

Suction Lipectomy During Flap Reconstruction Provides Immediate and Safe Debulking of the Skin Island

Arian Mowlavi, MD*

Richard E. Brown, MD†

Immediate suction lipectomy combined with flap reconstruction has not been reported to date. Concern of skin island compromise has swayed clinicians from attempting synchronous debulking of generous skin island tissue during primary flap reconstruction. To date, several reports have documented the safe use of liposuction during mobilization of skin flaps as a minimally invasive, undermining tool in the cervical neck area. Additionally, liposuction has been used safely as an adjunct to rhytidectomy procedures over areas containing vital structures. The authors report 2 patients in whom generous skin island tissue prevented primary closure after transposition of the flap into its recipient site. Aspiration of subcutaneous tissue in a transverse rectus abdominis musculocutaneous flap and gluteus musculocutaneous rotational flap for breast and sacral ulcer reconstructions respectively resulted in appropriate debulking of the skin island without any flap skin compromise. The findings of this report may provide impetus for further clinical investigations establishing the utility of combined suction lipectomy and flap reconstruction.

Mowlavi A, Brown RE. Suction lipectomy during flap reconstruction provides immediate and safe debulking of the skin island. *Ann Plast Surg.* 2003;51:189–193.

From *Southern Illinois University, School of Medicine, Division of Plastic Surgery, Springfield; and †Springfield Clinic, IL.

Received Sep 5, 2002, and in revised form Oct 28, 2002. Accepted for publication Oct 28, 2002.

Address correspondence and reprint requests to Dr Brown, Division of Plastic Surgery, Southern Illinois University School of Medicine, Springfield Surgical Associates, Springfield Clinic, Springfield, IL 62702.

Suction lipectomy has been extended from its introduction for aesthetic body contouring to various applications. Noncosmetic applications of liposuction have included excision of lipoma, hypertrophic insulin lipodystrophy, congenital lymphedema, and axillary hyperhidrosis, as well as evacuation of hematoma and fat necrosis.¹ Skin devascularization after liposuction is rare.² A national survey of plastic surgeons performing suction-assisted lipolysis demonstrated five cases of partial skin necrosis out of 75,591 reported cases, which translates to an incidence of only 0.006%.² This report led many investigators to conclude that neurovascular perforators from un-

derlying muscles to the overlying skin may be unharmed by mechanical agitation caused by multiple passes of a suction cannula.³

Liposuction in conjunction with standard abdominoplasty has been generally discouraged for fear of compromising the undermined superiorly based abdominal flap.^{4,5} Because the mid abdomen is devascularized from its perforators off the deep superior and inferior epigastric vessels, it must rely on random flow from the lateral abdominal wall, which is supplied by intercostal, subcostal, and lumbar perforators.⁶ Investigators feared injury to these remaining perforators, which could result in necrosis of the midabdomen skin.⁷ Despite these concerns, Matarasso⁸ demonstrated the safety of combining suction lipectomy with standard abdominoplasty in 150 retrospectively analyzed patients, observing no cases of skin necrosis. Another study of 42 patients undergoing large-volume liposuction with tumescent technique combined with extensive abdominoplasty resulted in no skin sloughing.⁹ Although liposuction-combined abdominoplasties have been associated with complications including infection, dehiscence, hemorrhage, or seroma or hematoma formation, skin necrosis has not been reported.⁵

The safety of primary suction lipectomy has been best demonstrated in liposuction-assisted rhytidectomy techniques.^{10–12} Liposuction combined with rhytidectomy can achieve safe mobilization of skin flaps without risk of skin necrosis associated with extensive undermining of skin flaps. Liposuction applications during primary rhytidectomy procedures include aspiration of the anterior neck, inframandibular jowls, and prominent cheek areas.^{13,14}

Recently, delayed suction lipectomy has been used to debulk subcutaneous tissue of pedicled or free flaps after neovascularization, with the goal of improving contour matching to the recip-

ient site or for functional improvement.¹⁵ Several case reports have been published demonstrating success with debulking of free flaps, such as a groin flap inset over the cheek or arm for improved aesthetic results and for debulking of fasciocutaneous flaps over the ankle for functional utility of fitting of shoes.^{16,17} Additionally, blunt liposuction mobilization of skin flaps has been used for head and neck defect coverage after tumor resection as a means of avoiding more invasive undermining of skin flaps.^{1,18,19}

Although initially described by Ilouz²⁰ as a technique that preserves vessels in the plane of suctioning, its use in the acute setting after flap construction has been avoided because of two poorly documented reported concerns of skin necrosis published in letter format.^{21,22} We present 2 patients in whom a generous skin island prevented closure before subsequent acute liposuction for debulking of subcutaneous tissue.

Patient Reports

Patient 1

A 65-year-old woman presented to the general surgery service with a strong family history of breast cancer and a workup notable for unilateral multifocal ductal carcinoma in situ. Because the patient was interested in contralateral reduction mammoplasty, we planned for her reconstruction to be performed in conjunction with the general surgery service using an inverted-T Wise pattern reduction mammoplasty incision for the mastectomy followed by ipsilateral pedicled transverse rectus abdominis musculocutaneous (TRAM) flap reconstruction. Although the patient maintained a generous pannus, we felt that we could complete her reconstruction safely without compromise to the flap by limiting the skin island area to the preferentially vascularized zone I. The patient's perioperative course was unremarkable throughout the mastectomy and subsequent pedicled TRAM flap elevation. On inseting the TRAM flap skin island it was observed that despite circumferential trimming of tissue bulk down to zone I, the increased depth of the transferred subcutaneous tissue prevented closure to the medially and laterally raised mastectomy skin flaps (Fig 1). Therefore, the flap was de-



Fig 1. The transverse rectus abdominis musculocutaneous flap is demonstrated after attempted inseting of the skin island. Despite circumferential trimming of tissue bulk down to zone I, the increased depth of the transferred tissue prevented closure of the medially and laterally raised mastectomy skin flaps.

bulked using suction lipectomy with a no. 6 blunt-tipped cannula using a crisscross aspiration technique. Approximately 200 ml of aspirate was removed from the subcutaneous fat deep to Scarpa's fascia (Fig 2). This allowed inseting of the TRAM flap and closure of overlying medially and laterally based skin flaps (Fig 3). The patient had partial loss of the medial skin flap created by the mastectomy. This was treated with debridement, dressing changes, and subsequent skin grafting. However, there was no fat necrosis or compromise of the TRAM flap itself (Fig 4).

Patient 2

A 38-year-old woman with paraplegia secondary to Guillain-Barré disease was admitted to the hospital for treatment of a grade IV sacral ulcer with presumed osteomyelitis. The wound was debrided and irrigated. The patient then underwent dressing changes and was placed on intravenous antibiotics. Six days later she was taken to the operating room for redebridement and closure with a rotational gluteus maximus musculocutaneous flap. After elevation and mobilization of the flap deep to the gluteus maximus muscle, inset of the musculocutaneous flap was attempted. However, the thickness of the musculocutaneous flap prevented approximation of the skin island edges to recipient skin edges. The flap was debulked using suction lipectomy with a wide Mercedes cannula. After aspiration of approximately 300 ml, the flap fit well within the



Fig 2. The transverse rectus abdominis musculocutaneous skin island was debulked using suction lipectomy with a no. 6 blunt-tip cannula using a crisscross aspiration technique. Approximately 200 ml of aspirate was removed from the subcutaneous fat deep to Scarpa's fascia.

defect, allowing easy closure. The patient's post-operative course was unremarkable, without breakdown or flap compromise.

Discussion

We present the first reported cases involving synchronous flap reconstruction and suction lipectomy for purposes of debulking the skin island acutely. We have demonstrated appropriate contouring of a TRAM flap and superior gluteal rotational musculocutaneous flap using suction lipectomy to allow for inseting into recipient sites. Furthermore, we have not observed any skin compromise despite generous aspiration of the cutaneous portion of the musculocutaneous



Fig 3. Proper inseting of the transverse rectus abdominis musculocutaneous (TRAM) flap and closure of overlying medially and laterally based skin flaps was possible after debulking of the TRAM flap skin island.

flaps using a criss-crossing pattern over the entire extent of the flap.

The deep adipose compartments contribute substantially to the overall skin island bulkiness. By aspirating in this layer, the more discrete superficial adipose compartment remains undisturbed, thus preventing contour irregularities. We recommend aspiration of skin islands below the superficial fascia (i.e., Scarpa's fascia) for several reasons. First, the larger caliber of the perforators present in the deeper tissue is more apt to resist damage from cannula trauma when compared with smaller, tapered caliber vessels located in the superficial fat layer. Second, the subdermal plexus that maintains much of the horizontal network of vessels is less apt to be injured. Finally, we recommend the use of blunt-tipped rather than cutting-tip cannulas in an effort to minimize ligation of fibrous septae that protect the vascular perforators.²³ One animal investigation has determined that the spherical, cobra, keel cobra, or Fournier tips are less harmful to neurovascular bundles than conical and spatula tips.²⁴ Finally, aspiration technique is advised to follow multiple directions to maintain random residual connective tissue attachments, which are thought to ensure adequate cutaneous vasculature.¹⁶

Safety of suction lipectomy during noncosmetic procedures was prompted initially by a favorable study performed by Teimourian and colleagues,⁴ demonstrating a lack of skin compromise using suction lipectomy to undermine in

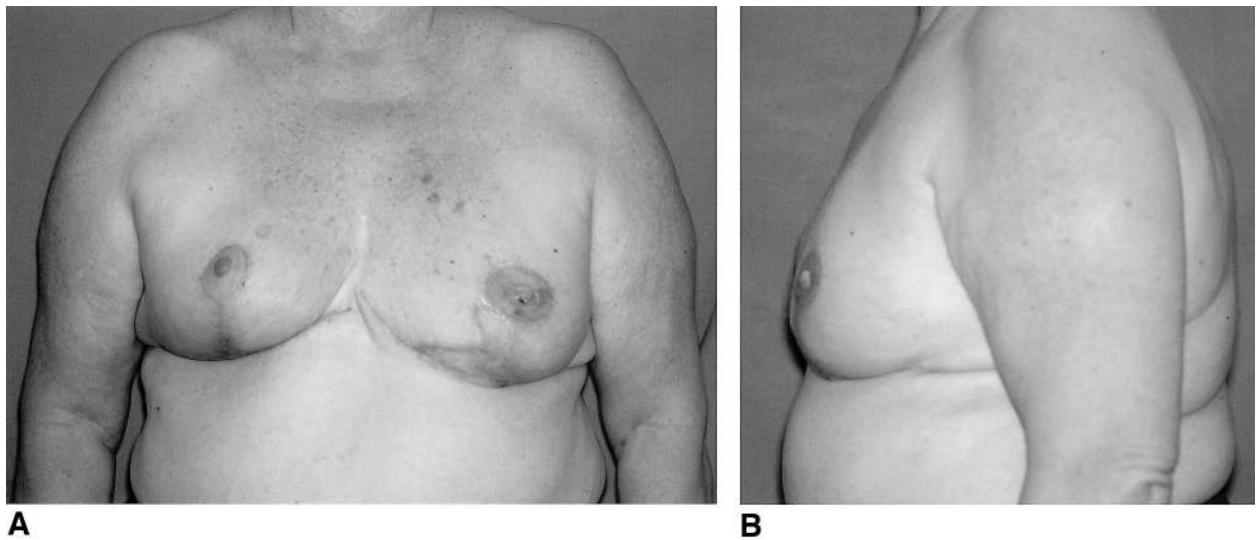


Fig 4. View of the patient at the 6-month follow-up. Despite partial loss of the medial skin flap from the mastectomy, debridement, dressing changes, and subsequent skin grafting were completed successfully. No skin island compromise or fat necrosis was observed in the transverse rectus abdominis musculocutaneous flap. (A) Anteroposterior view. (B) Lateral view.

the cervicofacial subcutaneous plane. Since this report, blunt liposuction cannula dissection has been performed clinically for the purposes of mobilizing skin flaps for skin closure as a less destructive alternative to sharp cautery dissection.¹⁸ Also, delayed suction lipectomy has been used routinely to debulk the skin island of pedicled and free flaps for both aesthetic and functional purposes. To date, a single case of partial skin necrosis has been reported and been presumed to have resulted from injury to the axial/perforator pedicle, resulting in insufficient neovascularization.²⁵ Consequently, the use of liposuction in the area of vascular pedicles has not been advised.¹⁶

Despite obvious concerns of potential damage to vascular perforators supplying skin islands during the immediate period after flap reconstruction, several investigators have questioned whether suction lipectomy could be used as a debulking measure in the acute setting. Suction-assisted lipectomy was described initially as a minimally invasive means of removing adipose tissue selectively from the subcutaneous tissues.²⁴ Liposuction cannulae were designed to glide through fatty tissue, pushing aside the fibrous septae that contain blood vessels.²⁶ This belief has been supported by a report of safe, delayed elevation of a TRAM flap after abdominal liposuction.²⁷ An animal study of porcine mus-

culocutaneous flaps has demonstrated the safety of combining immediate liposuction and flap reconstruction.²⁸ Additionally, a cadaveric perfusion study demonstrated intact vasculature of an overlying pectoralis major skin island immediately after liposuction as a pilot study.²⁹ Using synchronous liposuction during a TRAM flap as well as a gluteus musculocutaneous rotational flap reconstruction, we have observed further safety of combining these procedures. We caution that attempts at combining these procedures should be avoided in patients identified as having risk factors for flap compromise or if signs of skin island compromise are observed perioperatively. Additionally, we caution against the use of ultrasound-assisted lipectomy for fear of hyperthermic damage to neurovascular perforators. Although our experience has been limited, we think that our findings may provide the impetus for further clinical investigations establishing the utility of combined flap reconstruction and immediate suction lipectomy procedures.

References

- 1 Field LM, Skouge J, Anhalt TS, et al. Blunt liposuction cannula dissection with and without suction-assisted lipectomy in reconstructive surgery. *J Dermatol Surg Oncol.* 1988;14:1116–1122.
- 2 Teimourian B, Rogers WB. A national survey of complica-

- tions associated with suction lipectomy: a comparative study. *Plast Reconstr Surg.* 1989;84:628–631.
- 3 Emerji JF, Krupp S, Doerfl J. Is a free or pedicled TRAM flap safe after liposuction? *Plast Reconstr Surg.* 1993;92:1198. Letter.
 - 4 Teimourian B, Adham MN, Gulin S, Sapiro C. Suction lipectomy: a review of 200 patients over a six-year period and a study of the technique in cadavers. *Ann Plast Surg.* 1983;11:93–98.
 - 5 Grazer FM, Goldwyn RM. Abdominoplasty assessed by survey with emphasis on complications. *Plast Reconstr Surg.* 1977;59:513–517.
 - 6 Hester TR, Nahai F, Beegle PE, Bostwick J III. Blood supply of the abdomen revisited, with emphasis on the superficial inferior epigastric artery. *Plast Reconstr Surg.* 1984;74:657–670.
 - 7 Taylor GI, Watterson PA, Zelt RG. The vascular anatomy of the anterior abdominal wall: the basis for flap design. *Perspect Plast Surg.* 1991;5:1–4.
 - 8 Matarasso A. Liposuction as an adjunct to a full abdominoplasty. *Plast Reconstr Surg.* 1995;95:829–836.
 - 9 Cardenas–Camarena L, Gonzalez LE. Large-volume liposuction and extensive abdominoplasty: a feasible alternative for improving body shape. *Plast Reconstr Surg.* 1998;102:1698–1707.
 - 10 Teimourian B. Face and neck suction assisted lipectomy associated with rhytidectomy. *Plast Reconstr Surg.* 1983;72:627–633.
 - 11 Newman J. Liposuction tunneling in conjunction with rhytidectomy. *Am J Cosm Surg.* 1984;3:19–24.
 - 12 Shire JR, Johnson CM, Orr JB. The large flap sculptured facelift. *J Dermatol Surg Oncol.* 1988;14:1352–1356.
 - 13 Chrisman BB. Liposuction with facelift surgery. *Dermatol Clin.* 1990;8:501–522.
 - 14 Adamson PA, Cormier R, Tropper GJ, McGraw BL. Cervicofacial liposuction: results and controversies. *J Otolaryngol.* 1990;19:267–273.
 - 15 Hallock GG. Defatting of flaps by means of suction-assisted lipectomy. *Plast Reconstr Surg.* 1985;76:948–952.
 - 16 Hallock GG. Liposuction for debulking free flaps. *J Reconstr Microsurg.* 1986;2:235–239.
 - 17 Baird W, Nahai F. The use of lipoplasty in contouring and debulking of flaps. *Clin Plast Surg.* 1989;17:395–399.
 - 18 Field LM, Novy FG. Flap elevation and mobilization by blunt liposuction cannula dissection to repair temple defect. *J Dermatol Surg Oncol.* 1987;13:1302–1305.
 - 19 Field LM. Adjunctive liposurgical debulking and flap dissection in neck reconstruction. *J Dermatol Surg Oncol.* 1986;12:917–920.
 - 20 Illouz YG. Body contouring by lipolysis: a 5 year experience with over 3000 cases. *Plast Reconstr Surg.* 1983;82:591–597.
 - 21 Pfulg ME. Complications of suction for lipectomy. *Plast Reconstr Surg.* 1982;69:562–563. Letter.
 - 22 Vogt T, Dicksheet S. Suction curettage and alternatives to remove excess fat. *Plast Reconstr Surg.* 1982;69:724–725. Letter.
 - 23 Stallings JO. The defatting of flaps by lipolysis. In: Hetter GP, ed. *Lipoplasty*. Boston. Little, Brown; 1984:101–111.
 - 24 Ozcan G, Shenaq S, Baldwin B, Spira M. The trauma of suction-assisted lipectomy cannula on flap circulation in rats. *Plast Reconstr Surg.* 1991;88:250–258.
 - 25 Fisher J, Wood MB. Late necrosis of a latissimus dorsi free flap. *Plast Reconstr Surg.* 1984;74:274–281.
 - 26 Coleman WP. Non cosmetic applications of liposuction. *J Dermatol Surg Oncol.* 1988;14:1085–1090.
 - 27 Godfrey PM, Godfrey NV. Transverse rectus abdominis musculocutaneous flaps after liposuction of the abdomen. *Ann Plast Surg.* 1994;33:209–210.
 - 28 Dillerud E, Heden P. Circulation of blood and viability after blunt suction lipectomy in pig buttock flaps. *Scand J Plast Reconstr Surg Hand Surg.* 1993;27:9–14.
 - 29 Cueva R, Thomas JR, Davidson TM. Liposuction to debulk the pectoralis major myocutaneous flap. *Am J Otolaryngol.* 1988;9:106–110.