The Umbilicus Free Flap

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Summary: The morbidly obese patient has few reliable options if a single free flap is required for large surface area coverage. Usually, a latissimus dorsi muscle would be the primary option. If unavailable, a transverse-oriented abdominal flap based on deep inferior epigastric perforators as either a perforator flap or a muscle sparing type 2 transverse rectus abdominis musculocutaneous flap would be an alternative. A central panniculectomy type approach allows primary donor site closure by the cephalad advancement of the intentionally retained ptotic portion of the panniculus. Inclusion of the umbilicus with the free flap, which in this patient subgroup often is at risk for complications if excluded, mitigates against the need for undermining of the upper abdomen. The umbilicus free flap, as part of a panniculectomy, not only minimizes intrinsic flap risks, but also those of the abdominal donor site. (Plast Reconstr Surg Glob Open 2020;8:e3101; doi: 10.1097/GOX.0000000000003101; Published online 21 September 2020.)

The morbidly obese patient who requires a free flap that will provide significant surface area coverage always presents a dilemma, which becomes compounded when bilateral latissimus dorsi muscle free flaps have already been used. A transversely oriented abdominal flap should then be considered, often very acceptable for all because removal of the ptotic lower abdominal pannus will be an unexpected bonus! Almost always in this subset, any flap design will easily include the periumbilical deep inferior epigastric perforators (DIEP). Lee et al have shown that DIEP perforators are rarely found below the arcuate line; so that region is relatively underperfused when a DIEP flap is based on a periumbilical perforator. Therefore, for a wide and/or lengthy horizontal flap, it would be best to leave the lower pannus in situ; and instead retain also the supraumbilical region, as Boyd et al have shown this to be better perfused. Such removal of the central abdomen could only be executed like a panniculectomy, although leaving a higher donor site scar.

Cho et al have shown that umbilical complications with DIEP flaps, including complete necrosis, occur more frequently the higher the body mass index, the wider the diastasis recti, and the greater the umbilical stalk height, so that they often just discard the umbilicus to forego such a sequela. Instead, if the umbilicus were kept intact with the flap, there would be no flap wound healing issues, nor any in the upper abdomen because undermining would not be required as done in a conventional abdominoplasty. This case report demonstrates the advantages of transfer of the intact umbilicus itself as a free flap, and more importantly as a composite portion of a panniculectomy.

CASE REPORT

Ten years previously, this now 75-year-old woman still with a body mass index of 32 was in a motorcycle accident, sustaining circumferential skin degloving of the left lower extremity from the tibial tubercle to the ankle with multiple extremity fractures, left brachial plexus traction injury, pulmonary contusion, and splenic laceration. Serial debridement exposed a left fibular fixation plate involving the ankle. A right latissimus dorsi muscle free flap was used for plate coverage with skin grafting of the rest of the leg. Following an hypotensive episode 48 hours later, irreversible pedicle vein and artery thrombosis was found at the time of reexploration. Because the initial posterior tibial recipient site was again widely exposed, an immediate left latissimus dorsi flap was transferred, but slowly afterward it underwent irreversible necrosis. Two weeks later, a third attempt was made using the left gracilis muscle, with the anterior tibial vessels as the recipient site. This was completely successful.

Over the next 3 years, she had intermittent skin graft breakdown of the left pretibial area. It was suggested that her large, extremely ptotic abdominal pannus could cover this unstable area, allowing a concomitant abdominoplasty; but at that time, she wanted no part of another free flap as she preferred riding her motorcycle, which was...
her passion. She was not seen for 6 years until presenting with a large granulating and cellulitic 6 × 10 cm wound of the distal left leg as a result of falling off a treadmill (Fig. 1). These events were happening repeatedly; so now she allowed us to use her abdomen as previously advised.

Intraoperatively, the proximal posterior tibial vessels had an excellent flow. All sores and residual skin grafts overlying the left tibia over an area about 15 × 36 cm were removed. A preexisting right subcostal scar put at risk any undermining of the right side of the upper abdomen. Anticipating complications, a panniculectomy approach was designed to include the horizontal central 3/5ths of the abdominal skin of size slightly larger than the debrided recipient site (Fig. 2), where Boyd et al° have indicated would be found the majority of DIEP perforators. The retained inferior portion of her pannus would allow primary donor site closure.

Using a lateral to medial suprafascial approach on the virgin left hemiabdomen, two 1.5 mm lateral row periumbilical perforators were identified. The same approach from the medial side first revealed an umbilical hernia that would be repaired, additional justification for keeping the umbilicus within the flap. Further dissection demonstrated 2 similar caliber medial row perforators.

Considering the huge size (17 × 37 cm) of the flap and patient fragility, this was kept as a muscle sparing type 2 transverse rectus abdominis musculocutaneous free flap by harvesting a portion of the rectus abdominis muscle encompassing all these perforators to limit the risk of iatrogenic injury if they were individually dissected, which was more important than any minor amount of time saved. Their common deep inferior epigastric pedicle was then dissected into the groin to reach vessels of a reasonable caliber (Fig. 3).

Insetting placed the left hemiabdomen oriented toward the ankle before appropriate microanastomoses. The entire flap at first exhibited excellent capillary refill. Then started a series of complications. Premature extubation required reintubation in the operating room, prolonged ventilator support, and hypotension that necessitated vasopressors for several weeks. A small portion of the proximal flap (zone IV), though originally well perfused, necrosed, but enough survived to accomplish the original goal of resilient leg padding. The patient has returned to motorcycle riding and is considering liposuction soon so
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that the flap will not appear to be so bulky (Fig. 4). She is also quite satisfied with her leaner abdomen (See figure, Supplemental Digital Content 1, which demonstrates final appearance of abdomen donor site closure, http://links.lww.com/PRSGO/B469).

**DISCUSSION**

Morbid obesity has an adverse effect on all muscle-conserving abdominal flaps. A muscle sparing type 2 transverse rectus abdominis musculocutaneous flap is not unreasonable to maximize perfusion with the least risk of perforator injury in this high-risk subset, while also minimizing the time of their incorporation with the flap dissection. Retention of lateral and medial row perforators in this location best ensured capture of adjacent perforasomes.

Although Douglas et al\(^6\) state that a single perforator provides better zone IV perfusion in the standard DIEP flap, in this case the perfusion problem was instead secondary to prolonged postoperative hypotension and use of vaso-pressors. In spite of untoward events, this umbilicus free flap (a.k.a. panniculectomy free flap) achieved the primary goal of adequate pretibial padding, now permanently resistant to ongoing constant shear stresses.

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