



Distal Nerve Exploration in the Palm Avoids Nerve Transfer in a Posttraumatic Ulnar Nerve Injury with a Claw Hand

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Abstract

Posttraumatic low ulnar nerve injuries develop claw hand and poor hand function. Transferring the opponens pollicis branch of the thenar branch at the palm to the terminal division of the deep branch of the ulnar nerve is an effective distal nerve transfer to restore pinch in low ulnar nerve injuries. The author describes the surgical technique for a 4-month-old low ulnar nerve injury in a 25-year-old man with inconclusive electrodiagnostic findings and no clinical findings of distal nerve recovery. The intraoperative electrical stimulation of the nerve in the palm is a simple method to ensure the reinnervation of the ulnar nerve in a claw hand and muscle wasting. Therefore, all postcut injuries with a low ulnar nerve palsy with claw hands may not need a distal nerve transfer. However, performing distal nerve exploration in the palm is vital in cases of doubtful nerve recovery in a low ulnar nerve palsy with a claw hand.

Keywords

- ▶ low ulnar nerve palsy
- ▶ claw hand
- ▶ nerve transfer
- ▶ nerve exploration

Introduction

Recently, authors have preferred distal nerve transfer for low ulnar nerve injuries with a claw hand over tendon transfer.^{1,2} Though the tendon transfer corrects the claw hand, independent finger movements are not achieved. Unlike one tendon-one function, the distal nerve transfer reinnervates many muscles and executes multiple finger functions (thumb adduction, finger abduction/ adduction). Also, the distal nerve transfer effectively directs the maximum axonal counts to the terminal divisions of the deep branch of the ulnar nerve (TDDBUN) that supply the first dorsal interosseous (FDI) palmar interosseous and adductor pollicis (ADP). The transfer of the opponens pollicis brevis (OPB) branch of the median nerve to the TDDBUN successfully reinnervates the first webspace muscles and preserves the bulk and contour.¹ There are

situations where the ulnar nerve recovery is uncertain following a nerve injury at the elbow. In these conditions, surgeons prefer to explore the ulnar nerve at the elbow and a simultaneous distal nerve transfer in the palm. We report a case with inconclusive clinical and electrodiagnostic findings of a 25-year-old man with a 4-month-old low ulnar nerve injury with a claw hand and poor hand functions.

Case Report

A 25-year-old man came with a 4-month-old right elbow cut injury with muscle wasting and a claw hand. The pinch and grasp were weak because of ADP and interossei wasting. The Bouvier's test, Froment's, Wartenberg, and Pitres-Testut signs were positive, suggesting ulnar nerve palsy with a sensory loss in the ulnar nerve distribution. Ulnar motor

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nerve conductions to the flexor carpi ulnaris revealed distal latency of 5.1 ms, an amplitude of 4.4 mV, and a conduction velocity of 36 m/s at the elbow and no conduction findings below the elbow. Since the patient had worsening hand grip and pain, the author explored the ulnar nerve through a medial elbow incision. The nerve had a neuroma in continuity with a weak response to electrical stimulation. Neurolysis of the ulnar nerve was done and transposed submuscularly. The transposed ulnar nerve showed perceptible flexor carpi ulnaris contractions and weak contractions in the hypothenar muscles. So, the anterior interosseous nerve transfer to the distal motor branch of the ulnar nerve was deferred. The author decided to transfer the motor branch of the opponens pollicis to the TDDBUN for pinch construction (► **Video 1**).

Video 1

Surgical technique of exploring the terminal branches of the ulnar and median nerve in recovering low ulnar nerve palsy. Online content including video sequences viewable at: <https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0043-57031>.

The right hand was draped with a sterile tourniquet on the right arm. A zigzag incision was made over the carpal tunnel, the thenar region, and the first webspace. The carpal tunnel was released, and the motor branch of the median nerve was identified. The motor branch to the lumbrical was identified and stimulated to visualize the contractions. Medial to the flexor tendons lie the ADP muscle. This flexor tendon retraction facilitated a better view of the two heads of the ADP (transverse and oblique head). Identifying a thin tendinous white line between the two differently oriented adductor muscles showed a narrow fatty strip that contains the TDDBUN. The thenar branch arises from the median nerve anteroradially in the distal part of the retinaculum (palm). In this case, the branch bifurcated into two branches supplying the OPB and a separate branch for APB. Again, the nerve stimulation confirmed the muscle contractions.

Reconstruction

The ulnar nerve stimulation at the elbow showed strong flexor carpi ulnaris, weak hypothenar contractions, and poor response from the adductor and the interossei muscles. The palm exploration and stimulation of the terminal branch of the ulnar nerve stimulation showed weak contractions of adductor muscles and first, second, and palmar interossei. This also confirmed the neural conduction and ulnar nerve reinnervation in the distal-most muscles of the hand. Therefore, the author did not perform the distal OPB nerve to TDDBUN nerve transfer.

Outcome

Contrary to the clinical and electrodiagnostic findings, the intraoperative nerve stimulation showed a recovering low ulnar nerve palsy. The patient had no distal nerve transfer for the ulnar nerve palsy with a claw hand. The patient recovered from the ulnar nerve palsy and started back to work 12 months after the surgery. During the follow-up, the pinch grip was 75% contralateral, and the grasping strength was 70%. The first webspace bulk (fat caliper) and little finger abduction (Medical Research Council (MRC) grade 4/5) were also improved. The Froment's sign was negative in the final follow-up. The little finger monofilament perception was 2.0. The patient had no weakness or pain in the follow-up.

Discussion

The transfer of the OPB branch to the TDDBUN successfully reinnervates the first webspace muscles and preserves the bulk and contour.¹ In addition, the grasp and the pinch strength improve in the follow-up. Unfortunately, little is known about reconstructing the postinjury low ulnar nerve injury with a claw hand and distal muscle wasting, inconclusive clinical, and electrodiagnostic with an intraoperative neuroma in continuity.

In this case, the scar tissue formation around the ulnar nerve in the elbow slowed the axoplasmic flow (nerve compression), effectively allowing nerve degeneration, nerve ischemia, and irreversible injury.² In addition, the neurolysis and anterior transposition effectively decompressed the ulnar nerve at the elbow. Distally, the palm exploration showed visible adductor and interossei contractions on stimulation. But the contractions were not as strong as the proximal ulnar nerve stimulation at the elbow. Therefore, it is difficult for surgeons to try supercharging with an end-to-side distal OPB to TDDBUN transfer. There needs to be literature on this too.

Also, the distal nerve transfer in the palm is better than waiting for the ulnar nerve to recover following anterior transposition, considering the worsening clinical presentation (pain and poor hand grip) and inconclusive electrodiagnostic findings. The time taken to reinnervate the distal hand is longer and less preferred when the distal nerve transfer of OPB to TDDBUN efficiently restores pinch and grasp functions. This was the reason the author chose palm exploration in this case.

But the exploration of the ulnar nerve in the palm and weak contractions of first webspace muscles reinforced the reinnervation of the ulnar nerve. The FDI and ADP functions improved in the follow-up. There was no loss of thumb abduction, and the hand weakness improved. The grasp and the pinch strength improved after this distal nerve transfer. The first webspace bulk improved, and the pinch strength (reinnervation of FDI and ADP) improved to 75% of the contralateral hand.

Despite a claw hand with features of low ulnar palsy and inconclusive electrodiagnostic studies, neuroma in continuity will improve after neurolysis, anterior transposition, and no distal nerve transfers in the palm. The palm exploration and

stimulation of the TDDBUN are vital before a nerve transfer. Therefore, all claw hands do not require distal OPB to TDDBUN transfer. Complete transection of the ulnar nerve and neuroma with no distal muscle contractions benefit from the distal nerve transfer.

Informed Consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

Ethical Approval Statement

Ethical approval for this study was obtained from Ethical Committed Board of Olympia Hospital and Research Centre Approved. No 06/2022.

Trial Registration

This clinical trial was not registered but followed ICMJE requirements.

Guarantor: TJJ

Authors' Contribution

T.J.J. researched literature and conceived the study. T.J.J. was involved in protocol development, gaining ethical approval, patient recruitment, and data analysis. T.J.J. wrote the first draft of the manuscript and approved the version to be published. All author(s) reviewed and edited the manuscript and approved the final version of the manuscript.

Conflict of Interest

None declared.

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