A Cautionary Point in the Harvest of the Anterolateral Thigh Myocutaneous Flap

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Abstract: The anterolateral thigh myocutaneous flap is a versatile flap used for a variety of defects. The flap is usually harvested based on the descending branch of the lateral circumflex femoral artery. However, although the muscle is always reliable, sometimes the skin component is nonviable. The reason for this is that in a minority of patients, the skin in the lateral thigh is supplied by the perforators that originate directly from a source other than the descending branch of the lateral circumflex femoral artery, on which the flap is based. This case report illustrates this anatomic anomaly. We propose slight technical modifications when harvesting the anterolateral thigh myocutaneous flap to safeguard against such variations in the blood supply to the lateral thigh skin. With this modification in the technique of flap harvest, we have consistently been able to safely and reliably perform this flap.

Key Words: anterolateral thigh, myocutaneous flap, vastus lateralis, rectus femoris, lateral circumflex femoral artery, variation, anatomy, safety

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The anterolateral thigh (ALT) region has increasing been adopted as a "warehouse" of flaps for a variety of reconstructive needs.[1–5] Skin, fascia, and muscle in a variety of configurations can be harvested from this area with minimal donor morbidity.[6,7] The ALT myocutaneous flap is a popular flap affording the harvest of a large volume of skin, subcutaneous tissue, and muscle and is ideal when a large flap is needed.[4,8,9] Although the ALT perforator flap is known for its anatomic variability and unpredictability, harvest of the ALT myocutaneous flap is reputed to be relatively straightforward.[8–10] Although the conventional technique of harvesting the ALT myocutaneous flap assures the survival of the muscle, the inclusion of the vessel nourishing the skin component is not always guaranteed. This report highlights the anatomic variations in the blood supply to the skin of the lateral thigh that explains why the skin component may not be vascularized despite the inclusion of a significant amount of muscle with the ALT myocutaneous flap. A slight modification of the technique of harvest of this flap is described as a safeguard against such anatomic anomalies.

CASE REPORT

A 45-year-old man presented with a T2 buccal cancer. A hemiglossectomy, wide excision of the cheek, and modified radical neck dissection was performed. Reconstruction with an ALT myocutaneous flap with a small amount of muscle was planned to obliterate dead space in the neck. Preoperatively, handheld Doppler examination was performed to mark the locations of the cutaneous vessels (Fig. 1). The medial incision was made and 2 sizable perforators were noted apparently with a short intramuscular course from the descending branch of the lateral circumflex femoral artery (LCFA), making for a relatively easy and expedient flap dissection (Fig. 2). However, when the perforators were traced intramuscularly (as was our standard practice even when raising myocutaneous flaps), they were noted to converge and subsequently take a cephalad course to join the LCFA without any sizable vascular connections with the descending branch (Figs. 3, 4). The flap was harvested with a small cuff of vastus lateralis (VL) muscle based on 2 perforators and the descending branch was left in situ. The pedicle was 8 cm long with the 1 artery and 2 veins measured 1.5 mm, 1.5 mm, and 1.0 mm, respectively, and was adequate for microsurgical anastomosis. Reconstruction was completed uneventfully and the patient was well at 8 months follow-up.

DISCUSSION

The anatomic variation of the cutaneous supply to the lateral thigh is well known.[2,10] In fact, the ALT perforator flap is notorious for this and is one of the main barriers to its widespread adoption in many centers.[5] The ALT myocutaneous flap on the other hand is said to be relatively straightforward and reliable.[8,9] Not much has been reported in the literature on anatomic variations of relevance to the harvest of ALT myocutaneous flaps. This blood supply of the VL muscle itself based on the descending branch of the LCFA is certainly reliable. However, the same cannot be said of the skin component. As illustrated by this case, the inclusion of a generous cuff or even all of the VL muscle will not capture the cutaneous supply of the lateral thigh as both perforators supplying the lateral thigh skin originated directly from the LCFA. Harvesting the ALT myocutaneous flap in the "blind" conventional way in this case would inevitably result in complete loss of the skin component as one could imagine (Fig. 2).

In their analysis of 74 cases of ALT perforator flaps, Kimata et al proposed 8 types of branching patterns.[10] In his article, he noted that main perforators supplying the lateral thigh skin originated from a source other than the descending branch of the LCFA in as much as 14.3% of cases (Kimata types 4, 5, 6, and 7). Such classification, albeit a little cumbersome, is of interest when harvesting the ALT perforator flap. For the harvest ALT myocutaneous flap however, the critical anatomic point is whether the main cutaneous perforators arises from the descending branch of the LCFA or arises from a separate source. The former would correspond to Kimata types 1, 2, 3, and 8 whereas the latter to Kimata types 4, 5, 6, and 7. Harvesting the ALT myocutaneous flap with a cuff of muscle with the descending branch of the LCFA as the pedicle would be feasible in types 1, 2, 3, and 8 but not in types 4, 5, 6, and 7. Kimata et al also noted that all perforators that originated directly from the LCFA were located proximal to the 0.4 mark in the line between the anterior superior iliac spine and the superolateral corner of the patella. In our experience, this is not the case. As shown in Figure 1, even more distally located perforators can have this branching pattern. Suffice to say, one can never be sure no matter how distal in the thigh or

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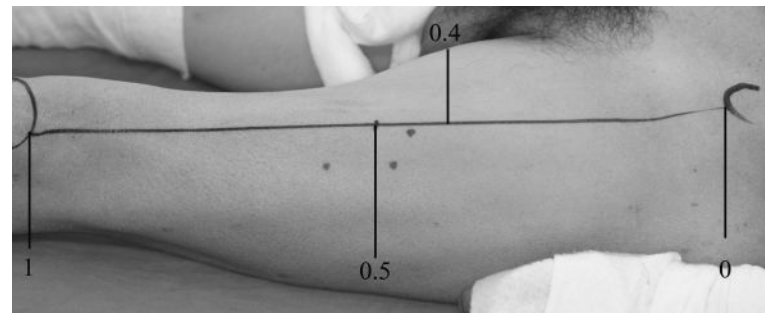

FIGURE 1. Preoperatively, the locations of significantly sized perforators were identified with a handheld Doppler. The point 0.5 marks the midpoint of the line from the anterior superior iliac spine and the superolateral border of the patella. Kimata et al noted in their study that perforators originating from a source other than the descending branch of the LCFA are located proximal to the 0.4 point. This was, however, not the case in this patient as was noted subsequently.

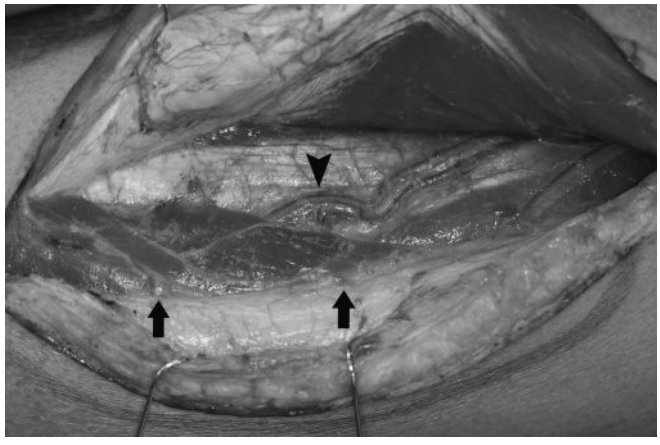

FIGURE 2. Intraoperatively 2 sizable musculocutaneous perforators were located (arrows). These were located beyond the midpoint of the ASIS and superolateral corner of the patella and seemingly originated from the descending branch of the LCFA (arrow head) with just a short intramuscular course.

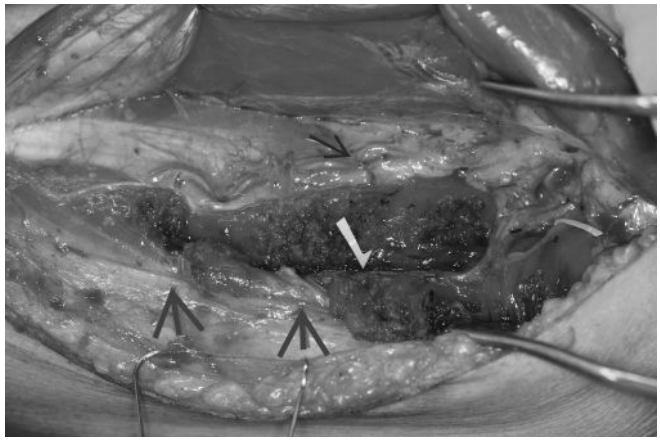

FIGURE 3. When traced intramuscularly, the perforators (bottom arrows) converged and traveled cephalad without any vascular connections with the descending branch (top arrow) and joined the LCFA directly (middle arrow).

how close the perforators are located relative to the descending branch. One should always check by deroofing the muscle over the perforators.

In the conventional technique of harvesting the ALT myocutaneous flap, the medial incision is made and the skin flap elevated

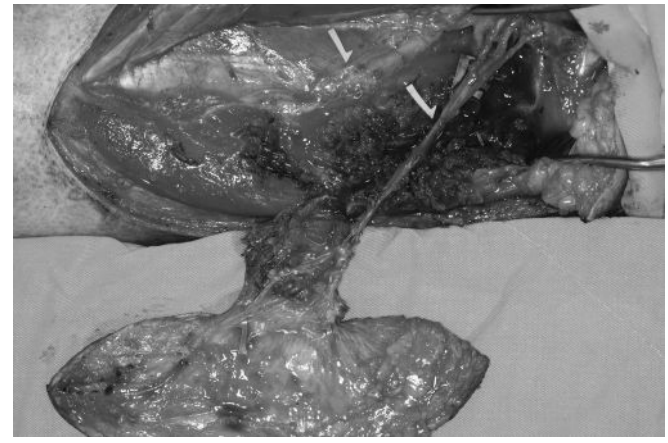

FIGURE 4. The ALT myocutaneous flap was harvested based on the musculocutaneous perforator from the LCFA. The larger descending branch was left in situ.

subfascially until the intermuscular septum between the rectus femoris and the VL is reached.[2,8,9] Ideally the septocutaneous vessel running within this septum is identified but this is not mandatory. The intermuscular septum is the opened and the descending branch of the LCFA is then identified. A segment of the VL muscle and the overlying skin is then taken with the descending branch. This blind approach is an easy and straightforward way of harvesting the flap and would reliably include the perforators supplying the skin in majority of cases where these perforators originate from the descending branch. However, it would fail in a minority of patients with perforators supplying the skin originating directly from a source other than the descending branch, such as from the transverse branch, the LCFA itself, or directly from the profunda femoral artery.

Based on our sizable experiences of harvesting flaps in the ALT region,[2] we have made slight modifications in the way the ALT myocutaneous flaps are harvested to safeguard against such anatomic anomalies. The skin flap is first elevated subfascially until the intermuscular septum between the RF and the VL is reached. Then the septum is explored and the septocutaneous vessel and the myocutaneous perforator supplying the skin identified and selected to base the skin flap on. The septum is then opened and the descending branch of the LCFA identified. One or 2 of the most sizable perforators are traced proximally by unroofing the muscle or septum over the perforator to its origin. In majority of cases, these would originate from the descending branch of the LCFA and the muscle proximal and distal to these perforators is then cut to be included with the flap, at all times keeping the locations of the perforators in sight (Fig. 5). If the perforators originate directly from the LCFA, then 2 options exist. If only a small amount of muscle is

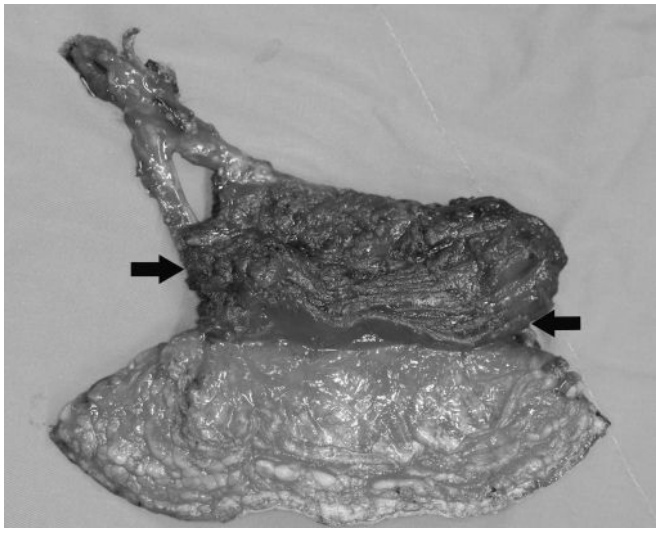

FIGURE 5. Our modified technique of harvesting the ALT myocutaneous flap entails firstly deroofing the perforators to see its exact course followed by cutting the muscle around these perforators to ensure a continuous blood supply from the pedicle to the muscle to the skin. These may result in the perforators located at the edge of the muscle flap as illustrated here (arrows).

needed, the flap can be harvested based on this perforator taking a small cuff of muscle surrounding the perforator, which it will reliably supply. The descending branch is left in situ. If a more significant amount of muscle is needed, the ALT myocutaneous flap would have to be harvested based on the LCFA itself incorporating both the descending branch and the perforator to the skin. More importantly, in this situation, unroofing the muscle over the perforators to the skin allows the surgeon to have a constant bearing on the course of the perforator supplying the skin thereby preventing him from inadvertently cutting it while harvesting the VL muscle. Rarely, if the perforators supplying the skin originates directly from the profunda femoral artery (Kimata type 7, 1.4% of cases), then the ALT myocutaneous flap may have to be based on both the descending branch and the branch that originates from the profunda femoris (necessitating 2 sets of microvascular anastomoses).

Although this approach adds a little to the duration of surgery, we believe that this is a safer and more reliable way of harvesting the ALT myocutaneous flap. With maturation of perforator flap techniques, in particular, that of intramuscular perforator dissection, the risk of perforator injury during exploration of these vessels should be minimal.

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