*Case report*

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# Thrombosed persistent median artery in a medical sonographer

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**Abstract**

The use of gray-scale and color Doppler ultrasound as a first-line imaging modality for wrist pain can be advantageous, especially in cases of clinically suspected carpal tunnel syndrome. This report presents the case of a medical sonographer who exhibited acute wrist pain secondary to a thrombosed persistent median artery after excessive stress loading on her scanning wrist. Ultrasound is able to easily diagnose this rare condition, which may at times be associated with carpal tunnel symptoms due to mass effect from the expanded aberrant artery.

**Keywords:** persistent median artery; median nerve; wrist pain; ultrasound

## Introduction

The persistent median artery (PMA) is a well-recognized embryological remnant seen in the wrist at the level of the carpal tunnel. The median artery serves as the main blood supply to the developing median nerve during embryogenesis. It can originate from the ulnar, common interosseous, or anterior interosseous arteries, and it usually terminates as a contributor to the superficial palmar arch or as the primary blood supply to the index and long fingers [1]. Under usual circumstances, it regresses prenatally as the radial and ulnar arteries mature. However, in approximately 11-15% of cases [1–3], it persists and is termed the persistent median artery (PMA). Patients with a PMA have variant anatomy of the median nerve in the majority of cases, often a bifid median nerve. A PMA is generally asymptomatic and found incidentally, but it can be a source of pain or paresthesia when rarely thrombosed. We present a case of a symptomatic, thrombosed persistent median artery in the dominant scanning hand of a sonographer.

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## Case report

A 37-year-old right hand dominant female sonographer presented with acute right wrist pain after performing multiple transplant Doppler ultrasound (US) examinations in the preceding days. She characterized the pain as a constant, dull ache along the base of the central to radial wrist crease, accompanied by mild hand weakness. Targeted US demonstrated the presence of a focally enlarged persistent median artery along the radial aspect of the median nerve (fig 1). The internal contents of the expanded artery appeared isoechoic to the vessel wall, with a 2 cm long region of incomplete Doppler signal filling of the PMA from partial thrombosis, and complete lack of Doppler flow just distal to the level of the carpal tunnel secondary to occlusion (fig 2). The median nerve was mildly enlarged in cross-sectional area measuring 12-13 $mm^2$, without bifid morphology. The radial and ulnar arteries appeared patent.

The patient was diagnosed with a thrombosed persistent median artery. Given her relatively mild symptoms and lack of evidence of digital ischemia, she was treated conservatively with aspirin and intermittent use of heating pads for two weeks. Her symptoms improved significantly within 1-2 weeks. She received a follow up US 2

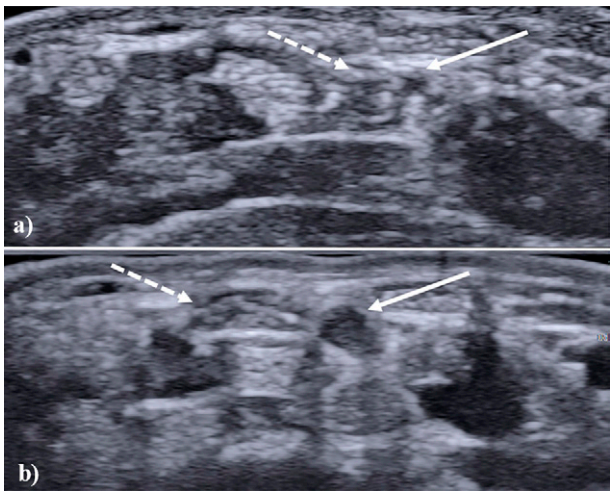



**Fig 1.** Transverse ultrasound image at the level of the distal forearm (a) demonstrates the median nerve (dashed arrow) with an adjacent small blood vessel along the radial aspect of the nerve measuring less than 1 mm in diameter, consistent with a persistent median artery. A more distal transverse ultrasound image obtained just proximal to the carpal tunnel (b) demonstrates focal expansion of the persistent median artery, which now measures approximately 3 times its proximal diameter (solid arrow), with internal echogenic thrombus material. The persistent median artery is again seen immediately along the radial side of the median nerve, which is mildly enlarged with a cross-sectional area of 12-13 $mm^2$.

years and 4 months after her initial US and was imaged utilizing the same US system. This subsequent imaging demonstrated a diminutive caliber of the persistent median artery compared to the prior US without detectable Doppler flow secondary to chronic, total occlusion (fig 3). This chronic occlusion was asymptomatic, likely secondary to collateral flow with the palmar arches via the radial and ulnar arteries.

## Discussion

The PMA is usually found along the ulnar or palmar aspect of the anatomic median nerve [3] or interposed between a bifid median nerve within the carpal tunnel [4]. The radial location of a PMA, as seen in our patient, is less common but has been previously reported [5]. The most commonly discussed impact of the PMA relative to carpal tunnel syndrome is an emphasis on preoperative identification to avoid iatrogenic injury during operative carpal tunnel release [2]. However, thrombosis of the PMA can result in expansion of the artery and potential compression of the adjacent median nerve resulting in a relatively acute presentation of carpal tunnel syndrome which may require treatment with carpal tunnel release [6]. Our patient had some thenar weakness which could have been due to mass effect on the median nerve, and

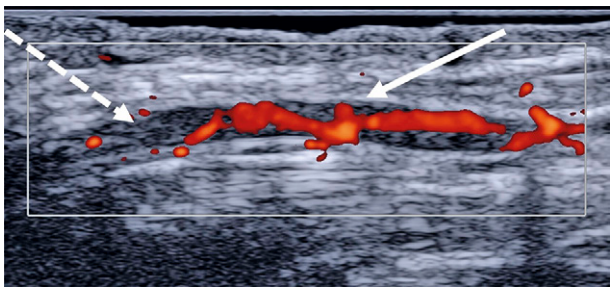


**Fig 2.** Longitudinal Power Doppler ultrasound image along the persistent median artery, proximal to the carpal tunnel, demonstrates echogenic material filling the majority of the arterial lumen. There is irregular partial filling of the arterial lumen (solid arrow) consistent with nonocclusive thrombus over a distance of approximately 2 cm. There is no significant power Doppler flow within the more distal aspect of the persistent median artery, consistent with complete occlusion (dashed arrow).

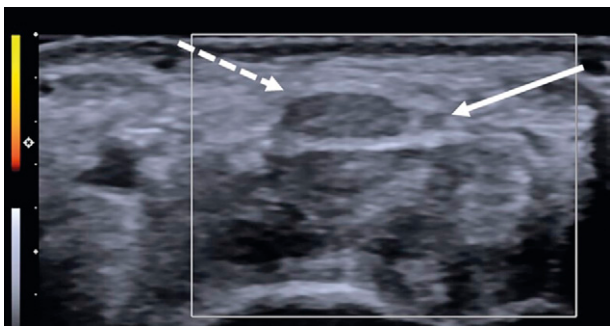


**Fig 3.** Follow up power Doppler transverse ultrasound image obtained over two years after the inciting event demonstrates the persistent median artery has decreased in caliber just proximal to the carpal tunnel with complete absence of power Doppler flow (solid arrow), consistent with chronic complete occlusion. The median nerve remains mildly enlarged with a cross-sectional area of 10 $mm^2$ (dashed arrow).

her symptoms promptly resolved with conservative treatment.

Various mechanisms for thrombosis have been proposed. These include increased stretch, vibration, and repetitive compression or trauma of the PMA [7]. These mechanisms are similar to the well-described "hypothenar hammer syndrome" which can result in occlusion of the distal ulnar artery from repetitive trauma to the hypothenar eminence [8]. Our patient was a sonographer who worked long hours with frequent stress loading of her dominant scanning wrist. Similar stressors on the base of the wrist such as bicycle/motorcycle riding, screwdriver usage, repeated floor scrubbing, and vibrating robotic arthroplasty surgical tools have all been associated with thrombosis of the PMA in earlier case reports [9].

The outcome of thrombosed PMA likely depends on the patient's anatomy. It has been reported that a PMA can either join the superficial volar arch, supply the radi-

al-sided digits without any connection to the arch, or terminate in an area of chronic occlusion [2]. Patients with the PMA directly supplying the digits may present with associated digital ischemia. Treatment of a thrombosed PMA associated with digital ischemia primarily consists of anticoagulation with symptoms resolving upon recanalization [10]. Endovascular treatments may be needed in some patients. However, patients with a PMA that communicates with the superficial palmar arch, likely the most common variation [3], may have only mild symptoms assuming the radial and ulnar arteries are patent, as was the case in our patient.

In **conclusion**, a firm anatomic understanding of this embryological remnant and its potential for thrombosis is important in the sonographic evaluation of wrist pain. This is especially true for sonographers and other patients with occupations that impose unusual and repetitive stresses on the wrist.

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