

A Rare Anatomical Variant of the Thenar Motor Branch Encountered during Carpal Tunnel Release

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Abstract

Iatrogenic injury to the thenar motor branch of median nerve, though rare, is a serious complication during carpal tunnel decompression. The incidence is high when there is variation in the thenar motor branch and hence we should be aware of the common as well as unusual and rare anatomical variants. As uncommon variations render the thenar branch more prone for iatrogenic injury knowing more would surely save one's day while doing a carpal tunnel release. We present a rare anatomical variant of the thenar motor branch of the median nerve that we encountered during open carpal tunnel release. The thenar motor branch was originating from the ulnar side of the median nerve proximal to the transverse carpal ligament, traversing subligamentous and joining a communicating branch from the median nerve distal to the transverse carpal ligament. The nerve was accidentally cut intraoperatively, which was immediately identified and repaired. At the postoperative follow-up after 6 months, patient has recovered thenar function with the ability to write with his right hand with good opposition.

Keywords

- ▶ thenar motor branch
- ▶ carpal tunnel decompression
- ▶ anatomical variants
- ▶ median nerve

Introduction

To avoid complications in carpal tunnel release, awareness about the “common” variations is a prerequisite; however, the rare and awkward variations could still challenge the surgeon. Probably, “eternal knowledge and vigilance is the price of safety.” We herein present a rare anatomical variant of the thenar motor branch (TMB) of median nerve that we encountered during a carpal tunnel release. The branch was arising from the ulnar side of the median nerve proximal to the transverse carpal ligament, traversing subligamentous and joining a communicating branch from the median nerve distal to the transverse carpal ligament. Though ulnar origin

of TMB and the accessory branches of median nerve are described in the literature,^{1–3} the combination of accessory branch arising proximally on the ulnar aspect with distal communication was not found in the previous literature. This combination is at greater risk of damage as incising transverse ligament ulnar side is a conventional practice and such an anatomically variant would have the nerve crossing across.

Case Presentation

A 17-year-old boy who had sustained tractor machine closed crush injury to his right forearm presented to our hand

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surgery department with pain in the forearm, hand and deep abrasions over the dorsum of proximal forearm. On clinical examination, patient had features of impending compartment and hence was taken for emergency fasciotomy of the flexor compartment of the forearm and carpal tunnel release.

Operative Technique

Surgery was performed under the supraclavicular nerve block. After fasciotomy of the flexor compartment of the forearm, site of incision for carpal tunnel release was marked. A longitudinal incision was made on the ulnar border of thenar crease and extended proximal across the wrist crease as an ulnar step and then extended to the distal third of the forearm. In view of the severe edema in the entire hand and the forearm, careful dissection was performed, and the transverse ligament was incised on the ulnar aspect of the median nerve to decompress the carpal tunnel. At this point, it was noted that there was a small nerve that was crossing across the median nerve from ulnar to the radial side just under the transverse carpal ligament and it had accidentally been transected. On further exploring and tracing the proximal part of the cut nerve, it was found that the thenar branch of the median nerve was originating from the ulnar side of the median nerve proximal to the transverse carpal ligament, traversing subligamentous and joining a communicating branch from the median nerve distal to the transverse carpal ligament (►Fig. 1). While incising the transverse ligament, the nerve was accidentally cut just proximal to its distal communication, which was immediately identified and the nerve was repaired under operative microscope using 10–0 Ethilon. Skin was closed using 4–0 Prolene. After 2 weeks of

immobilization with the below elbow cast, the patient was referred to the physiotherapy department. At 7 months follow-up, patient had completely recovered thenar function with the ability to write with his right hand with good opposition and normal thumb abduction power (►Fig. 2).

Discussion

The first literature on iatrogenic injury to the TMB was published in 1985.⁴ The most widely used classification of TMB is given by Lanz² and over the years multiple variations have been described in the literature. Anatomical variants of the median nerve, particularly the TMB render the nerve more prone for iatrogenic injury, especially when the branch originates from the ulnar side and travels supra-ligamentous.^{2,3,5,6}

This report discusses the challenge faced by the surgeon during the carpal tunnel release. The first branch arising from the median nerve trunk is taken to be the thenar nerve.⁷ Sectioning of this TMB has been called the “million-dollar injury” because injury to this nerve during carpal tunnel release can lead to a million-dollar lawsuit.⁸ In the present case, apart from the rare anatomical variation, the gross swelling of the entire hand made the dissection difficult and resulted in the injury to the nerve. Moreover, a branch was seen exiting from the radial side, like the classical thenar branch, which further prompted us to do the division of the transverse carpal ligament without much concern.

The true incidence of this complication cannot be known, as the weakness of thenar musculature is commonly found in the patients with carpal tunnel syndrome. In our case as well, as the patient had a total intrinsic deficit preoperatively the

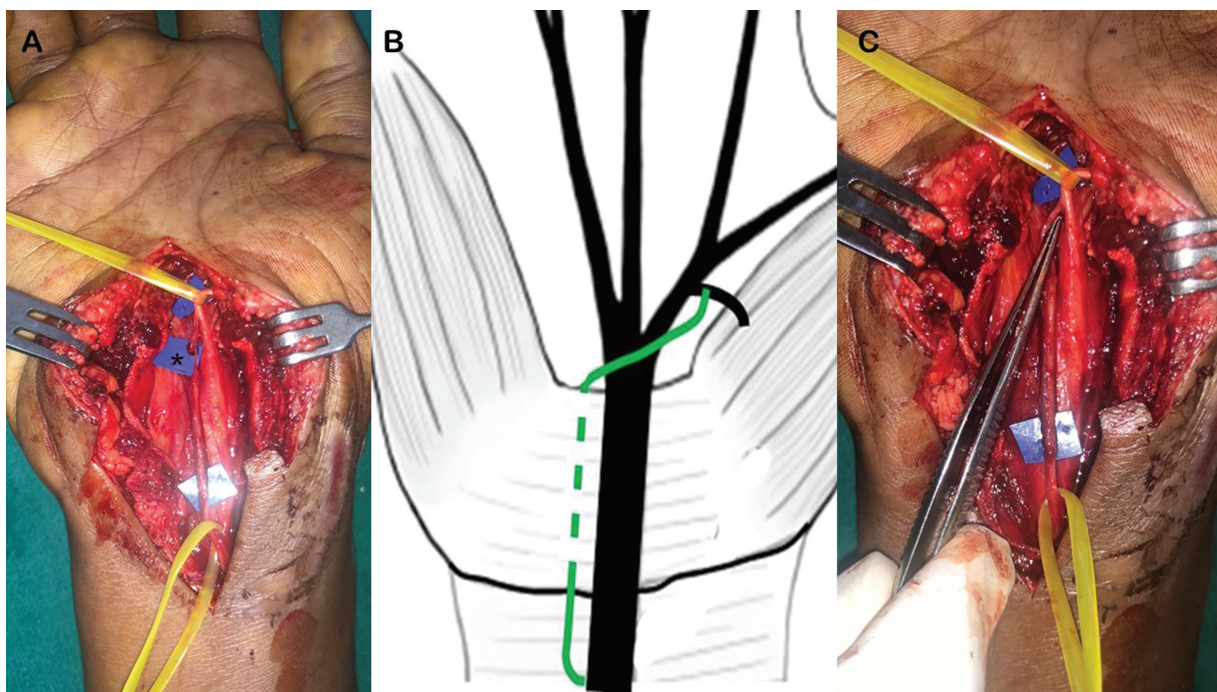


Fig. 1 (A) Thenar motor branch of the median nerve originating from the ulnar side of the median nerve proximal to the transverse carpal ligament, traversing subligamentous and joining a communicating branch from the median nerve distal to the transverse carpal ligament (A). Site of injury (asterisk). (B) Schematic representation. (C) Post-repair picture.

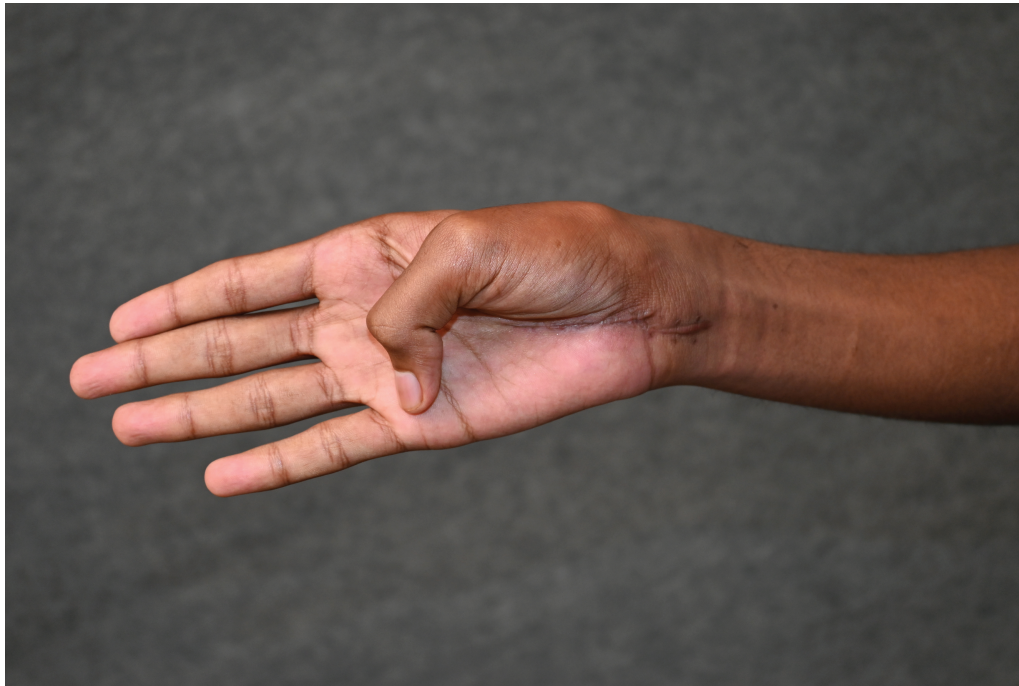


Fig. 2 At 7 months follow-up, patient had completely recovered thenar function with good opposition.

median motor deficit was not obvious immediate post-surgery. It is also not clear if injury to this accessory branch would have resulted in total paralysis of the abductor pollicis. However, at 7 months post-surgery patient had good recovery of the thenar muscle function. The thenar branch being a pure motor nerve and very close to the target muscle understandably has a very good chance of recovery. Hence, the surgeon should be very vigilant to identify the injury and repair it under microscopic magnification to assure good recovery.

As the thenar branch in this patient is arising proximal to the transverse carpal ligament, it can also be termed preligamentous. The preligamentous type is rare and is commonly associated with hypertrophic muscle overlying the transverse carpal ligament.⁹ We did not encounter any hypertrophic muscle in our case. Henry et al assessed the pooled prevalence of each Lanz type in a meta-analysis of 3,918 cases.¹⁰ Because of the rarity of a preligamentous TMB course, its prevalence was not included in the meta-analysis. The variation noted in our patient closely resembles the variation noted by Al-Qattan in their patient,¹¹ where the TMB arose from the ulnar side of the median nerve 2 cm proximal to the distal wrist crease, remained deep to both the antebrachial fascia and the transverse carpal ligament, crossing (from ulnar to radial) the persistent median artery to reach the thenar muscles. In our case, the crossing from ulnar to radial side is seen distal to the transverse carpal ligament and distally joined a communicating branch from the median nerve.

Candal-Couto et al¹ aimed to explore and document “expert experience and attitude” to the TMB during carpal tunnel release by a questionnaire to 220 surgeons who were members of the British Society for Surgery of the Hand and the consensus view suggests that formal demonstration of

the thenar branch of the median nerve during the release is unnecessary and one has to always be aware of common anatomical variants to avoid iatrogenic injuries to the TMB.

Conclusion

Due to significant differences in the reported prevalence of anatomical variations in the TMB of Median nerve, extensive knowledge of anatomy of the median nerve is essential to avoid iatrogenic nerve injury. It is important to bear in mind the possible existence of ulnar origin of TMB during surgeries on median nerve at the wrist. Moreover, if the nerve is injured, immediate microsurgical repair provides good outcome.

Availability of Data and Materials

Not applicable.

Financial Support and Sponsorship

None.

Ethical Approval

Institutional research ethical committee approval was obtained for the study.

Informed Consent Declaration

Written informed consent was obtained from all subjects before the study. There is no information (names, initials, hospital identification numbers or photographs) in the submitted manuscript that can be used to identify patients.

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Conflict of Interests

None declared.

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References

- 1 Candal-Couto JJ, Sher JL. The thenar motor branch during carpal tunnel decompression: "the expert opinion". *Arch Orthop Trauma Surg* 2007;127(06):431–434
- 2 Lanz U. Anatomical variations of the median nerve in the carpal tunnel. *J Hand Surg Am* 1977;2(01):44–53
- 3 Vinding MT, Tarnowski JR, Benyahia M. A rare anatomical variant of the thenar branch discovered during open decompression of the median nerve. *J Plast Surg Hand Surg* 2010;44(06):322–324
- 4 Lilly CJ, Magnell TD. Severance of the thenar branch of the median nerve as a complication of carpal tunnel release. *J Hand Surg Am* 1985;10(03):399–402
- 5 Stancić MF, Eskinja N, Stosić A. Anatomical variations of the median nerve in the carpal tunnel. *Int Orthop* 1995;19(01):30–34
- 6 Hurwitz PJ. Variations in the course of the thenar motor branch of the median nerve. *J Hand Surg [Br]* 1996;21(03):344–346
- 7 Vashishitha K. Variations of the median nerve in the carpal tunnel and its distribution in the hand. *J Anat Soc India* 2011;60:193–198
- 8 Krishnan P, Mishra R, Jena M, Das A. Transligamentous thenar branch of the median nerve: the million dollar nerve. *Neurol India* 2013;61(03):311–312
- 9 Al-Qattan MM. Variations in the course of the thenar motor branch of the median nerve and their relationship to the hypertrophic muscle overlying the transverse carpal ligament. *J Hand Surg Am* 2010;35(11):1820–1824
- 10 Henry BM, Zwinczewska H, Roy J, et al. The prevalence of anatomical variations of the median nerve in the carpal tunnel: a systematic review and meta-analysis. *PLoS One* 2015;10(08):e0136477
- 11 Al-Qattan MM, Al-Zahrani K. An unusual pre-ligamentous thenar motor branch of the median nerve. *Eur J Plast Surg* 2017;40(03):259–262