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Comparative study of gluteal faciocutaneous rotational flaps and myocutaneous flap for treatment of sacral pressure ulcer- A cross-sectional study.

Soni Kumari[1], Akhil Unnikrishnan[1], Anant Parashar[2],S.K. Gupta[3*]
Mch Resident, Department of Plastic Surgery, Patna Medical College Hospital, Patna, Bihar, India[1]
Mch Resident, Department of Neurosurgery, All India Institute of Medical Sciences, Patna, Bihar[2]
Assistant Professor, Department of Plastic and Reconstructive Surgery, Patna Medical College Hospital, Patna, Bihar, India[3]

Abstract

Background
Pressure ulcers, particularly sacral ulcers, are a major problem in immobilized patients, requiring effective surgical reconstruction. Gluteal fasciocutaneous (FC) and myocutaneous (MC) flaps are widely used but differ in complexity, durability, and complication rates. This study compares the outcomes of both techniques to guide surgical decision-making.

Methods
A prospective cohort study was carried out from March 2023 to October 2024 at the Department of Plastic and Reconstructive Surgery, Patna. Thirty-nine patients with Stage III/IV sacral pressure ulcers were included and divided into two groups (FC = 18; MC = 21). Preoperative assessment, standardized surgical techniques, and postoperative care were applied. Operative time, healing duration, blood loss, complications, and recurrence.

Results
The mean age was slightly higher in the fasciocutaneous flap group (57.16 ± 12.14 years) compared to the myocutaneous flap group (53.71 ± 14.38 years), though not significant (p = 0.594). The distribution of patients aged ≥61 years was identical in both groups (55.6%). Operative time and healing duration were similar, but blood loss was significantly lower in the FC group (p = 0.001). The MC group had zero recurrence with a short follow of 6 months, while FC showed a 23.5% recurrence rate (p = 0.036). Postoperative complications were minimal and statistically nonsignificant across groups.

Conclusion
This prospective cohort study demonstrated that both gluteal fasciocutaneous and myocutaneous flaps are viable options for the surgical management of sacral pressure ulcers, offering comparable safety and healing outcomes. Myocutaneous flaps demonstrated superior long-term durability, while fasciocutaneous flaps offered lower blood loss and ease of reuse.

Recommendations
As this was a short-term study, further research is needed with a longitudinal study design and a larger sample to achieve more definitive results.

Keywords: *Sacral pressure ulcers, Gluteal fasciocutaneous flap, Myocutaneous flap, Surgical reconstruction, Recurrence, Wound healing.*
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Corresponding author: *S.K. Gupta[*]*
Email: ***drguptask12@gmail.com***
Assistant Professor, Department of Plastic and Reconstructive Surgery, Patna Medical College Hospital, Patna, Bihar, India

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Introduction

Pressure ulcers, also termed pressure injuries, are localized damage to the skin and underlying soft tissue, typically occurring over bony prominences due to prolonged pressure and shear forces [1]. These ulcers are particularly common among immobile, elderly, or neurologically impaired patients and represent a significant challenge in long-term care settings due to their impact on morbidity, quality of life, and healthcare resource utilization [2,3]. Sacral pressure ulcers are among the most frequent and severe forms, often necessitating surgical intervention in advanced stages (Stage III and IV), where conservative measures prove insufficient [4].

Among the surgical options for sacral ulcer reconstruction, two primary flap techniques are widely employed: gluteal myocutaneous flaps and gluteal fasciocutaneous rotational flaps. Myocutaneous flaps, incorporating the gluteus maximus muscle and overlying tissue, offer excellent vascularity and bulk to fill dead space, though they are often linked with higher donor site morbidity and possible functional impairment [5,6]. In contrast, fasciocutaneous flaps spare the underlying muscle, relying on perforator vessels from the superior and inferior gluteal arteries to supply skin, subcutaneous fat, and fascia, offering shorter operative time, lower blood loss, and preservation of muscle function—making them advantageous for mobile patients and those requiring future surgeries [7,8]. The choice of flap depends on ulcer characteristics, infection status, prior surgeries, systemic health, and mobility, and requires detailed preoperative planning with imaging tools like Doppler or CT angiography [9,10].

This study aims to evaluate and contrast the clinical outcomes of gluteal fasciocutaneous (FC) rotational flaps and myocutaneous (MC) flaps in the surgical management of sacral pressure ulcers. The primary objective is to determine which flap offers greater durability and lower recurrence, while secondary objectives include comparing wound healing time, operative duration, intraoperative blood loss, and the rate of postoperative complications.

Methods

Study design

The study used a prospective, cross-sectional cohort study.

Study setting

The study was conducted at the Department of Plastic and Reconstructive Surgery, Patna Medical College and Hospital (PMCH), Patna, Bihar, India. The study took place from March 2023 to October 2024.

Study population

Patients attending the Plastic Surgery OPD with sacral pressure ulcers were evaluated for eligibility. The inclusion criteria comprised adults aged 30 to 70 years diagnosed with Stage III or IV sacral pressure ulcers according to the NPUAP classification, who were medically stable for surgery under spinal or general anesthesia and had adequate nutritional status. Only those who consented voluntarily were included. Exclusion criteria involved patients with systemic sepsis, uncontrolled comorbidities such as diabetes or renal failure, persistent malnutrition (serum albumin <2.5 g/dL), multiple gluteal pressure ulcers, or those unlikely to comply with follow-up.

Efforts to reduce bias

To minimize selection bias, patients in both groups were matched based on age, gender, and comorbidities. Standardized preoperative evaluation, surgical protocols, and postoperative care were applied uniformly across both cohorts.

Sample size and grouping

A total of 39 patients were enrolled and allocated into two cohorts. Group A (n=18) underwent reconstruction using gluteal fasciocutaneous rotational flaps, while Group B (n=21) received gluteus maximus myocutaneous flaps. Matching between the groups was done based on age, gender, and comorbidities to reduce selection bias.

Preoperative assessment

Each patient underwent a thorough preoperative evaluation, including complete blood count (CBC), liver function tests, renal function tests, serum albumin and total protein levels, wound culture and sensitivity testing, and imaging (X-ray or MRI if osteomyelitis was suspected). Nutritional status was optimized, and patients were managed with pressure-relieving devices like air or foam mattresses. Surgical wound debridement and infection control were ensured before flap coverage.

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Surgical techniques

In Group A, fasciocutaneous rotational flap reconstruction was performed under general or spinal anesthesia. After debridement, flaps incorporating skin, subcutaneous tissue, and fascia based on gluteal perforators were designed and rotated into the ulcer defect. The donor site was closed primarily or with a skin graft, and suction drains were placed.
In Group B, a similar initial debridement was followed by the elevation of a gluteus maximus myocutaneous flap, which included muscle and overlying skin. This flap was rotated into the defect, and closure and drain placement were carried out as in Group A.

Postoperative care

Postoperatively, patients were positioned prone or in a lateral decubitus position to offload pressure from the surgical site. Drains were closely monitored and removed once the output dropped below 30 mL/day. Antibiotic therapy was continued based on preoperative culture results. Nutritional support and physiotherapy were maintained, and mobilization was initiated based on flap stability and clinical progress.

Follow-up protocol

Patients were followed for at least 6 months with assessments at regular intervals postoperatively. Outcome parameters included operative time (in minutes), intraoperative blood loss (in mL), postoperative complications (e.g., flap necrosis, infection, seroma), duration of hospital stay, and time to complete healing.

Additional measures

Early management included regular dressing changes, debridement when necessary, and culture-based antibiotic therapy. If required, contracture release procedures for the hip or knee were performed. Standard postoperative care included a low-residue diet, scheduled patient repositioning, and proper drain management. Flap inspections were conducted on postoperative days (POD) 1, 3, 5, 7, and 14. Recurrence of pressure ulcers was assessed during bi-monthly follow-up visits for up to 24 weeks.

Statistical analysis

Statistical analyses were carried out using SPSS version 20, with a p-value of less than 0.05 regarded as the threshold for statistical significance.

Ethical considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee of PMCH, Patna, Bihar, India.

Informed consent

Written informed consent was obtained from all participants before their enrolment in the study.

Results

46 of the 52 patients that were screened had their eligibility evaluated, and 42 of them satisfied the requirements. With their consent, thirty-nine people were enrolled, i.e., 18 in the FC group and 21 in the MC group. 37 patients finished the study and were analyzed, with one patient dying and one being lost to follow-up.
The mean age was slightly higher in the FC flap group (57.16 ± 12.14 years) compared to the MC flap group (53.71 ± 14.38 years), though not significant ($p = 0.594$). The distribution of patients aged ≥61 years was identical in both groups (55.6%). Similarly, gender and etiological factors like cerebrovascular accident (CVA), head injury, or spinal injury were evenly matched across both groups, ensuring baseline comparability. The follow-up rate at 24 weeks was high and similar in both groups, supporting the reliability of outcome assessment (Table 1).

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Table 1: Baseline characteristics of study cohorts (N = 39)

Parameter	Group FC (n = 18)	Group MC (n = 21)	*P* Value	Significance
Mean Age (years)	57.16 ± 12.14	53.71 ± 14.38	0.594	Not Significant
Gender (Female: Male)	11:7	8:13	0.133	Not Significant
Age Group ≥ 61 yrs	55.6%	55.6%	-	Equal Distribution
Etiology (CVA/Spinal/HI/Others)	Comparable distribution in both groups	Comparable distribution in both groups	0.986	Not Significant
24-week Follow-up	94.4%	95.2%	0.363	Not Significant

Gluteal fasciocutaneous rotational flap.

Figure 1 – Before Operation.

Figure 2- Postoperative.

Figure 3- Follow up at 12 weeks.

Figure 1. FC rotational flap

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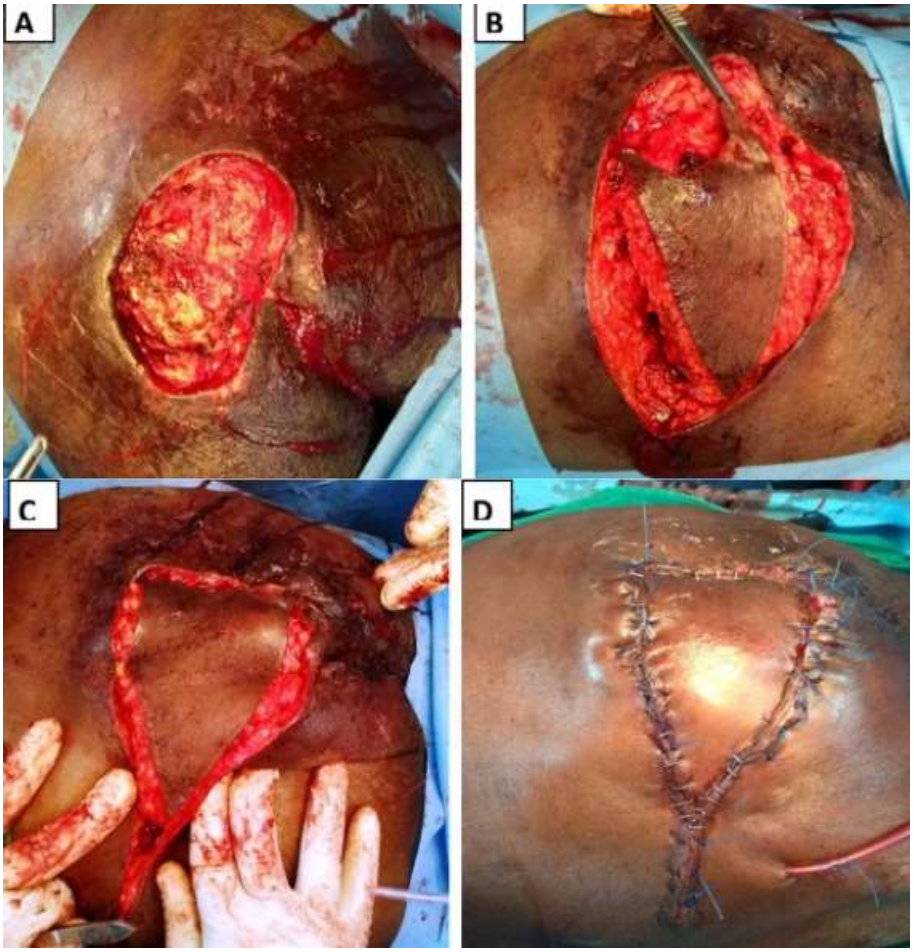

Figure 2. Gluteal maximus vy adv flap

There was no significant difference in operative time or healing duration between the two groups, with Group FC averaging 77.72 minutes and 20.11 days, and Group MC averaging 91.09 minutes and 23.95 days, respectively. However, intraoperative blood loss was significantly lower in the fasciocutaneous flap group, with only 11.1% experiencing high blood loss compared to 90.5% in the myocutaneous group (p = 0.001). Loss to follow-up and mortality were minimal and not significantly different between the groups, indicating that both surgical approaches were generally safe and well-tolerated (Table 2).

Table 2: Surgical and Postoperative Outcomes

Parameter	Group FC (n = 18)	Group MC (n = 21)	*P* Value	Significance
Operative Time (min)	77.72 ± 7.24	91.09 ± 6.08	0.986	Not Significant
Healing Time (days)	20.11 ± 3.21	23.95 ± 2.55	0.986	Not Significant
BloodLoss(> threshold)	2 patients (11.1%)	19 patients (90.5%)	0.001	Significant
Loss to Follow-up	1 patient (5.6%)	0 patients	-	Not Significant
Mortality	0	1 patient (4.8%)	-	Not Significant

Recurrence rates differed significantly between the groups. The fasciocutaneous flap group exhibited a 23.5% recurrence rate, with ulcer recurrence noted at 20, 22, and 24 weeks postoperatively. In contrast, no recurrences were reported in the myocutaneous flap group (p = 0.036). These findings suggest that while fasciocutaneous flaps

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offer several intraoperative advantages, myocutaneous flaps may provide superior long-term durability and protection against recurrence in sacral pressure ulcer reconstruction (Table 3).

Table 3: Recurrence analysis between fasciocutaneous and Myocutaneous flap groups

Recurrence Status	Group FC (n = 17)*	Group MC (n = 20)*	Total (n = 37)*	*P* Value	Significance
No Recurrence	13 (76.5%)	20 (100%)	33 (89.2%)	0.036	Significant
Recurrence total	4 (23.5%)	0 (0%)	4 (10.8%)		
Recurrence at 20 Weeks	1 (5.6%)	0	-	-	
Recurrence at 22 Weeks	2 (11.2%)	0	-	-	
Recurrence at 24 Weeks	1 (5.6%)	0	-	-	
Loss to Follow-up	1 (5.6%)	0	-	-	
Death	0	1 (4.8%)	-	-	

*Note: Total N = 37 includes only those patients available for 24-week follow-up (excluding loss to follow-up and death).

Postoperative complications were infrequent in both groups, with no statistically significant difference (p = 0.543). Group FC had one case each of necrosis and infection, whereas Group MC experienced isolated cases of seroma, sinus formation, dehiscence, infection, and one death. Most patients in both groups (83.3% in FC and 76.1% in MC) had no postoperative complications, indicating that both techniques are relatively safe with low complication rates (Table 4).

Table 4: Postoperative complications between the two groups

Complication Type	Group FC (n = 18)	Group MC (n = 21)	*P* Value	Significance
No Complication	15 (83.3%)	16 (76.1%)	0.543	Not Significant
Necrosis	1 (5.6%)	0		
Seroma	0	1 (4.8%)		
Sinus	0	1 (4.8%)		
Dehiscence	0	1 (4.8%)		
Infection	1 (5.6%)	1 (4.8%)		
Mortality	0	1 (4.8%)		
Loss to Follow-up	1 (5.6%)	0		

Discussion

This prospective cohort study compared gluteal FC and MC flaps in sacral pressure ulcer reconstruction and found both techniques to be safe and effective. The demographic and etiological characteristics of patients were well matched, allowing for unbiased comparison. Perioperative parameters such as operative time and healing duration were not significantly different between groups, suggesting similar surgical efficiency. However, blood loss was significantly higher in the MC group (p = 0.001), aligning with studies by Oksman et al. [11] and Thiessen et al. [12], which reported greater intraoperative bleeding with MC flaps. In contrast, FC flaps offered easier dissection, preservation of muscle function, and the potential for reuse in future reconstructions, as also supported by Djedovic et al. [13] and Chen et al. [14]. These features make FC flaps favorable for ambulatory patients or those needing repeated surgeries.

When examining postoperative outcomes, both flap types demonstrated acceptable safety profiles, with no statistically significant differences in complications (p = 0.543). These findings are in line with earlier reports that highlight comparable complication rates between FC and MC flaps [12,13,15]. Despite isolated cases of necrosis, seroma, and infection in both groups, the majority of patients recovered without complications. However, the most clinically relevant difference emerged in the recurrence rates. This study showed a statistically significant advantage of MC flaps in preventing ulcer recurrence, with no recurrences observed in the MC group in contrast to 23.5% in the FC group (p = 0.036). This supports earlier findings by Wong et al. [16] and Sameem et al. [17], who emphasized the superior mechanical support and vascularity of MC flaps as key factors reducing recurrence.

Nonetheless, not all prior studies report such a clear superiority of one technique over the other. Yamamoto et al. [18] reported a lower recurrence rate (17%) for FC

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flaps, close to our study's 23.5%, while Sameem et al. [17] found similar recurrence rates for FC (11.2%) and MC (8.9%) flaps, indicating both may offer long-term durability with proper technique and follow-up. Oksman et al. [11] similarly concluded that both flap types are generally effective, although minor differences exist in necrosis and usability. These mixed findings suggest that flap selection should be individualized based on patient condition, ulcer severity, comorbidities, and long-term care needs. Overall, while FC flaps offer surgical efficiency and minimal donor morbidity, MC flaps appear to provide more robust, durable coverage, especially in high-risk or recurrent cases.

Generalizability

Due to the small sample size and single-center design of the study, the results might not be entirely transferable to other contexts. External validity may be constrained by variations in surgical skill, patient demographics, and care practices.

Conclusion

This prospective cohort study demonstrated that both gluteal fasciocutaneous and myocutaneous flaps are viable options for the surgical management of sacral pressure ulcers, offering comparable safety and healing outcomes. While fasciocutaneous flaps were associated with significantly less intraoperative blood loss and easier flap reuse, myocutaneous flaps showed superior long-term durability with a significantly lower recurrence rate. These findings underscore the importance of individualized flap selection based on patient condition, risk of recurrence, and surgical goals. A multidisciplinary approach, incorporating meticulous surgical planning, postoperative care, and long-term follow-up, remains essential for optimizing outcomes in sacral pressure ulcer reconstruction.

Limitations

Since this study was conducted in a single urban tertiary care facility, it may not be feasible to extrapolate the findings to the broader population. Additionally, the study's sample size was too small to draw conclusions and extrapolate findings.

Recommendations

As this was a short-term study, further research is needed with a longitudinal study design and a larger sample to achieve more definitive results.

List of abbreviations

PMCH- Patna Medical College and Hospital
OPD- Outpatient Department
FC- Fasciocutaneous
MC- Myocutaneous
CVA- Cerebrovascular accident
POD- Post-operative Days
CBC- Complete blood count
NPUAP- National Pressure Ulcer Advisory Panel

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Source of funding

There was no external funding; the study was self-funded by the department.

Conflict of interest

The authors declare no conflict of interest.

Author contributions

All authors contributed to the study design, data collection, analysis, and manuscript preparation.

Data availability

The data generated during this study are available from the corresponding author upon reasonable request.

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