

Lateral Superior Genicular Flap for Reconstruction Around the Knee

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ABSTRACT

We describe our experience and evaluate the reliability of the lateral genicular artery flap in fifteen patients with soft tissue defects around the knee. The causes of these defects were post-burn contracture, trauma, and infection. They were presented at our service in Al-Azhar University Hospitals. In such patients, the surgical approach involved the repair of tissue loss through the use of the lateral genicular artery flap. The success rate and ability of the flap to create stable durable coverage at these sites were evaluated. We had excellent results with this type of flap in 14 cases, we had 100% success rate without necrosis. Only one patient had a 3cm necrosis of distal margin of flap which healed completely after one session of debridement.

INTRODUCTION

The event leading to a tissue defect around the knee are varied. The aetiology can be post-burn contracture, traumatic, and infective. Reconstruction of defects around the knee and proximal one third of the lower leg has always been a challenge for the plastic surgeon. Local and free flaps have been described for such reconstruction. These methods have disadvantages such as limited pedicle length and flap size and, in free flaps, difficult micro vascular anastomosis due to deep recipient vessels. Traditionally a local flap is preferable for knee reconstruction, because it involves a simpler and less destructive operation. However, the use of a local cutaneous flap is limited because the pedicle length is short for reaching the upper third of the leg [1].

Hayashi and Maruyama [2] described the fasciocutaneous flap of the lateral superior genicular artery (LSGA) for reconstruction of defects around the knee, popliteal region, lower third of the thigh, and upper third of the leg. The flap vascularization is based upon the skin perforators of the lateral superior genicular artery (LSGA), the right branch of the popliteal artery. At that time this flap was

not widely accepted, possibly because of the pathway variability of its pedicle, that is found to perforate the local musculature in many cases. During the nineties, when the dissection technique of perforator flaps has become widely known, clinical indications of the LSGA flap were reviewed [3,4].

Surgical anatomy:

The lateral superior genicular artery LSGA usually originates from the popliteal artery. It courses superolaterally, giving off branches to the vastus lateralis, biceps femoris, and the knee joint. After travelling in the intermuscular space between the vastus lateralis and the short head of the biceps femoris, the LSGA pierces the deep fascia just proximal to the lateral condyle of the femur. The point at which the cutaneous perforator of the LSGA penetrates the deep fascia is about 5cm from the plane of the knee joint.

The cutaneous perforator of the LSGA terminates in small cutaneous branches that follow a radial pattern. These branches anastomose freely with the rete patellae, the lateral perforator of the profunda femoris artery, the musculocutaneous perforators from the popliteal artery, and the musculocutaneous or septocutaneous perforators or both from the descending branch of the lateral circumflex femoral artery. Among these anastomoses, the communication between the LSGA and the lateral perforators of the profunda femoris artery are predominant, this arterial communication is well developed in the mid-layer of the subcutaneous adipose tissue [2].

PATIENTS AND METHODS

From April 2008 to January 2010 fifteen distally based fasciocutaneous lateral superior genicular artery flap, have been used for reconstruction of soft tissue defects of the distal third of the thigh, the knee, the popliteal fossa, and the proximal third

of the lower leg. Ten patients were men and five patients were women with age range 13 to 55. Patients were followed from 6 to 24 months. Patients data were reported in Table (1).

Operative technique:

The skin island is designed on the lateral aspect of the lower thigh when the patient standing. The distal end of the flap must cover the skin over the lateral condyle of the femur, to include the emergence of the cutaneous perforator of the SLGA. The proximal end of the flap can be safely extended to the mid-point between the greater trochanter and the lateral condyle of the femur.

The patient was placed in a lateral decubitus, the incision is begun from the proximal apex of the flap, and the plane of dissection is maintained on the loose areolar layer over the deep fascia. Distal to the point 10cm above the knee joint, the dissection should be carried down to the iliotibial tract for the safe dissection of the intermuscular septum between the vastus lateralis and short head of the biceps femoris. After division, the vascular pedicle can be identified just above the lateral condyle of the femur.

This island lateral genicular artery flap is then elevated and transferred to the defect. The flap arc of rotation reaches the distal third of the thigh, knee, and popliteal fossa, and the proximal third of the lower leg, with the exception of the medial aspects of these region [6].

RESULTS

All flaps survived, there was one case of distal tip necrosis about 3cm, which heal after debridement. Survived flaps healed with surround-

ing within 2 weeks. Split thickness grafts over the donors survived completely in all cases. Direct closure to the donor site was done in 3 cases. None of the cases required secondary intervention at the donor site.

The follow-up period was at least 6 months. In general, the texture, thickness and colour of the flaps matched the surrounding, and patients were satisfied with the results. The thickness of the flap was suitable to cover front and the back of the knee, the popliteal fossa and the distal third of the thigh.

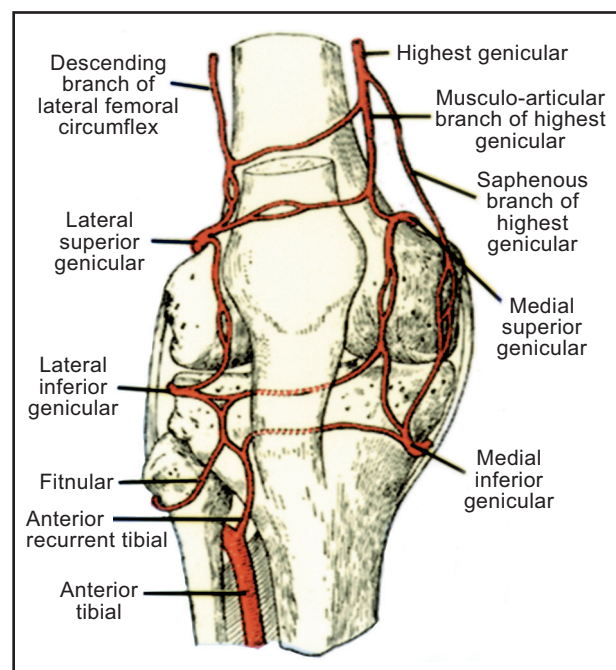


Fig. (1): Anatomy of the lateral superior genicular artery [5].

Table (1): Patient data.

Pat. No.	Age and Sex	Site of the defect	Cause of the defect	Size of the flap
1	20 M	Over the knee	Post-burn	6 x 15 cm
2	30 F	Back of the knee	Post-burn	3 x 5 cm
3	36 M	Back of the knee	Traumatic	9 x 18 cm
4	42 M	Popliteal fossa	Post-burn	7 x 15 cm
5	45 M	Over the patella	Traumatic	5 x 16 cm
6	15 F	Back of the knee	Post-burn	9 x 16 cm
7	51 M	Popliteal fossa	Traumatic	7 x 15 cm
8	55 M	Over the knee	Traumatic	8 x 14 cm
9	13 M	Back of the knee	Post-burn	7 x 14 cm
10	54 M	Upper 1/3 of the leg	Post-burn	6 x 12 cm
11	46 M	Lower third of the thigh	Necrotizing Fasciitis	8 x 16 cm
12	53 F	Over the knee	Post-burn	8 x 16 cm
13	55 M	Upper part of the leg	Traumatic	6 x 14 cm
14	41 F	Lower third of the thigh	Necrotizing Fasciitis	10 x 15 cm
15	33 M	Over the patella	Traumatic	5 x 16 cm

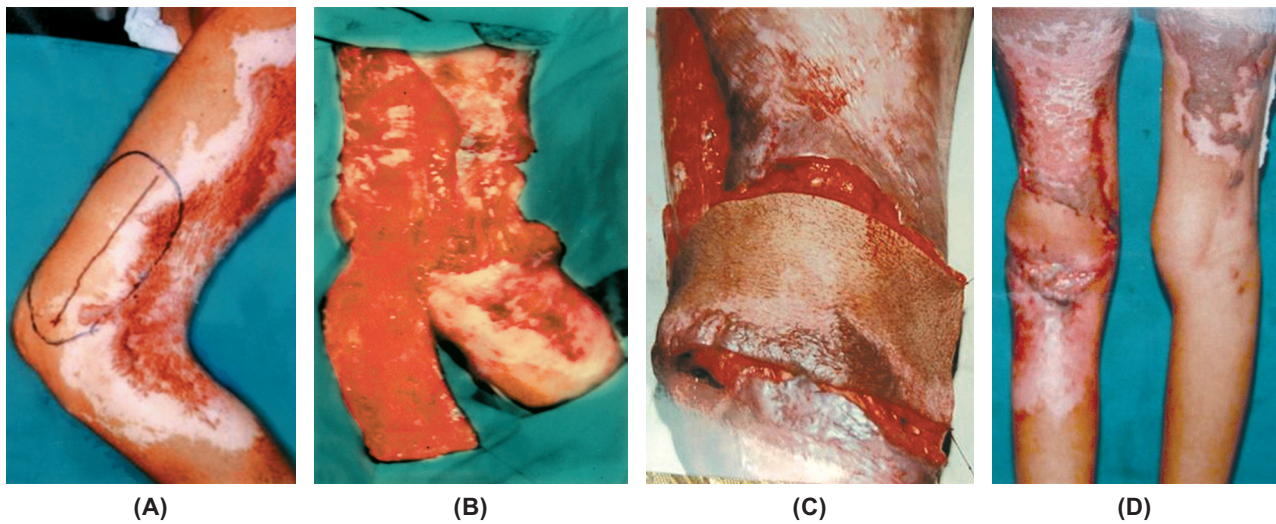


Fig. (2): (A) Post-burn contracture on the back of the left knee in 15-years old girl with design of the flap 9x16cm. (B) Elevation of the flap. (C) The flap cover the defect. (D) Final result after 6 months showed a good appearance without bulk.

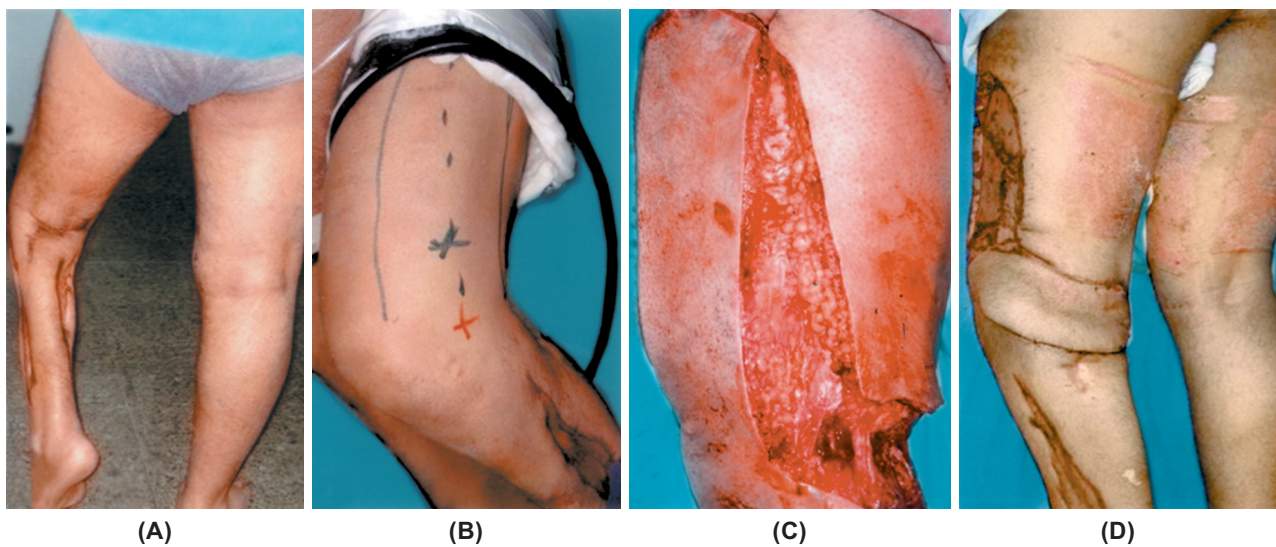


Fig. (3): (A) Post-traumatic soft tissue contracture on the back of the left knee in 36-years old man. (B) Design of the flap 9x18cm. (C) Elevation of the flap. (D) Final result 3 months later.

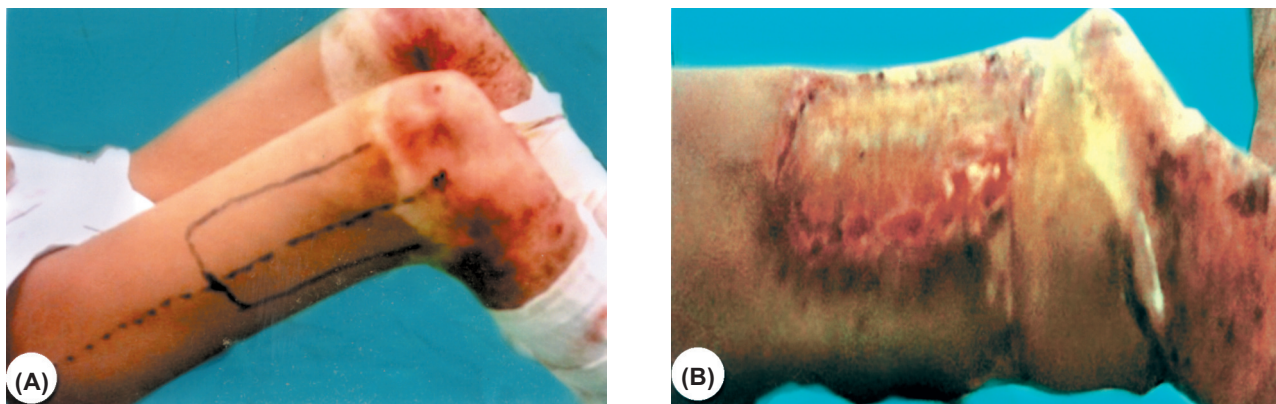


Fig. (4): (A) Post-burn contracture on the back of the right knee in 13-years old boy showing design of the flap 7x14cm. (B) Final result after one month.

DISCUSSION

Various flaps have been used to cover soft-tissue defects around the knee. Factors, which affect the choice of flap, include the location and size of the defect, potential donor site morbidity and status of the recipient vessels. A local random pattern skin flap has indistinct perfusion and is limited in size. The cross-leg flap has the disadvantage of a long period of immobilization and several operative stages. Although the free flap covers the defect successfully in a one-stage operation, it requires a long operating time and can be technically difficult because of deep recipient vessels [7]. The distally based vastus lateralis muscle flap is too bulky to cover the knee defect, and morbidity of donor site is a consideration [8]. The conventional gastrocnemius muscle is also a choice for providing soft-tissue coverage over the knee; the main disadvantage is that the volume of the distal part of the muscle is small and sometimes it does not provide enough coverage for large defects around the knee joint, particularly in the suprapatellar region [9,10]. The bulk of local muscle flaps should also be considered. The sural artery perforator flap can provide thin and pliable tissue for the reconstruction of a knee defect, but the size of the flap is limited [11,12]. Thigh flap is based on the lateral genicular artery flap is a fasciocutaneous flap used for knee reconstruction with low donor site morbidity [13]. Such a flap is an effective option for reconstruction of soft-tissue defects around the knee and proximal calf. Its advantages are a long pedicle, thin tissue, and minimal donor site morbidity without obvious depressive deformation, with a good appearance without bulk [14].

Conclusion:

The LSGA flap survived completely, and a good clinical outcome was obtained. The LSGA flap provides good recontouring of soft tissue defects around the knee. The donor site on the lateral aspect of the thigh is inconspicuous. The LSGA flap is a suitable option for reconstruction of skin defect around the knee.

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