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AESTHETIC AND FUNCTIONAL OUTCOME OF LOCAL FLAPS OF HAND ON FINGERTIP DEFECT

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ABSTRACT

Background: Soft tissue defects of the hand following trauma or tumour resection are frequently encountered in hand surgery and if not managed appropriately it may result in a temporary or permanent disability. **Aim and objectives**: This study aims to assess the aesthetic and functional outcome of local flaps of hand-on fingertip defect. **Methods**: We have included 50 cases of fingertip injury of hand in our Institute from July 2021 to June 2024. 31 patients (62%) were male and 19 (38%) were female, in age group from 25 to 55 years. 26 cases had machine injury, 15 cases sharp cut injury, and 9 malignant lesions on the finger. Defects reconstructed with local hand flaps. We have evaluated the aesthetic and functional outcome of local flaps of the hand 6 weeks and 12 months postoperatively. **Results**: 50 patients with small to medium-sized defects of fingertips of hand, 15 cases were managed with Kutler Bilateral V-Y advancement flap, 12 cases Volar V-Y advancement flap, 11 cases thenar flap, 7 cases cross finger flap, 5 cases FDMA flap. Postoperatively none of the cases had complications in 6 weeks and the functional and aesthetic outcomes were quite acceptable such as 35 patients (70%) had excellent, while 11 patients had good results (22%) and 4 patients had fair results (8%) after 12 months. **Conclusions**: Local hand flaps are the simple best option to reconstruct fingertip defects and provide excellent soft tissue coverage, texture, and sensation while giving good aesthetic results.

KEYWORDS: Fingertip defect, hand injury, local flaps.

INTRODUCTION

The hand is an intricate part of the body that plays an essential role in social functioning, expression, productivity, and interactions with our environment.[1] Skin/soft-tissue envelope of the hand is a complex structure that not only covers the underlying structures but also has specialized functional and sensory components. The soft tissue envelope of the hand is uniquely designed to provide tactile input from our environment and must also withstand substantial wear over a lifetime.[2,3] Today 1/3rd of all injuries consist of hand injuries and they are quite often sufficient enough to restrict daily activities accounting for days lost from work.[4,3]

Soft tissue defects of the hand following trauma or tumor resection are frequently encountered in hand surgery and may result in a temporary or permanent disability if not managed appropriately. However, local hand flaps are a workhorse for the majority of small to medium-sized defects of the fingertips.

Soft tissue reconstruction of the upper extremity requires strict adherence to standard surgical principles. With options of primary closure, secondary closure, skin grafting, local flaps, regional flaps, distant flaps, and free tissue transfer. Our goal is to restore a functional, sensate, and aesthetically acceptable hand.[5,6]

METHOD

We have included 50 cases of fingertip injury of hand in our Institute from July 2021 to June 2024. Out of 50 patients, 31 patients were male and 19 patients were female, with the age from 25 to 55 years (mean age- 40 years). 26 cases had machine injuries, 15 cases had sharp cut injuries, and 9 cases had malignant lesions. All patients underwent debridement and excision of necrotic tissue and in malignant cases, wide local excision was done on fingertip. Reconstruction of the small to moderate-sized defect (1.5-3 cm) with various local hand flaps. Large defects>3cm formed after excision of malignancy, and crush injury to the whole finger were excluded. We have evaluated within 6 weeks the postoperative complications in the form of flap loss either partial or complete, wound dehiscence, hematoma, seroma, and wound infection. Further, Patient evaluations were carried out after the 12th month and they included assessment of sensation, adequacy of soft-

tissue cover, and aesthetic appearance-based patient satisfaction. Sensory evaluations were carried out with Semmes-Weinstein monofilament and two-point discrimination tests. Aesthetic appearance and patient satisfaction were scored by the patients themselves, as excellent, good, or poor.

Surgical procedure

Kutler Bilateral V-Y advancement flap

These flaps are ideally suited for transverse or slightly volar amputations at the midnail level. Bilateral V-Y advancements flaps are cut from the sides of the injured finger and advanced over the tip by dividing the fibrous septa. Figure 1 shows the Kutler's bilateral V-Y advancement flap in a 40-year-old male with a middle fingertip crush injury. Care must be taken to avoid injury to the lateral pulp tissues in which the terminal elements of the neurovascular bundles pass into the mobilized flaps.

Figure 1: Kutler's bilateral V-Y advancement flap for a 40-year-old male with middle fingertip crush injury.

Atasoy Volar V-Y advancement flap

A single V-shaped volar flap is cut on the remaining distal phalanx with the tip of the flap at the distal interphalangeal (DIP) joint crease. After the division of the fibrous septa from the underlying distal phalanx, the flap is advanced and the donor defect is closed. The Volar V-Y advancement flap is for transverse midnail or dorsally directed fingertip amputations. Figure 2 shows the Volar V-Y advancement flap for a 27-year-old male with middle and ring finger machine injury. The use of V-Y advancement flaps to repair inappropriately large defects can stretch the innervating nerves with resultant dysesthesiaz.

Figure 2: Volar V-Y advancement flap for a 27-year-old male with middle and ring finger machine injury.

Gatewood Thenar flap

The thenar flap is a two-stage procedure, and we have explained this pre-operatively along with their hand position between the two stages of the procedure. The thenar flap is an excellent technique for the reconstruction of major distal phalangeal amputations. The tissue match is exact, there is sufficient subcutaneous tissue to restore the lost pulp, and the donor site is inconspicuous during most activities. Figure 3 shows the Thenar flap for a 45-year-old female with a malignant melanoma excision defect on the tip of the middle finger. The advantages of this flap are that the metacarpophalangeal joint of the recipient's finger is fully flexed in a protective position, minimizing proximal interphalangeal joint flexion. Flexing of the distal interphalangeal joint when present, further improves the position of immobilization, the thumb is placed in full palmar abduction or opposition, and the thenar flap is designed with a proximally based pedicle, high on the thenar eminence so its lateral margin is at the metacarpophalangeal skin crease, and the pedicle of the flap is severed after 10 to 14 days, then active exercises are begun to remobilize the hand. The flap donor site may be closed primarily or may require placement of a skin graft.

Figure 3: Thenar flap for a 45-year-old female with malignant melanoma excision defect on the tip of her middle finger.

Gurdin and Pangman Cross finger flap

The standard cross-finger flap is best performed for cases of volar fingertip pulp amputation. The flap is designed over the dorsal surface of the middle phalanx of an adjoining digit and elevated superficial to the extensor peritenon. After turning the flap over like the page of a book, the injured finger is flexed and the flap is sutured over the volar tip defect. The donor site is skin grafted and the digits are immobilized. Because adipose tissue is absent, revascularization is rapid and the pedicle may be divided on the eighth or ninth postoperative day. This short period of attachment lessens the risks of postoperative joint stiffness. Figure 4 shows a cross-finger flap used in 50 50-year-old male with a sharp cut injury on the index finger

Figure 4: Cross finger flap for 50 years male with sharp cut injury on index finger.

Foucher First Dorsal Metacarpal Artery flap

The first dorsal metacarpal artery flap is for the reconstruction of thumb defects involving the volar thumb pulp. This is also known as a kite flap because of its distinct appearance of a distal skin paddle pedicled on a tail of neurovascular structures. This flap utilizes the skin and subcutaneous tissue of the proximal phalanx of the index finger and is based on the neurovascular bundle that rests within or under the fascia of the first dorsal interosseous muscle. The first dorsal metacarpal artery supplies vascularity in the vena comitantes and some superficial veins supply the venous outflow of the flow. Branches of the superficial radial nerve provide sensibility to this flap. The flap is elevated at the plane above the paratenon so that the donor site can accept the split-thickness graft for closure. The rest of the pedicle is dissected and the flap can either be transposed through a tunnel or a zig-zag incision into the volar thumb defect. This flap provides protective sensation and cortical relearning. Figure 5 shows showing First Dorsal Metacarpal Artery flap for a 45-year-old male with a crush injury to his thumb and the flap pedicle is transposed through a tunnel.

Figure 5: First Dorsal Metacarpal Artery flap for a 45-year-old male with a crush injury to the thumb.

It has been our experience that most patients who undergo fingertip reconstruction are admitted overnight to aid in wound care and to ensure adequate intravenous hydration. Prescriptions at discharge include a broad-spectrum antibiotic, which is to be taken for 7–10 days. Post-operative wound care consists of maintaining the position of fingers and hands. The dressing is to be changed after 48 hrs of procedure and then biweekly for 2 weeks.

RESULT

31 patients (62%) were male and 19 patients (38%) were female, in the age group from 25 to 55 years (mean age 40 years) as given in Table 1. Table 2 includes the mode of injury to the fingertip as 26 cases had machine injury, 15 cases had a sharp cut injury and 9 cases had a malignant lesion on the finger. After written and informed consent, patients were treated under either local or regional block anesthesia. All patients tolerated the surgical procedures well with no systemic- or anaesthesia-related complications. Small to medium-sized defects of fingertips were reconstructed with local hand flaps, 15 cases were managed with Kutler Bilateral V-Y advancement flap, 12 cases Volar V-Y advancement flap, 11 cases thenar flap and, 7 cases cross finger flap, 5 cases FDMA flap.

Table 1: Demographic Distribution Of Fingertip Defect.

Sex	Number	Percentage
Male	31	62%
Female	19	38%
Total	50	
Age	25-55yrs	Average 40 yrs

Tabel 2: Mode Of Injury To Fingertip.

Mode of injury to finger tip	Number of cases
Machine injury	26
Sharpe cut injury	15
Malignant lesion on tip	9
	50

As with all flaps, a tension-free closure is mandatory. Postoperatively, there were no infections or hematomas. All flaps survived completely, and there were no instances of flap loss. We have evaluated the aesthetic and functional outcome of local flaps of the hand 6 weeks and 12 months postoperatively. Two-point discrimination tests on the postoperative 12th month showed the following mean values: 7 mm in V-Y advancement flaps, 6.8 mm in cross-finger flaps, 7.4 mm in Kutler flaps, 7.6 mm in thenar flaps, and 7.8 mm in FDMA flap. Static two-point discrimination assessment showed decreased-moderate sensation in all patients. Semmes-Weinstein monofilament test showed normal sensation in 33 patients (66%), diminished light sensation in 15 (30%), and diminished protective sensation in 2 (4%). Aesthetic appearance and satisfaction were subjectively evaluated by the patients which are shown in Table 3 as 35 patients (70%) had

excellent, while 11 patients had good results (22%) and 4 patients had poor results (8%) after 12 months.+

Tabel 3: An aesthetic and functional outcome of local flaps of hand 6 weeks and 12 months postoperatively

Outcome	After 6 weeks	After 12 months
Excellent	25 (50%)	35(70%)
Good	15 (30%)	11(22%)
Poor	10 (20%)	4(8%)

DISCUSSION

Fingertip injuries are a common occurrence in the workplace as well as at home, due to accidents.[1,2] The severity of injuries ranges from simple injuries, which may require only regular dressings to amputations of the tip.[4,5] Complex injuries that require flap cover are also common. The objective of the treatment is wound healing, functional restoration, and aesthetic restoration.[3,6,7]

The hand is an intricate part of the body that plays an essential role

- social functioning
- expression
- productivity interactions with our environment

When a soft tissue defect of the hand is not amenable to primary closure or skin grafting, local skin flaps can be used as a reliable source of soft tissue replacement that replaces like with like.[9] A local flap consists of skin and subcutaneous tissue that is harvested from a site near a given defect while maintaining its intrinsic blood supply.

Advantages

- the simplest procedure that provides an adequate amount of tissue coverage.
- maximal gain of function.
- the least amount of donor site deformity.
- tissue replacement should follow the principle of replacing like with like to provide good color, texture, hairiness, and volume match.

In the present series, we had accidents predominantly due to industrial injuries. E Arpaci et al reported that when the Super Kutler flap includes the neurovascular component the flap sensates on recovery.[11,12] In Our study we have included neurovascular components in 3 cases. Achilleas Thoma et al By solely suturing the base of the triangle flap to the nail matrix and allowing the donor site defect to heal by secondary intension, all of the benefits of the Atasoy flap are maintained. In addition, by leaving the donor site open, the primary problem associated with the Atasoy flap – closure under tension – is avoided.[15,18,19] In Our study we have dissected the v flap meticulously till the fascia with pulp soft tissue is preserved and sutured tension-free. F. Rabarin et al The recovery of fingertip sensitivity after CFF reconstruction was previously documented as Sensitivity reappearing at 12–18 months postoperative.[20,21] Our patient also has recovered sensitivity in 12 months. The caveats of flap design and division advanced by Beasley, are that the flap should be placed high on the thenar eminence, based laterally, and divided promptly to prevent flexion contracture at the PIP joint.[22,23] Shun-Cheng et al. also described the sensate first dorsal metacarpal artery flap for resurfacing extensive pulp defects of the thumb. They reported eight patients with extensive pulp defects of the thumb over 3 years.[24,25] Two-point discrimination is commonly around 9 to 10 mm while in our study two two-point discrimination for this flap was 7.8mm.

CONCLUSION

Local hand flaps are the simple and best option to reconstruct small to medium-sized fingertip defects and provide excellent soft tissue coverage, texture, and sensation with good aesthetic results.

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Ethical approval: The study was approved by the Institutional Ethics Committee.

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