

Median Nerve Neuropathy Caused by Persistent Median Artery Thrombosis

Yusuke Miyashima, MD
 Hiroyuki Gotani, MD, PhD
 Kotaro Okamoto, MD
 Hirohisa Yagi, MD
 Yoshitaka Tanaka, MD, PhD

Summary: Persistent median artery thrombosis mimicking carpal tunnel syndrome is rare. Here, we report the pathological, ultrasonography, and intraoperative findings of a case of persistent median artery thrombosis mimicking carpal tunnel syndrome. A 34-year-old man reported to our clinic with a complaint of numbness in his left thumb, index finger, and middle finger, which are innervated by the left median nerve. He also reported that he felt pain in his left wrist and distal forearm while working. Although findings of the usual provocative tests and nerve conduction studies were normal, ultrasonography revealed arterial thrombosis at the carpal tunnel level, whereas magnetic imaging showed persistent median artery thrombosis in the carpal tunnel. Three months after surgical resection of the thrombosed section of the artery, the patient fully recovered with no residual pain or limitations in the use of the affected arm. His patient-reported outcomes improved as well. It is important to investigate the existence of persistent median artery thrombosis if a patient presents with atypical symptoms of carpal tunnel syndrome. Ultrasonography is useful for the diagnosis of persistent median artery thrombosis. Surgical resection of a thrombosed persistent median artery in patients with carpal tunnel syndrome yields good results. (*Plast Reconstr Surg Glob Open* 2023; 11:e4916; doi: [10.1097/GOX.0000000000004916](https://doi.org/10.1097/GOX.0000000000004916); Published online 10 April 2023.)

Tumors or the soft tissue mass in the carpal tunnel may sometimes cause median nerve neuropathy, leading to the occurrence of symptoms that mimic carpal tunnel syndrome (CTS). Although the median artery gradually regresses during the normal fetal development process, it may persist in adulthood.^{1,2} Most cases of persistent median artery (PMA) are asymptomatic; however, arterial thrombosis may occur in rare cases and lead to the occurrence of symptoms similar to those of CTS. Herein, we report the pathological, preoperative ultrasonography, and intraoperative findings of a case of median nerve neuropathy caused by PMA thrombosis.

This report was approved by the institutional review board of our institution. The patient provided written informed consent for the publication of the case details.

CASE REPORT

A 34-year-old right-handed man, who was training to be a massage therapist, suddenly experienced numbness in his left thumb, index finger, and middle finger. At his first visit to our clinic three months after the initial onset of his symptoms, he reported that he also felt pain in his left wrist and distal forearm, which occurred when he was undergoing massage training. Thenar muscle atrophy was not observed. The grip strength of the affected hand had decreased to 71% of that of the unaffected hand. The patient reported wrist and distal forearm pain during carpal tunnel compression with the wrist extended. Regarding provocative tests, Phalen test was positive for the left hand, and the symptoms improved after performing the flick test. However, he showed negative Tinel sign and carpal tunnel compression test results. Blood supply to the hand was assessed using Allen test, and the result was negative for both the ulnar and radial arteries. As the patient presented with sudden numbness and pain, which were atypical compared with normal CTS symptoms, we considered the possibility of infection or bleeding around the median nerve and performed additional imaging examinations. Ultrasonography revealed arterial

From the Department of Orthopedic Surgery, Japan Seafarers Relief Association Osaka Ekisaikai Hospital, Osaka, Japan.

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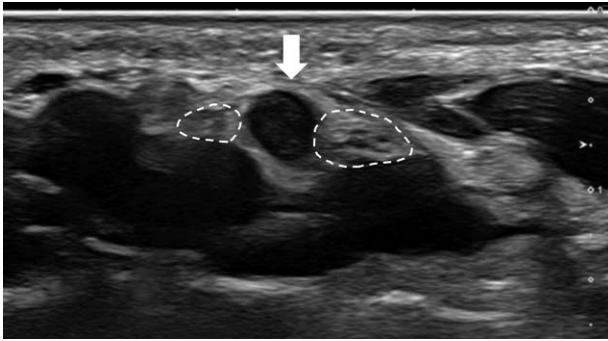


Fig. 1. Preoperative ultrasonography image of the left carpal tunnel shows persistent median artery thrombosis (white arrow) between the bifid median nerve (surrounded by white dotted lines).

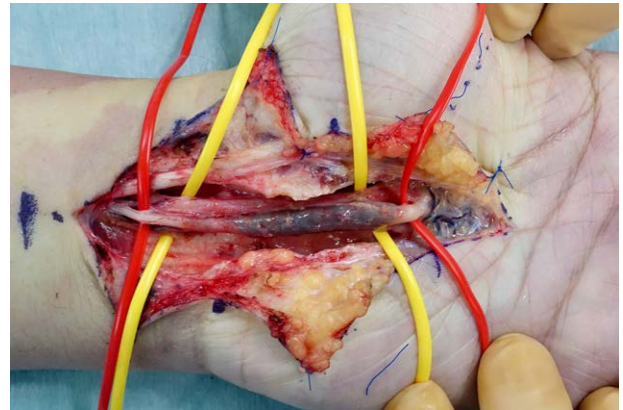


Fig. 2. Intraoperative findings. The median nerve is marked with yellow tapes, whereas the median artery is marked with red tapes.

thrombosis at the carpal tunnel level, with a length of 3 cm and a maximum diameter of 7 mm. The thrombosed artery abutted and compressed the bifid median nerve in the carpal tunnel. The ultrasonography results for the unaffected arm were normal (Fig. 1). (See Video 1 [online], which displays preoperative ultrasonography on the left side of the wrist.)

Magnetic resonance imaging of the left arm also showed PMA thrombosis in the carpal tunnel. Three-dimensional enhanced computed tomography showed that the PMA arose from the ulnar artery, passed the mid-forearm along with the median nerve, and formed the superficial palmar arch. Enhancement of the PMA was absent at the carpal tunnel level. Nerve conduction studies of both sides of the median nerve revealed normal findings. As median nerve neuropathy caused by PMA thrombosis was suspected, surgical intervention was performed.

The median nerve was explored using the extended carpal tunnel approach. The thrombosed artery between the two branches of the bifid median nerve was identified. The entire thrombosed portion of the artery was carefully dissected from the median nerve. After releasing the

tourniquet, the proximal normal portion of the median artery was palpated, and normal vascular flow to the distal hand was checked by placing vessel clamps proximal and distal to the thrombosed portion. Finally, the thrombosed portion of the PMA was resected (Fig. 2). (See Video 2 [online], which displays the operative resection of the persistent median artery thrombosis.)

The patient experienced immediate relief of the finger numbness and pain in the wrist and distal forearm. Pathological analysis of the resected PMA showed intraluminal organization and hyalinization of blood clots. Inflammatory cells, such as fibroblasts and neutrophils, and angiogenesis were observed in the intima (Fig. 3). Three months after surgery, the patient fully recovered with no residual pain or limitations in the use of the affected arm. In addition, patient-reported outcomes measured using the Quick Disability of the Arm, Shoulder, and Hand, Hand 20, and CTS instrument (symptom and function severity scales) improved from 31.82, 23, 1.73, and 2 preoperatively to 4.55, 2, 1.1, and 1, postoperatively, respectively.

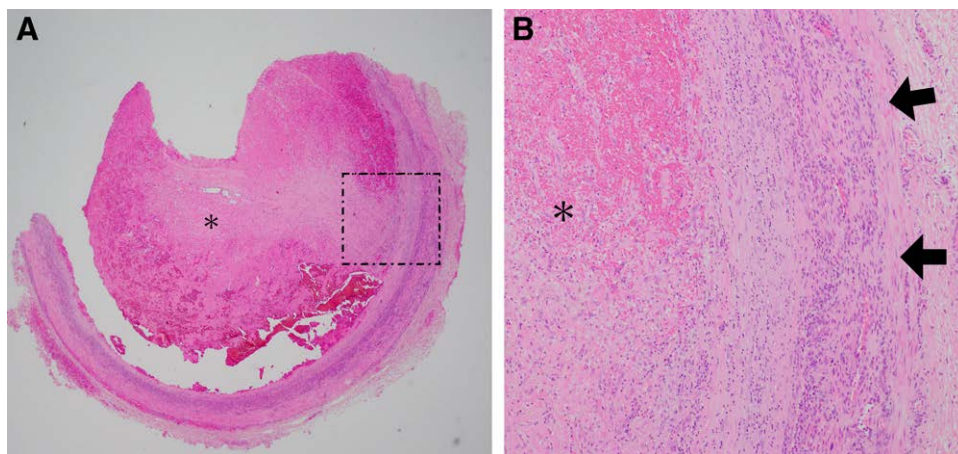


Fig. 3. Histopathological images. A (x2), B (x10). Hematoxylin and eosin staining of a fixed sample from the resected artery shows intraluminal organization and hyalinization of blood clots (asterisks). Inflammatory cells, such as fibroblasts and neutrophils, and angiogenesis are seen in the intima (arrows).

DISCUSSION

The prevalence of PMA ranges from 4% to 27%, and has approximately tripled over the last 125 years.^{2,3} PMA is associated with a risk of thrombosis because it passes through the narrow carpal tunnel and superficial palmar area, which are easily affected by a traumatic force.

Only 26 PMA thrombosis case reports written in English can be found in the PubMed database (from 1970 to date). The number of reported PMA thrombosis cases has been increasing in recent years, with nine cases reported in the last 5 years.⁴⁻⁸ In these cases, 14 were men and 12 were women [mean age, 42.7 (26–73) years]. The main cause of PMA thrombosis in the cases was repetitive wrist pressure or wrist motion during work or sports. High median nerve bifurcation is often associated with PMA and was reported in nine of the 26 cases.⁹

In the present case, the acute onset of numbness and wrist and distal forearm pain was atypical compared with the normal symptoms of CTS; thus, we performed additional imaging examinations. Ultrasonography is ideal for diagnosing rare causes of median nerve neuropathy because it is easier to use and is more cost-effective than magnetic resonance imaging.^{8,10}

Inflammatory cells were histologically observed in the thrombosed vessel in the present case. Therefore, the pain the patient felt was possibly caused by angialgia after PMA thrombosis. There is no consensus on the management of PMA thrombosis. Systemic anticoagulation is considered during the acute stage of thrombosis,¹⁰ whereas surgical treatment is recommended for the chronic stage. As simple carpal tunnel release is associated with a risk of recurrence of thrombosis, resection of the thrombosed segment of the artery is the best management strategy for chronic PMA thrombosis when the blood supply to the fingers is sufficient without the PMA.⁵⁻⁸ The present case was a case of chronic PMA thrombosis that lasted for more than 3 months from the onset of the initial symptoms. Therefore, we considered that surgical resection of the thrombosed segment was the best therapeutic option.

CONCLUSIONS

Ultrasonography is useful for diagnosing rare cases of PMA thrombosis. Surgical treatment of

chronic PMA thrombosis in patients with CTS yields good results.

Yusuke Miyashima, MD

Department of Orthopedic Surgery
Japan Seafarers Relief Association Osaka Ekisaikai Hospital
2-1-10 Honden, Nishi-Ku
Osaka 550-0022, Japan
E-mail: miyashimayusuke1012@gmail.com

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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REFERENCES

1. Kopuz C, Baris S, Gulman B. A further morphological study of the persistent median artery in neonatal cadavers. *Surg Radiol Anat.* 1997;19:403–406.
2. Eid N, Ito Y, Shibata MA, et al. Persistent median artery: cadaveric study and review of the literature. *Clin Anat.* 2011;24:627–633.
3. Lucas T, Kumaratilake J, Henneberg M. Recently increased prevalence of the human median artery of the forearm: a microevolutionary change. *J Anat.* 2020;237:623–631.
4. Jackson IT, Campbell JC. An unusual cause of carpal tunnel syndrome. A case of thrombosis of the median artery. *J Bone Joint Surg Br.* 1970;52:330–333.
5. Sheridan J, Waslewski G, Sheridan D. Surgical excision of a thrombosed persistent median artery in a professional hockey player. *J Hand Surg Am.* 2022;47:292 e291–292 e294.
6. Barr ML, Jain NS, Ghareeb PA, et al. Persistent median artery thrombosis causing a bifid median nerve and carpal tunnel syndrome: a case report. *JBJS Case Connect.* 2022;12:e22.00424.
7. Bartels DW, Shin AY. Surgical excision of a thrombosed persistent median artery causing carpal tunnel-like symptoms: a case report. *JBJS Case Connect.* 2020;10:e2000139.
8. Srivastava A, Sharma P, Pillay S. Persistent median artery thrombosis: a rare cause of carpal tunnel syndrome. *Australas J Ultrasound Med.* 2015;18:82–85.
9. Lanz U. Anatomical variations of the median nerve in the carpal tunnel. *J Hand Surg Am.* 1977;2:44–53.
10. Shyu SG, Chang MC, Boudier-Reveret M. Thrombosed persistent median artery diagnosed by ultrasonography and treated with oral anticoagulant. *Pain Pract.* 2020;20:228–229.