Five Simple Techniques to Enable Rapid Elevation and Donor Site Closure of the Anterolateral Thigh Flap

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Abstract

Keywords

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- microsurgery
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- technical point

We describe five technical notes to facilitate rapid elevation of the anterolateral thigh flap for extremity reconstruction. We highlight the advantages of (1) a lateral approach; (2) identification of the perforator with the shortest intramuscular distance; (3) deroofting technique with cutting monopolar for pedicle dissection; (4) taking a cuff of vastus lateralis in some cases to avoid unnecessary long perforator dissection; and (5) closure of large donor sites with a modified keystone flap. Using the sequence reduces flap-raising times to 60 to 90 minutes and improves theater usage while achieving excellent outcomes.

Introduction

The anterolateral thigh (ALT) flap is one of the workhorse flaps for extremity reconstruction.¹ In approximately 80% of cases, the flap has a musculocutaneous perforator that traverses the vastus lateralis. Furthermore, in most cases, there is a short musculocutaneous perforator of 3 to 5 cm through the muscle from the descending branch of the lateral circumflex femoral artery, although in some variants, a longer intramuscular course can be found. Consequentially the intramuscular dissection can be tedious, particularly with the heatsink bipolar technique. Here we describe five simple surgical steps to facilitate efficient ALT flap elevation and reduced operative time.

Technical Point

The standard flap elevation technique used by most groups is through a medial approach, thereby enabling visualization of the septum between rectus femoris (RF) and vastus lateralis (VL) in a subfascial plane. However, we adopt a suprafascial lateral approach. The fat over the lateral thigh is thinner which can be beneficial in patients with thicker thighs allowing a faster and bloodless elevation. Perforators are identified and marked with hand-held Doppler

pre-operatively. The incision for this approach is then made vertically down to fascia. Once this avascular lateral plane is identified the perforators are readily visualized and the surgeon can commit to the medial incision to identify the RF/VL septum through fascial incision. When switching to a medial approach we opt for either a supra- or sub-fascial technique. For dorsum of foot or hand reconstruction we opt for a suprafascial approach as this allows for a thinner flap. Subfascial harvest is often employed where flap thickness is not important.

Once the RF/VL septum is identified, the feeding vessel to the isolated perforators are found deep in the intermuscular septum. We agree with Saint-Cyr that it is often easier to identify the RF/VL septum with a distal extension.² However, we also extend the incision proximally with a lazy-S incision to provide additional exposure for maximal pedicle length and ease of pedicle preparation. Like Saint-Cyr and colleagues we try to identify the most proximal perforator, which often has the shortest intramuscular course.

Many departments routinely use bipolar cautery to dissect free the musculocutaneous perforators. However, this technique is often cumbersome and can waste time navigating through perforators with a long intramuscular course. Even with careful use of bipolar cautery and heat sinking, using DeBakey forceps, there remains a risk of thermal damage to the pedicle which is

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amplified by dissection of multiple side branches over a long pedicle length dissection. Thermal damage can be limited by using ligaclips to divide the side branches enabling a faster pedicle dissection. In contrast to bipolar dissection we prefer using tenotomy scissors to make windows between the side branches, and thereby *walk* the tenotomy scissors along the pedicle

to release it as far as the RF branch. This enables us to rapidly achieve pedicle lengths of >10 cm ($\blacktriangleright$ Fig. 1).

For intramuscular dissection, we use the deroofting technique popularized by Wei and colleagues.³ The tenotomy scissors are slid directly over the perforator to create a tunnel. Monopolar diathermy is then carefully used over

Fig. 1 (A) Lateral avascular plane for ALT elevation; (B) identification of perforator; (C) rectus femoris and vastus lateralis septum with descending branch of lateral circumflex femoral artery identified. The most proximal perforator identified (white arrow) with shorter intramuscular course; (D) dividing side branches with Ligaclips (black arrow) and walking tenotomy scissors along the windows between side branches. ALT, anterolateral thigh.

Fig. 2 (A) VL (black arrow) with tenotomy scissor slid over the perforator (white arrow) and deroofted with cutting monopolar. (B) Suprafascial flap elevation with perforators deroofted leaving VL intact. (C) Proximal incision will help dissection to the RF branch and facilitate easier dissection of a long pedicle. (D) A cuff of vastus can be taken to fill in dead space over a soft tissue defect and can also simplify flap elevation. RF, rectus femoris; VL, vastus lateralis.

Fig. 3 The sequence of ALT donor site closure with modified Keystone flap. (A) Donor site defect. (B) Modified Keystone flap design to facilitate closure of the central defect. (C) Immediate post-operative view of donor site. (D) Post-operative view of donor site at 9 months. ALT, antero-lateral thigh.

the tenotomy scissor to *deroof* the perforator. This both facilitates swift skeletonization of the perforators avoiding tedious dissection and limits the risk of iatrogenic thermal damage to the pedicle (►Fig. 2). Although in some cases, such a dorsal hand degloving injuries, a thin suprafascial flap is most suitable, in some cases, a cuff of vastus lateralis around the perforators is required to fill dead space at the recipient site. We have found that this expedites pedicle elevation and taking a partial segment of VL does not cause any significant donor site complications. We have previously demonstrated no donor site morbidity when using the entire VL for abdominal hernia reconstruction.⁴

Finally, when the width of the ALT flap donor site is >10 cm, primary closure may not be achievable. Instead of using a split thickness skin graft, which can leave an unsightly scar, we recommend a modified Keystone flap^{5,6} at the defect area of maximal width. This involves modifying the type I keystone flap with up to double the flap to defect ratio, which facilitates primary closure and improved donor site morbidity (►Fig. 3). This is based on the idea that the Keystone flap is reliant on the viscoelastic properties of skin with the element of soft tissue stretch facilitating its ability to close defects, rather than a V–Y type closure.^{6,7}

These steps have been developed from the extensive experience our unit has with lower limb trauma reconstruction. Although these techniques are well described individually, following them judiciously in the above sequence can limit flap elevation time to 60 to 90 minutes, enabling the surgical team to achieve a flap reconstruction on a half-day trauma

list, which in turn facilitates more than one microsurgical reconstruction in a day.

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Conflict of Interest

None.

References

- 1 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(7):2219–2226
- 2 Saint-Cyr M, Oni G, Lee M, Yi C, Colohan SM. Simple approach to harvest of the anterolateral thigh flap. *Plast Reconstr Surg* 2012;129(1):207–211
- 3 ALDeek NF, Tsao CK, Kao HK, Wei FC. A technical pearl to ensure reliable harvest of the anterolateral thigh myocutaneous flap. *Plast Reconstr Surg* 2015;135(3):652e–654e
- 4 Sadigh P, Burke J, Nikkhah D, et al. 'Abdominal reanimation' and massive flank hernias: moving towards a more functional reconstruction. *J Plast Reconstr Aesthet Surg* 2018;71(6):941–943
- 5 Behan FC. The Keystone Design Perforator Island Flap in reconstructive surgery. *ANZ J Surg* 2003;73(3):112–120
- 6 Nikkhah D, Vijayan R, King I, Bayne D. Improving the reliability of the Keystone flap. *Eur J Plast Surg* 2016;39:237–238
- 7 Moncrieff MD, Thompson JF, Stretch JR. Extended experience and modifications in the design and concepts of the keystone design island flap. *J Plast Reconstr Aesthet Surg* 2010;63(8):1359–1363