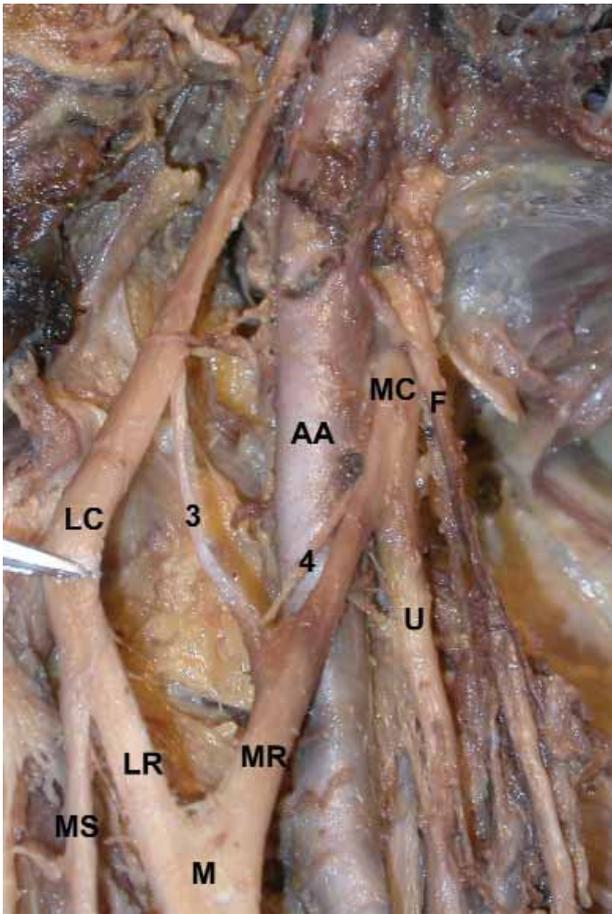


**Figure 1.** The anastomosis (1) between the median (M) and musculocutaneous nerves gives a branch (asterisk) for the accessory head (AH) of the biceps brachii muscle.

In the arm, there was an anastomosis running from the median to the musculocutaneous nerve. In turn, there was an offshoot issuing from this anastomotic branch that innervated the medial head of the triceps brachii muscle. The coracobrachialis, anterior brachialis and biceps brachii were innervated by the musculocutaneous nerve.

**Table 1.** Summary of results.

Cases	Case 1: Female aged 76, right side	Case 2 Female aged 73, left side	Case 3 Male aged 79, left side	Case 4 Male aged 74, right side
Anastomosis localization	arm	arm	arm	Axilla and arm



**Figure 2.** The lateral cord (LC) anastomoses with the medial root (MR). This anastomosis (3) receives a branch from the medial cord (MC) to form another anastomosis (4).

## DISCUSSION

Many authors have reported anastomoses between the musculocutaneous and median nerves (see introduction). Some have attempted to classify these anastomoses on the basis of several different criteria (Le Minor, 1990; Venieratos and Anagnostopoulou, 1998). Choi et al. (2002) recently classified these anastomoses in three patterns, based on the largest number of cases to date (138 cadavers). Pattern 1: a fusion of both nerves; pattern 2: the presence of a supplementary branch between the two nerves. The latter is subdivided into 2A, defined as a single branch contributing to the single anastomosis between the musculocutaneous and median nerves, and pattern 2B, in which the anastomosis is formed from two or three branches from the musculocutaneous nerve, joining to form one anastomotic branch to the median nerve. Pattern 3: two anastomosis branches between the musculocutaneous and median nerves, passing in both directions or crossing in their course.

Cases 1 and 2 presented the type 2A pattern, which is also the most common (Choi et al., 2002).

Case 3 can also be included within pattern 2A. However, it also presented a biceps brachii with an accessory head. This accessory head was innervated by a branch from the anastomosis between the musculocutaneous and median nerves. According to Kosugi et al. (1992), the incidence of anastomoses between the musculocutaneous and median nerves is higher in upper limbs in which the biceps brachii muscle has an accessory head. However, biceps brachii muscles have been reported with one accessory head (Rodríguez et al., 1999) and two accessory heads (Vázquez et al., 2003), which were innervated by the musculocutaneous nerve and did not present anastomosis between this and the median nerve.

Case 4 described in this paper could be construed as pattern 3 (Choi et al., 2002) with some peculiarities. The first anastomosis was located in the axillary region, and no such disposition has been reported by authors who have analysed variations in the brachial plexus (Bergman et al., 2000). However, it was similar to a case reported on the right side by Goyal et al. (2005). This case further presented an anastomosis in the arm running from the median to the musculocutaneous nerve, from which a branch issued, innervating the medial head of the triceps brachii muscle. Bergman et al. (2000) reported that the median nerve may innervate, in part, the biceps brachii and brachialis muscles.

During growth, the somitic mesoderm invades the anlage of the extremity and forms two condensations: one dorsal and one ventral. The dorsal condensation develops into the extensor and supinator muscles, while the ventral condensation develops into the flexor and pronator muscles of the upper limb. The nerves that invade the anlage of the upper member avoid or are unable to penetrate the dense mesenchymal region or regions containing glucosaminoglycans. Once the nerve penetrates, the direction of invasion of a muscle primordium is probably regulated by signals produced by the muscle itself (Larsen, 2003). This might account for the nerve variations in the members.

The variations reported are not uncommon and are vulnerable to lesion in surgical access to the arm (Choi et al., 2002).

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## ABBREVIATIONS

1	Anastomosis between musculocutaneous and median nerves
bb	Biceps brachii muscle branch
2	Anastomosis between median and musculocutaneous nerves
F	Medial cutaneous nerve of forearm
3	Anastomosis between lateral cord and medial root
LC	Lateral cord
4	Anastomosis between medial cord and 1
LR	Lateral root
AA	Axillary artery
mh	Branch of the medial head of the triceps brachii muscle branch
AH	Accessory head of biceps brachii muscle
MC	Medial cord
ah	Branch of the accessory head of biceps brachii muscle
MS	Musculocutaneous nerve
B	Brachialis muscle
M	Median nerve
b	Brachialis muscle branch
MR	Medial root
BA	Brachial artery
U	Ulnar nerve
BB	Biceps brachii muscle