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HETEROTOPIC RECONSTRUCTION OF THE THUMB WITH A CRUSHED RING FINGER IN A HEAVY SMOKER: CASE REPORT

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SUMMARY

Reconstruction of the thumb takes precedence over the other digits since it accounts to over forty percent of hand function. In a mangled hand, it is imperative to choose what can be saved and what could be used as reconstruction parts for other digits. We share our experience with successful reconstruction of the thumb by heterotopic reimplantation of the ring finger.

We present a case of a 45-year-old male known smoker who sustained machine grind injury at the workplace leading to amputation of the thumb, index and ring fingers and extensive soft tissue loss to the middle fingers. Assessment of the amputated parts revealed thumb and index finger unsalvageable. A decision was therefore made to reconstruct the thumb with the amputated ring finger and repair the extensively damaged middle and little finger.

Post-operatively, the patient was able to have good sensory recovery and pinch grip.

INTRODUCTION

There has been a paradigm shift in the management of a mangled hand with a shift towards hand salvage as opposed to amputation (1). With advancement in microsurgery skills more amputated digits have been successfully re-implanted leading to good functional and aesthetic outcomes (1,2). While it may be possible to attain full functional recovery the extent of recovery is dictated upon by severity of the injury, meticulous nature of the repair and hand rehabilitation services as well as patients' motivation. Other secondary factors that could influence outcome include comorbidities, patients age and social factors such as smoking (3,4).

Priority in the reconstruction of multiple severed digits has always been the thumb since it accounts for about 40 percent of the hand function. This is then followed by the middle or ring finger so as to provide a bi-pod or tripod hand that could provide apposition allowing for pinch grip. We present a middle-aged man who presented with a mangled right-hand injury at his workplace.

CASE PRESENTATION

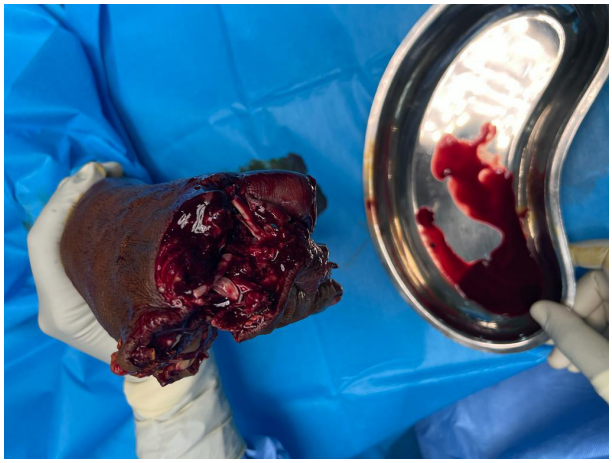
A forty-five-year-old male industrial worker also a heavy smoker was admitted with history of injury at his workplace when his hand got stack in a revolving machine. He sustained injury to the left hand with amputation of the left thumb, middle and ring finger. He had extensive soft tissue loss of the index finger with injury to the radial neurovascular bundles (Figure 1 and 2).

Figure 1: Multiple amputated digits of the left hand, ring, thumb and index finger

On examination the injury to the thumb was at the level of the proximal phalanx with multiple lacerations to the skin and underlying neurovascular structures. The ring finger had disarticulation at the proximal interphalangeal joint and the index finger

at the metacarpophalangeal joint. Both had minimal soft tissue injuries. The index finger on the other hand had volar skin loss with injury to radio neurovascular structures.

Figure 2: Proximal stump of the amputated hand , during surgical toilet



The patient after initial assessment followed by laboratory and radiological workups was taken to operating theatre for urgent surgical toilet and reimplantation of the digits. During surgery it was noted that the amputated thumb and the index finger could not be re-implanted. The ring finger was thus re implanted on the thumb stump with K wires for bone fixation, followed by repair of both the extensor and flexor tendons. The neurovascular structures were then repaired with nylon 10/0 (Figure 3).

Figure 3: Repaired left hand, immediately post-surgery with well vascularized digits

The middle finger neurovascular structures were also repaired with nylon 10/0 followed by skin grafting of the wounds with filleted skin from the amputated ring finger. Post operatively a back slab was put. After discharge the patient was followed up in the clinic. K-wires were removed after four weeks and the patient advised on regular physiotherapy and hand rehabilitation sessions as an outpatient. At six months of follow up the patient was noted to have about 30 degrees of metacarpophalangeal joint movement with limited movement at the distal interphalangeal joints of the reimplanted thumb. He however had a good apposition of the reconstructed thumb with the index and little finger (Figure 4)

Figure 4: Heterotopic thumb second day post-surgery with good circulation

Figure 5: Patient able to grasp objects between the repaired digits at six months of follow up

DISCUSSION

With improvement in microsurgery techniques digit re-implantations have become routine in many centers (2-4). Though there could be critical

differences in approaching single versus multiple digits re-implantations the ultimate goal is to achieve reimplanted digits that are sensate and with good function allowing for the patient to carry on with normal activities. In cases where all digits can't be reimplanted then one must prioritize the available digit/tissues to achieve maximum functional outcome with the focus being ability to have some form of apposition that could allow the patient to have some pinch grip. In such circumstances the focus would be to reconstruct a bipod or tripod hand (5). To achieve this heterotopic reimplantation becomes extremely important.

Hetero-topic reimplantation refers to the reimplantation of a finger /digit to a stump of a different finger so as to maximize function of the remaining hand. This technique has been in use for over fifty years with good outcomes reported by many authors (6-8). It is paramount to use it in situation where orthotopic reimplantation may not give good outcomes. Tommy Nai-Jen Chang reported good results with heterotopic reimplantation of more than 50 digits. He had a survival rate of more than 83 percent and a tripod hand in more than 80 percent of the cases (5). Another series By Kokkoli *et al* reported sensate prehensile function in all patients. They were able to achieve a tripod pinch in 90 percent of the cases and had a minimum two fingers and one thumb reconstructed in all patients (6).

Though our patient was a heavy smoker we did not experience any incidence of vessel thrombus or wound, or flap dehiscence after surgery a pointer to the fact that smoking should not be used as a contraindication to reimplantation. Despite the fact that we were able to achieve a tripod hand in our patient, the results were not fully impressive. there was reduction in movement of both the reconstructed thumb and the middle and little finger fingers both at the metacarpophalangeal and proximal interphalangeal joints. This was attributed to prolonged k wire placement of six weeks and delayed commencement on physiotherapy functions after discharge home due to financial constraints by the patient.

In conclusion heterotopic reimplantation of the digits remains a viable option for reconstruction of the hand following a mangled hand injury even in patients who smoke a lot. One should therefore carefully select the remaining parts and prioritize them with the thumb reconstruction and two adjacent fingers for opposition. Post operative follow-up and hand rehabilitation sessions are critical for full functional recover

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