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CASE REPORT

Trans-vastus Intermedius Transfer of the Pedicled Anterolateral Thigh Flap for Posterior Thigh Reconstruction

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Summary: Proximal, posterior thigh wounds from oncologic or traumatic defects can be difficult wounds to reconstruct if local flap options have been sacrificed during the trauma or oncologic resection. Free flap options to cover these defects are also difficult because of the lack of convenient recipient vessels in the region. The authors present 2 cases (oncologic and traumatic) wherein a myocutaneous anterolateral thigh (ALT) flap was harvested and tunneled from the anterior muscle compartment to the posterior muscle compartment of the thigh through a medially based transmuscular tunnel, decreasing the required pedicle distance to the wound. This technique of transmuscular tunneling of the ALT flap expands the indications and utility of the ALT flap to cover posterior thigh wounds. *(Plast Reconstr Surg Glob Open 2013;1:e81; doi: 10.1097/GOX.0000000000000024; Published online 10 December 2013.)*

The anterolateral thigh (ALT) flap has become one of the workhorse flaps in reconstructive surgery for wounds all over the body, as a pedicled or free flap. Its use as a pedicled flap has been described at length in the reconstructive literature for a variety of indications including trochanteric pressure ulcers, groin defects, perineal reconstruction, abdominal wall reconstruction, and lateral thigh defects.[1–7] When confronted with an upper posterior thigh defect, the reconstructive surgeon has limited local tissue flap options. Utilization of the ALT flap in resurfacing wounds of the posterior thigh and distal buttock is limited by its arc of rotation, even when the lateral circumflex femoral artery (LCFA) is dissected up to its origin.

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Received for publication August 30, 2013; accepted October 4, 2013.

DOI: 10.1097/GOX.0000000000000024

To circumvent these obstacles, the authors describe 2 cases (oncologic and traumatic) in which a pedicled myocutaneous ALT flap is dissected to the origin of the LCFA and a tunnel is created medial to the femur through the vastus intermedius (Fig. 1). The flap is then passed in transmuscular fashion from the anterior muscle compartment to the posterior muscle compartment (Fig. 2). There are several advantages to this approach. The direct transmuscular tunneling through the vastus intermedius allows for a shorter pedicle length required to reach the defect when compared with lateral subcutaneous tunneling of the flap to reach the posterior thigh. In addition, it potentially allows for shorter pedicle length to be dissected. Moreover, decreasing the distance to the recipient site allows for a more comprehensive and efficient use of the flap surface area. This approach mitigates the loss of a significant portion of the flap in a more circuitous lateral subcu-

Disclosure: The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the Division of Plastic and Reconstructive Surgery, Mayo Clinic, Rochester, MN.

Supplemental digital content is available for this article. Clickable URL citations appear in the text.

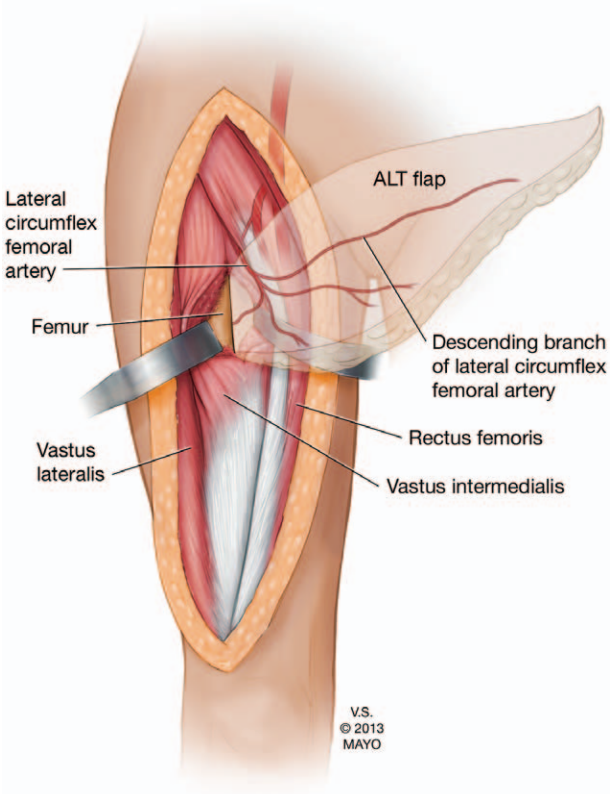

Fig. 1. A coronal illustration of the anterior thigh with a pedicled ALT flap dissected to its origin, with creation of a transmuscular tunnel through the vastus intermedius.

taneous route to the recipient site and maximizes the surface area of the flap within the defect during inset.

CASE 1

A 35-year-old woman was diagnosed with a third time recurrence of an epithelioid sarcoma of her distal buttock and proximal thigh. The tumor resection bed had been resurfaced with a split thickness skin graft (STSG) from her anterolateral thigh 3 years prior. The lack of padded tissue was very painful for her in the sitting position, and she had dealt with a chronic wound within the skin grafted wound for years (see **Supplemental Digital Content Fig. 1**, which demonstrates a chronic nonhealing wound in the skin graft and cancer recurrence, ***http://links.lww.com/PRSGO/A18***). The oncologic team performed the extirpative portion of the operation, which included en bloc resection of a 24-cm portion of her sciatic nerve that left a large 24×25 cm wound (Fig. 3). The radiation oncologist placed brachytherapy leads within the wound, and negative pressure wound therapy was applied for 3 days until the radiotherapy had been delivered. The patient was returned to the operating room, and a 15×40 cm ALT flap was harvested including a portion of the vastus lateralis for added flap bulk. The

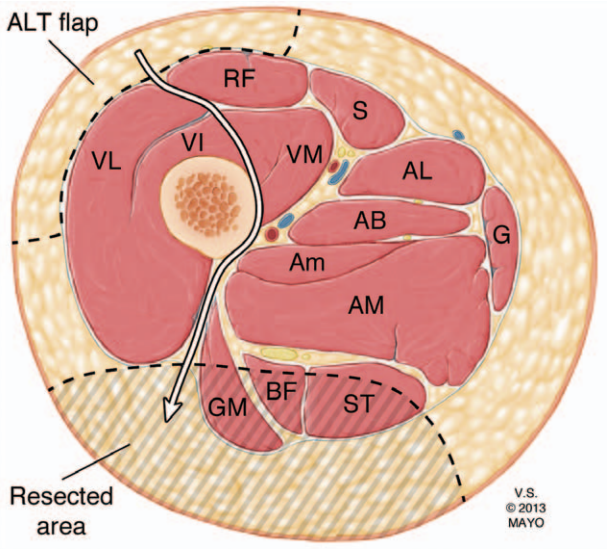

Fig. 2. An axial illustration of the proximal thigh demonstrating the anatomy of the transmuscular tunnel through which the pedicled ALT flap is passed to decrease the distance to the defect, allowing greater flexibility with insetting of the flap in the posterior thigh secondary to an increase in effective pedicle length. AB indicates Adductor Brevis; AL, Adductor Longus; ALT flap, Anterolateral thigh flap; Am, Adductor Minimus; AM, Adductor Magnus; BF, Biceps Femoris; G, Gracilis; GM, Gluteus Maximus; RF, Rectus Femoris; S, Sartorius; ST, Semitendinosus; VI, Vastus Intermedius; VL, Vastus Lateralis; VM, Vastus Medialis.

descending branch of the lateral circumflex femoral artery was dissected nearly to its origin, with division of the branch to the rectus femoris after temporary occlusion with an Acland clamp to assure muscle viability. A limited portion of the proximal vastus intermedius was released from the linea aspera of the medial femur using a Cobb elevator, creating a tunnel straight through the thigh into the base of the posterior wound (Fig. 4). The patient was then positioned in lateral decubitus position. The flap was transposed

Fig. 3. Photograph showing a large defect in the posterior thigh after tumor extirpation. The defect measured 20×25 cm, even with partial primary closure medially and inferiorly.

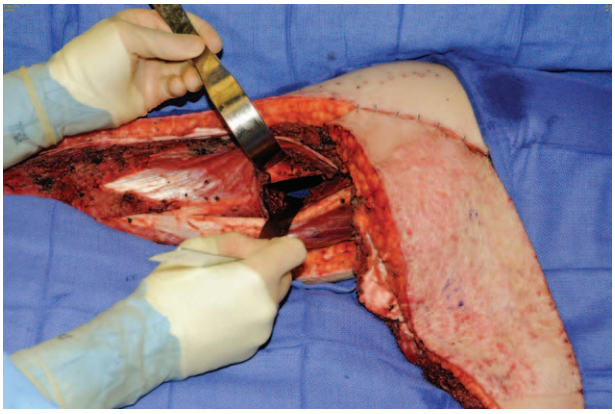

Fig. 4. View of the dissected pedicled ALT flap with exposure of the transmuscular tunnel through to the posterior thigh. Note that even though the donor site is from the lateral thigh, the pedicle origin is medial to the femur.

Fig. 5. Final intraoperative view of the flap inset. Because of an increase in the effective pedicle length, the flap was inset longitudinally, making the most of flap volume to fill the entire defect. The majority of the lateral thigh flap epidermis is a healed split thickness skin graft donor site from her previous operation.

from anterior to posterior through the tunnel medial to the femur in a sterile plastic bag, being careful to protect the pedicle. The flap was then inset with no tension after the wound edges were advanced with progressive tension sutures (Fig. 5). The donor site was covered with a large STSG. The patient recovered on a low air loss mattress in the prone position for 5 days, and then her activity was slowly progressed. She recovered uneventfully from the surgery (see **Supplemental Digital Content Figs. 2 and 3**, which show the healed flap and donor site at 8wk, ***http://links.lww.com/PRSGO/A18***), although with substantial lower extremity morbidity from the oncologic sacrifice of a long segment of her sciatic nerve.

CASE 2

A 15-year-old boy sustained a shotgun wound to the posterior thigh. Small debridements and dressing changes were initiated, and after 7 days, he was referred to plastic surgery as the wound was not healing. Wound exploration revealed nonviable hamstring and gracilis muscles. A thorough debridement was performed of all nonviable tissues. The sciatic nerve was exposed for a length of 10cm with significant dead space and inflammation (see **Supplemental Digital Content Fig. 4**, which shows an intraoperative photograph of the posterior thigh after debridement of the shotgun wound with an exposed segment of sciatic nerve, ***http://links.lww.com/PRSGO/A18***). The patient had a neurologic deficit in the sciatic distribution, but it was unclear how much he would recover. No local flap options were available to cover the nerve. After repositioning, a myocutaneous ALT flap with approximately 75% of the vastus lateralis was elevated. The flap was harvested and the transmuscular tunnel was created as described in Case 1. The flap was then directed through the tunnel (See **Supplemental Digital Content Fig. 5**, which shows the pedicled ALT flap being directed through the transmuscular tunnel to the posterior thigh, ***http://links.lww.com/PRSGO/A18***). Because of considerable edema in the anterior thigh, the donor site was partially closed, and remaining exposed muscle skin grafted. The patient was then positioned prone, and the flap was examined. It was under no tension and the color of the muscle was excellent. The muscle portion of the flap covered the exposed sciatic nerve completely, and the skin paddle was inset (see **Supplemental Digital Content Fig. 6**, which shows the final intraoperative photograph of the flap inset into the posterior thigh wound, ***http://links.lww.com/PRSGO/A18***). The patient's postoperative course was uneventful (see **Supplemental Digital Content Figs. 7 and 8**, which show the healed flap and donor site at 12wk, ***http://links.lww.com/PRSGO/A18***). He did not recover sciatic nerve function, and is walking with the aid of a cane, but is participating in his school's wrestling team. Interestingly, a postoperative electromyogram was performed to investigate the degree of sciatic nerve recovery, and it demonstrated neurotization of the transposed vastus lateralis as its motor nerve was not divided during harvest. This finding demonstrates the potential for functional muscle

reconstruction of the hamstrings with a pedicled vastus lateralis utilizing the technique of transmuscular tunneling.

KEY POINTS FOR FLAP HARVESTING

Myocutaneous flaps were used to provide volume and better flap contour, protect underlying structures, and decrease dead space. The ALT flap could be harvested as a fasciocutaneous flap only depending on the defect size and location. There are some limitations to this technique. If the posterior compartment wound is missing skin only, the flap pedicle would have to be longer to reach the surface area of the defect; therefore, the pedicle of the ALT flap would have to be dissected as proximally as possible to provide the longest effective pedicle length to allow the flap to reach the surface of the defect. Additionally, careful attention needs to be paid during the tunneling process to avoid pedicle injury, and the sterile bag technique offers an effective way of minimizing shearing forces at the muscle–skin paddle interface. Finally, when reconstructing defects with large ALT flaps, it is likely that an STSG will be required to cover the donor site. If cosmetic objections arose, serial excision of the STSG could be performed.

SUMMARY

This is the first report demonstrating the anterior to posterior tunneling of a pedicled ALT flap for oncologic and traumatic wounds. Lee et al[8] described the transmuscular tunneling of the ALT flap for 16 recurrent ischial pressure ulcers (largest flap size 12×6 cm). They had 1 flap loss. These case reports and series from Lee et al[8] highlight the utility of the ALT flap for covering a wide range of defects including large posterior thigh defects. Because of the limited arc of rotation through lateral subcutaneous tunneling, a more direct approach allows for coverage of larger defects posteriorly and allows the reconstructive surgeon more flexibility when insetting the flap.

It could be argued that harvest of a myocutaneous ALT flap is morbid, especially when the leg is already impaired from the oncologic or traumatic wound. In addition, partial release of the origin of the vastus intermedius could cause additional morbidity. However, our patients did not complain of significant morbidity from vastus lateralis transfer and the partial release of the origin of the vastus intermedius. In fact, in our 2 presented cases in which there has been significant loss of the hamstrings, any compromise of the quadriceps would only help the remaining hamstrings as there would be less contrasting forces on the knee.

CONCLUSION

The pedicle ALT flap has enjoyed increasing popularity and has been used for coverage of numerous defects. Its application for posterior thigh defects via anterior to posterior thigh tunneling simply increases its utility and range of applications. This technique will increase the armamentarium of the reconstructive surgeon when confronted with complex posterior thigh defect coverage. A larger clinical series is ongoing to corroborate these positive results.

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REFERENCES

1. Nthumba P, Barasa J, Cavadas PC, et al. Pedicled fasciocutaneous anterolateral thigh flap for the reconstruction of a large postoncologic abdominal wall resection defect: a case report. *Ann Plast Surg.* 2012;68:188–189.
2. Hsu H, Chien SH, Wang CH, et al. Expanding the applications of the pedicled anterolateral thigh and vastus lateralis myocutaneous flaps. *Ann Plast Surg.* 2012;69:643–649.
3. Nosrati N, Chao AH, Chang DW, et al. Lower extremity reconstruction with the anterolateral thigh flap. *J Reconstr Microsurg.* 2012;28:227–234.
4. Neligan PC, Lannon DA. Versatility of the pedicled anterolateral thigh flap. *Clin Plast Surg.* 2010;37:677–681, vii.
5. Lannon DA, Ross GL, Addison PD, et al. Versatility of the proximally pedicled anterolateral thigh flap and its use in complex abdominal and pelvic reconstruction. *Plast Reconstr Surg.* 2011;127:677–688.
6. Saint-Cyr M, Uflacker A. Pedicled anterolateral thigh flap for complex trochanteric pressure sore reconstruction. *Plast Reconstr Surg.* 2012;129:397e–399e.
7. Cheng A, Saint-Cyr M. Split and thinned pedicle deep inferior epigastric perforator (DIEP) flap for vulvar reconstruction. *J Reconstr Microsurg.* 2013;29:277–282.
8. Lee JT, Cheng LF, Lin CM, et al. A new technique of transferring island pedicled anterolateral thigh and vastus lateralis myocutaneous flaps for reconstruction of recurrent ischial pressure sores. *J Plast Reconstr Aesthet Surg.* 2007;60:1060–1066.