E-ISSN: 2708-1508
P-ISSN: 2708-1494
Impact Factor (RJIF): 5.39
IJCRS 2025; 7(2): 361-364
www.casereportsofsurgery.com
Received: 02-09-2025
Accepted: 07-10-2025

Dr. Surepally Arpitha
Associate Consultant, Department of Plastic Surgery, Yashoda Hospitals, Somajiguda, Hyderabad, Telangana, India

Dr. Sasikanth Maddu
Senior Consultant, Department of Plastic Surgery, Yashoda Hospitals, Somajiguda, Hyderabad, Telangana, India

Dr. Sanjeev Sasmith B
Senior Consultant, Department of Plastic Surgery, Yashoda Hospitals, Somajiguda, Hyderabad, Telangana, India

Corresponding Author:
Dr. Surepally Arpitha
Associate Consultant, Department of Plastic Surgery, Yashoda Hospitals, Somajiguda, Hyderabad, Telangana, India

Gastrocnemius muscle flap - its versatility in the coverage of megaprosthesis of knee joint

Surepally Arpitha, Sasikanth Maddu and Sanjeev Sasmith B

DOI: https://www.doi.org/10.22271/27081494.2025.v7.i2f.241

Abstract
Background: The gastrocnemius muscle flap is widely used for reconstruction of soft tissue defects around the knee and upper one third of the leg. In this study, the gastrocnemius flap and its application for the coverage of mega prosthesis around the knee joint is being studied. This study aims to evaluate the clinical and functional outcomes of reconstruction with gastrocnemius muscle flap for coverage of knee mega prosthesis.
Methods: This study was conducted from June 2024 to June 2025 on 7 patients treated with gastrocnemius muscle flap for coverage of mega prosthesis around the knee joint. Medial head was used in 5 patients and lateral head was used in 2 patients. The outcomes of the procedure including postoperative complications like wound infection, skin necrosis and functional outcomes were evaluated.
Results: The patients ages ranged from 15 to 40 years. All cases achieved complete flap survival (100%) with wound healing within 14-21 days. No postoperative wound infection or donor site morbidity was observed. Functionally, all patients regained a near-normal range of motion at the knee and ankle. Most patients resumed normal ambulation and daily activities within 2-3 months. Cosmetic outcomes were satisfactory.
Conclusion: The gastrocnemius muscle flap remains a reliable and versatile option for soft tissue coverage around the knee for the coverage of mega prosthesis. This study highlights its advantages of minimal donor site morbidity, excellent flap survival, and favorable functional outcomes.

Keywords: Gastrocnemius muscle flap, knee joint, megaprosthesis, coverage

Introduction
With the increasing number of knee prostheses and the existing risk of skin necrosis or infection, the gastrocnemius flap is the “cornerstone” of the strategy for dealing with cases of prosthetic knee replacement.
Surgical site infection is the most significant complication associated with mega prosthesis used in large defects after the removal of tumor tissue in extremities. However, infections of mega prosthesis are known for their high resistance to treatment and represent one of the most notable factors leading to amputation [1] with a significant occurrence noted during the first year post-surgery.
Literature emphasizes that inadequate soft tissue coverage and poor postoperative support significantly contribute to increased rates of surgical site infections that leads to an infected implat. Researchers have thoroughly examined how well-vascularized pedicled muscle flaps used in these areas affect the rate of surgical site infections, striving for ideal soft tissue integration [2]. The gastrocnemius flap coverage is the most preferred and reliable procedure for the coverage of prosthesis. In the literature, certain authors assert a notable reduction in surgical site infection rates, from 36% to 12%, with the use of this flap technique [3].
We present a comprehensive surgical technique and its results in seven patients who received gastrocnemius muscle flap coverage for knee joint megaprosthesis.

Materials and Methods
This prospective clinical study was conducted in the Department of Orthopaedics and Plastic Surgery, Yashoda Hospital, Somajiguda, between January 2024 and January 2025. A total of seven patients within the age between 15 to 40 years of age, who underwent knee joint megaprosthesis reconstruction following wide oncologic resection were included. Patients with poor general condition, systemic infection, or vascular compromise of the lower limb were excluded from the study.

Preoperative examination of the patient was done and the extent of resection and coverage area discussed with the orthopedic team. The orthopedic team are informed that care is to be taken to preserve the medial and lateral sural vessels supplying the gastrocnemius muscle without compromising oncological clearence. After the orthopedic procedure the wound is assessed and planning done. Depending on the coverage needed on the medial or lateral side, Gastrocnemius flap elevation is planned.

Surgical Technique

The patient is positioned supine on the operating table. The regular incision for gastrocnemius flap elevation begins at the mid-calf level, approximately 2 cm posterior to the medial border of the tibia or lateral border of fibula, and curves proximally along the medial or lateral aspect of the leg to reach the popliteal fossa. In this study, the exposure already achieved by the orthopedic team for tumor resection is utilized and additional incisions were taken to proximally or distally for exposure and harvest of the muscle. The crural fascia is incised in line with the skin incision. The fascia and overlying skin are then elevated off the underlying musculature as far as the intermuscular plane between the two heads of the gastrocnemius. Dissection begins by separating the medial and lateral heads of the gastrocnemius in the midline. The sural nerve and lesser saphenous vein, which are identified along the lateral border of the medial head, are carefully dissected and retracted posterolaterally.

The aponeurotic plane between the two muscle heads is progressively incised, separating the muscle bellies from distal to proximal. The space between the proximal portions of both heads is developed with particular attention to preserving the neurovascular pedicle, which lies approximately 2-3 cms above the popliteal fossa. The plane between the gastrocnemius and soleus muscles is then identified and developed through blunt dissection. This plane also contains the plantaris tendon. Once adequate mobilization is achieved, the distal tendon of the head is divided, and the flap is elevated from distal to proximal. Gastrocnemius muscle provides a long muscular body with a wide arc of rotation, allowing easy coverage of the megaprosthesis at the upper third of the leg with medial head providing more coverge than with lateral head. The muscle flaps are elevated upto the origin of the pedicle and pedicle isolated for maximum coverage of the implant. The islanded flap is used to cover the prosthesis over the lower knee and proximal part of the leg. During transfer, care is taken to ensure that the proximal portion of the muscle and its vascular pedicle are not excessively stretched, particularly when the knee is in full extension.

Patients were restricted in a knee brace with the leg raised for 2-3 weeks. Gentle passive ROM were started at 2-3 week, succeeded by progressive active physiotherapy after 3-4 weeks. Patients were monitored at 2 weeks, 1 month, 3 months, and 6 months after surgery to assess flap viability, healing of the wound, complications at the donor site, and functional recovery.

Clinical results were assessed by examining flap viability, healing duration, incidence of infection and complications at the donor site. Functional results were evaluated by measuring the range of motion at the knee and ankle, recovery of gait, and the duration taken to resume normal activities. All data were gathered and evaluated because of the limited sample size.

Results

Table 1 presents the demographic and clinical results of the seven patients who received reconstruction with the medial gastrocnemius muscle flap for soft tissue coverage after knee mega prosthesis implantation. The individuals ranged in age from 15 to 40 years, consisting of five males and two females. Medial head of gastrocnemius was used in 5 patients and lateral head in 2 patients. All flaps demonstrated total survival (100%), with no cases of partial or full flap loss. The healing time for the wound varied from 14 to 21 days, and there were no signs of postoperative infections or complications at the donor site noted in any instance. All patients reached independent walking ability within 8 to 12 weeks and returned to regular activities within 2 to 3 months after surgery. The aesthetic result was pleasing in all patients, noted for its favorable contour and mild donor site deformity.

Discussion

It is of vital importance to cover the mega prosthesis around the knee joint to avoid infection following the reconstruction of knee joint with muscle tissue that has abundant blood supply and reinforces the strength of the joint [4]. Multiple choices exist for repairing soft tissue defects surrounding the knee joint, such as local skin, muscle, and myocutaneous flaps. Reconstruction with a free muscle flap is essential for significant defects [5]. We have described seven patients who received gastrocnemius muscle flap coverage for knee joint megaprosthesis.

Identified risk factors for infection of a megaprosthesis are insufficient soft tissue coverage, extended and multiple surgeries, immune suppression, anaemia and hypoalbuminemia, chemotherapy, radiation treatment, extra-articular resection, hematoma development, and comorbid conditions like diabetes [6]. Morii *et al*. indicated that skin necrosis and superficial infection were risk factors for deep infection following reconstruction using megaprostheses near the knee. In the distal femur, the removal of three or four quadriceps muscles was linked to notably greater occurrences of skin necrosis, superficial infections, and deep infections compared to one or two muscle resections [7]. Skin necrosis results from the severing of the perforator due to significant subcutaneous detachment and inadequate vascular supply within the skin. Lack of soft tissue coverage leads to skin necrosis, which heightens the risk of severe infection and deteriorates the patient's outlook [8].

Muscle flaps are an effective treatment choice in instances of failure; they provide adequate prosthetic coverage and enhance vascularization along with the delivery of nutrients to the knee region. Muscle flaps offers a richly vascularized and significant tissue volume for the removal of voids. Muscular flaps demonstrate benefits over fasciocutaneous flaps in treating chronically infected wounds due to enhanced collagen accumulation and stronger suppression of bacterial proliferation [9]. Various local and free flaps have been employed; nevertheless, the gastrocnemius muscular flap remains the most frequently used technique for knee defect reconstruction because of its dependability and straightforward harvesting. The medial head of the gastrocnemius receives blood from the medial sural artery and can be rotated to address soft tissue defects in the medial, anterior, and upper areas of the knee [10], while the

lateral head for defects over the knee, lateral and anterior aspects of the knee and upper one third of leg.

Numerous authors have referred to the gastrocnemius muscle flap as a salvage method for supplying soft tissue coverage in cases of failed or infected knee arthroplasty with tissue loss, as well as an appropriate graft choice in tumor surgeries [11]. Few authors have documented excellent outcomes utilizing this flap following loss of the patellar tendon during complex knee arthroplasty. Reports also indicate its successful application following infection of the native knee and chronic osteomyelitis of the tibial tuberosity [12, 13].

In this study, coverage with a gastrocnemius muscle flap enabled complete coverage of the megaprosthesis area and did not lead to skin necrosis, wound infection or implant infection. A multicenter collaborative study is required to analyze a significant patient population and identify the most suitable muscle flap for soft tissue defect coverage in distal femoral replacements due to bone tumors.

Table 1: Demographic and clinical outcomes of the seven patients

Parameter	**Observation / Outcome** (N=7)
Age range (years)	15–40
Gender (M/F)	5/2
Type of flap	gastrocnemius muscle flap- Medial head - 5 cases, Lateral head – 2 cases
Flap survival rate	100%
Wound healing time	14–21 days
Postoperative infection	None
Donor site morbidity	None
Return to normal activities	2–3 months

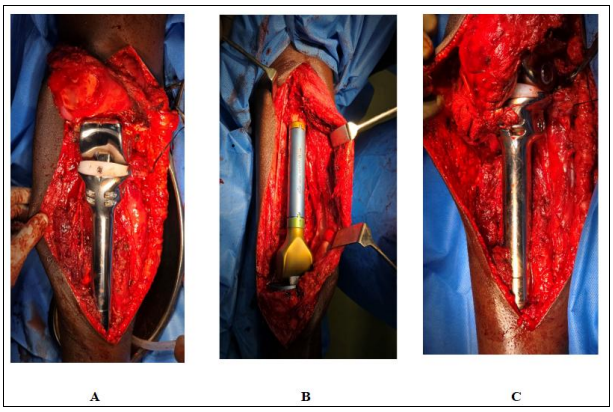

Fig 1: Knee defects after replacement with mega prosthesis

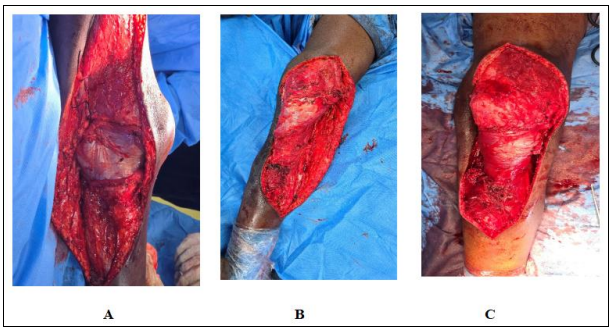

Fig 2: Gastrocnemius muscle flap for the coverage of mega prosthesis

Conclusion

The outcomes of this study reinforce the idea found in the literature that the medial gastrocnemius muscle flap is the primary treatment for coverage of knee megaprothesis which decreases the incidence of complications with satisfactory outcomes in terms of function with minimal donor site morbidity. The islanded gastrocnemius flap is the most versatile and reliable flap for the coverage of mega prosthesis over knee and proximal leg.

Acknowledgement: Authors would like to thank Management of Yashoda Hospitals for the continuous support and special thanks to Dr. Amidyala Lingaiah (Director of Medical Services Yashoda Hospitals).

Declarations

Funding: No funding sources.

Conflict of interest: None declared.

Ethical approval: Not required.

References

1. Hardes J, Gebert C, Schwappach A, Ahrens H, Streitburger A, Winkelmann W, *et al*. Characteristics and outcome of infections associated with tumor endoprostheses. Arch Orthop Trauma Surg. 2006;126(5):289-296.
2. Zeegen EN, Aponte-Tinao LA, Hornicek FJ, Gebhardt MC, Mankin HJ. Survivorship analysis of 141 modular metallic endoprostheses at early follow-up. Clin Orthop Relat Res. 2004;(420):239-250.
3. Grimer RJ, Carter SR, Tillman RM, Sneath RS, Walker PS, Unwin PS, *et al*. Endoprosthetic replacement of the proximal tibia. J Bone Joint Surg Br. 1999;81(3):488-494.
4. Mavrogenis AF, Pala E, Angelini A, Ferraro A, Ruggieri P. Proximal tibial resections and reconstructions: clinical outcome of 225 patients. J Surg Oncol. 2013;107(4):335-342.
5. R RB, Ramkumar S, Venkatramani H. Soft tissue coverage for defects around the knee joint. Indian J Plast Surg. 2019;52(1):125-133.
6. Jeys LM, Grimer RJ, Carter SR, Tillman RM. Periprosthetic infection in patients treated for an orthopaedic oncological condition. J Bone Joint Surg Am. 2005;87(4):842-849.
7. Morii T, Yabe H, Morioka H, Beppu Y, Chuman H, Kawai A, *et al*. Postoperative deep infection in tumor endoprosthesis reconstruction around the knee. J Orthop Sci. 2010;15(3):331-339.
8. Kawai A, Lin PP, Boland PJ, Athanasian EA, Healey JH. Relationship between magnitude of resection, complication, and prosthetic survival after prosthetic knee reconstructions for distal femoral tumors. J Surg Oncol. 1999;70(2):109-115.
9. Osei DA, Rebehn KA, Boyer MI. Soft-tissue defects after total knee arthroplasty: management and reconstruction. J Am Acad Orthop Surg. 2016;24(11):769-779.
10. Tetreault MW, Della Valle CJ, Bohl DD, Lodha SJ, Biswas D, Wysocki RW, *et al*. Factors influencing the success of medial gastrocnemius flaps in the treatment of infected total knee arthroplasties. Clin Orthop Relat Res. 2016;474(3):752-763.
11. Malhotra R, Sharma L, Kumar V, Nataraj AR. Giant cell tumor of the patella and its management using a

patella, patellar tendon, and tibial tubercle allograft. Knee Surg Sports Traumatol Arthrosc. 2010;18(2):167-169.
12. Ries MD, Bozic KJ. Medial gastrocnemius flap coverage for treatment of skin necrosis after total knee arthroplasty. Clin Orthop Relat Res. 2006;446:186-192.
13. Busfield BT, Huffman GR, Nahai F, Hoffman W, Ries MD. Extended medial gastrocnemius rotational flap for treatment of chronic knee extensor mechanism deficiency in patients with and without total knee arthroplasty. Clin Orthop Relat Res. 2004;(428):190-197.

How to Cite This Article
Arpitha S, Maddu S, Sasmith SB. Gastrocnemius muscle flap - its versatility in the coverage of megaprosthesis of knee joint. International Journal of Case Reports in Surgery. 2025;7(2):361-364.