Extensor indicis proprius opponensplasty for isolated traumatic low median nerve palsy: A case series

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INTRODUCTION: The standard opponensplasty for isolated low median nerve palsy in nonleprosy patients uses the flexor digitorum superficialis of the ring finger.
OBJECTIVE: To report the results of extensor indicis proprius (EIP) opponensplasty in 15 consecutive nonleprosy patients with isolated traumatic low median nerve palsy.
METHODS: A retrospective study of the author's cases of EIP opponensplasty for isolated traumatic median nerve palsy over the past 15 years was conducted. The author used the EIP to restore thumb opposition in all cases of isolated median nerve palsies when the following conditions were present: protective sensibility in the median nerve distribution; normal power of EIP; supple hands; and full passive range of opposition with no contracture of the first web space. There were a total of 15 patients with a mean age of 30 years (range 20 to 45 years). They all had traumatic isolated low median nerve palsy with recovery of at least protective sensation and no recovery of opposition. The tendon was harvested just proximal to the extensor expansion, the flexor carpi ulnaris was used as a pulley and the insertion was to the tendon of abductor pollicis brevis.
RESULTS: There were no postoperative complications or extension lag of the donor finger. Using previously published criteria, 12 patients experienced excellent results while the remaining three had a good result.
CONCLUSIONS: In nonleprosy patients with isolated traumatic low median nerve palsy, the results of this transfer are consistent and there is no need to harvest the EIP tendon distal to the extensor expansion because a single insertion to the abductor pollicis brevis is sufficient.

Key Words: *Opponensplasty; Tendon transfer*

Une plastie d'opposition de l'extenseur propre de l'index en raison d'une paralysie isolée du nerf médian inférieur causée par un traumatisme

INTRODUCTION : La plastie d'opposition standard d'une paralysie isolée du nerf médian inférieur chez des patients qui n'ont pas la lèpre fait appel au fléchisseur commun superficiel de l'annulaire.
OBJECTIF : Déclarer les résultats de la plastie d'opposition de l'extenseur propre de l'index (EPI) chez 15 patients non lépreux consécutifs ayant une paralysie isolée du nerf médian inférieur causée par un traumatisme.
MÉTHODOLOGIE : L'auteur a procédé à une étude rétrospective des cas de plastie d'opposition de l'EPI en raison d'une paralysie isolée du nerf médian causée par un traumatisme effectués au cours des 15 années précédentes. Il a fait appel à l'EPI pour restaurer l'opposition du pouce dans tous les cas de paralysie isolée du nerf médian, en présence des conditions suivantes : sensibilité protective dans la distribution du nerf médian, puissance normale de l'EPI, souplesse des mains et amplitude de mouvement passive opposées ans contraction du premier espace palmaire. L'auteur a soigné un total de 15 patients d'un âge moyen de 30 ans (plage de 20 à 45 ans) qui présentaient tous une paralysie isolée du nerf médian inférieur causée par un traumatisme et ont récupéré au moins la sensation de protection mais pas l'opposition. Il a prélevé le tendon tout juste dans la zone proximale de l'expansion de l'extenseur, utilisé le muscle cubital antérieur comme poulie et procédé à l'insertion dans le tendon du muscle court abducteur du pouce.
RÉSULTATS : L'auteur n'a observé aucune complication postopératoire ou extension incomplète du doigt du donneur. Selon des résultats déjà publiés, 12 patients ont profité d'excellents résultats, et les trois autres, de bons résultats.
CONCLUSIONS : Chez les patients non lépreux présentant une paralysie isolée du nerf médian inférieur causée par un traumatisme, les résultats de ce transfert sont constants. Il n'est pas nécessaire de prélever le tendon de l'EPI dans la région distale de l'expansion de l'extenseur, car une seule insertion dans le muscle court abducteur du pouce suffit.

The standard opponensplasty for isolated low median nerve palsy in nonleprosy patients uses the flexor digitorum superficialis of the ring finger (1). Extensor indicis proprius (EIP) opponensplasty has been performed mainly in leprosy patients and in patients with combined median/ulnar nerve palsies (2-6). All of these authors harvested the EIP tendon with an extension from the extensor expansion (also known as the extensor hood) to lengthen the tendon. These authors also recommended repair of the expansion to avoid the complication of postoperative extension lag of the donor finger. In his chapter on nerve palsy, Davis (1) stated that he now favours the EIP transfer for low median nerve palsy cases; however, no details of the results were given. For the past 15 years, the author of the present article has been using the EIP transfer for low median nerve palsy and harvested the tendon just proximal to the extensor expansion. The present report documents the results in 15 consecutive patients.

METHODS

Patient population

The present report is a retrospective study of the author's cases of EIP opponensplasty for isolated median nerve palsy over the past 15 years. The author uses the EIP to restore thumb opposition in all cases of isolated median nerve palsies when the following conditions are present: protective sensibility in the median nerve distribution; normal power of EIP; supple hands; and full passive range of opposition with no contracture of the first web space. There were a total of 15 patients (10 men, five women) with a mean age of 30 years (range 20 to 45 years). All patients experienced traumatic isolated low median nerve injury that was repaired at the time of original injury. In all cases, there was recovery of at least the protective sensation but no recovery of opposition. None of the patients had leprosy or any other peripheral nerve pathology.

Surgical technique

The procedures were perfomed under general anaesthesia. A transverse incision is made over the metacarpophalangeal joint of the index finger and the EIP tendon is divided just proximal to the extensor hood. The tendon is brought proximal to the extensor retinaculum and tunnelled subcutaneously to the ulnar aspect of the wrist. The substance of the flexor carpi ulnaris tendon is pierced with a number 11 scalpel blade and the EIP tendon brought through this tendon 'stab incision', which acts as the ulnar pulley for the transfer. A narrow subcutaneous tunnel is then created from this pulley to the insertion site of the abductor pollicis brevis (APB) tendon (Figure 1). The APB tendon is exposed via a longitudinal incision and divided at the musculotendinous junction. This gives about 5 mm to 7 mm extra length of tendon. The thumb is then brought in maximum opposition and fixed in that position by a K-wire through the basal joint of the thumb. The tourniquet is then released, hemostasis secured and all incisions (except for the insertion site incision) are closed. The wrist is then brought in 10° to 30° of flexion and slight ulnar deviation. The

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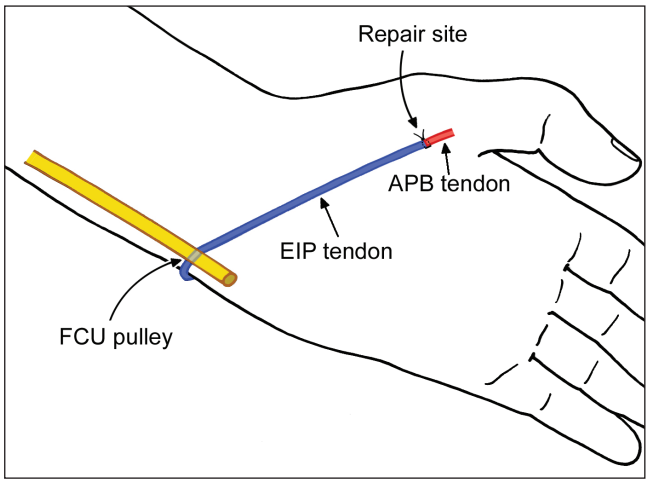

Figure 1) *An illustration of the surgical technique. Note the flexor carpi ulnaris (FCU) pulley. Also note the single insertion site of the extensor indicis proprius (EIP) to the abductor pollicis brevis (APB)*

least degree of flexion that allows the EIP tendon to reach the cut tendon end of the APB is chosen. Suturing of the two tendon ends is performed with two 'figure 8' sutures using 5/0 polypropylene. The hand is immobilized in a thumb spica cast for five weeks, at which time the cast and the wire are removed. Physiotherapy is then started in the physiotherapy department.

Assessment

Complications, such as infection, disruption of the repair or complex regional pain syndrome, were documented. Postoperative extension lag of the index finger was also recorded. At final follow-up, the results of opponensplasty were recorded using the criteria of Sundararaj and Mani (7) as follows:

Excellent: Opposition to the ring or little finger tip with the interphalangeal joint (IPJ) of the thumb extended.

Good: Opposition to the index or middle finger tip with the IPJ of the thumb extended.

Fair: The IPJ of the thumb flexes for opposition

Poor: No opposition.

Testing of opposition was performed with the wrist in 10° of extension to eliminate any element of wrist tenodesis that might aid opposition.

RESULTS

No postoperative complications were recorded. No postoperative extension lag of the index finger was apparent in any of the patients. However, the ability to perform independent extension of the index finger was lost in all patients. Functional opposition was initially obtained between six and eight weeks of postoperative physiotherapy, but continued to improve over several months before reaching a plateau. At final follow-up (range one to five years; mean two years), 12 patients experienced an excellent result and the remaining three patients had a good result. Patients were satisfied and reported improved use of the hand in daily activity. A demonstrative example is shown in Figure 2.

DISCUSSION

The current study has two strengths: a uniform etiology (traumatic low median nerve injury) and a uniform technique performed by a single surgeon. Weaknesses of the study include the relatively small number of cases and the fact that the 'power' of opposition was not assessed. Our Hand Unit is the largest in Saudi Arabia, yet only 15 cases of traumatic low median nerve palsy required opponensplasty over a period of 15 years. This is because most patients who experience traumatic low median nerve injury never lose opposition because of the intact

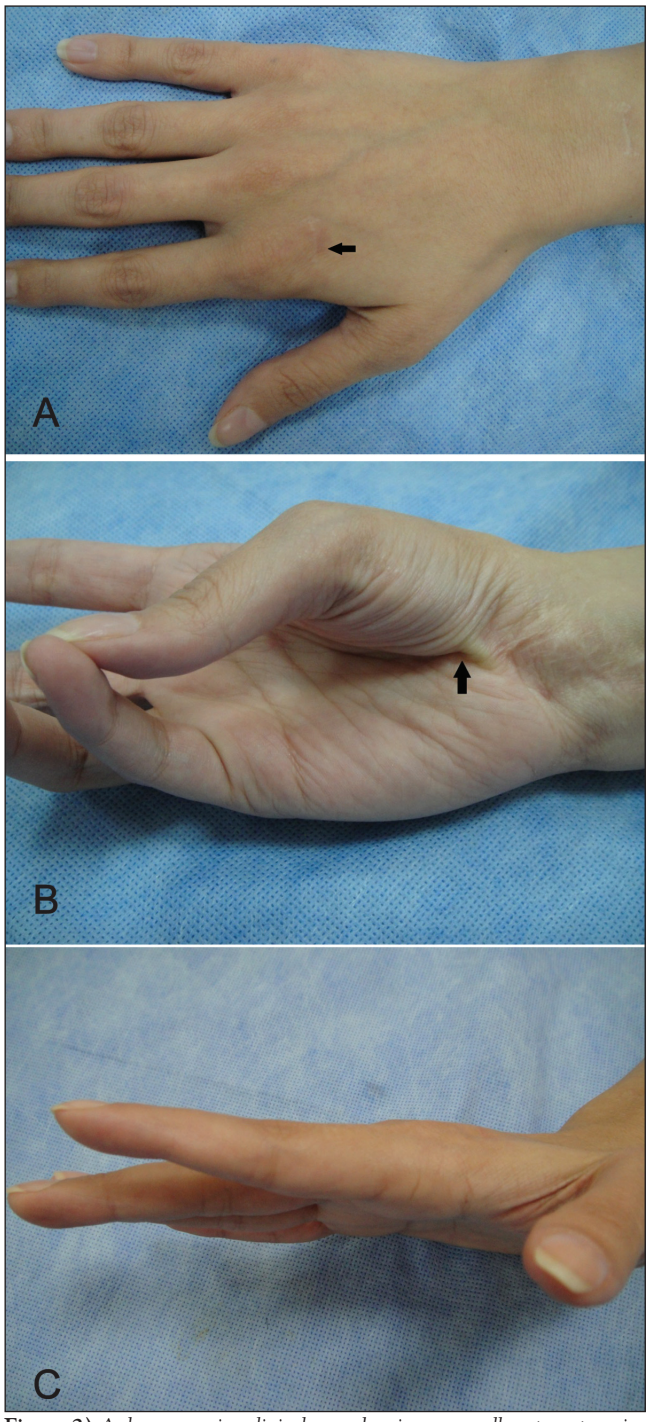

Figure 2) *A demonstrative clinical case showing an excellent postoperative result.* **A** *The donor site scar (arrow) is proximal to the extensor expansion. The extensor indicis proprius tendon was harvested proximal to the expansion.* **B** *An excellent result. Opposition is possible to the little finger tip with the interphalangeal joint of the thumb extended. The arrow is marking the extensor indicis proprius tendon which is bowstringing under the skin. Note that testing of opposition is performed with the wrist in extension to avoid the tenodesis effect.* **C** *No extension lag of the index finger. Note that testing of extension lag is also performed with the wrist in extension to avoid the tenodesis effect*

ulnar nerve, which frequently anomalously innervates the the ulnar muscles – a fact that was recently noted by Davis (1).

The main message from the present report is that there is no need to harvest the EIP tendon distal to the extensor expansion and that

this transfer may be considered in isolated low median nerve palsy in nonleprosy patients. Our unit believes that harvesting the donor tendon proximal to the extensor hood eliminates the potential risk of extension lag of the donor finger. Burkhalter et al (3) harvested the EIP tendon distal to the expansion and then repaired the expansion. However, the authors noted a mild extension lag in several patients and a major lag requiring secondary surgery in one patient. More recently, Mehta et al (4) reported that despite repair of the expansion, there may be lack of full extension of the donor index finger. These authors considered this complication "not serious" because the deficiency in full extension was usually "mild". Despite this well-known complication, almost all authors of previous articles in the English literature harvested the EIP tendon along with an extension into the expansion (2-6). The main reason for this is that these authors used the EIP transfer mainly for leprosy and for combined median/ulnar nerve palsy patients who had an 'intrinsic minus' thumb. In these cases, there is need to have a 'long' EIP tendon to reach for the dual insertion required for stabilization of the metacarpophalangeal joint of the thumb. All of our patients had traumatic low median nerve palsy and, hence, a single insertion to the APB was sufficient. Other factors in our patient selection and technique ensured the 'reach' of the EIP tendon that included supple hands, full passive range of opposition with no contracture of the first web space and maintenance of thumb in maximum opposition using a K-wire.

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