

## Original Research Article

# Surgical management of fingertip injuries

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**Received:** 22 November 2016

**Accepted:** 10 December 2016

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### ABSTRACT

**Background:** Fingertip injuries are common due to industrial accidents, ranging from small laceration and nail bed injuries to traumatic amputation and severe crush. It is best retain as much native tissue when viable. Surgical options in treating the fingertip injuries are individualized to each patient considering the injury pattern, age, hand dominance and occupation.

**Methods:** It is a retrospective study of 102 fingertip injuries in 95 patients, whose age ranges from 2 years to 60 years over a period of 3 years.

**Results:** In 90% of patient's primary wound healing was achieved in 2 weeks period. All were satisfied with the functional outcome and average period of returning to the work is 4 weeks.

**Conclusions:** Fingertip injuries needs individualized management specialized to achieve optimum results, maximum patient satisfaction rates and early return to pre injury occupation level.

**Keywords:** Fingertip injuries, Nail bed injury, Crush injury of finger

### INTRODUCTION

Fingertip is the part of terminal phalanx distal to the insertion of extensor and flexor tendons. Fingertip injuries and nail bed injuries are common due to industrial accidents producing significant functional and cosmetic morbidity.<sup>1,2</sup> Appropriate management is the key to achieve optimum function and good cosmesis. The aim is to achieve well-padded, stable, sensate and painless skin. This study is a retrospective analysis of outcome of management of fingertip injuries in 95 patients treated during 2010 to 2013 by various methods individualized based on injury pattern and age and injury pattern.

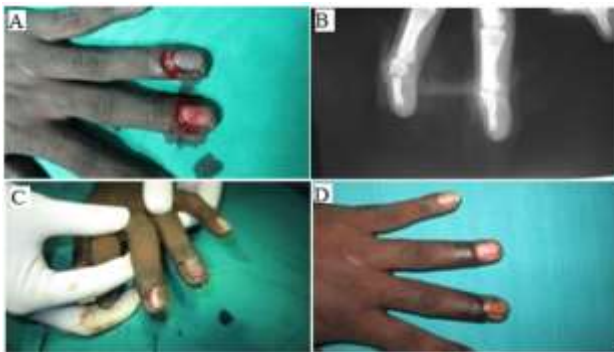
### METHODS

Fingertip injuries that presented to our emergency department during 2010 to 2013 were selected for this study. A detailed history including patient's demographics, mechanism of injury, hand dominance,

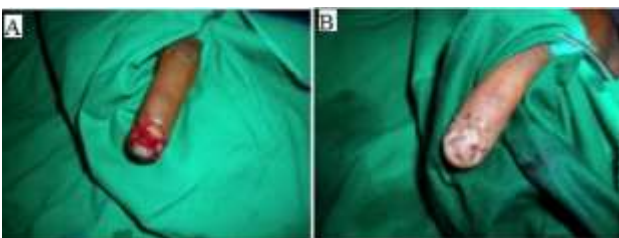
occupation, and duration since injury were taken. The injuries were evaluated for finger involvement, crush versus sharp injuries, location, depth, angle of the defect, nail bed involvement, status of the remaining soft tissue, co-morbid conditions and configuration of the fingertip defect. Standard view radiographs and photographs were taken both at presentation and final outcome. Digital block with 2% xylocaine were used for majority of the cases. In children general anaesthesia was administered. Regional block and tourniquet were used in cross finger flap and V-Y plasty procedures.

In volar wounds larger than 1 cm without exposed bone or tendon, split-thickness grafting (13 patients) was performed. Composite tip grafting (6 patients) was done in children below seven years of age. When bone or tendon was exposed, a local flap was considered. The choice of flap was based on the extent and obliquity of the fingertip loss. Volar V-Y flaps (6 patients) were performed in transverse amputations beyond the mid-nail level. Volar oblique amputations with exposed bone and

tendon, cross finger flap (2 patients) was done. Total crush amputations below the level of nail matrix, shortening and closure (6 patients) were done. All the nail bed lacerations were repaired under loupe magnification (2.5 X) with 6-0 Vicryl. In partial nail avulsion the edges of nail was trimmed and reinserted into the nail fold, taking care to prevent complete avulsion as shown in Figure 1. In complete nail avulsion, the nail plate is stabilized with figure of 8 as shown in Figure 2 suturing with 4-0 non-absorbable sutures. Regular non-adherent dressing applied for initial 2 days and followed by alternate day saline dressing. Sutures were removed on 10<sup>th</sup> postoperative day. In cross finger flap, flap division and insert was performed after 3 weeks. The patients were followed up from one year to three years. Postoperative follow-up was 2 to 3 years. During follow up fingertip appearance, pain, hypersensitivity, range of motion and patient satisfaction were evaluated.



**Figure 1: A- Nail plate avulsion. B- Distal Phalanx fracture in nail plate avulsion. C- Nail plate repositioned and phalanx stabilized with K-wire. D- 6 months follow up of nail plate avulsion.**



**Figure 2: A- Nail bed injury. B- Figure of eight suturing.**

**RESULTS**

The male predominance (79 males to 16 females) was observed due to increased occupational exposure. Seven patients had involvement of two fingers. The age group was 2 to 60 years as given in Table 1. The pediatric (12 patients) were due to door crush injury. The females had majority knife cut or household injury. Crush injury was the commonest cause of fingertip trauma, followed by laceration and avulsion injuries. Middle finger (37 patients) and index finger injuries (23 patients) were the most commonly involved. The ring finger (15 patients),

thumb (14 patients) and little finger (13 patients) accounted for the remaining injuries.

**Table 1: Showing the mean age, healing time and return to work.**

	Maximum	Minimum	Average	SD
<b>Age (years)</b>	65	2	30.56	14.36
<b>Healing time (weeks)</b>	6	2.0	3.4	1.41
<b>Return to work (weeks)</b>	8	2.0	4	1.41

Terminal phalanx fracture was noticed in 42 finger injuries, out of which 33 fractures are associated with partial and total crush amputations. K-wires are used to stabilize the terminal phalanx in 8 patients that were unstable after reconstructing the fingertip injury.

Deformed nail was noticed after 8 months in one patient, which had loss of nail bed at the time of injury. In one patient marginal necrosis of the flap occurred after V-Y plasty, which was managed conservatively. Partial wound dehiscence was observed in three patients out of which two was noticed in shortening and closure. Wound infection was seen in 4 patients, out of which 2 each in primary closure of partial amputation and primary closure. Cold intolerance was observed in 7 patients and paraesthesia in 3 patients. Joint stiffness was noted in 2 patients. 90 %of the patients were achieved primary wound healing at end of 2 weeks. But active mobilization started as early as pain permits. In our study average period of returning to normal work period is 4 weeks. The incisions healed with inconspicuous scars. The work incapacity time averaged between four to eight weeks and all patients could return to their routine pre injury work.

**DISCUSSION**

Fingertip injuries are extremely common and comprise the most common hand injuries. Inappropriate management could lead to considerable loss of skilled hand function. Fingertip injuries lead to significant morbidity affecting the occupational as well social activities. They account for approximately 10% of all accidents reported in the casualty and two-thirds of hand injuries in children.<sup>1</sup> In adults major cause is occupational injury, consistent with our study.<sup>1,2</sup>

There are several classifications describing the fingertip injuries.<sup>3-6</sup> Management of fingertip injuries depends upon the severity of injury, size and shape of the defect, tendon and bone cover, age, sex, dominant function, severity of injury, patient expectation, cosmesis. Goals of treatment in fingertip injuries include preservation of useful sensation, maximizing functional length, preventing joint contractures, providing satisfactory

appearance and avoiding donor site disfigurement (in case of reconstructive flaps) and functional loss. The amputated is retained if viable.<sup>7</sup> After providing appropriate and adequate analgesia (digital nerve block), thorough cleaning with copious saline solution and debridement excision of all non-viable tissue is to be performed. Debridement of the nail bed is avoided to prevent any scarring adhesions and nail deformity.<sup>8</sup> Dressing in both surgical and conservatively treated fingertip injuries must be non-adherent to granulation tissue and semi occlusive while maintaining moist wound surface to promote healing.<sup>9</sup>

Simple laceration without skin loss of the fingertip injuries are sutured in emergency department with non-absorbable monofilament sutures and it is removed on 7 to 10 days. The wound should be protected for 6 weeks.<sup>10</sup> Primary closure in tip amputation provides the advantage of sensation but tight closure will result in flexion deformity, finger stiffness and cold sensitivity.<sup>11</sup> Small defects less than 1 cm<sup>2</sup> of the pulp without bone exposure can be treated with non-adherent dressing.<sup>10</sup> The wound heals by secondary intension with scar formation.<sup>12</sup> The healing process takes 3-6 weeks and it is effective in children and adults with minimal tissue loss and well vascularized surrounding tissue.<sup>12,13</sup> The disadvantages are delay in returning to work, chance of infection, scarring and pulp's soft tissue loss.<sup>14</sup> Wounds larger than 1 cm<sup>2</sup> where bone or tendon are not exposed, split or full thickness graft can be used. The advantage being faster wound healing, less chances of cold sensitivity, no need for shortening of bone but has some complication of donor site scarring, loss of pulp contour, paraesthesia.<sup>15</sup>

Local flaps are a good choice in traumatic amputation of the fingertip with exposed vital structures like tendon, nerve and bone. The plane of amputation and the condition of the tissue at the injury site determine the best repair technique for these injuries. The V-Y plasty technique is used to repair amputations with dorsal or transverse planes.<sup>16</sup> The V-Y plasty advancement flap technique is used when the injury leaves more pulp than nail bed. The V-Y plasty technique preserves the normal sensation, contours of dorsal finger and helps pad the fingertip.<sup>17</sup> The major disadvantage of local flaps is limitation in length of advancement and size of the flap.

Cross finger flap is good option if the local flap is not available. Lee et al in his study comparing innervated cross finger flap with non-innervated cross finger flap concluded that sensory and two point discrimination was better in innervated cross finger flap.<sup>18</sup> Island flaps are fine instruments, technically demanding and time consuming, has the disadvantage of second procedure for to donor wound, finger stiffness, sacrificing major artery of the finger, hypersensitivity at the grafted donor area and unsatisfactory appearance.<sup>19</sup> For larger defects that cannot be approximated by direct closure and local flaps,

distant flaps like abdominal and groin flaps are used. These flaps require multiple operations and prolonged immobilization. However, free flaps using the tissues of the plantar area and the toes is preferred in cases with large defects and in cases that need reconstruction of finger nails.<sup>20</sup>

The integrity of the nail bed is important for proper formation of smooth, uniform and compact nail.<sup>21</sup> An intact nail is important for normal functioning of fingertip as nail provides dorsal support for delicate functions of fingertip.<sup>21</sup> Loup magnification (2X) should be used to repair nail bed laceration to prevent nail abnormalities. Wherever possible the nail plate if clean, should be preserved. The nail not only acts as splint for associated distal phalanx fracture but also allows the nail bed to remodel anatomically.<sup>22</sup> Occasionally, large defects of the nail bed require split-thickness graft from an uninjured area of nail bed or from the second toe. In some fingertip injuries revision amputation is preferable to allow tension-free closure of the soft tissues and adequate padding in an effort to minimize recovery time and hasten return to work.

## CONCLUSION

The treatment of fingertip injuries are complex due to the widely varying injury patterns and many number of different surgical treatment options. Treatment of fingertip injuries has to be individualized to each patient taking into consideration the patients age, sex, co-morbid medical illness, profession, hand dominance, digit injured, mode of injury, configuration and size of the defect to get best clinical outcomes.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: Not required*

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**Cite this article as:** Karthi Sundar V, Suresh Gandhi B, Shanmuga Sundaram P. Surgical management of fingertip injuries. *Int J Res Orthop* 2017;3:19-22.