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Surgery: A Case Report

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Motor Sparing Nerve Blocks can improve the Results of Digit Tendon Surgery: A Case Report

Short title: Wrist Blocks improve the Results of Digit Tendon Surgery

Imré Van Herreweghe, MD¹, Pieter Caekebeke, MD², Angela Lucia Balocco, MD^{1,3}, Sam Van Boxstael, MD^{1,3}, Admir Hadzic, MD, PhD¹

¹Department of Anesthesiology, Ziekenhuis Oost-Limburg, Schiepse Bos 6, 3600 Genk, Belgium

²Department of Orthopedics and Traumatology, Ziekenhuis Oost-Limburg, Schiepse Bos 6, 3600 Genk, Belgium

³UHasselt, Faculty of Medicine and Life Sciences & Limburg Clinical Research Centre, 3590 Diepenbeek, Belgium

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Corresponding author:

Imré Van Herreweghe

Department of Anesthesia

Ziekenhuis Oost-Limburg

Schiepse Bos 6

3600 Genk

Belgium

imrevanherreweghe@gmail.com

IVH: this author helped with the drafting and revision of the manuscript

PC: this author helped with the drafting and revision of the manuscript

ALB: this author helped with the drafting and the revision of the manuscript

SVB: this author helped with the drafting and the revision of the manuscript

AH: this author helped with the drafting and the revision of the manuscript

ABSTRACT

A 56-year old woman presented with flexion dysfunction of the fifth digit 6 weeks after surgical repair of a flexor digitorum profundus laceration. She was scheduled for surgical adhesiolysis and restoration of the functionality of the finger. Intraoperative monitoring of the range of motion by active flexion was deemed important to prevent incomplete release of the tendon and residual dysfunction. A distal median and ulnar nerve block were used for anesthesia, with the patient's ability to flex the finger. This case suggests that motor sparing peripheral nerve blocks can improve functional outcome in certain hand surgeries.

GLOSSARY OF TERMS

No abbreviations were used in the manuscript.

INTRODUCTION

Post-surgical stiffness of the fingers is a possible side effect after hand surgery. A common mechanism for this complication is the irreversible soft tissue fibrosis decreasing functionality of the respective finger. Tendon adhesions may lead to flexion or extension deficits, depending on the involved tendon. Early joint mobilization is advised to prevent postoperative contractures, but is not guaranteed. Stiff fingers can be treated with nonoperative and operative techniques. When a conservative approach is unsuccessful, a surgical release is indicated to restore functionality.

(1)

The use of peripheral nerve blocks for hand surgery is a common practice and the advantages over general anesthesia are well described in the literature. The use of ultrasound guidance and objective monitoring allow for a more accurate and reproducible quality of anesthesia and may decrease the nerve block complications. The overall incidence of permanent peripheral nerve injury appears to be very low. (2) Moreover, distal nerve blocks may be associated with even less risk since they have a higher connective tissue to neural tissue ratio, possibly decreasing the risk of needle-nerve injury. (3) In our practice, distal peripheral nerve blocks are routinely used for hand and finger surgery for their faster recovery times, postoperative analgesia, and faster turnover times between cases, as all nerve blocks are performed outside the operating room (block room). However, search of the literature in the English language did not reveal any studies or case descriptions on the use of distal upper extremity nerve blocks for intraoperative monitoring of the functional outcome during tendon surgery of the hand. By blocking only the terminal branches of the brachial plexus, the motor function of the flexors and extensors of the hand is preserved for intraoperative testing of tendon integrity and fingers flexibility, while providing complete anesthesia for the surgical procedure. We share our case report with the readership to promote the use of motor-sparing nerve blocks of the upper extremity to monitor intraoperative functional outcomes.

PATIENT CONSENT

The patient consented for this case report (written consent available on file upon request).

REPORT

We describe a case of a 56-year old woman admitted with a flexion dysfunction of the fifth digit, 6 weeks after a surgical repair of a flexor digitorum profundus laceration. The flexion deficit occurred despite the previous surgical repair and physiotherapy. The resulting functional deficit

required reoperation, exploration, and release of the adhesions and fibrotic tissue that had formed within the flexor tendon sheath. In preparation for the surgery, preoperative physiotherapy was performed to optimize passive mobility, as the passive range of motion prior to the tenolysis is important to achieve full active range of motion.

Median and ulnar nerve blocks were performed just proximal to the wrist crease for anesthesia. American Society of Anesthesiologists standard monitoring was applied during the block procedure. The patient was positioned with the hand exposing the volar surface of the wrist and the skin was prepared using a chlorhexidine 0.5% solution. A sterile drape was positioned under the forearm and hand. The two blocks were performed using a high-frequency linear ultrasound probe (13-6MHz; HFL38; SII; SonoSite, Bothell, WA) protected with a sterile cover and an injection pressure monitor (B-Smart; B. Braun Melsungen AG, Germany) standardized the injection force (<15 psi). To block the median nerve, the probe was positioned in a transverse orientation at approximately 5 cm proximal from the wrist crease where the nerve was identified just beneath the superficial flexors of the hand (Fig 1). A 25 gauge needle (25G x 1^{1/2}", 0.50 x 40 mm BL/LB, Sterican, BBraun) was inserted using an in-plane technique, and 5 mL of lidocaine 2% was injected after confirmation of the correct needle position within the fascial plane containing the nerve. To block the ulnar nerve, the probe was moved towards the anteromedial aspect of the forearm keeping the same transducer orientation and the same distance from the wrist. The ulnar nerve was identified medial to the ulnar artery and next to the tendon of the flexor carpi ulnaris muscle (Fig 2). The needle was inserted using an in-plane technique and 5 mL of lidocaine 2% were injected after confirmation of the correct needle tip position.

(FIGURE 1)

(FIGURE 2)

During surgery, the tourniquet was placed at the level of the lower arm and inflated. A Brunner incision was made by the surgeon over the volar aspect of the 5th digit. The A2 and A4 tendon pulley were kept intact. The A1, A3 and A5 pulley were opened to expose the flexor tendon. The fifth digit's flexor tendon was explored and released from the surrounding tissue by means of sharp dissection and blunt dissection under the A2 and A4 pulley. Suture dissection helped to free the tendon under the pulleys. The surgical repair had healed. During surgery, active testing of the flexor tendon was performed by asking the patient to open and close the hand at the surgeon's request. Active and dynamic intraoperative evaluation of the flexor tendon allowed detection of residual adhesions that prompted additional cleaning around the tendon until complete functionality was achieved (Fig 3).

(FIGURE 3)

DISCUSSION

A block of the median and ulnar nerves can provide complete anesthesia of the fifth digit without a motor impairment if the blocks are performed distal to the muscular innervation of the flexors of the hand and digits. Consequently, the patient was able to flex and extend the finger on request as the surgeons explored the flexor tendon. This particular case re-emphasizes the need for intraoperative testing and specific loco-regional anesthesia techniques that avoid motor block of finger flexors and allows intraoperative testing of the tendons function. This is because even after the surgical release and when the operation was considered completed, the active flexion evaluation detected residual adhesions that required additional release of the flexor tendon for the complete restoration of the hand function. An incomplete repair would require readmission and additional surgery.

In conclusion, specific distal peripheral nerve blocks of the upper extremity can be used for surgical anesthesia, while allowing active intraoperative motor evaluation of the digits. Moreover, the intraoperative evaluation and cooperation of the patient was crucial to achieve a good surgical outcome.

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FIGURE LEGENDS

Fig-1. Median nerve (MN) block at the level of the wrist; transducer position and sonoanatomy. FPL, flexor pollicis longus muscle; FDS, flexor digitorum superficialis muscle; FDP, flexor digitorum profundus muscle. (source: <https://app.nysora.com/>)

Fig-2. Ulnar nerve (UN) block at the level of the wrist; Reverse Ultrasound Anatomy with needle insertion in-plane and local anesthetic spread (blue). UA, ulnar artery; FCU, flexor carpi ulnaris muscle; FDP, flexor digitorum profundus muscle; FDS, flexor digitorum superficialis muscle. (source: <https://app.nysora.com/>)

Fig-3. Intraoperative testing of the finger and hand function documenting the complete restoration before the wound closure.