

Ultrasonographic Risk Assessment of Injury to Palmar Cutaneous Branch of Median Nerve: Pilot Study

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Introduction

The palmar cutaneous branch of the median nerve (PCBMN) is the last collateral branch of median nerve (MN) given off in the distal forearm. Several cadaveric studies have shown that invasive procedures in wrists including volar locking plates, carpal tunnel injection or endoscopic carpal tunnel release have a risk of damage to PCBMN. The aim of this study was to evaluate the relationship between the PCBMN and surrounding anatomical structures by using high-resolution ultrasonography (HRUS) to assess the risk of injury and suggest safe approaches minimizing the risk in various interventions performed on the wrist.

Method

The volar wrists of 8 healthy volunteers without symptoms suggesting neuropathy of PCBMN or MN were examined with HRUS. The scanning technique relied on images obtained in transverse plane between MN and the flexor carpi radialis tendon (FCR). To better recognize PCBMN, the examiner performed dynamic scanning by sweeping the probe slowly up and down over its course (Figure 1). After identifying course of PCBMN, we measure the distance between PCBMN and other anatomical structure including palmaris longus tendon (PL) and flexor carpi radialis tendon (FCR) at the bistyloid line (BSL), and then the distance between origin of the PCBMN from MN and BSL was measured (Figure 2). The depth of PCBMN from skin at BSL and origin of PCBMN were also measured. All measured distances were calculated by caliper mode of HRUS device. At the BSL, the cross-sectional area (CSA) of PCBMN was measured by continuous trace mode.

Results

HRUS was able to depict the PCBMN in 14 (88%) of the 16 wrists. All morphometric measurement data by scanning HRUS were shown in Table 1. The CSA of PCBMN was $0.63 \pm 0.15 \text{ mm}^2$ at BSL. The PCBMN appeared from the radial aspect of the median nerve in all cases. The PCBMN branched off from the radial aspect of the MN at $4.69 \pm 0.89 \text{ cm}$ proximal to the BSL and tracked radially toward the FCR. The PCBMN ran within the ulnar edge of the sheath of the FCR but did not cross the tendon in this study. The PCBMN became more superficial and perforated the antebrachial fascia between the FCR laterally and PL medially. The PCBMN was located at $3.85 \pm 0.56 \text{ mm}$ on the ulnar aspect of the FCR, and at $7.54 \pm 0.36 \text{ mm}$ (center to center) or $2.10 \pm 0.40 \text{ mm}$ (end to end) on the radial aspect of the PL at the BSL. The depth of PCBMN from skin at BSL was $1.92 \pm 0.41 \text{ mm}$. The depth of PCBMN from skin at the origin was $5.55 \pm 0.99 \text{ mm}$.

Conclusion

This is the first ultrasonographic study to investigate the relationship between PCBMN and surrounding anatomical structures related to invasive procedures in wrist. HRUS can identify the PCBMN and provide its relationship with other anatomical structures. This study provides the data that can predict the location of PCBMN, which will help avoid injury of PCBMN during invasive procedures performed on the wrist.

Table 1. Morphometric data of PCBMN

Morphometric measurement	Mean \pm SD
CSA of PCBMN (mm ²)	0.63 \pm 0.15
Depth at BSL (mm)	1.92 \pm 0.41
FCR to PCBMN (mm)	3.85 \pm 0.56
PL to PCBMN (center to center, mm)	7.54 \pm 0.36
PL to PCBMN (end to end, mm)	2.10 \pm 0.40
Origin to BSL (cm)	4.69 \pm 0.89
Depth at origin (mm)	5.55 \pm 0.99

CSA cross-sectional area, PCBMN palmar cutaneous branch of the median nerve, BSL bistyloid line, FCR flexor carpi radialis, PL palmaris longus

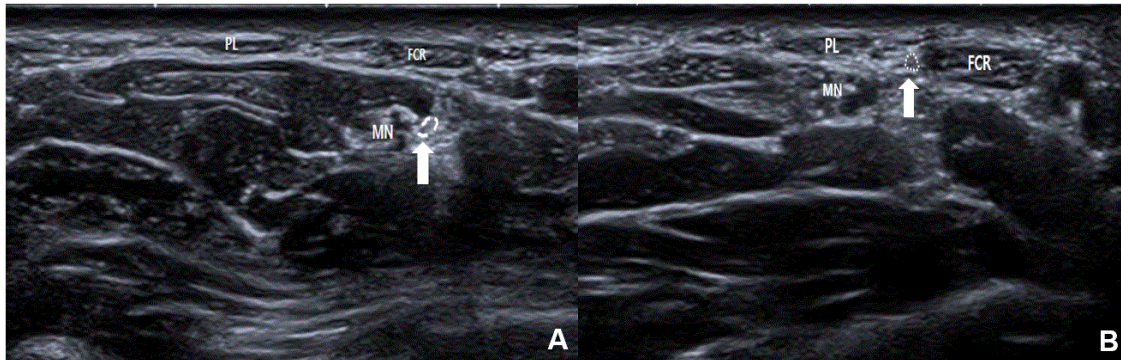


Fig. 1. Transverse scan obtained at from proximal to distal over PCBMN (arrow head) A, transverse scan at origin level. B, transvers scan at BSL level. PCBMN palmar cutaneous branch of the median nerve, BSL bistyloid line

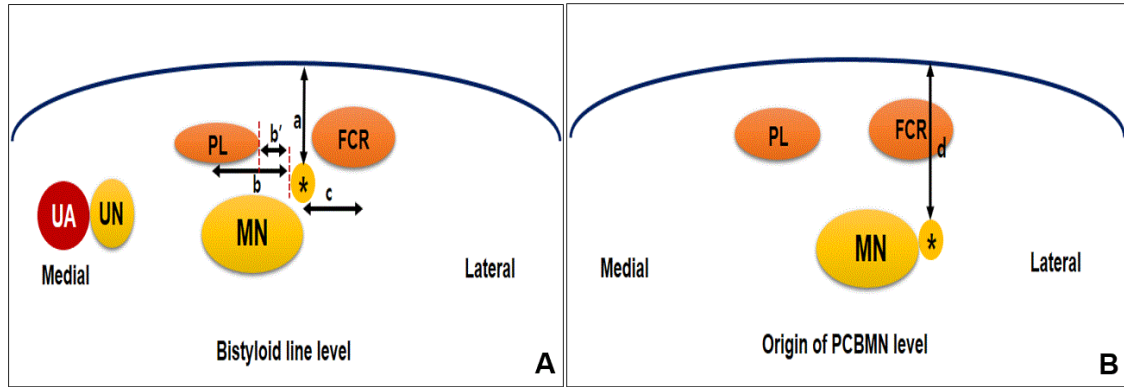


Fig. 2. Schematic diagram of PCBMN and other anatomical structures in transverse scan A, Diagram at BSL level. a: depth of PCBMN from skin, b: horizontal distance of PL to PCBMN (center to center), b': horizontal distance of PL to PCBMN (end to end), c: horizontal distance of FCR to PCBMN (center to center) B, Diagram at origin level. d: depth of PCBMN at origin level from MN PCBMN palmar cutaneous branch of the median nerve, BSL bistylloid line, PL palmaris longus tendon, FCR flexor carpi radialis tendon, MN median nerve, UN ulnar nerve, UA ulnar artery