

Evaluation of Extensor Indicis Proprius Opponensplasty for Traumatic Low Median Nerve Palsy

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ABSTRACT

Background: Thumb opposition is very critical for normal hand function. There are many surgical procedures for restoring thumb opposition. The standard opponensplasty for isolated low median nerve palsy uses the flexor digitorum superficialis (FDS) of the ring finger.

Aim of the Study: To evaluate the efficacy of using the extensor indicis proprius (EIP) in opponensplasty when the ring or middle superficialis is inappropriate for use.

Patients and Methods: Extensor indicis proprius opponensplasty (Burkhalter technique) was done to restore opposition in 9 patients, all were males, with post-traumatic low median nerve palsy. Surgical prerequisites included return, of at least, protective sensibility in median nerve distribution, supple hands, full passive range of thumb opposition, and no contractures of the first web space. The EIP tendon was rerouted around the ulnar side of the wrist and attached solely to the tendon of the Abductor Pollicis Brevis (APB).

Results: We used the criteria of Sundararaj and Mani for evaluating our functional results. According to these criteria, 7 patients had excellent results and 2 patients had good results. There were no post-operative complications, but some loss of independent extension of the index finger.

Conclusion: In patients with isolated low median nerve palsy with unavailable FDS, extensor indicis proprius opponensplasty provides consistent excellent functional results, does not weaken the hand grip and causes no functional disability.

Key Words: *Extensor indicis proprius (EIP) – Opponensplasty – Traumatic – Median nerve palsy.*

INTRODUCTION

Opposition of the thumb is the most important component of normal hand function. Opponensplasty is needed when loss of opposition causes a meaningful functional deficit for the patient. The standard opponensplasty for isolated traumatic low median nerve palsy uses the FDS of the ring finger using a variety of techniques including the Royal-Thompson, Bunnell, and Fritsch methods [1-4].

Extensor indicis proprius (EIP) opponensplasty was popularized by Burkhalter and used by many others in leprosy patients and in patients with combined median/ulnar palsies, [5-9] where they harvested the EIP tendon with an extension from

the extensor expansion to lengthen the tendon and repaired the expansion to avoid the postoperative extension lag of the index finger.

The purpose of this study was to evaluate the efficacy of extensor indicis proprius opponensplasty in traumatic low median nerve palsy when the ring FDS tendon was unavailable or inappropriate because of previous injury.

PATIENTS AND METHODS

This study was done at The Department of Plastic & Reconstructive Surgery, Menoufia University Hospitals, from February 2012 to June 2014 with a follow-up period of more than 12 months. It included 9 patients; all were males, their age ranged from 19 to 43 years. All the patients presented with post-traumatic loss of or weak apposition due to low injury of the median nerve or the motor branch to the thenar muscles. Associated with the nerve injury, there were accompanying injuries to neighboring flexor tendons, notably ring and middle FDS, and primary repair was done to the nerve and tendons elsewhere.

Inclusion criteria:

Extensor indicis opponensplasty was done only to patients when loss of opposition caused a meaningful functional deficit, with the following prerequisites; return of a at least protective sensibility in median nerve distribution, normal power of EIP, inability to use ring finger FDS, supple hands, and full passive range of opposition with no contracture of the 1st web space.

Surgical technique:

The procedures were performed under general anesthesia with tourniquet control. A transverse incision was made over the metacarpophalangeal (MP) of the index finger and the EIP tendon was isolated immediately proximal to the extensor hood. Another transverse incision was made over the dorsum of the hand aided in EIP tendon isolation

to the ulnar side of EDC tendon (Fig. 1). The EIP tendon was divided proximal to the extensor hood and retrieved proximal to the extensor retinaculum via a small longitudinal incision over the dorsal distal forearm (Fig. 2). A long incision was made on the dorsoulnar aspect of the distal forearm, and the EIP tendon was delivered into this wound (Fig. 3). A small incision was then made over the radial aspect of the thumb MP joint where the tendon of the Abductor Pollicis Brevis (APB) was isolated (Figs. 4,5). A wide subcutaneous tunnel was then made from the dorsoulnar incision to the thumb incision, passing around the ulnar border of the wrist and across the palm (Fig. 6). The EIP tendon was passed through this subcutaneous tunnel superficial to the flexor carpi ulnaris tendon (Fig. 7).

The tourniquet was released, hemostasis obtained, then the incisions were closed except the one over the thumb MP joint. The EIP tendon was sutured to the APB tendon with 2 figure of 8 prolene 4/0 sutures, with the wrist in 30 degrees of flexion and the thumb in maximum opposition. The incision over the thumb MP joint was then closed (Fig. 8).

Post-operatively, the hand was immobilized with the wrist in flexion and the thumb in full opposition for 4 to 6 weeks, and physiotherapy and rehabilitation were then started.

Post-operative assessment:

During the follow-up period, complications as extension lag of index finger, infection, weakened

grip, disruption of EIP tendon suturing, ulnar nerve compression were recorded. The results of EIP opponensplasty were recorded using the criteria of Sundararaj and Mani [10] (who graded their results in leprosy according to the range of opposition and the position of thumb interphalangeal (IP) joint) as follows:

- *Excellent*: Opposition to the ring or little finger tip with the IP joint of the thumb extended.
- *Good*: Opposition to the index or middle finger tip with the IP joint of the thumb extended.
- *Fair*: Thumb IP joint flexes during opposition.
- *Poor*: No opposition restored.

RESULTS

There were no post-operative complications. There was no post-operative extension lag of the index finger in any of the patients; however the patients experienced some degree of loss of independent index finger extension.

Post-operatively, the opposition started to improve with rehabilitation and at one year follow-up, seven patients had an excellent result and the remaining two patients had good results according to the criteria of Sundararaj and Mani.

The patients were satisfied with their regained opposition and reported improved use of their hands in daily activities, (Figs. 9,10).



Fig. (1): EIP tendon isolated via 2 small incisions over index MP joint and dorsum of hand.



Fig. (2): EIP tendon divided proximal to extensor hood and retrieved proximal to extensor retinaculum.



Fig. (3): EIP tendon delivered into the incision on dorsoulnar distal forearm.



Fig. (4): Isolation of APB tendon via an incision over thumb MP joint.

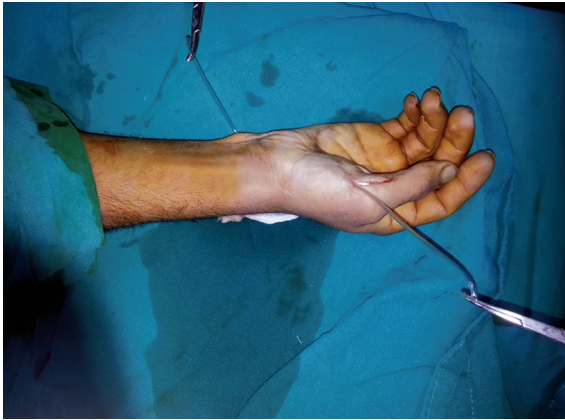


Fig. (5): Wide subcutaneous tunnel from dorsoulnar incision to thumb incision.



Fig. (6): EIP tendon in preparation for passing through the subcutaneous tunnel.



Fig. (7): Thumb attaining opposition at the end of the procedure.



Fig. (8): Preoperative photograph of post traumatic Rt. Hand with weak opposition compared to normal Lt. Hand



Fig. (9): Postoperative photograph, Rt. Thumb opposing to tip of ring finger with thumb IP joint extended (Excellent result).



Fig. (10): Postoperative photograph, Rt. Thumb opposing to tip of little finger with thumb IP joint extended (Excellent result).

DISCUSSION

Thumb opposition is the most important component of normal hand function. Opponensplasty should only be done when lack of or weakness of opposition causes functional hand deficit, in addition to return of protective sensibility in the median

nerve distribution, supple hands, full passive range of thumb opposition and absence of 1st web space contracture [1].

The EIP opponensplasty was favored by Burkhalter and colleagues [5] when the ring and middle finger FDS were unavailable. They reported

the results of EIP opponensplasty done in 65 trauma cases (32 combined ulnar and median nerve, 13 high median nerve, and 2 brachial plexus injuries). Eighty-eight percent of their patients achieved excellent results. They reported additional benefits of this transfer as ease of surgery, ease of rehabilitation (its excursion was naturally augmented by a wrist tenodesis effect) [5].

Anderson, et al., used EIP opponensplasty in 12 high and 28 low median nerve palsies caused by leprosy, trauma, and other conditions. They had excellent or good results in 88% of their patients followed for more than a year. They subsequently compared these results to those achieved by FDS transference and concluded that the EIP transfer should only be used in supple hands [6,9].

Al-Qattan had done EIP opponensplasty for 15 patients with low median nerve palsy. He had no post-operative complications or extension lag of the index finger. He had 12 patients experienced excellent results and 3 patients had good results [11].

Lemonas, et al., had done EIP opponensplasty for six patients with weak opposition due to different etiologies. They had no donor site morbidity and achieved impressive functional results [12].

In this study, EIP opponensplasty was done for 9 patients with post-traumatic low median nerve palsy, where the FDS was unavailable for use due to previous injury and repair. There were no post-operative complications, but variable degrees of loss of independent index extension. Seven patients experienced excellent results and two patients had good results.

In conclusion:

EIP opponensplasty has consistent excellent functional results and minimal donor site morbidity

limited to some loss of independent index extension. Not only is EIP largely expendable, it is of sufficient length and its harvest does not weaken the hand grip and causes no functional disability.

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