Algorithmic Approach to Anterolateral Thigh Flaps Lacking Suitable Perforators in Lower Extremity Reconstruction

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Background: The anterolateral thigh flap is preferred at the authors' institution for lower extremity reconstruction. When variations in vascular anatomy preclude flap harvest, the authors follow an algorithm for contingency planning. The authors compared outcomes of contingency strategies to anterolateral thigh flaps that go as planned.

Methods: Between January of 2001 and February of 2012, 548 free anterolateral thigh flaps were planned for lower extremity reconstruction at Chang Gung Memorial Hospital. In 30 cases, the flap could not be used because perforators were not identified ($n = 12$), unreliably small ($n = 14$), or injured ($n = 4$). Using the authors' algorithm, the flap was converted to an ipsilateral tensor fasciae latae ($n = 21$), anteromedial thigh ($n = 5$), or contralateral vastus lateralis myocutaneous flap ($n = 4$). Outcomes, including flap failure, necrosis, and re-exploration rate, were compared in successful cases and those that required conversion.

Results: The incidence of unreliably small or absent perforators was 4.8 percent. Adding cases of iatrogenic perforator injury, the incidence was 5.5 percent. There was no difference in flap survival, flap loss, or need for re-exploration regardless of whether or not the anterolateral thigh flap was used. In 70 percent of cases, the authors favored the tensor fasciae latae flap; partial flap necrosis occurred in six of 21 cases, and total flap loss occurred in one.

Conclusions: Without preoperative imaging, dilemmas may be encountered in roughly one of 20 anterolateral thigh flaps raised. Using the authors' algorithm, alternative options can reliably confer results comparable to those of planned anterolateral thigh flaps. (*Plast. Reconstr. Surg.* 135: 1476, 2015.)

CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, III.

Defects encountered in lower extremity reconstruction vary in size, shape, degree of tissue loss, and impact on ambulation. Aims of reconstruction are coverage of critical structures and preservation or restoration of function. To accomplish this, fasciocutaneous and muscle flaps have become the standard of care. Local muscle flaps are readily available and easier to harvest, but may come at the expense of donor-site function in a compromised extremity.[1,2] Free tissue transfer from other body regions, including the latissimus dorsi, parascapular, and rectus abdominis regions, spare affected extremities but often require repositioning and additional operative time.[3]

The anterolateral thigh flap is the most popular donor site at this institution and elsewhere. It is harvested as a fasciocutaneous or myocutaneous flap and fueled by a sizeable pedicle. In most cases, harvest of the flap obviates the need for position change and two teams can work simultaneously. Donor-site morbidity is well tolerated and minimized when muscle is spared.[4,5] Disadvantages of the anterolateral thigh flap include the potential for tedious intramuscular dissection, a conspicuous donor-site wound, and unwieldy thickness in obese patients.

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A sound understanding of perforator anatomy facilitates anterolateral thigh flap dissection. Classically, sizable perforators arise along a line between the anterior superior iliac spine and the lateral patella centered at the midpoint of that line.[5,6] Unfortunately, this is not always the case. Variations in vascular anatomy of the anterolateral thigh region may lead to challenging intraoperative surprises, particularly when no preoperative imaging is available. Moreover, perforator dissection can be challenging and vessels are prone to injury, even in experienced hands.

Meticulous preservation of perforators should be attempted when large skin or composite flaps are needed, or when the distal perforator is chosen to maximize anterolateral thigh pedicle length. Although surgical planning relies on consistent anatomy of the lateral circumflex femoral artery system, the microsurgeon must be prepared for anomalies. Fortunately, the expansive lateral circumflex femoral artery supplies more than the anterolateral thigh, giving the prepared surgeon an opportunity to change course under such circumstances.[4–6] The tensor fasciae latae myocutaneous and anteromedial thigh flaps are dependable fallbacks (Fig. 1).

In this article, we aim to provide solutions for unexpected or unreliable anterolateral thigh anatomy should it be confronted in the operating room. We review the incidence of anterolateral thigh flaps with absent, unreliable, or injured perforators and compare success rates of the alternative thigh flaps. Finally, we describe the algorithm followed at this institution when anterolateral thigh flaps lacking suitable perforators in lower extremity reconstruction are encountered.

PATIENTS AND METHODS

Between January of 2001 and February of 2012, 548 free anterolateral thigh flaps were attempted for complex lower extremity reconstruction at Chang Gung Memorial Hospital. Patient data were collected and included age, sex, associated injury, flap size and composition, conversion to another flap, the alternative flap type, indication for conversion, need for re-exploration, and flap survival. Two groups were reviewed retrospectively: anterolateral thigh flaps raised as planned (group A), and anterolateral thigh flap conversions to locoregional alternatives secondary to absent, unreliable, or injured perforators (group B).

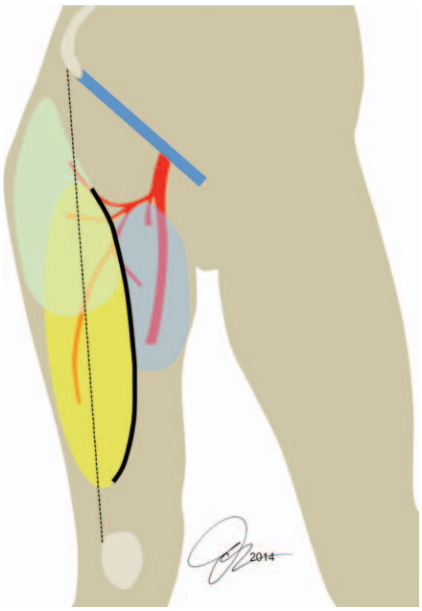

Fig. 1. The thigh is a soft-tissue warehouse. Markings are made for an anterolateral thigh flap (*yellow*) based on the anterior superior iliac spine–patellar axis (*dashed black line*). After committing to the medial incision (*solid black line*), if the anterolateral thigh flap is abandoned, a tensor fasciae latae (*green*) or anteromedial thigh (*blue*) flap can be used based on the same incision. Although a medial branch is shown arising from the descending lateral circumflex femoral artery (common), it is possible that anteromedial thigh tissue is perfused from the deep or superficial femoral systems.

Algorithm

Figure 2 summarizes the Chang Gung algorithm for confronting unreliable or absent anterolateral thigh perforators in lower extremity reconstruction. This was followed for all group B patients in this series. Appropriate use of the algorithm mandates accurate preoperative assessment of patient history, concomitant disease, soft-tissue deficit, and zone of injury. The success of this strategy also relies on hemodynamic stability of the patients and fastidious perioperative management of their wounds.

The authors' approach to anterolateral thigh harvest did not vary in 548 cases. A reassuring Doppler examination dictates flap design. The medial incision is made first and the flap is reflected laterally. If no perforating vessels are identified in the lateral intermuscular septum or distal vastus lateralis, perforating branches of the oblique and transverse branches are explored; tensor fasciae latae is our first-choice alternative. When fascia is desired, it is the only choice. If no perforators are found still, or they appear unreliable, dissection proceeds medially along the superficial

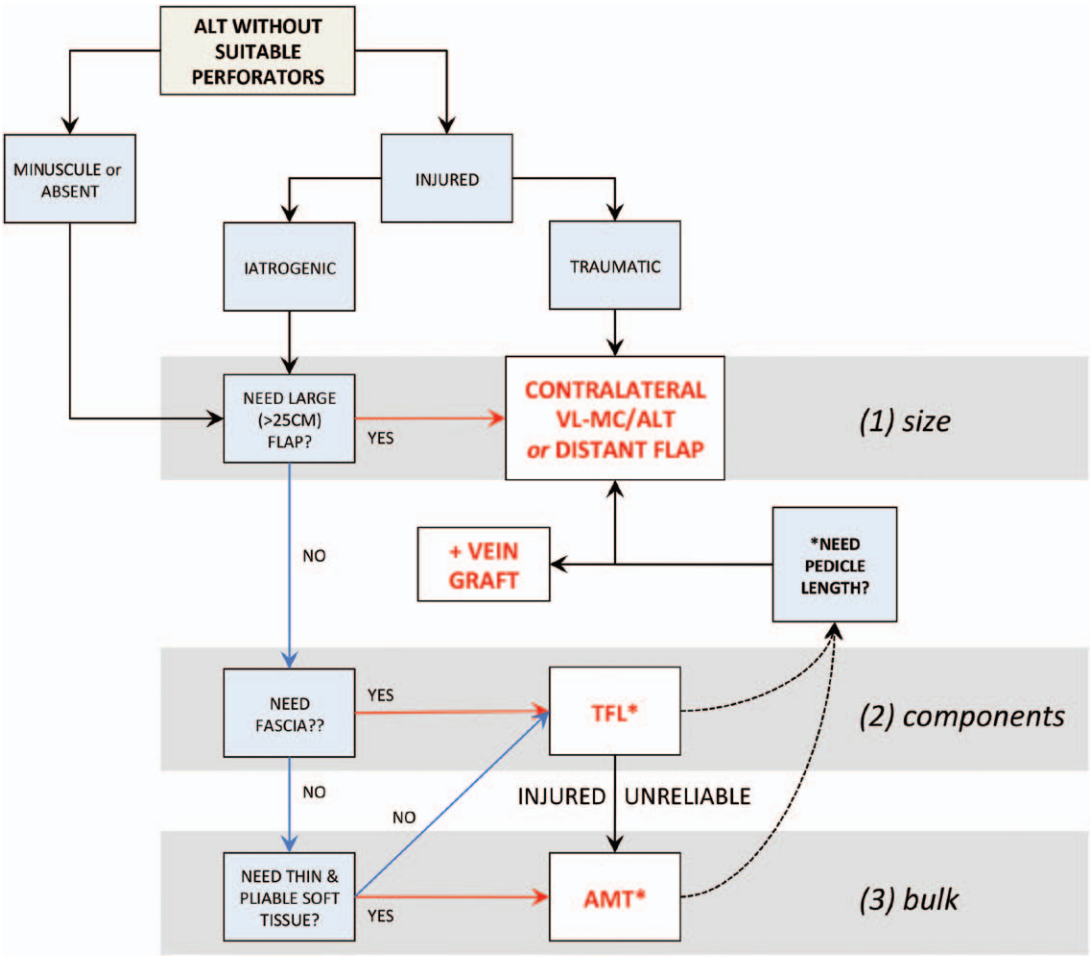

Fig. 2. Algorithm for contingency flap harvest when anterolateral thigh perforators are unreliable. *ALT*, anterolateral thigh; *VL-MC*, vastus lateralis myocutaneous; *TFL*, tensor fasciae latae; *AMT*, anteromedial thigh.

plane of the rectus femoris. Efforts are made to identify perforating vessels of the anteromedial thigh flap.[7] If a promising vessel is discovered, the anteromedial thigh flap can be designed about that perforator and raised. If a large flap (>25 cm long) is needed, neither the tensor fasciae latae nor anteromedial thigh will suffice and it is best to convert to the contralateral vastus lateralis myocutaneous flap, taking special care not to undermine the skin paddle, assuming the contralateral thigh has a symmetric anatomy. Another option is to harvest a distant flap when the contralateral thigh is not an option.

If perforating vessels are present but injured, the etiology of injury must be considered. Vessel injury attributed to the inciting trauma makes the ipsilateral anterolateral thigh unreliable. In such cases, the contralateral thigh is chosen unless it too exists within the zone of injury. When both thighs are compromised, distant alternatives are the best option. Iatrogenic vessel injury warrants careful evaluation of remaining blood supply and circumstances leading to injury. One or two perforators are generally sufficient to supply a modest-sized anterolateral thigh flap and dissection may proceed. However, if there is any concern of compromised or insufficient inflow after iatrogenic injury, a tensor fasciae latae or anteromedial thigh flap should be attempted.

A major disadvantage of the tensor fasciae latae and anteromedial thigh is short pedicle length. Often, a long pedicle is necessary to ensure that microvascular repair occurs outside the zone of injury. Vein grafting can be performed to lengthen the pedicle. Alternatively, the contralateral thigh can be used.

Statistical Analysis

The incidence of absent, unreliable, and injured perforators was evaluated, and patients were designated as group A or B. We investigated factors that may have contributed to poor outcomes. Re-exploration, partial flap loss, and failure rates were compared in both groups. Statistical

comparisons of the two groups between parametric continuous measures were performed using the paired *t* test. All data were evaluated with SPSS software (Version 17.0; SPSS, Inc., Chicago, Ill.). Statistically significant results were obtained for values of $p < 0.05$.

RESULTS

Incidence of Unreliably Small, Absent, and Injured Perforators

From January of 2001 to February of 2012, 548 anterolateral thigh flaps were planned for reconstruction of lower extremity wounds at this institution. Of those, 518 were performed as planned (94.5 percent). In 30 cases (5.5 percent), circumstances warranted conversion to another flap (Table 1). Motives for conversion included 14 unreliably small perforators (47 percent; 2.6 percent overall), 12 absent perforators (40 percent; 2.2 percent overall), and four iatrogenically injured perforators (13 percent; 0.7 percent overall) identified during thigh dissection.

In these 30 cases, the anterolateral thigh flaps were converted to 21 ipsilateral tensor fasciae latae flaps, five anteromedial thigh flaps, and four contralateral vastus lateralis myocutaneous flaps. Overall flap survival in group A was 95.8 percent and for Group B, it was 96.7 percent. One flap failed in group B with arterial occlusion and could not be salvaged. The re-exploration rates for early signs of vascular compromise were 13.9 percent in group A and 13.3 percent in group B. Pairwise comparison of both groups revealed no difference in success, flap failure, or re-exploration rates (Table 2).

When the anterolateral thigh flap was unreliable, it was most frequently converted to a tensor fasciae latae flap (21 cases, 70 percent). Average flap size measured 20.5 × 9.4 cm. Motives for conversion to the tensor fasciae latae included unreliable anterolateral thigh perforators in 13 cases and no perforators in eight cases. Two tensor fasciae latae flaps required adjunctive vein grafting for inadequate pedicle length. Four donor sites required skin grafts, and we used the shoelace technique to facilitate complete closure in two. The remaining 71 percent were closed primarily. Tensor fasciae latae flaps necessitated re-exploration in four cases (19 percent). Partial flap loss was observed in six cases (29 percent), and one flap failed (5 percent) (Table 3).

Table 1. Incidence of Flap Conversion, Unreliably Small or Absent Perforators, and Iatrogenic Injury (*N* = 548)

Group	*n* (%)
Group A: performed ALTs	518 (94.50)
Group B: converted ALTs	30 (5.50)
Small perforator(s)	14 (2.60)
Absent perforator(s)	12 (2.20)
Injured perforator(s)	4 (0.70)

ALT, anterolateral thigh.

Table 2. Comparison of Outcomes for Performed Anterolateral Thigh Flaps (Group A) and Conversions (Group B)

Outcomes	Group A (*n* = 518)	Group B (*n* = 30)	*p*
Success, *n* (%)	496 (95.9%)	29 (96.7%)	>0.05
Flap failure, *n* (%)	22 (4.25%)	1 (3.3%)	>0.05
Re-exploration, *n* (%)	72 (13.9%)	4 (13.3%)	>0.05
Salvage: redo, *n*	11	1	–
NPWT or local flap	3	0	
Amputation	8	0	

NPWT, negative-pressure wound therapy.

The anterolateral thigh was converted to an anteromedial thigh flap in five cases (17 percent). Absent perforators accounted for three of five conversions. In one case, a small and unreliable anterolateral thigh perforator was identified, and one case of iatrogenic injury warranted conversion. Average flap size measured 19.4 × 8.8 cm, the smallest of the group B flaps. One flap required additional vein graft, and the donor site was closed primarily in three cases. There was no need for re-exploration for any case when an anteromedial thigh flap was used. No anteromedial thigh flap failed, but partial loss was seen in one.

Ipsilateral options were abandoned in four cases (13 percent) and the contralateral thigh was used. In all cases, the decision was based the need for large (>25 cm) flaps that could not be obtained with the anteromedial thigh and tensor fasciae latae when no anterolateral thigh perforators were found (one case) and when the perforator(s) was iatrogenically injured (three cases). All four contralateral flaps were harvested as vastus lateralis myocutaneous flaps without skin paddle undermining. Although three cases with iatrogenically injured perforators were expected to have normal anatomy contralaterally, we elected for a vastus lateralis myocutaneous flap to minimize risk of injury to contralateral perforators. The resulting flap size was the largest of the group B strategies, averaging 27 × 12 cm, and no vein grafts were needed. There was no need for re-exploration in the four conversions, which were uncomplicated.

Table 3. Flap Conversions and Outcomes

Outcome	TFL ($n = 21$)	AMT ($n = 5$)	Contralateral ($n = 4$)
Flap size, cm	20.5 × 9.4	19.4 × 8.8	27 × 12
Cause for conversion, *n*			
Small perforator(s)	13	1	0
Absent perforator(s)	8	3	1
Injured perforator(s)	0	1	3
Donor-site closure method			
Primary/STSG/shoelace	15/4/2	3/2/0	2/1/1
Vein graft needed, *n* (%)	2 (9.5)	1 (20)	0
Re-exploration, *n* (%)	4 (19)	0	0
Partial loss, *n* (%)	6 (28.6)	1 (20)	0
Flap failure, *n* (%)	1 (4.7)	0	0

TFL, tensor fasciae latae; AMT, anteromedial thigh; STSG, split-thickness skin graft.

CASE REPORTS

Case 1: Anterolateral Thigh Flap Converted to Contralateral Vastus Lateralis Myocutaneous Flap

A 24-year-old man suffered extensive left lower extremity trauma with femoral and Gustilo type IIIB tibiofibular fractures. The plastic surgery service was consulted for a 30 × 17-cm wound with extensive bone exposure. A large anterolateral thigh flap measuring 30 × 20 cm was designed, and a Doppler signal was identified. However, no suitable perforators were found intraoperatively to perfuse such a large flap, so the decision was made to convert to a contralateral vastus lateralis myocutaneous flap. The skin paddle was minimally undermined. Ultimately, this flap provided complete coverage, there was no flap loss, and the donor site was successfully closed without a skin graft (Fig. 3).

Case 2: Anterolateral Thigh Flap Converted to Ipsilateral Tensor Fasciae Latae

A 9-year-old boy presented to this service with a degloving injury of his left medial ankle after a motor vehicle accident. A fascial flap was desired to allow smooth gliding of the underlying tendons and to reconstruct the open ankle joint capsule in the 11 × 9-cm defect. There was a concomitant 6-cm posterior tibial nerve gap that required grafting. The ipsilateral anterolateral thigh flap was planned with preservation of the lateral femoral cutaneous nerve. Elevation of the flap revealed a single minuscule musculocutaneous perforator distally that could not be relied on. Therefore, an ipsilateral tensor fasciae latae flap was harvested that included branches of the lateral femoral cutaneous nerve. Thick fascia provided the desired protection and gliding surface for underlying structures, and the joint capsule was reconstructed. The sural nerve graft was used for the tibial nerve gap and the lateral femoral cutaneous nerve was coapted to the proximal tibial nerve stump. By 3 months, the boy had full range of motion and weight-bearing capacity (Fig. 4).

Case 3: Anterolateral Thigh Flap Converted to Ipsilateral Anteromedial Thigh Flap

A 49-year-old ambulatory man with diabetes mellitus presented with a chronic wound of his left dorsal and medial plantar foot. Following serial débridement, the wound improved and began to granulate, but exposed tendon necessitated dependable coverage. A thin, pliable anterolateral thigh flap was chosen to cover the wound and allow him to wear shoes. Despite reassuring Doppler signals, an absent anterolateral thigh perforator was noted on flap elevation. Subsequent medial dissection revealed two hearty perforators arising from a medial branch originating from the descending branch of the lateral circumflex femoral artery. The anteromedial thigh flap survived, and the patient was satisfied with the functional and aesthetic result (Fig. 5).

DISCUSSION

The incidence of absent anterolateral thigh perforators varies from 0.89 percent to 11.2 percent in the literature, with the most recently published meta-analysis reporting 1.8 percent incidence.[5,6,8–14] When the criteria are expanded to include present but unreliably small perforators, the incidence becomes 2.1 percent to 5.4 percent. In our study, we observed an incidence of 4.8 percent that is consistent with other series[8–10,13,15] (Table 4). The algorithm described above was founded on an extensive review of the literature and our own experience with anterolateral thigh flap reconstruction. It is structured to accommodate (in order of priority) (1) size, (2) components needed, and (3) bulk when a contingency flap is needed.

Controversy exists about the arterial supply to the tensor fasciae latae flap, whether it is the transverse branch or the ascending branch of the lateral circumflex femoral artery.[16–19] There is a strong possibility that variation does exist, and although descriptions differ, we consider the transverse branch to be the dominant pedicle.[20] Regardless of name, the tensor fasciae latae is more reliable with more constant vascular anatomy than the anteromedial thigh,[21–27] even if there is an inverse relationship of anteromedial thigh and anterolateral thigh perforator anatomy.[28] We therefore prefer the tensor fasciae latae flap as a fallback to the anteromedial thigh, and so it is suggested first in our algorithm.

The anteromedial thigh is suitable for situations where a thin pliable flap is needed. The territory is defined by the surgical marking and may be supplied by the deep, superficial, or circumflex femoral system. In our series, the anteromedial thigh was medial to the anterolateral thigh marking and inferior to the groin flap; the most common source vessel was a medial branch of the descending branch of the lateral circumflex femoral artery.[29] The superficial femoral system also contributes perforators, but these tend to be shorter and less useful.[30] Of course, other, more

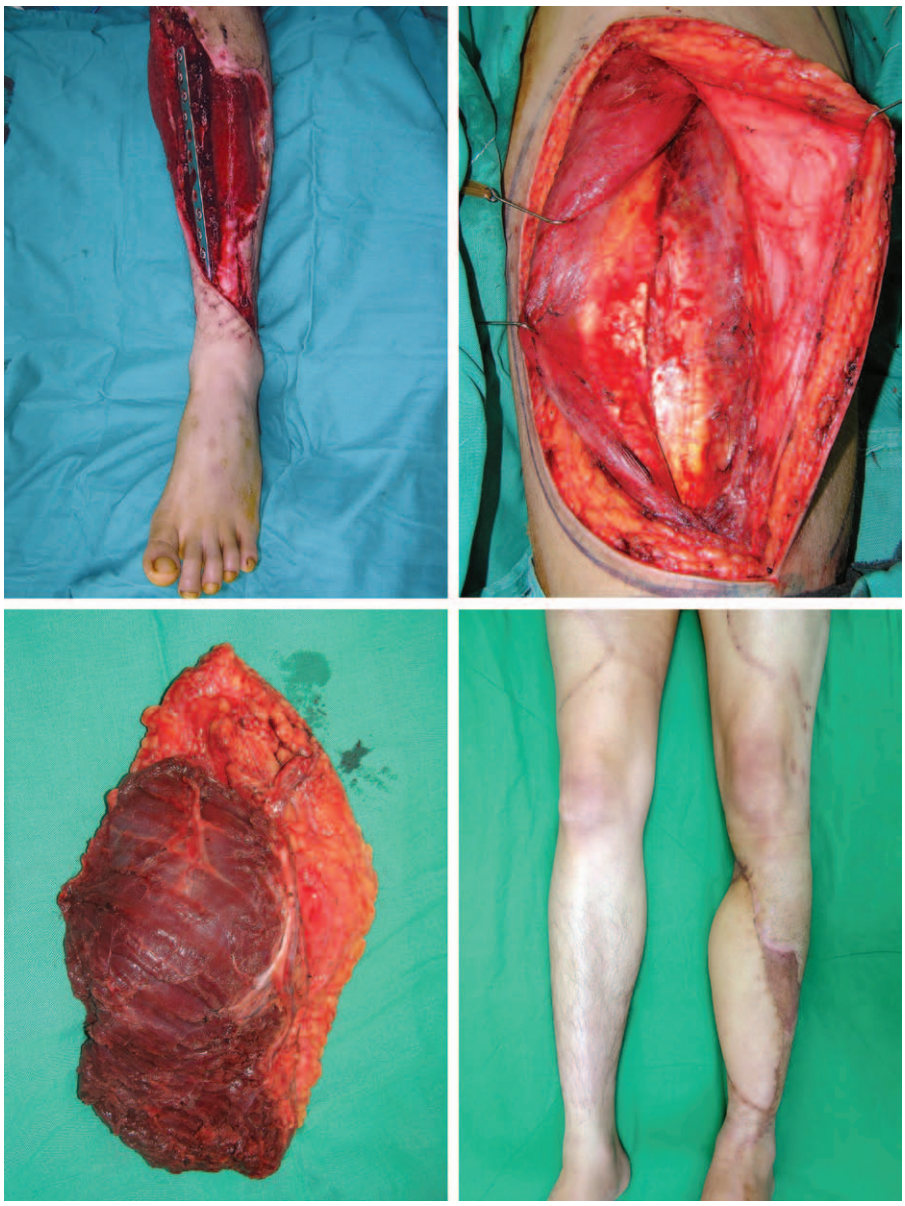

Fig. 3. Case 1. (*Above, left*) Gustilo IIIB fracture with extensive bony and hardware exposure. (*Above, right*) Flap elevation demonstrated no suitable perforating vessels. (*Below, left*) Successful coverage was achieved with a contralateral vastus lateralis myocutaneous flap, and special care was taken to avoid skin undermining. (*Below, right*) Excellent result at 8 months.

suitable perforators may be sought, in the manner of a free-style flap.

Because small perforators lacking muscular insulation are injury-prone, the incidence of iatrogenic vessel injury cannot be ignored. Accounting for iatrogenic injury, the incidence of anterolateral thigh perforator inadequacy was 5.5 percent in this series. There is little in the literature about iatrogenic vessel injury; its incidence was mentioned in only one other study (also 0.7 percent).[15] While a three-perforator model of the anterolateral thigh has been described and is generally accepted,[13] it is our experience that only one or two sizable perforators are more commonly identified. Therefore, injury to even one perforator may have profound implications that warrant a contingency plan.

Iatrogenic injury is different from perforator absence or diminution because a dominant thigh vessel may have been injured. Lower extremity defects often warrant large flaps fueled by sizeable perforators. When anterolateral thigh perforators are unreliably small or absent, conversion to a tensor fasciae latae or anteromedial

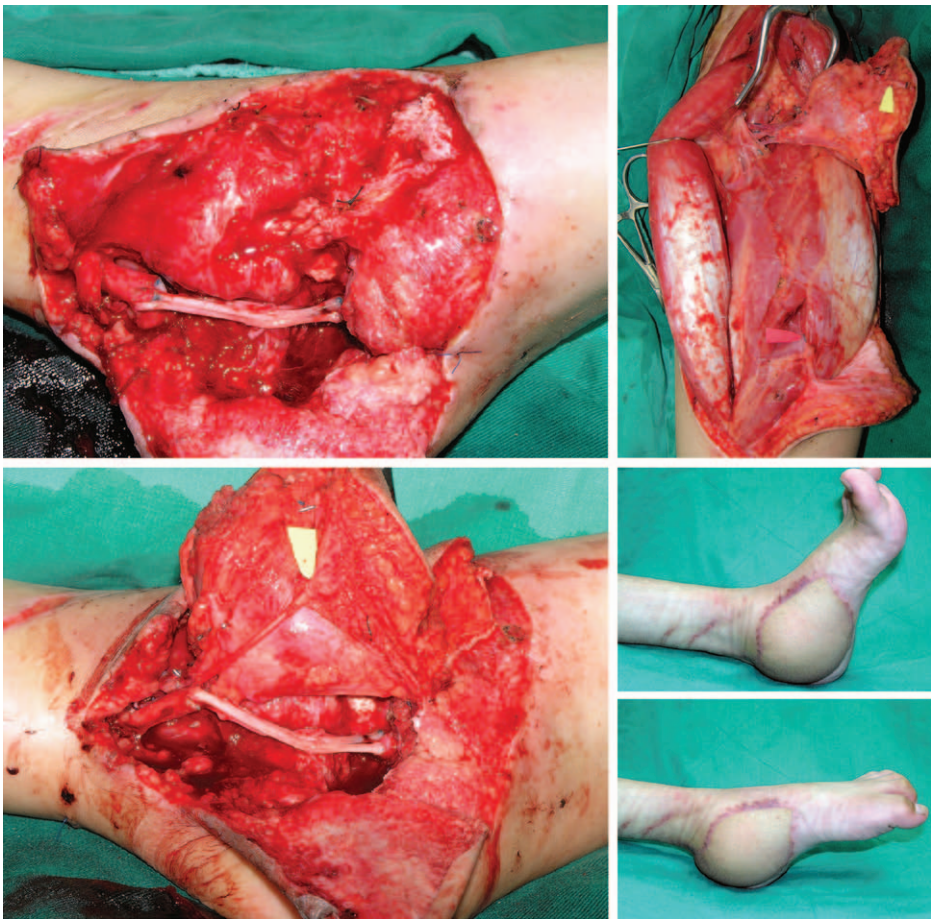

Fig. 4. Case 2. A 9-year-old boy with medial ankle degloving. (*Above, left*) Exposed tendon, an open joint, and 6-cm tibial nerve gap were addressed in a single stage with sural nerve cable grafting (*above, left*) and sensate tensor fasciae latae flap (*above, right*; *yellow arrow*) after the anterolateral thigh showed a single, small, and nonreassuring perforator. (*Below, left*) On inset, the proximal tibial nerve was coapted to the lateral femoral cutaneous nerve (*yellow arrow*) for sensation and the fascia was used to reconstruct the joint capsule. (*Below, right*) The final result. Excellent range of motion was observed at 3 months.

thigh flap is feasible, assuming vessels to those regions are dominant sources of thigh perfusion.[28] If sizeable perforators are injured, on the other hand, it is less likely that surrounding vessels are sufficient to reliably perfuse a large flap. Although the tensor fasciae latae and anteromedial thigh are dependable alternatives after iatrogenic injury, it is necessary to consider this implication for the size of the skin paddle that can be taken. When very large flaps are needed, it is generally better to use the contralateral thigh or another body region.

In the Far East, the thigh is a versatile soft-tissue warehouse that is ideal for lower extremity reconstruction (Table 5). In our experience, tissue encountered at this institution tends to be thinner and more reliable than tissue harvested in Europe and the West. While the obese abdomen can be used for perforator flap reconstruction for the breast, the obese thigh is not particularly well suited for many of the needs of the lower extremity, particularly around the ankle region and foot. Conceivably the anterolateral thigh may not be as ideal in all parts of the world. Still, the lateral circumflex femoral artery is of generous caliber. Donor sites can be closed primarily, and cosmesis is acceptable when they cannot. A two-team approach is possible without the need for position change. Because dependable options exist, a surgeon need not panic when anterolateral thigh perforators are injured, minuscule, or absent. Rather, we encourage consideration of the tensor fasciae latae or anteromedial thigh as guided by our algorithm. In this study, there was no difference in outcomes in groups A and B. That

Fig. 5. Case 3. The foot of a 49-year-old man with diabetes mellitus and an exposed tendon (*above*). Absent perforator was noted on anterolateral thigh flap elevation. Two robust perforators (*center, left*; *blue arrows*) were noted with medial dissection, and the anteromedial thigh flap (*center, right*) provided dependable coverage in a high-risk foot (*below*).

is to say, when no anterolateral thigh perforators were found, outcomes did not change when other flaps had to be used.

Tensor fasciae latae, anteromedial thigh, and anterolateral thigh flaps can be approached via a common incision, just medial to the lateral septum of the thigh. This facilitates flap conversion when no suitable anterolateral thigh perforators are identified. Of the available options, we prefer the tensor fasciae latae, as seen in this series. It has a shorter pedicle than the anterolateral thigh and may necessitate a vein graft, but it is harvested faster and is more predictable. While additional anastomoses conceivably increase the thrombosis rate when a vein graft is used, we do not believe it was a cause of flap failure in this series. One possibility for the high partial loss rate in this series is overzealous skin paddle harvest based on a single angiosome, particularly when the transverse branch was not intrinsically dominant. Although anteromedial thigh flaps demonstrated fewer complications and a slightly longer pedicle than

Table 4. Additional Series in the Literature Investigating Anterolateral Thigh Unreliability Based on Clinical Experience*

Parameter	Kimata, 1998	Rozen, 2009	Hsieh, 2009	Hong, 2010	Lin, 2010	Current Study
Purpose	Various defects	Various defects	Head and neck	Various defects	Various defects	Lower limb
Type	Free + pedicled	Free	Free	Free	Free	Free
ALT planned	70	44	923	564	250	547
Absent perforator	4	–	10	8	12	12
Small perforator	–	5	–	–	–	14
Injured perforator	–	–	–	4	–	4
Percentage	5.4	11.4	1.1	2.1	4.8	5.5

ALT, anterolateral thigh flap.
*Studies that relied on computed angiography and cadaveric dissection were not included.

Table 5. Characteristics of Flaps Derived from the Lateral Circumflex Femoral Artery System of the Thigh

Characteristic	ALT	TFL	AMT
Pedicle length, cm	12	5	5–10
Composition	SC, MC	MC	SC
Max. dimensions, cm	35 ×15	25 × 15	25 × 15
Thickness	++	+++	+/++
Dissection time	Moderate	Shorter	Variable
Advantage	Chimeric can be thinned	Fascia	Thin and pliable
Disadvantage	Intramuscular dissection	Shorter pedicle bulky	No fascia

ALT, anterolateral thigh; TFL, tensor fasciae latae; AMT, anteromedial thigh; MC, musculocutaneous; SC, subcutaneous.

tensor fasciae latae, we generally prefer the tensor fasciae latae for aforementioned reasons. The anteromedial thigh is more preferable when a thin flap is needed, such as in periarticular and foot defects.

Of course, another option is to approach the contralateral thigh sooner. Early abandonment of the ipsilateral thigh tensor fasciae latae and anteromedial thigh in favor of a contralateral flap in all cases could obviate the need for a vein graft for the tensor fasciae latae or anteromedial thigh in the mere 51 percent of cases where its perforator exists.[28] However, it also necessitates invasion of contralateral tissue, which we feel should be left in its virgin state when possible. Finally, the possibility of symmetrically challenging anatomy in the contralateral thigh encourages us to include the whole of the vastus to maximize vascular supply to the skin paddle, and the resultant flap may be bulky or unreliable.[9,31,32]

In summary, the anterolateral thigh flap is preferred at this institution for lower extremity flap reconstruction. When confronted with variations in vascular anatomy, the anterolateral thigh may not be an option, despite reassuring preoperative Doppler signals. Fortunately, the versatile lateral circumflex femoral artery system confers reliable backup strategies that result in similar outcomes through the same incision. We follow an algorithm tailored by our vast experience with thigh dissection that ensures good outcomes when the anterolateral thigh is not an option.

We do not rely on preoperative computed tomography or fluoroscopic angiography. Admittedly, imaging would alert the surgeon of surprises before they occur. Although preoperative guidance might save time and anxiety in one of 20 anterolateral thigh flaps raised, the skilled microsurgeon should be prepared to devise an alternate strategy on the fly that promises comparable outcomes when an alternate flap is used. In vivo real-time fluorescence angiography may serve a role in contingency flap design, but this role has yet to be determined.

CONCLUSIONS

The anterolateral thigh flap is our preference in lower extremity reconstruction. In 5.5 percent of planned anterolateral thigh reconstructions, perforators are unreliable, absent, or injured. The value of emergent backup plans may be underestimated. Contingency flaps, including the tensor fasciae latae, anteromedial thigh, and contralateral vastus lateralis myocutaneous flaps, generate outcomes comparable to those of planned flaps when our algorithm is used.

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