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THE ROLE OF GASTROCNEMIUS MYOCUTANEOUS FLAP IN COVERING DEFECTS OF PROXIMAL AND MIDDLE THIRD OF LEG

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ABSTRACT

BACKGROUND: The treatment of a large soft tissue defect affecting the upper and middle portion of the leg remains a problem. The purpose of this study was to determine the efficacy and adaptability of a gastrocnemius myocutaneous flap cover for a post-traumatic major defect of the upper and middle third of the leg. **METHODS:** This prospective study was undertaken from January 2021 to December 2022 on 27 consecutive cases with post-traumatic upper and middle third leg defect treated with gastrocnemius myocutaneous flap, and the functional and aesthetic outcomes were assessed. **RESULTS:** There were no reports of full flap failure. In two individuals (7.4%), there was partial cutaneous necrosis and infection noted in one individual (3.7%) There was no postoperative hematoma. In terms of donor site morbidity, no functional deformity was seen during the follow-up period. The process was proven to be dependable, technically simple, and visually pleasing. **CONCLUSION:** Post-traumatic extensive leg defects extending in the upper and middle thirds were easily covered with a regional gastrocnemius myocutaneous flap, resulting in a great outcome and cosmetically acceptable skin coverage without substantial problems or long-term morbidity and can be performed by an orthopedic surgeon without the assistance of plastic surgeon

INTRODUCTION:

The repair of a defect after severe trauma with prolonged soft tissue loss over the anterior portion of the upper and middle third of the leg is difficult due to the lack of accessible local options for large defects. Cross leg flap cover and free flap cover are both possible options, with cross leg flap being an age-old procedure and free flap currently lacking available competence. Because of its stable anatomy and powerful blood supply, the gastrocnemius myocutaneous flap is an effective and adaptable choice accessible for a significant deficit despite severe injuries over the anterior area of the leg [1,2]

The Gastrocnemius myocutaneous flap was first described in 1973 to provide coverage across the knee area 3.The gastrocnemius muscle is divided into two heads: medial and lateral. Each head can be moved independently via its own neurovascular pedicle [4]. The Sural arteries, one medial and one lateral, supply the gastrocnemius muscle's medial and lateral heads, respectively. Each musculocutaneous perforator has the ability to supply a vast region of skin proximally as well as a significant quantity distal to the muscle belly [5]

The majority of the gastrocnemius myocutaneous flap perforators are located 7-18 cm from the popliteal crease [6,7]. The lesser saphenous vein can also be included with the flap to improve venous drainage or as the flap's sole outflow8. The use of Doppler to map the location of skin perforators may aid in ensuring appropriate skin vascularity.

The aim of this study is to evaluate the role of gastrocnemius myocutaneous flap in covering defects of proximal and middle third of leg.

MATERIALS AND METHODS:

This prospective study was undertaken from January 2021 to December 2022 on 27 consecutive cases at department of orthopaedics, katuri medical college and hospital, Guntur. Patients with post-traumatic upper and middle third leg defect treated with gastrocnemius myocutaneous flap, and the functional and aesthetic outcomes were assessed. Debridement and, in certain circumstances, external fixator fixation of the fractured bone were the initial treatments used in all cases. They were between the ages of 14 and 56. Patients with concomitant injuries requiring multidisciplinary care were not included in the study. After vigorously debriding and washing all the nonviable and weakly vascularized tissues with hydrogen peroxide, the defect was assessed.

Surgical procedure

Patient was lying Prone, when the surgery was performed under spinal anaesthesia. The skin pedicle was identified across the medial or lateral head of the gastrocnemius muscle, not exceeding more than 1 cm of midline. Popliteal crease and midline were noted.

An incision was made in the skin that covered the previously defined area and went all the way down to the Achilles tendon. The soleus muscle was identified, the gastrocnemius muscle was divided from it, and the Achilles tendon's attachment was also divided. The musculocutaneous flap was elevated up to the knee joint with the preservation of the vascular pedicle after both heads were cleanly split. We separated the muscle's origin to enhance the flap's approach, which also raised the flap's rotation point. The division of the proximal skin portion, which produced an island myocutaneous flap, finally helped the flap move higher. After tunnelling, a flap was sutured in place over the defect. Skin graft was placed over flap. All patients received post-operative splinting and suction drainage. After 15 days of primary dressing, suture removal was done on 14th day. 4-6 months of follow-up were completed, during which time of course the treatment's effectiveness was assessed in terms of functional outcomes and patients' aesthetic satisfaction was rated as satisfied, acceptable, or not satisfied. All patients who participated in the trial gave their informed consent. All methods in research involving human subjects were carried out in line with the institutional and/or National Research Committee's ethical standards, as well as the 1964 Helsinki Declaration and its subsequent revisions or comparable ethical standards

RESULTS:

This study included 27 participants, 22 of whom were male and 5 of whom were female. Male patients had 19 medial muscle heads and 3 lateral muscle heads used, whereas female patients had 4 and 1 respectively. All cases were hospitalised and treated with debridement and fracture fixations before receiving residual defect covering. The majority of patients were between the ages of 25 and 50.

Table 1 demonstrates age and sex wise distribution of cases. Maximum size of defect that was covered by gastrocnemius myocutaneous flap was 16 cm in length, while most of the defects were of 5-10 cm in size. Mostly, the defect was covered proximally by medial head gastrocnemius myocutaneous flap. Table 2 shows the size of the flap used, Table 3 shows complications

Table 1: Age and sex wise distribution of cases

Age (years)	Male (n=22)	Female (n=5)	Total (n=27)
0-15	2	0	2
16-25	6	1	7
26-50	12	4	16
>50	2	0	2

Table 2: The size of the flap.

Size (cm)	Medial head	Lateral head	Total(n=27)
0-15	03	01	04
5-10	10	03	13
10-15	08	01	09
>15	01	00	01

Table 3: complications of flap cover

Complications	Medial head	Lateral head
Functional deficit	00	00
Infection	01	00
Partial flap necrosis	01	01
Complete flap loss	00	00

In 12 patients, donor site closure was achieved after flap elevation, whereas the remaining patients required split thickness skin grafting. There was no instance of total flap loss. Infection was seen Partial necrosis developed in two individuals and infection in individual who received debridement and split thickness skin grafts. In none of the cases was there a functional impairment of the donor location. Post-operative discharge from the recipient site was observed in four patients and was handled conservatively. Table 3 shows the flap cover complications. The average hospital stay was 5-7 days. The follow-up period ranged from 4 to 6 months, during which time the myocutaneous flap provided stable wound covering. One patient was not followed up on. No patient reported any functional deficits

DISCUSSION:

Skin and soft tissue defects of the leg are common after trauma, and early and precise management of the patients may improve the overall outcome aesthetically and functionally. There are many options for the upper and middle thirds of the leg separately, but the large defect involving the area between the upper and middle thirds or the transition zone between the two has very few options, such as the cross-leg flap, gastrocnemius flap, and free flap. Cross leg flaps are rarely used nowadays because they cause long-term morbidity and discomfort to patients due to their cumbersome position[9].

The most often used flap for covering any defect is the free flap, but it causes donor site morbidity and necessitates expertization. Furthermore, the areas of concern with free flap are intense postoperative surveillance, the requirement of a healthy recipient vascular, and the possibility of re-exploration. The gastrocnemius myocutaneous flap can eliminate the need for a cross leg flap and a free flap in the upper and middle thirds of the leg. The flap has a reliable vascular pedicle as well as a large skin paddle if needed9. The advantage of the gastrocnemius myocutaneous flap is that it can successfully cover the defect up to the middle portion of the leg without difficulties. In our study, no patient experienced functional loss, and the contour deformity was acceptable. This finding is comparable to that of Kroll et al., who concluded that functional and aesthetic outcomes are acceptable when only one flap is lifted10. By tunnelling the flap beneath the skin-bridge, a scar can be avoided.

Bashir et al. described a gastrocnemius tenocutaneous island flap at the lower end of the muscle in their investigation.[6] In our study, we used skin paddles, detaching their origin, repeated scoring of the muscle, and oblique flap placement to improve flap reach. The pedicle was skeletonized and the fascia above the proximal muscle was excised to expand the flap distally. Our study's complication rate was comparable to other large studies, with only minimal issues observed [6,7,10]. Complete flap necrosis did not occur in any of our cases, but it was seen in Chung et al study's which they attributed to inadequate flap tunnelling[11].

The gastrocnemius myocutaneous flap is a particularly appealing and adaptable choice for surgeries for defect reconstruction including the upper and middle third of the leg. It is a simple procedure that allows for quick, long-lasting, and dependable covering of these abnormalities without compromising a nerve or a major vessel to the foot. In any patient, there was no donor site morbidity or functional abnormality.

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Conflict of interest: None declared

Ethics approval: The study was approved by the Institutional ethics committee

Picture of a large post traumatic defect of 15 cm size of right leg involving upper third.

Medial sided gastrocnemius myocutaneous flap raised and covered over the defect.

Postoperative picture showing proper coverage of the defect by gastrocnemius myocutaneous flap

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