Body Lift Perforator Flap Breast Reconstruction: A Review of 100 Flaps in 25 Cases

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Background: Advances in autologous breast reconstruction continue to mount and have been fueled most substantially with refinement of perforator flap techniques.

Methods: For patients with a desire for autogenous breast reconstruction and insufficient abdominal fat for conventional abdominal flaps, secondary options such as gluteal perforator flaps or latissimus flaps are usually considered. Patients who also have insufficient soft tissue in the gluteal donor site and preference to avoid an implant, present a vexing problem. The authors describe an option that allows for incorporation of four independent perforator flaps for bilateral breast reconstruction when individual donor sites are too thin to provide necessary volume. The authors present their experience with this technique in 25 patients with 100 individual flaps over 5 years.

Results: The body lift perforator flap technique, using a layered deep inferior epigastric perforator/gluteal perforator flap combination for each breast, was performed in this patient set with high success rates and quality aesthetic outcomes over several years. Patient satisfaction was high among the studied population.

Conclusions: The body lift perforator flap breast reconstruction technique can be a reliable, safe, but technically demanding solution for patients seeking autogenous breast reconstruction with otherwise inadequate individual fatty donor sites. This sophisticated procedure overcomes a limitation of autogenous breast reconstruction for these patients that otherwise results in a breast with poor projection and overall volume insufficiency. The harvest of truncal fat with a circumferential body lift design gives the potential added benefit of improved body contour as a complement to this powerful breast reconstructive technique. (*Plast. Reconstr. Surg.* 129: 551, 2012.)

CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, IV.

The benefits of autogenous tissue breast reconstruction have been well described.[1,2] Women who want their breasts restored with the most natural and longest lasting material possible seek soft-tissue reconstruction and have benefited from the continuing evolution that has allowed for progressively better outcomes. This progress has been fueled most substantially in recent years by the refinement and increased understanding of perforator flap concepts. The surgical power, provided by techniques that allow autogenous transplantation of any soft-tissue composite supplied by an underlying perforating vessel, gives the well-experienced microsurgeon a set of tools with which to accomplish breast reconstruction with a finesse beyond that of more basic procedures. The essence of these techniques is to transfer skin and fat to provide natural tissue reconstruction with an attendant goal of minimizing damage at the donor site; however, the flexibility

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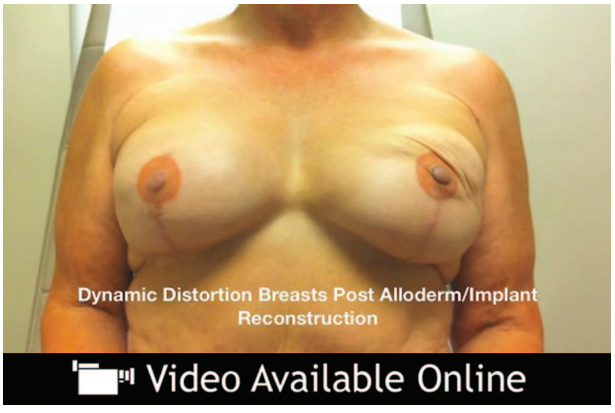
of these techniques affords outcome potentials far beyond that premise.

Female body shapes vary considerably, from gynecoid to android[3] and everywhere in between. Women with moderate to full breast size often wish to maintain their breast volume and, in some cases, increase it. Add to that the tendency for overall weight and resultant fatty thickness in areas of the trunk to vary considerably, and it is not uncommon to encounter patients who are incredibly difficult reconstructive challenges as a result of this single issue alone. The increased number of women who now undergo bilateral mastectomy, both prophylactic and therapeutic, compound the frequency with which these reconstructive dilemmas may be expected to present themselves. The quandary encountered when consulting with the patient who presents with a request for natural tissue reconstruction and an inadequate amount of donor fat with which to rebuild the breast is a situation with which every experienced plastic surgeon has dealt. In some cases, reconstructing the breast to a smaller size is an option. For others, the amount of donor tissue in the trunk is so inadequate that the ultimate result with a standard abdominal, gluteal, or latissimus tissue transfer will be disappointing and aesthetically poor. A thin flap provides minimal projection, and the base diameter of the breast needs to be considered, just as it does with cosmetic breast augmentation. Women who have had tissue expansion and failed implant reconstruction often have the added problem of a flattened bony rib cage, resulting in a need for even more volume to restore the breast than would otherwise be required.[4]

For those who wish to maintain their breast size and/or in whom the amount of abdominal fat is insufficient to give projection and shape to match the opposite breast, a number of second-tier options are usually considered. Gluteal artery perforator (GAP) flap reconstruction can often provide ample tissue in even the most athletic of patients[5]; however, if the gluteal donor sites are also thin, overreaching for fatty harvest in this area can produce resultant deformities that are challenging to correct. Tissue transfers from the thigh such as the transverse gracilis myocutaneous (TUG) flap have limited volume potential and may create scarring of an unfavorable nature. The sacrifice of the gracilis muscle must also be considered and discussed with the patient beforehand.

Augmenting the breast reconstructed with the deep inferior epigastric perforator (DIEP), transverse rectus abdominis myocutaneous (TRAM), or GAP flap with an implant may also be considered with an otherwise insufficient flap. In the case of the latissimus flap, this option almost universally requires an implant for adequate volume restoration. The muscle sacrifice and scar across the back are considerations that the patient and surgeon should take into account with this option as well. These options are less desirable for the patient who wishes to avoid the use of implants and the attendant potential risks that they incur.[6–9] Practitioners should also consider and disclose the deforming and dynamic contractile distortion that a submuscular implant may produce in a reconstructed breast, as some patients will find this troubling.[10,11] (**See Video, Supplemental Digital Content 1,** which demonstrates dynamic distortion as seen with implant reconstruction and activation of the pectoralis muscles, ***http://links.lww.com/PRS/A455***. Results from submuscular implant placement with a thin skin envelope tethered to underlying muscle surface are shown.) For patients who have insufficient soft tissue in the abdomen, gluteal, and latissimus donor sites and prefer to avoid an implant, a vexing problem is presented.

Fat injections are becoming more accepted for contour improvement in breast reconstruction; however, reconstructing a breast with an inadequate flap, with plans to make up the shortage by injecting it, has not been shown to be a reliable or lasting way to make up a substantial volume deficit. The tendency for fat injections to resorb in an unpredictable way, and the attendant suctioning of potential flap harvest sites, may leave patients with few options if the injections fail, and they should be counseled accordingly. Those attempting complete reconstruction with



Video. Supplemental Digital Content 1 demonstrates dynamic distortion as seen with implant reconstruction and activation of the pectoralis muscles, ***http://links.lww.com/PRS/A455***. Results from submuscular implant placement with a thin skin envelope tethered to underlying muscle surface are shown.

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fat injection alone should also understand the implications of suctioning potential flap donor sites away should the injections result in a less-than-hoped-for outcome.

Volume shortages in a unilateral breast reconstruction may be overcome with use of the whole abdominal pannus in a layered configuration with a bipedicled TRAM flap or our more recently described stacked DIEP flap.[12,13] Applying a multicomponent concept to the bilateral mastectomy patient allows the reconstructive surgeon to use multiple flaps in each breast reconstruction site and thereby overcome the volume limitations of conventional flap procedures. The body lift perforator flap technique as described in this article allows the fat of the abdominal donor site and the gluteal donor site to be used in each breast to reconstitute the volumetric requirement. A DIEP flap and a GAP flap are inset in a layered fashion to bring added volume and projection to the reconstructive field. This stacked DIEP/GAP free flap combination allows for a reconstruction that takes advantage of the soft-tissue volume of the entire midriff without sacrifice of the underlying muscles.

Harvesting the truncal fat with a belt lipectomy allows for substantial volume acquisition without overharvesting the abdominal skin or gluteal fat and affords the aesthetic benefit of a body lift design.[14,15] Using a set of techniques that also preserves the rectus abdominis in the abdomen and the gluteus maximus posteriorly minimizes the attendant morbidity and speeds recovery to the maximum extent possible.[16,17]

We now present this new procedure for bilateral autogenous breast reconstruction and an experience with 25 consecutive patients over a 5-year period. It is used in the patient with otherwise inadequate truncal fatty tissue volume by incorporating four independent perforator flaps when the abdomen and gluteal donor sites are individually too thin to provide for adequate reconstructive volume.

DESCRIPTION

The body lift perforator flap procedure is considered for patients presenting with a need for bilateral breast reconstruction and who have inadequate abdominal or gluteal fatty volume for a routine DIEP/TRAM or GAP flap procedure. Our experience includes those undergoing delayed and immediate reconstruction in a patient population treated for cancer and/or prophylactic concerns, and those with previous unsatisfactory or failed implant reconstruction.

Clinical examination allows for estimation of fatty volume in the truncal donor site both anteriorly and posteriorly. When the estimate of volume in a single site in the various donor fields falls roughly between one-third and one-half of the desired final breast volume, consideration of the body lift perforator flap procedure begins. The desired final breast volume predicates further consideration, quantified as less than, equal to, or greater than before mastectomy. For women seeking replacement of unsatisfactory implant reconstructions, the volume estimate is related to the size of the existing implants, with an added volume of at least 20 percent to account for the flattened thoracic platform that is often found and the anticipated recoil of the explanted skin. This number is arbitrary and based on clinical experience of the treating team. Perforators of the deep inferior epigastric system, the lumbar system, and septocutaneous and muscular gluteal perforators are identified, mapped, and marked before surgery with an 8-MHz handheld Doppler probe. Computed tomography–guided angiography is then referenced against these markings to allow for maximum precision in the presurgical plan with respect to exact donor-site marking location, planning of microsurgical linkages, and anticipated flap flow source (Fig. 1).

Surgery begins with dissection of the DIEP flap opposite the breast being reconstructed. Inspection of the superficial system is undertaken first and, if adequate, dissected just short of its entry into the common femoral, where it is ligated. Perforators of the deep inferior epigastric system are then identified and carefully dissected free of surrounding fascia and muscle. As the deep inferior epigastric vessels are identified, the branch points are carefully inspected. All large branches, including the distal extent of the deep inferior epigastric, are dissected for at least 2 cm and doubly ligated to serve as anastomosis points for the corresponding (GAP) flap (Fig. 2). Careful inspection of arterial and venous caliber of all components within the pedicle is undertaken during the dissection. A mental image of the desired vascular arrangement on flap linkage and associated inset is developed as the surgical dissection progresses and adjusted as surgical findings dictate. This process is aided by presurgical imaging as discussed. This allows the surgeon to develop the most appropriate plan for vascular construct as the elevation of the flap progresses. Once the pedicle dissection is complete, attention is directed to the opposite hemiabdomen, and the mirror image dissection is completed. Once the pedicle is dissected free, the flap

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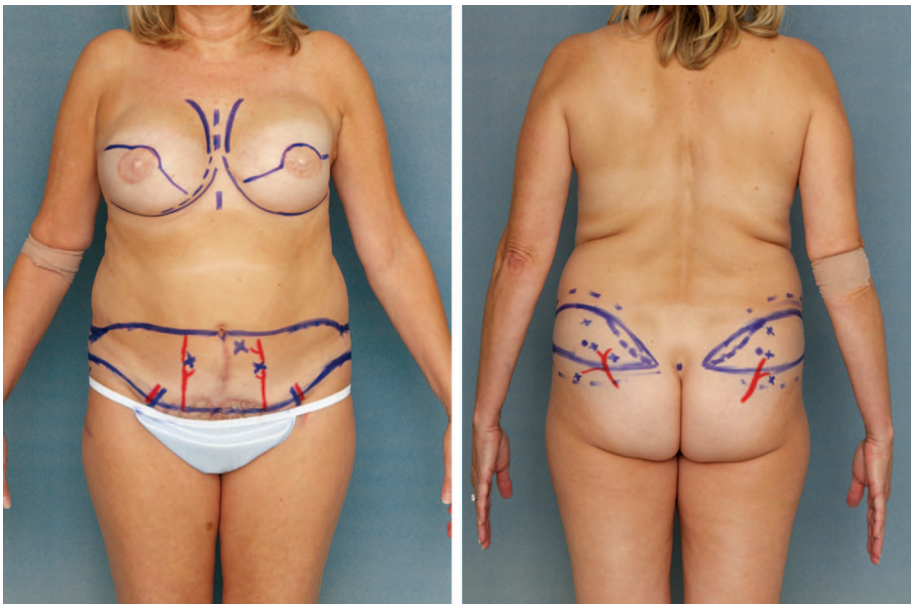

Fig. 1. Presurgical markings applied after computed tomographic angiography and Doppler examination for a patient with implant reconstruction complicated by chronic pain and animated breast.

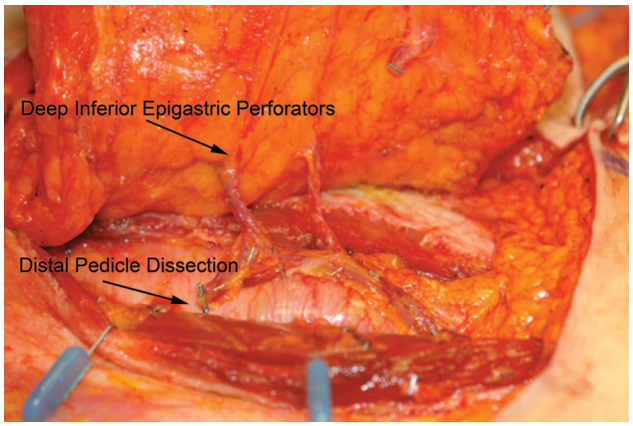

Fig. 2. DIEP flap dissection completed with selected branch points dissected to length.

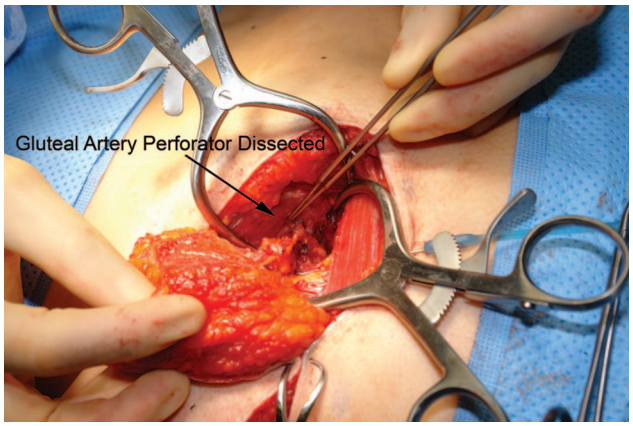

Fig. 3. GAP flap dissection.

is stapled back into position and continues to perfuse as preparation of the recipient internal mammary artery and vein in the breast pocket is undertaken. The patient is then placed into prone position for harvest of the gluteal perforator flaps.

The gluteal perforator flaps are then dissected along a continuous design extending from the anterior abdominal incisions. Typically, the amount of fat harvested will be less than an isolated GAP flap procedure would mandate, but is adjusted to volume requirements relative to the abdominal fatty volume present and the breast volume that the surgeon is trying to achieve. This minimizes the impact on the gluteal aesthetic, as does placement of the design high on the hip. The perimeter of each flap is defined with electrocautery, and incision through the superficial fascia of the gluteus maximus follows. The subfascial plane is then entered and serves as the plane for perforator identification. Once the dominant perforator is identified, it is followed down through the substance of the muscle by spreading and preserving the surrounding fibers (Fig. 3). The dissection is then carried through the deep gluteal fascia to reach the larger caliber vessels in the subgluteal fat pad as they emerge from the sacral foramina. Extreme care must be taken in this portion of the dissection, when required, as entry into the large venous confluence or a poorly controlled ar-

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terial branch point in the tight confines of this portion of the harvest can make for unnecessary blood loss and potential injury to the flap pedicle.

Once adequate vascular caliber is attained, the flaps are harvested and passed off the field. The donor sites are closed and the patient is returned to the supine position. The DIEP flaps are harvested expeditiously and the flap weights are determined (Fig. 4). The GAP flaps are then brought into the field, where they are deepithelialized and placed dermal side down into the breast pocket. The DIEP flaps are laid atop the GAP flaps, and their anastomoses to the internal mammary system are completed. The feeding branch of the pedicle is anastomosed to the pedicle of the underlying GAP flap (Fig. 5). Implantable Doppler devices are applied to the primary anastomosis sites as preference dictates. Once complete, the overlying flap is positioned carefully, taking particular care to inspect the vascular arrangement and design of inset (Fig. 6). Implantable Doppler devices were not routinely applied to the branch point anastomoses in this series because of concern regarding displacement of the vascular construct with Doppler wire removal; however, use for all anastomoses may be considered.

EXPERIENCE REVIEW

Circumferential body lift perforator flap breast reconstruction was performed on 25 patients over a 5-year period from 2005 to 2010. Twenty-eight of the 50 breasts were reconstructed immediately at the time of mastectomy, of which 17 were prophylactic and 11 were therapeutic. Twenty-two breasts were reconstructed in a delayed fashion after previous mastectomy. Twelve breasts were treated for unsatisfactory implant reconstruction because of capsular contracture, impending extrusion, unsatisfactory aesthetics, dynamic distortion, discomfort, or some combination of these issues (Table 1).

Average patient age was 50.52 years (range, 33 to 65 years). Two patients were active smokers with

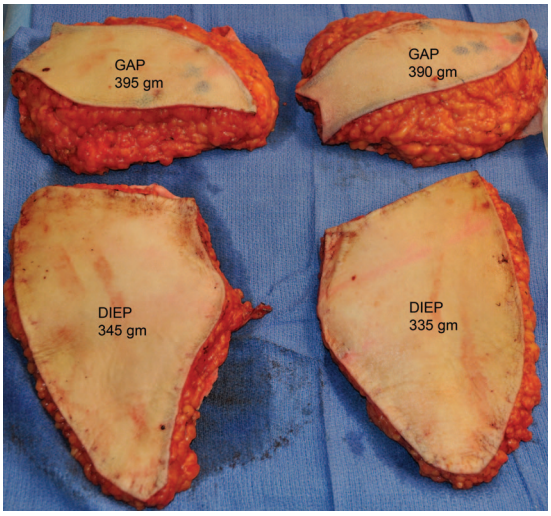

Fig. 4. Four independent flaps dissected free.

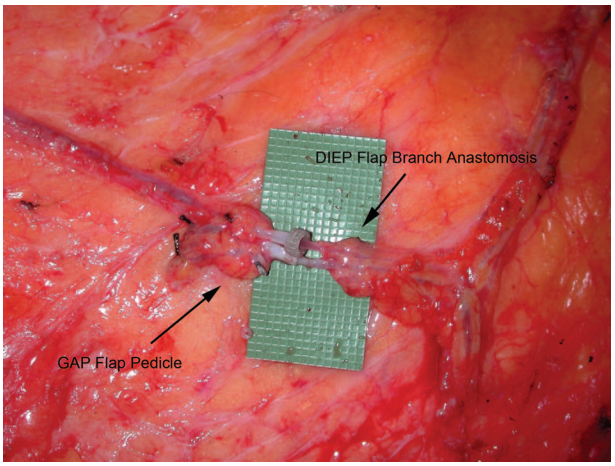

Fig. 5. Anastomosis between flaps with coupled venous connection completed.

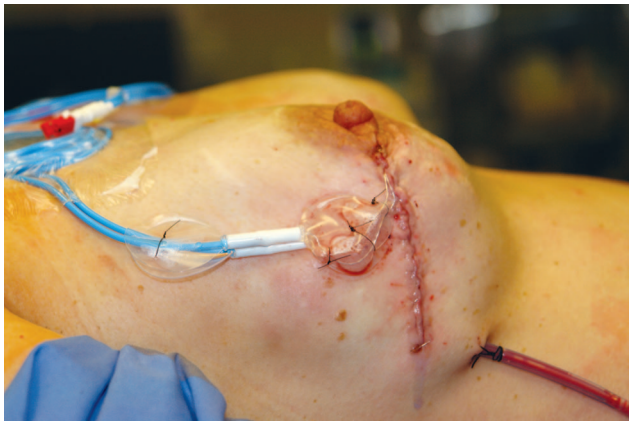

Fig. 6. Breast with stacked DIEP/GAP flaps and restored projection and shape.

Table 1. Patient Characteristics

	No. of Breasts Reconstructed
Immediate reconstruction	28
Prophylactic	17
Therapeutic	11
Delayed reconstruction	10
Implant failure	12
Extrusion	2
Capsular contracture	9
Nonspecific discomfort	1
Other	0
Failure of previous flap	0
Total	50

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Table 2. Patient Satisfaction with Body Lift Perforator Flap Breast Reconstruction*

	Breast Size (%)	Donor-Site Outcome (%)	Overall Outcome (%)
Excellent/very good	8 (88.9)	8 (88.9)	8 (88.9)
Good	1 (11.1)	0	1 (11.1)
Average/acceptable	0	0	0
Poor	0	1 (11.1)	0
Very poor	0	0	0

*n = 9 respondents (36%).

associated instruction to quit 3 weeks before surgery. Average patient weight was 139.32 lb (range, 115 to 190 lb). One patient suffered from hypertension and three were hyperthyroid, but no other significant medical problems were present in this patient population. Notably, six patients had undergone previous cesarean section, one had previous inguinal hernia repair, and three had appendectomies. Despite these previous abdominal

Fig. 7. Preoperative (*left*) and postoperative (*right*) views of a patient who underwent bilateral mastectomy with immediate body lift perforator flap breast reconstruction. Mastectomy weights were 385 and 435 g, and the combined weight of two DIEP/GAP flaps in each associated breast was 475 and 495 g.

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procedures, no problems were encountered with the microvascular dissections.

In those undergoing immediate reconstruction, the average mastectomy weight was 555.86 g. The average combined weight of the stacked DIEP and GAP flaps in these patients was 542.63 g. The overall average combined flap weights for the entire patient population was 551.5 g.

Operative time averaged 10 hours 15 minutes inclusive of mastectomy in those undergoing immediate reconstruction. Hospital stay averaged 4.32 days. Two patients required return to the operating room on postoperative day 1 for hematoma evacuation. These hematomas occurred in patients undergoing immediate reconstruction and were found to originate from small bleeding points in the breast pockets with no compromise of flap vascularity. Four patients required blood transfusion of 2 units postoperatively. All of these were noted to have also undergone bilateral mastectomy at the time of their body lift perforator flap reconstruction. One patient suffered total failure of the gluteal flap component on one side and a portion of the gluteal flap on the opposing side. The flap with partial loss resulted from overinclusion of soft tissue in a flap with a peripherally located perforator. The flap with total loss was a consequence of inset design, which resulted in a tensioned pedicle. Both losses occurred in the same individual, who was one of the first patients in the series and, coincidentally, continued to smoke postoperatively despite counseling regarding the associated risks. The overlying abdominal flaps in this patient were unaffected and the necrotic portions of the underlying gluteal flaps were débrided away in the postsurgical period without any problem other than volume loss. The side with the total loss of the underlying gluteal flap was restored with rotation of a latissimus flap into the soft-tissue defect. In the cases subsequent to this, the inset design was modified from a side-by-side arrangement of the flaps to a layered configuration with careful attention to avoid tension, kink, or compression of the pedicles during inset. No flap losses occurred in this series subsequent to these modifications.

The donor sites among the studied population healed without incidence other than one patient who developed cellulitis in the abdominal soft tissue that responded to oral antibiotics, and another who suffered from a seroma in the abdominal harvest site that responded to serial aspiration. Average return to work time for the patient group was 5 weeks. Patient satisfaction

Fig. 8. Posterior donor site of patient in Figure 7. Before (*left*), postoperative (*center*) demonstrating preserved gluteal aesthetic, and easily hidden scarline placement (*right*).

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with the procedure and associated outcome were analyzed by means of questionnaire. Although the number of respondents (36 percent) was limited, Likert scale analysis revealed an overall high level of satisfaction among patients surveyed (Table 2), comparing favorably with levels of satisfaction reported for other perforator flap–based breast reconstruction techniques.[18] All patients indicated that they would have elected to undergo the procedure again based on their experience and associated outcome (Figs. 7 through 10).

DISCUSSION

The combining of various flaps with independent pedicles or single vascular sources into composite flaps with associated microvascular linkages has been referred to as "chimeric" assembly of a reconstructive composite. This is considered when a need arises that, for whatever reason, is inade-

Fig. 9. Preoperative (*left*) and postoperative (*right*) views of a patient who underwent bilateral mastectomy with immediate body lift perforator flap breast reconstruction. Mastectomy weights were 620 and 800 g, and the combined weight of two DIEP/GAP flaps in each associated breast was 865 and 765 g. Radiated skin envelope on left with resultant mild peripheral contour constriction.

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Fig. 10. Posterior donor site of patient in Figure 9. Before (*left*), postoperative (*center*) demonstrating preserved gluteal aesthetic, and easily hidden scarline placement (*right*).

quately addressed by a single flap technique.[19] In the purest sense, one might conjecture that different tissue types are necessarily incorporated to fulfill the spirit of the term; however, the idea that a single flap may not always be adequate to do the job at hand is an age-old reconstructive truth. This principle may be applied to overcome volume limitations of a single tissue type in the field of breast reconstruction. The DIEP and GAP flaps have been described ad infinitum as techniques to provide for natural tissue breast reconstruction.[20,21] The combination of these techniques for individual patients has not been previously described. We add to that a substantial series with repeated success and a demonstration of a technique that addresses a reconstructive challenge that otherwise is very difficult if not impossible to overcome. Specifically, we describe reconstructing two breasts with autogenous tissue when both the abdominal and gluteal donor sites are inadequate to restore breast volume or, at a minimum, provide a breast of lesser size with adequate projection and shape. The added circumferential body lift with this approach (Fig. 11) may also be considered a favorable benefit or, at the very least, a means of handling the donor site with minimal impact.

Multiple authors have described various approaches for including more volume in a unilateral breast reconstruction than is possible with a single flap.[22–25] This report simply does the same for those with a need for bilateral reconstruction. The concern regarding use of all four flaps in a single operation, in an effort to provide proper volume, as opposed to using only one or the other and preserving the remaining donor site as a backup, is offset by technical expertise and practical success as described in this experience. A plan that produces a grossly insufficient breast, justified by preserving other insufficient flaps as a backup plan, is counterintuitive if there is a technique that produces a full breast with the tradeoff of added technical demand and more effort on the part of the operator. These matters are discussed thoroughly with each patient before surgery and, in our experience, the likelihood of a successful outcome equals that of other available techniques. This affords an informed consent and allows for those in need of this type of reconstruction reassurance in their decision.

The body lift perforator flap breast reconstruction technique gives the woman with need for more tissue than can be transferred from the abdominal thigh, or gluteal donor site with an isolated TRAM, DIEP/SIEA, TUG, or GAP flap another option for autogenous tissue reconstruction. The versatility of perforator flaps in terms of pedicle length, pedicle exposure, and location of pedicle

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Fig. 11. Preoperative (*left*) and postoperative (*right*) views show the donor-site impact on a patient who underwent body lift perforator flap breast reconstruction.

in the base of the flap is well demonstrated with this approach. This versatility is the singular reason that a procedure of this type is possible. Our experience reviews the repeated use of the body lift perforator flap technique in a large number of patients with high success rates and quality aesthetic outcomes over a relatively short period. It is our opinion that high patient satisfaction rates offset the added time and technical difficulty of the operation. The technical demands on even a well-experienced microsurgeon must be considered; however, if the success rate is equivalent to or better than the average for microsurgical breast reconstruction, as demonstrated in this series, the demands have a very real and tangible return on effort spent.

CONCLUSIONS

The body lift perforator flap breast reconstructive technique has been shown in this series and in this center's experience to be a reproducible, safe, and soundly conceived, yet technically demanding solution for patients seeking bilateral autogenous breast reconstruction with otherwise inadequate abdominal or gluteal fatty volume. Avoidance of sacrifice of the muscular core in the donor site is a major consideration, as is the aesthetic impact of a circumferential ("belt") body lift. These qualities provide a unique autogenous solution for the woman in need of greater breast volume in the setting of bilateral reconstruction than can be achieved with any other reconstructive technique. This type of procedure entails a degree of microsurgical complexity and an associated need for efficiency that must be considered by practitioners considering its use.

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Plastic Surgery Level of Evidence Rating Scale—Therapeutic Studies

Level of Evidence	Qualifying Studies
I	Highest-quality, multicentered or single-centered, randomized controlled trial with adequate power; or systematic review of these studies
II	High-quality, randomized controlled trial; prospective cohort or comparative study; or systematic review of these studies
III	Retrospective cohort or comparative study; case-control study; or systematic review of these studies
IV	Case series with pre/post test; or only post test
V	Expert opinion developed via consensus process; case report or clinical example; or evidence based on physiology, bench research, or "first principles"

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