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Original Article

Outcomes of Geriatric Patients with Free SCIP Flap Reconstruction: A Case Series

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SUMMARY

Background: The increased life expectancy and accompanying comorbidities of elderly patients is increasing the need for composite soft tissue defect reconstruction. Since its introduction in 2004, the superficial circumflex iliac artery perforator (SCIP) flap has become popular among reconstructive surgeons for its various advantages. We describe our experience of free SCIP flap reconstruction in geriatric patients and examine its versatility in a literature review.

Methods: Between 2018 and 2022, 19 geriatric patients (12 males, 7 females; 65–82 years old) underwent free SCIP flap transfer for reconstruction. The locations of the defects were all over the body area, from the trunk to the extremities. Patient perioperative demographic data are listed, along with surgical outcomes and complications.

Results: In our experience, only one of 19 free SCIP flaps failed (total skin flap necrosis), presenting an overall flap survival rate of 94.7%. Partial flap loss was noted in 2 cases, which could be managed by other minor operations. Over at least 6 months of follow-up, all surviving flaps showed good contour and minimal donor site morbidity.

Conclusion: The success rate was high and remained stable over time in geriatric patients managed with free SCIP flap reconstruction. The appearance of recipient and donor sites was optimal. With reduced donor site morbidity, we believe that the free SCIP flap will become a popular option for composite soft tissue defect coverage in the elderly.

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1. Introduction

Microvascular free tissue transfer is a well-accepted and reliable method of complex soft tissue defect reconstruction, whether this involves tumor resection, trauma, burn injuries, or severe infection.¹ The ever-increasing global population of older adults is influencing an unavoidable rise in microsurgical reconstructions among elderly patients with multiple comorbidities and age-related problems.²

The groin flap is historically important because it was the first successful free flap, but is less commonly used nowadays due to its anatomic variations, small vessel diameter size and short pedicle length. Unlike the groin flap, the superficial circumflex iliac artery perforator (SCIP) flap is nourished by only a perforator of the superficial circumflex iliac system, so offers increased versatility.^{3,4} Since the introduction of the SCIP flap in 2004, several modifications have evolved that overcome its shortcomings, such as the short pedicle length, and we have added this reconstruction option to our armamentarium when managing soft tissue defects in elderly patients.^{5,6} In this series, we review our experience of 19 geriatric patients who underwent free SCIP flap reconstruction and we evaluate the efficacy and morbidity of this procedure with the available evidence in the literature.

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2. Materials and methods

This study was approved by the Institutional Review Board of MacKay Memorial Hospital, Taipei, Taiwan (Approval No.: 22MMH IS246e). We retrospectively reviewed the medical records of 19 consecutive patients of advanced age (over 65 years) who underwent free SCIP flap reconstruction in our hospital between 2018 and 2022. This study has been prepared in adherence to relevant STROBE guidelines.

The study involves 12 males and 7 females, aged between 65 and 82 years. The defects were located in the upper (n = 7) or lower extremities (n = 5), the head and neck region (n = 6), or the trunk area (n = 1). Patient demographic data are listed in Table 1. The flap characteristics, including flap dimensions, pedicle lengths, diameters of the arteries, and surgical outcomes are listed in Table 2. All patients were followed for flap survival status and postoperative complications for a minimum of 6 months.

Operations were performed on all patients under general anesthesia and in the supine position. Preoperative identification of the superficial circumflex iliac artery perforator was made using handheld Doppler ultrasound, near the border of the anterior superior iliac spine (ASIS).⁷ In our cases, the lateral branch (deep branch) was usually adapted for its naturally relatively long pedicle and large size of skin paddle. The dimension of the SCIP flap was

Table 1
Patient demographic data.

Case	Age (years)/ Sex	Comorbidities	ASA	Flap survival	Cause of defect	Location of defect	Postoperative hospital stay (days)
1	65/M	DM	III	Y	Infection	Left medial foot	10
2	66/M	HTN	III	Y (partial necrosis)	Malignant tumor (SCC)	Right buccal	16
3	69/M	DM	II	Y	Trauma	Left dorsal hand	22
4	71/F	Dementia	III	Y (partial necrosis)	Trauma	Right lower leg	28
5	68/M	Hyperthyroidism	II	Y	Trauma	Left middle finger	12
6	75/M	HTN, DM	III	N	Metastatic cancer (SCC)	Left neck	20
7	67/M	Nil	II	Y	Trauma	Right middle finger	12
8	76/M	HTN	III	Y	Malignant tumor (SCC)	Tongue	14
9	65/M	DM, Gout	III	Y	Trauma	Right big toe	17
10	73/M	HTN	III	Y	Infection	Right ankle	13
11	75/M	HTN, DM	III	Y	Malignant tumor (SCC)	Scalp	9
12	79/F	Af, CHF, CKD	III	Y	Radiotherapy	Chest	15
13	66/M	Nil	II	Y	Malignant tumor (SCC)	Tongue	14
14	82/F	CKD, DVT	III	Y	Malignant tumor (RMS)	Right forearm	8
15	65/F	HTN	II	Y	Malignant tumor (SCC)	Tongue	22
16	68/F	Nil	II	Y	Trauma	Left ankle	14
17	77/M	DM	III	Y	Trauma	Left palm	10
18	76/F	HTN, DM	III	Y	Trauma	Left index finger	7
19	65/F	HTN, CAD, DM	III	Y	Burn	Right dorsal hand	12

Abbreviations: Af, atrial fibrillation; ASA, American Society of Anesthesiologists; CAD, coronary artery disease; CHF, congestive heart failure; CKD, chronic kidney disease; DM, diabetes mellitus; DVT, deep vein thrombosis; F, female; HTN, hypertension; M, male; N, no; RMS, rhabdomyosarcoma; SCC, squamous cell carcinoma; Y, yes.

Table 2
Assessment of flap characteristics.

Characteristics	Value (%)
Flap dimensions	
Length, cm	6.0–22.0
Width, cm	2.5–10.0
Area, cm ²	15.0–220.0
Pedicle length, cm	1.5–8.0
Diameter of artery, mm	
Mean, mm	1.1
Range, mm	0.7–2.0
Harvesting time	
Mean, min	102.0
Range, min	88.0–126.0
Exploration	2 (0.11)
Flap necrosis	
Total	1 (0.05)
Partial	2 (0.11)
Secondary debulking surgery	4 (0.21)
Donor site closure	
Primary closure	19 (100)
Split skin graft	0 (0)
Donor site lymphorrhea	
Delayed drain removal	3 (0.16)
Debridement	0 (0)

outlined based on the requirement of the defect, before we elevated the flap along the inferiolateral border under loupe magnification, which enables the best identification of the superficial fascia lying between the superficial and deep fat.⁸ After identifying any reliable perforator near the Doppler marked region, the remainder of the flap can be elevated.

After ensuring the perforator that best serves the skin flap, we then skeletonized toward the source vessel, passing the deep fascia under microscopy to obtain a longer pedicle length and a larger vessel diameter. During this procedure, most of the dissection is limited to the subcutaneous layer and no muscle dissection is necessary. Moreover, the thickness of the flap is adjustable; it can be elevated either as a super-thin flap (skin flap elevated on the superficial fascia

plane),⁹ or as a bulky flap.¹⁰ It is also of great importance to include the superficial vein, for better venous drainage when the main pedicle is reached. In certain circumstances, the diameter of the vessels to be anastomosed is less than 0.8 mm, and the operator must be extremely skilled with supermicrosurgical techniques to ensure vessel patency.

3. Results

The average age of the patients was 70.9 years (median, 69; range, 65–82) and most presented with at least one comorbidity, such as hypertension or diabetes mellitus. In all 19 free SCIP flaps performed, only one was complicated by total necrosis, giving an overall flap survival rate of 94.7%. Partial flap loss was recorded in 2 cases, which were easily managed with a split thickness skin graft or local flap wound closure. The mean flap harvesting time was 102 minutes (range, 88–126). Secondary debulking surgery was performed at about 8 to 12 weeks postoperatively in 4 cases, all in the upper extremity area to improve the range of motion of fingers or wrist joints. During follow-up, all surviving flaps showed acceptable contours and the donor site morbidity was negligible, leaving a well-concealed groin scar without any limitation in range of motion.

3.1. Case 9

A 65-year-old man suffered from a severe crushing injury of the right big toe, resulting in an open comminuted fracture of the distal phalanx with osteomyelitis. After serial debridement surgery with antibiotic treatment, a defect measuring 3 cm × 3 cm with phalangeal bone exposure was covered with a super-thin SCIP flap. The supermicrosurgical technique was used to identify the anastomosis between the superficial branch of the superficial circumflex iliac artery (SCIA) and the branch of the dorsalis pedis artery, in an end-to-end fashion (0.6 mm in artery diameter). The patient was satisfied with the contour, but chronic inflammatory status was noted at 2 months postoperatively. This was controlled by oral antibiotics and no further debridement was necessary (Figure 1).

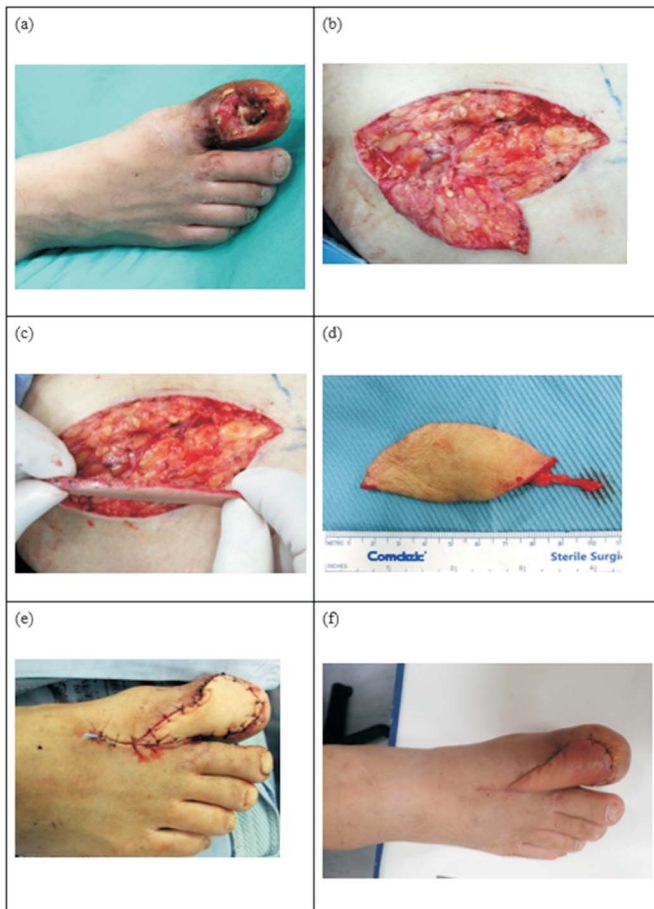


Figure 1. (a) Open comminuted fracture of the right big toe complicated by chronic osteomyelitis. (b)&(c) Harvesting a super-thin flap based on the lateral branch of the superficial circumflex iliac artery, 0.5 cm in thickness. (d) Skin paddle measuring 6.5 × 3 cm in size. (e) Defect was covered with good contouring. (f) Postoperative view at 2 months; survival of the flap total, but local inflammation status was noted.

3.2. Case 13

This 65-year-old male had a history of left tongue squamous cell carcinoma, stage T2N0M0. After hemiglossectomy and selective neck lymph node dissection, we reconstructed the defect with a free SCIP flap measuring 8 cm × 5 cm in dimension. After carefully evaluating the pathway of the deep branch of the SCIA, we modified the skin flap design to further lateral aspect to elongate the pedicle.⁵ A lengthened pedicle may be as long as 8 cm, which is sufficient for mouth floor, tongue and most buccal defect reconstruction after composite tumor excision. The reconstructed tongue had a good contour without excessive bulkiness at the 1-year follow-up (Figure 2).

3.3. Case 14

A 82-year-old female presented with multiple huge sarcomas over the right forearm, and leaving a skin defect about 20 cm × 10 cm in size after wide excision. We harvested a 22 cm × 10 cm SCIP flap from the right groin and the microvascular anastomosis was performed in an end-to-side fashion to the brachial artery, end-to-end to the concomitant vein and end-to-end to the cephalic vein. This case exhibits a good representation of skin laxity of the groin donor site, making it always achievable for primary wound closure.

4. Discussion

As the general population ages, microsurgical reconstruction is increasingly needed in elderly patients, a group with accompanying comorbidities. A multicentric prospective study has demonstrated that reconstructive microsurgery in the elderly is generally safe and that the American Society of Anesthesiologists (ASA) score is useful for risk stratification.¹¹ However, there is lack of consensus on the overall safety or potential age limits for older patients undergoing a

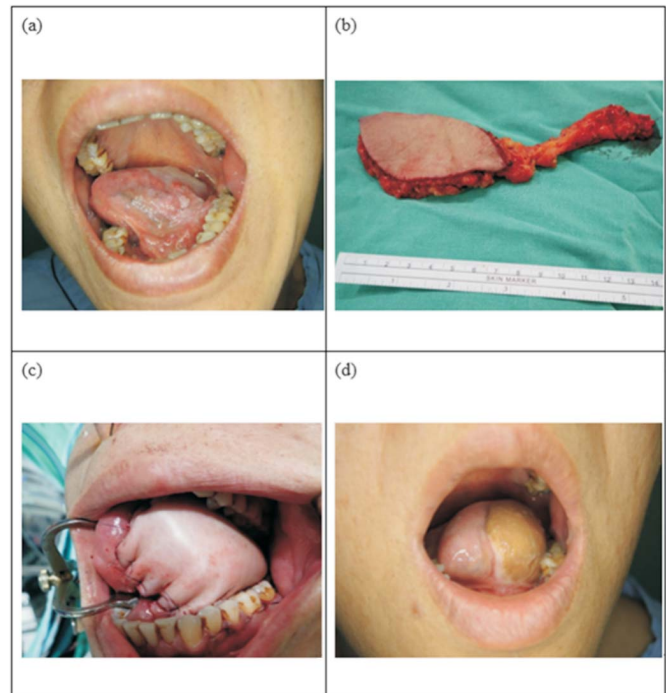


Figure 2. (a) A left tongue squamous cell carcinoma, T2N0M0. (b) Harvesting a long pedicle SCIP flap, pedicle length approximately 8 cm. (c) Left tongue defect was reconstructed with a SCIP flap, pedicle artery end-to-end anastomosis to the superficial thyroid artery. (d) No excessive bulkiness was noted at 1 year postoperatively.

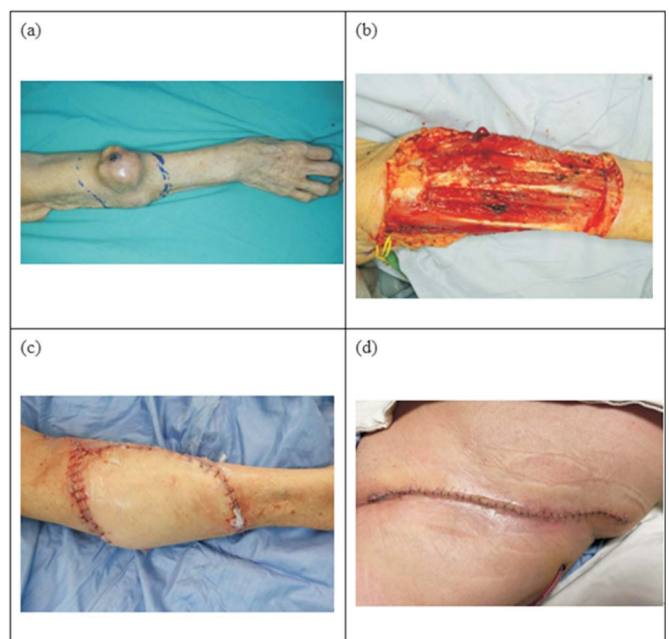


Figure 3. (a) Right forearm sarcoma, T3N0MX. (b) Skin defect approximately 20 cm × 10 cm in size after a wide excision. (c) A free SCIP flap for composite soft tissue defect coverage. (d) The donor site was closed primarily.

free SCIP flap transfer. The reconstructive surgeon must weigh the improved cosmetic and functional outcomes of microvascular reconstruction with the potential morbidity and mortality of a prolonged major surgery.¹²

The pursuit of versatile reconstructive options is a never-ending challenge, and a vast number of alternative free flaps are harvestable from available areas.¹³ With its minimal donorsite morbidity, the SCIP flap became an appraisal reconstruction option, but its disadvantages including the short pedicle, small vessel diameter and anatomic variations led to its unpopularity. A systemic review published in 2020 reported that the SCIP flap offers versatility in various aspects of reconstruction and the evidence suggests that this flap is not limited by its acknowledged shortcomings.¹³ In our experience, the SCIP flap has served as a workhorse flap for resurfacing a wide range of defects in geriatric patients, using a pedicle elongation design and sometimes the supermicrosurgical technique.

Compared with other free fasciocutaneous flap options such as the anterolateral thigh (ALT) flap or medial sural artery perforator (MSAP) flap, SCIP flap harvesting is of less concern regarding age-related atherosclerosis, varicose veins, or significant peripheral artery disease.¹⁴ A radial forearm flap is reported to have more donor site complications and generally needs a skin graft for donor site coverage.¹⁵ Besides the positive aspects of a safe vascular supply, quick flap harvesting and minimal donor site morbidity, free SCIP flap reconstruction offers superior quality of life parameters and is associated with higher patient satisfaction compared with all available fasciocutaneous flaps. Few circumstances could be the contraindication of SCIP flap application including previous trauma or surgical intervention of groin or lower abdomen area such as open herniorrhaphy and groin radical lymph node dissection.

Reconstruction with microvascular tissue transfer is a complicated surgical procedure associated with a high anesthetic risk due to the prolonged length of surgery, especially in senile patients.¹⁶ In our retrospective cohort, the mean flap harvesting time was less than 2 hours, and no postoperative medical complications were recorded such as delirium, bronchopneumonia, heart arrhythmia, or cerebrovascular accident. The low donor site morbidity rate meant that the postoperative hospital stay was 2 weeks on average. Shorter postoperative hospital stays are known to contribute to an improvement in functional status, as patients can be moved faster into rehabilitation.¹²

Many review studies of free flap reconstruction techniques in the elderly have demonstrated favorable results.^{1,2,12,14,17–19} In recent meta-analyses, the failure and surgical complication rates of geriatric microvascular tissue transfer range from 3.5% to 10% and from 32% to 41.3%, respectively.^{1,12,14,17} Our free SCIP flap success rate of 94.7% is achievable with prudent preoperative planning and a cautious microsurgical technique, even in patients of advanced age.

Postoperative vascular exploration was performed in 2 of our cases (10.5%). One of those cases involved a SCIP flap for neck reconstruction after a wide excision of metastatic cancer. Flap congestion was found on postoperative day 2, which caused total flap necrosis despite emergent exploration. During exploration, we noted that the left internal jugular vein was prone to thrombosis formation in this patient, which could be related to the particular nature of the disease (metastatic cancer). One week later, the defect was covered with another ALT flap after exploration, with vessel anastomosis to the contralateral neck. In the second case (buccal cancer reconstruction after wide excision), arterial occlusion was found on postoperative day 5. After thrombectomy and repeat anastomosis of the pedicle, the flap survived with only partial flap margin necrosis. In our

experience, repeat exploration and salvage procedures are more challenging in the SCIP flap than in other flap types, because of the small vessel diameter (~1 mm) and relatively short pedicle length of the SCIP flap.

The limitation of this study includes its retrospective nature with a relatively small number of cases, without a control group. To evaluate the safety and versatility of the free SCIP flap in geriatric patients, our data need to be compared with outcomes from other flaps in a randomized controlled trial. Nevertheless, the evidence supports a promising future for free SCIP flap reconstruction in geriatric patients; this technique enables easy resurfacing of small-to-large-sized defects in multiple indications.¹³

5. Conclusion

In our study, the management of elderly patients with the free SCIP flap technique was associated with reliable outcomes and a high success rate in different applications. We believe that the SCIP flap will become a popular option in geriatric reconstruction owing to the low rate of donor site morbidity and the optimal outcomes.

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Declaration of conflicting interests

None.

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