

# Aesthetic Refinement of the Abdominal Donor Site after Autologous Breast Reconstruction

Mark W. Stalder, M.D.  
Katherine Accardo, M.D.  
Robert J. Allen, M.D.  
Alireza Sadeghi, M.D.

New Orleans, La.; and New York, N.Y.

**Background:** The abdominal donor site has consistently demonstrated excellent aesthetic outcomes when used for autologous breast reconstruction. However, a consistent point of dissatisfaction is the location and appearance of the abdominal donor-site scar, which can be a frequent cause of distress for the patient. The authors consider the appearance of the donor-site to be as important to the overall reconstructive effort as that of the breast, and believe it worthwhile to achieve an aesthetically pleasing result. Thus, the authors present here their technique for aesthetic revision of the abdominal donor site after autologous breast reconstruction.

**Methods:** This is a series of 51 patients who underwent autologous tissue breast reconstruction with deep inferior epigastric perforator flaps. All patients subsequently underwent abdominal donor-site revision during the second stage of their reconstruction, including excision and lowering of the abdominal scar, and liposuction of the abdomen and mons pubis to achieve optimum contouring.

**Results:** The donor-site scars were lowered an average of 5.93 cm (range, 5 to 7 cm). The average procedural time was 27 minutes. No wound dehiscence, seromas, hematomas, or infections were reported postoperatively.

**Conclusions:** With this report, the authors put forth a new obtainable standard for autologous tissue breast reconstruction donor-site aesthetics, and propose a conceptual shift that includes the trunk aesthetic unit as an integral part of the overall reconstructive outcome. The authors' results here demonstrate that this is a safe, successful, and reproducible procedural adjunct to the second stage of breast reconstruction. (*Plast. Reconstr. Surg.* 136: 455, 2015.)

In the nearly two decades since it was first introduced for breast reconstruction, the deep inferior epigastric perforator (DIEP) flap has become a common technique for autologous tissue breast reconstruction.<sup>1,2</sup> Numerous reports have discussed the benefits of the DIEP flap, demonstrating limited donor-site morbidity and short recovery periods, and abdominal donor-site techniques in general have produced superior aesthetic outcomes relative to other autologous options in these cases.<sup>2–15</sup>

*From the Division of Plastic and Reconstructive Surgery, Louisiana State University Health Sciences Center; and the Institute of Reconstructive Plastic Surgery, New York University School of Medicine.*

*Received for publication May 21, 2014; accepted April 8, 2015.*

*Presented at the 15th International Course on Perforator Flaps, in New York, New York, November 29 through December 2, 2012; and the 57th Annual Meeting of the Southeastern Society of Plastic and Reconstructive Surgeons, in Nassau, Bahamas, June 8 through 12, 2014.*

*Copyright © 2015 by the American Society of Plastic Surgeons*

DOI: 10.1097/PRS.0000000000001561

Although the available literature suggests that patients are typically pleased with the results of their breast reconstruction using abdominal flaps, a consistent and significant point of dissatisfaction noted clinically is the unseemly location and appearance of the transverse abdominal donor-site scar.<sup>7,15,16</sup> This scar is frequently too superior to be masked by the waistband of standard women's undergarments, and can often be unsightly secondary to suboptimal healing or wound complications that may occur in as many as 13.6 percent.<sup>3</sup> Also, aside from the adverse aesthetic outcomes that result from wound infections and prolonged healing, there are frequently significant contour abnormalities, persistent dog-ears at the lateral extent of the scar, or broad discolored scars secondary to the significant tension on the wound after the initial closure.<sup>3,17</sup>

Although the majority of these women undergo secondary reconstructive procedures

**Disclosure:** *The authors have no financial interest to declare in relation to the content of this article.*

designed to improve the overall aesthetic outcome of the breast reconstruction, there is too frequently inadequate attention given to aesthetic refinement of the donor site. We believe that a successful reconstructive effort in this patient population should focus beyond just the creation of an appealing breast mound, and should consider the entire result, including the idea that reasonable attention and effort should be given toward achieving an aesthetic appearance of the donor site. We also believe that this can be accomplished quickly, safely, and effectively with a simple and reproducible technique performed during the second stage of reconstruction, and thus present here our experience with aesthetic revision of the abdominal donor site after autologous DIEP flap breast reconstruction.

## PATIENTS AND METHODS

This is a prospective series of 51 patients who underwent revision of the donor-site scar after autologous tissue breast reconstruction with DIEP flaps between January of 2012 and December of 2012. All of these patients subsequently underwent aesthetic revision of the abdominal donor site during the second stage of their reconstruction no less than 3 months after their initial operation. All procedures were performed by the senior author (A.S.), and all content and procedures described within conform to the principles outlined in the Declaration of Helsinki. Data were collected regarding patient comorbidities, the presence of any donor-site wound complications, the distance the scar was lowered on the abdominal wall relative to the anterior commissure of the labia majora, and any complications encountered subsequent to the revision procedure.

### Surgical Technique

The superior abdominal flap at the time of the original procedure is often significantly thicker than the inferior flap, which can result in suboptimal contouring after healing. In addition, in many women, there exists a prominent fat pad at the level of the mons pubis that can contribute to the discord of the overall contour of the healed abdominal wall. To address these issues, suction lipectomy is performed as the initial part of the procedure before any tissue excision. This fat is then used to optimize the contour of the reconstructed breasts with fat grafting.

Next, the location of the donor-site scar is evaluated relative to the anterior commissure of the labia majora; some patients require less of a

revision, depending on their overall build, the quality of their tissue at the time of the initial surgery, whether they experienced any wound healing complications, and the general appearance of the postsurgical abdomen. Our standard design is to lower the scar to a point that is 4 to 7 cm from the commissure of the labia majora, depending on the build of the patient (Fig. 1). The scar would then be located on or adjacent to the most superior aspect of the mons pubis, a location where it is easily concealed by most women's underwear.

A crescentic area is marked for excision, which includes the entirety of the donor-site scar and extends down to, and often includes, some degree of hair-bearing skin. After this area of skin is resected, a superior abdominal adipocutaneous flap is undermined along the fascia of the abdominal wall to mobilize the tissue for wound closure. Undermining may proceed as high as the xiphoid, but more commonly proceeds to a point somewhere between the umbilicus and the xiphoid, depending on the patient's tissue quality and specific needs. The umbilical stalk is transected during this process, and the umbilicus is raised as part of the superior abdominal flap. The residual fascial defect is closed, and the umbilicus is relocated inferiorly and anchored to the fascia

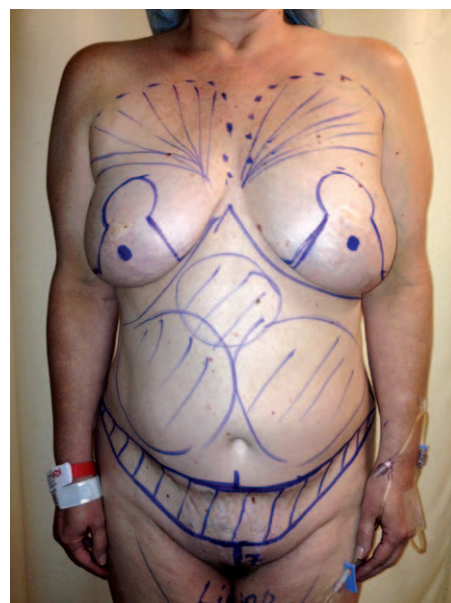


**Fig. 1.** Standard preoperative markings at the time of the second stage of reconstruction. Of particular note are the abdominal areas marked for contouring by suction lipectomy, and the crescentic area of resection that is marked at the inferior aspect of the abdomen that includes the donor-site scar, and lowers the incision to a point that is 7 cm above the superior aspect of the commissure of the labia majora.

as the wound is closed. If some degree of rectus diastasis is present, we typically plicate the fascia at this time to further improve the abdominal contour. The abdominal flap is then advanced inferiorly, and the wound is closed in two layers—a Scarpa fascia repair, and a running dermal/subcuticular reapproximation. The tension at closure is significantly decreased relative to what is typically present at the time of the original reconstructive surgery.

RESULTS

Of the 51 women who underwent abdominal donor-site revision, 17 had a body mass index greater than 30, three had diabetes mellitus, two were smokers, and 11 had donor-site wound complications after their initial reconstruction (Table 1). The donor-site scar was lowered an average of 5.93 cm (range, 5 to 7 cm) (Table 2). The average time for that portion of the procedure was 27 minutes. No instances of wound dehiscence, seroma, hematoma, infection, or neuralgia were reported postoperatively (Table 2 and Figs. 2 through 5).

DISCUSSION

Although numerous surgical options for autologous tissue breast reconstruction exist, adipocutaneous flaps from the lower abdomen have become established as the criterion standard for these procedures because of the superior aesthetic results that can be achieved using

abdominal tissue, and improvements that have been observed regarding donor-site morbidity relating to the DIEP flap. Indeed, the incidence of donor-site revisions because of hernias or fascial bulging has declined significantly with the use of perforator flaps, sparing the rectus abdominis muscle and anterior rectus sheath, and thus maintaining the integrity of the abdominal wall.<sup>8,18</sup>

The primary objective of breast reconstruction, of course, centers around restoration of the female breast mound in an attempt to restore the patient’s natural form, thereby promoting improved body image after mastectomy, with the accompanying psychosocial benefits.<sup>10,19</sup> However, with an intact, functional postoperative abdominal wall, we can collectively shift some of our focus toward, and improve on, the elective second-stage revisions that further augment the aesthetic outcomes of the overall reconstructive effort.

In our practice, we have encountered significant patient dissatisfaction with the location and appearance of the standard transverse abdominal scar after the initial stage of DIEP flap reconstruction, irrespective of how pleased they are with the appearance of their breasts. This is consistent with findings reported in other published articles and is often a subject of concern among patients when consenting for surgery.<sup>10–12</sup> Nevertheless, there exists virtually no reported meaningful attempt to address this issue. This overlooked component of reconstructive surgery, donor-site aesthetics, begs for improvement, certainly within the realm of breast reconstruction, a field that continuously strives to achieve improvements in cosmetic outcomes.

Using our described technique, the second-stage procedure is undertaken 3 months after the initial operation, allowing for settling of the tissue, resolution of edema and inflammation, maturation of scarring, and physiologic delay of the superior abdominal flap. At that point, the surgeon is able to accurately evaluate the postoperative abdominal wall to plan for contour revision and lowering of the incision. In addition, harvest of the deep inferior epigastric perforators, and the initial division of the superior abdominal adipocutaneous flap from other contributing perforators along the midline of the abdominal wall, essentially acts as a physiologic delay procedure and promotes a more robust lateral and superior collateral circulation from perforating vessels off of the external iliacs, intercostals, and internal mammary arteries.<sup>21–23,25–28</sup> Similarly, the significant tension on the surgical incision that is present at the time of the initial closure of the donor site, which

**Table 1. Comorbidities of the 51 Patients Who Underwent Aesthetic Abdominal Donor-Site Revision after DIEP Free Flap Breast Reconstruction**

| Comorbidity                 | No. (%)   |
|-----------------------------|-----------|
| Obesity (BMI ≥30)           | 17 (33.3) |
| Diabetes mellitus           | 3 (5.9)   |
| Preoperative smoking        | 2 (3.9)   |
| Wound healing complications | 11 (21.6) |

BMI, body mass index.

**Table 2. Postoperative Outcomes following Aesthetic Abdominal Donor-Site Revision after DIEP Free Flap Breast Reconstruction\***

| Outcome               | Value          |
|-----------------------|----------------|
| Distance scar lowered | 5.93 ± 0.77 cm |
| Dehiscence            | 0              |
| Seroma                | 0              |
| Infection             | 0              |
| Hematoma              | 0              |

\*Data were collected from 51 patients regarding the average distance the scar was lowered as measured at the time of surgery, in addition to the incidence of hematoma, seroma, dehiscence, and infection.



**Fig. 2.** (Left) Preoperative image of a 48-year-old woman with stage II cancer of the right breast. (Center) The patient underwent right skin-sparing mastectomy and left nipple-sparing mastectomy with immediate bilateral DIEP flap reconstruction. (Right) During the second stage of her reconstruction, the patient's abdominal scar was excised and lowered, and she underwent suction lipectomy for abdominal wall contouring. In addition, she underwent fat grafting, right nipple-areola reconstruction, and bilateral mastopexy for shaping of the reconstructed breasts.



**Fig. 3.** (Left) Preoperative image of a 46-year-old woman who tested positive for the *BRCA* gene mutation. (Center) The patient underwent bilateral prophylactic nipple-sparing mastectomies with immediate bilateral DIEP flap reconstruction. (Right) During the second stage of her reconstruction, the patient's abdominal scar was excised and lowered, and she underwent suction lipectomy for abdominal wall contouring. In addition, she underwent fat grafting and bilateral mastopexy for shaping of the reconstructed breasts.

contributes to some of the wound complications observed in these patients, is not a consideration with this second-stage procedure because of the

expansion of the superficial abdominal tissue during the intervening 3 months, similar to the effects seen during tissue expansion.



**Fig. 4.** (Left) Preoperative image of a 62-year-old woman with left stage I breast cancer. (Center) The patient underwent bilateral nipple-sparing mastectomy with immediate bilateral DIEP flap reconstruction. (Right) During the second stage of her reconstruction, the patient's abdominal scar was excised and lowered, and she underwent suction lipectomy for abdominal wall contouring. In addition, she underwent bilateral reduction mammoplasty for shaping of the reconstructed breasts.

Thus, the wound that is created after excision of the 5 to 7 cm of tissue around the donor-site scar is easily closed with minimal tension after advancement of the “expanded” superior abdominal flap. The absence of any delayed healing or wound complications associated with this procedure can be presumptively accredited to a combination of both the improved blood supply to the superior flap and the decreased wound tension at secondary closure, and should reassure both patient and surgeon that this is a safe procedure with benefits far surpassing the potential risks.

An additional beneficial component to this procedure is the harvested fat that is collected during suction lipectomy contouring of the abdominal wall. In our practice, fat grafting is a standard adjunctive procedure during the second-stage revision of the reconstructed breast. It is a powerful technique for augmenting volume, achieving symmetry, and improving contour, and affects scar remodeling and the overall feel of the reconstructed breast.<sup>29,30</sup> Once again, this contributes to the overall aesthetic outcome of the reconstructive process, and bolsters the argument for elective abdominal wall donor-site revision procedures.

Available information suggests that women who ultimately opt for autologous tissue breast

reconstruction are more likely to actively seek information about their reconstructive options and make independent decisions regarding their treatment.<sup>31</sup> With essentially limitless availability of postoperative photographs by means of the Internet, these patients are able to consider the potential aesthetic outcomes of these procedures before consulting a microsurgeon. In our discussions with these patients, we have found that the donor-site scar is a consistent point of question and considerable anxiety. The ability to demonstrate postoperative cosmetic improvements at the donor site, and indeed the entire abdominal wall, comparable to what is seen with traditional abdominoplasty, certainly alleviates some of the patient's anxiety about undergoing such a major operation, and indeed in coping with the entire oncologic-ablative process. Although a focused study would be required to determine the degree of influence that these aesthetic refinements might have on a patient's final decision of whether or not to undergo autologous reconstruction or on their overall satisfaction with the reconstructive outcomes, at least anecdotally this has been borne out in our practice.<sup>32</sup>

As a component of standard second-stage procedures, our described technique for lowering the donor-site scar consumes on average 27 minutes

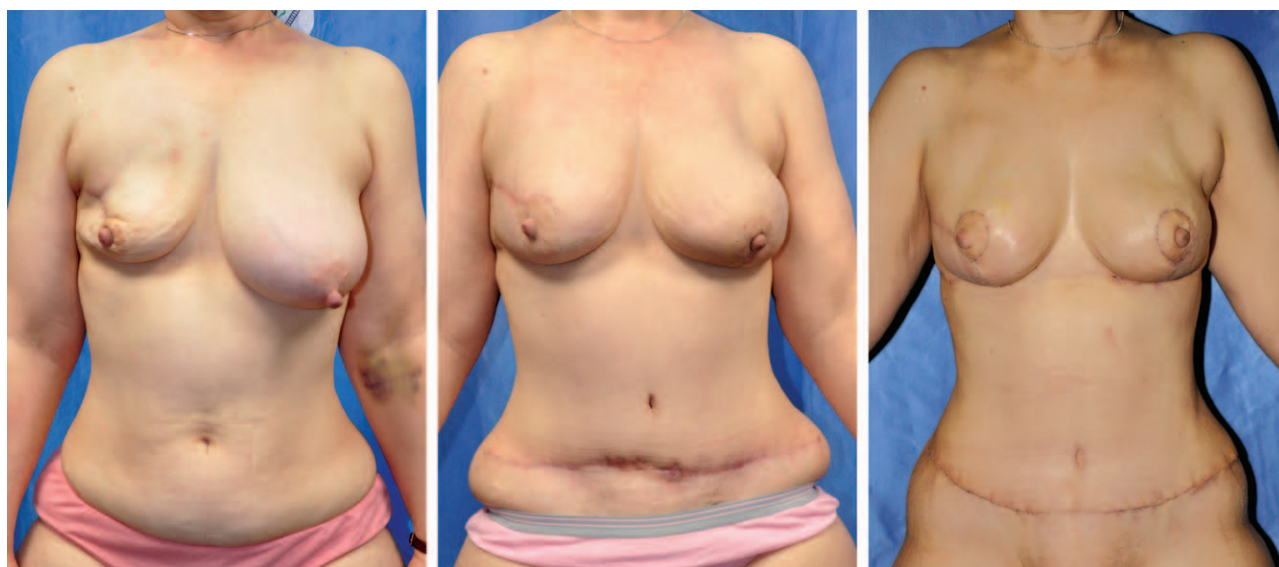


**Fig. 5.** (Left) Preoperative image of a 45-year-old woman with right stage II cancer and previous right nipple-sparing mastectomy. (Center) The patient underwent left nipple-sparing mastectomy with bilateral DIEP reconstruction. (Right) During the second stage of her reconstruction, the patient's abdominal scar was excised and lowered, and she underwent suction lipectomy for abdominal wall contouring. In addition, she underwent fat grafting and bilateral mastopexy for shaping of the reconstructed breasts.

of operative time, and provides reproducible, aesthetically pleasing results. The abdominal donor-site scar is lowered to a location easily concealable by women's undergarments, and the postsurgical abdomen in these patients is comparable in appearance to what would be seen after cosmetic abdominoplasty, especially when performed in conjunction with the other select adjunctive procedures described in this article. The overall outcome of the postmastectomy reconstructive process is improved with an aesthetically appealing abdomen, and it is our belief that this procedure will significantly augment the psychosocial benefits observed in these patients after breast reconstruction. With this study, we put forth a new obtainable standard for autologous tissue breast reconstruction donor-site aesthetics, and suggest that reconstructive surgeons consider a conceptual shift in their approach to include the trunk aesthetic unit as an integral part of the overall result.

**Alireza Sadeghi, M.D.**

3434 Prytania Street, Suite 420  
New Orleans, La. 70115  
drs@arbreastcenter.com

## REFERENCES

1. Allen RJ, Treece P. Deep inferior epigastric perforator flap for breast reconstruction. *Ann Plast Surg.* 1994;32:32–38.
2. Guerra AB, Metzinger SE, Bidros RS, et al. Bilateral breast reconstruction with the deep inferior epigastric perforator (DIEP) flap: An experience with 280 flaps. *Ann Plast Surg.* 2004;52:246–252.
3. Gill PS, Hunt JP, Guerra AB, et al. A 10-year retrospective review of 758 DIEP flaps for breast reconstruction. *Plast Reconstr Surg.* 2004;113:1153–1160.
4. Futter CM, Webster MH, Hagen S, Mitchell SL. A retrospective comparison of abdominal muscle strength following breast reconstruction with a free TRAM or DIEP flap. *Br J Plast Surg.* 2000;53:578–583.
5. Nahabedian MY, Tsangaris T, Momen B. Breast reconstruction with the DIEP flap or the muscle-sparing (MS-2) free TRAM flap: Is there a difference? *Plast Reconstr Surg.* 2005;115:436–444; discussion 445.
6. Garvey PB, Buchel EW, Pockaj BA, et al. DIEP and pedicled TRAM flaps: A comparison of outcomes. *Plast Reconstr Surg.* 2006;117:1711–1719; discussion 1720.
7. Bodin F, Zink S, Lutz JC, Kadoch V, Wilk A, Bruant-Rodier C. Which breast reconstruction procedure provides the best long-term satisfaction? (in French). *Ann Chir Plast Esthet.* 2010;55:547–552.
8. Nahabedian MY. Secondary operations of the anterior abdominal wall following microvascular breast reconstruction with the TRAM and DIEP flaps. *Plast Reconstr Surg.* 2007;120:365–372.
9. Granzow JW, Levine JL, Chiu ES, Allen RJ. Breast reconstruction with the deep inferior epigastric perforator flap: History and an update on current technique. *J Plast Reconstr Aesthet Surg.* 2006;59:571–579.
10. Yueh JH, Slavin SA, Adesiyun T, et al. Patient satisfaction in postmastectomy breast reconstruction: A comparative evaluation of DIEP, TRAM, latissimus flap, and implant techniques. *Plast Reconstr Surg.* 2010;125:1585–1595.
11. Momoh AO, Colakoglu S, Westvik TS, et al. Analysis of complications and patient satisfaction in pedicled transverse rectus abdominis myocutaneous and deep inferior epigastric perforator flap breast reconstruction. *Ann Plast Surg.* 2012;69:19–23.
12. Allen RJ, Levine JL, Granzow JW. The in-the-crease inferior gluteal artery perforator flap for breast reconstruction. *Plast Reconstr Surg.* 2006;118:333–339.

13. de Weerd L, Elvenes OP, Strandenes E, Weum S. Autologous breast reconstruction with a free lumbar artery perforator flap. *Br J Plast Surg*. 2003;56:180–183.
14. Blondeel N, Vanderstraeten GG, Monstrey SJ, et al. The donor site morbidity of free DIEP flaps and free TRAM flaps for breast reconstruction. *Br J Plast Surg*. 1997;50:322–330.
15. Christensen BO, Overgaard J, Kettner LO, Damsgaard TE. Long-term evaluation of postmastectomy breast reconstruction. *Acta Oncol*. 2011;50:1053–1061.
16. Alderman AK, Wilkins EG, Lowery JC, Kim M, Davis JA. Determinants of patient satisfaction in postmastectomy breast reconstruction. *Plast Reconstr Surg*. 2000;106:769–776.
17. Salgarello M, Tambasco D, Farallo E. DIEP flap donor site versus elective abdominoplasty short-term complication rates: A meta-analysis. *Aesthetic Plast Surg*. 2012;36:363–369.
18. Seidenstuecker K, Munder B, Mahajan AL, Richrath P, Behrendt P, Andree C. Morbidity of microsurgical breast reconstruction in patients with comorbid conditions. *Plast Reconstr Surg*. 2011;127:1086–1092.
19. Atisha D, Alderman AK, Lowery JC, Kuhn LE, Davis J, Wilkins EG. Prospective analysis of long-term psychosocial outcomes in breast reconstruction: Two-year postoperative results from the Michigan Breast Reconstruction Outcomes Study. *Ann Surg*. 2008;247:1019–1028.
20. Andrade WN, Baxter N, Semple JL. Clinical determinants of patient satisfaction with breast reconstruction. *Plast Reconstr Surg*. 2001;107:46–54.
21. Holm C, Mayr M, Höfter E, Ninkovic M. Perfusion zones of the DIEP flap revisited: A clinical study. *Plast Reconstr Surg*. 2006;117:37–43.
22. Tregaskiss A. Perfusion zones of the DIEP flap revisited: A clinical study. *Plast Reconstr Surg*. 2006;118:816; author reply 816–817.
23. Shoaib T, Marucci D. Adjacent angiosomes instead of zones II and III: Reply to “Perfusion zones of the DIEP flap revisited—a clinical study”. *Plast Reconstr Surg*. 2006;118:817–818; author reply 818.
24. Rozen WM, Ashton MW, Pan WR, Taylor GI. Raising perforator flaps for breast reconstruction: The intramuscular anatomy of the deep inferior epigastric artery. *Plast Reconstr Surg*. 2007;120:1443–1449.
25. Morris SF, Yang D. Effect of vascular delay on viability, vasculature, and perfusion of muscle flaps in the rabbit. *Plast Reconstr Surg*. 1999;104:1041–1047.
26. Ghali S, Butler PE, Tepper OM, Gurtner GC. Vascular delay revisited. *Plast Reconstr Surg*. 2007;119:1735–1744.
27. Holzbach T, Neshkova I, Vlaskou D, et al. Searching for the right timing of surgical delay: Angiogenesis, vascular endothelial growth factor and perfusion changes in a skin-flap model. *J Plast Reconstr Aesthet Surg*. 2009;62:1534–1542.
28. Wong C, Saint-Cyr M, Mojallal A, et al. Perforasomes of the DIEP flap: Vascular anatomy of the lateral versus medial row perforators and clinical implications. *Plast Reconstr Surg*. 2010;125:772–782.
29. de Blacam C, Momoh AO, Colakoglu S, Tobias AM, Lee BT. Evaluation of clinical outcomes and aesthetic results after autologous fat grafting for contour deformities of the reconstructed breast. *Plast Reconstr Surg*. 2011;128:411e–418e.
30. Dini M, Mori F, Giordano V, Quattrini Li A, Famiglietti M, Mori A. Our experience with autologous fat grafting for contour deformities of the reconstructed breast. *Plast Reconstr Surg*. 2012;130:500e–501e.
31. Gopie JP, Timman R, Hilhorst MT, Hofer SO, Mureau MA, Tibben A. Information-seeking behaviour and coping style of women opting for either implant or DIEP-flap breast reconstruction. *J Plast Reconstr Aesthet Surg*. 2011;64:1167–1173.
32. Hallock GG. Abdominoplasty as the patient impetus for selection of the deep inferior epigastric perforator free flap for knee coverage. *Microsurgery* 2014;34:102–105.