

Intraoperative use of the Checkpoint stimulator to assess tendon transfers

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Introduction

Tendon transfers are used to restore function after nerve or muscle injury. Ensuring that the tension of the transfer is set correctly is critical to optimize surgical outcomes and prevent the need for revision surgery. Too tight of a transfer may limit motion, and too loose of a transfer will fail to restore the desired function. Traditionally, tension is set by assessing the relative position of the joints and tenodesis movement intraoperatively.

Case

We present a case demonstrating how intraoperative use of the Checkpoint® stimulator can augment these traditional techniques through direct stimulation and activation of the donor muscle. This allows the surgeon to assess the integrity of the transfer and demonstrates expected postoperative motion and outcomes.

A 7-year-old male was referred for a chief complaint of loss of right-sided wrist extension secondary to stroke during surgical resection of a left temporal brain tumor at one and a half years of age (Figure 1). This interfered with use of the hand for sports and limited tenodesis grasp. He had good passive wrist range of motion to neutral and a functioning brachioradialis. Passive wrist extension was limited by extrinsic finger and wrist flexor tightness.

To improve wrist extension, we first performed fractional lengthening of his extrinsic finger and wrist flexors. Active wrist extension was then restored with a brachioradialis (BR) to extensor carpi radialis brevis (ECRB) tendon transfer. The BR was freed from the surrounding fascial attachments until adequate excursion could be achieved. This was then transferred to the ECRB with the



FIGURE 1. Preoperative demonstration of wrist extension.

elbow flexed to 90 degrees and the wrist extended and inset at its resting length using three Pulvertaft weaves secured with 3-0 Ethibond. He had good passive wrist flexion with the elbow flexed and came into extension as the elbow was extended. The Checkpoint stimulator was then used to simulate postoperative function and to confirm proper tension of the transfer (Figure 2). This is done by stimulating the donor BR muscle near the insertion of the motor branch at 20mA and gradually increasing the pulse width which proportionally increases the strength of contraction of BR. Stimulating directly on the nerve should be avoided as this will cause an immediate strong contraction of the entire muscle.



FIGURE 2. Intraoperative assessment of brachioradialis (BR) to extensor carpi radialis brevis (ECRB) tendon transfer by stimulation of the BR muscle using the Checkpoint Stimulator (20 mA, 0-200 usec). Note the British Medical Research Council (MRC)¹ Scale M4 muscle contraction (movement against resistance) demonstrated intraoperatively by direct muscle stimulation.



FIGURE 3. Postoperative assessment of wrist extension. The intraoperative assessment of wrist extension by use of the Checkpoint Stimulator provides a predictive measurement of postoperative wrist extension.

Antigravity wrist extension was noted with the elbow flexed to 45 degrees.

Conclusion

At 7-month follow-up, the patient was out of supportive wrist splints and was actively using the hand more for activities of daily living, according to his parents, and his active wrist extension was similar to what was seen intraoperatively (Figure 3).

Reference

- 1) British Medical Research Council. Aids to the examination of the peripheral nervous system, Memorandum no. 45, Her Majesty's Stationery Office, London, 1981.

Dr. Kyle J. Chepla received his medical degree in 2007 from The Ohio State University College of Medicine. He completed his integrated residency in Plastic and Reconstructive Surgery at University Hospitals-Case Medical Center in Cleveland, Ohio. Dr. Chepla then completed a Hand and Upper Extremity Fellowship at the University of Pittsburgh Medical Center in Pittsburgh, Pennsylvania. He joined the Division of Plastic Surgery at MetroHealth in August of 2014. Dr. Chepla is an Assistant Professor of Surgery at Case Western Reserve University School of Medicine. His special interests include surgery of the hand and wrist, peripheral nerve surgery, and upper extremity reconstruction.



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