Article published online: 2021-07-19

Case Report

A rare cause of median neuropathy at the carpal tunnel: Thrombosis of the persistent median artery

Richa D Jain, Lokesh Bathala[1], H K Anuradha[1], Sudhir K Kale, Guruprasad S Pujar[1], Man M Mehndiratta[2], Leo H Visser[3]

Departments of Radiodiagnosis and [1]Neurology, Aster CMI Hospital, Bengaluru, Karnataka, [2]Department of Neurology, Janakpuri Super Speciality Hospital, New Delhi, India, [3]Department of Neurology and Clinical Neurophysiology, St. Elisabeth Hospital, Tilburg, Netherland

Correspondence: Dr. Lokesh Bathala, Department of Neurology, Aster CMI Hospital, Bengaluru - 560 092, Karnataka, India.
E-mail: drlokeshbdvt@gmail.com

Abstract

Carpal tunnel syndrome is a common peripheral nerve entrapment neuropathy caused due to compression of the median nerve at the level of the wrist joint. Bifid median nerve associated with a persistent median artery is a rare entity and in itself asymptomatic anatomical variant. However, distension of the persistent median artery due to a thrombus can be symptomatic due to compression on the median nerve and can compromise the blood flow to the palm. We report a case of persistent median artery thrombosis in a young female patient who presented with symptoms of carpal tunnel syndrome diagnosed on the ultrasonography and confirmed on the MRI with subsequent improvement post anticoagulation therapy.

Keywords: Carpal tunnel; MR Angiogram; persistent median artery; thrombosis; ultrasound

Case Report

A 35-year-old female patient presented with intermittent pain in the wrist radiating to fingers of right palm and fingers since one month and her pain was continuous since last one week. Pain was exaggerated on flexion of the wrist and on doing household activities. She had no neck or shoulder pain. No pain or paraesthesia of other limbs. The pain was not relieved by pain killers. She had no medical comorbidities like diabetes mellitus or hypothyroidism.

On examination, there was no weakness of the thenar muscles and sensory examination to touch and pain was normal. Clinically a possibility of carpal tunnel syndrome was considered. Nerve conduction study of median nerve was performed as per the guidelines of the American Association of Neuromuscular and Electrodiagnostic Medicine. Median nerve motor and sensory latency were normal and both motor and sensory action potentials were within normal limits.

High-resolution ultrasound was performed with Philips ultrasound machine, CX 50, 15-7 MHz Hockey stick probe. The median nerve was traced from the wrist till the mid-forearm. On Ultrasound, the median nerve was found

Access this article online	
Quick Response Code:	Website: www.ijri.org
	DOI: 10.4103/ijri.IJRI_423_19

Cite this article as: Jain RD, Bathala L, Anuradha HK, Kale SK, Pujar GS, Mehndiratta MM, *et al*. A rare cause of median neuropathy at the carpal tunnel: Thrombosis of the persistent median artery. Indian J Radiol Imaging 2020;30:229-32.

Received: 15-Oct-2019 **Revised:** 16-Jan-2020
Accepted: 05-Mar-2020 **Published:** 13-Jul-2020

to be bifid and in-between the two nerve segments was a persistent median artery which was dilated and compressing the bifid fascicles [Figure 1]. An echogenic thrombus within the distended persistent median artery with dampened Doppler signals was seen [Figure 2A and 2B]. The median nerve showed increase in echogenicity suggestive of edema. Subsequently, magnetic resonance imaging (MRI) was performed which confirmed the persistent median artery and bifid median nerve [Figures 3A, 3B and 4] with T2 hypointense thrombus in the median artery with T2 hyperintense signal intensity within the nerve, suggesting edema due to mass effect of the distended artery on the median nerve. Time of Flight MR angiogram images showed nonvisualization of the short segment of the PMA [Figure 5] due to thrombus, well demonstrated on the 3D-Dixon images [Figure 6]. The case was discussed with vascular surgeons and they advised to start oral anticoagulants.

Four weeks later, the pain at the wrist and hand was reduced considerably and on USG, there was resolution of the arterial thrombus [Figure 7A-C], with improvement in the flow in the thrombosed part as evidenced by color uptake on Doppler.

Discussion

Carpal tunnel syndrome (CTS) is the most common nerve entrapment neuropathy with symptoms of paraesthesia of first three fingers and weakness of the thenar muscles. The carpal tunnel consists of the median nerve (MN), four flexor tendons of flexor digitorum profundus (FDP), and four flexor tendons of flexor digitorum superficialis (FDS).[1] As far as the etiology of CTS is considered, it is mostly idiopathic with secondary causes like trauma, tenosynovitis, ganglia, excessive fat, tumors, anatomical variants, and synovial hypertrophy. CTS due to a thrombosed PMA is rare and is usually accompanied by a bifid median nerve with variable vascularity of the hand.

The incidence of the PMA has been reported by a few studies and is quite variable (10%–50%, 4%, and 1.5%–27%)[2] and dependent on populations studied; out of which, a thrombosed persistent median artery causing CTS is very rare.[3,4]

Persistent median artery seen in adults in two forms: 1) the antebrachial type, which arises from the anterior interosseous artery and does not reach till the palm and 2) the palmar type, which arises from any of the forearm arteries and accompanies the median nerve in the carpal tunnel, and usually terminates as the superficial arch or main supplier to the index and long fingers.[5,6]

The median artery typically regresses into a small artery after the eighth week of gestation and accompanies the median nerve as the arteria comitans nervi median.

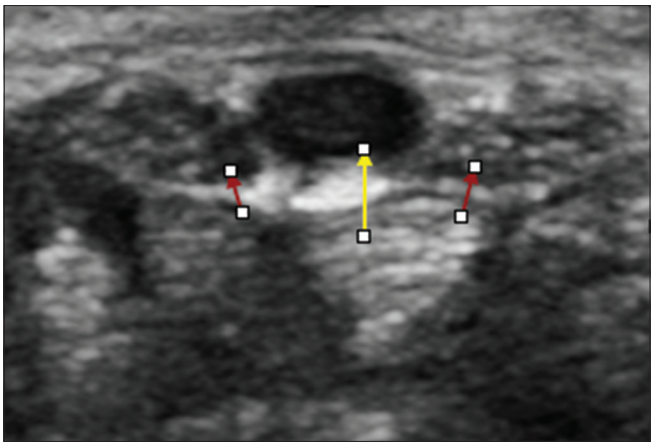

Figure 1: Axial USG shows distended PMA with echogenic thrombus (Yellow arrow) in between bifid median nerve (Red arrows)

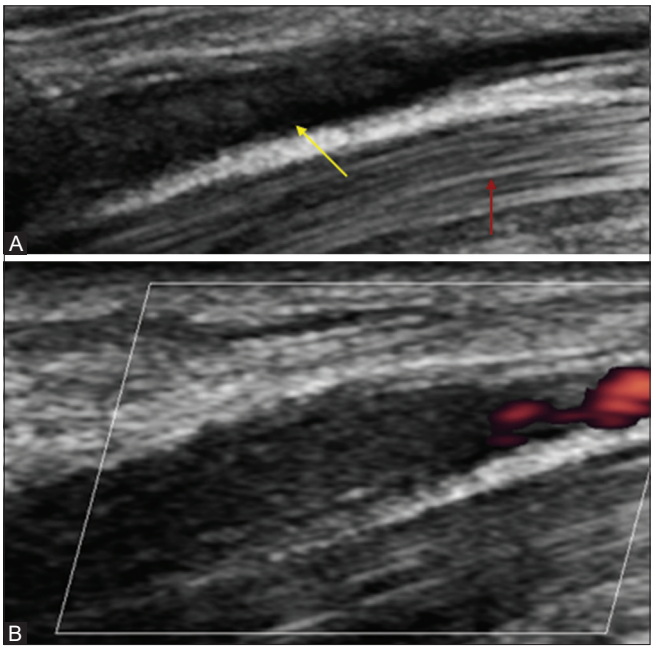

Figure 2: (A and B) Sagittal USG with Doppler showing distended PMA with echogenic thrombus (Yellow arrow) and no color flow on color Doppler. Red arrows show the longitudinal section of flexor tendon

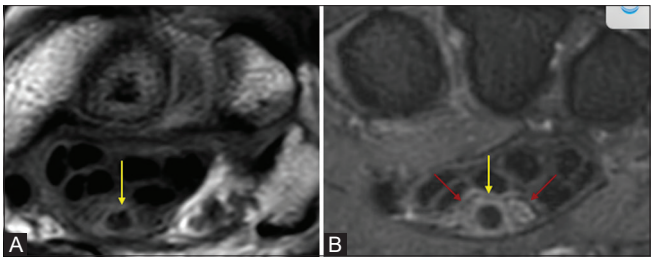

Figure 3: (A and B) Axial T2WI with fat and fat suppression showing the T2 hypointense thrombus in the distended PMA (Yellow arrow) with hyperintense signal in the bifid median nerve indicating edema (Red arrows)

Occasionally persistent median artery is seen accompanying or piercing the median nerve and at times associated with bifid nerve, lying in between.[7]

Figure 4: T2WI sagittal image shows the linear hypointense thrombus (Yellow arrow) with hyperintense flow voids (Blue arrows) proximally and distally

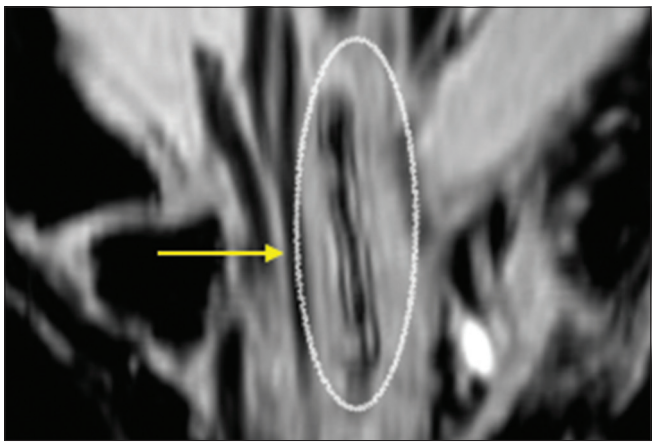

Figure 6: 3D-Dixon image shows the linear hypointense thrombus (Yellow arrow) in the PMA

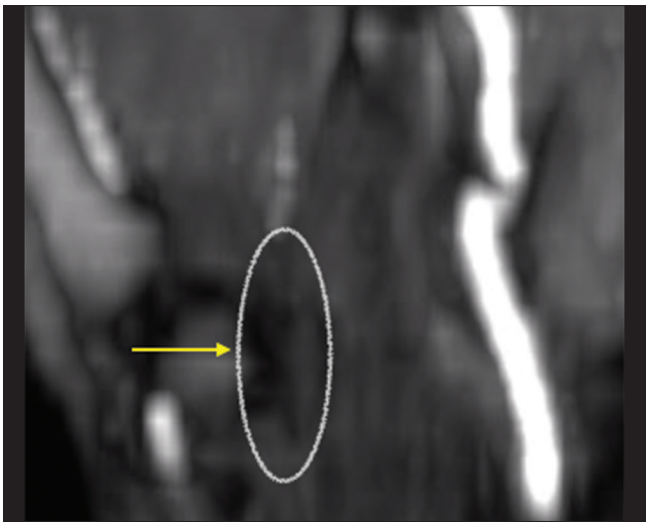

Figure 5: TOF Angiogram: Nonvisualization of short segment of the PMA

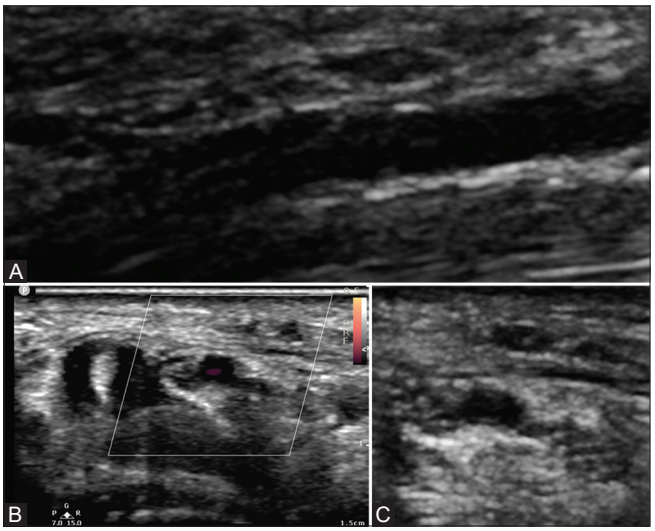

Figure 7: (A-C) showing sagittal and axial USG sections with color Doppler. Post treatment follow-up, near-complete resolution of the echogenic thrombus within the PMA. The PMA is not distended and normal bifid median nerve fascicles

The PMA like any other artery is at risk of intimal calcifications and thrombosis and the later may lead to carpal tunnel syndrome-like symptoms.

In our patient, the nerve conduction study was normal. Hence, ultrasound was performed to look for the median nerve. The USG detected a long segment palmar type PMA. The artery was distended with a thrombus causing mass effect on the median nerve which caused edema of the nerve fascicle causing pain. There was dampened flow on the color Doppler in the distal segment of the artery. MR Angiogram confirmed the presence of the thrombus and edema in the median nerve fascicles.

Treatment of the thrombosed PMA is intravenous heparin and surgical intervention like carpal tunnel release in cases of significant symptoms.[8-10] Excision of artery is avoided to prevent vascular compromise.[11]

The patient was put on anticoagulants and came in for follow-up after 2 weeks with near-complete resolution of the pain and thrombus on the follow-up Doppler study.

Our case emphasizes that nerve imaging by USG can help in early detection and change the treatment and prognosis and that thrombosis of the persistent median artery is a rare treatable cause of unilateral carpal tunnel syndrome/ mono-neuropathy.

Anatomical variants and bifid median nerve should be looked for and can be well delineated on routine ultrasound scan.

Ultrasound nerve imaging is an amazing effective and affordable diagnostic modality for CTS as it provides detailed characterization of the anatomy and further identifying rare causes of CTS. Its utility is highlighted by cases where a persistent median artery is implicated as identification of PMA has serious clinical implications and can improve patient outcomes through appropriate treatment and avoiding unnecessary intervention.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support andsponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Mitchell R, Chesney A, Seal S, McKnight L, Thoma A. Anatomical variation of the carpal tunnel structures. Can J Plast Surg 2009;17:3-7.
2. Srivastava A, Sharma P, Pillay S. Persistent median artery thrombosis: A rare cause of carpal tunnel syndrome. Australas J Ultrasound Med 2015;18:82-5.
3. Eid N, Shibata MA, Otsuki Y. Persistant median artery: Cadaveric study and review of literature. J Clin Anat 2011;00:1-7.
4. Rodríguez-Niedenführ M, Sañudo JR, Vázquez T, Nearn L, Logan B, Parkin I. Median artery revisited. J Anat 1999l; 195:57-63.
5. Kele H, Verheggen R, Reimers CD. Carpal tunnel syndrome caused by thrombosis of the median artery: The importance of high-resolution ultrasonography for diagnosis. J Neurosurg 2002;97:471-3.
6. Vag T, Koch M, Waldt K. Acute carpal tunnel syndrome from dissected and thrombosed persistent median artery diagnosed at magnetic resonance imaging. Rofo 2012;184:829-30.
7. Fumière E, Dugardeyn C, Roquet ME, Delcour C. US demonstration of a thrombosed persistant median artery in carpal tunnel syndrome. JBR-BTR 2002;85:1-3.
8. Barfred T, Hojlund AP, Bertheussen K. Median artery in carpal tunnel syndrome. J Hand Surg [Br] 1985;10A: 864-68.
9. Bilgin SS, Olcay SE, Derincek A, Adiyaman S, Demirtas AM. Can simple release relieve symptoms of carpal tunnel syndrome caused by a persistent median artery? Arch Orthop Trauma Surg 2004;124:154-6.
10. Lisanti M, Rosati M, Pardi A. Persistent median artery in carpal tunnel syndrome. Acta Orthop Belg 1995;61:315-8.
11. Salter M, Sinha N, Szmigielski W. Thrombosed persistent median artery causing carpal tunnel syndrome associated with bifurcated median nerve: A case report. Polish J Radiol 2011;76:46-8.