Superior Lateral Genicular Artery Perforator Flap for Soft Tissue Coverage Around Knee: Clinical Experience at A Teaching Hospital of Chittagong, Bangladesh

F AKHTER[a], RU AHMED[b], MM UDDIN[c], SB SHEULY[d], F SALAM[e]

Abstract:

Background: Knee joints play an important role in gait and weight bearing. So reliable knee joint coverage is essential for recovery of the most function of lower limb. Among a variety of reconstructive options for the knee the Lateral Genicular artery Perforator Flap is reliable method in soft-tissue cover around the knee with an excellent outcome and minimal morbidity of the donor site. The vascular basis of this flap has consistent and reliable anatomy. So the present study observes the outcome of superior lateral genicular artery flap for soft tissue defect around the knee.

Material & Methods: This study was done at the department of Plastic and Reconstructive Surgery, Chittagong Medical College Hospitals (CMCH), from January 2020 to July 2023. It included 18 patients

Result: Among 18 patients male were predominant with their age ranged from 15 to 60 years. The knee defects were due to different etiologies maximum patients (12) were patients with road traffic accidents. The defects were covered by the superior lateral genicular artery perforator flap all flaps survived except in 3 cases. 2 cases managed conservatively and healed well and in the third case the necrotic part was debrided and skin grafted. The donor site was closed primarily in 12 cases and skin grafted in 6 cases.

Conclusion: Superior Lateral genicular artery perforator flap is a good option for cover of soft tissue defects around the knee . The anatomy of the flap perforators is consistent and reliable. Donor site morbidity is minimal with no functional loss.

Key Words: Superior lateral genicular artery, Knee defects, Perforator flap.

(J Bangladesh Coll Phys Surg 2026; 44: 83-87)
DOI: https://doi.org/10.3329/jbcps.v44i2.89354

Introduction:

Knees are the largest and most complex joints of the body and an important support for walking and weight bearing which are also easily exposed to injury due to its accessibility. Infection, burns, trauma, and other causes can lead to skin and soft tissue defect around the knee, which is often accompanied by bone or joint exposure, vascular and nerve injury or exposure, ligament injury or exposure [1,2]. If it is not promptly and effectively repaired, the patient's joint function may be severely damaged or lost. Thus repair of skin and soft tissue defects around the knee is an important issue that needs to be addressed urgently. Functional recovery and acceptable appearance are the primary purpose of reconstructing the skin and soft tissue around the knee. Good vascularization is the key to ensuring wound healing [1]. Clinically, the major method of repairing soft tissue defects around the knee is the flap repair. Different options for flap repair include local flaps (fascia flaps, muscle flaps) or free flaps. When there is a wide range of soft tissue defects the local flaps always have no effect.[3] Most muscle flaps, such as the lateral or medial Gastrocnemius are bulky and

a. Dr. Farhana Akhter, Assistant Professor, Burn and Plastic Surgery, Chittagong Medical College Hospital, Bangladesh.
b. Dr. Rafiq Uddin Ahmed, Associate Professor, Burn and Plastic Surgery, Chittagong Medical College Hospital, Bangladesh.
c. Dr. Mohammad Minhaz Uddin, Assistant Registrar, Department of orthopedics, Chittagong Medical College Hospital, Bangladesh.
d. Dr. Sayera Banu Sheuly, Assistant Professor, Department of Surgery, Chittagong Medical College Hospital, Bangladesh.
e. Dr. Farhana Salam, Assistant Professor, Department of Surgery, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.

Address of Correspondence: Dr. Farhana akhter, Asst. Prof (burn and plastic surgery) CMCH. Email farhanacmch@gmail.com, Mobile: 01816251331

Received: 21 July, 2025 **Accepted:** 24 December, 2025

cannot cover soft tissue defects around the knees, often leading to aesthetic and functional deficits.[4].When the local flap is not available or the knee soft tissue defect is large, free flaps may be used to cover the knee defect, but its vascular anastomosis is very difficult because the vascular site of the receptor is too deep for anastomosis. Gravvanis et al have reported that perforator flap was a real revolution in the cover of soft tissue around the knee by reducing muscle tissue, thereby reducing donor site morbidity and loss of function; the perforator flap could be ideal for cover of skin and soft tissue defect wounds around the knee joint.[2,5] In terms of the specific repair program, clinicians should take into account the size, location, shape, and other conditions of the wound before making the appropriate choice.[6] Therefore, in order to find the simplest technique to achieve wound closure and minimum donor site morbidity in our study we observe the outcomes of superior lateral genicular artery perforator flap.

Material and Method:

The study is designed as prospective observational type performed on the patients of Department of Plastic Surgery at Chittagong Medical College Hospital (CMCH) Bangladesh from January 20 to July 2023 for a period of 4 years. Patient admitted in department of Plastic Surgery, CMCH with soft tissue defect around knee joint were the study population. Sample size of present study was 18 patients. The sampling technique was purposive non random sampling method. This purposive sampling was performed as per inclusion and exclusion criteria. Inclusion criteria were soft tissue defect anterior-lateral knee, Post burn scar contracture anterior-lateral knee, Soft tissue tumour anterior-lateral knee. Exclusion criteria are Multiple trauma patient, Patient loss from follow up.

Surgical Technique:

Surgical technique Pre-operative marking was done by identification of superior lateral genicular artery perforators by an 8MHz hand-held Doppler at the septum between the vastus lateralis and short head of biceps femoris, from the knee level proximally. The flap was marked from knee level up to mid-point between the femoral condyle and greater trochanter, with flap axis laying over that intermuscular septum, The procedures were done under spinal anesthesia with tourniquet control without exsanguination to easily detect the SLGA perforators. The anterior margin of the flap was incised down to deep fascia, with subfascial dissection towards the intermuscular septum to identify the SLGA perforators. We did not skeletonize the perforators, only dissect them to allow tension-free flap inset without perforator kinking or spasm. After dissection and isolation of the SLGA perforators, dissection continued in the subfascial plane towards the flap posterior margin, which was incised to completely island the flap, to be only hinged by the perforators. The tourniquet was deflated, flap viability was checked, and minor perforator was clamped, preserving only the dominant perforator. The perforator flap could be rotated 90 degrees counter-clockwise or clockwise to cover anterior surface of the knee or popliteal fossa, respectively, or even rotated 180 degrees in a propeller fashion to cover. The proximal one third of the leg. The SLGAp flap was transferred into the defect, with excision of any intervening skin bridge, with suction drain inserted on need. The flap was inset in a tension-free manner to avoid spasm or kinking of the pedicle and the flap donor site was either closed primarily or split-skin grafted.

Ethical Implications:

This study has been approved by ethical committee of our institution and permission has been accorded by the concerned departments and authorities. Patients or guardians of patients are properly explained about the proposed procedure and its outcome and complications. Feasibility and outcome of alternative procedure like muscle flap are counseled. Informed written consent is taken.

Data Analysis:

Observation and interview with the patient and attendants were recorded on prescribed data collection sheet (attached here) that are fulfilled by the investigator. After collection of data, all data were compiled in a master table used and were formulae first.

Results:

This study included 18 patients, 16 male and 2 female, presented with defects around the knee at the anterior aspect of the knee in 3 cases, at lower lateral aspect of the leg in 6 cases and at the lateral border of popliteal fossa 9 cases. The etiology of the defects was due to malignant wound in 2 cases, road traffic accident in 12 cases, and post-burn contracture of lateral popliteal

fossa in 4 cases. The flap size ranged from 5x9 cm to 9x16cm, with 2 perforators in 10 SLGA flaps and1 perforator in 8 flaps, located averagely from 5 to 10 cm proximal to knee level.

Table-I

Etiology of knee defect (n=18)

Etiology	Number of Patients	Percentage
1. Road Traffic Accident	12	66.6%
2. Marjolin ulcer (Malignant)	02	11.1%
3. Post burn scar contracture	04	22.2%

Table-II

Sight involve (n=18)

Site	Number of Patients	Percentage
Front of knee	03	16.6%
Lateral side of knee	06	33.3%
Popliteal fossa	09	50.0%

Table-III

Flap Outcome

Outcome of flap	Number of Patients	Percentage
Total flap survival	15	83%
Partial flap loss	01	5.55%
Tip Necrosis	02	11.1%

All flaps survived except in 3 cases, where 2 cases had marginal flap necrosis at the edge and managed conservatively with debridement and frequent dressings and healed spontaneously. In the third cases the flap was used in a propeller fashion and had distal one-third necrosis, where the necrotic part was debrided and split-skin graft applied.

The donor site was closed primarily in 12 cases. In which narrow flaps was used, up to 5 cm width. In the remaining 6 cases, split-skin graft was applied to the donor site. The take of the skin graft was good, except in 1case, where there were partial graft losses, managed conservatively and healed spontaneously. Infection at the original defect occurred in I cases and managed by culture-specific antibiotics and frequent dressing and healed uneventfully as regards the donor site morbidity, there was no functional deficit, with acceptable graft appearance. The appearance of the flap was satisfactory for all patients in terms of thick-ness, texture and color and flaps provided stable coverage throughout the follow-up period.

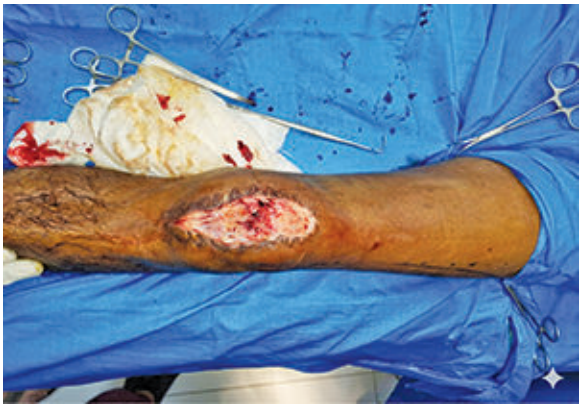

Figure 1: *Preoperative*

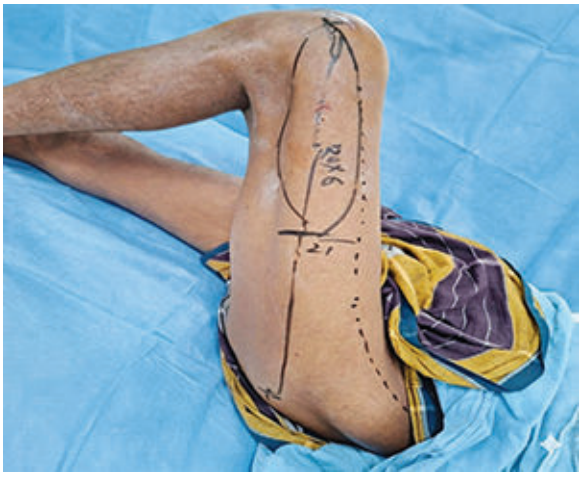

Figure 2 *Preoperative Flap Design*

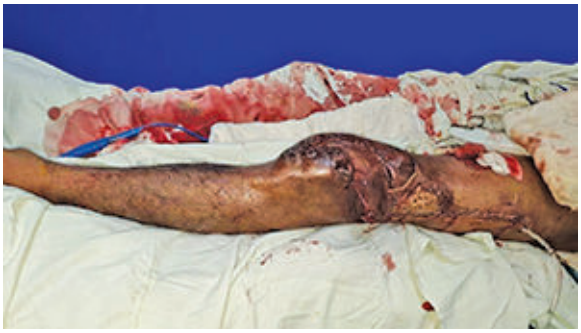

Figure 3 *Postoperative Flap inset*

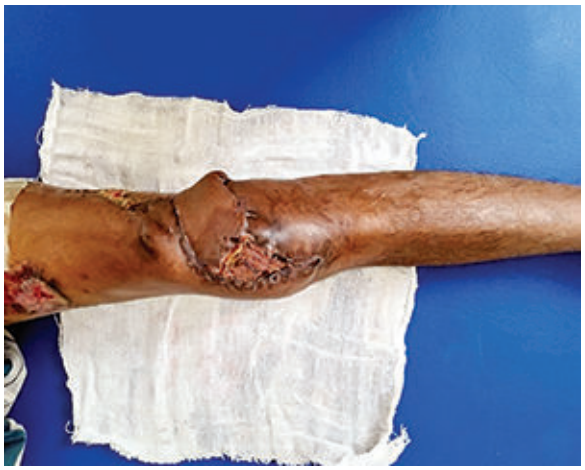

Figure 4: *Follow up Picture*

Discussion:

Traditional flaps applied for repair of soft tissue defects around the knees include myocutaneous flaps, fasciocutancous flaps, free flaps.[3,4,13] These flaps all have their own advantages, disadvantages and scopes of application. In recent years, the perforator flap has been widely noticed and applied since its advantages in aspects including miniaturization, thinning and refinement[20].

The present study observes the outcome of superior lateral genicular artery flap for soft tissue defect around the knee. In present study among 18 cases age of the patients in this series range from 15-60 years. Majority patients were male.

RTA (66.6%) was the main etiology of knee defect in this study. Masoodi Z et al also observes RTA as the most common cause of knee defect cover with this flap (68.8%). In the present series, the most common sight was popliteal fossa 9(50%).[21] Al Moktader et al reported involved sight (40%) was popliteal fossa. The findings of this study are consistent with our study. [22]

In 1990, Hayashi and Maruyama studied the anatomy of the SLGA perforators on 10 cadaver lower extremities and reported their results, describing the operative procedure of the islanded lateral genicular artery flap and its application in 3 clinical cases.[7] The anatomic results ascertained the consistency of the nutrient artery, which penetrates the deep fascia in a small triangular area surrounded by the lateral femoral condyle, the vastus lateralis, and the short head of the biceps femoris muscle. One of the 3 clinical cases was complicated by a superficial tip necrosis. This small series of clinical cases led us to undertake our own study of the SLGA flap.

In 2005, Zumiotti et al presented their results of an anatomic and histomorphometrie study of the lateral genicular artery flap in I8 fresh cadavers (36 anatomic regions) and 4 clinical applications. The vascular pedicle was found in all (100%), and the flap succeeded in all 4 cases, with 1 partial loss of the distal end of the flap, which is similar to our study.[9] But even if the vessel is consistent, the point where the cutaneous perforator of the SLGA penetrates the deep fascia ranges, according to the first authors Hayashi and Maruyama,[1] from 30 to 80 mm from the plane of the knee joint.

In common with Zumiotti et al, we found the limited arc of rotation, especially for the medial and inferior region of the knee, to be a disadvantage of this flap.[9]

The most common local flap in the knee area is the gastrocnemius muscle flap, which was introduced for primary closure of compound injuries of the knee by Barfod and Pers [11] in 1970. The advantage of this muscle flap is the easy operative technique, but the results often appear bulky and the required split skin graft does not match the surrounding skin; there may be functional loss. The donor site morbidity is higher than in cutaneous, subcutaneous flaps because the use of this muscle can compromise function and strength of the lower limb. The nearest transposition of perforation flap not only can overcome these shortcomings in traditional flaps, but also can make the wound repair more accurate and beautiful.

Shim and Kim performed an anatomic study involving 20 cadaver dissections to discern the anatomic basis for the medial sural artery perforator flap, especially the distances from the popliteal area to the cutaneous perforators, on which the flap was designed. They used this flap in 6 clinical cases, in 2 cases with the first perforator as pedicle, in 3 cases with the second, and in I case with the third perforator, The consequence of the perforator choice is the different arc of rotation.[15] Primary donor site closure was possible in 4 cases; a split skin graft was necessary in 2 cases. The results of our study were more or less comparable to these studies. We had found that the superior lateral genicular artery perforator flap is a versatile and valuable option for coverage of defects of knee and popliteal fossa, Donor site morbidity is minimal with no functional deficit. The anatomy of the SLGA perforators

is consistent and reliable. The SLGA perforator flap is a good option for coverage of defects around the knee due to the above mentioned attributes.

Limitations:

The present studies include the limited number of cases, the natural limitations of a retrospective review. Further studies with large number of patients are required to objectively evaluate aesthetic outcome by numerical grading scale and evaluate functional outcome by measuring degree of flexion/extension deficit of the knee joint pre and postoperatively, with statistical analysis of the results.

Conclusion:

Despite these limitations, we feel that this flap has the potential to augment our armamentarium of tools available for surgical coverage of around knee soft tissue defects, especially if the gastrocnemius (workhorse) flap is not available for use. The lateral genicular artery flap is a single stage axial pattern flap which provides a durable and a thin pliable skin cover and no functional defects or sensory loss around the deficit with good cosmesis. The anatomy of the SLGA perforators is consistent and reliable. So It has become the primary choice of repair of soft tissue injury around the knee and meets the general principles of flap repair Funding: No funding sources.

Conflict of interest: None

References:

1. Corten K, Struelens B, Evans B, ct al, Gastrocnemius flap reconstruction of soft-tissue defects following infected total knee replacement, Bone Joint J, 2013;95;1217-1221.
2. Suda AJ, Cieslik A, Grützner PA, et al. Flaps for closure of soft tissue defects in infected revision knee arthroplasty. Int Orthop. 2014. 38:1387-1392.
3. Sanders R, O'Neill T. The Gastrocnemius myocutaneous flap used as a over for the exposed knee prosthesis. J Bone Joint Surg Br. 1981;63-B:383-386.
4. K wiecien GJ, Lamaris G, Gharb BB, et al. Long-term outcomes of total knee arthroplasty following soft-tissue defect reconstruction with muscle and fasciocutaneous flaps. Plast Reconstr Surg. 2016;137:177e-186e
5. Gravvanis A, Tsoutsos D, Papanikolaou G, et al. Refining perforator selection for Deep infcrior epigastric perforator flap: the impact of the dominant venous perforator. Microsurgery. 2014;34:169
6. Wallis C. The coming revolution in knee repair. Sci Am. 2015;312:25-26.
7. Hayashi A, Maruyama Y The Lateral genicular artery flap. Ann Plast Surg,1990;24:310-317,
8. Spokevicius S, Jankauskas A. Anatomy and clinical applications of a com- posite utaneo-subcutaneous flap based on the Lateral superior genicular vessels. J Reconstr Microsurg. 1995;11:15-20.
9. Zumiotti AV, Hsiang WT, Queipo Briceno NC, et al. Lateral genicular artery flap: anatomical and hystomorphometrical study and clinical applications. Acta Ortop Bras. 2005;13:24-27.
10. Taniguchi Y, Kitano T, Shimoe T, et al. Superior lateral genicular artery flap for coverage of a soft tissue defect after total knee arthroplasty. J Reconstr Microsurg. 2009;25:479-482.
11. Barfod B, Pers M. Gastrocnemius-plasty for primary closure of compound injuries of the knee. J Bone Joint Surg Br. 1970;52:124-127.
12. Pan SC, Yu JC, Shieh SJ, et al. Distally based anterolateral thigh flap: an anatomic and clinical study. Plast Reconstr Surg. 2004;114:1768-1775.
13. Shieh SJ, Chiu HY, Yu JC, et al. Free anterolateral thigh flap for reconstruction of head and neck defects following cancer ablation. Plast Reconstr Surg 2000;105:2349-2357; discussion 2358-2360.
14. Kim HH, Jeong JH, Seul JH, et al. New design and identification of the medial sural perforator flap: an anatomical study and its clinical applications Plast Reconstr Surg. 2006;117:1609-1618
15. Shim JS, Kim HH. A novel reconstruction technique for the knee and upper one third of lower leg. J Plast Reconstr Aesthet Surg. 2006;59:919-926; discussion 927.
16. Hallock GG. The medial sural (MEDIAL GASTROCNEMIUS) perforator local flap. Ann Plast Surg. 2004;53:501-505
17. Cheon SJ, Kim IB, Park WR, et al. The proximally-based sural artery flap for coverage of soft tissue defects around the knee and on the proximal third and middle third of the lower leg: 10 patients followed for 1-2. 5 years.Acta Orthop. 2008;79:370-375.
18. Park S, Eom JS. Selection of the recipient vessel in the free flap around the knee: the superior medial genicular vessels and the descending genicular vessels. Plast Reconstr Surg. 2001;107:1177-1182.
19. Chai Y, Zheng B, Cai P, et al. A reversed superficial peroneal neurocutaneuos island flap based on the descending branch of the distal peroneal perforator: clinical experiences and modification, *Microsugery*. 2008;28:4-9
20. Acosta R, Smit JM,Qudolfsson T, et al. A clinical review of 9 years offree perforator flap breast reconstructions: an analysis of 675 flaps and the influence of new techniques on clinical practice. J Reconstr *Microsurg*: 2011;27:91-98
21. Al Moktader MA Hassan M, Taman E, Taha A, Elawa S. Lateral superior genicular flap for reconstruction around the knee. Egypt J PlastReconstrSurg.2010;34:223-226.
22. MasoodiZ, Ahmad I, Khurram F, Haq A. Management of post road traffic accident compound leg defects using fasciocutaneous flaps. J Wound Care. 2013;22(7):376-8, 380-2. Doi:10.12968/jowc.2013.22.7.376.