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A Study on the Anatomical Variations of Median Nerve Formation

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Objectives: To study the anatomical variations of the formation of the median nerve.

Methods: Forty-eight upper limbs obtained from 24 embalmed adult cadavers were used for this study. They were carefully dissected and examined to detect any anatomical variations of the formation of the median nerve.

Results: Four anomalies of the median nerve formation were detected in this study. In one anomaly, two interconnecting branches were present between the two roots of the median nerve. These two branches had a very close relation to the axillary artery. One interconnecting branch was found between the roots of the median nerve in three upper limbs. An interconnecting branch was found between the median and musculocutaneous nerve in one upper limb. The median nerve was formed at a lower level than normal in one case.

Conclusion: The knowledge of the abnormal communicating branches mentioned in this study has a clinical importance. The injury of these branches may give rise to unusual clinical symptoms. The presence of these branches must be kept in mind during the performance of surgery to avoid their injury.

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The median nerve is formed in the axilla by the union of lateral and medial roots[1,2]. The medial root originates from the medial cord of the brachial plexus. The lateral cord of the brachial plexus divides into the lateral root of the median nerve and the musculocutaneous nerve[1,2].

The knowledge of the anatomical variations of the peripheral nerves in the upper limbs is important as these abnormal nerves could be injured during surgical procedures. It can also explain unusual clinical symptoms. The aim of this investigation is to study the anatomical variations of median nerve formation.

METHODS

Forty-eight upper limbs obtained from 24 embalmed adult cadavers were utilized in this study. They were carefully dissected and examined for any anatomical variations of median nerve formation.

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RESULTS

Anomaly 1 (Fig 1). The median nerve was formed in the axilla by the union of medial and lateral roots. The medial and lateral roots originated from the corresponding cords of the brachial plexus. Two interconnecting branches were present between the two roots of the median nerve. They ran from the upper part of the medial root downward and laterally to join the lateral root of the median nerve. The course of these two branches was very close to the axillary artery. This anomaly was observed unilaterally in the left arm of an adult cadaver (2.1%).

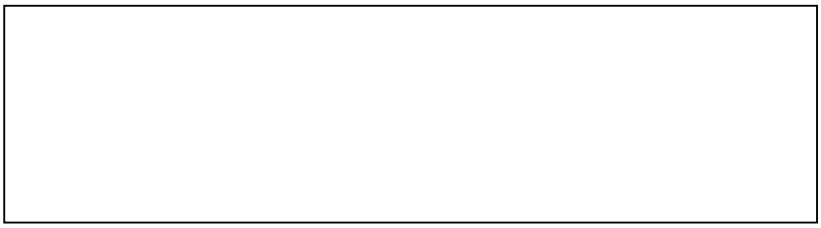

Figure 1. A photograph of the left upper limb of an adult cadaver, showing two interconnecting branches (i) between the lateral (l) and medial roots (m) of the median nerve (me). Note that, the two interconnecting branches have a close relation to the axillary artery (a).

Anomaly 2 (Fig 2). The median nerve was formed in the axilla by the union of medial and lateral roots. The medial and lateral roots arose from the medial and lateral cords of the brachial plexus respectively. A communicating branch ran from the upper part of the lateral root and passed downward and medially. It joined the lower part of the medial root of the brachial plexus. This anomaly was found in three upper limbs (6.3%). It was observed bilaterally in an adult cadaver and was present unilaterally in the right side of another cadaver.

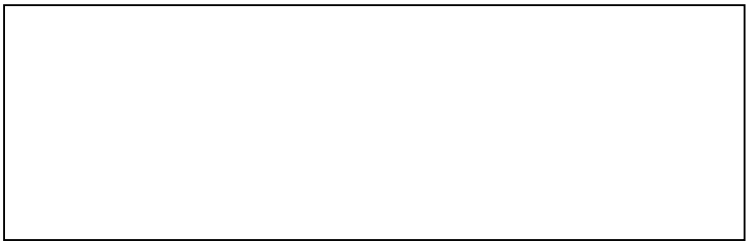

Figure 2. A photograph of the left upper limb of an adult cadaver, showing one interconnecting branches (i) between the lateral (l) and medial roots (m) of the median nerve (me).

Anomaly 3 (Fig 3). The median nerve was formed in the axilla as usual by the union of medial and lateral roots. The musculocutaneous nerve originated from the lateral cord of the brachial plexus. The musculocutaneous nerve passed downward and laterally and pierced the coracobrachialis muscle as usual. An interconnecting branch ran from the musculocutaneous nerve downwards and medially and joined the upper part of the median nerve. This anomaly was present unilaterally in the left arm of an adult cadaver (2.1%).

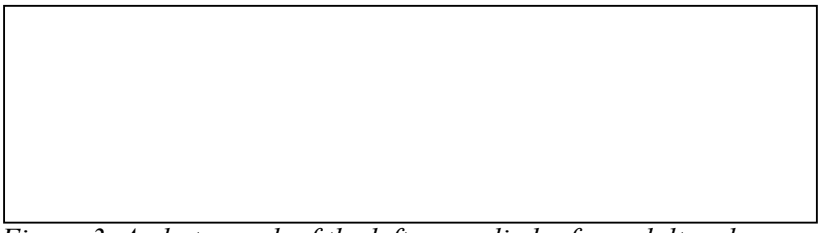

Figure 3. A photograph of the left upper limb of an adult cadaver, showing an interconnecting branch (i) between median nerve (me) and musculocutaneous nerve (mu).

Anomaly 4 (Fig 4). The median nerve was formed at a lower level. It was formed in the upper part of the arm by the union of medial and lateral roots. The medial and the lateral roots of the median nerve originated from the medial and lateral roots of the brachial plexus respectively. The medial and lateral roots of the median nerve were longer than usual. This anomaly was found unilaterally in the left arm of an adult cadaver (2.1%).

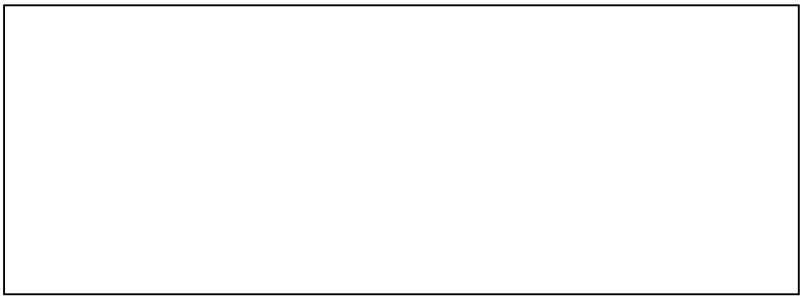

Figure 4. A photograph of the right upper limb of an adult cadaver. The median nerve (me) is formed at a lower level. l, lateral root of median nerve; m, medial root of median nerve.

DISCUSSION

In anomaly 1, two communicating branches were found between the lateral and medial roots of the median nerve and were present in a close relation to the axillary artery (Figure 1). This may result in compression of the axillary artery and reduce the blood supply to the upper limb. It was reported in the literature that the close relation of a nerve to an artery could result in its compression. Sargon et al[3] found an interconnecting branch between the musculocutaneous and median nerves. They added that the close relation of this interconnecting nerve to the brachial artery could result in compression of the artery and impair the blood supply to the upper limb. Previous cases of axillary artery compression were reported in the literature. Dijkstra and Westra[4] and Finkelstein and Johnston[5] reported cases of axillary artery compression by pectoralis minor muscle. McCarth et al[6] found cases of axillary artery compression in athletes suffering from thoracic outlet compression. Rohrer et al[7] found that axillary artery was compressed by the humeral head in athletes. In anomaly 2 (Figure 2), there was one communicating branch between the two roots of the median nerve. A variation in the formation of the median nerve was observed in the literature. Sargon et al[3] reported that the median nerve was formed of three branches. Two branches originated

from the lateral cord of the brachial plexus and one branch originated from the medial cord of the plexus. Eglseder and Goldman[8] also found that the median nerve was formed of two lateral roots in 14% of their specimens. Uzun et al[9] found that the median nerve was formed by three branches coming from the lateral cord of the brachial plexus and one branch coming from the medial cord of the brachial plexus.

In anomaly 3 (Figure 3) an interconnecting branch was present between the musculocutaneous nerve and the beginning of the median nerve. Interconnecting branches between the median and musculocutaneous nerves were reported in the literature. Kerr[10] reported a communicating branch between the median and musculocutaneous nerves. Kosugi et al[11] reported supernumerary head of biceps brachii muscle and an interconnecting branch between the median and the musculocutaneous nerves. Kaus and Wotowicz[12] also found a communicating branch between the median and the musculocutaneous nerves. Venierotos and Anagnostopoulou[13] reported three types of communications between the median and musculocutaneous nerves. In type one, the communication was observed proximal to the site of entry of the musculocutaneous nerve into the coracobrachialis muscle, while in type two the communication was present distal to the site of entry. In type three the nerve and the communicating branch did not pierce the muscle. Iwamoto et al[14], Eglseder and Goldman[8] and Uzun et al[9] also found communicating branches between the median and the musculocutaneous nerves. In the present investigation the interconnection between the median and musculocutaneous nerves occurred in one out of 48 upper limbs (2.1%). However, the reported percentage of the interconnection between the two nerves varied in the literature. Kerr[10] reported one communicating branch out of 175 cases (0.57%). Sunderland and Marshall[15] reported interconnection in 24% of their specimens. This percentage varied from 0% to 30% in Iwamoto et al[14] review. Kaus and Wotowicz[12] found communicating branch in 43 out of 75 limbs (57%), while, Eglseder and Goldman[8] reported interconnection between the two nerves in 36% of their specimens. Venierotos and Anagnostopoulou[13] reported communicating branch in 22 out of 79 limbs (28%).

The median nerve is usually formed in the axilla by the union of medial and lateral roots[1,2]. In the present study low fusion of the two roots of the median nerve was found. They fused with each other in the upper part of the arm (Figure 4). However, various levels for fusion of the roots of median nerve have been reported in the literature. Testut and Latarjet (cited by Jakubowicz and Ratajczak[16]) reported that the lateral root united with the medial root at the level of the cubital fossa to form the median nerve. Jakubowicz and Ratajczak[16] reported that the two roots of the median nerve united lower than normal. They added that the two roots united with each other at about 5 cm above the epicondylar line.

CONCLUSION

The knowledge about the abnormal communicating branches reported in the present study has a clinical importance. These branches may be injured and give unusual clinical symptoms. The presence of these branches must also be kept in mind during the performance of surgery to avoid injury.

REFERENCES

1. Williams PL, Warwick R, Dyson M, et al. Neurology. In: Gray's anatomy. 37th ed. Edinburgh: Churchill Livingstone, 1989:1133.
2. McMinn RMH. Upper limb. In: Last's anatomy. 8th ed. Edinburgh: Churchill Livingstone, 1990:82
3. Sargon M, Uslu S, Celik H, et al. A variation of the median nerve at the level of the brachial plexus. Bull de l Assoc des Anatom 1995;79:25-6.
4. Dijkstra P, Westra D. Angiographic features of compression of the axillary artery by the musculus pectoralis minor and the head of the humerus in the thoracic outlet compression syndrome. Case report. Radiol Clin 1978;47:423-7.
5. Finkelstein J, Johnston K. Thrombosis of the axillary artery secondary to compression by the pectoralis minor muscle. Ann Vasc Surg 1993;7:287-90.
6. McCarth W, Yao J, Schafer M, et al Upper extremity arterial injury in athletes. J Vasc Surg 1989;9:317-27.
7. Rohrer M, Cardullo P, Pappas A, et al. Axillary artery compression and thrombosis in throwing athletes. J Vasc Surg 1990;11:768-9.
8. Eglseder E, Goldman M. Anatomical variations of the musculocutaneous nerve in the arm. Am J Orthop 1997;26:777-80.
9. Uzun A, Leonard L, Seelig J. A variation in the formation of the median nerve: communicating branch between the musculocutaneous and the median nerve in man. Folia Morphol 2001;60:99-101.
10. Kerr A. The brachial plexus of nerves in man, the variation in its formation and branches. Am J Anat 1918;23:285-95.
11. Kosugi K, Shibata S, Yamashita H. Supernumerary head of biceps brachii and branching pattern of the musculocutaneous nerve in Japanese. Surg Radiol Anat 1992;14:175-85.
12. Kaus M, Wotowicz Z. Communicating branch between the musculocutaneous and median nerves in human. Folia Morphol 1995;54:273-7.
13. Venierotos D, Anagnostopoulou S. Classification of communications between the musculocutaneous and median nerves. Clin Anat 1998;11:327-31.
14. Iwamoto S, Kimura K, Takahashi Y, et al. Some aspects of communicating branch between the musculocutaneous and median nerves in man. Okajimas Folia Anat Jpn 1990;67:47-52.
15. Sunderland S, Marshall R. The intraneural topography of circumflex, musculocutaneous and obturator nerve. Brain 1959;82:116-29.
16. Jakubowicz M, Ratajczak W. Variation in morphology of the biceps brachii and coracobrachialis muscles associated with abnormal course of blood vessels and nerves. Folia Morphol 2000;58:255-8.