

〈Case Report〉

Reconstruction of a deep burn-afflicted knee joint using a superior medial genicular artery flap

Shogo EBISUDANI, Kiichi INAGAWA, Yoshinori SUZUKI,
Ikuko OSUGI, Miori TAKASU

Department of Plastic and Reconstructive Surgery, Kawasaki Medical School

ABSTRACT We herein present a case of an 88-year-old female. The left knee joint was injured by a low-temperature burn due to a heater, and the patient had undergone conservative treatment at a local primary care physician. Since the skin necrosis was spreading, she was referred to our department on the 36th day after the injury. 8×4 cm black necrosis was observed on the left patella, and when debridement was performed, the patella was exposed but the joint was not exposed. For soft tissue defects, it was possible to sufficiently cover the exposed part of the patella with superior medial genicular artery flap. After the procedure, the knee joint did not show any contracture, had good mobility, and the patient was able to walk independently. Knee joint deep burn is often difficult to treat due to joint exposure and gait disorder associated with joint contracture. The superior medial genicular artery flap is considered to be a good indication for patients with advanced complications and the elderly because the procedure is simple. doi:10.11482/KMJ-E202046189 (Accepted on November 26, 2020)

Key words : Knee joint, Deep burn, Superior medial genicular artery flap

INTRODUCTION

The knee joint is susceptible to trauma, and because the soft tissue on the patella is relatively thin, bone exposure is likely to occur. Treatment is often difficult, and as it is a mobile portion of the joint, knee joint contracture may occur unless proper treatment is administered. This can significantly obstruct daily activities¹⁾. We experienced a case in which reconstruction of a left knee joint following deep burns using a superior medial genicular artery flap yielded good results. Superior medial genicular

artery flap is a thin and supple flap with excellent color and texture match.

CASE REPORT

An 88-year-old woman, suffered a low-temperature burn to the left knee joint from a heater in December 2019. She underwent conservative medical treatment at a local clinic; however, the knee joint developed skin necrosis. A skin incision was made by the local physician at the necrotic site to prevent the accumulation of necrotic tissue

Corresponding author
Shogo Ebisudani
Department of Plastic and Reconstructive Surgery,
Kawasaki Medical School, 577 Matsushima, Kurashiki,
701-0192, Japan

Phone : 81 86 462 1111
Fax : 81 86 464 1068
E-mail: ebisu@med.kawasaki-m.ac.jp



Fig. 1. Image during the first visit
Skin necrosis is observed on the left patella. A skin incision was made at the necrotic site by a local physician.

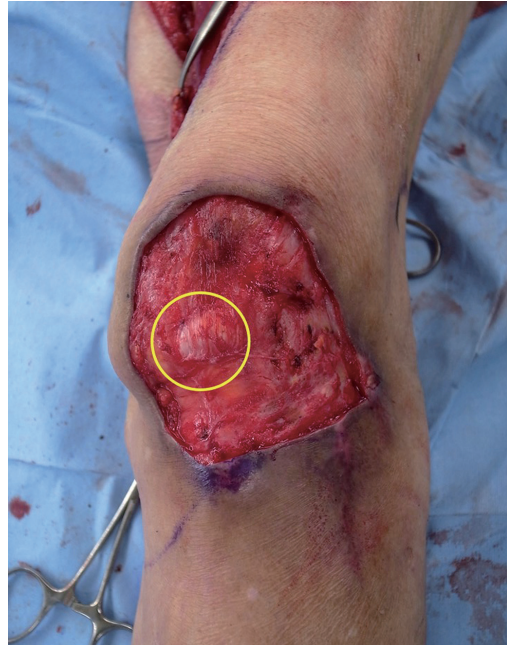


Fig. 2. Intraoperative image
Debridement of the left knee necrotic tissue.
The exposed patella can be seen in the yellow area.

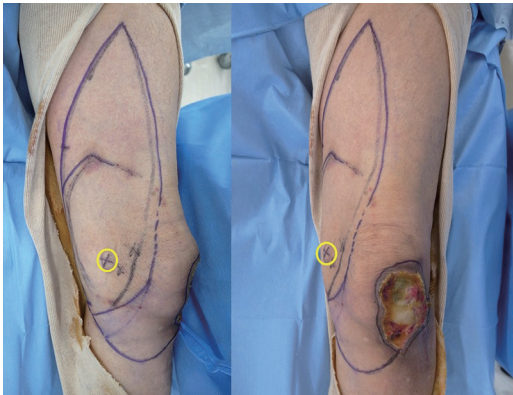


Fig. 3. Preoperative image (left: medial thigh; right: front of the knee)
The superior medial genicular artery flap is designed on the left medial knee.
The yellow part is the perforated fascia of the superior medial genicular artery.

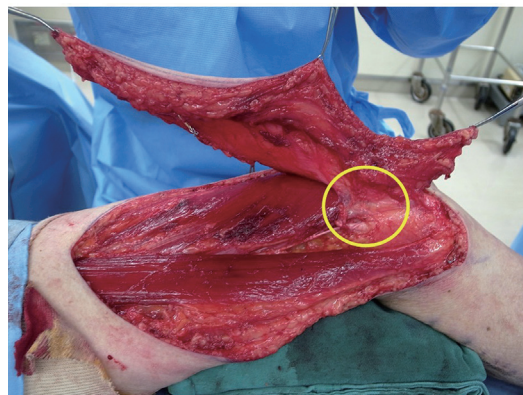


Fig. 4. Intraoperative image
The superior medial genicular artery flap is elevated.
The yellow part is the perforated fascia of the superior medial genicular artery.

under the skin. Thereafter, she was referred to our department 36 days after the injury.

Initial examination revealed a necrotic skin patch of 8×4 cm in size in the knee joint. There were no signs of infection in the knee joint (Fig. 1). An

excision of the necrotic tissue was expected to expose the patella / joint; therefore, we planned to reconstruct the knee joint using a superior medial genicular artery flap. She was admitted to our department, and underwent surgery under



Fig. 5. Image at the end of surgery
All soft tissue defects could be covered with a superior medial genicular artery flap.

general anesthesia 48 days after the injury. During debridement of the necrotic skin, the patella was exposed, but the joint was not (Fig. 2). Using laser Doppler blood-flowmetry, we confirmed the position where the superior medial genicular artery perforated the fascia, and using this part, designed a 26 × 10 cm-sized superior medial genicular artery flap from the medial thigh (Fig. 3, 4). It was performed with great care around the area where the superior medial genicular artery perforates the fascia. The tissue defect site could be sufficiently covered with the flap. The flap collection site was sutured, and a drain was placed to prevent hematoma formation (Fig. 5).

The postoperative course was uneventful, and the flap was fully engrafted. Walking rehabilitation



Fig. 6. 4 months after surgery.
The color and texture match appear good, and the patient is able to walk on her own.

was initiated 2 weeks after the surgery. Following discharge from the hospital, no knee contracture was observed, and she was able to walk on her own. The color and texture match of the skin flap were good, and the patient was able to achieve excellent outcomes (Fig. 6).

DISCUSSION

For soft tissue defects of the knee joint, many reconstruction methods using the sural flap²⁾, saphenous flap³⁾, and gastrocnemius muscle flap^{4, 5)} have been reported. However, in case of the sural and saphenous flaps, skin grafting is necessary at the flap collection site. In case of the gastrocnemius muscle flap, collection of the gastrocnemius muscle for flap construction may cause some weakness in the lower limbs. Because the area around the knee joint is the joint's range

of motion, it is desirable to perform reconstruction using a thin and a flexible flap, so as to not interfere with movement. Furthermore, because the knee joint is an exposed area, it is necessary to consider cosmetic aspects such as the skin color and texture match.

The superior medial genicular artery flap used in this case has the following advantages: ① It does not require any special techniques such as a microsurgery and can shorten the surgery time; ② The flap collection site can be sutured; as the site is located in the medial thigh, the suture is relatively unnoticeable; and ③ It is a thin and supple flap with excellent color and texture match. However, one disadvantage is that it cannot be used in patients with a history of trauma around the knee joint. Preoperative angiography is required to confirm the condition of blood vessels in the presence of trauma⁶⁾.

Many arteries are distributed around the knee joint, and each artery forms a network. The superior medial genicular artery flap is a flap that uses the superior medial genicular artery present inside the knee joint as a feeding vessel⁷⁻¹⁰⁾. The superior medial genicular artery is always stably present in anatomical search¹¹⁾, and flap coverage is possible from the distal 1/3rd of the medial thigh to the proximal 1/3rd of the lower leg¹²⁾. Furthermore, because this is a pedicled flap, the operation time is short. It is possible to perform surgery even in the elderly and patients with many complications¹³⁾.

During flap elevation, it is important that the part where the superior medial genicular artery perforates the fascia be included in the flap. This position is confined to the triangle surrounded by the vastus medialis, the adductor magnus, and the medial condyle. Because the major axis of the flap almost matches the course of the sartorius muscle, the design is created on the line connecting the medial condyle of the femur to the midpoint of the inguinal ligament. The width of the flap is usually a

size that can be sewn, and can be approximately 10 cm. When the flap is elevated, an incision is made in the thigh, and a subfascial detachment is performed toward the knee joint. Detachment is performed with great care around the area where the superior medial genicular artery perforates the fascia; it is important to remove enough from the region where the artery that would serve as the pivot point of the flap perforates the fascia, so that excessive force would not be applied in the superior medial genicular artery.

CONCLUSION

We encountered a case in which favorable results were obtained after superior medial genicular artery flap reconstruction of a left knee joint that sustained a deep burn. The operative time for this reconstruction is short, and the flap can be used in the elderly and in patients with serious complications. The flap is excellent in terms of color and texture matching, and is very useful as a reconstruction material for soft tissue defects around the knee joint.

CONFLICT OF INTEREST

The author has no conflicts of interest to declare.

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