

Management of fingertip injury in Erbil, an evaluation study

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Abstract

Background and objective: Fingertip injuries are common. Out of the various available reconstructive options, one needs to select an option which achieves a painless fingertip with durable and sensate skin cover. The objective of this study was to find out the characteristics of patients, and to describe the methods of management and the proportions of complications.

Methods: A prospective study of 130 cases of fingertip injuries of patients managed from March 2009 to March 2011. The data were collected through using a questionnaire. Standardized photographs and radiographs were taken. Various reconstructive options were considered for the fingertip injuries. Statistical package for social sciences (SPSS version 17) was used for data entry and analysis.

Results: Crush injury (76 cases) was found to be the commonest mechanism of fingertip injury. Various reconstructive options were considered based on the preoperative evaluation. Ninety percent of reconstructions healed uneventfully. Few minor complications occurred which responded to conservative management.

Conclusion: A proper evaluation of fingertip defects is necessary to choose the best possible reconstructive option to achieve best result.

Keywords: Fingertip injury, Crush injury, graft, flap.

Introduction

A fingertip injury is any soft tissue, nail or bony injury distal to the insertions of the long flexor and extensor tendons of a finger or thumb¹. The components of the finger tip is shown in **Figure 1**².

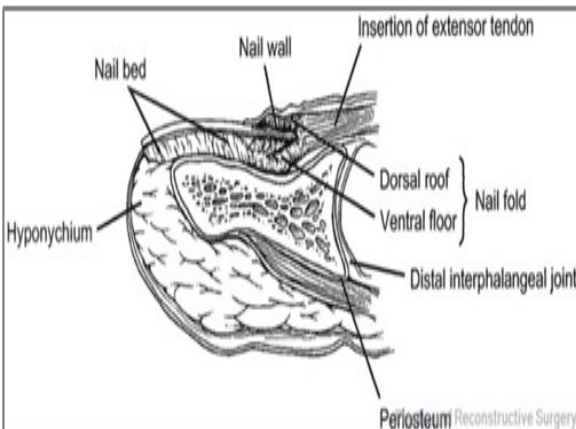


Figure 1 : Anatomy of the finger tip²

Hand injuries are very common, and injuries in the fingertip region represent a large subgroup^{3,4}. Fingertip injuries may occur in all age groups but are most commonly seen in children and in men who work with moving machinery⁵. Some of these cases are simple to treat, However, there are many conditions where early intervention by a plastic surgeon is warranted for better functional and aesthetic outcomes⁶. Common injuries include crush injuries to the fingertip, simple lacerations, and avulsion injuries⁷. Information that is useful to the surgeon when receiving a referral is the level of fingertip amputation and the anatomy of the tip loss whether the amputation is transverse, or oblique, dorsal or volar, Figure 2. Diagnosis is usually straightforward, based on the clinical history and examination, as well as the plain radiographs of the affected digit^{7,8}.

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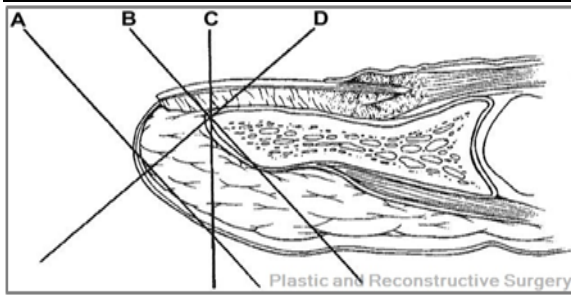


Figure 2 : Injury geometry. Line A, Volar oblique without exposed bone; line B, volar oblique with exposed bone; line C, transverse with exposed bone; line D, dorsal oblique with exposed bone⁷.

The approach to the management of fingertip injuries depends on many variables, including patient age, sex, hand dominance, profession, finger involvement, depth, angle of the defect, nail bed involvement, status of the remaining soft tissue, co-morbid conditions and the anatomy of the fingertip defect⁸. Treatment option targeted toward the exact kind of the defect which includes primary suturing, secondary intention healing, skin grafting, local flaps (Volar VY advancement, lateral VY advancement, Moberg flap, etc.), regional flaps (the narflap, cross finger flap, neurovascular island flap, etc.), distal flap, revision amputation, and distal replantation⁹. The objectives of the study were to evaluate the demographic pattern of fingertip injury and the way of management in Erbil and comparing them with other published data.

Methods

A review of 130 cases of fingertip injuries treated at Central emergency hospital and Rozhalat emergency hospital in Erbil over a period of two years (from March 2009 to March 2011) was undertaken. A detailed history including patient's demographics, mechanism of injury, hand dominance, occupation, duration since injury, etc. was taken using a questionnaire designed by the researchers with the help of a statistician. The injuries were evaluated in a careful and systematic manner for finger involvement, mechanism of injuries,

location, depth, angle of the defect, nail bed involvement, status of the remaining soft tissue, co-morbid conditions and the configuration of the fingertip defect. Standardized photographs and radiographs were also taken. Informed consent was signed by all of the patients except in children for whom the consent was signed by their responsible adult persons. The following reconstructive options were performed based on the preoperative evaluation, including primary closure, skin grafting, composite tip grafting, local flaps, regional flaps, distant flap and revision amputation. The patients were followed up to new year. In the follow-up period, the observations were recorded for appearance, patient satisfaction, cold intolerance, numbness, pain, passive and active range of motion and were also photographed in standardized views. Statistical package for social sciences (SPSS version 17) was used for data entry and analysis.

Results

The mean age was 35 years. The commonest age group was 21-40 years. The male predominance was seen as shown in, Table 1. The majority of the males were either agricultural, carpenter, or house building workers. Crush injury (76 cases) was found to be the commonest mechanism of fingertip injury, followed by sharp injury (34 cases) as shown in, Table 2. Middle finger (42 cases) was found to be the most commonly involved. The little finger (8 cases) was the least commonly involved as shown in, Table 3. The following reconstructive options were performed based on the preoperative evaluation as shown in, Table 4, Figure 3, 4, and 5. In volarly directed wounds larger than 1cm without exposed bone, split-thickness grafting (26 fingers) was performed. When bone or tendon was found to be exposed, flap coverage was considered. Ninety percent of reconstructions healed uneventfully. Some minor complications occurred, as shown in Table 5. All responded to conservative management. The patient's

satisfaction with the results is shown in, Table 6.

Table 1: The demographic pattern of the patients.

Age group(Year)	Male No	Male row %	Female No	Female row %	Total
<10	17	17/30	13	13/30	30
11-20	8	8/12	4	4/12	12
21-30	23	23/36	13	13/36	36
31-40	22	22/30	8	8/30	30
41-50	6	6/10	4	4/10	10
51-60	6	6/8	2	2/8	8
>60	3	3/4	1	1/4	4
Total	85	85/130	45	45/130	130

Table 2: Mechanisms of fingertip injury .

Mechanism of injury	No	%
Crush injury	76	58
Sharp injury	34	26
Avulsion	20	16
Total	130	100

Table 3: The distribution of finger involvement .

Finger involved	No	%
Middle	42	32.3
Ring	29	22.3
Index	21	16.1
Thumb	18	13.8
Multiple	12	9.2
Little	8	6.3
Total	130	100

Table 4: The reconstructive options used based on the preoperative evaluation.

The reconstructive option	Finger numbers	Finger %
Primary closure	19	12.66
Secondary intention	24	16
Skin graft	26	17.34
Composite graft	17	11.33
Volar V-Y flap	22	14.8
Lateral V-Y flap	3	2
Moeberg flap	10	6.66
Thenar flap	9	6
Cross finger flap	7	4.66
FDMA flap	2	1.33
Abdominal flap	1	0.66
Revision amputation	10	6.66
Total	150	100

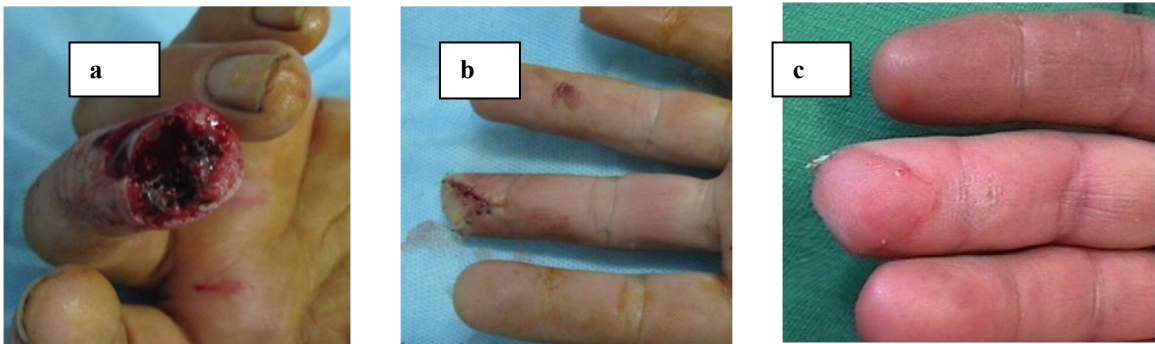


Figure 3 : a- Dorsal oblique fingertip amputation of left middle finger with exposed bone, b-Atasoy flap done, c- result after two month shows good healing with preservation of length.



Figure 4 : a- Pulp loss of left little finger, cross finger flap is raised on the adjacent ring finger, b- Flap inset, c – after pedicle division and flap inset shows good flap intake and restoration of normal contour to the little finger.

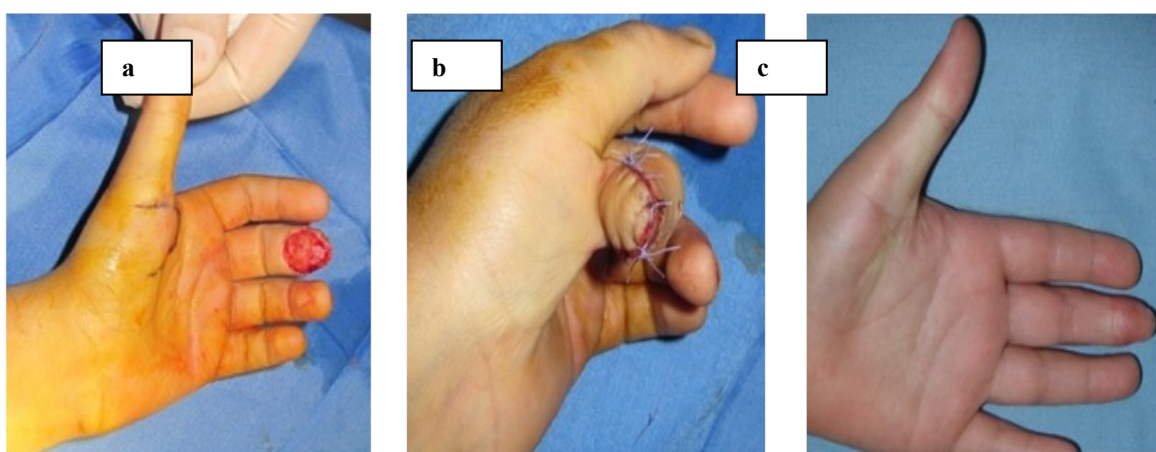


Figure 5: Fingertip injury with exposed bone of left middle finger with marking of the thenar flap, b- the flap inset, c- the result two months after pedicle division and flap inset, shows good flap take and good healing of the donor site.

Table 5: Complications of the finger tip reconstruction.

Complications	Patient number	Patient %
Marginal flap necrosis	6	4.6
Partial loss of skin graft	3	2.3
Partial loss of composite graft	1	0.76
Wound infection	2	1.53
Joint stiffness	2	1.53
Total	14	10.76

Table 6 : Patients satisfaction with the result .

Patients satisfaction	No	%
Aesthetic satisfaction	123	95
Functional satisfaction	122	94

Discussion

Fingertip injuries comprise the most common hand injuries^{1,4}. The male predominance (Male: Female 1.9:1) was seen due to increased exposure and occupational hazards. The majority of the males were either agricultural, carpenter, or house building workers. Crush injury (76 cases) was found to be the commonest cause of fingertip trauma, because blunt trauma was the commonest mechanism of injury, this agrees with the study done by Sanjay and Tiwari in Dubai who found that crush injury was the commonest cause of finger tip trauma⁹. Middle finger (42 cases, 32%) was found to be the most commonly involved finger as it is the longest finger. The approach to the management of fingertip injuries depends on many variables, including patient age, sex, hand dominance, profession, finger involvement, depth, angle of the defect, nail bed involvement, status of the remaining soft tissue, co-morbid conditions and the anatomy of the fingertip defect⁸. The wound was closed primarily in Nineteen cases as there were no or minimal tissue loss. Healing by secondary intention was applied in Twenty four cases as the wound size was less than 1cm with no exposure of bone. However, it took 3-5 weeks for complete healing. This is in agreement with the findings of another study done by Mennen and Wise who reported a series of 200 fingertip injuries treated by secondary intention with good results. However, there was a prolonged time to complete wound healing, with an average of 3 to 4 weeks^{1,14}. In Twenty six cases, the wound was larger than 1 cm without exposure of bone, skin grafting was done to provide faster healing. Split-thickness grafts were favored as contraction results in a smaller defect. Preferring split-thickness grafts over full thickness skin graft confirmed by other authors like Goitz R, Westkaemper J, Tomaino M, Sotereanos D, and Patten^{1,4,15}. skin grafts should be used when the wound is too large for healing by secondary intention

with no exposure of bone⁹. Composite tip grafts were used in fourteen children and three patients above twenty years of age with excellent take. Composite tip grafts have historically been associated with good results only in children¹¹. In our opinion, it can be attempted in children and young adults, however, it should never be performed in smokers or diabetics or in the setting of crush injury. When bone or tendon is exposed at the base of a fingertip wound, the use of skin grafts is not feasible and a flap is necessary^{6,9}. The type of flap reconstruction which is appropriate depends on the extent and configuration of the tip loss. The volar V-Y flap (Atasoy) were used in Twenty two fingers with a transverse amputation beyond the mid-nail level and dorsal oblique amputations beyond the proximal nail fold with good results. The good result of Atasoy flap is confirmed by other researchers^{1,8}. Bilateral V-Y (Kutler) flaps are best applied to volar oblique avulsions with exposed bone when excess lateral skin is present (seven cases). The limitations to this technique, such as limited advancement and the creation of a volar tip scar, led to its use only in three cases. The nar flap were used for the other four cases. If local flap is not possible, a regional flap like the nar, cross-finger flap or neurovascular island flap may have to be considered^{2,4}. The cross-finger flap (Seven cases) is preferable if the wound is volar without sufficient volar pulp to facilitate V-Y flap specially for ring and small finger⁴. The nar flap (Nine cases) used for large volar, transverse and dorsal injuries, specially for index and long fingers and is often preferred in females as it does not scar the visible dorsum^{2,9}. Some have argued that mobility complications increase over 30 years of age, making the procedure contraindicated¹². Recent data do not support this, and its use has been well-tolerated in adults of all ages^{1,4}. In this study two of the patients with The nar flap were above thirty years of age with successful outcome. Microsurgical replantation for complete amputation of the tip of a digit

was not done because most often the amputated part was either not available or was badly damaged in addition to the unavailability of the proper equipments for microsurgery. However, in a study done by Kim et al., in 1996 they reported fingertip replantation in 135 digits (20% of the cases) with a survival rate of 86 percent¹³. Revision amputation is an acceptable option in many circumstances like laborers (seven cases) who desire a rapid return to the work may choose a well-performed terminalization rather than a reconstruction to speed recovery. In advanced age (one case), mentally unstable patient, patient with osteoarthritis or other systemic comorbid conditions, revision amputations are preferred. Injuries proximal to the lunula (two cases) are best managed with nail ablation and revision amputation^{5,9}. Thumb tip defects need special consideration as thumb accounts for 40-50 percent of hand function. The rectangular volar advancement (Moberg) (used in ten cases) is the preferred option for small defects less than 1.5 cm as it brings sensate durable skin to the thumb tip⁴. As the dorsal vascular anatomy is dependent on the proper digital vessels in digits, the Moberg flap should not be used in the digits^{5,9}. In thumb defects more than 1.5 cm, first dorsal metacarpal artery flap (used in two cases) or the Littler flap (not used because of technical difficulty) are often required for sensate resurfacing with preservation of thumb length⁸. Large thumb defects are often best reconstructed with a free sensate flap from the great toe/first web space which was not done in this study because of the unavailability of the proper equipments for microsurgery. Most reconstructions healed uneventfully, except for 6 patients in whom marginal necrosis of the flap occurred, which was managed conservatively. The marginal necrosis was attributable to tension closure. Partial loss of skin graft was observed in three patients which was managed conservatively. Infection was seen in two patients which responded to antibiotic and dressing changes. Joint

Stiffness noted in two of the cases which responded to physiotherapy. Ninety five percent of patients were satisfied with the functional result and the aesthetic contour. The incisions healed with inconspicuous scars. The work incapacity time averaged between four to eight weeks and most patients could return to their routine.

Conclusion

1. Proper evaluation of fingertip defects is necessary to choose the best possible reconstructive option to achieve best results.
2. We advise to supply the emergency hospitals with the necessary equipments for performing microsurgery for distal replantation of the amputated fingertip in the suitable cases.

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