

COMPARISON OF GROIN FLAP DIVISION AT DAY 14 & DAY 21

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ABSTRACT

Background: Pedicled groin flap is a reconstructive option for hand and forearm defect caused by trauma or other etiological factors. Traditionally pedicled groin flap is divided on 21 days in which patient develops stiffness of joints and also longer hospital stay. Early flap division may overcome these problems. **Objective:** To compare the outcome of groin flap division at day 14 and day 21. **Methods:** This prospective observational study was carried out among forty patients who presented with soft tissue defect in the distal forearm, palm and dorsum of hand were included in this study according to inclusion and exclusion criteria. **Results:** Out of forty patients, most of the soft tissue defect occurred due to burn (52.5%) followed by trauma (42.5%) and). Dorsum of the hand and palm defect were involved in 67.50% & 17.50% cases, respectively. 72.5% flap showed very good outcome and 27.5 % shows good result. 5% patients had partial flap loss, 3(7.5%) patients had marginal necrosis, 4(10%) patients had infection but there is no total or subtotal flap loss. Functional outcome in terms of movement of joints was better at day 14 cases and hospital stay was also shorter than day 21 cases. **Conclusion:** Early division of the groin flap at 14th day could be a better choice with more safety and promising results to prevent inter-phalangeal, wrist, elbow and shoulder joint stiffness and to reduces hospital stay and discomfort of the patient.

KEYWORDS: Pedicled groin flap, hand and palm defect, joint stiffness, flap loss.

INTRODUCTION

Hand is one of the most important organ of the body where Skeletal framework and tendons are covered with soft tissue and skin. The hand serves three basic functions; sensory perception, precise manipulation and power grip. In our country, most of the hand trauma are caused by machinery injuries, road traffic accidents and electric burns. The injuries may be of a variable combination of skin, soft tissue, tendons, nerves, blood vessels & bone damage. When bone and tendons are exposed for a long time they become dried, desiccated, infected and ultimately destroyed with loss of function. All of these can be easily prevented by covering the exposed bones and tendons with a flap.^[1]

Pedicled groin flap is a reconstructive option in use for hand defects particularly when cannot be reconstructed with regional flaps. Groin flap is a reliable flap with axial blood flow. Despite the current developments in the free

flap surgery and its widespread usage, groin flap can be safely used in cases with technical difficulties and high risk patients.^[2]

The pedicled groin flap has many indications in hand resurfacing. It has been shown to be reliable and it has minimal peri-operative complications a pedicled flap may be the only option for the hand surgical team where microsurgery facilities are scarce.^[3] The pedicled flap is more widely used to reconstruct the injury mainly due to wide range of mobility, flap safety, technically less complicity. However, it tends to be bulky and requires thinning, for improving hand function.^[4]

In trauma, the groin flap is delayed unless a clean and healthy wound bed can be ensured. Initially, it is generally prudent to thoroughly debride the wound, observe the wound for a few days and then apply the groin flap only after a clean, healthy wound surface is

ensured. The flap that is prone to shearing motion weight is borne on the palmar surface of the hand, such as seen with pushing, gripping, tool use or twisting motions. For this reason, it is wise to consider thinner flaps. During thumb reconstruction in total or near total thumb loss, it is necessary to use free digit transfer such as the great or second toe. Unfortunately, traumatic thumb amputation can leave the patient with insufficient soft tissue of the thenar region. In these cases, the groin flap is an excellent choice to provide a soft tissue based on which the digit transfer can be placed at a later date.^[5]

MATERIALS AND METHODS

Prospective observational study conducted in department of Plastic Surgery, Dhaka Medical College Hospital, Dhaka and Sheikh Hasina National Institute of Burn and Plastic Surgery, Dhaka between 2018 and 2020 among 40 patients who presented with defects over dorsum & palm of the hand and distal one third of the forearm resulting from traumatic de-gloving/crush injury, post electric burn wound. Patients with potential injuries to the pedicle of donor site due to previous trauma or surgery, patients with poly trauma and other life-threatening injury.

Vascular doppler was used to identify the position of the perforators pre-operatively. Regular mathematical scale was used to take the measurements. All measurements were recorded in centimeter. Surgical loupe was used for flap dissection.

Operative Procedure

The patient was placed supine. The sartorius muscle, inguinal ligament, and iliac crest all were identified and marked to determine flap design. A pencil doppler was used to determine the location of the arterial pedicle, usually approximately a finger breadth below the inguinal ligament. The maximum width of the design was determined by pinching the skin to assess the potential tension of the closure after flap harvest. The axis of the flap was a finger breadth below the inguinal ligament. A pencil doppler was used to define the distal course of the artery. The flap dissection begun medially or laterally. Our preference was to make the superior incision and elevate from the distal superior aspect toward the medial origin of the flap.

The incision was carried down to the deep fascia and the dissection begun over the deep fascia, identifying and ligating perforating vessels as one proceeds medially. The superior and medial incision was made down to the level of the muscular fascia and the flap was then elevated from lateral to medial.

At the level of the anterior superior iliac spine (ASIS), the interval between the tensor fascia lata and the sartorius muscle was identified. In addition, the lateral femoral cutaneous nerve of the thigh was identified as it exits the deep fascia to enter the subcutaneous tissue in its inferior course. The sartorius muscle was a key

landmark in dissection. When the lateral aspect of the muscle was identified, the muscular fascia was incised along the lateral aspect, and the flap elevation plane was now conducted deep to the muscular fascia.

Proceeding medially, the superficial circumflex iliac vessels became visible in the plane above the sartorius heading into the muscular fascia.

As the dissection proceeds, the skin incisions were continued inferiorly and medially to relieve tension and without fear of transecting the pedicle. Any branches to the muscle were ligated. At the medial aspect of the sartorius, the fascial plane around the pedicle was incised and the artery and vein were dissected free to their origin.

When the fascia over sartorius muscle was identified, it was incised and entered. The dissection proceeds medially deep to this fascial layer, elevating the pedicle from lateral to medial. The flap was mobilized on the vascular pedicle. The artery may arise directly from the femoral vessel or from the trunk of a parent vessel supplying the SCIA and the DCIA. The artery could also arise from a common trunk that gives off the SIEA. When the origin of the artery and vein were identified, the flap was isolated on the vascular pedicle.

The donor area was closed after slight undermining superficial to the deep fascia. A layered closure had done with slight hip. The hip was extended over the course of a few days (image 1).

All patients were put on a standard post-operative regime. Check dressing was done on 3rd and 6th postoperative day. Post-operative flap monitoring to see hemodynamic changes in the flap (colour, temperature, turgor, pin prick, blister). Marginal necrosis (<1 cm) was salvaged by excising the necrosed margin and closure of the wound with secondary wound closure (image 3).

Stitches were removed at the end of second or third postoperative weeks. The patient is allowed to work freely 3 weeks after surgery.

Flap division had done on at day 14 (image 2) & at day 21.

Data analysis was done with SPSS-23. In this study, continuous variables were expressed with mean and standard deviation whereas categorical variable were expressed with frequency and percentage. Chi-square test and Fisher Exact test were used to see the association between two group. P value less than 0.05 considered as significant.

RESULTS

Among the respondents, (80%) respondents were male and (20%) respondents were female. Among the respondents, 9(22.5%) respondents had wound size less

than 5 cm, 28 (70%) respondents had wound size 6-9 cm and 3(7.5%) respondents had wound size larger than 10 cm(Table 1). 27(67.5%) respondents had defect on the right hand and 13(32.5%) respondents had defect on the left hand. Among the respondents, 21 (52.5%) respondents had burn, 17 (42.5%) respondents had trauma and 2 (5%) respondents had neoplasia. 27(67.5%) had defect over dorsum of hand, 7(17.5%) had defect over palm of the hand and 6(15%) had defects over forearm.

Viable flap was seen in 19(95%) in day 14 and 20(100%) in day 21. There was one partial flap loss in day14. No total flap loss in either group (Table 2). Hemodynamic changes in the flap among the cases showed colour was normal 19(95%) cases at day 14 and 20(100%) at day 21 cases, Temperature & capillary refill test both were 100% in day 14 and at day 21 cases, red blood comes out during puncture by a needle in the flap were 19(95%) at day 14 and 20 (100%) at day 21 cases (Table 3). There is 2(10%) infection at day 14 & 1(5%) at day 21 and 2

(10%) wound infection at day 14 and nil at day 21 (table 4). Among recipients site complications, 2 (10%) & 2(10%) respondents had infection, 1(5%) & 2(10%) respondents had marginal necrosis at day 14 and at day 21respectably. There is a partial flap loss at day 14 and nil at day 21 (Table 5). The table 6 shows that joint stiffness in inter-phalangeal and metacarpo-phalangeal was absent in both group. Stiffness in the wrist were 2(10%) at day 14 and 10(50%) at day 21. Elbow stiffness were 2(10%) at 14 and 8(40%) at day 21. In the shoulder joint, stiffness was nil at day 14 and 2(10%) at day 21. Table 7 shows less than 20 days hospital stay was 18(90%) at day 14 cases. 21- 30 days hospital was 2(10%) at day 14 and 16(80%) at day 21 cases. More than 30 days hospital stay was nil at day 14 and 4(20%) at day 21 cases. Mean hospital at day 14 was 16.22 ± 4.1 and 26.5 ± 6.1 at 21day group. The table 8 shows final outcome of the flap were very good at day 14 & day 21 18(90%) & 11(55%) respectably. Good result were 2(10%) at day 14 & 9(45%) cases at day 21. There were no poor outcome in either group.

Table 1: Distribution of the respondents according to their wound size (N=40).

Wound size	Frequency (n)	Percentage (%)
≤ 5 cm	9	22.5
6-9 cm	28	70
≥10 cm	3	7.5
Total	40	100.0

Table 2: Distribution of the respondents according to viability of the flap (N=40).

Flap survival	Day 14 (n=20) No. (%)	Day 21 (n=20) No. (%)	p-value
Viable flap	19(95%)	20(100%)	1.000ns
Partial flap loss	1(5%)		
Total	20(100%)	20(100%)	

Table 3: Distribution of respondents according to hemodynamic changes in the flap (N=40).

Clinical observation	Findings	Day 14 (n= 20) No. (%)	Day 21(n= 20) No. (%)	p-value
Colour	Normal	19 (95%)	20(100%)	1.000ns
Temperature	Normal	20(100%)	20(100%)	
Capillary refill	< 2 seconds	20(100%)	20(100%)	
Pin prick test	Punctate red blood comes out	19 (95%)	20(100%)	
Total	40(100%)			

Table 4: Distribution of the respondents according to their donor site morbidity (N= 40).

Complications	Day 14(n=20) No. (%)	Day 21(n=20) No. (%)	p-value
Infection	2(10.0%)	1(5.0%)	1.000ns
Wound dehiscence	2(10.0%)		0.468ns
Total	4 (20%)	1(5%)	0.339ns

Table 5: Distribution of the respondents according to their complication of recipient site (N=40)

Complications	Day 14 (n=20) No. (%)	Day 21 (n=20) No. (%)	p-value
Infection	2(10%)	2(10%)	1.000ns
Marginal Necrosis	1(5%)	2(10.0%)	1.000ns
Partial Flap Loss	1(5.0%)		1.000ns
Total	4(20.0%)	4(20.0%)	1.000ns

Table 6: Distribution of the respondents according to functional outcome (N= 40).

Name of the Joint	Stiffness (Present/ Absent)	Day 14(n=20)No. (%)	Day 21(n=20)No. (%)	p-value
Wrist	Present	2(10%)	10(50%)	0.041S
Elbow	Present	2(10%)	8(40%)	
Shoulder	Present		2(10%)	
Total		4(20%)	20(100%)	

Table 7: Distribution of the respondents according to hospital stay (N= 40).

Hospital Stay (Days)	Day 14(n=20) No. (%)	Day 21(n=20) No. (%)	p- value
<20 days	18(90%)		
21- 30 days	2(10%)	16(80%)	
>30 days		4(20%)	
Total	20(100%)	20(100%)	
Mean± SD	16.22±4.1	26.5±6.1	<0.001s

Table 8: Distribution of the respondents according to final outcome (N=40).

Final outcome	Criteria	Day 14(n=20) No. (%)	Day 21(n=20) No. (%)	P- value
Very good	Excellent flap adhesion. No infection. No flap loss	18 (90%)	11(55%)	
Good	Mild infection managed by dressing and antibiotic according to c/s Marginal flap necrosis managed by secondary healing	2 (10%)	9 (45%)	0.034S
Poor	Partial flap loss managed by skin grafting. Moderate infection managed by debridement, skin grafting needed.	Nil	Nil	
Total		20(100%)	20(100%)	

**Image 1: Groin flap in situ; Image 2: After division of the flap at 14 day; Image 3: Complication in the donor area.**

DISCUSSION

The groin flap is an axial-pattern cutaneous flap based on the superficial circumflex iliac artery provide soft-tissue coverage for defects on any part of the hand and the distal two thirds of the forearm. The groin flap is valued for its easy harvest, short surgery time and good functional result. In addition, the groin flap offers thinner flaps than are achievable in most other parts in obese patients.^[6]

In this study total forty (40) cases with hand defects were treated by resurfacing the wound with pedicled groin flap. In twenty (20) patient flap division had done at day 14 and in another twenty (20) cases flap division was done at day 21. The mean age of the study case was 33.27±9.6 years. Majority of the soft tissue defect of the hand occurred in relatively younger age group between 21 to 40 years which indicate that active age group of peoples were the most sufferers. Young groups are more vulnerable to injury.^[7]

Majority of the patient were male 32(80%), 8(20%) patients were female and male female ratio was 4:1. The cause may be that male people of our country are the most active member of the family thus they are more prone to trauma. Male to female ratio was 5.6:1 in the study done by Naalla.^[8] But in the study, there was no significant differences were found during the recovery in relation to the age variation and sex differences.

In this study size of maximum cases of the hand and distal forearm defects were in between 6-9 cm that was 28(70%) of the total defects followed by less than 5 cm defect in 9(22.5%) cases. Only three (3) patients had defects over 10 cm which are comparable.^[9-10]

In this study, the right-hand injured persons were the majority 27(67.5%) and left hand involved were 13 (32.5%). But there was no significant differences were found among the involved side of hand. the distribution of etiology showed that maximum numbers of patients were suffered from burn 21(52.5%) followed by trauma. Electric burn was the cause of burn in 21 cases. As electric burn is more devastating and may cause extensive tissue defect including exposed tendons, bones and joints which essentially requires coverage with a flap. As the study was conducted in a specialized center for burn and plastic surgery, burn was the most common cause of hand and distal forearm defects. Trauma was the second most cause of soft tissue defect of the hand which accounts for 17(42.5%) cases. Goertz, O. et al., the etiology were mechanical crush injuries in 79%, burn injury in 12% and malignant tumors in 2% of cases.^[11]

In this study standard groin flap was done. 100% cases were viable in day 14 group and in only one case there was partial flap loss which was healed by secondary intention. In day 21 group of flap division the viable flap also 100%.^[17] Hemodynamic of the flap at the recipient site observed by clinically. Colour change in the flap was normal in 19(95%) cases at day 14 and 20(100%) at day 21. Temperature & capillary refill test both were 100% at day 14 and at day 21 cases. Red blood comes out during puncture by a needle in the flap were 19(95%) at day 14 and 20 (100%) at day 21 cases. Complications of donor site were infection 2(10%) in day 14 and 1(5%) in day 21. Wound dehiscence 2(10%) in earlier group and absent in later group.

No patients on either group requires skin grafting of the donor area, whereas 6% of patients requires skin grafting of donor groin area by study done by Goertz, O. et al.^[11] Complications were absent in 16 (80%) & 19 (95%) in day 14 and day 21 group respectably. all donor site defects were primarily closed in some study.^[12-14]

Infection of the recipient site at day 14 group were 2(10%) and day 21 group were same. Partial flap loss was 1 (5%) & absent in day 14 and day 21 group respectably. Wound dehiscence in recipient area was nil at day 14 group and 1(5%) at day 21 group. Total and

subtotal flap loss was absent in both group. The complication rate was higher after severe hand infections followed by crush injuries and burn. Cheng et al.^[15] reported a high complication rate after the treatment of burn and a flap infection rate was 33%.

Functional outcome were evaluated in terms of movement of inter-phalangeal joint, metacarpophalangeal joint, wrist joint, elbow joint, shoulder joint. Joint stiffness in inter-phalangeal and metacarpo-phalangeal was absent in both group. Stiffness in the wrist were 2(10%) at day 14 and 10(50%) at day 21. Elbow stiffness were 2(10%) at 14 and 8(40%) at day 21. In the shoulder joint, stiffness was nil at day 14 and 2(10%) at day 21. In the cases at day 14, joint stiffness developed in patients where there were infection, wound dehiscence and in partial flap loss patient. At day 21 cases joint stiffness developed in 100% cases. Joint stiffness were less in number at day 14 cases due to early division of the flap. Physiotherapy was required to treat stiffness of the joints.^[17]

Less than 20 days hospital stay was 18(90%) at day 14 cases. 21- 30 days hospital was 2(10%) at day 14 and 16(80%) at day 21 cases. More than 30 days hospital stay were none at day 14 and 4(20%) at day 21 cases. Mean hospital at day 14 was 16.22±4.1 and 26.5±6.1 at 21 day group. Patients were discharged with acceptable compliance 3-5 days after division of the groin flap. Hospital stay was 10-12 days less at day 14 cases. In the study done by Goertz, O. et al.^[11] mean hospital stay was 29 days.

The result of final outcome of resurfacing the hand defects with pedicled groin flap were categorized as very good, good and poor on the basis of a) flap adhesion b) infection and c) extent of flap loss. The adhesion of the flap in the recipient site was hundred percent in both the group. There was no total loss of flap in both group of the study cases. The final outcome was very good in 18(90%) cases at day 14 patients and 11(55%) in day 21 patients. Outcome was good in 2(10%) & in 9(45%) cases at day 14 cases and day 21 case respectively.

Some limitation present during study as Patients above 50 years were not included, sample size was small, radiological assessment not included for monitoring of the flap and Short study period.

CONCLUSION

Early division of the groin flap at 14th day could be a better choice to prevent inter-phalangeal, wrist, elbow and shoulder joint stiffness. Early division reduces hospital stay and also reduces discomfort position of the patient. Division of the pedicled groin flap at 14th day is safe with acceptable result.

RECOMMENDATIONS

The pedicled groin flap could be divided on 14th day.

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