

## Case Report

# Extensor indicis proprius to extensor pollicis longus tendon transfer with first dorsal interossei muscle flap cover for reconstruction of post traumatic thumb defect in an acute setting: a very rare case report

Tanveer Ahmad Bhat\*, Abdulla S. Altamimi, Musleh K. Alsharari, Mohammed Y. Mirza

Department of Plastic Surgery and Burns, King Saud Medical City, Kingdom of Saudi Arabia

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**\*Correspondence:**

Tanveer Ahmad Bhat,

E-mail: drtab1014@gmail.com

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### ABSTRACT

The thumb plays a vital role in the function of the hand and is indispensable part of gripping, pinching and other activities and therefore its reconstruction is a priority for every hand surgeon. Different flaps have been used in the soft tissue reconstruction of the thumb. Here we presented a 38 year male patient case of road traffic accident with trauma to the right upper limb having composite tissue defect involving the thumb with loss over the dorsum of the thumb with periosteal stripping and partial loss of the dorsal cortex of the metacarpal in which we have successfully performed thumb reconstruction in acute setting by doing extensor indicis proprius (EIP) to extensor pollicis longus (EPL) tendon transfer for the extensor tendon loss and soft tissue cover by using the ulnar head of first dorsal interossei muscle with overlying split thickness skin graft. EIP to EPL transfer is an efficient tendon transfer to restore the thumb extension in post-traumatic extensor loss of thumb without any functional donor site morbidity. First dorsal interossei muscle is a good and reliable reconstructive option for the small full thickness soft tissue defects over the first metacarpal first because of its axial blood supply. We recommend to divide the extensor indicis proprius tendon around half centimetre proximal to the extensor hood and suture this tendon remnant to the side by extensor digiti communis tendon while maintaining the finger extension and for the first dorsal interossei muscle flap preferably use the ulnar head of muscle for thumb reconstruction to avoid functional donor site morbidities.

**Keywords:** Thumb defect, Tendon transfer, Interossei muscle, Reconstruction

### INTRODUCTION

The role of thumb in hand function is indispensable as it has a vital role in gripping, pinching, and actions. Thumb contributes around 40% of the function of the entire hand, especially the grip function which accounts for 80% of the function of the hand.<sup>1</sup> The special thing about the thumb is that it is the only digit that can oppose the other 4 digits.<sup>1</sup> Loss of thumb affects the performance of activities of daily life (ADL) besides affecting the patient mental health as hand trauma patients are prone to develop neurotic problems like depression in early stage which in turn creates hurdles in the recovery of the hand

function.<sup>2</sup> So thumb reconstruction is important aspect of hand surgery to restore the full hand function. Thumb reconstruction is based on the principles of restoring the basic thumb characteristics and movements, including mobility, stability, sensitivity, length, and appearance.<sup>3</sup> Different methods have been used in post traumatic thumb reconstruction depending upon the level of amputation and the component loss. For the soft tissue reconstruction of the thumb various flaps have been used including local, regional and distant pedicled flaps as well as free tissue transfer which may be either simple or composite flap depending upon the component loss. The first dorsal interossei muscle (IDIOM) flap has been used

very rarely in thumb reconstruction. While searching the relevant literature regarding its use in hand reconstruction we found only two case reports where IDIOM flap has been used for hand reconstruction.<sup>4,5</sup> Here we reported a case of post traumatic right upper limb injury with full thickness composite tissue loss of the thumb including part of dorsal cortex of the first metacarpal in which we successfully performed the EIP to EPL tendon transfer and soft tissue coverage with ulnar head of IDIOM and overlying split thickness skin graft (STSG).

## CASE REPORT

A 38-year-old male patient reported to our emergency department as a case of road traffic accident (RTA) with trauma to left right upper limb. The patient was resuscitated and the life threatening injuries ruled out according to latest advanced trauma life support (ATLS) guidelines by the emergency physicians. The patient was conscious, oriented with a normal Glasgow Comma scale score and maintained vital signs. Blood samples were taken and sent for routine base line investigations including complete blood count, kidney and liver function tests and coagulation profile and intravenous broad spectrum antibiotics started for the patient. On local examination of the right upper limb, there was big wound measuring around 10×15 cm<sup>2</sup> with full thickness soft tissue loss with exposed flexor muscle bellies involving the flexor aspect of the proximal half of forearm (Figure 1). In addition to that, there was composite tissue loss over the dorsum of its metacarpal and surrounding area, with periosteal stripping and partial loss of the dorsal cortex. The dorsal capsule of the proximal interphalangeal joint was lost partially but the joint was stable and not exposed. The both extensors of the thumb were lost leading to tendon defects and the thumb was in complete flexion (Figure 2). The strip of the skin between these two tissue defects, of the thumb and the proximal forearm, were intact but abraded with partial thickness skin loss. Distal neurovascular status was normal. X-ray showed no fractures. After a thorough discussion with the patient about his injury and treatment options available an informed consent was documented and the patient was prepared for surgery. Patient was subjected to general anaesthesia with orotracheal intubation and operated under tourniquet control. Power pulsed lavage (PPL) of the wounds were done followed by optimal surgical debridement. The defects were assessed for the component loss and reconstruction decided (Figure 3). To restore the thumb extension we performed EIP to EPL transfer for loss of thumb extensors followed by soft tissue coverage by transposing the ulnar head the IDIOM flap by dividing it's insertion from the radial aspect of the index finger. We cut the EIP tendon around half centimetre proximal to the extensor hood and sutured this remnant to side by EDC tendon while maintaining full extension of the fingers to avoid the extension lag. We did scoring of the perimysium to spread out the muscle to increase the surface area. We made sure that some part of the muscle is preserved

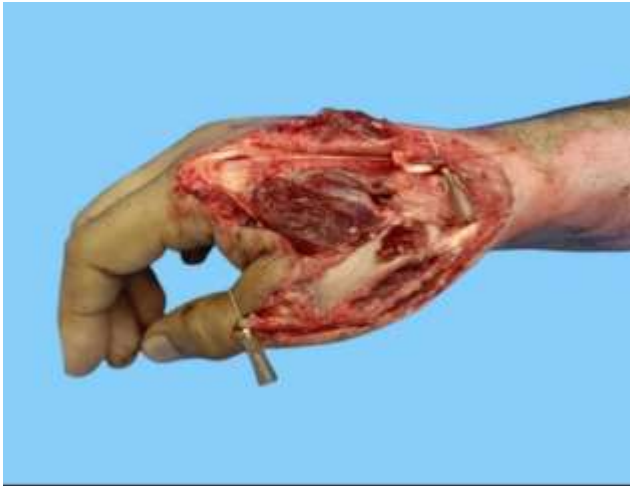
which is sufficient to retain its function. Tourniquet was released and hemostasis achieved. After checking the vascularity of the muscle flap, inset was given by 4-0 vicryl (Figure 4). STSG of the exposed muscle flap with the surrounding wound was done by meshed (1:1.5) skin graft harvested from the thigh. A non adherent supra tulle dressing was applied followed by application of thumb spica in complete extension of the thumb. Post operatively patient was put on patient controlled analgesia (PCA) for pain relief and parenteral antibiotic therapy continued. On first dressing done 5th postoperative day, the skin graft was well taken and the wound was clinically healthy without any signs of infection (Figure 5). After 2nd dressing patient was discharged and advised to follow up outpatient department (OPD) once weekly for 6 weeks. After 6 weeks the thumb spica was removed and patient was referred for occupational therapy and advised to follow up our OPD three monthly for one year and then 6 monthly for next year. After 10 months follow up visit the skin graft was well matured, supple and the range of the movements (RoM) of the operated hand were normal and comparable to the other hand without any functional donor site morbidity (Figures 6- 10).



**Figure 1: Pre operative picture showing full thickness skin loss over the flexor aspect of the proximal forearm with exposed muscle bellies.**



**Figure 2: Pre operative picture showing full thickness skin defect over proximal forearm and composite tissue loss involving the dorsal aspect of the thumb.**



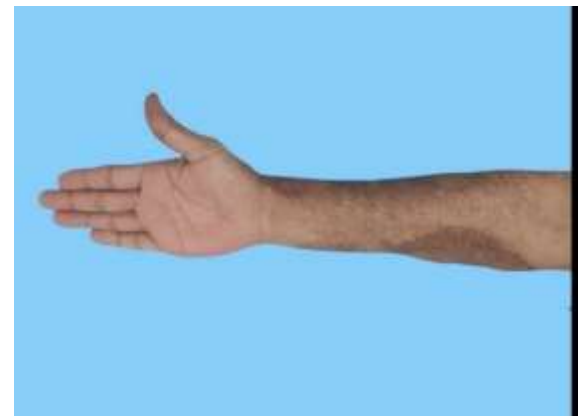
**Figure 3: Intra operative picture showing composite tissue loss involving the skin, both extrinsic extensor tendons and the dorsal cortex of the first metacarpal.**



**Figure 6: Post operative picture well taken skin graft over the forearm.**



**Figure 4: Intra operative picture showing the first dorsal interossei muscle covering the exposed metacarpal and the EIP tendon transferred to distal remnant of EPL.**



**Figure 7: Picture on follow up showing normal thumb normal hyperextension post EIP to EPL tendon transfer.**



**Figure 5: Post operative picture showing well taken skin graft on ist dressing.**



**Figure 8: Follow up picture showing the normal flexion of the thumb following EIP to EPL tendon transfer.**



**Figure 9: Follow up picture showing no functional donor site morbidity following EIP to EPL tendon and cover by IDIOM flap.**



**Figure 10: Follow up picture showing equally comparable extension of the thumbs and index fingers of both hands.**

## DISCUSSION

Hand function is crucial for maintaining independence in ADL and the thumb contributes 40% of hand, 36% of upper extremity, and 22% whole-person impairment.<sup>1</sup> This emphasizes the importance of the post traumatic thumb reconstruction in restoring the hand function to enable the patient to continue his activities of daily life. Our patient had full thickness soft tissue defect including loss of both extensor tendons with exposed metacarpal. So, we planned EIP to EPL tendon transfer to restore the extension and cover by IDIOM. The most widely used tendon transfer to restore thumb extension is the EIP tendon to the distal stump of the EPL tendon.<sup>6-14</sup> Noorda et al reported a combined extension lag of the MCP, proximal IP and distal IP joints of the index finger of 5° to 105° in 24 of 34 patients after transfer of the EIP tendon.<sup>13</sup> Other authors reported an extension lag of the index MCP joint ranging from 10° to 20° in seven of 27 patients, from 4° to 20° in four of six patients, or a mean extension lag of 25° in 13 patients.<sup>6,12,16</sup> However in our patient there was no lag of extension of the index finger found following the EIP transfer possibly because we

sutured the residual stump of EIP tendon to extensor digiti communis (EDC) while maintaining the finger in extension followed by splinting the finger in extension for 3 weeks. Some authors attributed the extensor lag to scarring induced around the extensor hood, rather than from the loss of extension power after EIP transfer.<sup>15-18</sup> In our patient we cut the EIP 1 cm proximal to the extensor hood to avoid any post operative scarring around the latter which may result in extension lag.

IDIOM is type I muscle according to Mathes and Nahai muscle flap classification with the dominant pedicle from ist dorsal metacarpal artery and the venae comitantes originating from the radial artery and innervated by deep palmar branch of the ulnar nerve. It has 2 heads of origin and single insertion on the radial aspect of proximal phalanx of the index finger. It abducts of index finger, flexes the metacarpophalangeal joint and extends the interphalangeal joint and is considered as not expendable muscle. While reviewing the literature we found only Matches et al and Lubahn et al have used this muscle for hand reconstruction.<sup>4,5</sup> Lubahn used the muscle to cover the dorsum of hand in a patient with gunshot injury in whom the muscle was already denervated secondary to the primary injury. Our patient will be possibly the first case report in whom we used only the ulnar head of IDIOM to resurface the thumb metacarpal and preserved the radial head to avoid the functional donor site morbidity. However, the main limitation of this muscle flap is its small size. In our patient as only the dorsal cortex of the metacarpal was exposed so we could easily cover this exposed bone after scoring the perimysium to spread out the muscle.

## CONCLUSION

The EIP to EPL is an easy and efficient tendon transfer option to restore thumb extension in acute setting in patients with extensor tendon loss. We recommend to cut the EIP tendon around half to one cm proximal to the extensor hood and suture this remnant to the EDC to avoid index finger extension lag. IDIOM flap is an effective reconstructive option for resurfacing first metacarpal and utilizing the ulnar head only we can avoid the donor site functional morbidity. However, the limitation is that this flap is sufficient for small defects only.

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