

Skin Coverage for Acute Fingertip Injuries – A case series of Traumatic Injury at Prof. Dr. R. Soeharso Hospital, Surakarta

Tito Sumarwoto^{1,2)}, Seti Aji Hadinoto^{1,2)}, Sigit Bayudono^{1,2)}, Pamudji Utomo^{1,2)}

¹⁾Department of Orthopaedic and Traumatology, Faculty of Medicine, Universitas Sebelas Maret

²⁾Prof. Soeharso Orthopaedic Hospital, Surakarta

ABSTRACT

Background: Traumatic fingertip injuries are the most common injuries of the hand. Several million estimated visits to primary care providers and the emergency department occur each year. But the handling is often not done properly and comprehensively. Reconstruction of the fingertip must be done as soon as possible in the acute stage, resulting in better outcomes in the future. Aim of the surgery was to restore as much finger length, preserve sensation fingertip properties and achieve normal nail growth, and cosmetics appearance as well.

Case presentation: Three cases of emergency patients with fingertip injury treated at the hospital in the acute setting. All of these patients experienced work injuries and were immediately taken to the emergency department.

Results: The debridement and skin coverage reconstruction were carried out. Functional and aesthetic outcome were a postoperative assessment.

Conclusion: The right choice of treatment and good wound care will produce a better outcome.

Keywords: traumatic injury, fingertip injury, skin coverage

Correspondence:

Tito Sumarwoto. Department of Orthopaedic and Traumatology, Faculty of Medicine, Universitas Sebelas Maret. Jl. Ir. Sutami 36A, Surakarta, Central Java.

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BACKGROUND

The importance to the overall function of the hand is stable, mobile and sensate fingertip. The face and hands are the most looked at parts of our body. So, that the right handling as early as possible for hand injuries must be considered. When faced with a fingertip injury, clinicians will need to manage both functional and aesthetic considerations in their treatment plan.

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 thumb. Fingertip injuries are commonly seen by family and emergency

physicians. Many of these cases are simple to treat and don't need specialized treatment by a hand surgeon. However, there are certain conditions where early intervention by a hand surgeon is warranted for better functional and aesthetic outcomes (Sebastin and Chong 2010).

The ideal aim in management of fingertip traumatic injury is to restore the length of finger, obtain a stainless and sensate tip with normal nail growth. Severe injuries sometimes require replantation, but depend on the severity of the injury and the availability of experts. In these cases, soft tissue coverage with flaps or skin graft

and nail bed reconstruction would offer a good outcome (Lee, Mignemi, and Crosby 2013).

With advancement of medical care, more reconstruction surgeries are attempted at initial presentation. Surgeons preferred thorough debridement and early coverage of finger tips. Many choices we can make depend on the state of the injury itself. Options for soft tissue coverage are skin grafts, cross finger flaps, island flap, advancement flaps or pedicle digital island flaps, groin flaps or even free flaps from toes. Early repair or reconstruction of nail beds in acute injuries had better outcomes compared to chronic nail deformities.

Nail beds are a highly specialized tissue where replacement with other tissue results in inconsistent outcomes. For example, split-thickness skin grafts and dermal grafts caused non-adherence of nail plates.

This was cosmetically unpleasant and functionally unhygienic. The best option for replacement was a nail bed graft including both split-thickness nail bed graft (STNBG) and full-thickness nail bed graft (FTNBG). STNBG could be harvested from the residual nail bed of the injured finger stump. FTNBG was better harvested from the amputated fingertip (if the patient brought the part) or toes as it has 100% donor site morbidity (Gunasagaran, Sian, and Ahmad 2019).

CASE PRESENTATIONS

Case report I

A 29-year-old man works as a laborer in a clothing company. Three hours before admission his right hand was hit by clothing machine. He suffered pain and open wound on his 2nd finger but no fracture. He was taken to Soeharso Hospital.



Figure 1. The right index finger with open wound

From inspection, open wound on 2nd finger of right hand with irregular edge. Distal phalanx was exposed after thorough debridement. Cross-finger flap with the middle finger was performed to cover the pulp defect. Nail bed defect was covered with STNBG obtained from the same 50% remnant healthy nail bed. Graft was harvested as thin and uniform as possible;

free hand with a scalpel (size 11) under magnification. Nail plate was reapplied and bandaged. Wound was inspected weekly and dressing changed. Separation of finger was done on the six week. The uptake of nail bed graft was 100%. And the skin has already healed after six months with normal sensation of the fingertip and a good appearance.



Figure 2. The right index finger after surgery

Case report II

A 33-year-old man works as farmer. 1 hour before admission, his right hand pinched by rope after the incident, he complained of

pain and suffered from open wound on his middle finger and there was no bone exposed. By the helper he was brought to Soeharso Hospital.



Figure 3. The right middle finger with open wound

From inspection, open wound on 3th finger of right hand with irregular edge. The patient was underwent surgery thorough debridement + performed FTSG from the donor of his wrist region volar site. Graft was harvested as thin and uniform as possible; free hand with a scalpel (size 11) under magnification. Five months after surgery the fingertip has already healed and

the normal sensation of the fingertip is preserved also good cosmesis.

Case report III

A 27-year-old man, his left hand was hit by the machine when he worked. He complained of pain and suffered open wound on his left thumb, no bone exposed and nail still insist.



Figure 3. Open wound in the left thumb

By his mate he was taken to hospital for seeking the help. He was underwent surgery by debridement + FTSG taken from thenar region in the same site. After 1 week surgery the graft has already graft taken but the sensation is still hard to evaluate and the appearance is not bad.

DISCUSSION

Finger tip injuries commonly involved soft tissue and nail bed. In severe crush injuries, both structures need to be considered for reconstruction. The aim of management is to obtain painless sensate finger tip, normal nail growth and maintain length of finger (Lee et al. 2013).

We chose cross-finger flap from middle finger as the lesion was at palmar-radial aspect (lateral oblique). STNBG was obtained from the remnant of injured nail bed as the size was adequate to cover the defect. Many informative surgical techniques are described by all authors. Shepard emphasized the importance of microscopic assessment of the injured nail bed. In partial thickness loss, grafting is not necessary as the nail could heal and grow normally. Placement of nail bed graft sondepithelialized flap has excellent graft take. Sabapathy et al. created a raw area for nail bed graft placement by suturing the undersurface of flap to nail bed remnant. Rohard et al. described nail bed recon-

struction in paediatric group. They emphasized that the nail plate is pliable that it can be bent to elevate for STNBG harvest. Complete removal of nail plate is unnecessary.

Table 1. Summary of the total acute fingertip injuries and their definitive reconstructive surgeries

Author	Patients (fingers)	Level of injury	Mechanism of injury	Surgery for skin coverage	NB graft
Sabapathy	15	Proximal half NB to nail fold	Door crush and industrial accidents	V-Y advancement flap	FTNBG from amputated part
Brown	14	Mid nail to lunula level	Crushing injuries	Oblique triangular flap ^a Palmar V-Y flap (6) Thenar flap (4) Lateral V-Y flap (2) Moberg flap (1) Cross-finger flap (1) ^b	STNBG -toe (6) -injured part (2) FTNBG from amputated part (6) FTNBG from amputated part and lesser toes
Saito	9 (10F) (excluded one patient for chronic nail deformity involving germinal matrix)	Sterile matrix	Crush and bitten off by pig, sliced off by electric planer cutter	V-Y flap Thenar flap Cross-finger flap	FTNBG from amputated part and lesser toes
Shepard	48 (including toes)	Avulsed NB segment	'Crush injury' Example: Mix master, lawn mower, punch press and saw	Rotation flap (4)	SSG (3) Dermal (4) FTNBG from great toe (6) STNBG (31) -great toe (7) -injured nail (24) STNBG from great toe
Hsieh	12 (12F)	Sterile matrix	Crush injury with avulsed NB defect	None	
Clayburgh	9 (excluded 10 patients for chronic nail deformity)	Half or less sterile matrix	Crush or power tool laceration or avulsion or pulley belt entrapment	None	Reverse dermal graft -forearm or wrist crease
Rohard	9 (all children)	Defect at sterile matrix (more than 3 × 3 mm ²)	Door crush	Moberg flap (3) Palmar V-Y flap (2) Thenar flap (1)	STNBG -injured finger (6) -great toe (3)

NB: nail bed; SSG: split-thickness skin graft; STNBG: split-thickness nail bed graft; FTNBG: full-thickness nail bed graft.

^aUndersurface of V-Y flap sutured to nail bed remnant, create raw area for nail bed graft.

^bGraft applied on de-epithelialized flap.

A full-thickness skin graft (FTSG) is applied with caution over exposed bone and tendon, but contemporary investigators have shown that a FTSG can be reliably used in the context of exposed bone or tendon. Using skin grafts judiciously for pulp reconstruction, and note imperceptible differences between glabrous and non glabrous graft in the long term, because the graft remodels according to stress to which it is exposed. Donor site morbidity is prioritized over like-for-like reconstruction because there are limited donor sites for glabrous skin (Martin-playa and Foo 2019).

The possibility of obtaining thick nail bed graft is low as the nail beds are generally thicker in children (Sebastin and Chong 2010).

The assessment of surgical outcome is too subjective. Some authors only assessed the outcome appearance of finger and nail without considering the patient's opinion. Clayburgh et al. and Rohard et al. Introduced scoring systems which included the surgeon's assessment and patient's satisfaction level. Even these objective assessments did not include the function of the fingers like motion and pinch strength. All of the assessed the cosmetic aspect of the nail, for example, irregularity, adherence and splitting (Gunasagaran et al. 2019).

Table 2. Outcome and complication of reconstructive surgeries performed for acute NB injuries with or without concomitant pulp loss

Author	Function	Cosmesis	Uptake	Donor site	Follow up	Complications
Sabapathy	NA	Excellent ^a	100% uptake	None	1 year	Hook nail (2)
Brown	Able to use in daily activities	Excellent ^a	Partial flap loss (1), partial graft loss (1)	None	4 months to 2 years	Hard nail -germinal matrix injury
Saito	NA	Excellent (normal or slightly rounded) ^b	NA	None	2.5–15 months	None
Shepard	NA	All flap – nail deformity (4) Five in STNBG – irregular nail/non-adherence All dermal grafts – no adherence nail (4) All SSG – irregular thick nail with partial adherence nail (3) All FTNBG – normal ^b	NA	Deformity in all FTNBG (6), none in STNBG	6 months to 1 year	NA
Hsieh	NA	Excellent ^b	NA	None	10–14 months	NA
Clayburgh	NA	Excellent (7) Poor (1) ^a	NA	None	6–26 months	Deformed nail (1)
Rohard	NA	Satisfied to very satisfied (8) ^c Inadequate length (2) ^b	No flap loss, 100% uptake	None	7–88 months	Hook and split nail (1)

SSG: split-thickness skin graft; STNBG: split-thickness nail bed graft; FTNBG: full-thickness nail bed graft

^aPatient satisfaction + author's assessment.^bAuthor's assessment of surgical outcome.^cPatient satisfaction.**AUTHOR CONTRIBUTION**

Tito Sumarwoto, Seti Aji Hadinoto, Sigit Bayudono, and Pamudji Utomo, collect the data, did the surgery, and wrote the paper.

CONFLICT OF INTEREST

None.

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