

An unusual origin and course of multiple branches of the median nerve to the thenar muscles: a case report.

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ABSTRACT: Three supernumerary motor branches of the median nerve were found in the left thenar region of a male cadaver. In particular these branches were arising proximal to the carpal tunnel and after penetrating the flexor retinaculum, they were distributed to the thenar muscles. The main recurrent branch was observed curving the distal border of the flexor retinaculum supplying the superficial head of the flexor pollicis brevis and the opponens pollicis muscle. The three detected multiple motor branches of the median nerve supplied the thenar muscles as follows: the upper branch, innervated the opponens pollicis, the middle branch the abductor pollicis brevis and the lower branch the superficial head of the flexor pollicis brevis muscle. Such combination of multiple muscular branches of high origin from the median nerve constitutes a very rare anatomical variant. We attempt to highlight the significance of such variation for the hand surgeon in order to avoid undesirable implications such as iatrogenic injury of these aberrant branches.

Key Words: Median nerve, Recurrent branch, Multiple motor branches.

INTRODUCTION

The muscular thenar branch (MTB) or recurrent or motor branch of the median nerve (MN) is a short ramus of the MN originating from the anteroulnar aspect of the radial deviation of the MN. In specific, MTB curves around the distal border of the flexor retinaculum in order to supply usually the flexor pollicis brevis, the abductor pollicis brevis and the opponens pollicis muscles^{1,2}. Variability concerning, in particular, the number and the course of MTB is of great importance for the surgeon of the hand in order to maintain the thenar muscles' innervation for an adequate function of the whole hand.

The presence of multiple MTBs has been documented in the literature mainly as regards these branches arising from the main trunk of MN within the carpal tunnel and it has been found varied in incidence between 2.7% and 38.3%^{3,4}. The incidence of an accessory MTB arising proximal to the flexor retinaculum has been estimated 1.6%⁵. The aim of the current study is to present a very rare case of three

supernumerary MTBs arising proximal to the carpal tunnel and after perforating the flexor retinaculum supplying the thenar muscles. A brief review of the relative literature and the potential surgical applications are discussed.

CASE REPORT

A very rare variant of multiple aberrant MTBs of the MN was encountered during a gross anatomy course undertaken for undergraduate medical students at our Department of Anatomy. In particular, in a 67-year-old male cadaver who died of unrelated to the detected abnormality causes, we came across an unusual origin and course of supernumerary MTBs on the left hand and forearm of the cadaver. By means of the classic method of anatomic dissection and after removal of the skin, the fascia of the forearm and the palmar aponeurosis, we incised vertically and retracted laterally the flexor retinaculum in order to visualize the MN and its branches. We observed the existence of three distinct, separate nerves, the so-called upper, middle

and lower branch originating from the main trunk of MN at distances, 3, 1.5 and 1 cm, respectively, from the proximal border of the flexor retinaculum. All three branches were directed caudally and radially and perforated the flexor retinaculum. The upper branch supplied the opponens pollicis muscle, the middle branch the abductor pollicis brevis, whereas the lower branch the superficial head of the flexor pollicis brevis muscle. The main MTB arose from the MN just distal to the flexor retinaculum and was directed to the superficial head of the flexor pollicis brevis and opponens pollicis muscle (Figure 1). The cadaver was formalin-fixed, whereas neither pathologic conditions, nor previous surgical procedures on the hand and forearm were detected. The finding was repeatedly photographed and measured with the assistance of an electronic digital vernier caliper (Mitutoyo Co, Japan) with an accuracy of 0.1 mm.

DISCUSSION

The MN enters the palm beneath the flexor retinaculum and divides at the distal edge of the flexor retinaculum usually into a radial or lateral branch and an ulnar or medial branch. The ulnar branch provides the second and third common digital nerves for the adjacent sides of index and middle finger, as well as for the adjacent sides of ring and middle fingers, respectively. In addition, the second common digital nerve supplies the second lumbrical muscle. The MN's radial branch gives off the muscular or recurrent branch for the thenar muscles, as well as the first common digital nerve for the radial side of the index and the whole of the thumb^{1,2}.

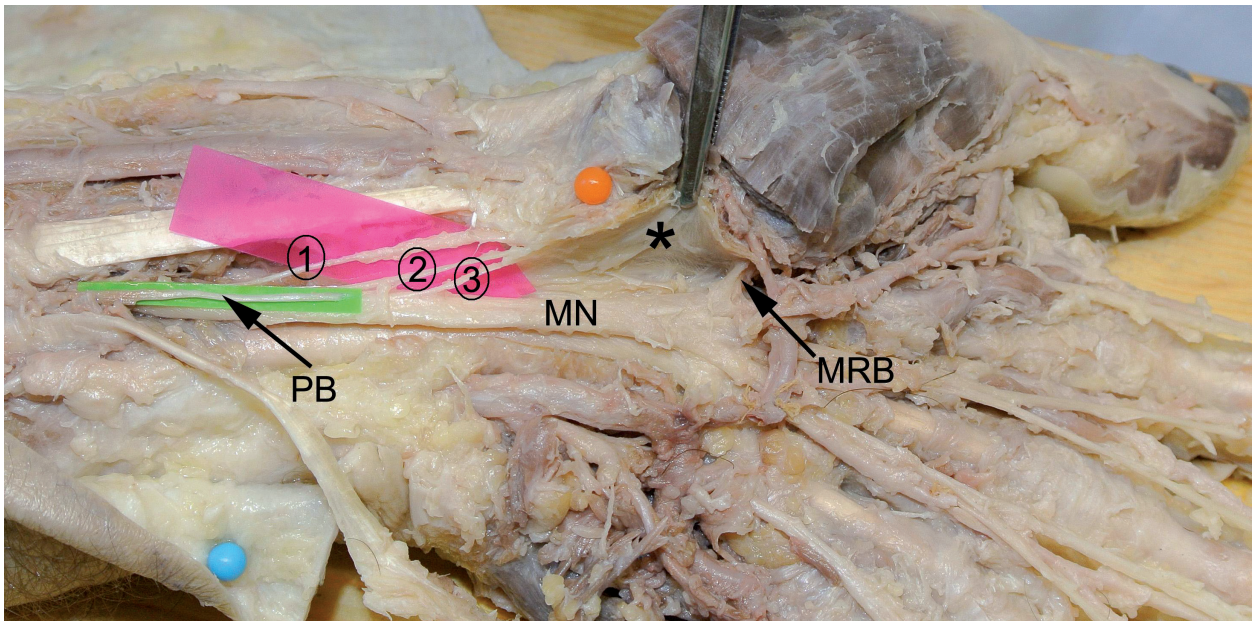
The MTB curls upwards with a recurrent curve from around the distal border of the flexor retinaculum. It is the first or most lateral branch of the MN in the palm. It crosses the surface of the flexor pollicis brevis muscle before penetrating it and passes superficial to the tendon of the flexor pollicis longus^{1,6}. The MTB usually originates from the anteroulnar aspect of the MN's radial division². The superficial portion of the flexor pollicis brevis, as well as the abductor pollicis brevis and opponens muscles are supplied by the MTB. Most constantly from the latter ramus is innervated the abductor pollicis brevis⁶.

The most common MTB's variation detected in the literature concerns the variable MTB's course.

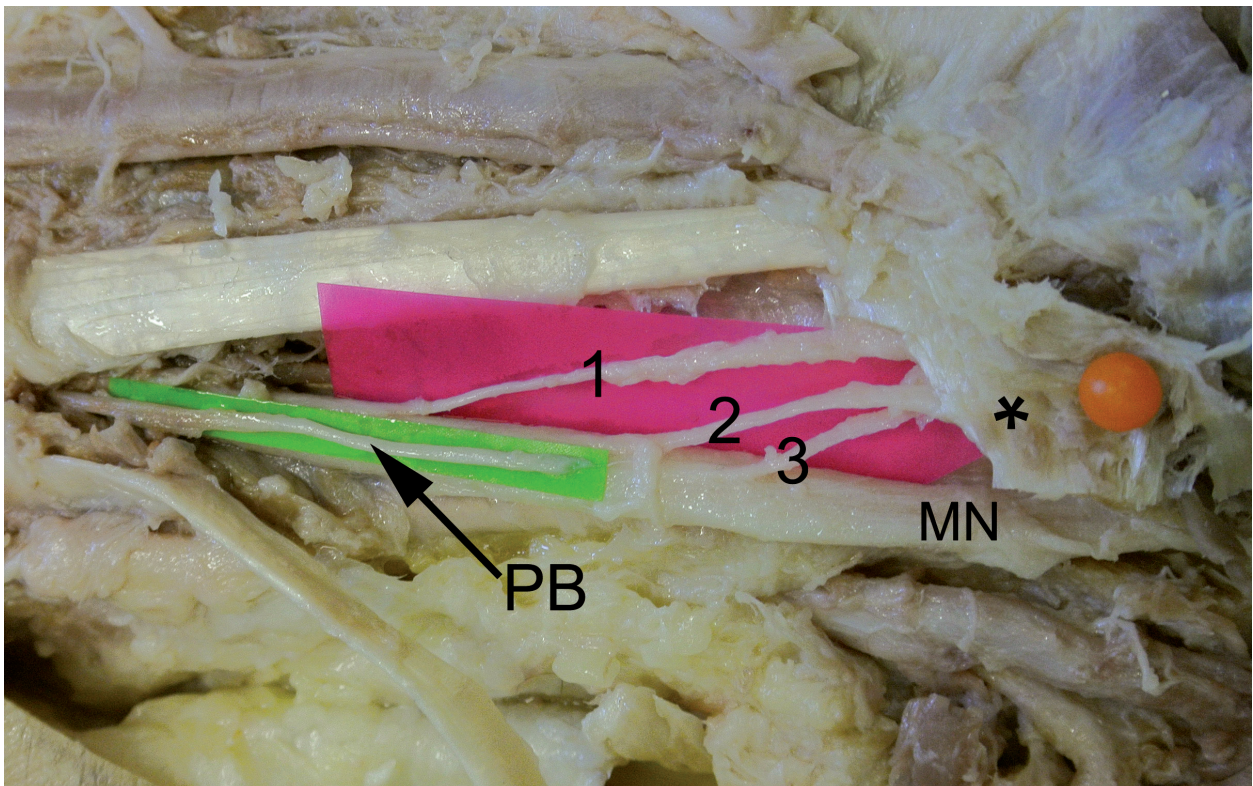
Thus, as normal branching of the MN is considered the extraligamentous MTB arising distal to the flexor retinaculum in 46%⁷, 46%⁵, 19%⁸, 46.7%⁹, 88%¹⁰ and 51.51%¹¹. The subligamentous and transligamentous MTB's course was noted in 31% and 23% respectively⁷, 31% and 23%⁵, 0 and 7%⁸, 28.3% and 11.7%⁹, 12% and 0%¹⁰, 39.39% and 9.09%¹¹.

The presence of multiple MTBs, usually two, originated in the distal portion of the carpal tunnel can be observed in an incidence of 2.7%⁴, 7.3%⁵, 20%¹² and 38.3%³. The origin of an accessory MTB leaving the MN trunk proximal to the carpal tunnel has been classified as group IV from Lanz and has been found in 1.6% of all subjects⁵. Apart from a single supernumerary MTB arising proximal to the carpal tunnel¹³, the existence of three accessory MTBs originating from the MN proximal to the carpal tunnel and innervating the thenar muscles has been very rarely documented in the literature. Mumford et al¹⁴ reported the presence of two, three or four branches, whereas Vashishtha¹¹ noted two (32%) and seven branches (2%). Akio¹⁵ noticed two (15.65%) and three branches (6.8%), as well. Natsis et al¹⁶ prescribed four distinct MTBs arising from the MN trunk distal to the flexor retinaculum. In our case the main MTB innervated the abductor pollicis brevis, whilst the supernumerary upper MTB supplied the superficial head of the flexor pollicis brevis, the middle MTB distributed to the abductor pollicis brevis and the lower MTB innervated the opponens pollicis muscle. It is noteworthy to highlight that these three multiple MTBs perforated the flexor retinaculum in order to terminate into the thenar muscles.

In conclusion, the accurate awareness of such multiple MTBs is of great importance for the surgeons of the region, since he/she may reduce the hazards of MTB's iatrogenic injury. Moreover, the surgeon of the hand should be aware of such multiple aberrant MTBs in order to preserve them and not misinterpret them as thin sensory branches or the palmar cutaneous branch of the MN.



A.



B.

Figure 1. A. The left median nerve (MN) with its multiple motor branches to the thenar muscles arising proximal to the flexor retinaculum (*) (1: upper motor branch, 2: middle motor branch, 3: lower motor branch, MRB: main recurrent branch, PB: palmar branch).

B. The site of origin of the multiple branches from the MN, is demonstrated in magnification.

Σπάνια έκφυση και πορεία πολλαπλών κλάδων του μέσα νεύρου προς τους μύς του θέναρος: παρουσίαση περίπτωσης.

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ΠΕΡΙΛΗΨΗ: Σκοπός: Τρεις υπεράριθμοι κινητικοί κλάδοι του μέσου νεύρου, εντοπίστηκαν στην περιοχή του αριστερού θέναρος ενός πτώματος άρρενος ατόμου. Συγκεκριμένα, οι κλάδοι αυτοί εκφύονταν κεντρικά του καρπιαίου σωλήνα και αφού διατρυπούσαν τον εγκάρσιο σύνδεσμο του καρπού διανέμονταν στους μύς του θέναρος. Ο κύριος παλίνδρομος κλάδος του μέσου νεύρου περιέκαμπτε τοξοειδώς το περιφερικό χείλος του εγκάρσιου συνδέσμου του καρπού για να διανεμηθεί στην επιπολής κεφαλή του βραχέος καμπτήρα μυός του αντίχειρα και στον αντιθετικό μυ του αντίχειρα. Οι τρεις αυτοί υπεράριθμοι νευρικοί κλάδοι διανέμονταν ως ακολούθως: ο άνω κλάδος στον αντιθετικό μυ του αντίχειρα, ο μέσος κλάδος στον βραχύ απαγωγό μυ του αντίχειρα και ο κάτω κλάδος στην επιπολής κεφαλή του βραχέος καμπτήρα μυός του αντίχειρα. Ο συνδυασμός πολλαπλών κινητικών κλάδων με υψηλή έκφυση από το μέσο νεύρο αποτελεί μία ιδιαίτερα σπάνια ανατομική παραλλαγή. Στην παρούσα εργασία καταβάλλεται προσπάθεια ώστε να διαφωτιστεί η αξία του ευρήματος για τον χειρουργό της άκρας χειρός, έτσι ώστε να αποφύγει ανεπιθύμητες επιπλοκές, όπως είναι η ιατρογενής βλάβη αυτών των νευρικών κλάδων.

Λέξεις Κλειδιά: Μέσο νεύρο, Παλίνδρομος κλάδος, Πολλαπλοί κινητικοί κλάδοι.

REFERENCES

1. McMinn RMH. Last's Anatomy, Regional and Applied. Eighth edition. Edinburgh :Churchill Livingstone, 1990:110-112.
2. Lu HL, Chase RA, Strauch B .Atlas of Hand Anatomy and Clinical Implications. Missouri :Mosby, 2004:505.
3. Olave E, Prates JC, Gabrielli C, Pardi P. Short report morphometric studies of the muscular branch of the median nerve. J Anat 1996; 189: 445-449.
4. Beris AE, Likissas MG, Kontogeorgakos VA, Vekris MD, Korompilias AV. Anatomic variations of the median nerve in carpal tunnel release. Clin Anat 2008; 21: 514-518.
5. Lanz U. Anatomical variation of the median nerve of the carpal tunnel. J Hand Surg (Am) 1977; 2: 44-53.
6. Rosse C, Gaddum – Rosse P. Hollinshead's Textbook of Anatomy. Philadelphia: Lippincott - Raven Publ., 1997: 285-286.
7. Papatjanassiou BT. A variant of the motor branch of the median nerve in the hand. J Bone J Surg (Br) 1968; 50: 156-157.
8. Kozin SH. The anatomy of the recurrent branch of the median nerve. J Hand Surg (Am) 1998; 23:852-858.
9. Alizadeh K, Lahiji F, Phalsaphy M. Safety of carpal tunnel release with a short incision. A cadaver study. Acta Orthop 2006; 72(4): 415-419.
10. Senanayake KJ, Salgado S, Fernando R. Course pattern of the muscular branch of the median nerve in Sri Lankans hand. Int J Morphol 2009; 27(4): 1059-1061.
11. Vashishtha K. Variations of median nerve in carpal tunnel and its distribution in hand. J Anat Soc India 2011; 60(2):193-198.
12. Falconer D, Spinner M. Anatomic variations in the motor and sensory supply of the thumb. Clin Orthop Relat Res 1985; 195:83-96.
13. Ogden JA. An unusual branch of the median nerve. J Bone J Surg (Am) 1972; 54:1779-1781.
14. Mumford J, Morecraft R, Blair WF. Anatomy of the thenar branch of the median nerve. J Hand Surg (Am) 1987; 12:361-365.
15. Akio M. Variations and anomalies of the branching of the median nerve observed on carpal tunnel release. J Jap Soc Surg Hand 1998; 15:452-456.
16. Natsis K, Karanassos MT, Papatjanassiou E, Nouisios G. A coexisting anatomical variation of median and ulnar nerves in a cadaver palm. Folia Morphol 2012; 4: 269-274.