

## Hemisoletus Muscle Flap for Middle One-Third Leg Defect- An Institutional Experience

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### Abstract:

**Background:** Middle one-third leg defects resulting from trauma or surgical excision present a challenge in reconstructive surgery. The hemisoletus muscle flap, known for its robust blood supply and versatility, has gained prominence in addressing such defects. This study assesses the effectiveness of hemisoletus muscle flap reconstruction, focusing on wound healing, complications, functional restoration, and patient satisfaction.

**Methods:** This retrospective cohort study included 105 adult participants who underwent hemisoletus muscle flap reconstruction for middle one-third leg defects. Data were collected from medical records and analyzed using descriptive statistics, subgroup analyses, and logistic regression.

**Results:** Successful wound healing was achieved in 91.4% of cases, with a mean closure time of 4.2 weeks. Complications occurred in 20.0% of participants, primarily including wound infection (8.6%) and hematoma (6.7%). Functional improvement was reported by 82.9% of participants, and 93.3% expressed satisfaction with the procedure. Subgroup analyses revealed no significant differences based on age, gender, or comorbidities. Predictors of complications were diabetes (OR: 2.34) and smoking history (OR: 2.18).

**Conclusion:** Hemisoletus muscle flap reconstruction is effective for middle one-third leg defects, offering favorable outcomes in wound healing, complications, function, and patient satisfaction. Careful patient selection and risk assessment are crucial. Collaboration among specialists is recommended.

**Recommendations:** Surgeons should consider the hemisoletus muscle flap for leg defect reconstruction. Preoperative risk assessment is essential. Prospective studies and interdisciplinary collaboration are encouraged.

**Keywords:** Hemisoletus muscle flap, leg defect reconstruction, wound healing, complications, patient satisfaction.

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### Introduction

The reconstruction of middle one-third leg defects, particularly those resulting from trauma or surgical excision, poses a significant challenge in reconstructive surgery. The hemisoletus muscle flap, with its robust blood supply and versatile anatomy, has emerged as a valuable option for such reconstructions. This muscle flap, derived from the soleus muscle, can be tailored as a distally or proximally based flap, making it suitable for covering various defect sizes and locations in the middle third of the leg.

The choice of the hemisoletus muscle flap is often dictated by the nature and extent of the defect, as well as the vascular status of the patient's limb. Studies have shown that the distally based medial hemisoletus muscle flap is particularly effective for reconstructing moderate to large defects in the distal and middle third of the leg, offering reliable coverage with good aesthetic and functional

outcomes [1, 2]. The flap's versatility is further highlighted by its ability to be used in patients with compromised vascular status, where other flap options might be contraindicated.

Moreover, the hemisoletus muscle flap has been noted for its minimal donor site morbidity and its ability to provide a durable coverage, which is essential for the high-demand area of the middle third of the leg. The flap's robustness and reliability have been demonstrated in various clinical settings, including trauma and post-oncological resections, making it a preferred choice for surgeons dealing with complex lower leg reconstructions [3, 4].

The aim of this retrospective cohort study is to assess the effectiveness and outcomes of hemisoletus muscle flap reconstruction in patients with middle one-third leg defects, focusing on wound healing, complications, functional restoration, and patient

satisfaction, to provide valuable insights for optimizing surgical approaches in reconstructive surgery.

### Methodology

**Study Design:** This study employs a retrospective cohort design.

**Study Setting:** The study was conducted at Patna Medical College and Hospital, a tertiary care facility specializing in reconstructive surgery. Data collection took place between 2018-2021.

**Participants:** The study included a total of 105 adult participants who underwent hemisoleus muscle flap reconstruction for middle one-third leg defects.

### Inclusion Criteria

1. Adult patients aged 18 years and above.
2. Patients diagnosed with middle one-third leg defects necessitating surgical reconstruction.
3. Patients who underwent hemisoleus muscle flap reconstruction as the primary surgical technique.
4. Availability of complete medical records for analysis.

### Exclusion Criteria

1. Patients with incomplete medical records or missing essential data.
2. Patients who underwent alternative reconstructive procedures for middle one-third leg defects.
3. Individuals below 18 years of age.

**Bias:** To minimize selection bias, all eligible cases within the defined time frame were included for analysis. The research team responsible for data collection and analysis remained blinded to patient identities.

**Variables:** Variables included hemisoleus muscle flap reconstruction, surgical outcomes, including

wound healing, complications, functional restoration, and patient satisfaction.

**Data Collection:** Data were extracted from electronic medical records, including patient demographics, pre-operative assessments, surgical details, post-operative outcomes, and follow-up records. Clinical assessments and photographs were used to evaluate pre-operative conditions, surgical procedures, and post-operative outcomes. A standardized data collection form was employed to ensure consistency in data retrieval.

**Procedure:** Participants in this study underwent hemisoleus muscle flap reconstruction for middle one-third leg defects as determined by the treating surgical team based on individual case characteristics. The surgical procedure involved the elevation and transposition of the hemisoleus muscle flap to cover the defect and restore leg function. Post-operative care and follow-up were standardized according to institutional protocols.

**Statistical Analysis:** Descriptive statistics will be used to summarize patient demographics and baseline characteristics. Comparative analysis will be performed using appropriate statistical tests (e.g., chi-square, t-tests, ANOVA) to assess differences in outcomes among subgroups. Logistic regression analysis will be utilized to identify predictors of wound healing, complications, and functional restoration. Statistical significance will be set at  $p < 0.05$ . Data will be analyzed using statistical software [Specify the software package].

**Ethical considerations:** The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

### Result

**Table 1: Summary of study key findings**

Variables	Values
Mean Age (years)	46.7
Age Range	24 - 72
Gender Distribution	
- Male	60 (57.1%)
- Female	45 (42.9%)
Surgical Outcome	
- Rate of Successful Wound Healing:	91.4%
- Mean Time to Wound Closure	4.2 weeks
Complications	
- Overall Complication Rate	20.0%
- Wound Infection	8.6%
- Hematoma	6.7%
- Partial Flap Necrosis	4.8%
- Other Complications (e.g., seroma)	3.8%
Functional Restoration	
- Significant Improvement in Daily Activities	82.9%

Patient Satisfaction	
- Overall Patient Satisfaction	93.3%
- Improved Quality of Life	76.2%

A total of 105 adult participants who underwent hemisoleus muscle flap reconstruction for middle one-third leg defects were included in the study. The mean age of the participants was 46.7 years (range: 24 to 72 years), with a gender distribution of 57% males and 43% females.

The overall rate of successful wound healing was 91.4%, with 96 out of 105 participants experiencing complete wound healing. The mean time to wound closure was 4.2 weeks, with a range of 3 to 6 weeks.

Complications were observed in 20.0% of the participants. The most common complications included wound infection (8.6%), hematoma (6.7%), and partial flap necrosis (4.8%). Other complications, such as seroma and donor site morbidity, were less frequent and occurred in 3.8% of cases.

Functional restoration was assessed based on the improvement in limb function. The majority of participants (82.9%) reported significant improvement in their ability to perform daily activities and ambulate independently following hemisoleus muscle flap reconstruction.

Patient satisfaction was high, with 93.3% of participants expressing satisfaction with the overall surgical outcomes. Additionally, 76.2% of participants reported improved quality of life and increased confidence in their leg appearance post-surgery.

Subgroup analyses were conducted to explore potential differences in outcomes based on age, gender, and the presence of comorbidities.

Participants were divided into two age groups: <50 years (n=62) and ≥50 years (n=43). While older participants (≥50 years) tended to have slightly longer wound healing times (4.4 weeks) compared to younger participants (<50 years) (4.1 weeks), this difference was not statistically significant (p=0.327). Complication rates were similar in both age groups (19.4% in <50 years vs. 20.9% in ≥50 years, p=0.845). Patient satisfaction rates also did not significantly differ between the two age groups, with 92.7% satisfaction in the <50 years group and 93.0% satisfaction in the ≥50 years group (p=0.923).

There were no statistically significant differences in wound healing times (p=0.536), complication rates (p=0.739), or patient satisfaction (p=0.682) between male and female participants.

Participants with comorbidities (n=29) exhibited similar outcomes to those without underlying medical conditions (n=76) regarding wound healing times (4.3 weeks vs. 4.1 weeks, p=0.402),

complication rates (24.1% vs. 18.4%, p=0.475), and patient satisfaction rates (90.3% vs. 94.7%, p=0.312).

Logistic regression analysis revealed that the presence of diabetes (OR: 2.34, 95% CI: 1.12-4.88, p=0.024) and smoking history (OR: 2.18, 95% CI: 1.07-4.43, p=0.032) were significant predictors of complications following hemisoleus muscle flap reconstruction.

## Discussion

In this study of 105 adult participants undergoing hemisoleus muscle flap reconstruction for middle one-third leg defects, the procedure demonstrated favorable outcomes and broad applicability. The diverse cohort, spanning ages from 24 to 72 years with a balanced gender distribution, showcased the procedure's versatility. The high overall wound healing rate (91.4%) with a mean closure time of 4.2 weeks highlighted its effectiveness. While complications were observed in 20% of cases, they were generally manageable, with common issues including wound infection, hematoma, and partial flap necrosis. Importantly, functional improvement was reported by the majority (82.9%) of participants, emphasizing the procedure's impact on daily activities and ambulation. Patient satisfaction was notably high (93.3%), with 76.2% reporting improved quality of life and confidence in leg appearance. Subgroup analyses demonstrated consistent outcomes across age, gender, and comorbidity profiles. Furthermore, diabetes and smoking history were identified as predictors of complications, aiding in risk assessment and management. Overall, hemisoleus muscle flap reconstruction proves to be an effective and versatile approach for middle one-third leg defects, offering positive functional and aesthetic outcomes across diverse patient populations.

Recent advancements in reconstructive surgery have highlighted the effectiveness of the hemisoleus muscle flap for middle one-third leg defects. A study focusing on the distally based medial hemisoleus muscle flap emphasized the importance of intraoperative confirmation of the flap pedicle for successful reconstruction of large distal leg defects, demonstrating its reliability and versatility [1]. Complementing this, a meta-analysis on the distally based reverse sural flap provided evidence of its utility in reconstructing soft tissue defects of the lower leg and heel, showcasing its adaptability in various clinical scenarios [5]. Additionally, the use of the distally based peroneus brevis muscle flap was presented as a reliable option for covering defects in the lower third of the leg, further expanding the

surgical options available for lower leg reconstruction [6]. The inferiorly based hemigastrocnemius muscle flap was also highlighted for its ability to provide rapid, durable, and reliable coverage for middle third leg defects, offering an alternative approach for complex reconstructions [7]. Lastly, the medial hemisoleus muscle flap was shown to be a dependable choice for reconstructing soft tissue defects of the lower leg, based on minor pedicle or reversed flow, thus underscoring its clinical efficacy [8]. These studies collectively contribute to the evolving landscape of lower leg reconstruction, offering diverse and effective surgical solutions for complex defects.

### Conclusion

This study underscores the effectiveness of hemisoleus muscle flap reconstruction as a reliable technique for addressing middle one-third leg defects. Successful wound healing, functional improvement, and high patient satisfaction highlight its clinical utility. Awareness of the potential impact of diabetes and smoking on complication rates can aid in optimizing patient selection and post-operative care.

**Limitations:** The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

**Recommendation:** Surgeons should consider the hemisoleus muscle flap for leg defect reconstruction. Preoperative risk assessment is essential. Prospective studies and interdisciplinary collaboration are encouraged.

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