e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(4); 1287-1291

Original Research Article

Outcome of Partial Thickness Nail Bed Graft in Acute Finger Tip Injuries at a Tertiary Care Centre

N. Ramyadeepthi

Assistant Professor, Department of Plastic Surgery, Dr Chandramma Dayananda Sagar Medical Education and Research, Devarakagalahalli Village, Harohalli, Kanakapura Taluk, Ramnagara Dist. Karnataka 562112

Received: 25-01-2024 / Revised: 23-02-2024 / Accepted: 26-03-2024
Corresponding Author: Dr. N. RAMYADEEPTHI
Conflict of interest: Nil

Abstract:

Introduction: Fingertip injuries are the most common injuries nowadays due to increased industrial and traumatic accidents causing permanent deformity and functional disturbance, which raises the need for reconstruction to retain finger function and prevent nail bed deformity. The aim in the management of fingertip traumatic injury is to restore the length of the finger, and obtain a painless fingertip with normal nail growth. Replantation of fingertips is not always possible; it depends on the severity of the injury and the availability of experts. In these cases, soft tissue coverage with flaps and nail bed reconstruction with sterile nail bed graft would offer a good outcome.

Methods: This is a prospective study. Between August 2023 and December 2023, we selected patients with a full-thickness nail bed defect and significant exposure to the distal phalanx. Patients are treated via a 1-stage or 2-stage surgical procedure with partial thickness sterile matrix nail bed graft from the great toe and flap, followed by 2-3 weeks of immobilization and then flap division.

Results: Among 25 patients, 21 patients have excellent outcomes. In 2 cases there is total nail bed loss due to infection. In 2 cases the nail bed is macerated and necrosed due to irregular follow-ups.

Conclusion: Nail bed grafting and fingertip reconstruction have an excellent result. The initial debridement with a well-vascularized bed for the nail bed graft has given a good cosmetic and functional outcome. Good techniques in harvesting donor site nail bed grafts can avoid donor site morbidity.

Keywords: Partial thickness sterile nail bed matrix (PTSNBM)**,** Partial thickness sterile nail bed graft (PTSNBG)**,** Split-thickness nail bed graft (STNBG)**,** Full-thickness nail bed graft (FTNBG).

Introduction

This case series is based on acute fingertip injuries which include industrial, and road traffic accidents, contaminated domestic injuries, and human/animal bites which involve both one-stage and two-stage reconstructions [1]. This case series includes fingertip reconstruction with partial thickness nail bed graft and flap reconstruction.

Full-thickness nail bed defects with significant exposure of the distal phalanx are typically challenging to reconstruct because of the absence of a vascularized wound bed for the graft to take. [2] Because of the proximity of the bone and nail bed, exposure to the distal phalanx is common in nail injuries. Exposed bone can rapidly desiccate, and scarring on the nail bed can lead to nail deformity [2]. The sterile matrix is a unique structure that is challenging to substitute because it is a thin and highly vascularized tissue [2]. To prevent deformity, the defect of the nail bed is grafted with partial thickness sterile nail bed matrix (PTSNBM) or partial thickness sterile nail bed graft (PTSNBG). Herein, we describe a 2-stage method for reconstructing nail bed defects using flaps like cross-finger flap, VY flap, and thenar flap [3].

A nail bed is a highly specialized tissue where replacement with other tissues results in inconsistent outcomes. For example, split-thickness skin grafts and dermal grafts caused non-adherence of nail plate [4]. This is cosmetically unpleasant and functionally unhygienic. The best option for replacement is a nail bed graft including both split-thickness nail bed graft (STNBG) and full-thickness nail bed graft (FTNBG) [4].

Methods

This is a prospective study approved by Dr. Chandramma Dayanand Sagar Institute of Medical Education and Research, and all patients provided

informed consent for undergoing the procedures. Between August 2023 and December 2023, we selected patients who presented to our department with a full-thickness nail bed defect and significant exposure to the distal phalanx. Patients are treated via a 1-stage or 2-stage surgical procedure with partial thickness sterile matrix nail bed graft from the great toe and flaps, followed by 2-3 weeks of immobilization and flap division [12]. We included patients coming to the hospital with acute work site injuries, accidents, human/animal bites, and domestic injuries in the age group of 5 to 60 years. We excluded patients with infected wounds, or with bone necrosis of the distal phalanx.

Surgical Technique:

The procedure can be performed in local/regional/general anesthesia. All the patients included in the study had full-thickness nail bed defects (size approximately 40-70% of the size of the sterile matrix) with or without pulp loss/periosteum and with or without fracture of tuft of the distal phalanx. [5] Around 3 cases of fingertips are reconstructed with PTSNBG from the great toe. 10 cases are reconstructed with PTSNBG + Cross finger flap ± K wire. [11] 7 cases were reconstructed with PTSNBG and thenar flap and 5 with PTSNBG and V-Y flap. [5]

In all the above cases, nail bed graft is harvested from the great toe after proper marking of the size of the defect, with the No. 11 surgical blade, PTSNBG is harvested and care is taken not to expose the bone or periosteum of the great toe. [6] We adjusted the cutting depth to a level at which the blade was visible through the graft and ensured that the graft had appropriate thickness. The nail is reinserted into the eponychial fold after adequate hemostasis. The PTSNBG is sutured to the defect with 5-0/6-0 Ethilon and bolster dressing is done.

In cases where fracture of the tuft of the distal phalanx is present, it is fixed with 0.8mm axial K-wire. Pulp defects are reconstructed with cross-finger, V-Y, and thenar flaps [7]. In cases where the periosteum of the phalanx is lost, the outer cortex of the exposed phalanx is nibbled and vascularity is ensured and nail bed grafting is done [8]. In all cases, adequate, immediate debridement and adequate vascular bed for nail bed graft is ensured. Regular dressing is done every 3 to 4 days for donor sites of nail bed graft and flaps with topical antibiotics and Vaseline [6]. Oral/IV antibiotics/anti-inflammatory is given for 5-7 days post-operatively depending upon the contamination. Suture removal is done after 10-14 days of surgery. Flap division and inset is done after 2-3 weeks of the first procedure. K wire is removed after 3 weeks [9].

After flap division, the patient is followed up for 3-4 months to assess the nail growth, preservation of fingertip function, and great toe morbidity.

Result

Table 1:

Sl. No.	Type of injury	Procedure done	Outcome
1	Worksite injury - Right index finger	Cross finger flap with PTSNBG	Excellent
2	Worksite injury - Left thumb	Cross finger flap with PTSNBG	Excellent
3	Worksite injury - Right thumb	V-Y flap with PTSNBG	Excellent
4	Cycle chain injury - Left little finger	Cross finger flap with PTSNBG	Excellent
5	Worksite injury - Left index finger	PTSNBG	Excellent
6	Dog bite injury - Right little finger	Cross finger flap with PTSNBG	Excellent
7	Worksite injury - Left index finger	Cross finger flap with PTSNBG	Excellent
8	Domestic injury - Right index finger	PTSNBG	Excellent
9	Human bite - Right index finger	V-Y flap with PTSNBG with K wire	Excellent
10	Worksite injury - Right index finger pulp loss with nail bed loss	Thenar flap + PTSNBG	Excellent
11	RTA – Left thumb injury	Cross finger flap with PTSNBG	Excellent
12	Worksite injury – Right ring finger injury	V-Y flap with PTSNBG	Excellent
13	RTA – Right index finger injury	Cross finger flap with PTSNBG	Infection and nail bed loss

14	Worksite injury – Left middle finger pulp loss with nail bed loss	Thenar flap + PTSNBG	Excellent
15	Domestic injury – Right index finger	Cross finger flap with PTSNBG	Excellent
16	Worksite injury – Right middle finger injury	Thenar flap + PTSNBG	Excellent
17	Worksite injury – Right thumb	PTSNBG	Excellent
18	RTA – Left middle finger injury	Thenar flap + PTSNBG	Excellent
19	RTA – Left ring finger injury	V-Y flap with PTSNBG	Nail bed loss due to irregular follow-up
20	Worksite injury – Left index finger injury	Thenar flap + PTSNBG	Infection and nail bed loss
21	Dog bite – Left thumb injury	Cross finger flap with PTSNBG	Excellent
22	Worksite injury – Left index finger pulp loss with nail bed loss	Thenar flap + PTSNBG	Infection
23	Worksite injury – Right thumb injury	Cross finger flap with PTSNBG	Nail bed loss due to irregular follow-up
24	RTA – Left middle finger injury	V-Y flap with PTSNBG	Excellent
25	Worksite injury – Left index finger	Thenar flap + PTSNBG	Excellent

Figure: 1

Figure: 2

Figure: 3

Figure: 4

Figure: 5

Figure: 6


Figure: 7 **Figure: 8**

Worksite injury right index finger with nail bed and pulp loss with exposed distal phalanx (Fig No: 1). Underwent PTSNBG from left great toe (Fig No: 2) and cross finger flap (Fig No: 3 and 4). Three months follow up of the finger showing normal nail and good fingertip shape (Fig No: 8). Donor site after 3 months showing nail. (Fig No: 7).



Figure: 9 **Figure: 10** **Figure: 11**



Figure: 12 **Figure: 13** **Figure: 14**



Figure: 15 **Figure: 16** **Figure: 17**

Figure: 18

Worksite injury left thumb with nail bed and pulp loss with exposed distal phalanx (Fig No: 09). Underwent PTSNBG from left great toe (Fig No: 11) and cross finger flap.

Three months follow-up of the finger showed normal nails and good fingertip shape (Fig No: 18). Among 25 patients, 21 patients had excellent outcomes which mean total nail bed graft take up and nail growth in three months with good functional and cosmetic outcomes and no donor site morbidity. In 2 cases there is total nail bed loss due to infection which is treated with antibiotics according to culture and sensitivity and the flap is readjusted to cover the defect.

In 2 cases the nail bed is macerated and necrosed due to irregular follow-ups. The nail bed graft was debrided, bone nibbled and flaps were readjusted to cover the defect.

Conclusion

Nail bed grafting and fingertip reconstruction have an excellent result. The initial debridement with a well-vascularized bed for the nail bed graft has given good cosmetic and functional outcomes [6]. Good techniques in harvesting donor site nail bed grafts can avoid donor site morbidity [10].

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