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Three Cases of the Musculocutaneous Nerve not Perforating the Coracobrachialis Muscle

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Abstract: We encountered three anomalies in which the musculocutaneous nerve did not penetrate the coracobrachialis during a gross anatomy course in 1996. Two of the anomalies were present in the bilateral arms of the cadaver of an 89-year-old woman, and the other in the right arm of the cadaver of a 64-year-old man. In all of the anomlies the musculocutaneous nerve, the lateral cord of the brachial plexus, and the median nerve were contained in a common sheath of connective tissue. Thus, muscular branches to the flexor muscles of the upper arm and the lateral antebrachial cutaneous nerve seemed to arise from the cord and the median nerve. After the common sheath was removed, the musculocutaneous and median nerves were completely separated, or the fusion between the musculocutaneous and median nerves only remained partially. These variations are apparently not rare, and it is possible that the combined paralysis of the musculocutaneous and median nerves would occur. The present variation may be important to clinicians.

Key words: musculocutaneous nerve, median nerve, anomaly, gross anatomy, Japanese

INTRODUCTION

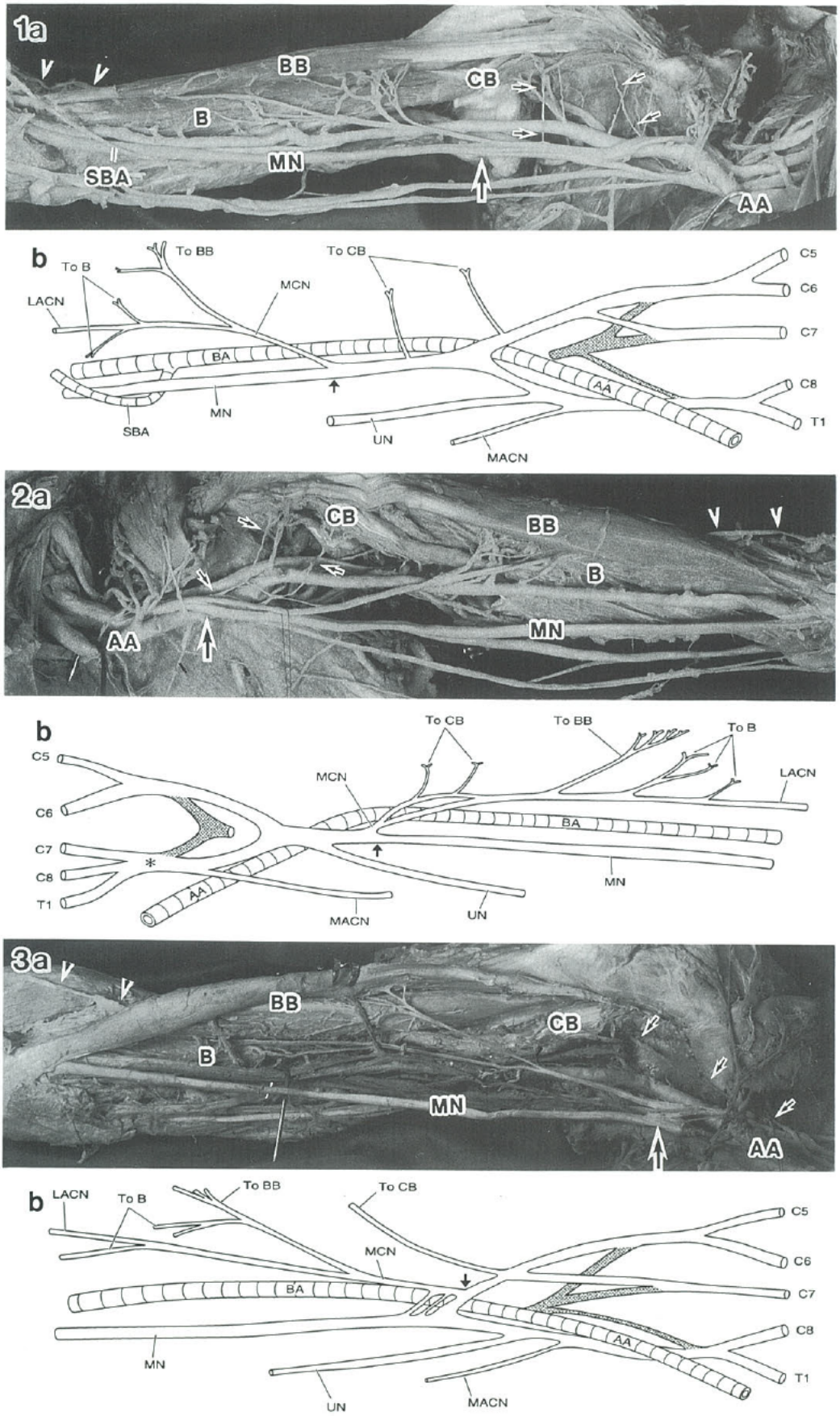
Variations involving the musculocutaneous nerve are common. In one variation, the musculocutaneous nerve does not perforate the coracobrachialis and the nerve adheres to the median nerve for some distance down the arm then, either as a single trunk or several branches, passes between the biceps and brachial muscles to supply all three muscles (Bergman et al., 1988). This anomaly is not rare, and Koizumi (1989) reported a frequency of 4.2%. We encountered the anomaly in the bilateral arms of the same individual and in the right arm of another individual during a gross anatomy course for medical students in 1996. We report the anomaly and discuss its clinical importance.

CASES

The anomalies in question were observed in the right arm (Anomaly 1) and the left arm (Anomaly 2) of an 89-year-old Japanese woman who had died of old age, and in the right arm (Anomaly 3) of a 64-year-old man who had died of pulmonary emphysema. In none of these cases was the musculocutaneous nerve observed to pierce the coracobrachialis and pass between the biceps brachii and brachialis. Instead, the muscular branches to the coracobrachialis, biceps brachii, and brachialis, and the lateral antebrachial cutaneous nerve left the lateral cord of the brachial plexus and the median nerve, in this order. After the common sheath of connective tissue covering the cord and the median nerve was carefully removed, the musculocutaneous nerve could be completely or partially separated from the median nerve. All figures shown herein depict the appearance following the separation. Moreover, no anomalies of the coracobrachialis, biceps brachii or brachialis were present.

Anomaly 1 (Fig. 1a, b). The composition of the upper, middle, and inferior trunks, and the lateral, medial, and posterior cords of the brachial plexus was typically normal in the right arm of the 89-year-old woman. The fibers of the musculocutaneous nerve extended in the lateral cord from which one muscular branch to the coracobrachialis was arose. The musculocutaneous nerve then continued in the median nerve to form a common trunk from which another muscular branch to the coracobrachialis arose. A short distance distally the musculocutaneous nerve left the median nerve, crossed over the brachial artery coursing between the biceps brachii and brachialis, and continued as the lateral antebrachial cutaneous nerve after branching off twigs to the biceps brachii and brachialis. The common trunk was about 5 cm long. No communicating branch between the musculocutaneous and median nerves was observed. The superficial brachial artery originated from the brachial artery at the distal third of the upper arm wound around the median nerve and continued in the radial artery.

Anomaly 2 (Fig. 2a, b). In the left arm of the same cadaver, the union of the fifth and sixth cervical nerves formed the superior trunk which split into a divi-


1a
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Figs. 1–3

sion of the posterior cord and the lateral cord. The seventh and eighth cervical nerves and the first thoracic nerve were united into one trunk from which a division of the posterior cord and the medial cord were derived. The lateral and medial cords combined ventral to the axillary artery, forming a common trunk of the ulnar, musculocutaneous, and median nerves. A short distance distally the ulnar nerve left the common trunk. At 1 cm distal to the origin of the ulnar nerve, the trunk divided into the musculocutaneous and median nerves. The musculocutaneous nerve crossed over the axillary artery passing between the biceps brachii and brachialis, and continued as the lateral antebrachial cutaneous nerve. Along its course it provided twigs to the coracobrachialis, biceps brachii, and brachialis, in this order. No branch to the coracobrachialis originating from the lateral cord, nor anastomotic branch between the musculocutaneous and median nerves, was observed. The axillary artery did not pass between the lateral and medial cords but rather under the medial cord, then passing distally along its normal course.

Anomaly 3 (Fig. 3a, b). The composition of the superior, middle, and inferior trunks, and the lateral, medial, and posterior cords was normal in the right arm of the 64-year-old man. The musculocutaneous nerve passed within the lateral cord from which one branch to the coracobrachialis arose. At 2.5 cm distal to the branching the musculocutaneous nerve left the lateral cord which continued as the lateral root of the median nerve. Immediately distal to the division, the musculocutaneous nerve issued two communicating branches to the median nerve, then passed down between the biceps brachii and the brachialis supplying the two muscles, and continued as the lateral antebrachial cutaneous nerve.

DISCUSSION

The incidence of this type of anomaly in which the musculocutaneous nerve does not pierce the coracobrachialis muscle was reported to be 6% (6/100 arms) by Ferner (1938), 8.5% (6/71 arms) by Buch-Hansen (1955), 14% (7/50 arms) by Buch (1964), 22% by Bergman et al. (1988), and 4.2% (10/240 arms) by Koizumi (1989). We observed the anomaly at the frequency of 6% (3/50 arms), hence this anomaly is not very rare.

The anomalies in which the musculocutaneous nerve does not penetrate the coracobrachialis are classified into two types as described by Ferner (1938). In the complete fusion type, the musculocutaneous and median nerves fuse completely to form a true common trunk, and thus each of the muscular branches to the coracobrachialis, biceps brachii, and brachialis, and the lateral antebrachial cutaneous nerve arise independently from the trunk, although sometimes a common trunk of a branch to the brachialis and the lateral antebrachial cutaneous nerve is formed (Fujita, 1957; Lang and Spinner, 1970; Watanabe et al., 1985). In the incomplete type, although both the musculocutaneous and median nerves are enveloped by the same connective sheath to form an apparent common trunk, the thorough dissection of the connective sheath resolves the trunk into the musculocutaneous and median nerves, that is, both nerves are either completely separated (Anomaly 3 in this report, Nakamura et al., 1976) or only fused together into a common trunk for a variable distance to the site at which the musculocutaneous nerve leaves the median nerve (Anomalies 1 and 2; Imokawa, 1935; Buch, 1964). However, in both types, before the common sheath of connective tissue covering the musculocutaneous and median nerves has been removed, the muscular branches to the coracobrachialis, biceps

Fig. 1. Anomaly 1. a) Photograph of the right upper extremity. A large arrow, small arrows and arrow heads indicate the bifurcation into the musculocutaneous and median nerves, muscular branches to the coracobrachialis, and the lateral antebrachial cutaneous nerve, respectively. b) Corresponding drawing of the extremity. The musculocutaneous nerve leaves the median nerve at the point indicated by an arrow.

Fig. 2. Anomaly 2. a) Photograph of the left upper extremity. A large arrow, small arrows, and arrow heads indicate the bifurcation into the musculocutaneous and median nerves, twigs to the coracobrachialis, and the lateral antebrachial cutaneous nerve, respectively. b) Corresponding drawing of the extremity. An arrow indicates the point where the common trunk divides into the musculocutaneous and the median nerves. The union of the middle and inferior trunk forms a medial cord (asterisk). The axillary artery does not pass between the lateral and medial cord but under the medial cord.

Fig. 3. Anomaly 3. a) Photograph of the right upper extremity. A large arrow, small arrows, and arrow heads indicate the branching of the musculocutaneous nerve from the lateral cord, a single thick branch to the coracobrachialis, and the lateral antebrachial cutaneous nerve. b) Corresponding drawing of the extremity. An arrow indicates the branching point of the musculocutaneous nerve from the lateral cord. Note the communicating branches between the musculocutaneous and median nerves.

AA, axillary artery; B, brachial muscle, BA, brachial artery; BB, biceps brachii muscle; C, cervical nerve; CB, coracobrachialis muscle; LACN, lateral antebrachial cutaneous nerve; MACN, medial antebrachial cutaneous nerve; MCN, musculocutaneous nerve; MN, median nerve; SBA, superficial brachial artery; T, thoracic nerve; UN, ulnar nerve.

brachii, and brachialis, and the lateral antebrachial nerve seem to originate independently from the lateral cord and the median nerve. Moreover, based upon the development of the brachial plexus (Lewis, 1902; Iwata, 1960), the median, musculocutaneous, and ulnar nerves first appear as a mass of anterior neural fibers deriving from C4 or C5 to C8 and Th1. The mass then divides into the median and ulnar nerves, and finally the median nerve divides into the proper median and the musculocutaneous nerve. The above mentioned observations of the anomalies and the development of the brachial plexus make us suppose that if the separation of the median and musculocutaneous nerves does not occur or occurs incompletely, both nerves would fuse or be covered with the common connective sheath, and thus the musculocutaneous nerve might fail to perforate the coracobrachialis.

According to Koizumi (1989), the coracobrachialis is divided into two parts, of which the superficial part is innervated by a twig originating from the musculocutaneous nerve and the deep part by a twig originating directly from the middle trunk of the brachial plexus or C7. When the development of the superficial part is extremely poor, the musculocutaneous nerve does not pierce the coracobrachialis. However, since we did not work out the finer details on the spinal nerve supplying the coracobrachialis or on the distribution of the nerve in the muscle, it is difficult to verify the hypothesis by Koizumi on the basis of the present cases.

There are few reports of cases (Kim and Goodrich, 1984) in which the musculocutaneous nerve alone is damaged in routine life, in contrast to in combat (Sunderland, 1978), because the nerve pierces the coracobrachialis and then takes a course between the biceps brachii and brachialis, being protected by these muscles. On the other hand, the median nerve is easily injured (Iconomou et al., 1993; Sunderland, 1978). Therefore, when the musculocutaneous nerve is combined with the median nerve or covered with the same connective sheath accompanying the median nerve and takes a course alongside the brachial artery through the medial bicipital groove, it is possible that a small puncture wound to the axilla or upper arm would produce a combined paralysis of the musculocutaneous and median nerves as indicated by Lang and Spinner (1970).

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REFERENCES

1) Bergman RA, Thompson SA, Afifi AK, Saadeh FA (1988) Compendium of Human Anatomic Variation, Urban & Schwarzenberg, Baltimore-Munich, pp 127–164
2) Buch C (1964) Zur Variation der Innervationsweise des M. biceps brachii unter Beachtung der Astabgabe vom N. musculocutaneus und vom N. medianus. Anat Anz 114: 131–140
3) Buch-Hansen K (1955) Über Varietäten des Nervus medianus und des Nervus musculocutaneus und deren Beziehungen. Anat Anz 102: 187–203
4) Ferner H (1938) Der Nervus musculocutaneus, seine Verlaufsvarietäten am Oberarm und deren Beziehung zur Entwicklung eines Caput tertium musculi bicipitis. Z Anat Entwgesch 108: 567–586
5) Fujita T (1957) Complete fusion of the musculocutaneus and median nerves in a human arm, with remarks on its combination with some anomalies of the biceps brachii muscle. Acta Anat Nippon 32: 257–262 (in Japanese with English abstract)
6) Iconomou TG, Zuker RM, Michelow BJ (1993) Management of major penetrating glass injuries to the upper extremities in children and adolescents. Microsurgery 14: 91–96
7) Imokawa R (1935) A rare case of the brachial plexus. Hokuetsu Igakukai Zasshi 50: 852–856 (in Japanese)
8) Iwata H (1960) Studies on the development of the brachial plexus in Japanese embryo. Rep Dept Anat Mie Univ Sch Med 13: 129–143 (in Japanese)
9) Kim SM, Goodrich JA (1984) Isolated proximal musculocutaneous nerve palsy: case report. Arch Phys Med Rehabil 65: 735–736
10) Koizumi M (1989) A morphological study on the coracobrachialis muscle. Acta Anat Nippon 64: 18–35 (in Japanese with English abstract)
11) Lang J, Spinner M (1970) An important variation of the brachial plexus-complete fusion of the median and musculocutaneous nerves. Bull Hosp Jt Dis 31: 7–13.
12) Lewis WH (1902) The development of the arm in man. Am J Anat 1: 145–184
13) Nakamura R, Kanno Y, Suenaga Y (1976) Anomaly of the musculocutaenous nerve. Hokkaido Igaku Zasshi 51: 265–266 (in Japanese)
14) Sunderland S (1978) Nerve and Nerve Injuries, 2nd ed, Churchill Livingstone, Edinburgh London and New York, pp 651–1031
15) Watanabe M, Takatsuji K, Sakamoto N, Morita Y, Ito H (1985) Two cases of fusion of the musculocutaneous and median nerves. Acta Anat Nippon 60: 1–7