

Original Article

PEDICLED GROIN FLAP FOR COVERAGE OF SOFT TISSUE DEFECT OF HAND

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Submitted: 9th – June – 2023, Revised: 23rd – July- 2023, Accepted: 9th – August- 2023

DOI:

ABSTRACT

Background

Distant pedicle flaps like groin flaps are still considered workhorse flaps for the coverage of soft tissue defects of the hand. In the era of free flaps pedicle flaps are still considered as primary flaps by many surgeons. Pedicle flaps are easy to raise, require less experience and microsurgical facility.

Methods

In this retrospective descriptive study, patients in whom groin flap was done for reconstruction of hand soft tissue defects were included from April 2017 to April 2022.

Results

Thirty-three flaps were included in this study with an average patients' age of 34.6 years. There were 24 males and 9 females. All flaps survived and served the purpose of covering wounds. Complications like finger and shoulder stiffness were seen in 18 (54.5%), partial necrosis was seen in 4 (12.1%), marginal necrosis in 2 (6%), and infection was seen in 5 (15.2%) patients. Donor sites were healthy after inseting of the flap and did not show any sign of morbidities like infection or bad scarring.

Conclusion

Groin flaps are versatile flaps. Where microvascular free flaps are not possible due to severity of injury or due to unavailability of the facility for microvascular free flap groin flap is an excellent option. With less complication, those flaps can be executed easily.

Keywords: Groin flap, Hand injuries, Pedicle flap, Soft tissue defect



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Citation

Parajuli NP, Yadav KK, Sah RK, Bohra LK, Sundas M, Pedicled Groin Flap for Coverage of Soft Tissue Defect of Hand, MJEN. 2023 July-December; 2(4):6-10



INTRODUCTION

McGregor and Jackson, in 1972, were the first to describe groin flap, since then it has been used for coverage of soft tissue defects of the hand with some variations.¹ Groin flap either used as free flap or pedicled flap is still considered a "workhorse" flap in the reconstruction of soft tissue defects of the hand. Even though it has some limitations like bulkiness, stiffness of upper extremity joints due to prolonged immobilization, need for division, and debulking procedure; it is still used widely for large defects of the hand.^{2,3} The microvascular free flap has replaced the use of pedicled groin flap in recent time. Free flaps have the advantage of larger area coverage, stable coverage, less rate of infection, and are cosmetically acceptable; but are associated with donor site morbidity, sacrifice of major vessel of already injured limb, need of skilled surgeon, and require good operating room setup with operating microscope.⁴ Pedicled groin flap on other hand does not require advanced setup, procedure that can be done by less experienced surgeons, does not compromise any vessel of the injured limb, is easy to harvest, is versatile and can cover large soft tissue defects of the hand in different regions.^{5,6} The major drawback of the groin flap is the upper extremity is strapped to the body for three weeks (till division) which is extremely uncomfortable for the patients.

Hand injuries are common in our part of the world as people working with machinery in the factory or in the field are not equipped with proper protective gear and are also not trained to use that equipment. Motor vehicle accidents are the second most common etiological factor in injuring hands. The commonest type of injury is crush injury leading to degloving of skin of the hand exposing tendons, nerves, bone, and other sensitive vital structures; loss of which can result in significant functional impairment and aesthetic deformity (Figure 1). Reconstruction of such defects requires the use of tissues that can provide adequate coverage and restore the function of the hand.^{4,5,6} One such option is a pedicled groin flap.

There are many options for coverage of soft tissue defects of the hand. They can be classified into local or distant flaps. Local axial flaps like reverse radial artery flap and posterior inter-osseous artery flap are good options but are associated with injuring already injured soft tissue and major vessels of the forearm and are limited in size. Distant flaps include pedicled groin flap and

pedicled abdominal flap which are versatile and good option for coverage.^{10,11,12} In our institute, we use groin flap as a first option whenever there is requirement of coverage of soft tissue defect of the hand. In this article, we discuss the versatility of the groin flap and its uses in our institute.



Figure 1: a. 45/M Machinery injury left hand with loss of index, middle and ring finger with exposed first metacarpal. b. Elevation of groin flap. c. Inseting of groin flap over the defect. d, e. Six months post division of flap with good coverage, f. with good function

METHODS

This retrospective study consists of 33 patients in whom groin flap was done from April, 2017 to April, 2022 at our institute. After ethical clearance, the data was retrieved from the medical record department and were analyzed. Age, gender, etiology of defect, location, size of the groin flap, donor site morbidity, flap separation time, additional treatments, and complications were recorded. All patients in whom pedicle groin flap were executed, were included in this study. Those cases other than groin flaps were excluded from the study. Data was retrieved from the patient charts, operative notes, outpatient visit records, pictures, and telephonic interviews. Data retrieved was entered into Microsoft excel (windows 10) for analysis.

Relevant surgical anatomy and technique^{1,3,7-8.}

The pedicled groin flap is designed on the superficial circumflex iliac artery (SCIA). SCIA arises from the femoral artery to supply the skin of

inguinal region. The origin of SCIA is located within 2-3 cm distal to the inguinal ligament from femoral artery and runs proximally and laterally parallel to inguinal ligament. At the medial border of Sartorius muscle, it becomes superficial and supplies the skin and subcutaneous tissue along its course. The course of this artery is the axis of the flap. The flap was raised in single setting. After proper measurement of defect of the hand, groin flap is elevated from lateral to medial with the base over femoral artery pulsation. As described by Chuang and colleagues, the rule of "two fingers width" was followed in most of the cases. In some cases, flap was elevated parallel to inguinal ligament ending just above the inguinal ligament along the axis of SCIA. This rule locates the theoretical origin of the SCIA out of the femoral artery in the interval of two fingers width below the inguinal ligament. The upper limit of the flap is at two fingers width above the inguinal ligament parallel to a line, defined by the course of the SCIA from its origin to the anterior superior iliac spine, which also represents the axis of the flap. The lower limit is two fingers width below the emergence of the SCIA on a line also parallel to the axis. The lateral limit is determined according to the size of the recipient site defect. The donor area was primarily closed in all cases. After flap elevation it is inset over recipient hand. Upper limb is immobilized in such a way that there will be no tension over the pedicle. The patient's arm is wrapped to the chest for two to three days to prevent too much arm movement. Periodically flap viability was checked and utmost care was given to prevent infection. Flap division was done after confirming that neo-vascularization had occurred. This is usually achieved after three weeks or can be confirmed clinically after applying the hemostat over the pedicle and confirming the flaps' vascularity.

RESULTS

Out of 33 patients in 16 (48.4%) patients groin flap was used for coverage of defects of the dorsum of the hand due to machinery injury, in 10 (30.3%) patients groin flap was done for wounds due to RTA, in four (12.1%) patients flap was done for loss of soft tissue of the hand due to electrical burn, in two (6%) patients flap was used to resurface wounds due to iatrogenic loss of skin during syndactyly release, and in one patient (3%) groin flap was used for coverage of wound due to loss of skin due to crush injury by heavy object.

There were 24 (72.7%) males and 9 (27.3%) females with an average age of 34.6 years. The right hand was affected in 23 (69.7%) patients and in 10 (30.3%) patients left hand was affected. Primary debridement was performed within a few hours of presentation to the emergency department. The average time from presentation to primary debridement was 2.6 hrs. The average days to groin flap after primary debridement was 4.6 days with maximum days of 11 and minimum of one day. The maximum size of flap harvested was 17cm x 8cm (length x width) and minimum size was 7cm x 4cm. Complications like finger and shoulder stiffness was seen in 18 (54.5%), partial necrosis was seen in four (12.1%), marginal necrosis in two (6%), and infection was seen in five (15.2%) patients. Out of four partial necrosis cases, we observed partial flap necrosis in two patients after the division of the flap. Flap division was done after three weeks of inseting. The average time to the division of flap was 21.6 days with maximum of 24 days and a minimum of 20 days. The average hospital stay of the patient was 20 days with a maximum stay of 45 days and a minimum of seven days. The donor site was primarily closed. Serosanguineous discharge was seen in six (18.2%) patients over the donor site which subsided with conservative management. Debulking was done in four (12.1%) patients.

DISCUSSION

Groin flap reconstruction has emerged as a valuable technique for addressing soft tissue defects in the hand. This surgical procedure involves transferring a flap of tissue from the groin region to the hand, providing a reliable and well-vascularized tissue source. In our series of 33 patients, we have excellent outcomes in terms of coverage of soft tissue defects of the hand with pedicled groin flap. In a study done in a cohort of 49 patients with soft tissue defects of the hand; the authors reported a high success rate. The reconstructed hands demonstrated improved function and aesthetic appearance, leading to enhanced patient satisfaction. The study concluded that groin flap reconstruction is a reliable option for hand soft tissue defects, offering favorable outcomes.⁹ One of the main advantages of the groin flap technique is the amount of tissue that can be harvested, which allows for the coverage of larger soft tissue defects of the hand. This is particularly useful in cases where other donor sites, such as the forearm

or thigh, are not suitable due to insufficient tissue or previous harvesting.¹⁰⁻¹⁴ The maximum size of flap harvested was 17cm x 8cm (length x width) for coverage of soft tissue defect of the dorso-ulnar aspect of the hand (Figure.2) and minimum size was 7cm x 4cm for coverage of the exposed thumb inter-phalangeal joint due to electrical burn.



Figure 2: a. 37/M Machinery injury left hand with loss of ring and little finger ray with exposed wrist joint and excessive soft tissue loss. b. Elevation of groin flap. c. Insetting of groin flap over the defect. d,e. Six months post division of flap with good coverage

According to a study, the groin flap provides an average of 15.5 cm² of skin and subcutaneous tissue, making it a reliable option for reconstruction of larger defects.¹⁵ Another study which reported on the outcomes of treatment of 34 patients with traumatic soft tissue defects within the upper limb, observed complete flap healing in 29 patients (85%), with partial and complete necrosis being observed in four and one patients, respectively. The authors concluded that even in the era of advanced microsurgery, groin flaps remain useful in cases of medium and large defects.¹⁶ In our series of 33 patients, we also observed complete healing of groin flap in 27 patients (81%) with partial necrosis in four and marginal necrosis in two.

Despite its many advantages, the groin flap technique is not without its limitations and potential complications. One of the most significant concerns is donor site morbidity, which can include pain, numbness, and weakness in the groin region. In our series of 33 patients,

minimal serous discharge without infection was seen in six (18.2%) patients over the donor site, which subsided with conservative treatment. Partial necrosis (12.1%) (Figure 3) and marginal necrosis (6%) required debridement, flap readvancement and resuturing. Infection was seen in five (15%) patients who required serial debridement and antibiotics. Two patients, who had flap partial necrosis after division required debridement and secondary suturing. Joint stiffness was common in patients with fractures and tendon injuries where mobilization was compromised. Shoulder stiffness was common in age group of more than fifty years; which was also observed by many authors in their cases.^{17, 18} In another study of 30 patients who underwent groin flap harvesting, 24 patients experienced complications such as seroma, marginal necrosis, tip necrosis, infection and joint stiffness. However, the authors noted that most of these complications were minor and resolved with conservative management and minor interventions.¹⁹



Figure 3: Partial necrosis of flap which required debridement and re-suturing

Flap division should be done after three weeks of inseting; as during this period neo-vascularization or revascularization will occur and there will be fewer complications like flap necrosis.²⁰ The average hospital stay of the patient was 20 days with a maximum stay of 45 days and a minimum of seven days. Patients who went home before flap division came back on 21 days for flap division. Flap partial necrosis, marginal necrosis, and infections were the major causes of prolonged hospital stay. Another cause contributing to longer hospital stays was patients with polytrauma. Out of 33 patients, flap debulking was done in four patients only who complained of

bulkiness of the flap.

Limitations of this study are its retrospective nature, lack of comparative group, and no functional outcome measurement.

CONCLUSION

The groin flap technique is a safe and effective option for the reconstruction of soft tissue defects of the hand. Its advantages include the amount of tissue that can be harvested, excellent vascularization, and a high success rate. Where microvascular free flaps are not possible due to severity of injury or due to unavailability of the facility for micro vascular free flap groin flap is an excellent option. However, careful consideration of potential complications, such as donor site morbidity, partial necrosis, and joint stiffness is necessary, and proper postoperative care is essential for optimal outcomes.

ACKNOWLEDGE

We would like to thank our entire orthopedic team from operation theatre, wards, and outpatient departments for their continuous support in writing this article.

Funding: None

Conflict of interest: None

Ethical approval: Yes

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