THE PLANET

Original Article

Outcome of Superior Lateral Genicular Artery Perforator Flap for Reconstruction of Defects Around Knee Joint, in DMCH, Bangladesh

Mahima Sultana[1*], Umme Rubya Mst Maksudun Nahar[2], Tazia Haider[3], Touhid Alam[4], Achintya Kumar Das[5], Nahid Sultana Rony[6], Abu Nahiyan[7], Kamruzzaman Akash[8]

ARTICLE INFO

Received: 11 May 2026
Accepted: 14 May 2026
Published Online: 18 May 2026

DOI: 10.5281/zenodo.20277557

Volume: 9, Number: 3, Page: 127-132

e-ISSN: 2789-5912
ISSN: 2617-0817

*Corresponding author

ABSTRACT

Background: Knee soft tissue defects from trauma, infection, burns, or tumors are difficult to reconstruct due to limited local tissue and functional demands. The SLGAp flap offers a reliable option with thin, pliable tissue, a constant vascular pedicle, and good functional outcomes, avoiding the bulk of conventional flaps. **Objective:** To assess the outcomes of superior lateral genicular artery perforator flap reconstruction for defects around the knee joint. **Methods & Materials:** This prospective observational study was conducted in the Department of Plastic Surgery, Dhaka Medical College Hospital (June 2024–September 2025). Sixty patients with knee soft tissue defects were purposively sampled. All underwent reconstruction using the superior lateral genicular artery perforator (SLGAp) flap under anesthesia, with intraoperative flap measurements. Follow-up on days 5, 14, 30, and 90 assessed viability, complications, and outcomes. Data were analyzed in SPSS v27. **Results:** Among 60 patients (mean age 31.5 ± 13.93 years; 76.66% male), 80.00% had no co-morbidities. The mean flap size was 66.66 ± 18.67 cm². No flap loss occurred in 80.00% of cases; marginal and partial loss were seen in 13.33% and 6.66%, respectively, with no complete loss. Complications were minimal, with 83.33% having none. Full knee motion was achieved in 83.33% of patients. Good, satisfactory, and poor outcomes were observed in 70.00%, 16.70%, and 13.33% of cases, respectively. **Conclusion:** The superior lateral genicular artery perforator flap is a safe and reliable option for effective reconstruction of knee joint defects with favorable functional and clinical outcomes.

Keywords: *Superior Lateral Genicular Artery Perforator Flap, Knee Joint Reconstruction, Soft Tissue Defects, Flap Outcome.*

1. *FCPS Trainee, Department of Plastic Surgeon, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh (ORCID: 0009-0000-7090-1013)*
2. *Assistant Surgeon, Department of Burn and Plastic Surgery, National Institute of Burn & Plastic Surgery, Dhaka, Bangladesh (ORCID: 0009-0005-8738-1401)*
3. *Medical Officer, Department of Burn and Plastic Surgery, Directorate General of Health Services (DGHS), Dhaka, Bangladesh (ORCID: 0009-0004-0555-4800)*
4. *Assistant Professor, Department of Burn and Plastic Surgery, National Institute of Burn & Plastic Surgery, Dhaka, Bangladesh (ORCID: 0009-0006-6680-6869)*
5. *Indoor Medical Officer, Department of Burn and Plastic Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh (ORCID: 0009-0001-9361-492X)*
6. *Resident, Department of Burn and Plastic Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh (ORCID: 0009-0004-4352-7301)*
7. *Plastic Surgeon, Dhaka, Bangladesh (ORCID: 0009-0002-2929-0745*
8. *Resident, Department of Burn and Plastic Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh (ORCID: 0009-0007-7078-2342)*

INTRODUCTION

Tissue defects around the knee are commonly the result of traumatic injuries, oncologic resections, severe infections, and deep burns. Reconstruction of such defects in the knee and lower leg region remains challenging and continues to be an important area of interest in plastic surgery due to the complex anatomy, functional demands, and limited local tissue availability [1].

Several reconstructive options have been described for coverage of knee defects. The gastrocnemius muscle flap is frequently used; however, its bulky nature and limited distal reach make it less suitable for large or suprapatellar defects, particularly where thin and pliable coverage is required [2]. Similarly, the sural artery perforator flap provides thin and pliable tissue but is limited by flap size, restricting its use in larger defects around the knee [3]. The distally based vastus lateralis muscle flap is another option; however, its bulkiness may also compromise aesthetic and functional outcomes in knee reconstruction [4].

Because of these limitations, local flap options are generally preferred for knee reconstruction as they offer simpler, less invasive procedures with reduced donor-site morbidity. In this context, Hayashi and Maruyama first described the fasciocutaneous flap based on the lateral superior genicular artery in 1990 for reconstruction of defects around the knee, popliteal region, lower thigh, and upper leg. This flap is based on perforators of the lateral superior genicular artery, a branch of the popliteal artery, providing a reliable vascular supply [5].

The superior lateral genicular artery perforator (SLGAp) flap has since emerged as a valuable alternative to muscle and musculocutaneous flaps, particularly in situations where muscle-based options are unavailable or undesirable [6]. It offers several advantages, including single-stage reconstruction, a constant vascular pedicle, good color and texture match, and a thin, pliable tissue composition without bulk or contour irregularity. Importantly, it preserves underlying muscle function and is not associated with significant functional or sensory deficits in the donor limb [5].

Despite these advantages, clinical reports on its outcomes remain relatively limited and variable in different settings. Therefore, the present study was undertaken to evaluate the outcomes of the superior lateral genicular artery perforator flap for reconstruction of defects around the knee joint in patients treated at Dhaka Medical College Hospital, Bangladesh, with the aim of assessing its reliability, complications, and functional results in routine clinical practice.

OBJECTIVE

To assess the outcomes of superior lateral genicular artery perforator flap reconstruction for defects around the knee joint.

METHODS & MATERIALS

This prospective observational study was conducted in the Department of Plastic Surgery, Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh, from June 2024 to September 2025. A total of 60 patients with soft tissue defects around the knee joint requiring reconstructive coverage were included in the study and were selected by purposive sampling according to predefined inclusion and exclusion criteria.

Inclusion Criteria

- Patients of any age and both sexes
- Patients with soft tissue defects around the knee joint due to trauma, tumor, burn, non-healing ulcer, or post-surgical wounds
- Patients with exposed tendon, bone, vessel, or joint requiring reconstruction

Exclusion Criteria

- Patients with injury involving or compromising the vascular pedicle of the donor site
- Patients with uncontrolled systemic comorbidities (uncontrolled diabetes mellitus, uncontrolled hypertension, peripheral vascular disease, or major psychiatric illness)
- Patients with life-threatening injuries

Data Collection

Data were collected through face-to-face interviews, clinical examination, and a structured questionnaire. Informed written consent was obtained from all patients or from guardians in cases where patients were under 18 years of age. Preoperative and postoperative photographs were taken for documentation.

Figure 1 Preoperative Flap Planning, Marking, and Elevation of the Superior Lateral Genicular Artery Perforator (SLGAp) Flap for Reconstruction of a Knee Joint Defect.

Operative Procedure and Follow-Up

All patients underwent reconstruction using the superior lateral genicular artery perforator (SLGAp) flap. Spinal anesthesia was used in all adult patients, while general anesthesia was administered in pediatric cases. Flap dimensions were measured intraoperatively (*Figure 1*).

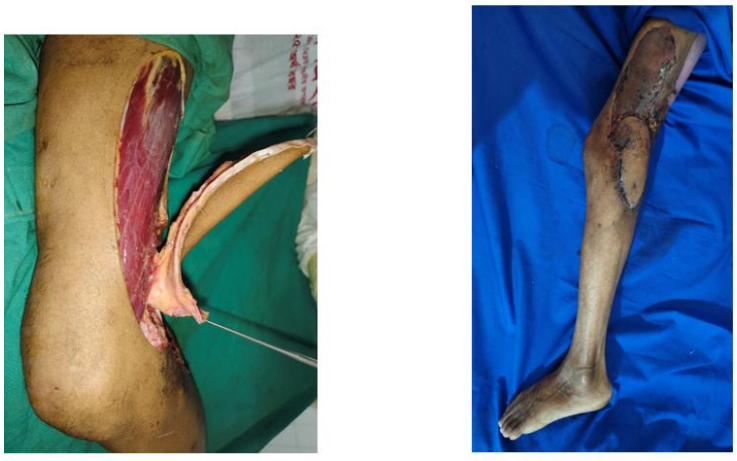

Figure 2 Peroperative Flap Elevation and Postoperative Outcome Following Superior Lateral Genicular Artery Perforator (SLGAp) Flap Reconstruction of Knee Joint Defect.

Postoperatively, patients were followed up on day 5 for assessment of flap viability, on day 14 for initiation of physiotherapy, and subsequently on day 30 and day 90 for evaluation of wound healing, complications, and functional outcome (*Figure 2*).

Outcome Assessment

Flap viability was categorized as:

- No flap loss
- Marginal flap loss (≤10%)
- Partial flap loss (>10%–30%)
- Significant flap loss (≥30%)

Flap-related complications included venous congestion, wound infection, and wound dehiscence.

Knee joint range of motion was assessed using a goniometer and classified as:

- Good: Full range of motion
- Satisfactory: 10°–15° restriction
- Poor: >15° restriction

Statistical Analysis

Data were analyzed using SPSS version 27. Descriptive statistics were expressed as frequency, percentage, mean, and standard deviation. Associations between variables were assessed using the Chi-square test. A p-value of <0.05 was considered statistically significant, with a 95% confidence interval.

Ethical Consideration

Ethical approval was obtained from the Research Review Committee (RRC) and the Institutional Review Board (IRB) of Dhaka Medical College Hospital.

RESULTS

Table I presents the demographic characteristics of the study population. The mean age of the participants was 31.5 ± 13.93 years. No statistically significant difference in mean age was observed between males (30.70 ± 14.14 years) and females (34.14 ± 12.81 years) (t = 1.652, p > 0.05, not significant). The study population was predominantly male, comprising 46 (76.66%) males and 14 (23.33%) females. The majority of patients were in the 21–40 years age group, accounting for 34 (56.70%) cases.

Table I

Demographic Data and Baseline Characteristics of the Study Population (n = 60).

Age (Years)	Total n (%)	Male	Female	Mean Age ± SD (Years)	Mean Male Age ± SD	Mean Female Age ± SD
≤20	12 (20.00%)	8	4	31.5 ± 13.93	30.70 ± 14.14	34.14 ± 12.81
21–40	34 (56.70%)	28	6			
41–60	12 (20.00%)	8	4			
≥61	2 (3.33%)	2	0			
Total	60	46 (76.66%)	14 (23.33%)			

Table II presents the distribution of co-morbidities among the study population. The majority of patients, 48 (80.00%), had no co-morbid conditions, while 8 (13.33%) had controlled hypertension and 4 (6.66%) had controlled diabetes mellitus.

Table II

Co-Morbidity of the Study Population (n = 60).

Co-Morbidity	Frequency n (%)
No Co-Morbidity	48 (80.00%)
Controlled DM	4 (6.66%)
Controlled HTN	8 (13.33%)

Table III presents the distribution of flap dimensions among the study population. The mean flap size was 66.66 ± 18.67 cm², ranging from 35 cm² to 112 cm².

Table III

Flap Dimensions Among the Study Population (n = 60).

Parameter	Mean ± SD (cm²)	Minimum (cm²)	Maximum (cm²)
Flap Dimension	66.66 ± 18.67	35	112

Table IV presents the flap viability outcomes among the study population. No flap loss was observed in 48 (80.00%) cases, while marginal flap loss occurred in 8 (13.33%) cases and partial flap loss in 4 (6.66%) cases. No cases of significant or complete flap loss were recorded.

Table IV

Flap Viability of the Study Population (n = 60).

Flap Viability	Frequency n (%)
No Flap Loss	48 (80.00%)
Marginal Flap Loss	8 (13.33%)
Partial Flap Loss	4 (6.66%)
Significant Flap Loss	0 (0%)
Complete Flap Loss	0 (0%)

Table V presents the relationship between flap dimension and flap viability. Among flaps measuring 35–50 cm², marginal flap loss occurred in 4 (6.66%) cases and partial flap loss in 1 (1.66%) case. In flaps measuring 51–90 cm², marginal flap loss was observed in 4 (6.66%) cases and partial flap loss in 3 (5.00%) cases. No flap loss was observed in flaps measuring 91–112 cm². Overall, marginal flap loss occurred in 8 (13.33%) cases and partial flap loss in 4 (6.66%) cases. A statistically significant association was found between flap dimension and flap viability (χ^2 = 83.542, p < 0.05).

Table V
Relationship Between Flap Dimension and Flap Viability (*n* = 60).

Flap Dimension (cm²)	Number of Flaps n (%)	Marginal Flap Loss n (%)	Partial Flap Loss n (%)
35–50	28 (46.66%)	4 (6.66%)	1 (1.66%)
51–90	23 (38.33%)	4 (6.66%)	3 (5.00%)
91–112	9 (15.00%)	0 (0%)	0 (0%)
Total	60	8 (13.33%)	4 (6.66%)

Table VI presents the flap-related complications observed in the study population. The majority of patients, 50 (83.33%), experienced no complications. Venous congestion was observed in 6 (10.00%) cases, while wound dehiscence and wound infection were each observed in 2 (3.33%) cases.

Table VI
Flap-Related Complications Among the Study Population (*n* = 60).

Complication	Frequency n (%)
No Complications	50 (83.33%)
Venous Congestion	6 (10.00%)
Wound Dehiscence	2 (3.33%)
Wound Infection	2 (3.33%)

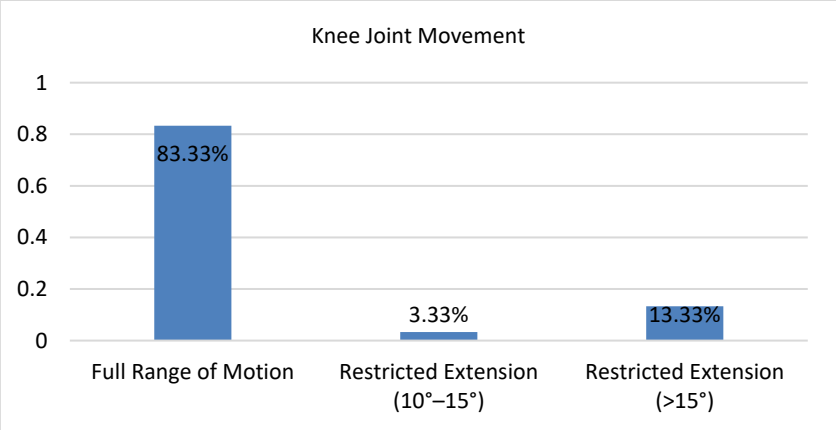

Figure 3 Range of Motion of the Knee Joint at Final Follow-Up (*n* = 60).

Figure 3 shows the functional outcomes in terms of knee joint mobility at final follow-up. A full range of motion was achieved in 50 (83.33%) patients. Restricted extension of 10°–15° was observed in 2 (3.33%) cases, while restriction greater than 15° was observed in 8 (13.33%) cases.

Table VII presents the overall outcomes of the flap procedures among the study population. A good outcome was observed in 42 (70.00%) cases, a satisfactory outcome in 10 (16.70%) cases, and a poor outcome in 8 (13.33%) cases. Co-morbidities were present in 12 (20.00%) patients, among whom poor outcomes were more frequent. A statistically significant association was found between co-morbidity and flap outcome ($\chi^2 = 22.08$, $p < 0.05$).

Table VII
Outcome of the Flap Among the Study Population (*n* = 60).

Outcome	Frequency n (%)	Co-Morbidity (n)
Good	42 (70.00%)	4
Satisfactory	10 (16.70%)	2
Poor	8 (13.33%)	6
Total		12 (20.00%)

DISCUSSION

This prospective observational study was conducted to evaluate the outcomes of the superior lateral genicular artery perforator flap for coverage of defects around the knee joint in the Department of Plastic Surgery, Dhaka Medical College Hospital (DMCH) from June 2024 to September 2025. The present study findings were discussed and compared with previously published relevant studies.

This study shows that the mean age of the study population was 31.5 ± 13.93 years, with the majority of patients belonging to the 21–40 years age group. This finding is similar to that of Low et al., where the mean age was 38.4 years. This indicates that individuals in the active age group are more commonly affected by knee joint trauma requiring reconstructive procedures [7].

The present study was male predominant, with 46 (76.66%) male and 14 (23.33%) female patients. This is comparable to the study conducted by Hossain et al., who reported 10 (66.7%) male and 5 (33.3%) female patients among 15 cases undergoing SLGA perforator flap reconstruction [8].

Regarding comorbidities, the present study demonstrated that 48 (80.00%) patients had no co-morbid conditions, while 8 (13.33%) had controlled hypertension and 4 (6.66%) had controlled diabetes mellitus. These findings are consistent with the study by Fu et al., who reported a series of 16 patients undergoing complex knee defect reconstruction in which most cases were post-traumatic and involved otherwise healthy individuals, with comorbidities such as diabetes mellitus and hypertension being uncommon or present in only a small proportion of patients [9]. Similarly, Vaillant et al., in a large review of 286 patients (380 defects) undergoing lower limb perforator flap reconstruction, documented comorbidities such as diabetes mellitus and hypertension as recorded variables; however, these were present only in a minority of cases rather than the predominant patient population [10]. Overall, these findings support the observation that knee defect reconstruction using perforator flaps is most commonly performed in relatively healthy patients, with controlled systemic diseases representing a smaller subset of the study population.

The present study demonstrated that the mean flap dimension was 66.66 ± 18.67 cm², with a range from 35 cm² to 112 cm², indicating a wide variability in defect size requiring reconstruction around the knee joint. This reflects the versatility of the superior lateral genicular artery perforator flap in managing both moderate and relatively larger soft tissue defects. Similar findings have been reported by Li et al., who described a clinical series of knee defects treated with various perforator flaps, where wound sizes ranged from approximately 18 cm² to 180 cm², with most cases falling within the moderate size category [11]. Likewise, R. R. B. et al. reported that knee defects requiring reconstruction are commonly within the range of 5 × 3 cm to approximately 10 × 8 cm, particularly in trauma-related cases [12]. These findings collectively support the present study results, demonstrating that SLGA perforator flaps are suitable for a broad spectrum of defect sizes around the knee joint.

In terms of flap viability, marginal flap loss was observed in 8 (13.33%) cases and partial flap loss in 4 (6.66%) cases, while 48 (80.00%) cases showed uneventful healing with no flap loss. These findings indicate a high overall success rate of the superior lateral genicular artery perforator flap, with only minor degrees of flap compromise and no cases of complete loss. Comparable outcomes have been reported by Chiang et al., who described a clinical series of knee defect reconstructions with 100% flap survival and no flap necrosis or total loss [13]. Similarly, Katpar et al. reported a high overall flap survival rate exceeding 90% in proximal leg and knee reconstructions, with no cases of total flap loss and only minor complications in a small number of patients [14]. These studies support the present findings, highlighting the reliability and safety of perforator flaps for reconstruction of defects around the knee joint.

A Chi-square test demonstrated a statistically significant association between flap dimension and flap viability, indicating that flap size has a significant relationship with postoperative outcome.

These findings are consistent with those of Elkashty et al., who reported marginal necrosis in 2 cases that were managed conservatively [6]. Similarly, Hayashi and Maruyama reported three cases of SLGA perforator flap, all of which survived, with superficial tip necrosis in one case that healed with conservative management [5].

In the present study, venous congestion was observed in 6 (10.00%) cases, while wound infection and wound dehiscence were each observed in 2 (3.33%) cases. All complications were managed conservatively with appropriate treatment. These findings are comparable to those reported by Arju et al., where the majority of patients experienced no complications and venous congestion occurred in 10% of cases [15]. Similarly, Grassa et al. reported an overall complication rate of approximately 20.5%, with infection and wound dehiscence being among the observed complications, while complete flap failure was rare [16]. Chandra et al. also noted that most lower limb flap reconstructions heal uneventfully despite occasional complications [17].

Full range of motion of the knee joint was achieved in 50 (83.33%) patients. Restricted extension of 10°–15° was observed in 2 (3.33%) cases, while restriction greater than 15° was observed in 8 (13.33%) cases. These findings demonstrate that the majority of patients achieved satisfactory functional recovery of the knee joint. Comparable outcomes have been reported by Louer et al., who documented functional limb salvage in approximately 88% of cases [18]. Similarly, Kwiecień et al. reported functional preservation in up to 80% of patients with improved range of motion [19]. This finding is also consistent with the study by Sahasrabudhe et al., where most patients achieved full functional range of motion [7].

At final follow-up, good outcomes were observed in 42 (70.00%) cases, satisfactory outcomes in 10 (16.70%) cases, and poor outcomes in 8 (13.33%) cases. Comparable findings have been reported by Corten et al., who documented satisfactory to good functional outcomes in approximately 92% of cases [20]. Similarly, Rovere et al. reported good or complete healing in about 93.9% of cases with minimal complications [21].

Therefore, the study concludes that the superior lateral genicular artery perforator flap is a reliable and effective option for reconstruction of soft tissue defects around the knee joint.

LIMITATIONS

Aesthetic outcomes were not evaluated in this study.

CONCLUSION

According to the study results, the superior lateral genicular artery perforator flap provides a reliable method for reconstruction of knee defects. Most patients achieved good outcomes, and flap survival was complete in the majority of cases. Flap-related complications were infrequent, and normal knee joint movements were achieved in most patients. Therefore, in the context of Dhaka Medical College, Dhaka, Bangladesh, the SLGA perforator flap can be considered a safe and dependable reconstructive option for defects around the knee joint.

ACKNOWLEDGMENT

I sincerely acknowledge Almighty Allah, my supervisor Prof. Dr. Bidhan Sarker, all respected teachers and colleagues of the Department of Plastic Surgery, DMCH, my family and well-wishers, and especially the patients and their guardians for their kind cooperation in completing this thesis work.

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Zbuchea A. Lateral genicular artery flap for reconstruction of a large knee defect, following oncological resection: case report. Chirurgia (Bucur). 2016 Jul 1;111(111):353-7.
2. Gravvanis A, Kyriakopoulos A, Kateros K, Tsoutsos D. Flap reconstruction of the knee: a review of current concepts and a proposed algorithm. World journal of orthopedics. 2014 Nov 18;5(5):603.
3. Umemoto Y, Adachi Y, Ebisawa K. The sural artery perforator flap for coverage of defects of the knee and tibia. Scandinavian journal of plastic and reconstructive surgery and hand surgery. 2005 Jan 1;39(4):209-12.
4. Necmioglu S, Askar I, Lök V, Subasi M. Use of the vastus lateralis muscle flap with a grooving procedure in the surgical treatment of chronic osteomyelitis of the femur. Annals of plastic surgery. 2004 Dec 1;53(6):570-6.
5. Hayashi A, Maruyama Y. The lateral genicular artery flap. Annals of plastic surgery. 1990 Apr 1;24(4):310-7.
6. El Kashty SM, AboShaban M, Taalab AA. Versatility of the superior lateral genicular artery perforator flap for coverage of soft tissue defects around the knee. The Egyptian Journal of Plastic and

Reconstructive Surgery. 2021 Jul 1;45(3):193-9.
7. Low OW, Loh TF, Lee H, Yap YL, Lim J, Lim TC, Nallathamby V. The superior lateral genicular artery flap for reconstruction of knee and proximal leg defects. Archives of Plastic Surgery. 2022 Jan;49(01):108-14.
8. Hossain SM, Islam SB, Chowdhury MA, Khatun MR. An Assessment of the Outcome of the Superior Lateral Genicular Artery Flap for Soft Tissue Reconstruction around the Knee. Annals of International Medical and Dental Research E. 2021;7(6).
9. Fu J, Qing L, Wu P, Tang J. Customized reconstruction of a complex soft-tissue defect around the knee with a free perforator flap. Am J Transl Res. 2021 May 15;13(5):4401-4411.
10. Vaillant C, Berkane Y, Lupon E, Atlan M, Rousseau P, Lellouch AG, Duisit J, Bertheuil N. Outcomes and reliability of perforator flaps in the reconstruction of hidradenitis suppurativa defects: a systemic review and meta-analysis. Journal of Clinical Medicine. 2022 Sep 30;11(19):5813.
11. Li Z, Li P, Tan Q. Reconstruction of Soft Tissue Defects Around the Knee With Pedicled Perforator Flaps. Ann Plast Surg. 2018 Oct;81(4):462-467.
12. R RB, Ramkumar S, Venkatramani H. Soft Tissue Coverage for Defects around the Knee Joint. Indian J Plast Surg. 2019 Jan;52(1):125-133.
13. Chiang IH, Wu CC, Chen SG, Wang CH. Pedicled medial sural perforator flap for the reconstruction of knee defects. Int Wound J. 2017 Aug;14(4):673-677.
14. Katpar H, Javaid RH, Ahmed RS, Rasool A, Naz F, Noor S. The outcome of pedicled Medial Sural Artery Perforating Flap for proximal leg reconstruction. J Ayub Med Coll Abbottabad [Internet]. 2023;35(3):375–9.
15. Arju KS, Dash PC, Ahmed T, Reza HK, Biswas G, Khan MN. Outcome of venous supercharged pedicled anterolateral thigh flap for reconstruction of soft tissue defect around the knee joint. Journal of Bangladesh College of Physicians and Surgeons. 2022 Oct 16;40(4):233-9.
16. Grassa D, Bocchino G, Stefanelli C, Capece G, Comodo RM, El Motassime A, Totti R, Maccauro G, Vitiello R. The role of the gastrocnemius flap in implant retention strategies for acute periprosthetic joint infection following total knee arthroplasty: a systematic review. Archives of Orthopaedic and Trauma Surgery. 2026 Jan 28;146(1):33.
17. Chandra AA, Romanelli F, Tang A, Menken L, Zhang M, Feintisch A, Liporace FA, Yoon RS. A comparison of healing and complication rates between common flaps utilized in total knee arthroplasty: a review of the literature. Knee Surgery & Related Research. 2022 Mar 26;34(1):15.
18. Louer CR, Garcia RM, Earle SA, Hollenbeck ST, Erdmann D, Levin LS. Free flap reconstruction of the knee: an outcome study of 34 cases. Ann Plast Surg. 2015 Jan;74(1):57-63.
19. Kwiecien GJ, Lamaris G, Gharb BB, Murray T, Hendrickson MF, Zins JE, Isakov R. Long-Term Outcomes of Total Knee Arthroplasty following Soft-Tissue Defect Reconstruction with Muscle and Fasciocutaneous Flaps. Plast Reconstr Surg. 2016 Jan;137(1):177e-186e.
20. Corten K, Struelens B, Evans B, Graham E, Bourne RB, MacDonald SJ. Gastrocnemius flap reconstruction of soft-tissue defects following infected total knee replacement. The bone & joint journal. 2013 Sep 1;95(9):1217-21.
21. Rovere G, Smakaj A, Calori S, Barbaliscia M, Ziranu A, Pataia E, Maccauro G, De Mauro D, Liuzza F. Use of muscular flaps for the treatment of knee prosthetic joint infection: A systematic review. Orthopedic Reviews. 2022 Apr 25;14(5):33943.