Ulnar nerve transection during Tommy John surgery: novel findings and approach to treatment

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Introduction

While iatrogenic injuries to peripheral nerves in sports-related surgeries are rare, the morbidity of a peripheral nerve injury can be substantial, particularly in the young, active patient population [8]. Medial ulnar collateral ligament (UCL) reconstruction with tendon graft (Tommy John surgery) is a safe and effective operative intervention in treating medial elbow instability in overhead throwing athletes [6, 9] and complications are rare. Ulnar nerve neurapraxia is the most commonly recognized nerve complication [4]. However, median nerve transection during tendon graft harvest has been reported [5, 7, 10, 11, 13]. We report the first documented case of a complete ulnar nerve transection following UCL reconstruction and present a novel surgical intervention to address this serious complication.

Case Report

A 19-year-old right hand-dominant male with medial UCL instability underwent UCL reconstruction. In the course of the surgical procedure, the ulnar nerve was inadvertently

transected approximately 8 cm proximal to the medial epicondyle. This injury was immediately recognized and a microsurgically trained surgeon was called to transpose and repair the ulnar nerve.

The treating surgeons contacted the senior author the following day, and a referral to our clinic was facilitated. The patient was seen 5 days postoperatively. The physical exam was limited by the patient's immediate postoperative pain and immobilization. There was no ulnar nerve function noted except for the question of some intrinsic muscle function. Surgical options were discussed and included the following: re-exploration of the ulnar nerve at the elbow to assess the repair and transposition, decompress the ulnar nerve at Guyon's canal, perform a profundus tenodesis from the third to the fourth and fifth profundi, and a nerve transfer from the anterior interosseous nerve (AIN) to the motor fascicular group of the ulnar nerve. Sensory nerve transfer was deferred in anticipation of eventual recovery of protective sensibility from the proximal repair.

Surgery took place on postoperative day 6, well after the 72-h period where residual neurotransmitter would still be present in the distal ulnar nerve. Any response to electrical stimulation of the deep branch of the ulnar nerve would imply the presence of a Martin–Gruber anastomosis. This finding would direct the nerve transfer surgery from an end-to-end [2] to an end-to-side to augment and preserve the Martin–Gruber contribution.

To minimize tourniquet time and allow electrical stimulation, Guyon's canal was explored first (Fig. 1). Electrical stimulation of the motor fascicles of the ulnar nerve produced a weak response in the intrinsic muscles (Video 1) and directed an end-to-side nerve transfer from the AIN to the ulnar motor fascicular group [1] (Fig. 2). Flexor tenodesis was performed as well to help

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Fig. 1 Preoperative photos. **a** The right arm prepped and draped with proposed incisions noted for a Guyon's canal release, anterior interosseous to ulnar motor nerve transfer, and a profundus tenodesis. **b** The small step incisions, where the palmaris tendon was harvested for the Tommy John surgery are noted. **c** Previous surgical incision from the ulnar nerve repair and transposition

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with grip strength (Fig. 3). The ulnar nerve repair and transposition site were examined and excellent surgical management confirmed (Fig. 4).

At 15 months postoperatively, pinch and grip were 15/70 lb on the right and 30/125 lb on the left. The visual analog scale (VAS) had decreased from 10/10 to 1/10. Ulnar nerve intrinsic/extrinsic motor function was present. Two years postoperatively, he has returned to his collegiate baseball team and ranks second in innings pitched.

Discussion

The occurrence of ulnar nerve injury during upper extremity surgery is not benign (Table 1). The most common complication of medial UCL reconstruction (Tommy John surgery) is postoperative paresthesia, which occasionally requires a secondary surgical procedure [3, 9, 12]. Given the proximity of the ulnar nerve in this procedure, postprocedure neuropathy is not surprising. This outcome has led to a large debate in the literature as to whether the ulnar nerve should be

Fig. 2 End-to-side anterior interosseous to ulnar motor nerve transfer. **a** The ulnar nerve was identified in the forearm. Distally, the ulnar nerve was decompressed through Guyon's canal and the deep motor branch was also decompressed. **b** The anterior interosseous was end-to-side transferred into the motor component of the ulnar nerve. Note that it is important to identify the dorsal cutaneous branch of the ulnar nerve (DCU) proximally in order to confirm that the motor fascicular group is located between the DCU and the ulnar sensory component

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Fig. 3 Flexor digitorum profundus tenodesis. The profundus tenodesis was performed between the ring and small finger profundus tendons and the long finger tendon. The patient had completely independent flexor digitorum profundus (FDP) tendon to the index finger and was not included in the profundus tenodesis. Three Ethibond sutures are noted. Tension is placed on the profundus to the ring and small finger to allow the normal profundus function to the long finger to motor the denervated profundus to the ring and small finger

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decompressed, transposed subcutaneously, or transposed into a submuscular or transmuscular plane. Our report is the first in

the literature to detail a complete transection of the ulnar nerve associated with this procedure. The patient's Martin–Gruber

Fig. 4 Exploration of ulnar nerve at the elbow. No tension along the course of the ulnar nerve and no distal kinking of the ulnar nerve were noted. The repair site below the blue background appeared excellent

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Table 1 Ulnar nerve injury by procedure [12, 14]

Rate of ulnar nerve injury by procedure	
Tommy John	6 %
Positioning for surgery	0.5 %
CABG radial artery graft	12 %
Crossed K-wires for supracondylar fracture	5–20 %
Distal humerus ORIF	5–13 %
Cubital tunnel decompression/transposition	5–12 %

anastomosis, use of an end-to-side nerve transfer, profundus tenodesis, and immediate surgical repair with transposition combined to provide this patient with an excellent functional result.

Complications are inevitable in surgery no matter the experience (in our case, a fellowship trained orthopedist) or precautions of the practitioner. Better care can be provided through knowledge of the potential pitfalls associated with this procedure and knowledge of surgical options for reconstruction of devastating high ulnar nerve injuries. The purpose of this report was twofold: (1) to increase awareness of surgeons and patients alike to this potential injury and (2) to suggest a surgical intervention to aid a meaningful functional recovery.

Conflict of Interest Benjamin Z. Phillips declares that he has no conflict of interest.

Christopher Stockburger declares that he has no conflict of interest.

Susan E. Mackinnon declares that she has no conflict of interest.

Statement of Human and Animal Rights No human subjects or animals were involved in this study.

Statement of Informed Consent No informed consent was obtained for this retrospective review.

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