

Original Article

Management of fingertip injuries

¹Sanjay Patel, ²Rajkumar Rajput

¹Junior Resident, ²Assistant Professor, Department of Surgery, M.L.B. Medical College, Jhansi, Uttar Pradesh, India

ABSTRACT:

Aims and Objective: 1.To assess age wise incidence of fingertip injuries. 2. Incidence of injury according to sex. 3.To find out the deference in frequency of involvement in left and right limbs. 4. Frequency of involvement of various digits. 5. Acceptance to operative procedures by patients. 6. Comparison of result of various methods of management of fingertip injuries in terms of •Work days lost •Sensation at the new fingertip •Aesthetic result •Complication rates of various methods. **Methods:** This study was undertaken at M.L.B. Medical College, Jhansi from March 2009 to August 2010. During this period 40 patients of fingertip injuries (48 fingers) were managed by various methods. **Result:** 72.5% (29) patients between 11-40 years of age. Right limb was involved in 52.5% cases and left limb involved in 17.5%. 10% (4) patients came with mallet finger injury. Out of 4 patients 3 patients had acute injury and 1 patient had chronic injury. Acute mallet finger injuries were managed as out patients by mallet splint for 3-4 weeks. Chronic mallet finger injury was managed by exploration and repair of tendon by stainless steel wire and DIP was immobilized in hyperextension for 3 weeks with the help of K-wire. After this patient was kept on mallet splint for another 3 weeks. Hospital stay for chronic mallet injury was 2 days. This patients resume work 42 days after the surgery. **Conclusion:** Injury to the fingers is most commonly caused by metal items and hand tools with blades. Such sharp injuries can result in lacerations, amputations, or neurovascular injuries. Improper treatment of fingertip amputations may lead to complications such as defects in appearance like hook nail deformity, cold intolerance, and skin tenderness. In this study, we provided an overview of the anatomy of the fingertip, the presentation of fingertip injuries and their management.

Keyword: Fingertip, Digital amputation, Fingertip injury, Hand injury

Received: 18-05-2013

Accepted: 22-06-2013

Corresponding Author: Rajkumar Rajput, Assistant Professor, Department of Surgery, M.L.B. Medical College, Jhansi, Uttar Pradesh, India

This article may be cited as: Patel S, Rajput R. Management of fingertip injuries. J Adv Med Dent Scie Res 2013;1(1):170-174.

INTRODUCTION

Injury to the fingertip (ie, injury distal to the insertion of the flexor and extensor tendons), is common, especially in young men who perform manual labor^[1]. The paucity of local soft tissue available for coverage of these injuries and the presence of the nail bed complicate management. The nail itself plays an important role in the normal function of the hand by protecting the fingertip, providing counterforce to assist with picking up small objects, and contributing to the tactile sensation of the fingertip^[2-4]. Management of injuries to the nail bed is based on the integrity of the nail plate and nail margin^[5-6]. In patients who sustain amputation of the fingertip, the nature of the injury and the physical demands of the patient should be considered when selecting a treatment method. For example, the presence of exposed bone helps to guide management. Treatment options range from healing by secondary intention to flap coverage or replantation. Although replacement of the fingertip as a composite graft has been successful in children^[7], replantation of the fingertip in adults often requires a vascular anastomosis to produce a viable fingertip^[8-9].

AIMS AND OBJECTIVES

1. To assess age wise incidence of fingertip injuries.
2. Incidence of injury according to sex.
3. To find out the deference in frequency of involvement in left and right limbs.
4. Frequency of involvement of various digits.
5. Acceptance to operative procedures by patients.
6. Comparison of result of various methods of management of fingertip injuries in terms of
 - Work days lost
 - Sensation at the new finger tip
 - Aesthetic result
 - Complication rates of various methods.

MATERIAL AND METHODS

This study was undertaken at M.L.B. Medical College, Jhansi from March 2009 to August 2010. During this period 40 patients of fingertip injuries (48 fingers) were managed by various methods.

PROCEDURE

- Patients presenting with fingertip injuries in OPD/Emergency of M LB Medical College, Jhansi were included in study.
- Detailed examination of the involved digit, adjacent digit, and patients as whole were done.
- Injuries were classified in Zone-I, Zone-II and Zone-III.
- Zone-I is distal to the phalanx (bone) - There is not exposed bone and most of the nail bed is intact.
- Zone-II is distal to the lunula (growth matrix of the nail) - There are complicated by the bony exposure of the distal phalanx.
- Zone-III is proximal to the lunula. These involve the nail matrix and result in the entire loss of the nail bed.

After examination of patient's appropriate methods of management were offered to patients and after written consent management were done.

Details of procedure and outcome were noted according to proforma attached. Ring block anaesthesia was used in most of the patients. But in a few patients brachial block and short general anaesthesia was used.

Radiological evaluation of injury was done. Basic haematological investigations like Hb, TLC and DLC were also done. Blood sugar was done in elderly patients.

Ethilon 4.0, Ethilon 5.0 were used to primary closure and for flap repair and to fix the skin graft.

Detailed analysis of findings were done to reach the conclusion.

RESULT

Table 1: Age distribution of patents

| Age (in years) | Number of patients | Percentage (%) |
|----------------|--------------------|----------------|
| 0-10 | 2 | 5.00% |
| 11-40 | 29 | 72.5% |
| 51-60 | 5 | 12.5% |
| >60 | 4 | 10.00% |
| Total | 40 | 100% |

Table 2: Sex distribution of patents

| Sex | Number of patients | Percentage (%) |
|--------|--------------------|----------------|
| Male | 31 | 77.5% |
| Female | 9 | 22.5% |
| Total | 40 | 100% |

Table 3: Occupational details of patients

| Occupation | Number of patients | Percentage (%) |
|------------|--------------------|----------------|
| Farmer | 15 | 37.5% |
| Student | 11 | 27.5% |
| Labourer | 7 | 17.5% |
| Shopkeeper | 7 | 17.5% |
| Total | 40 | 100% |

Table 4: Incidence of limbs involved (Right and left)

| Incidence of limbs | Number of patients | Percentage (%) |
|--------------------|--------------------|----------------|
| Right | 21 | 52.5% |
| Left | 19 | 47.5% |
| Total | 40 | 100% |

Table 5: Methods of Management

| Method of Monument | Number of patients | Percentage (%) |
|--------------------------------|--------------------|----------------|
| Primary/ Linear closure | 16 | 40% |
| Healing by secondary intension | 8 | 20% |
| Various types of flap | 9 | 22.5% |
| Mallet splint | 3 | 7.5% |
| Skin grafting | 3 | 7.5% |
| Exploration and tendon repair | 1 | 2.5% |

DISCUSSION

Fingertip injuries are extremely common and comprise the most common hand injuries. They are often viewed as a relatively minor injury but their improper management can lead to considerable loss of skilled hand function. Fingertip injuries lead to significant morbidity affecting the occupational as well social activities.

The management of fingertip injuries is complex and not without controversy as a variety of treatment options are available. Goals of treatment in fingertip injuries include preservation of useful sensation, maximizing functional length, preventing joint contractures, providing satisfactory appearance and avoiding donor disfigurement and functional loss.

The approach to the management of fingertip injuries depends on many variable, including patient's age, sex, hand dominance, profession, hobbies, finger involvement, location, depth, angle of the defect, nail bed involvement, and status of the remaining soft tissue, co-morbid conditions and the anatomy of the fingertip defect. As the primary goal of treatment of an injury to the fingertip is a painless fingertip anatomy and the available techniques of treatment are of paramount interest.

HEALING BY SECONDARY INTENTION

According to Abbase E et al^[10] key factors for selection of conservative management are the location of the wound and its size, the presence of exposed deep structure, the degree of contamination, and the age, handedness, occupation and reliability of the patient. The willingness and ability of the patients to perform or to receive regular dressing changes is also an important consideration.

According to Russel R et al^[11], conservatively treated very distal wounds that are clean, transverse or oblique in the volar direction and without exposed bone. Abbase E et al^[10] included wounds with small amount of exposed bone which can be cut below the level of the surrounding soft tissue.

According to Lectercq et al^[12], Martin C et al^[13], Massan J. et al^[14], fingertip injuries left to heal by secondary intention do so through the process of granulation, wound contraction and epithelization this process takes 3-4 weeks on average.

Complications are cold intolerance, loss of tissue volume, instability of pulp, change in tip sensitivity have been reported by above authors. In our study group average healing time was also 3-4 weeks.

In our study group cold intolerance and wound infection as a complication was present in about 37.5% of patients. Average time for resume of work was about 38 days.

LINEAR CLOSURE

Linear closure of most fingertip amputation or injuries often requires shortening of the bone so that skin can be closed without tension.

According to Russel R et al^[11], Sturman et al^[15], another 10 consideration is the length of the remaining distal phalans and the support of nail. Complication associated with this method is hook nail deformity due to inadequate support to nail.

In our study group average time taken to heal the wounds by linear closure was 11 days. Average time were taken by these to resume their regular work was 15 days. Common complications associated with this technique were scar tenderness and hook nail deformity.

SKIN GRAFT

According to Russell R et al^[11], and Stevenson T et al^[16], skin graft can be used only in a subset of wounds that could otherwise be allowed to heal by secondary intention. Wound that would accept a skin graft would also heal by secondary intention. Skin grafts require a well vascularised bed devoid of necrotic tissues and exposed bone, tendon or nerve. Skin grafts can be used for permanent or temporary coverage.

According to Lectercq C. et al^[12] and Martin C. et al^[13], before application of the skin graft, the wound in derided to remove devitalized issue and any exposed bone that is devoid of periosteum and to reduce he bacterial count.

Failure is usually due to a poorly vascularized graft bed, infection, movement or inter position of avascular materials, between the graft and its nutrient bed.

Complications are hyperpigmentation, cold intolerance, hyperesthesia, fissuring and tenderness. In our study group patients managed by skin grafting resumed their work on about 21-25 days. Hyperpigmentation of graft, hyperesthesia and cold intolerance were problems faced by some of these patients.

KUTLER LATERAL V-Y FLAP

According to Freiburg A et al^[17], Frandsen P et al^[18] complications like cold intolerance hypoesthesia, dysesthesia, tenderness to percussion are seen in as many as 30-70% of patients.

In our study group patients resumed their work between 26-28 days after surgery. Hook nail deformity and cold intolerance was seen in some of our patients. All of our patients managed by this method had good sensation (two point discrimination 3-5 mm).

ATASOY VOLAR V-Y FLAP

The indications are similar to those for the Kutler flap. The ideal defect is less than 1 cm in size, is transverse or slightly dorsal oblique in position and has exposed bone.

Results with the volar V-Y advancement flap are generally go Atasoy E. et al^[19], noted normal sensation and movement in almost all patients. The

flap provides glabrous, sensate coverage for the fingertip with minimal donor morbidity. Frandsen^[20] found that 70% of patients had hypoesthesia or dysesthesia and 40% suffered from cold intolerance. Tupper and Miller et al noted that the average loss in two point discrimination was about 3mm. Fifty percent had hypersensitivity, especially to cold. The patients estimated the sensory loss at about 27% and most returned to work in 30 days.

In our study group patients returned to their routine work in 30 days about 50% of our patients had cold intolerance. All of our patients had good sensations at fingertip (two point discrimination 4-5 mm).

MOBERG VOLAR ADVANCEMENT FLAP

It was the first sensate flap used to maintain thumb length in a digit in which preservation of length and sensation are critical. Because this flap is raised on both neurovascular pedicles, it has excellent sensation and vascularity. However this flap can be used reliably only in the thumb, where an independent dorsal blood supply guards against necrosis of dorsal skin.

According to Trumble T et al^[21] Hynes D et al^[22] the result with Moberg flap in the thumb are generally excellent. The advantages include a well vascularized, easily dissected flap with minimal donor morbidity. The sensory recovery is excellent and the pulp is covered with well-padded, cosmetically superior, glabrous skin.

Complication includes rarely dorsal skin loss and flexion contracture Macht & Watson et al^[23] noted no skin loss and two point discrimination was within 2mm of normal. The maximum extension loss was 5 degrees.

In our study group no significant complications were seen. Patients resumed their routine work in 30 days. Sensations were good (two point discrimination 2-5mm).

MALLET FINGER

This injury usually due to forced flexion of an actively extended distal interphalangeal joint. The tendon can rupture proximal to its insertion into the distal phalanx or tendon can avulse a fragment of bone from the dorsal base of the distal phalanx at the site of tendon insertion. Closed treatment with splint immobilization of the distal joint is simple and effective. The joint is held on extension for 6 weeks. Patient is allowed to remove splint to clean the finger, the joint must remain in extension at all times to avoid gap formation of healing tendon. The PIP joint is not immobilized. PIP joint motion does not result in a tendon gap at the injury site. Late treatment of a mallet injury by prolonged extension splinting is often successful. Good results have been reported with the use of a static splint more than 4 weeks after the injury. Eight weeks of static splinting is advisable with late treatment.

In our study group there were not any complication associated with mallet splint management. Patients resumed their work after few days, of course with splint in place.

HOSPITAL STAY

Average hospital stay for the patients managed by primary closure was 1-2 days. All the patients managed with healing by secondary intention were managed as out patients.

Maximum duration of hospital stay in our study were 2 days (for procedures like various types of flap, skin grafting and for tendon repair).

RESUME OF WORK (IN DAYS) ACCORDING TO MODE OF MANAGEMENT OF PATIENTS

- Patients resume their work 14-16 days after primary closure of stump.
- Patients managed with healing by secondary intention resumed their work between 39-42 days after injury.
- Patients managed by skin grafting resume their work 3 weeks after grafting.
- Patients managed by flap repair resumed their work 26-30 days after flap.
- Patients managed by mallet splint resumed their work after 6-7 days, of course with splint.

CONCLUSION

Injury to the fingers is most commonly caused by metal items and hand tools with blades. Such sharp injuries can result in lacerations, amputations, or neurovascular injuries. Improper treatment of fingertip amputations may lead to complications such as defects in appearance like hook nail deformity, cold intolerance, and skin tenderness. In this study, we provided an overview of the anatomy of the fingertip, the presentation of fingertip injuries and their management.

REFERENCES

1. Sorock GS, Lombardi DA, Hauser RB, Eisen EA, Herrick RF, Mittleman MA: Acute traumatic occupational hand injuries: Type, location, and severity. *J Occup Environ Med* 2002;44(4):345- 351.
2. Ashbell TS, Kleinert HE, Putcha SM, Kutz JE: The deformed finger nail, a frequent result of failure to repair nail bed injuries. *J Trauma* 1967;7(2):177- 190.
3. Gellman H: Fingertip-nail bed injuries in children: Current concepts and controversies of treatment. *J Craniofac Surg* 2009;20(4):1033-1035.
4. Zook EG: The perionychium: Anatomy, physiology, and care of injuries. *Clin Plast Surg* 1981;8(1):21-31.
5. Seaberg DC, Angelos WJ, Paris PM: Treatment of subungual hematomas with nail trephination: A prospective study. *Am J Emerg Med* 1991;9(3):209-210.
6. Meek S, White M: Subungual haematomas: Is simple trephining enough? *J Accid Emerg Med* 1998;15(4): 269-271.

7. Moiemmen NS, Elliot D: Composite graft replacement of digital tips: 2. A study in children. *J Hand Surg Br* 1997;22(3): 346-352.
8. Ito H, Sasaki K, Morioka K, Nozaki M: Fingertip amputation salvage on arterial anastomosis alone: An investigation of its limitations. *Ann PlastSurg* 2010; 65(3):302-305.
9. Lee BI, Chung HY, Kim WK, Kim SW, Dhong ES: The effects of the number and ratio of repaired arteries and veins on the survival rate in digital replantation. *Ann PlastSurg* 2000;44(3):288-294.
10. Abbase EA, Tadjalli HE, Shenaq SM. Fingertip and nail bed injuries. *Postgrad Med*. 1995 Nov;98(5):217-236. doi: 10.1080/00325481.1995.11946081.
11. Russell R; Fingertip injuries. In May JW JR. Littler IW, eds: *The Hand Philadelphia*, WB Saunders, 1990:4477. McCarthy J, ed: *Plastic Surgery*; vol.7.
12. Leclercq C. Management of fingertip injuries. *I Hand Surg Br* 1993;18:411.
13. Martin C, del Pi no J: Controversies in the treatment of fingertip amputations. *Clin Ortho* 1998;353:63.
14. Masson j: Hand I; fingernails, infections, tumors and soft tissue reconstruction. *Selected reading plastsurg* 1995;7:20.
15. Sturman M, Duran R: Late results of finger tip injuries. *J Bone Joint Surg Am* 1963;45:289.
16. Stevenson T: Fingertip and nailbed injuries. *OrthoChin North Am* 1992;23:149.
17. Freburg A, Manktelow R: The kutler repair for fingertip amputaions. *PlastReconstSurg* 1972;50:371.
18. Fradsen P: V-Y plasty as treatment of fingertip amptations. *Act OrthopScand* 1978;49:255.
19. Atasoy E, Ioakimidis E, Kasdan M: Reconstruction of the amputated finger tip with a triangular volar flap. *Bone Joint Surg Am* 1970;50:921.
20. Fradsen P: V-Y plasty as treatment of finger tip amputations. *ActaOrthop Scan* 1978;49:255.
21. Trumble T: Fingertip and nail bed injuries. In Trumble T, ed: *Principles of Hand Suregry and Therapy*. Philadelphia, WB saunders, 1997:192.
22. Hynes D: Neurovascular pedicle and advancement flaps for plamar thumb in distal reconstruction. *J. Hand Surg Br* 1993;18:399.
23. Macht S, Watson K: The moberg volar advancement flap for digital reconstruction. *Hand Surg Am* 1980;5:372.