

*Research Article***Evaluation of the Reversed Homodigital Island Sensate Flap for Reconstruction of Fingertip Injuries****Tharwat M. Ali, Ragab A. Mohamed, Khaled M. Hassan and Mohamed A. Gamal Mohamed**

Department of Plastic Surgery, El-Minia Faculty of Medicine

Abstract

Introduction: The fingertip trauma in children was one of the most common incidents in emergency rooms. Napkin injuries are commonly referred to as subungual hematomas, clear or star lacerations, pulsations and crush wounds. **Aim of the Work:** The aim of this study was to; Evaluate the role of peroneal artery pedicled perforator flap for reconstruction of lower leg and foot soft tissue defects. **Patients and Methods:** Study design: A Prospective non-randomized clinical study, This has been conducted at Minia university hospital and Minia insurance hospital in the duration from 1st of April 2019 to 31st of October 2019 .It included 20 patients presented with distal phalangeal dorsal and pulp defects. **Results:** This clinical study includes reconstruction of fingertip injuries. Besides, we have evaluated the functional and aesthetic outcomes of reversed homodigital island sensate flap.

Keywords: fingertip trauma, Napkin injuries, foot soft tissue**Introduction**

The fingertip trauma in children was one of the most common incidents in emergency rooms. Napkin injuries are commonly referred to as subungual hematomas, clear or star lacerations, pulsations and crush wounds.⁽¹⁾

The injury caused when the nail bed is compressed between the nail and the underlying bone causes straight, stellate or shrinkage to a bed. It may result in an amputation of the fingertip if the fingertip is damaged by a sharp object⁽²⁾.

Injuries can cause a distal phalanx fracture, while other injuries can result in fingertip amputation by crushing alone, partially or completely⁽³⁾.

Crushing a finger into the door is the most prevalent injury mechanism, usually with the right hand and often with a second child closing the door, with nail bed injury being the most common type of injury⁽⁴⁾.

The most injured fingertips are the most distal portion of the upper extremities and this type of

damage could have long-term cosmetic and sensory implications, depending on the severity of the injury, which can have an impact on daily activities. When a finger pad touches an object protecting the doorbell and plays a role in the tactile sensation when it is able to pick up small objects⁽⁵⁾.

A subungual haematoma is a blood collection underneath the nail caused by a fingertip crush⁽⁶⁾.

The management of the subungual hematomas and nail bed injury is controversial. In comparison with a trephination of a large subungual haematoma, many debate has been held about the removal of a nail plate for the restoration of nail beds⁽⁷⁾.

Fingertip injuries are easy to distract due to childhood distress and pain, but evaluation of more serious extremity injuries is not necessary⁽⁸⁾.

The priority of pain relief is to apply analgesia according to the local pediatric guidelines for pain relief⁽⁹⁾.

To ensure that no injuries are missed, a digit test should be methodical and structured. It is helpful to use 'look, feel, move.' In the patient's notes, it is important not to forget to examine the extensor and bending tendons and to check the potential avulsion of the extensor tendon findings⁽¹⁰⁾.

Evaluation of the affected figure consists in an examination of the integrity of neurovascles, tendon or ligament injury, soft tissue or skin loss and ossic sensitivity. A complete test should also be performed prior to inserting a digital block on sensation, motor status and vascular function⁽¹¹⁾.

This test can usually be performed without anaesthesia, although in small children it may not be possible. A digital block and adequate oral pain alleviation will allow thorough cleaning of the fingertip to identify injured structures, in particular, if the nail plate is avulsed or unstable from the nail bed (Patel, 2014). The injury mechanism, age and dominance of the patient should be quickly defined as this information will guide your treatment⁽¹²⁾.

Aim of the Work

The aim of this study was to; Evaluate the role of peroneal artery pedicled perforator flap for reconstruction of lower leg and foot soft tissue defects.

Patients and Methods

Study design: A Prospective non-randomized clinical study, This has been conducted at Minia university hospital and Minia insurance

hospital in the duration from 1st of April 2019 to 31st of October 2019 .It included 20 patients presented with distal phalangeal dorsal and pulp defects.

Inclusion criteria:

- Age: from (preschool age → middle age) (2 → 60 years old) .
- fingertip injuries distal to DIP joint with exposed bone and tendons.
- Acceptance and compliance of the patient.

Exclusion criteria:

- Immunocompromised patients: e.g. diabetic patients, patients on long-term corticosteroids, cancer patients under chemotherapy,... etc.
- Polytrauma patients.
- Thumb amputation.
- Defects proximal to distal interphalangeal joint.
- Proximal digital vascular injuries.
- Heavy smokers, chronic ischemia e.g. Raynaud's disease.

Management protocol:

Admission data included:

- * Time and mechanism of injury.
- * History of smoking and diabetes
- * General and local examination of the extremity.
- * Sterile dressing was applied to the wound
- * Plain digital radiographs were performed to exclude any concomitant fracture.
- * All patients were counseled and signed an informed consent to share in the study.
- * Photography.

Results

Demographic Data

Case no.	Age (yrs)	Sex	Smoking	DM	Location of the defect according to classification
1.	28	Male	Yes	No	Type 2
2.	65	Male	Yes	No	Type 2
3.	12	Male	No	No	Type 3
4.	4	Male	No	No	Type 2
5.	53	Male	Yes	No	Type 3
6.	25	Male	Yes	No	Type 3
7.	7	Female	No	No	Type 3
8.	11	Male	No	No	Type 3
9.	14	Male	No	No	Type 3
10.	37	Male	Yes	Yes	Type 3
11.	55	Male	No	Yes	Type 2
12.	30	Male	No	No	Type 2
13.	42	Male	No	Yes	Type 3
14.	9	Male	No	No	Type 2
15.	60	Male	No	No	Type 3
16.	34	Male	Yes	No	Type 2
17.	57	Male	Yes	Yes	Type 3
18.	23	Female	No	No	Type 3
19.	48	Male	Yes	No	Type 3
20.	33	Male	Yes	No	Type 3

This clinical study includes reconstruction of fingertip injuries. Besides, we have evaluated the functional and aesthetic outcomes of reversed homodigital island sensate flap. We have evaluated the functional and aesthetic outcomes of reversed homodigital island sensate flap for reconstruction of fingertip injuries. and these are the results at the end of the 6 months follow up period after healing

Table (3): Data collected based on (bone, tendon, operation time and etiology of the defect).

Case no.	Exposed bone	Exposed tendon	Op. time (min)	Etiology
1.	Yes	No	50	Trauma
2.	Yes	No	65	Trauma
3.	Yes	No	60	Trauma
4.	Yes	No	70	Trauma
5.	Yes	No	70	Trauma
6.	Yes	No	65	Trauma
7.	Yes	No	60	Post inflammation parrot peak deformity
8.	Yes	No	80	Trauma
9.	Yes	No	55	Trauma
10.	Yes	No	60	Trauma
11.	Yes	No	70	Trauma
12.	Yes	No	75	Trauma
13.	Yes	No	65	Post Primary closure gangrene
14.	Yes	No	50	Trauma
15.	Yes	No	55	Trauma
16.	Yes	No	60	Trauma
17.	Yes	Yes	65	Trauma
18.	Yes	Yes	50	Trauma
19.	Yes	No	60	Trauma
20.	Yes	No	55	Trauma

Discussion

The most common traumatic injuries present in acute care include fingertip amputation. The fingertip is specially designed to allow for fine motor activity and accurate sensations and to contribute to the esthetic of hands⁽¹³⁾.

Any soft tissue, nail or knee amputation distal to long-flexor inserts and extensor tendons of the finger or thumb is a fingertip amputation⁽¹⁴⁾.

The available treatments cover a wide range of techniques without any single recommended treatment reference standard. While there is no consensus on how these injuries should be addressed, the treatment objectives are to minimize pain, optimize healing time, maintain sensitivity and length, avoid or limit nail defects, minimize time lost during work and provide an acceptable cosmetic appearance⁽¹⁵⁾

There are no clear definitions of fingertip defects in the literature, mostly small and big defects, but the structures are classified as nail, pulp or bone⁽¹⁶⁾

Various methods for reconstruction of fingertip injuries have been introduced. However, adequate treatment should preserve digital functional length, sensitivity and minimize esthetic deterioration. In addition, a painless digit that lacks symptoms linked to neuroma formation or cold intolerance should result in the reconstruction. Finally, rapid return to complete employment should be provided with various advancement flaps for reconstruction instruments,⁽¹⁷⁾

Regional flaps and free tissue transfers.

The flaps show limitations of rotational size, arc and cold intolerance⁽¹⁸⁾.

Regional flaps as a thermostat or flap need to be operated by two stages, in particular in elderly persons, together with the associated risk of residual joint stiffness. Free transfers of tissue require not only considerable microsurgical expertise but also prolonged surgery for the patient.

The distally based homodigital insel pad offers many benefits for fingertip reconstruction, initially described by Weeks and Wray (1973) and modified by others. It permits a 1-stage

operational approach, avoiding the participation of a second finger (cross-finger-flap) or a thenar eminence (thenar-flap). The risk of residual joint stiffness is minimized since the long immobilization of the injured digit is avoided. The thin glabrous skin of the proximal phalanx's lateral surface is comparable to the volar pulp in texture and thickness, enabling reconstructive action in accordance with the time-honored substitute principle like this. The width of its arc makes it easy to cover the most distally situated defects to preserve the functional length. However it is necessary to prevent dissection beyond the digital transverse artery. Also, if an injury is proximal to a distal interphalangeal joint you do not recommend using this flap. This flap 's disadvantages include both a risk of venous failure and the necessity for a digital artery to be sacrificed. ⁽¹⁹⁾

Although we no longer transfer the reverse homodigital flap as a sensitive flap⁽²⁰⁾ as long-term analysis revealed no significant difference in the level of discrimination of 2 different points⁽²¹⁾.

Conclusion

Reversed Homodigital island sensate flaps save on operating time and does not rely on expensive microsurgical facilities which are not that readily available to surgeons working in a large part of the world

Homodigital island sensate flaps are safe and reliable flaps and represent an important step forward in reconstructive plastic surgery of the hand as they:

- (1) Decrease donor-site morbidity.
- (2) A better cosmetic and reconstructive result

The homodigital, laterodorsal fasciocutaneous flap has a Reliable blood supply, suitable thickness, good texture, avoiding The need for sacrificing a major artery, easy and secure dissection,

No functional loss of the involved digit, tiny two-point discrimination, good finger-pulp appearance, excellent aesthetic results and high patients' satisfaction. The homodigital, laterodorsal fasciocutaneous flap based on the dorsal branch of the proper palmar digital artery is an

ideal alternative to reconstruct the finger-pulp for single-stage reconstruction without sacrificing the proper palmar digital artery and nerve

Future plans

1. More cases of Reversed Homodigital island sensate flaps, more experience and more research need to be done.
2. Further research is needed to establish a clear understanding of the effect of leech therapy postoperative to decrease complication rate

References

1. Aboulwafa, A. & Sherif, E. Versatility of Homodigital Islandized Lateral VY Flap for Reconstruction of Fingertips and Amputation Stumps. *Egypt J Plastic Reconstruction Surgery*. 2013; 37: 89-96
2. Bas, H. & Kleinert, J.M. Anatomic variations in sensory innervation of the hand and digits. *The Journal of hand surgery*. 24(6),1999; pp.1171-1184.
3. Gellman, H. Fingertip-nail bed injuries in children: current concepts and controversies of treatment. *Journal of Cranio-facial Surgery*. 2009;20:1033-1035.
4. Gigis, P.I. & Kuczynski, K. The distal interphalangeal joints of human fingers. *The Journal of hand surgery*, 7(2),1982; pp.176182.
5. Iwasawa, M., Kawamura, T. & Nagai, F. Dorsally extended digital island flap for repairing soft tissue injury of the fingertip. *J Plast Reconstr Aesthet Surg*. 2011; 64: 1300–1305
6. Liu & Edward, H. A prospective study of pediatric hand fractures and review of the literature. *Pediatric emergency care*. 2014; 30: 299-304.
7. Peterson, S.L., Peterson, E.L. & Wheatley, M.J. Management of fingertip amputations. *The Journal of hand surgery*, 39(10),2014; pp.2093-2101.
8. Strauch, B. & de Moura, W. Arterial system of the fingers. *The Journal of hand surgery*, 15(1),1990; pp.148-154.
9. Zook, E.G. Anatomy and physiology of the perionychium. *Clinical Anatomy*, 16 (1), 2003; pp.1-8.
10. Zook, E.G., Guy, R.J. & Russell, R.C. A study of nail bed injuries: causes, treatment, and prognosis. *J Hand Surg* 1984; 9A:247– 252
11. Towers, K. L. & R. Eckersley. Assessment of the injured hand. *Trauma* 2004; 6: 261-270
12. Venkataswami, R. & Subramanian, N. Oblique triangular flap: a new method of repair for oblique amputation of the fingertip and thumb. *Plast Reconstr Surg*. 1980; 66: 296–300