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FUNCTIONAL AND AESTHETIC OUTCOME AFTER SKIN COVER FOR FINGER TIP INJURIES, A PROSPECTIVE STUDY FROM CHENGALPATTU MEDICAL COLLEGE, INDIA

Plastic Surgery

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ABSTRACT

Background: Fingertip injuries are regarded as those distal to the insertions of the flexor and extensor tendons at the base of the distal phalanx. Primary goal of treatment is a painless fingertip with durable and sensate skin. We conducted a prospective study to evaluate the functional and aesthetic outcome after different types of skin cover for fingertip injuries in 34 patients during the period of November 2009 to December 2011. **Methods:** Wound healing characteristics, aesthetic appearance, sensory return, scar characteristics, quality of skin, patient acceptance, movements of finger joints and secondary procedures are assessed and univariate analysis was done. **Results:** Two patients had marginal flap necrosis,healed conservatively. Middle and index finger of right hand was the most commonly injured and most were men. Average two point discrimination was 4mm after v-y advancement flap and composite grafting, shortening and closure, 5mm after composite grafting, 6mm after Cross Finger Flap (CFF). **Conclusions:** Fingertip is appropriately managed considering the level and plane of injury, though Split Skin Graft (SSG) aids in closing the wound aesthetically it is inferior to second layer hythothenar graft. Smaller defects in children can be managed conservatively. Volar v-y advancement flap gives a good sensate tip and aesthetically better outcome compared to CFF.

KEYWORDS

Fingertip Injury, Ssg, Finger Flap, Volar V-y Advancement Flap

INTRODUCTION

The fingertip is defined as structures distal to the creases at the distal interphalangeal joint.[1] Fingertip injuries are regarded as those distal to the insertions of the flexor and extensor tendons at the base of the distal phalanx. This region represents an intricate aggregate of structural and functional entities and is responsible for some of the most complex functions of hand.[2]Its exposed position gives the fingertip a significant cosmetic value but also places it at high risk for injury. Injuries to the finger tip are among the most common hand injuries.[3]They occur in all age groups and can result from recreational or occupational causes.[4] Fingertips are the eyes of hand providing delicate structures for improving pinch. The distal padding protects the tuft of distal phalanx where it remains fixed by deep fibrous space. Because fingertip injuries have the potential for significant morbidity their efficient management requires the sound judgement and technical proficiency of a knowledgeable surgeon[5,6,7] In this study, we have tried to assess the functional and aesthetic outcomes with patient satisfaction after different types of skin cover for finger tip injuries

METHODS

We enrolled 34 patients with fingertip injuries distal to DIP crease who presented to our institute between November 2009 to December 2011in our study. Patients with mangled extremity/major crush injury, associated flexor/ extensor tendon injury/small bone fractures, thumb injuries were excluded. All the investigations required were routinely done during the admission period or prior to it.

Anteroposterior and oblique view X-rays of the involved hand were taken pre and post operatively in all patients. Patients were explained regarding the procedure and an informed consent was obtained before carrying out any diagnostic or surgical procedure. Axillary block is given along with musculo cutaneous nerve block. A tourniquet is applied and time noted. The involved upper limb is placed on the hand table. All the structures of the fingertip are examined and extent of soft tissue injury are assessed. Integrity of nailbed, flexor and extensor tendon are assessed. Radio graph of the patients are evaluated simultaneously. Wound debridement is done and the wound is reassessed. Depending on the level and angle of amputation, appropriate reconstruction in the form of split skin grafting, composite grafts, local or regional flaps were done.

Skin grafts were used in wounds where the bone is not exposed, and not much of pulp tissue is lost. Split skin grafts (SSG) were taken from the medial aspect of arm using No.22 blade, free hand technique. In two of the cases grafts were taken from the ulnar border of hand as second layer palmar grafts. First layer of palmar graft taken and kept in continuity, then the second layer is harvested and first layer reposed back to the donor area. The harvested grafts are applied to the raw area and tie-over bolster dressings are applied. Finger crepe bandage is applied.

Patients were advised hand elevation in the post operative period. After 48 hours, graft was inspected and dressings applied with dressing change on alternate days. After wound healing patients were advised scar massage and compression garments. Fingertips were reassessed, evaluated for length, padding, nail deformity, fingertip sensation and range of motion.

Seven composite grafts are done in this series, five in children and two in adults. If the amputated part has been recovered and is clean and of adequate integrity the part is used for soft tissue coverage. If bone is not exposed skin is de-fatted and sutured into the defect and tie-over dressings are applied. This piece functions as a full thickness skin graft. The thickness is minimized to enhance the chances of 'taking'. Even if the skin necrose, it will serve as a biologic dressing.

Graft was inspected on the fifth day and on alternate days dressings are changed. Patients were followed up similar to split skin grafted patients.

Figure 1: composite graft done for ring finger and SSG for little finger

Figure 2: second layer palmar graft done for superficial raw area

Revision amputation was done in two of the patients with significant degloving of skin and angle of injury is such that other options are not appropriate. On postoperative day1 suture line was inspected and after wound healing patients are advised scar massage and compression. Among the local flaps volar V-Y advancement flap was done as described earlier in 8 patients and Kutler lateral V-Y flap in one patient, dorsal transposition flap in one patient. Volar V-Y flaps are done in patients with transverse amputation beyond the midnail level and dorsal oblique amputations beyond the proximal nail level.

Figure 3: volar v-y advancement flap

Lateral V-Y flap was done for the wound with avulsion of fingertip with exposed bone and excess lateral skin.

Dorsal transposition flap is done in a patient with transverse amputation with exposed bone and total loss of nailplate including germinal matrix.Cross finger flap is done in nine fingers with volarly directed wound without sufficient pulp. After two weeks flap division and inset was done. After flap cover for fingertip injuries, when the patient comes for follow-up fingertips are evaluated for length, padding, nail deformity, fingertip sensation and range of motion and photographed.

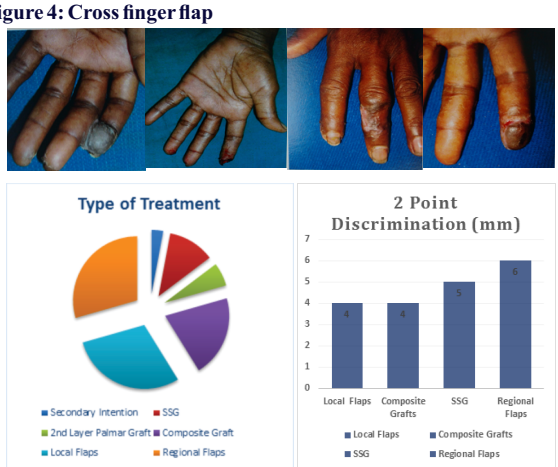
Postoperative follow up:

Patients were reviewed on a regular basis at weekly intervals in the first month till complete wound healing. Later reviews were done at 2nd, 4th and 6th month after surgery. During every visit, functional and aesthetic assessments were done along with assessment of patient satisfaction. Functional assessment was based on sensory recovery, two point discrimination, active and passive range-of-motion of PIP and DIP joints, development of flexion contracture etc.

RESULTS:

Of the total 34 patients enrolled over 24 months with finger tip injury were studied. Of the patients, 16 were male adults, 10 were female adults and eight children (<14yrs of age). Age of the injured ranged between 18 months to 58yrs. Eighteen were due to industrial accidents and 16 were accidental injuries due to road traffic accidents, door crush injuries, household and kitchen accidents.

Figure 4: Cross finger flap



The right hand was injured in 20 cases and left hand in 14. Index finger was involved in 12 cases, mid finger in 10, ring finger in 6 cases, little finger in 4 patients, multiple fingers (max of 2) in 2 cases. Surgeries performed were split skin grafting in 4, second layer palmar grafting in 2, composite grafts in 7, volar v-y advancement flap in 8,lateral v-y flap in 1, revision amputation in 2, healing by secondary intention in 1, cross-finger flap in 9, homodigital island flap in 1, dorsal transposition flap in 1. Total duration of treatment variesdfrom 2 to 6 weeks and the patients were followed up from 2 months to 1 year.

Post operatively two patients developed marginal flap necrosis managed conservatively. A partial dehiscence of wound was grafted secondarily, 3 cases of wound infection were managed with antibiotics and dressings. Complete loss of split skin graft in a patient was managed with cross finger flap.

Numbness was the complaint in the post operative period in patients with SSG, Composite graft and cross-finger flap. It improved with time.

Range-of-motion was mildly restricted in injured and donor finger in cross-finger flap, which improved with physiotherapy over time. ROM was full after 3 months.

Pain in the fingertip was complained by 2 patients, 1 with SSG and 1 with shortening closure.

Average 2PD after SSG was 5mm, after composite grafting was 4mm, after cross finger flap was 6mm, 4mm after v-y advancement flap and 4mm after revision amputation.

Overall function of the hand was assessed using Michigan hand outcome questionnaire. Patients were asked about the function of hand after surgery and were given the options of "very good", "good", "fair", "poor" and "very poor". Overall 95% of the patients opted for "good".

Aesthetic outcome was assessed by asking the patient how they felt about the appearance of operated site. Are they satisfied, uncomfortable, depressed or not able to do the normal activities. Most of the patients said they were satisfied with the aesthetic outcome. One patient after CFF and one after SSG were uncomfortable.

Patient satisfaction was assessed by asking whether they are "very satisfied", "somewhat satisfied", "neither satisfied nor dissatisfied", "somewhat dissatisfied", "very dissatisfied". Patients were very satisfied with the aesthetic outcome except for few who said they were somewhat satisfied. Nearly all the patients were satisfied with the functional and aesthetic outcome.

DISCUSSION:

Fingertip injuries lead to significant morbidity affecting the occupational as well as social activities.[8,9,10]

Finger tip often mistreated relatively minor injury.[11] Their improper management can lead to considerable loss of skilled hand function. Management of fingertip injuries is complex and not without controversy as a variety of treatment options are available[12,13,14,15]. Goals of treatment in fingertip injuries include preservation of useful sensation, maximizing functional length, preventing joint contractures, providing satisfactory appearance and avoiding donar disfigurement and functional loss.[16,17]

The approach to the many variables including age, sex, hand dominance, profession, hobbies, finger involvement, location, depth, angle of defect, nail bed injuries, status of remaining soft tissue, comorbid conditions and anatomy of fingertip defect.

As the primary goal of treatment of an finger tip injury is a painless fingertip with durable and sensate skin, the knowledge of the anatomy and available techniques of treatment are of paramount importance[21]

Fingertip injuries can be classified according to the site of amputation and whether it involves the pulp or nailbed and refer to zone and plane of injury.[1,2,17,22]

The injuries classified as zone I occur distal to the distal phalanx with preservation of majority of the nailbed and matrix. Treatment of zone I injuries are usually conservative.

Injuries classified as zone II are located distal to the lunula of the nailbed and are characterized by exposure of the distal phalanx. These injuries require flap reconstruction. Plane of zone II can be further classified as dorsal, transverse or volar according to the plane of amputation. The slope of transection, and the condition of the local tissue determine the best reconstructive technique.

Fingertip injuries classified as zone III involve the nail matrix and result in entire loss of nailbed. Injuries in zone III are not considered for

elaborate reconstruction.

As finger tip injuries can be treated in different ways, their management need to be carefully individualized.[23] If there is no or minimal tissue loss, the wound can be closed primarily with or without debridement. Healing by secondary intention or open technique by combination of wound contraction and re-epithelialisation is applicable to small volarly directed fingertip wound with no exposure of bone. This approach has definite place for finger tip injuries in children as they have a good capacity of regeneration.

If the wound is larger than 1cm, and volarly directed, without exposure of bone or tendon, skin graft provide faster healing. SSG are favoured as contraction results in a smaller defect. However some favour full-thickness graft as they reinnervate early and provide durable coverage. Composite grafts considered for children below

When bone or tendon is exposed, at the base of finger tip wound the use of split skin grafting is not feasible and local flap is necessary.
The type of flap reconstruction which is appropriate depends on extent of configuration of tip loss, local flaps if properly applied can provide a very satisfactory functional and aesthetic result.

Various local flaps used to reconstruct fingertip include volar v-y, bilateral v-y flaps, cross-finger flap, thenar flaps and island flaps. Flap choice depend on the orientation and configuration of the wound, injured digit and sex of the patient.[15,16,24,25]

If the wound is small and involves a finger with a transverse amputation beyond the nail bed level and dorsal oblique amputation beyond the proximal nail fold the volar flap gives good results.[4,24]

The cross-finger flap is preferable if the wound is volar directed without sufficient volar pulp to facilitate volar flap. However if local flap is not feasible, a regional flap like thenar, cross-finger or neuro vascular island flap is to be considered. Thenar flap is better prefered in females as it does not scar the visible dorsum.

The common complication encountered postoperatively were marginal necrosis, cold intolerance and hypersensitivity. Marginal necrosis was attributable to tension closure and other minor complication like wound dehiscence, partial graft loss were independent of the surgical technique employed to them. Cold intolerance and hypersensitivity are basically complications of injury and not treatment. Many reconstructed hands which are a source of pride to the surgeon are doomed by their appearance to remain in the patients pocket or hidden up a sleeve.[23-25]

CONCLUSION:

Finger tip injuries if appropriately managed considering the level and plane of injury then the functional and aesthetic outcome is good small defect in children can be treated conservatively, it heals with secondary intention. But the aesthetic result is better than SSG.

Large defect in finger tip >1.5cm, can be initially treated with SSG in the acute setup. Later when it heals, it contracts and decreases in size than the original wound. A flap cover can be planned secondarily at this stage to provide a sensate finger tip and aesthetically better look. Also the requirement of flap is less because of smaller size of the defect. Composite grafts are done in children if the recovered part is clean. But the take is poorer in adults compared to children.

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