

Deep Inferior Epigastric Artery Perforator Flap Breast Reconstruction in the Setting of Cryolipolysis

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Summary: The deep inferior epigastric artery perforator (DIEP) flap is a safe and reliable autologous breast reconstruction option for patients undergoing surgical treatment for breast cancer. Success of the procedure relies on adequate flap perfusion from perforators that travel within the subcutaneous layer of the abdominal wall. Patients who have undergone invasive abdominal wall procedures such as suction-assisted liposuction may therefore be at increased risk of postoperative complications such as flap loss and fat necrosis. In recent years, noninvasive fat-reduction techniques such as cryolipolysis have grown immensely in popularity. However, there are no data regarding outcomes for patients who have undergone DIEP flap breast reconstruction after having previously undergone abdominal cryolipolysis. The current case demonstrates that free flap breast reconstruction can be performed safely in this patient population, and that adjunct imaging modalities may improve clinical decision-making. (*Plast Reconstr Surg Glob Open* 2021;9:e3976; doi: 10.1097/GOX.0000000000003976; Published online 7 December 2021.)

Breast cancer is one of the most common malignancies in women, with approximately 281,550 cases of invasive breast cancer expected in the United States in 2021.¹ Reconstruction following surgery for breast cancer is more common, owing to increasing collaboration between surgical oncologists and plastic surgeons and improvements in patient psychosocial outcomes.² Several breast reconstructive options are available. Implant-based reconstruction is most common, but autologous breast reconstruction such as the deep inferior epigastric perforator (DIEP) flap is increasingly popular, as it offers natural feeling to the reconstructive breast, improved patient satisfaction, and lower complication profile with radiation treatment.³⁻⁵

DIEP flap breast reconstruction is safe and reliable; however, risks of postoperative complications are increased in certain populations, including patients with obesity or active tobacco use.² Patients with prior abdominal suction-assisted liposuction can have an increased risk of partial flap loss and fat necrosis, thought to be

due to compromised integrity of subcutaneous fat and vasculature.^{4,6}

Recently, several noninvasive fat-reduction techniques have grown popular. One example is cryolipolysis, which achieved FDA approval in the United States in 2010, whereby a vacuum device cools the area of interest to induce apoptosis and phagocytosis of adipocytes while sparing nerves and vasculature.⁷ These techniques may theoretically confer risk to patients undergoing flap-based reconstruction by compromising vascularity and promoting fat necrosis; however, data to support this are lacking. There is a paucity of literature regarding autologous breast reconstruction in patients with prior noninvasive fat-reduction techniques. Herein, we report a safe and uncomplicated case of bilateral DIEP flap breast reconstruction in a patient who had previously undergone multiple cycles of cryolipolysis of the abdomen. To the best of our knowledge, this is the first reported case in the literature.

CASE PRESENTATION

The patient is a 45-year-old woman with recurrent left breast cancer who presented for bilateral total mastectomy and immediate DIEP flap reconstruction. Previous surgical history was notable for lumpectomy and sentinel lymph node biopsy of her left axilla. She declined postoperative radiation therapy. She self-reported three rounds of cryolipolysis to the abdomen approximately 5 years before presentation. Details of the duration and effects of

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cryolipolysis are unavailable. Patient reported no history of abdominal surgery.

On preoperative evaluation, the patient had a body mass index of 24 (weight 57.6kg) and no abdominal masses or scars (Fig. 1). CT angiography of the abdomen demonstrated six deep inferior epigastric perforators on the right, seven deep inferior epigastric perforators on the left, and no abnormalities. A surgical oncologist subsequently performed bilateral total mastectomies using a Wise pattern incision, after which the plastic surgery team performed immediate DIEP flap reconstruction. Intraoperatively, one dominant medial row perforator was identified on the left hemiabdomen, and two perforators (one medial and one lateral) were chosen on the right hemiabdomen. No abnormalities were observed within the adipose tissue during flap elevation. Secondary perforators were temporarily occluded with vascular clamps. Adequate perfusion was confirmed with clinical assessment and indocyanine green laser angiography imaging (Fig. 2). The right (385g) and left (325g) abdominal hemiflaps (Fig. 3) were harvested and successfully anastomosed to the internal mammary vessels using microsurgical techniques. At the conclusion of the procedure, both flaps demonstrated excellent clinical perfusion and Doppler signal.

Postoperatively, the flaps were monitored closely and had adequate perfusion, Doppler signal, and stable oxygen saturation. She was discharged on postoperative day three. She was assessed again at postoperative day 10 and



Fig. 1. Preoperative image of the patient before undergoing bilateral DIEP flap reconstruction.



Fig. 2. Intraoperative indocyanine green laser angiography revealing adequate perfusion.

94. There was no evidence of flap loss, fat necrosis, infection, seroma, hematoma, or other notable postoperative complications (Fig. 4). She subsequently returned for final revision surgery, including bilateral nipple creation, scar revisions of the abdomen and breast, and autologous fat grafting from the flanks to bilateral breasts on postoperative day 104 without complication.

DISCUSSION

Understanding postoperative complication risks is essential for surgeons to adequately set expectations and inform shared decision-making with patients. Unfortunately, there can often be limited data to inform patients who have undergone novel procedures. The case we report here is representative of this issue. To the best of our knowledge, there are no studies examining DIEP flap breast reconstruction in patients who have previously undergone abdominal cryolipolysis.

Minimally invasive cosmetic procedures performed in the United States have increased 174% between 2000



Fig. 3. Intraoperative image of the right and left hemiflaps before microsurgical anastomosis.



Fig. 4. A 94-day postoperative image of the newly reconstructed breasts with bilateral DIEP flaps before second stage revision surgery, which includes nipple creation, scar revision, and autologous fat grafting.

and 2020.⁸ There were 357,938 cases of noninvasive fat-reduction techniques such as cryolipolysis performed in 2020 alone.⁸ The high incidence of breast cancer together with growing popularity of noninvasive fat reduction make it likely that plastic surgeons will more frequently encounter patients who have had abdominal cryolipolysis seeking DIEP flap breast reconstruction.

Presently, data are limited to patients who have undergone invasive techniques such as suction-assisted liposuction. Postoperative complication rates from these studies vary and have small sample sizes,^{4,6} although one study identified a significant reduction in partial flap loss and fat necrosis from 71.4% to 0% when using intraoperative indocyanine green laser angiography (ICG).⁶ ICG angiography has also demonstrated near 100% sensitivity for identifying tissue necrosis in flap-based reconstruction.⁹ Furthermore, appreciable cost savings have been shown in patients with a high risk for mastectomy skin flap necrosis, namely smokers, obese (body mass index >30), and large mastectomy volumes (>800 g).¹⁰ Therefore, ICG angiography should be considered in patients with prior abdominal cryolipolysis undergoing DIEP flap breast reconstruction given its utility in aiding intraoperative decision-making and the present lack

of outcomes data in this population. However, institutions will need to assess reconstructive outcomes against the cost of ICG use per patient to determine the value of ICG use in preventing complications for this select patient population.

Complications following cryolipolysis are seldom severe, and given the noninvasive nature of the procedure, theoretically may better maintain integrity of subcutaneous nerves and vasculature when compared with more invasive procedures.⁷ Additionally, there is no correlation between body mass index, abdominal wall thickness, and DIEP flap success rates; so fat reduction alone is unlikely contributory.¹¹ However, studies examining long-term outcomes in these patients are still warranted. This is especially important, given expansion of cryolipolysis use in hips, flanks, knees, thighs, arms, and ankles.⁷ Cryolipolysis therefore may have implications for reconstructive surgery throughout the body.

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REFERENCES

1. Breastcancer.org. U.S. breast cancer statistics. Published February 4, 2021. Available at https://www.breastcancer.org/symptoms/understand_bc/statistics. Accessed July 17, 2021.
2. 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.
3. Costanzo D, Klinger M, Lisa A, et al. The evolution of autologous breast reconstruction. *Breast J*. 2020;26:2223–2225.
4. Zavlin D, Jubbal KT, Ellsworth WA IV, et al. Breast reconstruction with DIEP and SIEA flaps in patients with prior abdominal liposuction. *Microsurgery*. 2018;38:413–418.
5. Saldanha JJ, Cao W, Broyles JM, et al. *Breast Reconstruction after Mastectomy: A Systematic Review and Meta-Analysis*. Rockville, Md.; Agency for Healthcare Research and Quality (US); 2021.
6. Casey WJ III, Connolly KA, Nanda A, et al. Indocyanine green laser angiography improves deep inferior epigastric perforator flap outcomes following abdominal suction lipectomy. *Plast Reconstr Surg*. 2015;135:491e–497e.
7. Ingargiola MJ, Motakef S, Chung MT, et al. Cryolipolysis for fat reduction and body contouring: safety and efficacy of current treatment paradigms. *Plast Reconstr Surg*. 2015;135:1581–1590.
8. American Society of Plastic Surgeons. Plastic surgery statistics report 2020. Published April 27, 2021. Available at <https://www.plasticsurgery.org/news/plastic-surgery-statistics>. Accessed July 17, 2021.
9. Bigdeli AK, Thomas B, Falkner F, et al. The impact of indocyanine-green fluorescence angiography on intraoperative decision-making and postoperative outcome in free flap surgery. *J Reconstr Microsurg*. 2020;36:556–566.
10. Kanuri A, Liu AS, Guo L. Whom should we SPY? A cost analysis of laser-assisted indocyanine green angiography in prevention of mastectomy skin flap necrosis during prosthesis-based breast reconstruction. *Plast Reconstr Surg*. 2014;133:448e–454e.
11. Modarressi A, Müller CT, Montet X, et al. DIEP flap for breast reconstruction: is abdominal fat thickness associated with post-operative complications? *J Plast Reconstr Aesthet Surg*. 2017;70:1068–1075.