COMPARISON OF FREE ANTEROLATERAL THIGH FLAPS AND FREE MUSCLE-MUSCULOCUTANEOUS FLAPS IN SOFT TISSUE RECONSTRUCTION OF LOWER EXTREMITY

YENER DEMIRTAS, M.D.,* OSMAN KELAHMETOGLU, M.D., MEHMET CIFCI, M.D., VOLKAN TAYFUR, M.D., AHMET DEMIR, M.D., and ETHEM GUNEREN, M.D.

Background: The objective of this study was to compare the free muscle-musculocutaneous flaps and free perforator skin flaps used for soft tissue reconstruction of the lower extremities. *Methods:* Fifty-three patients whose skin and soft tissue of the lower extremities had been reconstructed were divided into two groups: a perforator flap group, reconstructed using anterolateral thigh (ALT) free flap (23 cases), and a muscle-musculocutaneous flap group, in whom latissimus dorsi and rectus abdominus muscle-musculocutaneous free flaps were used (30 cases). Postoperative complications, long-term results, and donor site morbidities were studied in the two groups. *Results:* Complete flap survival was 78.3% with four total and one partial flap loss in the ALT group and 90.0% with one total and two partial failure in the muscle-musculocutaneous flap group. Muscle-musculocutaneous flaps were the flaps of choice in Gustillo grade IIIB-C injuries and for reconstruction of more proximal localizations. ALT was preferred in relatively younger patients and was typically used for coverage of the distally localized defects. Flap complication rate was significantly higher in the ALT group, but the overall complication rate was similar between the groups. *Conclusion:* ALT perforator flap is a precious option for lower extremity soft tissue reconstruction with minimal donor site morbidity. Nevertheless, the beginners should be attentive to an increased rate of flap complications with the ALT flap and free axial muscle-musculocutaneous flaps would still be the tissue of choice for coverage of leg defects for a surgeon before gaining enough experience with perforator flap dissection. © 2009 Wiley-Liss, Inc. Microsurgery 30:24–31, 2010.

Soft-tissue defects of the lower extremity that expose underlying bones, joints, and tendons pose challenging problems and generally require a free tissue transfer for a successful reconstruction. Among many others used, latissimus dorsi and the rectus abdominis muscle-musculocutaneous free flaps with robust blood supply and consistent anatomy had been the workhorse flaps in reconstruction of the complex lower extremity defects. Yet, the bulky deformity associated with transfer of these flaps require defatting procedures and can result in restriction of function as well as in poor esthetics in certain localizations.[1] On the other hand, perforator flaps emerged as a phenomenon in the last decade, offering superior esthetic and functional results in both donor and the recipient sites, and are increasingly preferred for free flap reconstruction of many regions in the body, including the lower extremity.[2–5] However, clinical studies comparing the outcomes of both types of flaps for lower extremity reconstruction are relatively scarce. The purpose of this study, therefore, was to analyze free muscle-musculocutaneous flaps and free perforator skin flaps used for lower extremity reconstruction and to compare these two groups of flaps in many aspects including patient demographics, flap outcomes, complication rates, donor site morbidities, hospitalization period, and costs.

Department of Plastic, Reconstructive and Aesthetic Surgery, Ondokuz Mayis University Medical School, Samsun, Turkey

*Correspondence to: Yener Demirtas, M.D., Ondokuz Mayis Un. Tip Fak. Plastik Cerrahisi AD, 55200 Kurupelit, Samsun, Turkey.

E-mail: yenerdemirtas@hotmail. com

Received 11 May 2009; Accepted 20 July 2009

Published online 22 September 2009 in Wiley InterScience (www.interscience. wiley.com). DOI 10.1002/micr.20696

PATIENTS AND METHODS

The patients in whom free tissue transfer was performed for reconstruction of lower extremity soft tissue defects between October 2005 and December 2008 were retrospectively reviewed. Fifty-three patients were detected and divided into two groups as free perforator skin flaps (Group 1: 23 patients) and free axial muscle or musculocutaneous flaps (Group 2: 30 patients). These two groups of patients were analyzed and compared according to age, ASA (American Society of Anesthesiologists) scores, etiology, size and localization of the defects, flap complication scores, duration of operations, hospitalization, cost of treatment, early and late infections, donor site morbidities, and the need for secondary debulking procedures. There were 47 males and 6 females with a mean age of 39.0 ± 18.9 years. The mean dimension of the defects was 151.4 ± 110.5 cm. The etiology of the defects was trauma ($n = 38$), chronic wound ($n = 13$), and tumor excision ($n = 2$).

Group 1 (Free ALT Flap Group, 23 Patients)

Flaps were harvested as described elsewhere in detail.[6,7] The muscular fascia of the flap was used for tendon reconstruction in seven patients with dorsal foot injury. A small piece of vastus lateralis muscle was included with the flap to fill dead space in two patients. There were 20 male and 3 females with a mean age of 34.1 ± 18.0 years. The etiology was trauma in 18 patients and chronic wound in 5. Recipient vessels were tibialis anterior ($n = 11$), tibialis posterior ($n = 10$), popliteal ($n = 1$), and femoral ($n = 1$) vessels. For microarterial anastomosis, end-to-end technique

was selected in 12 cases, 8 anastomoses were performed end-to-side, and 3 flow-through flaps were used. All vein anastomoses were performed using end-to-end technique. The donor sites were closed by a skin graft in seven cases (30.0%) in whom the width of the donor site defect was more than 12 cm. Mean follow-up was 28.2 months (range, 9–42 months).

Group 2 (Free Muscle-Musculocutaneous Flap Group, 30 Patients)

Flaps were harvested in the usual way. There were 27 male and 3 females with a mean age of 42.8 ± 19.1 years. The flaps used were latissimus dorsi musculocutaneous flap in 7 patients, latissimus dorsi muscle in 6, rectus abdominus musculocutaneous flap in 2, and rectus abdominus muscle in 15 patients. The etiology of the defects was trauma ($n = 20$), chronic wound ($n = 8$), and tumor excision ($n = 2$). Recipient vessels were tibialis anterior ($n = 12$), tibialis posterior ($n = 8$), popliteal ($n = 5$), peroneal ($n = 3$), sural ($n = 1$), and femoral ($n = 1$) vessels. For microarterial anastomosis, end-to-end technique was selected in 22 cases, while 8 anastomoses were performed end-to-side. All but three vein anastomoses were performed using end-to-end technique. No vein graft was used for pedicle lengthening, except one case, in whom a vascular loop was used. All the donor sites were closed primarily. Mean follow-up was 22.6 months (range, 6–41 months).

Initial treatment of acute lower extremity injury consisted of adequate debridement of nonviable tissue, usage of prophylactic antibiotics; and free tissue transfer was performed as soon as the patient is stabilized. Vacuum-assisted closure (VAC) was applied to those patients in whom free flap had to be delayed for more than a few days. Though a significant number of patients were referred in the subacute period for bone or implant exposure due to skin flap necrosis after orthopedic procedures, debridement and free tissue transfer were performed at the same session in these cases. Patients with chronic osteomyelitis, prior to flap coverage, were additionally treated with preoperative and postoperative culture-specific antibiotics, and an intraoperative radical debridement was performed until only healthy tissue remained in the wound bed. The majority of the patients were operated on by two surgical teams, except three latissimus dorsi transfers where the position of the patient did not allow simultaneous working. Commitant veins were generally used as the recipient, but superficial veins were used in three cases. Regarding scoring of the flap outcomes, a number from 1 to 4 was assigned to each patient (1: no flap problems, 2: minor flap complications but no actions taken, 3: flap complications requiring intervention, 4: complete flap failure).[8]

Table 1. Patient Demographics

	Group 1	Group 2	Total or mean
Number of patients (n)	23	30	53
Age (years), $P = 0.15$	34.1 ± 18.0	42.8 ± 19.1	39.1 ± 18.9
ASA score, $P = 0.45$	1.3 ± 0.4	1.4 ± 0.7	1.4 ± 0.6
Dimension of defect (cm^2), $P = 0.9$	134 ± 67	165 ± 134	151 ± 111
Smokers (%), $P = 0.8$	43.5	40.0	41.5
Atherosclerosis detected (%), $P = 0.5$	13.0	10.0	11.3
Gustillo IIIB-C injury (%), $P = 0.2$	17.4	31.0	25.0

The Statistical Package for the Social Sciences (SPSS) for Windows (SPSS, Chicago, IL), version 13.0, was used for statistical analysis. Data were analyzed using Mann–Whitney U test for nonparametric variables, and Chi-square (χ^2) analysis was done for categorical variables. Data were given as mean ± standard deviation (SD) and percentage. P-value <0.05 was considered as statistically significant.

RESULTS

Demographic data of both groups are presented in Table 1, the outcomes are shown in Table 2, and the different aspects of the flaps are compared in Table 3.

Group 1

The rate of complete flap survival was 78.3% with four total and one partial flap loss. The cause of total failures, as identified during re-explorations, was inadvertent injury to the perforator vein during dissection in one patient, flap infection in the early postoperative period in a patient with Gustillo grade IIIC injury, and arterial thrombosis in two old patients with long-lasting diabetes. Final reconstructions were completed with VAC therapy followed by skin grafting in these patients. Two flaps were re-explored for hematoma evacuation and salvaged. Four patients were treated nonsurgically with antibiotherapy for early postoperative infections. Three patients required systemic antibiotherapy for osteomyelitis observed at the late postoperative period (later than 4 weeks following free tissue transfer). Wound dehiscence was observed in donor site of one patient. Overall complication rate was 56.5% (13 of 23 patients). Secondary debulking surgery was required in two patients.

Group 2

The rate of complete flap survival was 90.0% with one total flap failure due to venous thrombosis in a

patient in whom a superficial vein was used as the recipient vein. Two partial losses occurred; one due to arterial thrombosis, which was salvaged with thrombus removal and renewal of the anastomosis, and another due to a superficial muscle necrosis requiring regrafting. Two other patients were reoperated for partial graft take problems on muscle flaps. One patient was lost due to toxic hepatitis at postoperative day 10. Early postoperative infection occurred in four patients and surgical debridement was required for two of them. Osteomyelitis was detected in six patients (20%) during follow-up. Donor site morbidity requiring surgical intervention was observed in five patients. Overall complication rate was 56.7% (17 of 30 patients). Secondary thinning procedures were performed in four patients.

Regarding the distribution of the flaps according to the anatomic localization of the defects, ALT was mostly used for foot and muscle-musculocutaneous flaps dominated in more proximal parts (see Fig. 1). ALT was preferred in relatively younger patients, and muscle-musculocutaneous flaps were the flaps of choice in the presence of Gustillo grade IIIB-C injuries. But these findings were not supported with a statistical significance, probably due to the small sample size.

The incidence of smokers and the number of atherosclerotic recipient arteries detected during the surgery did not differ significantly between the two groups. Operative times, days of hospitalization, and total cost of treatment were also comparable between the two groups of patients. Early infection rate was also similar between the groups, but osteomyelitis observed as a late infection was more prevalent in Group 2 with a statistically insignificant distinction.

Although the complications related to the flaps were more frequent in Group 1 as depicted with a higher flap score ($P < 0.001$), overall complication rate was fairly similar between the two groups due to a higher number of patients with donor site morbidity and a higher rate of osteomyelitis occurrence at the recipient site in Group 2 patients.

Table 2. The Outcomes of Reconstructions

	Group 1	Group 2	Total or mean
Operative time (min), $P = 0.3$	339 ± 101	320 ± 137	329 ± 122
Flap score, $P < 0.001$*	2.0 ± 1.1	1.2 ± 0.7	1.6 ± 1.1
Hospitalization (days), $P = 0.3$	38 ± 35	38 ± 19	38 ± 27
Total cost (USD), $P = 0.2$	5958 ± 5583	6055 ± 3026	6012 ± 4887
Early infections (%), $P = 0.9$	17.4	13.3	15.1
Osteomyelitis (%), $P = 0.5$	8.7	20	15.1
Donor site morbidity (%), $P = 0.3$	4.3	16.7	11.3
Overall complication rate (%), $P = 0.9$	56.5	56.7	56.6
Rate of secondary procedures (%), $P = 0.45$	8.7	13.3	11.3

**The difference between the groups is statistically significant.*

CASE REPORTS

Case 1

A seven-year-old boy sustained a car tire injury of his right dorsal foot. A 8 × 4 cm ALT flap was transferred to the defect with anastomosis to the tibialis anterior vessels, and the donor site was closed primarily. The outcome at 6 months was excellent (see Fig. 2).

Case 2

A 26-year-old male survived a traffic accident and presented with a 8 × 6 cm soft tissue defect over fractured metatarsal bones of his right foot. A free rectus abdominus muscle flap with anastomosis to tibialis anterior vessels was used for reconstruction and covered with a split-thickness skin graft. Postoperative period was free

Table 3. Comparison of Different Aspects of the Two Groups of Flaps

Flap type	ALT	Muscle-musculocutaneous flaps
Defect size and localization	Preferred for foot region (thin flap needed) and shallow defects	Dominated in more proximal parts, Gustillo IIIB-C injuries, and defects with large dead space
Patient demographics	Flap of choice in younger patients to avoid functional donor site morbidity	Better for geriatric and critically ill patients to decrease the operative time and the risk of repeated general anesthesia (lower re-exploration rates)
Experience required	Steeper learning curve	Consistent anatomy, relatively less experience needed
Complication rate	Higher flap complication rate observed	Higher complication rate at the donor site
Esthetic outcome	Superior for the recipient site, undesirable at the donor site (if skin grafted)	Esthetically more acceptable donor site morbidity, unpleasant at the recipient site for skin-grafted muscle flaps and bulky musculocutaneous flaps

of complications and the result at 9 months was satisfactory with normal foot wearing. No debulking surgery was required (see Fig. 3).

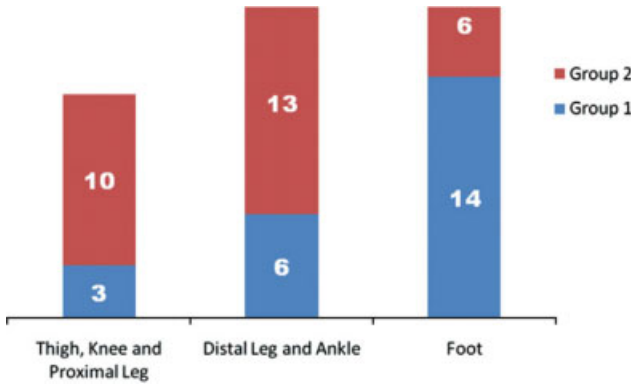

Figure 1. Distribution of the flaps according to the anatomic localization of the defects. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

Case 3

A 48-year-old woman was operated for open reduction and orthopedic fixation of a proximal tibia fracture. Following this procedure, a compartment syndrome developed and despite intervention with lateral and medial fasciotomies, necrosis of the muscles exposed tibia and fibula with large soft tissue defects on both medial and lateral sides of the leg. The medial defect was primarily closed after contracture with VAC therapy and a 25 × 12 cm ALT flap with a 14 cm vascular pedicle was transferred to cover the lateral defect. Donor site was closed primarily. The artery of the flap was anastomosed to the distal stump of the tibialis anterior artery with retrograde flow. A stable soft tissue coverage was obtained at 6 months follow-up allowing uncomplicated application of an external fixator device to the tibia (see Fig. 4).

*Figure 2. **A**: Appearance of the foot of Case 1 immediately after injury. **B**: Donor site of ALT before flap harvesting. **C**: Postoperative view of the foot at 6 months. **D**: Postoperative view of the donor site at 6 months. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]*

Figure 3. ***A****: Appearance of the foot of Case 2 before reconstruction with a free rectus abdominus muscle flap.* ***B****: Anterior view of the foot at postoperative 9 months. Compare with Figure 2C for texture and color match of two different flaps.* ***C****: Lateral view of the foot at postoperative 9 months. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]*

Case 4

A 37-year-old male had bilateral open tibial fractures after a traffic accident. The necrosis of the skin flaps exposed both of the tibia 10 days after implantation of orthopedic external fixation devices. After debridement of the nonviable tissue, the soft tissue defect at the right leg was reconstructed with a pedicled perforator flap. A free rectus abdominus muscle flap was transferred to cover the defect at the left leg. Anastomoses were performed to the tibialis anterior vessels. At 2-year follow-up, the patient had no gait abnormality with satisfactory healing (see Fig. 5).

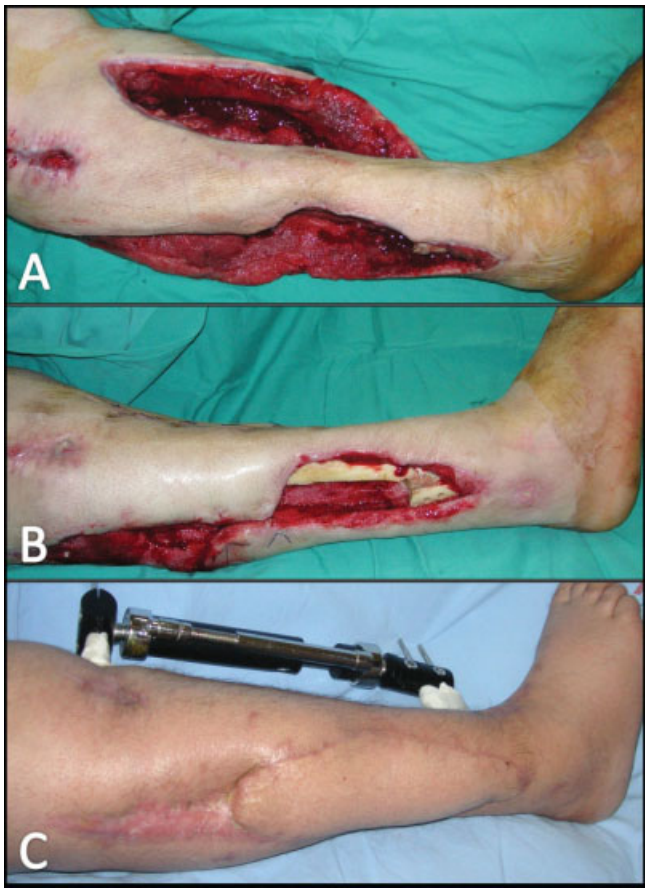

Figure 4. ***A****: Anterior view of the defect of Case 3 before reconstruction with free ALT.* ***B****: Lateral view of the defect.* ***C****: Postoperative view at 6 months. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]*

DISCUSSION

Reconstructive surgery for soft tissue defects of the lower extremity in its ideal form requires microsurgical expertise, versatility, and a significant awareness of the needs of the dynamic structure of this region. Before planning a lower limb reconstruction, the size and the structures involved in the defect, whether the vascular condition of the neighboring tissues is adequate or not, the vascular anatomy of the extremity, the donor-site quality, and the vascular pedicle length needed should be thoroughly evaluated.[5] Lower extremities have always been known as a scarce source of flaps and for usual wound healing challenges associated with decreased distal perfusion. The leg vessels may have pre-existing atherosclerotic disease, further limiting options. In Gustillo grade IIIB-C injuries, bony stabilization can be established, but large soft tissue defects may still remain, or

Figure 5. ***A****: Appearance of the legs of Case 4 before debridement and reconstruction, which were performed in one session.* ***B****: Rectus abdominus muscle flap ready for transfer.* ***C****: Postoperative view of the legs at 2 years. Note that the smaller defect at the right leg was covered with a pedicled perforator flap, which provided a superior esthetic result compared to the left leg, reconstructed with a free rectus abdominus muscle flap. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]*

injured and devitalized tissues may break down and expose hardware.[9]

The characteristics of an ideal soft tissue free flap donor for lower extremity reconstruction might be described as having a large skin territory, good color and texture match with the recipient site, a long and large caliber vascular pedicle, reliability for different flap designs, constant pedicle anatomy, acceptable donor-site morbidity, suitability for sensate reconstruction, feasibility for a two-team approach, no requirement for major artery or muscle sacrifice, applicability as a flow-through flap, and suitability for usage as a thin flap.[3] Before the introduction of perforator skin flaps, muscle flaps with split thickness skin grafts or musculocutaneous flaps in which the whole functional muscle unit is harvested were used for reconstruction of lower extremity defects. The most common donor sites include the latissimus dorsi and the rectus abdominis muscle territories.

A musculocutaneous free flap is a good choice to fill dead space due to its large size and ability to bring a greater blood supply to the bone fragments and may be better in preventing osteomyelitis in lower extremity reconstruction.[10] The higher osteomyelitis rate observed in Group 2 of this series could be explained with prevailing preference of the muscle-musculocutaneous flaps in patients posing higher risk for osteomyelitis, such as Gustillo grade IIIB-C injuries. Clinical examination for color and capillary refill during postoperative monitoring can be more difficult in muscle flaps covered by skin graft compared with flaps with cutaneous paddles. This has been found to be associated with lower rates of re-exploration and concomitantly higher rates of failure,[11] though this has not been the case in our series; perforator flaps had higher rates of re-exploration and failure.

When functional repair is not the main objective in lower extremity reconstruction, a skin flap may be a better alternative compared with a muscle flap to avoid donor site morbidity.[10] As for trauma patients, who may have other injuries and who often face a long road of physical therapy, maximizing preservation of muscles would overall be a benefit.[9] In recent years, perforator flaps have been offered as a useful surgical option in soft tissue lower limb reconstruction,[2–6] but outcome studies comparing these flaps with the workhorse muscle-musculocutaneous flaps are still lacking.

The ALT flap, the prototype of the perforator flaps, was first described by Song et al. in 1984.[12] Although established in the literature as an excellent option for head and neck oncologic reconstruction, it has not been a first line choice for reconstruction of the lower extremity.[9] The ALT region provides a wealth of tissues (i.e., skin, subcutaneous tissue, fascia, muscle, nerve) that can be tailored to reconstruct a wide variety of defects. Taken as a perforator skin flap, ALT leaves the muscle essentially intact and thus minimizes donor site morbidity. If muscle is needed for the reconstruction, a smaller cuff of vastus lateralis muscle tailored to the defect may be harvested, rather than the whole functional unit. In addition, the color and texture of the ALT is optimal for lower extremity reconstruction, compared to the use of this flap for head and neck reconstruction, and the color match of skin flaps is much more better compared with muscle flaps with skin grafts.

The ALT flap offers a fairly long vascular pedicle and it is also possible to perform a flow-through flap suitable for reconstruction of the ischemic defects of the lower limb. The long vascular pedicle is important for avoidance of vein grafts, since the cause of defects is trauma in most of the patients, and microvascular anastomoses should be performed far away from the trauma

zone for successful free flap transfer. Anastomoses were tenaciously undertaken proximal to trauma zone in this series, and according to the analysis of the failed and re-explored flaps, only one flap in Group 2 suffered arterial thrombus possibly due to anastomosis at the injury zone, which was salvaged with renewal of the anastomosis. It was demonstrated that the use of interposition vein graft in lower extremity reconstruction increased the complication rate as much as 5-fold.[3,13] It has been possible to avoid vein grafts in all but one patient of Group 2 in whom a long vein graft was used as a vascular loop.

The ALT can be harvested from the ipsilateral leg, confining all surgery to the already injured leg and avoiding repositioning the patient intraoperatively. Hence, in certain patients who cannot tolerate general anesthesia, reconstruction can be performed with the use of an epidural catheter. Furthermore, it can facilitate a two-team approach to the reconstruction. The rationale for preference of the ALT flap in Case 3, for example, instead of a musculocutaneous flap were to confine the donor site morbidity to the injured extremity by harvesting the flap from the same side, the need of a long vascular pedicle to avoid a vein graft, and the concern on the impairment of ambulation that will be caused by sacrificing a major muscle (rectus abdominus or latissimus dorsi) in a patient with the impending risk of limb amputation in case of failure of the free tissue transfer.

A bulky appearance is still one of the major patient complaints after free flap reconstruction, especially when the pretibial area, ankle, or foot is affected. These regions are best treated using thin flaps that will not contract and fibrose, particularly if secondary procedures are required.[14] Muscle flaps covered by skin grafts undergo less predictable atrophy, and thus it can be difficult to estimate the final contour. If contouring is required, tangential excision of the muscle with reapplication of a skin graft is needed. However, skin flaps are easily contoured with liposuction.[14] One argument against using the ALT flap in western patients is that these flaps are thicker in the more obese western population. However, the flaps can be thinned to a uniform thickness of 3–4 mm, except for a small cuff around the perforators,[15] allowing customized adaptation to the defect. This can be performed during harvest or later as a secondary procedure. In this series, although secondary debulking procedures were performed for some flaps (two flaps in Group 1 and four flaps in Group 2), the majority of the flaps had acceptable thickness for functional and esthetic outcomes especially in the pretibial, ankle, and foot reconstruction.

ALT flap survival rates in lower extremity were reported to be comparable to reconstructions with free muscle and musculocutaneous flaps.[2–4,6,9] Lin et al. also reported that perforator skin flaps and skin-grafted muscle flaps both had similar survival rates; however, skin flaps required fewer secondary procedures to correct deformities, and whenever a skin component was present, it provided useful tissue during the secondary procedure and minimized complications.[16] They also observed that skin-grafted muscle flaps demonstrated a higher incidence of trophic ulcers for plantar foot reconstructions and a higher need for resurfacing procedures than flaps with a skin component. Rodriguez et al. reported that functional outcomes of perforator skin flaps were equal to muscle flaps and future prospective studies were warranted and should focus on subtle differences in donor site morbidity as well as ease of secondary orthopedic procedures after flap coverage to reveal the superior flap choice for lower extremity reconstruction.[17]

The perforator dissection technique needs good microsurgical skill for precisely isolating and dissecting the perforators and vascular pedicle. This has a higher potential for unintentional damage to the vessels and is associated with a steeper learning curve.[9] Since only one of the flaps was lost due to inadvertent injury to the perforator during dissection, lower flap survival and higher flap complication rates observed for the ALT group in this series was not totally attributable to learning curve of the surgical team during perforator dissection. And we criticized that proper patient selection would have prevented the two failures occurred in these patients with atherosclerotic recipient vessels, which was not related to the nature of the flap. On the other hand, more than 20 ALT free flaps were transferred to head and neck region by the same surgical team during this study period with no flap loss (unpublished data). Thus, lower extremity as a recipient site would have a negative impact on perforator flap survival rates.

One major lesson learned from this experience is that a beginner reconstructive surgeon wish to perform perforator flaps on every occasion and may sometimes overrun, until the decision-making process is ascertained in the surgeon's mind, and the dissection becomes safer and easier with knowledge of the well-described anatomic variations and the increase of surgical experience after the initial cases. Nevertheless, the beginners should be attentive to an increased rate of flap complications with the ALT flap, as the success rate of perforator flaps would be lower for the surgeons with limited experience on perforator dissection, when compared to the conventional axial muscle-musculocutaneous flaps.

CONCLUSION

When a free tissue transfer is needed, a perforator flap would be employed because of its undoubted advantages including the following: important decrease in donor-site

morbidity, preserving muscles and their functions, and sparing the main vascular trunks; specificity in "like-to-like" soft tissue replacement; and a better cosmetic and reconstructive result. The anterolateral thigh, in this sense, offers a variety of tissues available from a single donor site, as well as a long, reliable vascular pedicle, and is an excellent option for reconstruction of the lower extremity providing a useful alternative to muscle-musculocutaneous flaps. Based on the findings of this study, it could still be argued that free axial muscle-musculocutaneous flaps would still be the tissue of choice for coverage of lower extremity defects for a surgeon, before gaining enough experience with perforator flap dissection in less risky anatomic regions. There are many factors affecting the flap choice for a particular patient, and larger prospective series with long-term functional and quality of life evaluations are warranted to conclude that one flap is superior to other for reconstruction of lower extremity.

REFERENCES

1. Ohjimi H, Taniguchi Y, Kawano K, Kinoshita K, Manabe T. A comparison of thinning and conventional free-flap transfers to the lower extremity. Plast Reconstr Surg 2000;105:558–566.
2. Yazar S, Lin CH, Lin YT, Ulusal AE, Wei FC. Outcome comparison between free muscle and free fasciocutaneous flaps for reconstruction of distal third and ankle traumatic open tibial fractures. Plast Reconstr Surg 2006;117:2468–2475.
3. Yildirim S, Gideroglu K, Aköz T. Anterolateral thigh flap: Ideal free flap choice for lower extremity soft-tissue reconstruction. J Reconstr Microsurg 2003;19:225–233.
4. Ozkan O, Coşkunfirat OK, Ozgentaş HE. The use of free anterolateral thigh flap for reconstructing soft tissue defects of the lower extremities. Ann Plast Surg 2004;53:455–461.
5. Masia J, Moscatiello F, Pons G, Fernandez M, Lopez S, Serret P. Our experience in lower limb reconstruction with perforator flaps. Ann Plast Surg 2007;58:507–512.
6. Wei FC, Jain V, Celik N, Chen HC, Chuang DC, Lin CH. Have we found an ideal soft-tissue flap? An experience with 672 anterolateral thigh flaps. Plast Reconstr Surg 2002;109:2219–2226.
7. Koshima I. Free anterolateral thigh flap for reconstruction of head and neck defects following cancer ablation. Plast Reconstr Surg 2000;105:2358–2365.
8. McCrory AL, Magnuson JS. Free tissue transfer versus pedicled flap in head and neck reconstruction. Laryngoscope 2002;112: 2161–2165.
9. Park JE, Rodriguez ED, Bluebond-Langer R, Bochicchio G, Christy MR, Bochicchio K, Scalea TM. The anterolateral thigh flap is highly effective for reconstruction of complex lower extremity trauma. J Trauma 2007;62:162–165.
10. Nasir S, Aydin MA. Reconstruction of soft tissue defect of lower extremity with free SCIA/SIEA Flap. Ann Plast Surg 2008;61:622–626.
11. Khouri RK, Cooley BC, Kunselmann AR. A prospective study of microvascular free-flap surgery and outcome. Plast Reconstr Surg 1998;102:711–721.
12. Song YG, Chen GZ, Song YL. The free thigh flap: A new free flap concept based on the septocutaneous artery. Br J Plast Surg 1984;37:149–155.
13. Khouri RK, Shaw WW. Reconstruction of the lower extremity with microvascular free flaps: A 10-year experience with 304 consecutive cases. J Trauma 1989;29:1086–1094.
14. Duffy FJ Jr, Brodsky JW, Royer CT. Preliminary experience with perforator flaps in reconstruction of soft-tissue defects of the foot and ankle. Foot Ankle Int 2007;26:191–197.
15. Kimura N, Satoh K. Consideration of a thin flap as an entity and clinical applications of the thin anterolateral thigh flap. Plast Reconstr Surg 1996;97:985–992.
16. Lin CH, Mardini S, Wei FC, Lin YT, Chen CT. Free flap reconstruction of foot and ankle defects in pediatric patients: Long-term outcome in 91 cases. Plast Reconstr Surg 2006;117: 2478–2487.
17. Rodriguez ED, Bluebond-Langner R, Copeland C, Grim TN, Singh NK, Scalea T. Functional outcomes of posttraumatic lower limb salvage: A pilot study of anterolateral thigh perforator flaps versus muscle flaps. J Trauma 2009;66:1311–1314.