

## Case Series

# Utility of distal palmar flap in the reconstruction of distal thumb injury

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## ABSTRACT

Selecting the most appropriate technique for thumb reconstruction depends on multiple factors, including level of injury, status of the remaining hand, age, occupation, overall health, and functional demands of the patient. In this study we used distal palmar flap for reconstructing distal tissue loss of thumb in patients. It was noted that such defects could be treated effectively with regional flap i.e. distal palmar flap, which gives good aesthetic outcome and patient satisfaction. Patient satisfaction was found to be better with palmar crease flap for smaller defects than larger defects, however all of the patients graded satisfaction as good (80%) and very good (20%). Distal palmar flap is a good reconstructive method for thumb reconstruction, as it is an easier and non-microvascular technique which retains the thumb length, colour, vascularity and appearance of thumb. Thus, can be safely advocated for use as it has no significant complications associated with the technique.

**Keywords:** Distal palmar flap, Thumb injury, Distal tip injury, Patient satisfaction

## INTRODUCTION

Reconstruction of thumb tip, while providing a durable and sensate flap, is a challenging task. It is important as thumb accounts for 50% of hand functions. It is always recommended that the thumb, the most important functional segment of the hand, be reconstructed or replanted in case of complex traumas or amputations.<sup>1</sup>

The prehensile thumb provides the human mind an outlet for coordinated activity through its fine motions of prehension, opposition, and circumduction. A comprehensive understanding of the anatomy and biomechanics of the thumb provides a foundation on which functional disorders may be recognized and effectively treated.<sup>2</sup>

Selecting the most appropriate technique for thumb reconstruction depends on multiple factors, including level of injury, status of the remaining hand, age, occupation, overall health, and functional demands of the patient.

There are cut, crush, and avulsion injuries as well as their associations produced by various industrial, agricultural, domestic equipment.<sup>3</sup>

In cases of thumb injuries, the goal of surgical treatment is to preserve its length, mobility, opposition, sensitivity, and last but not least its appearance.<sup>4-6</sup> Extensive pulp defects of the thumb, with the exposure of tendon or bone, are challenging reconstructive problems. Surgical treatment includes the use of local, regional, and free flaps. Numerous thumb reconstruction techniques have been described over time.<sup>7</sup>

Though, in thumb amputation microsurgical transplantation is the gold standard.<sup>8,9</sup> In cases where this is not possible the result of the selected surgical technique should be a thumb of adequate length, opposable, with possible thumb-digital pinch, that should be sensitive and look as similar as possible to the contralateral thumb.<sup>10</sup> Distal palmar flap used in the reconstruction of avulsed

thumb gives adequate length, opposability, sensitivity and appearance with minimal scarring at donor site.

### Aims and objectives

Aims and objectives of the study was assessment of utility of palmar flap in reconstruction of distal thumb injuries.

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The procedure was performed in tissue loss of thumb in patients over a time period of 2 years. It was performed under loupe magnification with regional block. All the patients were in the age group of 16 and 60 years. Demographic details, cause of tissue loss, its extent, presence of bony injury, and presence of any comorbidity were noted.

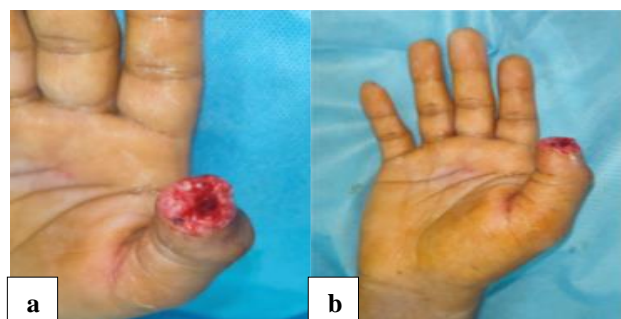
Only patients with isolated digital injuries were included in the study. Contraindications were defects at the proximal or distal phalanx which can be closed primarily or by advancement of local tissue and previous injury at the second metacarpal level.

Preoperative photographs were taken. The flap was performed by standard technique. Flap division and donor site closure by suturing or STSG on day 21, Dressing was changed on day 2, 4, 8 and sutures were removed on day 10. Physiotherapy for thumb was started after 1 month.

Patient satisfaction, in terms of cosmesis and function was recorded (graded as poor, good, and very good). Patients were followed up and scar was assessed at 2 months' follow-up.

The study was conducted over a period of 2 years, patients presenting with thumb injury were in the age bracket of 16-60 years, most of these injuries occur in middle aged individuals at workplace or due to road traffic accidents.

It was noted that such defects could be treated effectively with regional flap using palmar flap, which gives good aesthetic outcome and patient satisfaction.

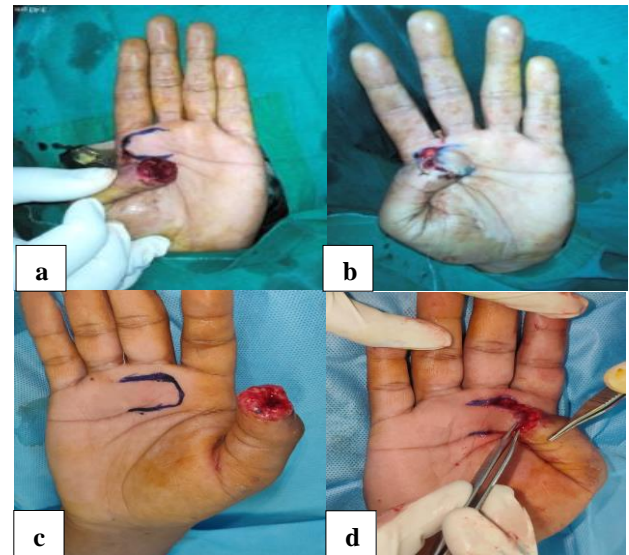


**Figure 1 (a and b): Distal thumb injury.**

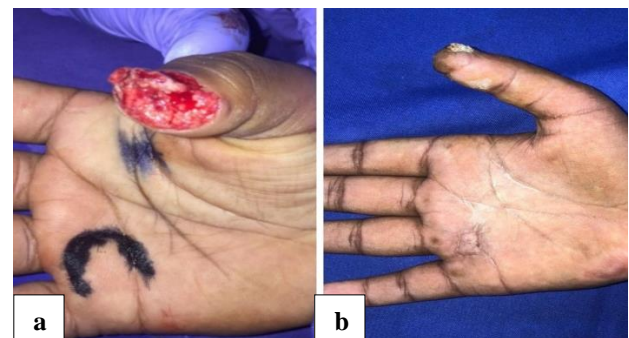
Statistically no significant association was found between scar appearance and patient satisfaction. Patient

satisfaction was found to be better with palmar crease flap for smaller defects than larger defects, and younger patients showed better healing, however all of the patients graded satisfaction as good (80%) and very good (20%).

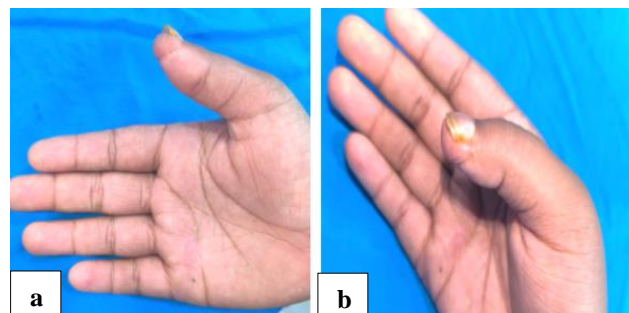
None of the patients presented with any complications in intra op or post-operative period, and were satisfied with the functional and aesthetic outcome of the reconstructed thumb.



**Figure 2 (a-d): Marking and suturing of distal palmar crease flap to cover distal thumb tip injury.**



**Figure 3 (a and b): Intra op and late post op pictures in distal palmar flap for distal thumb injury.**



**Figure 4 (a and b): Late post op pictures.**

**Table 1: Patient demography, patient satisfaction and scar scores.**

| S. no. | Age | Sex | Size of defect (cm) | Kapandji score | Patient satisfaction | Scar score-thumb | Scar score-donor |
|--------|-----|-----|---------------------|----------------|----------------------|------------------|------------------|
| 1      | 16  | M   | 0.7×1.0             | 9              | Good                 | 2                | 4                |
| 2      | 22  | M   | 1.2×1.2             | 8              | Good                 | 3                | 3                |
| 3      | 24  | M   | 1.0×1.3             | 8              | Good                 | 3                | 4                |
| 4      | 25  | M   | 0.8×0.8             | 9              | Very good            | 3                | 2                |
| 5      | 28  | F   | 1.0×1.0             | 9              | Good                 | 4                | 3                |
| 6      | 33  | M   | 0.7×1.0             | 8              | Good                 | 3                | 3                |
| 7      | 49  | F   | 1.0×1.0             | 7              | Very good            | 2                | 3                |
| 8      | 52  | M   | 1.0×1.7             | 7              | Very good            | 3                | 3                |
| 9      | 54  | M   | 0.6×1.4             | 8              | Very good            | 4                | 3                |
| 10     | 56  | M   | 1.0×1.8             | 7              | Good                 | 4                | 5                |

## DISCUSSION

The goals of thumb reconstruction include the restoration of thumb length, strength, position, stability, mobility, sensibility, and aesthetics. It is a rare event when all of these objectives can be achieved, and prioritization should be based on the goals and functional demands of the patient.

According to Heitmann and Levin, the goals to be considered in thumb reconstruction are stability at the IPJ and metacarpal -phalangeal joint, sensate and non-tender thumb tip, adequate strength to resist the forces of the fingers, correct posture and positioning of the thumb with a wide webspace, and mobility of the carpometacarpal joint with intrinsic muscles to aid prehension.<sup>11</sup> All these can be obtained when the chosen surgical technique preserves the length of the thumb as close as possible to the normal one. The pursuit and achievement of the above goals are aimed at ensuring the best possible pinch, fine manipulation, and power grip.<sup>12</sup>

In a study by Perteau et al, the thumb was reconstructed using “reposition-flap” with an O’Brien flap in 15 cases. In the remaining 17 cases where the amputation was at the level of the interphalangeal joint, they used the same technique, but the thumb neo pulp was reconstructed with the Littler hetero-digital neurovascular flap harvested from the ulnar border of the middle finger in 11 cases or radial border of the ring finger in 6 cases. The results were evaluated from a functional (Kapandji score), sensitive (2-point discrimination, Semmes-Weinstein test) but also aesthetically (patient satisfaction) point of view. Donor site morbidity, cold intolerance, the presence of nail dystrophy, and bone resorption were also assessed. The disabilities of the arm, shoulder and hand score was evaluated for each patient. All 32 patients of current report were fully satisfied with neo thumb function and appearance although in 8 patients, the IPJ mobility was not recovered. As in the study by Choo et al in which 5 of the 51 patient studies developed claw nail, this did not diminish patient satisfaction at all.<sup>8</sup>

The Littler flap is relatively “controversial” due to its disadvantages. Although at the time of its description by Littler in 1960 it was an effective way of covering large thumb pulp, later, donor site morbidity and cortical reintegration of the neo pulp became topics of debate.<sup>2</sup> The advantage of using this flap is the possibility of providing (for thumb pulp reconstruction) a sensitive skin island, with texture and qualities similar to the lost one, the functional and aesthetic sequels compared with the advantages of this flap being insignificant.

One study done on wrist crease flap showed good results, the flaps in 71 patients survived completely without ischemia. Vascular crisis appeared in one case, and the wound healed gradually after changing wound dressing for nearly 1 month. Slight infections of wounds appeared in eight cases. There were no complications in the donor site, like infection and poor wound healing. At the last follow-up, the mean static two-point discrimination was  $9.6 \pm 2.4$  mm on the injured finger and  $4.5 \pm 0.8$  on the contralateral corresponding finger. The motion range of the distal interphalangeal joint and proximal interphalangeal joint on the injured finger were  $72.5 \pm 23.3\%$  and  $78.7 \pm 32.5\%$  of the contralateral corresponding finger, respectively. Patient self-evaluations were good in 53 cases and fair in 19 cases.<sup>13</sup> However, no data is available on the use of palmar crease flap for thumb defects to the best of our knowledge.

Replantation remains the gold standard for digital reconstruction. When replantation is not possible, various reconstructive techniques can be used. Selecting the right reconstructive technique is a real challenge for any surgeon, even more so when the patient refuses to “sacrifice” another anatomical region. There are techniques which although “controversial” at one time, when used have the best results.

Therefore, as an easier and non-microvascular technique which retains the thumb length, colour, vascularity and appearance of thumb, this flap can be safely advocated for use as it has no significant complications associated with the technique.

## CONCLUSION

It was noted that distal thumb defects could be treated effectively with distal palmar flap, as it gives good aesthetic outcome and patient satisfaction, patient satisfaction was found to be better with palmar crease flap for smaller defects than larger defects, however all of the patients graded satisfaction as good (80%) and very good (20%). Palmar crease flap is an effective reconstructive method for distal thumb reconstruction as it retains the thumb length, colour, vascularity and appearance of thumb. It was noted that distal thumb defects could be treated effectively with distal palmar flap, as it gives good aesthetic outcome and patient satisfaction, patient satisfaction was found to be better with palmar crease flap for smaller defects than larger defects, however all of the patients graded satisfaction as good (80%) and very good (20%). Palmar crease flap is an effective reconstructive method for distal thumb reconstruction as it retains the thumb length, colour, vascularity and appearance of thumb.

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