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Original Article

Reconstruction of Soft Tissue Defects of Leg with Local Fasciocutaneous Flaps

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Background: Reconstruction of soft tissue defects of the leg remains challenged. The purpose of this study was to evaluate the treatment of soft tissue defects of leg with local fasciocutaneous flaps.

Patients and Methods: Ten patients underwent the reconstruction of leg defects. Local fasciocutaneous flaps were performed to reconstruct leg defects in all patients at Buriram Hospital from July 2014 to March 2016.

Results: Seven of ten flaps survived completely without complication. Three patients (30%) had partial flap necrosis but could be resolved by debridement and split-thickness skin graft. The follow-up time ranged from 1-8 months. Flaps and skin graft on the donor site survived completely.

Conclusion: Using the local fasciocutaneous flaps to reconstruct leg and ankle defects are safe and reliable procedure with a high success rate, however partial flap necrosis remains an important complication.

Keywords: Leg reconstruction, local fasciocutaneous flap

INTRODUCTION

Management of soft tissue defects of the lower limb remains difficult especially the area with exposure of bone, tendon or vessels. Wounds in the leg and ankle regions remains a frequent and challenging problem. The choices of soft tissue reconstructions include local muscular based flap, local fasciocutaneous flaps and free flaps¹.

Recently, Chan et al. reported retrospective review comparing fasciocutaneous and muscle flaps of soft tissue reconstruction for open fractures of the lower limb. They concluded that similar numbers of patients achieved bony union and were able to walk unaided after two years².

The main advantages of local fasciocutaneous flaps over muscle flaps and free flap are easy to harvest

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and less donor site morbidity due to the preservation of the muscular structure and function. Ayestaray et al. presented a classification of propeller flaps and clinical application of propeller flaps for lower limb reconstruction³. Pignatti et al. showed the result of propeller flaps in soft tissue defects of the legs in six patients. They concluded that propeller flaps are an excellent choice to resurface complex soft tissue defects of the leg⁴. Brave et al. reported defect coverage in 21 patients with free style local perforator flaps. All flaps survived. They concluded that the concept of freestyle local perforator flaps represents a safe, versatile and reliable surgical procedure⁵. Wallace et al.⁶ and Lecours et al.⁷ showed their experience with freestyle perforator flaps. They concluded that freestyle pedicle perforator flaps can provide a simpler alternative to freeflaps. Vergara-Amador⁸, Chai et al.⁹, Morgan et al.¹⁰, Chen et al.¹¹, and Olawoye et al.¹² reported their experience of the distally based sural flap for ankle and foot reconstruction. They concluded that this flap is a good alternative to free flaps for soft tissue defects in the distal area of the leg and foot.

The objective of this study was to present my experience of utilization of local fasciocutaneous flaps

for soft tissue reconstruction of the leg.

MATERIALS AND METHODS

Medical records of the patients who were diagnosed with soft tissue defect of leg and ankle at Buriram Hospital from July 2014 to March 2016 were reviewed. Patient characteristics including age, etiology of defect, site of defect, size of defect, type of flap, size of flap, complication and follow up period were recorded. Ten patients, eight men and two women, underwent the procedures of the local fasciocutaneous flap transfer for coverage of soft tissue defects over the leg at Buriram Hospital. The average age of the patients was 44 years (ranged from 20 to 66 years). The cause of soft tissue defects included trauma in five patients, thermal burn injury in one patient, electrical injury in one patient, shotgun wound in one patient and chronic ulcer in two patients. Among them, complications with bone, joint, tendon or fixation materials exposure were seen in all patients. The design of flaps was equal or slightly larger than the defect. Follow up time ranged from 1 month to 8 months, with an average of 3.80 months. Details of these patients are showed in Table 1.

Table 1 Patient Demographic Data

Patients	Age (years)	Etiology	Site of defect	Size of Defect (cm)	Type of flap	Size of Flap (cm)	Complication	Follow-Up (months)
1	56/M	Thermal burn	Medial malleolus and dorsum of foot	7 × 20	Reverse sural fasciocutaneous flap	7 × 20	-	8
2	40/M	Chronic ulcer	Anterolateral ankle	5 × 6	Propeller flap	6 × 30	Partial necrosis	2
3	62/F	Chronic ulcer	Anterolateral ankle	7 × 9	Propeller flap	9 × 17	Partial necrosis	5
4	20/M	Trauma	Mid-tibia	3 × 7	Freestyle perforator transposition flap	3 × 10	-	2
5	26/M	Shotgun wound	Distal tibia	8 × 8	Reverse sural fasciocutaneous flap	9 × 9	-	4
6	65/F	Trauma	Medial malleolus transposition flap	8 × 10	Freestyle perforator	8 × 18	Partial necrosis	1
7	50/M	Electrical injury	Anterior ankle	8 × 8	Reverse sural fasciocutaneous flap	8 × 8	-	6
8	32/M	Trauma	Mid-tibia	4 × 5	Superiorly based sural fasciocutaneous flap	6 × 6	-	2
9	23/M	Trauma	Distal tibia	7 × 8	Freestyle perforator	8 × 27	-	5
10	66/M	Trauma	Distal tibia	6 × 15	Reverse sural fasciocutaneous flap	6 × 10	-	3

RESULTS

The reconstructions were performed as follows: two propeller flaps to cover defects of ankle area; four reverse sural fasciocutaneous flaps to cover ankle or distal tibial defects; one superiorly based sural fasciocutaneous flap to cover defect of mid-tibia; and three free style perforator transposition flaps to cover defects of mid-tibia, medial malleolus and distal tibia. In all cases, the donor site was closed with a split-thickness skin graft.

Seven of ten flaps (70%) survived completely without complications. In 3 patients (30%), superficial partial necrosis of distal flap occurred due to local venous congestion and the wound healed with debridement and split-thickness skin graft.

The reconstruction has been stable in all cases during the follow-up period (1-8 months). All donor sites healed uneventfully.

CASE REPORTS

Patient 2

A 40-year-old man was admitted with a chronic ulcer on his right anterior ankle. Tissue biopsy was obtained and showed no malignancy. Excisional debridement was performed to convert chronic wound into acute wound. The wound was 5 × 6 cm in size, involving the anterolateral ankle and dorsum of the foot, with exposure of tendon. The defect was covered by the propeller flap^{3,4}. The flap was 6 × 30 cm in size. The donor site was covered by split-thickness skin graft. I tried to preserve more tissue for saving skin graft tissue, but unfortunately partial flap necrosis had occurred on the proximal site which had previous unhealthy tissue. I resolved this problem by excision of necrotic tissue and a split-thickness skin graft. The final result, after two months, was satisfactory (Figure 1), and the patient was able to ambulate and return to work.

Patient 4

A 20-year-old man sustained a traffic accident injury on his left leg, resulting in an open fracture of the tibia and a soft tissue defect at mid-tibial area, and measured 3 × 7 cm in size. After treatment of tibial fracture by external fixation, a 3 × 10 cm perforator transposition flap based on freestyle local perforator

flap concept⁵⁻⁷ was transferred to the defect, using hand held doppler ultrasound to locate the perforator. The donor site was covered by split-thickness skin graft. Both flap and skin graft on the donor site healed without complication (Figure 2).

Patient 5

A 26-year-old man suffered a soft tissue defect over the distal tibia and both tibia and fibula were fractured by a short gun injury. After debridement and external fixation of both bones by orthopedic surgeon, the defect was covered with a reverse fasciocutaneous flap⁸⁻¹². The flap was 9 × 9 cm in size. The donor site was covered by split-thickness skin graft. The wounds healed without complication (Figure 3).

DISCUSSION

The primary goal of surgical reconstruction of the lower extremity wound is to restore or maintain function. Different options have been described throughout the history for soft tissue reconstruction of leg such as pedicled fasciocutaneous flaps, muscle flaps and free flaps. In general, flaps used to cover the leg have common requirements including skin match with the recipient, larger size of skin paddle, no sacrifice of any major artery, and minimal donor site morbidity. The advantages of local fasciocutaneous flap over muscle flap and free flap are easy to harvest, not required microsurgical skill and no significant functional loss of donor site. Local fasciocutaneous flaps are very useful to reconstruct soft tissue defects in the leg area because of their versatility and reliability, based on a constant vascular anatomy pattern making it unnecessary to perform preoperative vascular examination. Special surgical skills are not needed.

I prefer the local fasciocutaneous flap to reconstruct soft tissue defects of the leg. The outcome revealed 100% flap survival. However, partial flap necrosis occurred in 30% of cases which were resolved by excision and split-thickness skin graft. All patients had good result of defect coverage, bone union and ambulation.

The author presented small series of patients who were treated for soft tissue defects of leg and ankle with local fasciocutaneous flaps. The concept is simple and technique of flap harvesting is easy in all cases, with short surgical time and minimal blood loss. No sacrifice

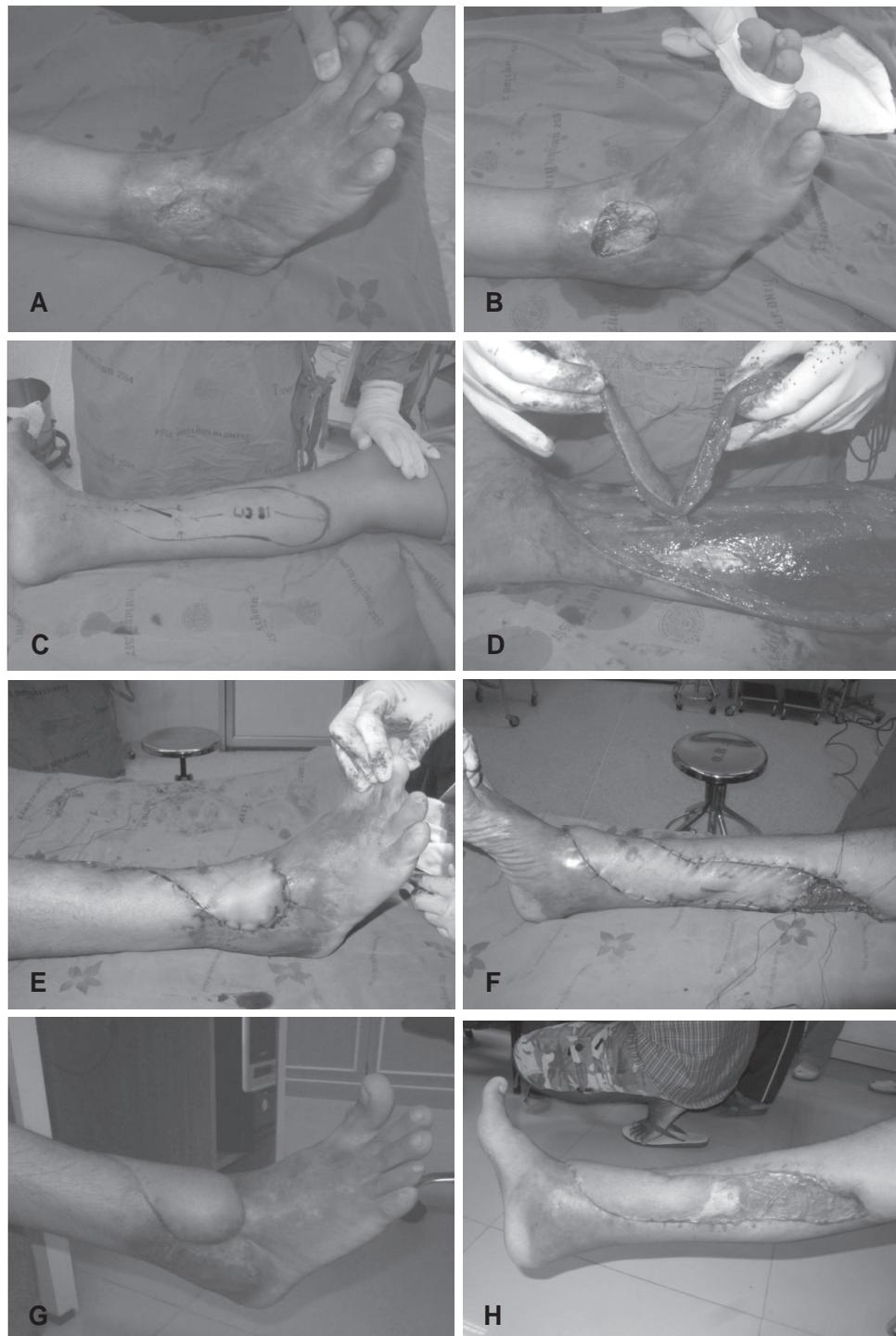


Figure 1 (A) Chronic ulcer over anterolateral ankle. (B) Soft tissue defect after debridement. (C) A design of propeller flap and marking of perforator by hand held Doppler ultrasound. (D) Flap harvesting and intraoperative view of septocutaneous perforator. (E) The flap was rotated 180° to cover the defect. (F) Donor site was covered by split-thickness skin graft. (G,H) Two months after surgery.

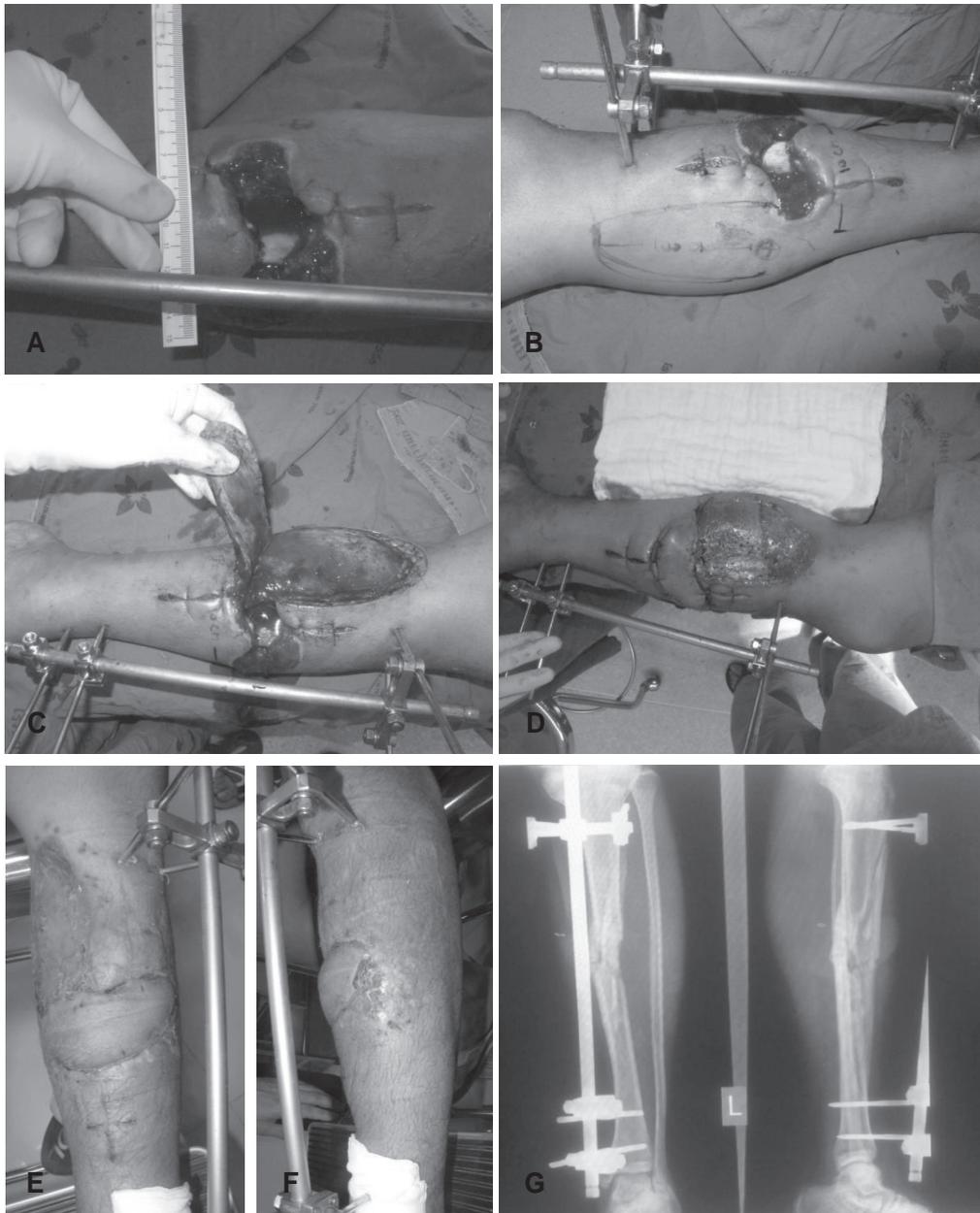


Figure 2 (A) Preoperative view. (B) Marking perforator by hand held Doppler ultrasound flap design. (C) Elevation of perforator transposition (D) Immediate after operation, the defect was covered by perforator transposition fasciocutaneous flap and donor site was covered by spit-thickness skin graft. (E, F) View at 2 months follow-up complete survival of flap and skin graft on the donor site. (G) Film left leg at 2 months after surgery

of main vessels is required. Local fasciocutaneous flaps for reconstruction of leg defects provide an excellent result of reconstruction.

CONCLUSION

Based on my own experience, the local fasciocutaneous flaps for leg and ankle defects are safe

and reliable procedure with a high success rate, however, partial flap necrosis remains an important issue. I concluded that pedicle fasciocutaneous flaps should be considered the main choice of reconstruction of soft tissue defects. Free flap would be salvaged in more complex cases when none of these flaps could be performed.

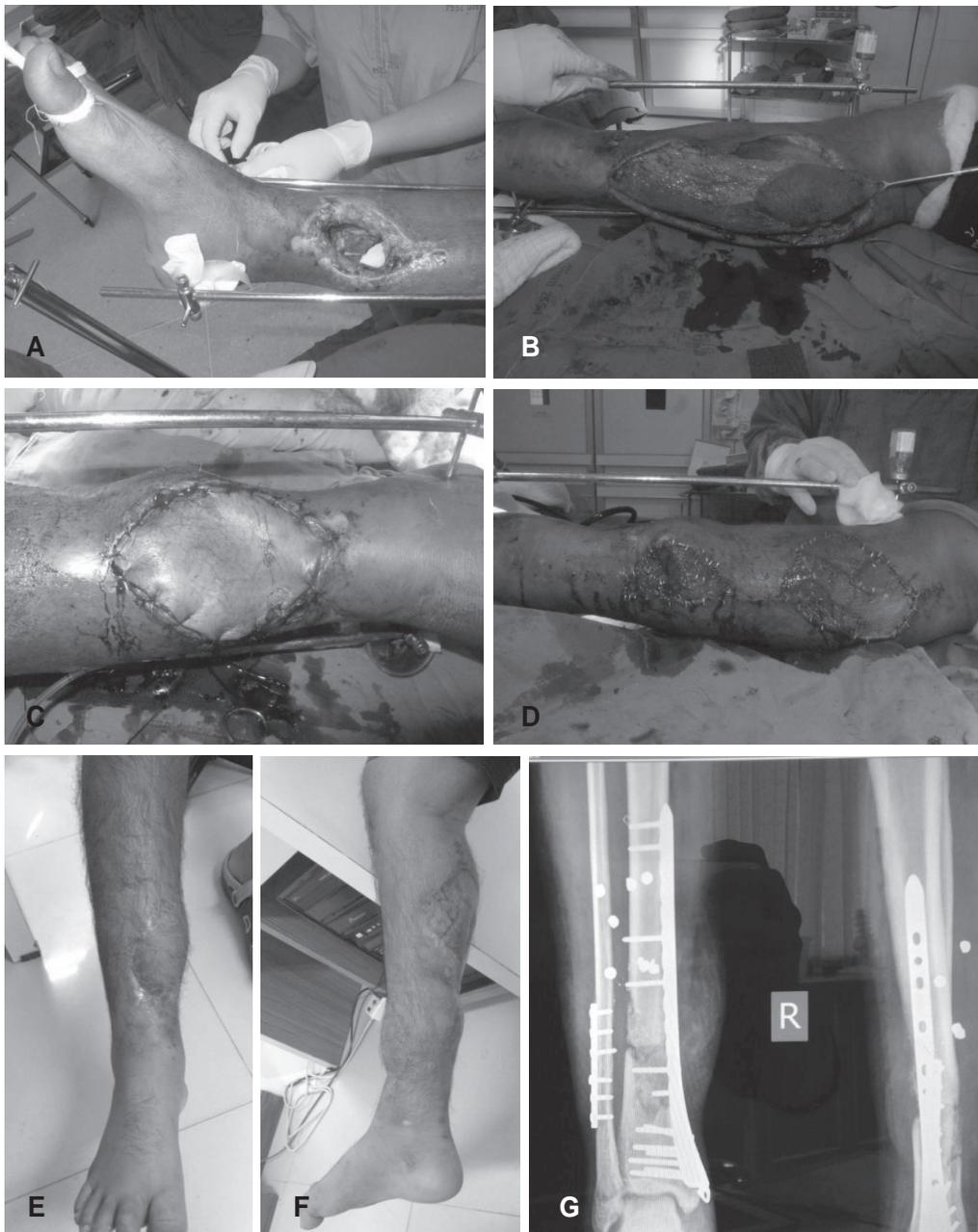


Figure 3 (A) Preoperative view. Distal tibia defect after debridement and external fixation by orthopedic surgeon. (B) A reverse sural fasciocutaneous flap was harvested from the upper calf. (C) The defect was covered with the fasciocutaneous flap. (D) The donor site was covered by split-thickness skin graft. (E, F, G) View and film at 4 months after surgery.

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What is already known on this topic?

There are many choices of soft tissue reconstructions of the leg include local muscular based flap, local fasciocutaneous flaps and free flaps.

What this study adds?

Local fascio cutaneous flaps for leg and ankle defects are safe and reliable procedure with a high success rate. It is an alternative to free flap or muscular flap transposition in the proper circumstances.

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บทคัดย่อ การผ่าตัดเสริมสร้างเนื้อเยื่อที่ขาดหายไปบริเวณขาด้วยแผ่นเนื้อชนิด fasciocutaneous แบบมีขั้วจากบริเวณข้างเคียง

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บทนำ: การผ่าตัดเสริมสร้างเนื้อเยื่อที่ขาดหายไปบริเวณขายังคงเป็นเรื่องที่ทำหยาที่น่าสนใจ วัตถุประสงค์ของการศึกษานี้เพื่อศึกษาประเมินการผ่าตัดเสริมสร้างเนื้อเยื่อที่ขาดหายไปบริเวณขาด้วยการใช้แผ่นเนื้อชนิด fasciocutaneous แบบมีขั้วจากบริเวณข้างเคียง

รูปแบบการศึกษา: การศึกษาเชิงพรรณนา

ผู้ป่วยและวิธีการศึกษา: การศึกษาในผู้ป่วย 10 คนที่ได้รับการผ่าตัดเสริมสร้างเนื้อเยื่อที่ขาดหายไปบริเวณขาไป ศัลยแพทย์ตกแต่งได้ทำการผ่าตัดเสริมสร้างเนื้อเยื่อที่ขาดหายไปบริเวณขาทั้งหมด 10 คนด้วยเทคนิคเคลื่อนย้ายแผ่นเนื้อชนิด fasciocutaneous แบบมีขั้วจากบริเวณข้างเคียง การผ่าตัดทั้งหมดทำในโรงพยาบาลบุรีรัมย์ช่วงเดือนกรกฎาคม 2557-มีนาคม 2559

ผลการศึกษา: จากการศึกษาพบว่าผู้ป่วย 7 คนจากทั้งหมด 10 คน แผ่นเนื้อที่ได้รับการโยกย้ายมาสามารถอยู่รอดได้โดยสมบูรณ์โดยไม่มีภาวะแทรกซ้อนใด ๆ เกิดขึ้น ส่วนอีก 3 คนคิดเป็น 30% พบว่าแผ่นเนื้อที่โยกย้ายมามีเนื้อเยื่อบางส่วนขาดเลือด แต่สามารถแก้ไขได้ด้วยการตัดเนื้อเยื่อที่ตายออกและปิดแผลด้วยการปลูกถ่ายผิวหนัง (split-thickness skin graft) ระยะเวลาการติดตามการรักษาอยู่ระหว่าง 1-8 เดือน ผู้ป่วยทุกรายแผลบริเวณเนื้อเยื่อที่ขาดหายไปและบริเวณที่โยกย้ายแผ่นเนื้อมาหายดีทุกคน

สรุปผลการศึกษา: การใช้แผ่นเนื้อชนิด fasciocutaneous แบบมีขั้วจากบริเวณข้างเคียงในการผ่าตัดเสริมสร้างเนื้อเยื่อที่ขาดหายไปบริเวณขาและข้อเท้าเป็นการผ่าตัดที่ปลอดภัยและได้รับการยอมรับ เนื่องจากมีอัตราผลสำเร็จของการผ่าตัดสูง อย่างไรก็ตามการขาดเลือดและการเกิดเนื้อตายบางส่วนของแผ่นเนื้อที่โยกย้ายมายังคงเป็นภาวะแทรกซ้อนที่สำคัญของหัตถการนี้