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Adipofascial Anterolateral Thigh Free Flaps For Oncologic Hand and Foot Reconstruction

Katie Weichman, MD², Robert J. Allen Jr., MD³, Vishal Thanik, MD², Evan Matros, MD, MMSc¹, and Babak J. Mehrara, MD¹

¹The Department of Surgery, Division of Plastic and Reconstructive Surgery, Memorial Sloan-Kettering Cancer Center, New York, New York

²The Department of Plastic Surgery, New York University Langone Medical Center, New York, New York

³The Department of Surgery, Division of Plastic and Reconstructive Surgery, Montefiore Medical Center, Bronx, New York

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Introduction

The anterolateral thigh flap (ALT) was first described in 1984 for use in patients suffering neck burn contracture.¹ Since that time it has proven to be advantageous in numerous different reconstructive scenarios. Despite this versatility, one criticism of the ALT is the propensity for flap thickness adjustments. Several solutions to this problem have been proposed: primary thinning, secondary liposuction, and, recently, the adipofascial ALT flap (aALT).

The aALT is harvested in a similar fashion to the standard fasciocutaneous ALT; however, the skin and subcutaneous adipose tissue are removed from the flap prior to transfer, leaving an ultra-thin flap on the range of 0.5-2.8-cm.² Herein, we describe our experience using the aALT for reconstruction of oncologic defects of the hand and foot.

Patients and Methods

After obtaining an IRB waiver, a retrospective review of patients undergoing free aALT reconstruction of oncologic extremity defects at a single academic medical center between January of 2005 and January of 2014 was performed. Patients were included if they underwent an aALT reconstruction of the hand or foot and had at least six months follow up. All reconstructions were performed by two senior surgeons (BM and EM). Patients were

Corresponding Author: Babak J. Mehrara, MD, Memorial Sloan Kettering Cancer Center, Plastic and Reconstructive Surgery, 1275 York Avenue, New York, NY 10065, O: (212) 639-8639, mehrarab@mskcc.org.

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then analyzed based on age, body mass index (BMI), type of primary tumor, defect size, flap size, size of flap vein and artery, recipient vessel type, ischemia time, complications, and need for revisionary surgery.

Operative Technique

The ALT is marked and dissected in the customary fashion. The desired fascial dimensions are centered on the skin perforator and the skin paddle is marked to allow for primary closure. Once identified, standard perforator dissection is performed. The flap is then thinned in situ while leaving approximately 4-mm of fat on the fascia. Care is taken to identify and ligate (rather than cauterize) the perforator exiting the fascia and entering the overlying skin and subcutaneous tissues. The flap is then harvested and inset. A split-thickness skin graft is obtained from discarded skin paddle and is secured to the surrounding skin without a bolster dressing.

Results

Seven patients (5 males, 2 females) underwent reconstruction of extremity defects with free aALT, however one patient was excluded secondary to lack of appropriate follow up. The average patient age was 41.7 -years (range: 22-72-years), and the mean BMI was 29.0-kg/m² (22.6-34.8-kg/m²). Three flaps were used for hand defects and three flaps for dorsal foot defects. Defects ranged from 24 to 140-cm² (mean=54.2-cm²). The average flap size was 112.0-cm² (range: 90-140-cm²). All flaps were based on a single perforator. Average artery size was 2-mm (range: 1.5-2.5-mm) and vein size 3-mm (range 2-4-mm). The average ischemia time was 80.75-minutes (range 60-106-minutes). Two patients (33%) required reconstruction of toe extensor tendons and zero patients required revisionary surgery. (Table 1)

Post-operatively, patients with lower extremity defects were non-weight bearing to the affected extremity. Dangling was permitted on postoperative day 14 under direct observation with longer elevation time prescribed as necessary. Once the patient was able to dangle the extremity without signs of vascular compromise to the flap, they were advanced from toe-touch to full weight-bearing as tolerated.

Complications included a hypertrophic scar (n=1), wound dehiscence requiring a return to the OR for a first dorsal metacarpal artery/FTSG for exposed bone (n=1), and wound infection (n=1). There was no incidence of flap loss in this series and all patients demonstrated excellent functional recovery after an average follow up time of 52.5-months. There were no donor site complications observed.

Case Example

A 32 year old man with a spindle cell sarcoma on the dorsum of his left foot underwent wide local excision including skin, subcutaneous tissues, tendons, and periosteum thereby exposing the metatarsal bones (Figure 1). The extensor tendons were reconstructed by orthopedic surgery using free fascial graft from anterolateral thigh. A 5 × 22 cm aALT flap on a single dominant perforator was used. The flap was thinned in situ (Figure 2) and

anastomosed to the dorsalis pedis artery and vein. A split thickness skin graft was harvested from the discarded flap skin and meshed 1:2 (Figure 3). The patient had no postoperative complications and required no further intervention returning to full ambulation by 1 month (Figure 4).

Discussion

The ALT is a reliable reconstructive option for defects throughout the body; however, its use is often criticized secondary to flap bulkiness. To abate this problem, the aALT, which can be as thin as 5-mm, has been described.² Agostini et al. proposed three indications for the use of the aALT including: oral cavity defects, extremity reconstruction, and facial atrophy.³ In this series, we describe our use of the aALT for reconstruction of extremity defects following oncologic extirpation.

While several series have described using aALTs for reconstruction of defects throughout the body, here we look specifically at oncologic defects of the extremity.⁴⁻¹⁰ These defects have unique reconstructive concerns including: the need for radiation therapy, presence of a gliding surface for the underlying tendons, and low profile tissue.

The aALT is beneficial in our population for several reasons. First, our patient population is generally heavier (BMI of 29.0-kg/m²), resulting in flaps that cannot be safely thinned to an appropriate degree. Second, and like other series, we feel that the blood supply of the aALT via the fascial plexus is more robust than the dermal plexus of the thinned ALT.³ Third, the ability to use extra fascia for the reconstruction of locally affected tendons, its pliability, low-contour, ease of harvest and inset and the ease of which tendons glide underneath the flap following reconstruction.

While there are many advantages to this technique, the need to harvest a skin graft for coverage of the aALT remains the main deterrent. However, the split thickness skin graft was harvested from the skin paddle in all cases and all donor sites were closed primarily.

Conclusion

The free aALT is pliable, consistently provides a long pedicle, has few complications, and reduces the bulk frequently associated with standard ALTs. For these reasons, we feel it is an ideal reconstructive option for oncologic extremity defects.

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Figure 1. Dorsal foot defect after excision of spindle cell carcinoma with exposed bone

Figure 2. Flap thinning demonstrating thickness of fascial anterolateral thigh flap

Figure 3. Meshed split thickness skin graft on fascial anterolateral thigh flap

Figure 4. One -year postoperative appearance

Table 1**Patient Characteristics**

Patient	Age (years)	Sex	Tumor Histology	Tumor Site	Follow up (months)	Defect Size (cm ²)	Skin Paddle (cm ²)	Prior Irradiation	Postop Irradiation
1	29	M	Epithelioid Sarcoma	Dorsal Thumb	99	24	90	No	No
2	46	F	Leiomyosarcoma	Thumb	94	27	132	No	No
3	29	M	Dermatofibrosarcoma protuberans	Dorsal foot	96	49	105	No	No
4	52	M	Myxoinflammatory fibroelastic sarcoma	Dorsal foot	10	45	100	No	Yes
5	72	F	Myxoinflammatory fibroelastic sarcoma	Dorsal foot	10	140	140	Yes	No
6	22	M	Epithelioid sarcoma	Dorsal thenar eminence	6	40	105	Yes	Yes