

Intracarpal tunnel pressure in patients with carpal tunnel syndrome and the effects of mini-open carpal tunnel release

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INTRODUCTION

- Elevated intracarpal tunnel pressure is considered a pathomechanism of carpal tunnel syndrome (CTS).
- The non-uniform shape of the carpal tunnel may be responsible for varying intracarpal tunnel pressure.
- When conservative treatments fail to relieve CTS symptoms, carpal tunnel release surgery is often performed.

OBJECTIVE

- The purpose of this study was to investigate intracarpal tunnel pressure at varying anatomical locations and to examine the pressure change associated with mini-open carpal tunnel release (MOCTR).
- We hypothesized that (1) intracarpal tunnel pressure would be dependent on specific anatomical locations within the carpal tunnel, and (2) MOCTR would reduce this pressure in CTS patients.

METHODS

- Six patients (7 hands: 3L, 4R; mean age 52.0 yrs)
- Patients' forearms were fully supinated with **their hand/wrist resting in a neutral position**
- Before MOCTR, palpation was performed to identify three standardized pressure measurement locations: hook of hamate (HH), proximal pisiform (PP), and midpoint (MP) between PP and HH
- After making a 1.0-1.5 cm palmar incision, a pressure catheter was introduced at the distal end of the carpal tunnel and advanced to the PP (Figure 1)
- The catheter was retracted measuring pressure at each location three times (Figure 1)
- MOCTR was performed according to standard procedures, and pressure recordings were repeated (Figure 2)
- A Wilcoxon signed-rank test and Friedman RMANOVA on ranks analyzed the effects of tunnel location (PP, MP, HH) and surgical release (pre- and post-MOCTR) on intracarpal tunnel pressure



Figure 1. A Mikro-Cath catheter (Miller Instruments Inc, Houston Texas, USA) was inserted into the carpal tunnel to measure intracarpal tunnel pressure



Figure 2. A universal carpal tunnel knife guide (Innomed, Savannah, GA, USA) was placed within the carpal tunnel to assist a KnifeLight (Stryker Leibinger GmbH & Co. KG, Freiburg, Germany) in performing the MOCTR

RESULTS

- Before MOCTR, the pressure at the HH was the highest at 37.1 (SD 19.3) mmHg, and the pressure at the PP was the lowest, 23.4 (SD 21.6) mmHg (Figure 3)
- Statistical analyses showed that pressure at the HH and MP were significantly higher than the PP pre-MOCTR ($p < 0.05$)
- The mean intracarpal tunnel pressures were 29.6 (SD 18.9) mmHg before MOCTR, and significantly decreased to 7.1 (SD 8.2) mmHg after MOCTR ($p < 0.05$) (Figure 3)

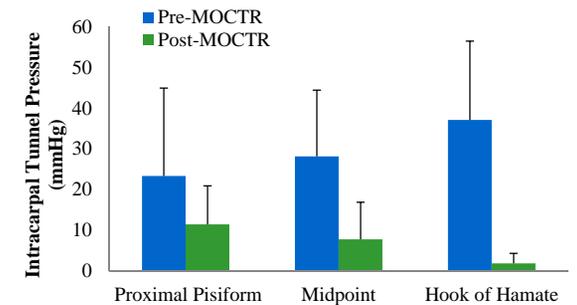


Figure 3. Mean intracarpal tunnel pressure at three locations. Error bars indicate +1 SD

DISCUSSION

- Intracarpal tunnel pressure tended to be the highest at the HH for CTS patients, although more data is needed to confirm statistical significance
- This finding suggests that pressure may be greatest where the carpal tunnel is narrowest, at the hook of hamate level
- We confirmed that MOCTR reduced elevated intracarpal tunnel pressure to within normal physiological range (< 10 mmHg), indicating that MOCTR is an effective surgical approach to treat CTS