Median nerve fascicular anatomy at the wrist demonstrated by nerve ultrasound

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BACKGROUND

The internal anatomy of the upper-limb nerves was investigated with micro-dissection by the seminal work of Sunderland. More recent autopsy studies further explored the fascicular anatomy of the median nerve (MN) and confirmed a radial-to-ulnar sensory and motor arrangement of nerve fascicles at the wrist.

AIM OF THE STUDY

To report two patients with partial MN damage, in whom sensory neurography and ultrasound documented asymmetrical involvement of the nerve involving its ulnar and radial sectors, respectively.

CASE REPORTS

Patient 1 was a 22 year-old man with a penetrating lesion of the wrist because of a glass fragment. He reported sensory loss and paraesthesia involving the ulnar side of the index, the middle and the radial side of the ring finger with no motor symptoms. Median sensory neurography showed markedly reduced ring finger sensory nerve action potential (SNAP), absent middle finger SNAP and slightly reduced, but still in normal range, index finger SNAP (Figure 1A). Motor neurography showed normal thenar compound muscle action potential (cMAP) and absent cMAP in the second lumbrical muscle. Ultrasound (US) documented enlargement and loss of fascicular appearance of the ulnar sector of the MN (Figure 1B).

Patient 2 was a 29 year-old man who underwent a cut at the wrist. He reported sensory loss in the radial part of the palm and the first finger and reduced thenar muscle strength. Median neurography showed the absence of thumb finger SNAP (Figure 1C), palmar cutaneous branch SNAP and thenar cMAP. US demonstrated enlargement and loss of fascicular appearance of the radial sector of the MN (Figure 1D).

Martin-Gruber anastomoses was ruled out in both patients. Both patients gave written informed consent for the present report.

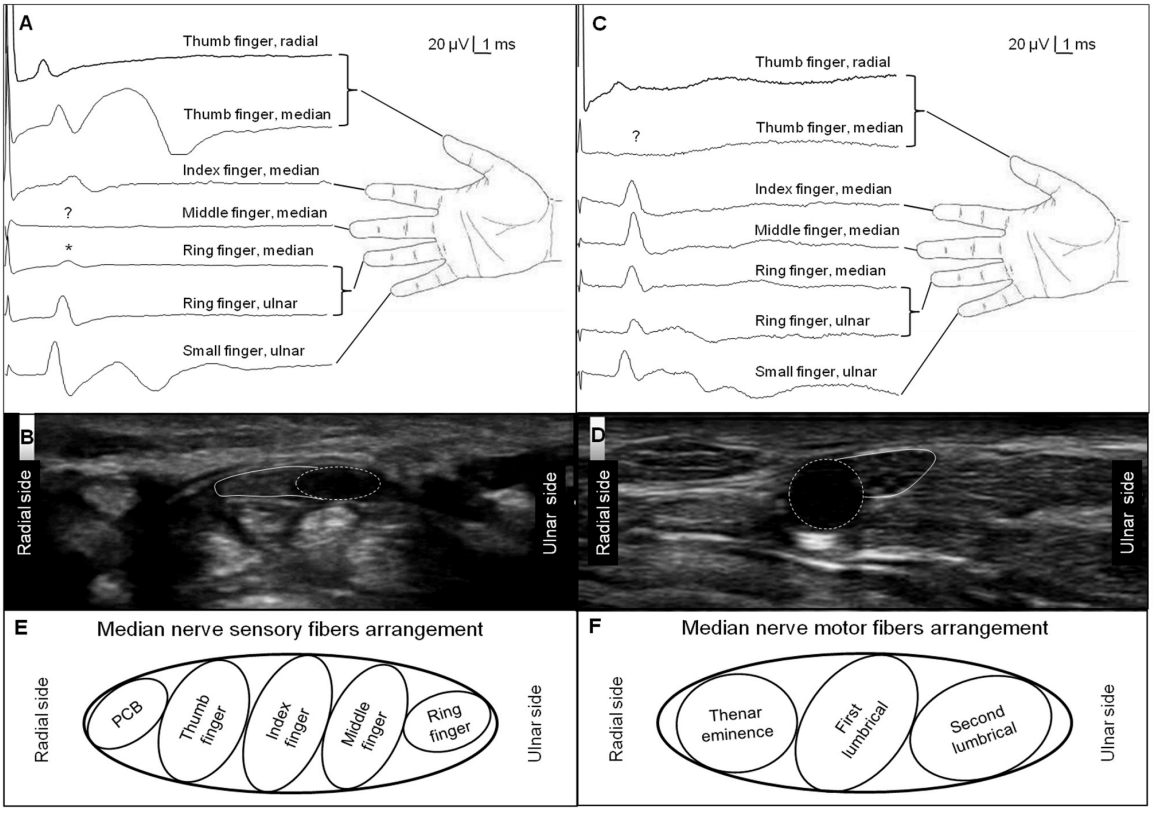

Figure 1. A, C. Sensory nerve action potentials (SNAPs) to stimulation of the radial, median and ulnar nerve at the wrist in patient 1 (panel A) and 2 (panel C). ? marks the absent middle finger SNAP in patient 1 (panel A) and the absent thumb finger SNAP in patient 2 (panel C). * marks the markedly reduced ring finger SNAP in patient 1 (panel A). B, D. Median nerve (MN) ultrasound at the wrist documented loss of fascicular appearance in the ulnar sector of the nerve in patient 1 with MN cross sectional area (CSA) = 19 mm2 and enlarged fascicle CSA = 11 mm2 (panel B) and in the radial sector in patient 2 (MN CSA = 17 mm2, enlarged fascicle CSA = 11 mm2, panel D). Continuous lines indicate the normal MN and dashed line mark the enlarged fascicles. E,F. MN sensory (panel E) and motor (panel F) fibers arrangement according to anatomical studies. PCB = palmar cutaneous branch.

COMMENT

The two patients reported here underwent traumatic lesion at the wrist. Clinical history and examination suggested partial MN damage. Neurography and ultrasound confirmed selective MN fascicular lesion, involving its ulnar and radial sectors, respectively. In both cases, anatomical continuity of the nerve was preserved. Despite their small number, the present cases confirmed in vivo the seminal autopsy study on the fascicular arrangement of MN at the wrist reported by Sunderland, whose findings were explored in more details by recent cadaveric dissection reports. They also confirms that MN fascicular somatotopy is preserved not only proximally, as documented with magnetic resonance neurography in spontaneous anterior interosseus nerve syndrome, but also distally. Fascicular nerve anatomy offer the basis for surgical nerve repair and functional electrical stimulation. Injury involving only part of the nerve does not necessarily imply that recovery can be expected and surgical fascicular repair may be indicated in such cases. Clinical neurophysiology and ultrasound may offer converging and complementary pieces of information in the study of peripheral nerves and their lesions. Nerve ultrasound represents a promising tool not only for the non-invasive exploration of the pathogenesis of peripheral nervous system diseases, but also for guiding surgical decisions.