Anatomical Variations of the Musculocutaneous and Median Nerves: A Case Report

Marzieh Darvishi, Ardeshir Moayeri
Department of Anatomy, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran

INTRODUCTION
Variations of human anatomy pose significant challenges in surgical procedures. The extremities, especially the upper limbs, are at risk of injury; nevertheless, the variations of brachial plexus are not rare. Almost half of anatomical variations in studies of human neural system have been presented from the brachial plexus by investigators.1 The plexus supplies motor and sensory innervations to the upper limbs, constituted by the anterior rami of C5 to C8 and T1. The plexus begins in the neck, crosses inferiorly over rib I, and descends the axilla. The brachial plexus divisions are roots, trunks and cords. One of the terminal branches of the lateral cord (C5-7) of the plexus is the musculocutaneous nerve (MCN). Normally, the MCN lies between the coracobrachialis muscle and the axillary artery and afterwards penetrates the muscle to descend among the biceps and brachialis, then continues on the forearm as the lateral cutaneous nerve of the forearm. Many surgical procedures of the upper extremities are associated with shifts in the muscles of the anterior arm compartment and MCN injuries; therefore, knowledge of this nerve is important for surgeons, orthopedists, and anesthetists.

The aim of this study was to present an anatomical variation of the median nerve and the MCN and the muscles that are innervated by these nerves.2,3 These findings were observed after dissection of a cadaver at the Department of Anatomy at Ilam University of Medical Sciences, Iran.

CASE REPORT
After dissection of the upper limb for medical undergraduate students, a variation of the MCN nerve was found in the right upper extremities of a 28-year-old male cadaver in the Department of Anatomy at Ilam University of Medical Sciences. This cadaver was fixed in 10% formalin and had no surgical or traumatic lesions to the upper limb. Cunningham’s manual of practical anatomy was used to guide dissections of upper extremities. Both upper limbs on the right and left sides were carefully dissected. In this case report, the lateral,
medial and posterior cords of the brachial plexus position were normal, but the MCN had variations on the right side. On the right side, the origin of the median nerve was located 10.6 cm from the acromion process and 3.8 cm from the middle lateral border of pectoralis minor. The median nerve followed laterally for 4.2 cm, then crossed below the coracobrachialis muscle without penetration of this muscle.

The MCN connected to the median nerve after being removed from the lateral cord and passing a short distance. Once again, after passing a short distance, it separated from the median nerve, and in that area branched to the coracobrachialis muscle and the biceps brachii. Then it connected to the median nerve for a second time, and eventually separated and branched to the brachialis muscle. In this case, the MCN did not pierce the coracobrachialis muscle.

In addition, behind the pectoralis minor, one communicating branch was detached from the median nerve before the bifurcation that passed against the axillary artery and connected to the medial cord. The cutaneous branches of the forearm were not separated from the MCN. In the left upper limb the course and distribution of the median nerve and MCN were normal. The distance from the origin of MCN to the acromion process was 9.8 cm and to the middle lateral border of the pectoralis minor was 3 cm. On the left elbow, contrary to the right, cutaneous branches for the forearm separated from the MCN when it perforated the deep fascia lateral to the tendon of biceps (Fig. 1).

**DISCUSSION**

It is necessary for surgeons, anesthetists and neurologists to identify the MCN during clinical procedures of upper limb. The MCN can be damaged with coracoids process grafting, shoulder dislocations, plastic surgery and arthroscopies. Injury to this nerve leads to paralysis of the anterior compartment muscles of arm (brachialis, biceps brachii and coracobrachialis) and this disorder causes motor defects of the elbow joint (flexion) and sensory deficiency in the lateral compartment of the forearm. Therefore, in order to prevent damage to the nerve during surgical procedures, studies have been done on nerve variations.

Anomalies in the formation of the MCN and its communicating branches are common enough that Le Minor (1992) described five types of variations between the MCN and the median nerve.

- **Type I**: a pattern without communication between the MCN and the median nerve. The MCN penetrates the coracobrachialis muscle and divides into three branches to innervate the coracobrachialis, biceps and brachialis muscles.
- **Type II**: some of the fibers of the lateral and medial root of the median nerve pass through the MCN and then join to the median nerve in the distal coracobrachialis muscle.
- **Type III**: the MCN stems from the lateral cord and after some distance sends communicating fibers to join the median nerve that is formed by the medial cord.
- **Type IV**: The fibers of the MCN and the lateral root of the median nerve merge together and the MCN arises from the median nerve and then divides into branches to innervate the biceps, coracobrachialis and brachialis muscles.
- **Type V**: The MCN nerve runs within the median nerve and the muscles are supplied by branches directly from this complex nerve (Fig. 4).

This case report shows a different type of connection between the MCN and the median nerve compared to the five pattern types discussed by Le Minor. As a result, the MCN was not completely absent, and after being formed in two areas, it

---

**Figure 1.** Diagrammatic presentation of the findings of the present study. A. left side; B. right side.

LC: lateral cord; MC: medial cord; LR: lateral root of the median nerve; MR: medial root of the median nerve; MCN: musculocutaneous nerve; CB: coracobrachialis muscle; BB: biceps brachii; B: brachialis muscle; MN: median nerve; UN: ulnar nerve.
Anatomical Variations of the Musculocutaneous and Median Nerves

Figure 2. A. Diagrammatic and macroscopic picture from normal musculocutaneous and median nerves in the left arm. B. Median nerve with unusual muscular branches in right arm. Non piercing coracobrachialis with two communicating fibers with median nerve.

LC: lateral cord; MC: medial cord; MCN: musculocutaneous nerve; MN: median nerve; UN: ulnar nerve; CBM: coracobrachialis muscle; BBM: biceps brachii; BM: brachialis muscle; C: communicating branch; LR: lateral root of the median nerve; MR: medial root of the median nerve (type I).

Figure 3. Macroscopic picture from musculocutaneous & median nerves in right and left arm.

LC: lateral cord; MC: medial cord; MCN: musculocutaneous nerve; MN: median nerve; UN: ulnar nerve; CB: coracobrachialis muscle; BB: biceps brachii; B: brachialis muscle; LR: lateral root of the median nerve; MR: medial root of the median nerve.

Figure 4. Schematic picture of the anatomical variations of the median and the musculocutaneous nerves according to Le Minor’s classification.

LC: lateral cord; MC: medial cord; MCN: musculocutaneous nerve; MN: median nerve; UN: ulnar nerve; CB: coracobrachialis muscle; BB: biceps brachii; B: brachialis muscle; C: communicating branch; LR: lateral root of the median nerve; MR: medial root of the median nerve.
connects to the median nerve.

Our present study falls under the new type of division called type VI, where the fibers of the MCN and the median nerve of the right arm are connected in two areas and the biceps brachii and brachialis innervated by the MCN in the first and second separation from the median nerve respectively. Based on the division discussed by Venierotors and Anagnostopoulou (1998) in relation to the coracobrachialis muscle, this report classifies three types.7

Type 1: the relation between the MCN and the median nerves is proximal to the coracobrachialis muscle.

Type 2: the communication between the MCN and the median nerve is distal to the coracobrachialis muscle.

Type 3: the MCN branch does not pierce the coracobrachialis muscle.

The case in the present study is the type that does not pierce the nerve of the coracobrachialis muscle. We also observed this type of classification on the right side (Figs 2B and 3) and innervation of coracobrachialis after connection with median nerve. In a study done by Babu et al. (2016) the MCN did not pierce the coracobrachialis in two of the limbs.8 However, the left side of the median and ulna nerve structure is normal (Fig 2A and 3).

CONCLUSION

This study examines a case of variation of the median nerve associated with variations in distribution patterns of the MCN, which provides finding of possible anatomical variations of use in surgical approaches, clinical investigation and management of disorders of the upper limb.

REFERENCES

1. Nascimento S, Ruiz CR, Pereira E, et al. Rare anatomical variation of the musculocutaneous nerve – case report. Rev Bras Ortop. 2016; 51(3): 366-9.
2. Arora L, Dhingra R. Absence of musculocutaneous nerve and accessory head of biceps brachii: a case report. Indian J Plast Surg July. 2005; 38(2): 144-6.
3. Williams PL, Warwick R, Dyson M, et al. Gray’s anatomy. In: Neurology. 37th ed. London: Churchill Livingstone; 1989; 1132.
4. Flatow EL, Bigliani LU, April EW. An anatomic study of musculocutaneous nerve and its relationship in the coracoids process. Clin Orthop Relat Res 1989; (244): 166-71.
5. Virupaxi RD, Shirol VS, Desai SP, et al. Absence of musculocutaneous nerve in the left axilla. Int J Anat Var 2009; 2(1): 140-2.
6. Sah SK, Chaudhary D, Pandey N. Prevalence of absence of musculocutaneous nerve among the nepalese cadaver. International Journal of Scientific and Research Publications. 2016; 6(8): 222-5.
7. Venierotors D, Anagnostopoulou S. Classification of the communications between the musculocutaneous and median nerves. Clin Anat 1998; 11(5): 327-31.
8. Babu DJ, Pillai P, Priyanka K, et al. A study on variations of musculocutaneous nerve in adult cadavers. IOSR Journal of Dental and Medical Sciences 2016; 15(5): 14-17.
Анатомические вариации мышечно-кожных и срединных нервов: клинический случай
Марзи Дарвиши, Ардэшир Моайери

Кафедра анатомии, Медицинский факультет, Ильянский медицинский университет, Илам, Иран

Адрес для корреспонденции: Ардэшир Моайери, Кафедра анатомии, Медицинский факультет, Ильянский медицинский университет, Илам, Иран, 6939177143, Иран
E-mail: moayeri46@medilam.ac.ir
Tel: +988432235713

Дата получения: 21 марта 2018
Дата приемки: 12 декабря 2018
Дата онлайн публикации: 19 января 2019
Дата публикации: 30 июня 2019

Ключевые слова: плечевое сплетение, мышечно-кожный нерв, срединный нерв

Образец цитирования:
Darvishi M, Moayeri A. Anatomical variations of the musculocutaneous and median nerves: a case report. Folia Med (Plovdiv) 2019;61(2):327-31.
doi: 10.2478/folmed-2018-0080

Мышечно-кожный нерв представляет собой крупную терминальную ветвь латерального пучка плечевого сплетения. Он проходит под малой грудной мышцей и проникает в клововидно-плечевую мышцу, опускаясь между плечом бицепса и мышцами плеча кисти. После вскрытия верхних конечностей трупа 28-летнего мужчины было обнаружено, что срединный и мышечно-кожный нерв имели вариации на правой стороне, где мышечно-кожный нерв образует связь со срединным нервом. Медиальный нерв иннервирует мышцы передней части руки описываемого трупа. Кроме того, мускулатура не „прокалывает“ клововидно-плечевую мышцу с правой стороны. Осведомленность об этих вариациях чрезвычайно важна при планировании операции в области подмышечной впадины.