



PALMAR AVULSION INJURIES – A RECONSTRUCTIVE CHALLENGE

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ABSTRACT

Palmar avulsion injuries are most devastating injuries of the hand. Reconstruction and resurfacing the entire palm remains a great challenge for Plastic surgeons because it is thick and glabrous skin. Palmar avulsion injuries are very rare and only few cases are reported. Reconstruction should be done at the earliest to regain hand function and to preserve the underlying tendons and nerves. The patients who had a groin flap reconstruction were analysed with regard to hand function and aesthetic outcome.

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INTRODUCTION

Resurfacing the entire palm after an avulsion injury constitutes a unique challenge to Plastic surgeons as Palmar skin is a specialized type of skin (thick and glabrous). Palmar avulsion injuries are very rare and only few cases are reported. They can occur following industrial accidents, road traffic accidents, assault and gunshot injuries. The reconstruction options for extensive defects of the palm are

- Skin graft
- Flap cover

Various flap options available are groin flap, abdominal flap, reverse radial forearm flap, fascial flap and free flaps.

Groin flap is known to provide the most reliable, durable skin for reconstruction of the palmar skin.

Indications

Soft tissue defects of the entire palm with maximum defect of size 10 X 20 cms

Contraindications

- Polytrauma patients with life threatening injuries.
- Doubtful vascularity of fingers and hand
- Noncompliant patient
- Previous scars in the groin region.

The challenge of reconstructive surgery is to replace lost tissue with tissue of similar texture, quality and functional characteristics. This is possible with tissue from the local or distant sites. The skin of the palm differs from the hair bearing skin of the rest of the body in several ways. Palmar skin has a thick epidermis, with a particularly thick layer of keratin on its outer surface. Pigment cells containing melanin are few, and sebaceous gland are absent. Connective tissue is more compact and therefore less elastic. These characteristics allow greater resistance to pressure, friction and trauma. Superficial skin loss in the palm can be repaired by second layer palmar graft. The treatment of more extensive deep soft tissue defects exposing the tendons, nerve or bone requires regional flaps in the form of reverse radial forearm flap, distant pedicled flaps, fascial flaps or free flaps. Of the pedicle

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flaps, the axial groin flap is the most versatile and popular. It is the work horse flap for hand defects.

Differences between Skin Graft and Flap Cover

SSG		FLAP COVER
		1. Further procedure can be done
		2. Axial flap
		3. More mobile which in turn permits freedom of movements of the fingers
Advantages	Simple procedure	4. Donor site is in an inconspicuous location particularly important in women
		5. Easy to perform, even in hands of beginners
Disadvantages	<ol style="list-style-type: none"> 1. Cosmetically not acceptable 2. Graft over contact area 3. Graft break through 4. Can cause contractures 5. Further procedure can't done 	<ol style="list-style-type: none"> 1. Staged procedure 2. Bulky

Surgical technique

McGregor and Jackson in 1972 described groin flap which till date remains to be the work horse flap in the management of soft tissue loss of the palm and hand. It remains one of the most useful flaps. It is an axial pattern flap based on the superficial circumflex iliac artery.



Fig. 1 Groin Flap Marking

The patient in supine position, and under regional anaesthesia wound debridement was done and lint pattern of the defect was taken. Markings for groin flap was made and planning in reverse was done.



Fig. 2 Defect After Wound Debridement

Groin flap raised and viability was ascertained. Donor raw area was covered with split thickness skin graft. Flap inset

was given with business end at the base of the fingers. Arm restraints applied.



Fig. 3 Donor Raw Area Covered With SSG



FIG. 4 Post Operative after Flap Inset

Post operative management

The patient should be mobilised as early as possible. Dressing and flap monitoring was performed daily. Flap division and inset was performed after 3 weeks.

Case I

A 25 year old male sustained a road traffic accident, and the avulsed palmar skin was serially debrided. After wound debridement, the raw area was exposing the underlying structures like the tendons, and nerves hand with loss of palmar soft tissues. The defect measures 20×10 cms. The soft tissue defect was reconstructed with a groin flap cover



Fig. 5&6 Case I Preoperative Dorsal And Volar Aspect



Fig. 7 CASE I Raw Area Exposing The Tendons And Nerves After Debridement

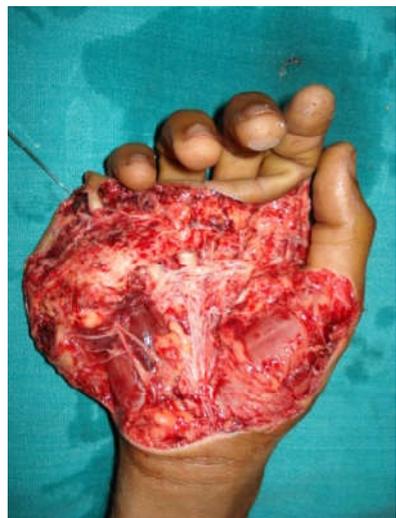


FIG. 10 & 11 Case II: Preoperative Volar Aspect



Fig. 8 & 9 Case I 3 Months Post Operative Picture Showing Good Function And Stable Skin Cover

Case II

A 33 year old male sustained industrial accident at work spot, when his hand was caught in a roller machine. He had immediately withdrawn his hand from the machine. The palmar skin was avulsed and was not viable. Wound debridement was done and the defect measures 15× 9 cms resurfaced with a groin flap cover.



Fig. 12 Case II Groin Flap At The Time of Division

Both the groin flaps were divided and final inset given at the end of 3 weeks.

After the wounds healed, assessment of the hand function was carried out, in the following way.



FIG. :13&14 Case II: Post Operative After 3 Months With Good Function And Appearance

Functional assessment

Motor assessment

Active and passive total range of motion (TRM) of the MP, PIP, and DIP joints of the reconstructed hand was measured with a standard hand goniometer and compared with normal contralateral hand.

Power grip measurement

Jamar dynamometer was used to measure the power grip in both the patients. Recordings were taken from both normal and reconstructed hand thrice alternatively. Calculation of the mean and percentage was done and compared with the normal hand.

Sensory assessment

Two point discrimination test was done over the reconstructed contact surface of the palm, using a two point discriminator (calibrated callipers). The values for 2PD in the normal hand vary in different areas. Initially the callipers is set at 15 mm and then brought together gradually. A comparison test is first done in the normal hand. The rules that were followed strictly are:

1. There should be an interval of 3-4 seconds between each test.
2. Application must be performed gently, without causing the blanching of skin at each point.

3. Simultaneous contact of the two points must be obtained in the line of the palm.
4. Testing must be from distal, proximal finger tip to palm.

Normal two point discrimination of the palm 10 - 15 mm. For these tests the central portion of the flap was assessed, and tests were repeated until a consistent result was obtained

RESULTS

Motor Assessment

Range of movements progressively increased with physiotherapy, achieving the maximum range at 3 months in both the patients.

Active TRM of the injured of the injured hand was 156° and 170° respectively for the first and second patient.

Grip assessment

Measurement using grip dynamometer was done with full flexion of the fingers. Variation range between hands is usually within 10%. Both patients have yielded similar reproducible and consistent results.

Sensory assessment

The mean 2PD on the palm was found to be 20 mm and 23 mm respectively for the two patients.

Analysis of aesthetic outcome

Aesthetic outcome was assessed by asking the patient about the colour, bulk, and texture of the flap. The results were quantified as good, satisfactory, poor and unacceptable. Both the patients said they were satisfied with the aesthetic outcome.

Motor function

Mobility is the key function of the hand. All disabilities in the hand are due to interference in the range of movements of the fingers and thumb. The normal range of various joints are as follows:

Metacarpo phalangeal joint = 0-90°

Proximal interphalangeal joint = 0-100°

A total of 270° (95-270) is commonly seen in the general population and this is called as total ROM.

DISCUSSION

Plastic surgeons for years have been facing the challenge of dealing with extensive defects of the palm. A good surgical technique for dealing with these complex injuries necessitates adequate functional and cosmetic result of both the donor and recipient site as well as providing ample coverage to all the vital underlying structures. The pedicled groin flap provides a safe, easy and reliable option for the reconstruction of soft tissue defects of the palm, with a hidden donor site. The versatility of this flap helps to cover huge defect of size upto 10×25 cms this allows coverage of entire palm without need for an another combined flap (double flap) or graft. Despite various other options being attempted like abdominal flap, fascial and free flaps, groin flap offers a simple and safe option even for the less experienced surgeon and does not require microsurgical expertise.

CONCLUSION

- The groin flap provides safe and reliable resurfacing option for extensive soft tissue defects in the palm.
- Groin flap offers good functional and satisfactory aesthetic out come for palmar avulsion injuries.
- Hidden and inconspicuous donor site renders an added advantage for groin flap.

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