High-Resolution Sonography of the Palmar Cutaneous Branch of the Median Nerve

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OBJECTIVE. The aim of this study was to describe the potential value of high-resolution sonography for evaluation of the palmar cutaneous branch of the median nerve (MN).

SUBJECTS AND METHODS. The volar wrists of 12 healthy volunteers and 22 consecutive patients with sensory deficit in the palmar triangle and thenar eminence suggesting neuropathy of the palmar cutaneous branch of the MN were examined with high-frequency sonography. Nine patients underwent carpal tunnel release, five had a history of penetrating trauma, six had symptoms suggesting concurrent carpal tunnel syndrome, one received surgery for palmaris tendon transfer, and one underwent resection of a ventral carpal ganglion cyst. Correlative 1.5-T MRI was performed in six patients.

RESULTS. In 83% of the healthy volunteers, 17-5–MHz sonography was able to identify the palmar cutaneous branch of the MN from its origin down to slightly distal to the wrist crease. In the patient group, sonography allowed detection of nerve abnormalities in 55% of the cases. Focal hypoechoic swelling of the nerve at the fascial crossing was observed in patients who had either concurrent carpal tunnel syndrome (four cases) or previous carpal tunnel release (three cases). Sonography performed after a penetrating trauma revealed nerve encasement by scar tissue (two cases) or complete transection of the nerve ending in a terminal neuroma (one case). Nerve transection secondary to resection of a ventral carpal ganglion cyst (one case) or to carpal tunnel release (one case) was also observed.

CONCLUSION. Sonography can identify the palmar cutaneous branch of the MN and characterize its abnormalities, providing unique information about this small nerve branch.

Keywords: carpal tunnel syndrome, median nerve, peripheral nerve disorders, sonography, wrist sonography

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The palmar cutaneous branch of the median nerve (MN) is the last collateral branch of the MN given off in the distal forearm. This small but clinically relevant nerve travels alongside the MN at the wrist between the palmaris longus (PL) and the flexor carpi radialis (FCR) tendons to emerge in the palm and provide sensory supply to the skin of the thenar eminence and the proximal palm [1, 2]. Traumatic injury and entrapment neuropathy of the palmar cutaneous branch of the MN can cause significant symptoms that can be quite troublesome to the patient. Direct damage and scar encasement of the palmar cutaneous branch of the MN are well-recognized complications after surgery for carpal tunnel syndrome that can lead to the onset of new symptoms such as painful discharges—the so-called "pillar pain"—and sensory loss or hyperesthesia through the palmar aspect of the hand [3].

Although a positive Tinel sign and neurophysiologic assessment by recording the sensory nerve action potentials may suggest the presence of lesions in the palmar cutaneous branch of the MN, these tests are not always reliable and specific to diagnose involvement of the palmar cutaneous branch of the MN because the sensory distribution of the main MN and the palmar cutaneous branch of the MN overlap extensively [2, 4]. As sonography technology progresses, the introduction of very high frequencies and new developments in signal-processing software are leading to a continuing improvement of image contrast and detail resolution. The result is improved delineation of small and superficial soft tissues that makes sonography a reliable means by which to identify very small anatomic and pathologic details.

To the best of our knowledge, no attention has been given in the literature to the imaging evaluation of the palmar cutaneous branch of

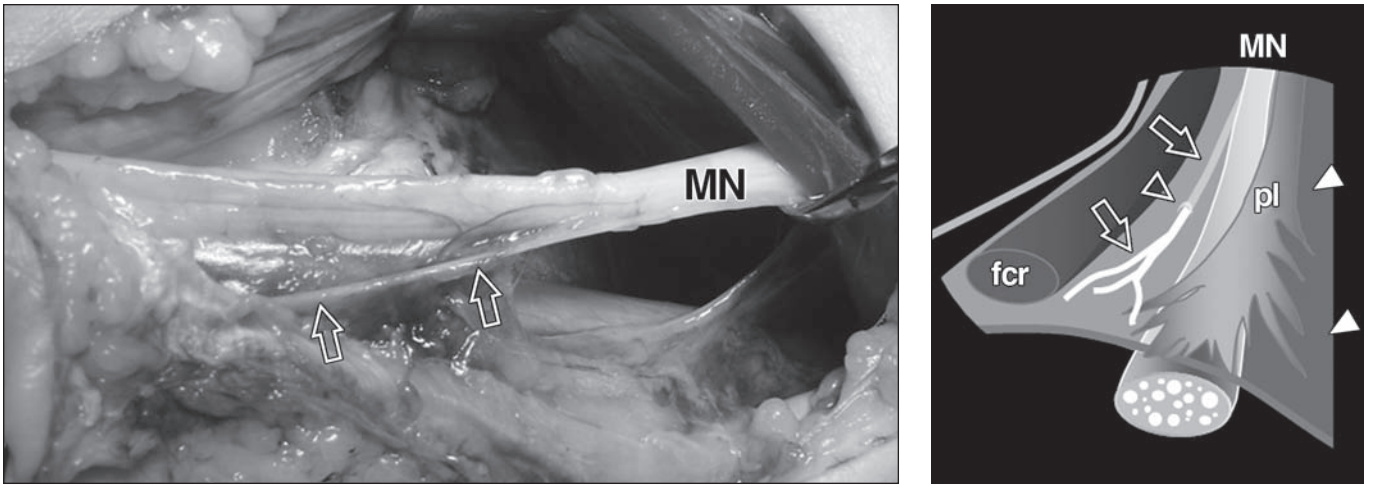

Fig. 1—Anatomy of palmar cutaneous branch of median nerve (MN).
A, Gross surgical view of ventral wrist in 40-year-old woman with carpal tunnel syndrome–like symptoms shows origin of palmar cutaneous branch of the MN (*arrows*) from MN.
B, Diagram shows relationship of palmar cutaneous branch of MN (*arrows*) with median nerve (MN), flexor carpi radialis (fcr) tendon, palmaris longus (pl) tendon, and antebrachial fascia (*solid arrowheads*). Open arrowhead indicates point at which palmar cutaneous branch of MN pierces fascia.

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the MN. Accordingly, the aim of this prospective study was to describe the normal appearance of this small nerve branch using high-resolution sonography and to assess the value of this technique in detecting and characterizing neuropathy of the palmar cutaneous branch of the MN.

From an anatomic point of view, the palmar cutaneous branch of the MN originates from the MN at the point where the MN emerges from underneath the flexor digitorum superficialis muscle to pass between its radial boundary and the FCR tendon [3]. In most cases (88.3%), it arises from the radial side of the MN [3].

After its origin, the palmar cutaneous branch of the MN courses alongside the MN for approximately 15–25 mm slightly deep in relation to the antebrachial fascia (Fig. 1A). Then it curves radially to approach the ulnar side of the FCR tendon, approximately 1–1.5 cm proximal to the wrist crease. After giving off sensory branches to supply the scaphoid bone and, in some instances, the lunate bone, the palmar cutaneous branch of the MN enters a tunnel between the superficial and deep layers of the distal antebrachial fascia or the flexor retinaculum (Fig. 1B). This fascial passage is approximately 8 mm long and is commonly referred to as the "palmar cutaneous branch of the MN tunnel" [3, 5]. The point of fascial penetration is variable and may range from 1 cm to more than 7 cm proximal to the wrist crease [6]. At the end of this tunnel, the palmar cutaneous branch of the MN pierces the fascia to reach the subcutaneous tissue; crosses the base of the thenar eminence directly over the prominence of the tubercle of the scaphoid bone; and supplies the skin over the thenar eminence and the proximal palm, dividing into sensory radial and ulnar branches [7]. As reported in a cadaveric series [3], the palmar cutaneous branch of the MN has a very small cross-sectional area, with a mean axial diameter of 0.9 ± 0.3 (SD) mm.

Subjects and Methods

Between January 2006 and July 2007, 22 consecutive patients (15 women and seven men; age range, 24–63 years; mean age, 43 years) with symptoms suggestive of neuropathy of the palmar cutaneous branch of the MN were referred to our radiology department by neurologists and orthopedic surgeons to be included in this prospective study. Patients complained of sensory deficit in the palmar triangle and thenar eminence and point tenderness over the palmar aspect of the wrist. Nine had undergone carpal tunnel release, five had a history of penetrating trauma on the volar aspect of the wrist, six presented with symptoms suggesting concurrent carpal tunnel syndrome, one received surgery for PL tendon transfer, and one underwent removal of a ventral carpal ganglion cyst. Imaging findings from the patient group were compared with those obtained in 24 wrists of 12 healthy volunteers (six women and six men; age range, 27–35 years; mean age, 32 years) who were free of MN neuropathy and symptoms suggesting neuropathy of the palmar cutaneous branch of the MN. Informed consent was obtained from all patients and members of the control group before sonography was performed.

High-resolution sonography was performed with a digital scanner (IU-22, Philips Medical Systems) equipped with "small parts" broadband linear array transducers (frequency band, 17-5– MHz

TABLE 1: Sonographic Detection of Palmar Cutaneous Branch of the Median Nerve (MN) in Healthy Volunteers: Comparison with Sex and Body Mass Index (BMI)

Sex	No. of Volunteers	No. of Wrists	BMI (kg/m^2)	Sonography Findings[a]	
				No. of Volunteers in Whom Palmar Cutaneous Branch of MN Was Seen	No. of Palmar Cutaneous Branches of MN Examined
M	6	12	22–26	5	10
F	6	12	18–24	5	10
Total	12	24		10	20

[a]Using 17-5–MHz transducer.

and 12-5–MHz). All sonographic studies were performed by the same musculoskeletal radiologist. During scanning, patients were seated in front of the examiner with the affected wrist resting on the examination table in an extended position, palm up. The scanning technique relied on images obtained in transverse planes between the MN and the FCR tendon.

Once detected, the palmar cutaneous branch of the MN was kept in the center of the field of view of the sonographic image, examined in its short-axis, and followed distally by sweeping the probe from the distal forearm down to the palm. To better recognize this small nerve, the examiner performed dynamic scanning by sweeping the probe slowly up and down over its course, which was more effective than static imaging. This maneuver helped to distinguish the nerve as a continuous threadlike hypoechoic structure from the adjacent soft-tissue echoes and to identify the point at which the palmar cutaneous branch of the MN pierces the fascia.

Correlative MRI was performed in six patients using a 1.5-T unit (Magnetom Avanto Syngo MR 2004V, Siemens Medical Solutions) with a flexible surface coil (gradients of 25 mT/m, slew rate of 800 T/m per second, rise time of 400 m/s). The protocol included the following sequences: T1-weighted spin-echo (SE) (TR range/TE, 500–650/15; matrix, 384 × 384; slice thickness, 3.5 mm; field of view, 11.0 × 11.0 cm; number of excitations, 4), fat-suppressed T2-weighted turbo SE, and contrast-enhanced fat-suppressed T1-weighted SE sequences. The contrast media used were gadopentetate dimeglumine 0.5 mol/L (Magnevist, Bayer HealthCare) and gadobenate dimeglumine 0.5 mol/L (MultiHance, Bracco). All acquisitions were obtained in axial planes. Patients were examined in the supine position while keeping the upper arm alongside the body with an extended elbow and supinated wrist.

To assess the reliability of recognizing the palmar cutaneous branch of the MN using high-resolution sonography, the musculoskeletal radiologist who performed the pathologic studies obtained two corresponding series of 10 video clips from healthy volunteers using 17-5–MHz (first series) and 12-5–MHz (second series) transducers. Then, two musculoskeletal radiologists with different levels of experience—namely, observer 1 with more than 20 years and observer 2 with 3 years of experience in musculoskeletal imaging—were asked to review the video clips and to indicate the position of the palmar cutaneous branch of the MN with a mark. Each of the two observers was blinded to the results achieved by the other, and final data were checked for accuracy by the radiologist who obtained the video clips.

Results

In the group of healthy volunteers, high-resolution sonography was able to depict the palmar cutaneous branch of the MN at the volar wrist in 20 of the 24 (83%) wrists. When visible, the palmar cutaneous branch of the MN was always detected in both wrists of the same person. In our series, the ability of sonography to depict this small nerve did not depend on patient sex or body mass index (Table 1). On transverse planes, the palmar

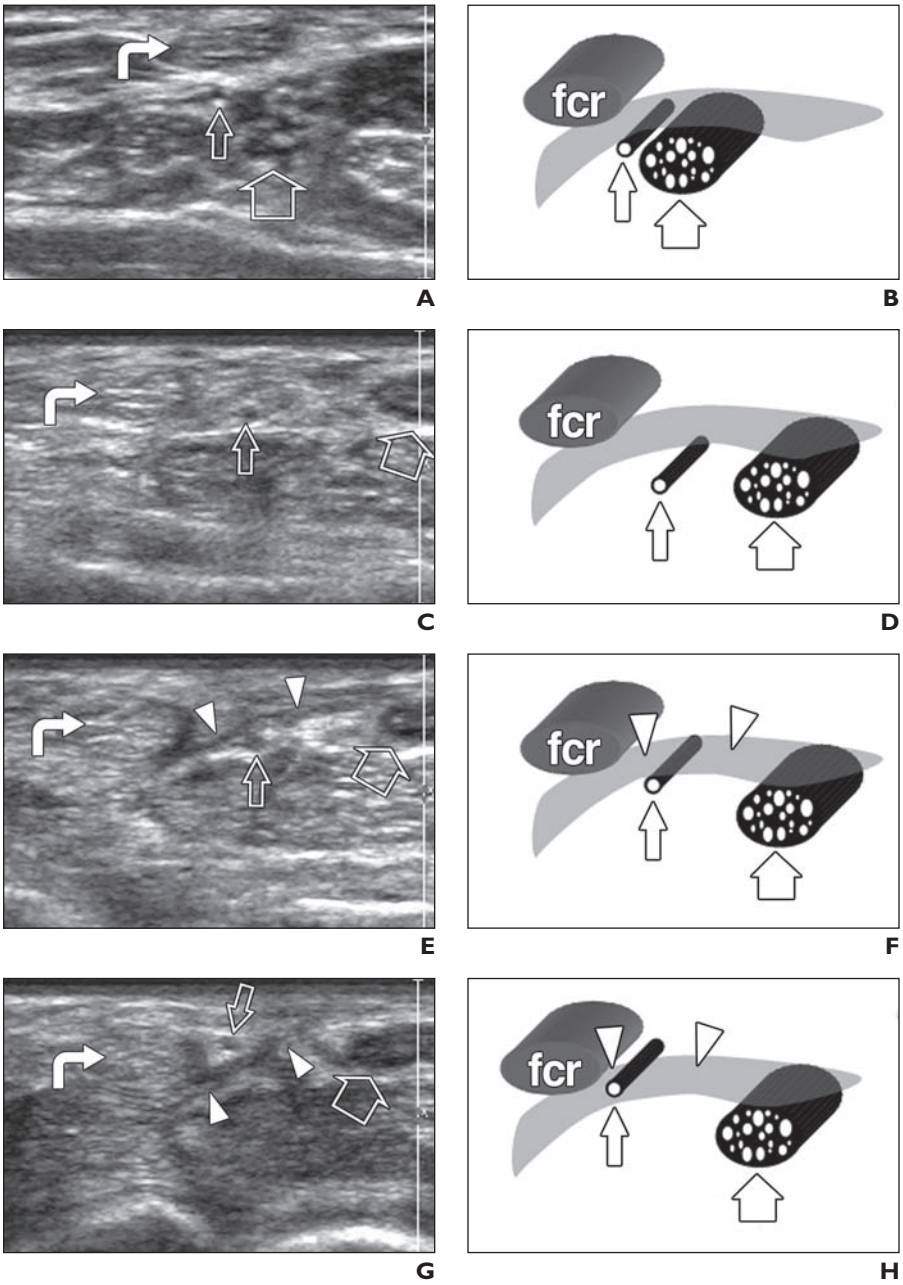

Fig. 2— Series of transverse 17-5–MHz sonography images obtained from proximal to distal over palmar cutaneous branch of median nerve (MN) in 35-year-old healthy man with corresponding diagrams. Relationships of palmar cutaneous branch of MN (*thin open arrows*) with median nerve (MN) (*thick open arrows*), flexor carpi radialis tendon (*curved arrow* in **A**, **C**, **E**, and **G**; fcr in **B**, **D**, **F**, and **H**), and antebrachial fascia (*arrowheads*, **E**–**H**) are shown.
A and **B,** Palmar cutaneous branch of MN detaches from MN as one of its most radial fascicles.
C and **D,** Palmar cutaneous branch of MN gradually deflects to approach flexor carpi radialis tendon.
E and **F,** Palmar cutaneous branch of MN runs slightly deep in relation to antebrachial fascia.
G and **H,** Palmar cutaneous branch of MN lies adjacent to flexor carpi radialis tendon after piercing fascia.

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TABLE 2: Imaging and Surgical Findings in Patients with Neuropathy of the Palmar Cutaneous Branch of the Median Nerve by Clinical History

Clinical History	No. of Patients	Sonography Findings				MR Findings	Surgical Findings
		No. of Abnormal Studies	No. of Normal-Appearing Nerves	No. of Undetected Nerves	Abnormal Findings		
Carpal tunnel syndrome	6	4	2	0	4 hypoechoic swelling	4 negative	2 hypoechoic swelling
Carpal tunnel release	9	4	3	2	3 hypoechoic swelling, 1 stump neuroma	—	1 stump neuroma
Penetrating Injury	5	3	2	0	2 scar encasement, 1 stump neuroma	2 scar encasement	1 stump neuroma
Ganglion cyst	1	1	0	0	1 distal branch injury	—	—
Peroneus longus transfer	1	0	0	1	1 negative	—	—

Note—Dash (—) indicates MRI or surgery was not performed.

cutaneous branch of the MN appeared as a rounded hypoechoic fascicle of 0.8–1 mm in cross-sectional diameter (nerve cross-sectional area = 0.5–0.7 mm^2) originating from the radial edge of the MN at the point where the MN crosses between the FCR tendon and the radial boundary of the flexor digitorum superficialis muscle (Figs. 2A and 2B). Distally, the palmar cutaneous branch of the MN continues its course alongside the MN until it approaches the FCR tendon (Figs. 2C and 2D). In this area, the antebrachial fascia becomes progressively thicker and sonographically more evident (Figs. 2E and 2F). Then, the palmar cutaneous branch of the MN pierces the fascia to move into the subcutaneous tissue (Figs. 2G and 2H).

The fascial passage was identified in all wrists in which the nerve was visible. Distal to the wrist crease and after crossing the fascia, the palmar cutaneous branch of the MN gradually tapered and became less definite. Discrete divisional branches of the palmar cutaneous branch of the MN in the palm were depicted in five of 20 wrists but only for a short proximal segment.

Retrospective blinded review of the video clips by the two observers resulted in correct discrimination of the palmar cutaneous branch of the MN in all wrists when the 17-5–MHz probe was used. At 12-5–MHz frequency, the trunk of the palmar cutaneous branch of the MN could still be distinguished, although its pattern became coarser and more undefined than at the other frequency. However, the observers continued to label it correctly in seven of 10 video clips. During the review process, there was no case of disagreement between observers.

In the patient group, high-resolution sonography showed an abnormal palmar cutaneous branch of the MN in 12 of 22 (55%) wrists; a normal-appearing palmar cutaneous branch of the MN was seen in seven wrists, whereas this nerve branch was not visible sonographically in the other three wrists (Table 2). In four of the 12 wrists with abnormal sonographic findings, the abnormal palmar cutaneous branch of the MN was associated with carpal tunnel syndrome (Fig. 3). All of these patients presented with an abnormally swollen and hypoechoic MN (nerve cross-sectional area = 12.2–23.4 mm^2) at the carpal tunnel level, indicating a coexisting compression of the MN trunk and fusiform hypoechoic swelling (axial diameter = 2–3 mm, nerve cross-sectional area = 4.7–7.0 mm^2) of the palmar cutaneous branch of the MN at the level of the fascial passage; the fascia forming the palmar cutaneous branch of the MN tunnel appeared thickened in one patient.

Four other patients with abnormal sonographic findings had undergone carpal tunnel release and presented with persistent pain in the territory of the palmar cutaneous branch of the MN distribution. One patient in whom a radial-sided surgical approach was performed presented with discontinuity of the palmar cutaneous branch of the MN along the surgical access with a terminal neuroma (Fig. 4). In the other three patients, surgery was performed with an ulnar-sided release extending in-line with the ring finger, and the palmar cutaneous branch of the MN was not directly injured along the surgical incision. In these patients, the nerve showed focal hypoechoic thickening (axial diameter = 2–3 mm, nerve cross-sectional area = 3.1–4.7 mm^2) at the level of the fascial tunnel, an appearance similar to that observed in the nonoperated cases with concurrent MN entrapment. In the other three of 12 patients who had a penetrating wound over the ventral wrist, the diagnosis of involvement of the palmar cutaneous branch of the MN was based on detection of either a terminal neuroma in one case or encasement of the nerve by hypoechoic scar tissue in two cases.

Different from the cases described, the site of the nerve lesion was strictly related to the location of the injury and occurred outside the point of fascial crossing in one case (Fig. 5). In the patient who underwent surgery for a ventral carpal ganglion, the injury involved a distal divisional branch of the palmar cutaneous branch of the MN. In the patient who developed symptoms suggesting injury of the palmar cutaneous branch of the MN after PL tendon transfer, sonography was unable to show the nerve. MRI was able to confirm posttraumatic nerve encasement by scar tissue in two cases (Figs. 5B and 5C). On the contrary, MRI was unable to detect discrete abnormalities along the nerve course in four patients with sonographic evidence of entrapment of the palmar cutaneous branch of the MN at the fascial tunnel.

Four patients complaining of persistent severe wrist pain, positive Tinel sign, and exquisite tenderness over the course of the palmar cutaneous branch of the MN in whom there was sonographic evidence of nerve entrapment at the fascial tunnel (two cases) or of nerve trauma (two cases) underwent surgery. In patients with fascial entrapment, surgical exploration revealed a swollen palmar cutaneous branch of the MN tethered by a thickened antebrachial fascia (Fig. 3D). Dissection of the fascicles and external neurolysis were performed. In patients with terminal neuromas, surgery included stripping of the entire palmar cutaneous branch

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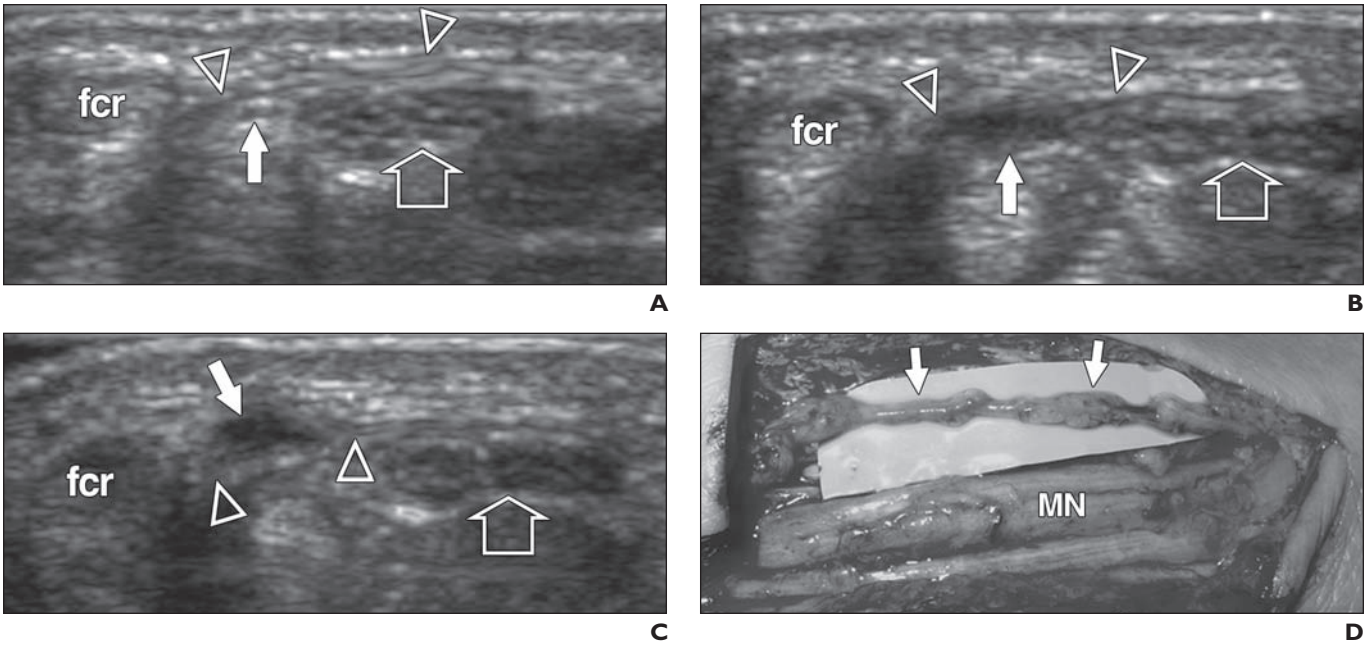


Fig. 3— 42-year-old woman with carpal tunnel syndrome and symptoms suggesting concurrent neuropathy of palmar cutaneous branch of median nerve (MN). Transverse 17-5–MHz sonography images were obtained from proximal to distal over palmar cutaneous branch of MN.
A, Normal-appearing palmar cutaneous branch of MN (*solid arrow*) runs deep in relation to antebrachial fascia (*arrowheads*), passing between median nerve (MN) (*open arrow*) and flexor carpi radialis tendon (fcr).
B and **C,** Palmar cutaneous branch of MN (*solid arrow*) exhibits focal fusiform hypoechoic swelling as it enters fascial tunnel (**B**) and after crossing it (**C**). Arrowheads = antebrachial fascia, fcr = flexor carpi radialis tendon, open arrow = median nerve.
D, Gross surgical view after fascial release confirms presence of irregularly thickened palmar cutaneous branch of MN (*arrows*). MN = median nerve.

of the MN directly at its origin from the MN to avoid secondary neuroma formation. Patients with suspected neuropathy of the palmar cutaneous branch of the MN and negative sonographic findings did not undergo surgery.

Discussion

The palmar cutaneous branch of the MN is a small constant branch of the MN that provides sensation to the palmar skin directly over the thenar eminence and the mid proximal palm [8]. The clinical significance of this small superficial nerve is mainly related to its vulnerability to direct trauma or accidental injury during a variety of surgical procedures around the ventral distal forearm and the wrist, including carpal tunnel release, volar synovectomy, tendon transfer procedures, and resection of ventral carpal ganglia [2, 6, 9]. Although routinely performed in an elective surgical setting and currently based on standardized techniques, carpal tunnel release still represents the procedure that most commonly places the palmar cutaneous branch of the MN at risk, especially when an incorrect incision extends proximal to the wrist crease in the area between the PL tendon and the FCR tendon or when the longitudinal access running

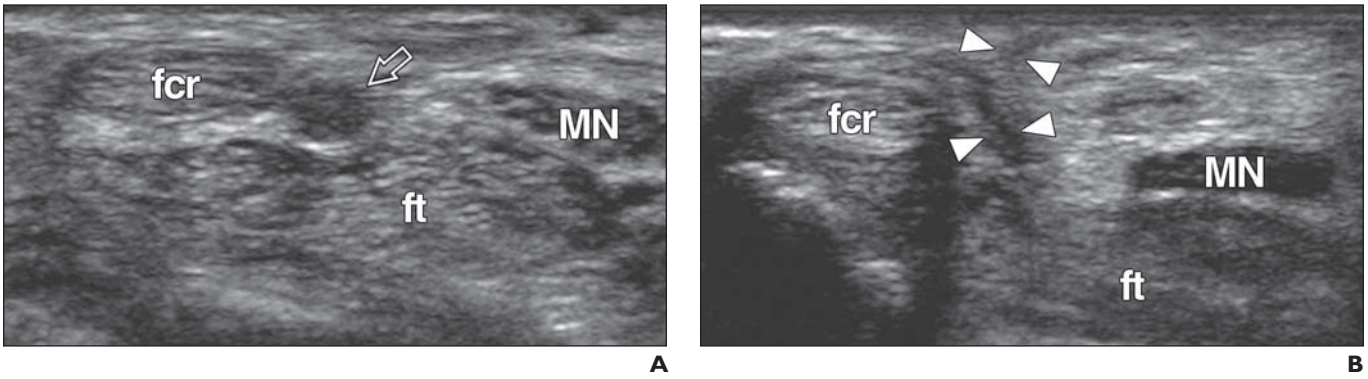
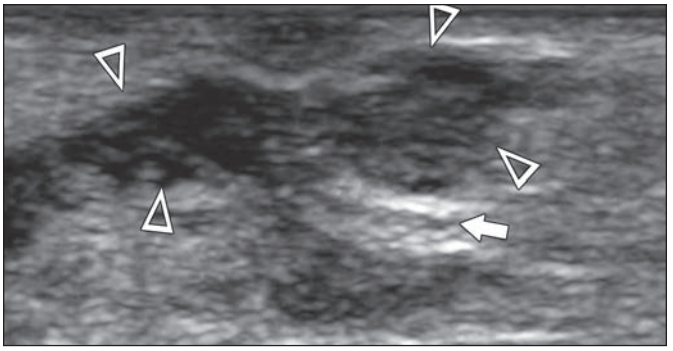


Fig. 4— 53-year-old woman with previous carpal tunnel release. After surgery, patient complained of persistent pain and tenderness in territory of palmar cutaneous branch of median nerve (MN) distribution.
A, Proximal transverse 17-5–MHz sonography image shows hypoechoic stump neuroma (*arrow*) due to transection of palmar cutaneous branch of MN. Note relationships of neuroma with MN, flexor digitorum tendons (ft), and flexor carpi radialis tendon (fcr).
B, Distal transverse 17-5–MHz sonography image reveals fibrous scar (*arrowheads*) resulting from surgical access performed in too radial a position, close to flexor carpi radialis tendon (fcr). MN = median nerve, ft = flexor digitorum tendons.



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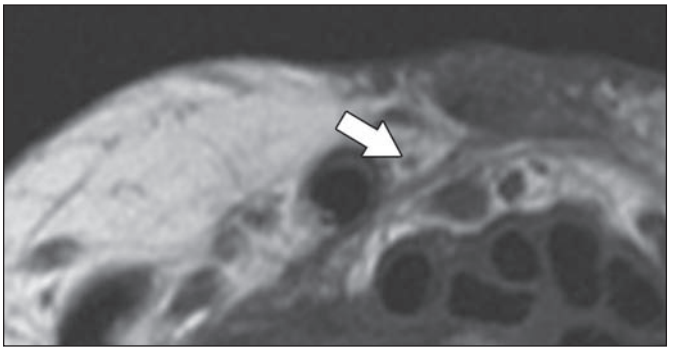

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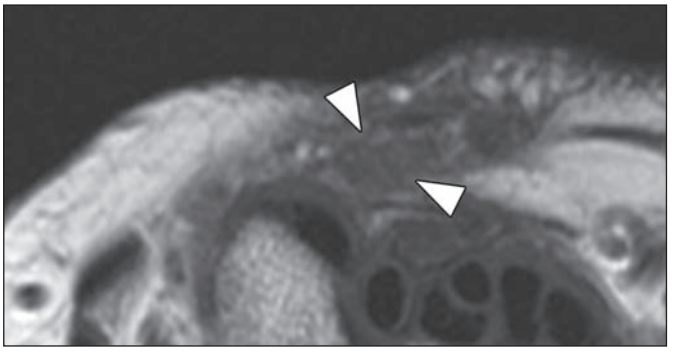

C

Fig. 5— 32-year-old woman with persistent sensory disturbances in territory of palmar cutaneous branch of median nerve (MN) distribution after penetrating injury at ventral wrist.
A, Longitudinal 17-5–MHz sonography image shows encasement of palmar cutaneous branch of MN (*arrow*) by hypoechoic scar tissue (*arrowheads*).
B and **C,** Proximal (**B**) and distal (**C**) axial spin-echo T1-weighted MR images (TR/TE, 600/20) obtained over palmar cutaneous branch of MN (*arrow*, **B**) show continuity of nerve with hypointense mass (*arrowheads*, **C**). Unlike sonography, MRI is unable to correctly depict nature of this mass—that is, if it is scar tissue encasing nerve or if it is stump neuroma.

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along the thenar skin crease extends too radially at the level of the wrist crease [6].

A period of local numbness perceived immediately after surgery may provide an initial clue that the palmar cutaneous branch of the MN is injured. Later, development of a painful neuroma can be particularly distressing for the patient because it can significantly prolong disability time and result in severe impairment of hand function.

Diagnosis of involvement of the palmar cutaneous branch of the MN after carpal tunnel release may be challenging. Persistent pain may, at times, be mistakenly attributed either to failure to completely decompress the MN itself or to formation of fibrous adhesions between the cut edges of the retinaculum and the epineurium of the MN when, in fact, the patient's symptoms are due to a neuroma of the palmar cutaneous branch of the MN [6]. Although electrophysiology of the palmar cutaneous branch of the MN seems encouraging as a means to diagnose neuropathy of the palmar cutaneous branch of the MN, there is relatively poor experience in this field [4, 10] and there is a lack of prospective studies correlating functional palmar cutaneous branch of the MN abnormalities with the results of carpal tunnel release. In these patients, high-resolution sonography can, therefore, aid in distinguishing involvement of the palmar cutaneous branch of the MN from other postsurgical complications to suggest the most appropriate surgical strategy for managing painful neuromas or persistent compression of the palmar cutaneous branch of the MN after surgical release. Implantation of the palmar cutaneous branch of the MN into the pronator quadratus muscle or stripping the whole branch from the MN is the procedure of choice to treat painful neuromas of the palmar cutaneous branch of the MN [11, 12].

Although the palmar cutaneous branch of the MN is theoretically not affected in carpal tunnel syndrome because it does not pass through the carpal tunnel, four patients in our series presented with concurrent entrapment of the palmar cutaneous branch of the MN at the point of fascial crossing and carpal tunnel syndrome. This relatively high proportion of cases seems to contradict the scanty reports of compression neuropathy of the palmar cutaneous branch of the MN concomitant with carpal tunnel syndrome in the literature [4, 13–16]. Nevertheless, the opinion that compression of the palmar cutaneous branch of the MN is probably more common than previously thought is gaining credit [17]. Based on electrophysiologic testing, some authors recently reported that nearly 50% of the palmar cutaneous branches of the MN had abnormal sensory nerve conduction in patients with carpal tunnel syndrome [10]. This surprising result of frequent abnormalities of the palmar cutaneous branches of the MN encountered in patients with carpal tunnel syndrome may help to explain, at least in part, why patients with carpal tunnel syndrome often show sensory involvement beyond the classical MN sensory borders of MN neuropathy [18, 19]. In addition, a lack of experience with nerve-conduction studies of the palmar cutaneous branch of the MN and the fact that clinical signs are not always reliable, owing to the fact that sensory distribution of the main MN and the palmar cutaneous branch of the MN overlaps extensively, may contribute to the underreported prevalence of lesions of the palmar cutaneous branch of the MN in association with carpal tunnel syndrome.

From a pathophysiologic point of view, explanations of possible underlying causes of abnormalities of the palmar cutaneous branch of the MN in patients with carpal tunnel syndrome have been suggested. The anatomic evidence is that, first, the palmar cutaneous branch of the MN traverses a fascial tunnel in direct continuity with the proximal flexor retinaculum, which also makes it susceptible to entrapment therein; and, second, the abnormally restricted mobility of the compressed

MN in the tunnel could result in strain and subsequent damage of the palmar cutaneous branch of the MN [10].

In the present study, high-resolution sonography detected focal abnormalities of the palmar cutaneous branch of the MN at the level of fascial crossing, thereby confirming that entrapment occurs at that site. Three patients in our series who had undergone previous carpal tunnel release also showed enlargement of the palmar cutaneous branch of the MN at the fascial crossing point. It was unclear in these cases if the onset of symptoms related to the palmar cutaneous branch of the MN was the result of nerve distortion and straining within the released fascia or, more likely, if it reflected an unrecognized compression already established before surgery. Also, it remains unclear whether the two entrapment neuropathies were independent or associated events. Apart from these considerations, nerve entrapment related to fascial passageways is not a peculiar condition of the palmar cutaneous branch of the MN but also has been described for the lateral femoral cutaneous nerve in the pelvis and the superficial peroneal nerve in the lateral leg [20, 21].

On the whole, our data suggest that evaluation of the palmar cutaneous branch of the MN should be included as part of the conventional sonographic examination for carpal tunnel syndrome. Preoperative detection of coexistent involvement of the palmar cutaneous branch of the MN with concomitant carpal tunnel syndrome would lead the hand surgeon to perform additional neurolysis of the palmar cutaneous branch of the MN and a wider excision of the antebrachial fascia. These modifications to the surgery would reduce the risk of persistent symptoms related to the palmar cutaneous branch of the MN after surgery that may cause the patient to believe that carpal tunnel release was badly done.

In our study, the high-resolution provided by a 17-5–MHz transducer allowed us to identify the palmar cutaneous branch of the MN in 83% of wrists. Missing cases could be related to the intrinsic small size of the palmar cutaneous branch of the MN, even if unexpected anatomic variants, agenesis, or abnormal nerve course and origin were unrecognized due to our lack of experience. In addition, the ability of diagnostic sonography to depict the palmar cutaneous branch of the MN may be underestimated in our study given the strict scanning technique used in which the nerve was identified in one plane only.

Because of the larger size of diseased palmar cutaneous branches of the MN compared with normal palmar cutaneous branches of the MN, nerve abnormalities were unexpectedly recognized even when using a lower frequency (12-5–MHz) (data not shown). Even without clearcut depiction of the nerve bundle, a diseased nerve could theoretically be excluded using diagnostic sonography if a focal hypoechoic mass does not appear while sweeping the probe up and down over the area between the FCR tendon and the MN.

High-resolution sonography provides some advantages to image the palmar cutaneous branch of the MN over MRI, including higher spatial resolution and better contrast resolution to isolate the nerve from surrounding soft tissues. For this difficult application, the requirements of MRI are availability of high static and gradient fields; high-end technology surface coils; and, most importantly, absolute immobilization of the patient, which is not easy to achieve. Given these requisites, identification of the palmar cutaneous branch of the MN on MRI requires the presence of some amount of fatty tissue surrounding the nerve and acquisition of scanning planes oriented perpendicular to the nerve axis, and both conditions cannot always be met.

This study is only a pilot study with some limitations related to the small series of patients, the absence of comparison between normal sonographic and histologic findings at cadaveric dissection, and the lack of surgical controls for all cases presented. We can conclude, however, that the palmar cutaneous branch of the MN can be added to the list of nerves for which high-resolution sonography is able to identify and characterize a spectrum of abnormalities. In this clinical setting, sonography may help to explain the occurrence of persistent sensory disturbances over the thenar aspect of the proximal palm, especially in patients who have undergone carpal tunnel release. Sonography may distinguish this condition from other complications of wrist surgery and can provide guidance for resection of painful neuromas arising from this small nerve branch. Further studies are needed to determine if the sonographic findings of an abnormal palmar cutaneous branch of the MN can potentially alter the surgical strategy in patients with carpal tunnel syndrome.

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