

Foot reconstruction with the superficial circumflex iliac artery perforator flap under local anesthesia

Two case reports

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Abstract

Rationale: The superficial circumflex iliac artery perforator (SCIP) free flap is a popular method used in foot reconstruction. Although the SCIP flap has a relatively short pedicle and does not require intramuscular dissection, general anesthesia is largely preferred for SCIP flap reconstruction. We report 2 cases with the free SCIP flap for skin and soft tissue reconstruction of the foot under local anesthesia.

Patient concerns: Case 1 was a 34-year-old man sustained a crush injury to the dorsal foot, resulting in a soft tissue defect with bone and tendon exposure. Case 2 was a 41-year-old man with type 2 diabetes was referred to our division for an intractable ankle wound after surgery for a calcaneal bone fracture.

Diagnosis: The diagnosis was intractable wounds on feet caused by trauma and surgery. Patients were unable to receive general anesthesia because of asthma or elevated liver enzymes.

Interventions: Two patients with tissue defects on their feet were treated with SCIP flaps under local anesthesia. Fifteen milliliter of 0.5% bupivacaine was injected for ankle block. SCIP flaps were harvested after injecting 10 to 15 mL of 1% lidocaine combined with epinephrine around the flap incisions.

Outcomes: No complications related to the use of local anesthesia developed during the operation or postoperatively. Two flaps survived and fully took without complications.

Lessons: With proper local anesthesia, successful foot reconstruction with a free SCIP flap was possible. This method can be considered a sufficient option for foot reconstruction for patients unable to receive general anesthesia.

Abbreviations: FFI = foot function index, SCIP = superficial circumflex iliac artery perforator.

Keywords: flap, foot reconstruction, local anesthesia, microsurgery

1. Introduction

When reconstruction of the dorsal foot is performed, the use of a free flap is beneficial in a number of clinical settings such as extensive loss of skin and soft tissues. The superficial circumflex iliac artery perforator (SCIP) free flap is a popular method used in reconstructive surgery in this region.^[1–5]

Although the SCIP flap has the relatively short pedicle and no need for intramuscular dissection, general anesthesia combined

with different types of regional anesthesia is largely preferred for the free flap reconstruction.^[6]

Anesthesia is an important factor for improving the success rate of this type of surgery by controlling the global hemodynamics and regional blood flow.^[6] However, with general anesthesia, there are risks depending on the patient's age and general condition, including preexisting health problems. Patients with an unstable preoperative general condition, such as elevated liver enzyme values or other chronic diseases, may be unable to receive general anesthesia needed for surgery. On the other hand, local anesthesia and peripheral nerve block are safe and effective methods to perform surgery on the extremities.^[7–9]

To our knowledge, there is no previous report of foot reconstruction with a SCIP flap under local anesthesia. Therefore, we present the use of the free SCIP flap for skin and soft tissue reconstruction of the foot under local anesthesia in patients unable to receive general anesthesia and local tissue coverage.

2. Case reports

2.1. Case 1

A 34-year-old man sustained a crush injury to the dorsal foot, resulting in a soft tissue defect with bone and tendon exposure. Two weeks after the injury, he was referred to our division to resurface the wound. As anesthesiologists described high risks with general anesthesia because of asthma, all procedures had to be performed under local anesthesia. Patient actively wished for this specific procedure with knowledge of the possible risks and

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complications. Written informed consent was obtained for the publication of this report. Preoperative Doppler and ultrasonography examinations were used to identify the course of the superficial circumflex iliac artery and localization of perforators. Fifteen milliliters of 0.5% bupivacaine was injected for ankle block under ultrasound guidance. Debridement of necrotic tissues resulted in a circle-shaped final soft tissue defect of 6 × 6 cm. The flap design under local anesthesia was similar to that performed under general anesthesia. Flaps were designed to be centered on the identified vessels and sized to fit the defect. Flaps were elevated from distal to proximal after injecting 10 mL of 1.0% lidocaine combined with epinephrine around the flap incisions. A total of 1.0 mL of lidocaine was used when additional anesthetic was needed. The flap was elevated with 1 perforator. Flap inset and vessels anastomosis with the dorsalis pedis artery and veins were performed by microsurgery. Femoral tourniquets were not applied. The surgeon needed to pay attention to the toxic signs of the local anesthetic agent intraoperatively and postoperatively. If the patients noted back pain or discomfort, the surgeon provided them with a relaxation time of at least 3 minutes during the operation. All operations were performed by

1 team of 2 surgeons. Other operative procedures not specifically stated followed those of classic SCIP flap transfer. The donor defect was closed by direct closure. The operation duration was 5 hours and 10 minutes requiring 21 mL of lidocaine and 15 mL of bupivacaine. The flap survived and fully took, and no complications with local anesthesia occurred. The patient was discharged home at postoperative day 20. The patient had no complaints regarding shoe comfort and satisfied with the final esthetic appearance 3 months after surgery (Fig. 1). The foot function index (FFI) was used to evaluate the postoperative functional outcomes.^[10,11] The FFI form has 3 domains, which are pain, disability, and activity limitation, and lower FFI scores indicate a better functional result. The final FFI scores were 0 for pain, 0 for disability, and 0 for actively limitation. The FFI scores after this operation indicated good functional results.

2.2. Case 2

A 41-year-old man with type 2 diabetes was referred to our division for an intractable ankle wound after surgery for a calcaneal bone fracture. Elevated liver enzymes were noted



Figure 1. (A) Preoperative view of the defect before debridement, (B) outline of the superficial circumflex iliac artery perforator (SCIP) flap, (C) intraoperative view of flap harvest under local anesthesia, (D) flap inset and partial-thickness skin graft following vessels anastomosis with dorsalis pedis artery and vein, (E) 3 months after transfer.



Figure 2. (A) Preoperative view of the defect before debridement, (B) outline of the SCIP flap, (C) the forceps shows the perforator of the deep branch, (D) the elevated flap, (E) after flap inset, (F) 6 months after surgery. SCIP=superficial circumflex iliac artery perforator.

because of the long-term use of antibiotics for wound infection. Following infection control, necrotic tissue was debrided prior to surgery. As anesthesiologists described high risks with general anesthesia because of elevated liver enzymes, all procedures had to be performed under local anesthesia. Patient actively wished for this specific procedure with knowledge of the possible risks and complications. Written informed consent was obtained for the publication of this report. Free SCIP flap transfer under local anesthesia was performed to resurface the wound. The defect was 4×6 cm, and the flap was 6×14 cm. The flap was elevated with one perforator. Flap inset and vessel anastomosis with the dorsalis pedis artery and veins were performed by microsurgery. The donor defect was closed by direct closure. All operations were performed by 1 team of 2 surgeons. The operation duration was 3 hour and 35 minutes requiring 25 mL of lidocaine and 15 mL of bupivacaine. As the flap survived completely and healed well, the patient was discharged home at day 35. Furthermore, he had a little pain upon ankle movement or walking at the 6-month follow-up with no complications (Fig. 2). The final FFI scores were 2.1 for pain, 5.6 for disability, and 2.0 for actively limitation. The scores were relatively poor because of the calcaneal bone fracture.

3. Discussion

Advances in microsurgical techniques have enabled smaller operative fields with fewer extensive incisions and dissections. However, performing procedures without general anesthesia require modern techniques and precise surgical planning.

Free flap transfer without general anesthesia has been reported with epidural anesthesia and peripheral block anesthesia in the

extremities.^[12,13] However, the use of pure local anesthesia in either long-period surgery or regional complicated surgery is not prevalent. The most commonly expressed reason for this is technical difficulties associated with the use of local anesthesia. There are some case reports describing the use of local anesthesia in reconstructive surgeries. Carey et al^[14] reported a 91-year-old patient who received a free flap for scalp reconstruction under local-regional anesthesia in 2012. Kim et al^[9] introduced free toe soft tissue transfer using local infiltration anesthesia for patients unable to receive general anesthesia. Hung et al^[15] presented 5 elderly patients with complex head and neck defects who underwent free flap reconstruction using the pure local anesthesia method. Local anesthesia with an epinephrine appears to be effective for vasoconstriction and less bleeding at the incisional area during plastic surgery procedure.^[16] In addition, the difference in delayed bleeding between noninfiltrated flaps and flaps infiltrated with various combinations of lidocaine and epinephrine is insignificant.^[17] So, we suggest that local anesthesia with an epinephrine should be used for this specific procedure.

In this report, each free SCIP flap harvest was performed safely and smoothly. The duration of SCIP flap elevation and the donor site closure was about 1 hour in both 2 cases. Both microvascular anastomosis and inset were also performed entirely under local anesthesia, negating any possible physiological effects on flap survival. In foot reconstruction, the advantages of the SCIP flap transfer are as follows^[3,18]: deeper and longer dissection is unnecessary; the flap elevation time is short; the muscle layer at the donor site is not damaged; there is minimal donor-site morbidity; there is no need for large or long pedicle vessels because we are able to anastomose the pedicle to the dorsalis

pedis artery and veins. These short vessels allow for less extensive dissection and a shortened operative time, making the SCIP flap suitable for foot reconstruction under local anesthesia. The flap size is simply determined by both fitting the size of defect and covering the anastomosis site. If the direct closure of donor site of the SCIP flap is impossible, the donor site defect would be resurfaced by skin grafting.

In foot and ankle surgeries, neuroaxial blockage is often used to reduce major complications.^[19–21] As peripheral nerve block at the ankle and foot with bupivacaine produce analgesic effects for at least 10 hours,^[22] additional anesthetic for the foot was not required.

One of the largest limitations of this procedure is the severe side effects induced by local anesthesia. In this report, no complications due to local anesthesia were noted. However, local anesthesia has some problems, including pain control and toxicity. Therefore, the adequate dose of local anesthetic agents needs to be calculated accurately to avoid overdose. The safe dosage for local lidocaine injection is generally in the range of 3 to 5 mg/kg.^[23] Although no sedative or tranquilizing agent was used for our patients, intraoperative and postoperative 24-hour electrocardiography monitoring was carried out to find and prevent complications as early as possible.

The final esthetic and functional outcomes were good. This report describes the first case report for foot reconstruction with the SCIP flap under local anesthesia. We consider SCIP flap transfer under local anesthesia to be more convenient for foot reconstruction with less donor site morbidity.

In summary, the advantages of foot reconstruction by SCIP flap transfer under local anesthesia are that the operative field is more limited with a shorter operative time, enabling reconstruction for patients unable to receive general anesthesia. We believe that local anesthesia provides better results than those by general anesthesia with respect to recovery times, patient complaints of sore throat, and patient recovery and satisfaction. However, only 2 patients were included in this report. Further studies are needed to advise our patients about the best anesthetic techniques for free flap procedures for foot reconstruction.

Author contributions

Data curation: Sho Yamakawa, Hiroto Saijo.

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