

Simultaneous Contralateral Autologous Breast Augmentation during Unilateral Breast Reconstruction Utilizing Deep Inferior Epigastric Flaps

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Background: It is predicted that 281,550 new cases of invasive breast cancer and 49,290 new cases of ductal carcinoma in situ will be diagnosed this year. In this study, we will detail our experience with simultaneous contralateral autologous breast augmentation during unilateral breast reconstruction utilizing bilateral deep inferior epigastric perforator (DIEP) flaps.

Methods: A retrospective analysis of patients who underwent simultaneous contralateral autologous breast augmentation during unilateral breast reconstruction utilizing bilateral DIEP flaps by the senior surgeons at Beaumont Health Systems, Royal Oak, was conducted. Demographic data, operative details, complications, medical comorbidities, and patient outcomes were retrospectively analyzed.

Results: Seven patients who met the inclusion criteria were identified. One patient underwent immediate reconstruction with DIEP flaps, one patient had a history of lumpectomy and underwent delayed partial breast reconstruction, three patients had delayed unilateral DIEP breast reconstruction with contralateral breast augmentation, and two patients had previous augmentations that were revised. All patients examined in this review tolerated the procedures well and had clinically viable flaps along with superior aesthetic outcomes.

Conclusions: This technique can be applied to various clinical conditions, including immediate breast reconstruction, delayed breast reconstruction, and salvage for failed implant-based reconstruction, leading to optimal patient outcomes and satisfaction. Unilateral breast reconstruction with simultaneous contralateral autologous breast augmentation utilizing bilateral DIEP flaps is a surgical technique that more plastic surgeons should utilize. (*Plast Reconstr Surg Glob Open* 2022;10:e4498; doi: 10.1097/GOX.0000000000004498; Published online 14 September 2022.)

INTRODUCTION

According to the American Cancer Society, breast cancer is the most common cancer in American women with a lifetime risk of 13%.¹ In addition, it is predicted that in 2022, 287,850 new cases of invasive breast cancer and 51,400 new cases of ductal carcinoma in situ will be diagnosed, with 43,250 women dying from breast cancer.¹ For most women diagnosed with early stage breast cancer, the preferred treatment method is breast-conserving therapy,

which consists of lumpectomy, sentinel lymph node biopsy (SLNB), and radiation.^{2,3} However, in patients with larger tumor size, increased cancer stage, and advanced breast cancer, mastectomy is the preferred treatment method.⁴ In addition, studies have shown that there has been a decrease in the number of patients who are choosing against lumpectomies in the last 5–10 years; this has correlated with an increase in the number of bilateral mastectomies.⁵ Furthermore, there has been an increase in patients willing to undergo further surgeries for breast reconstruction. According to the 2020 plastic surgery report by the American Society of Plastic Surgeons, 137,808 breast reconstructions and 193,073 breast augmentation procedures were performed by plastic surgeons in the United States.⁶

Breast reconstruction is broken down into two broad categories: implant-based reconstruction and flap reconstruction.⁷ Currently, implant-based reconstruction techniques are popular, primarily due to affordability and an immediate breast-mound formation.^{8,9} However, patients

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are more willing to undergo flap reconstruction due to concerns of breast implant illness (BII), a poorly defined group of symptoms including joint pain, changes in hair and skin quality, and fatigue.¹⁰ Microsurgical abdominal flap-based reconstruction has been found to score higher in patient psychosocial health, sexual well-being, and cosmetic outcomes when compared with that of implant-based reconstruction.¹¹ Furthermore, it has been found that patients who underwent flap reconstruction compared with implant-based reconstruction are more likely to have a better quality of life and sensory recovery with fewer complications.¹²

Several free flaps, such as the superficial inferior epigastric artery flap, deep inferior epigastric perforator (DIEP) flap, and muscle-sparing transverse rectus abdominis musculocutaneous (TRAM) flap, are alternatives for breast reconstruction.¹³ Although comparable, the literature has found that the DIEP flap has advantages over the utilization of other flaps, including shorter recovery periods, decreased donor site morbidity, and lower complication rates.¹⁴ Additionally, breast augmentation procedures are done not only for cosmetic purposes but also play a pivotal role in postmastectomy reconstructive treatment plans. Breast augmentation by autologous fat grafting (AFG) has also been used as an alternative to breast implants due to low complication rates and cosmetically appealing results.¹⁵ In addition, breast augmentation by AFG has been shown to enhance patient satisfaction, have high satisfaction rates, and improve quality of life.¹⁶ Finally, AFG has been shown to improve patient body image, the aesthetic appearance of the breast, and scar quality in patients undergoing breast-conserving therapy and hybrid reconstruction.^{17,18}

A significant challenge to unilateral breast reconstruction is achieving symmetry to the contralateral side in size and shape while optimizing breast aesthetics. This is particularly difficult in patients with small breasts who desire natural breast augmentation following mastectomy. This study will detail our experience with simultaneous contralateral autologous breast augmentation during unilateral breast reconstruction utilizing bilateral DIEP flaps. This approach can be applied to multiple clinical scenarios, including immediate breast reconstruction, delayed/staged breast reconstruction, and salvage for failed implant-based reconstruction.

METHODS

After institutional review board approval was obtained in accordance with the Declaration of Helsinki, a retrospective analysis of all patients who underwent simultaneous contralateral autologous breast augmentation during unilateral breast reconstruction utilizing bilateral DIEP flaps by the senior surgeons was conducted. Demographic data, operative details, complications, medical comorbidities, and patient outcomes were retrospectively gathered and analyzed. Seven patients who met the inclusion criteria were identified. All patients were screened for clotting history and hypercoagulability disorders. Finally, all patients underwent computed topography angiography to

Takeaways

Question: Can the DIEP flap be utilized for simultaneous breast procedures?

Findings: Augmenting the contralateral breast with DIEP flaps has been shown to be safe, have low complication rates, and lead to successful surgical outcomes.

Meaning: DIEP flaps can be applied to several clinical conditions and have been shown to have high patient satisfaction in patients undergoing bilateral breast procedures.

obtain preoperative vascular mapping. Both anastomoses were performed to the ipsilateral internal mammary vessels and inset to the chest wall with 2-0 Vicryl sutures, and the average operating room time was 237 minutes.

RESULTS

Case 1

A 50-year-old woman with a surgical history of bilateral breast augmentation in 2009 developed BII-like symptoms and had her implants removed in 2019 (Table 1). She was diagnosed with ductal carcinoma in situ of the right breast in March 2020, which was later determined to be Paget's disease. The patient underwent genetic testing, which was found to be negative. Given the patient's diagnosis of Paget's disease, breast oncology recommended the patient undergo a right mastectomy and SLNB. In addition, there was no plan for adjuvant chemotherapy or radiation. Furthermore, the patient expressed a desire to have a single operation consisting of her mastectomy and reconstruction. The patient was deemed a great candidate for the DIEP flap, and in conjunction with the breast surgery team, the patient was recommended a right simple mastectomy with SLNB and immediate right breast reconstruction with innervated DIEP flap and left breast augmentation with a DIEP flap (Fig. 1A). The patient was counseled that neurotization may not be beneficial for buried flaps, but she stated that she still preferred to have her buried flaps neurotized. The patient underwent right-sided simple mastectomy and SLNB with immediate right breast reconstruction with innervated DIEP flap and left breast augmentation for symmetry with innervated DIEP flap (Fig. 1B). The abdominal flap was split symmetrically at midline, and the right breast was reconstructed by the transfer of the left hemiabdomen, while the left breast was reconstructed by the right hemiabdomen. There were no intraoperative or postoperative complications. The flaps were clinically viable, and the patient was extremely happy with her results (Fig. 1C).

Case 2

A 59-year-old woman with a medical history of depression, hypothyroidism, hyperlipidemia, and left-sided breast carcinoma underwent left nipple-sparing mastectomy with implant breast reconstruction and right breast augmentation for symmetry in 2018 (Table 1). The patient had a 440 ml implant on the left and a 165 ml implant on the

Table 1. Demographics of Patients Undergoing DIEP Flap Breast Reconstruction

Patient	BMI	Indications	Cancer Staging	Lymph Node Involvement	Length of Stay	Complications	Revision Surgery
Case 1	24.07	Paget's disease—right breast					
Case 2	27.66	Ductal carcinoma in situ—right breast Ductal carcinoma status/post left nipple-sparing mastectomy with implant-based reconstruction	Grade 2 Grade 1	None None	3 d 3 d	None None	One One
Case 3	19.74	Reconstruction status/post left mastectomy	Grade 2	None	3 d	None	One
Case 4	31.01	Invasive ductal carcinoma—left breast	Grade 2	None	5 d	None	One
Case 5	23.91	Invasive ductal carcinoma—right breast	Grade 2	None	5 d	None	One
Case 6	22.71	Tubal carcinoma of the right breast status/post lumpectomy	Grade 1	None	3 d	None	One
Case 7	27.46	Left-sided breast cancer status/postmastectomy with implant-based reconstruction	Grade 1	None	3 d	None	One

BMI, body mass index.

right. Postoperatively, the patient developed painful capsular contracture bilaterally, causing breast asymmetry. She reported that she was advised against autologous breast reconstruction by previous plastic surgeons. The possibility of a right breast augmentation with a DIEP flap using a small flap and left breast reconstruction with a larger flap was discussed with the patient (Fig. 2A). The senior authors discussed utilizing a larger DIEP flap (2/3 abdomen) to the left breast and augmentation of the contralateral breast with a smaller DIEP flap (1/3 abdomen). The patient was counseled that neurotization may not be beneficial for buried flaps, but she stated that she still preferred to have her buried flaps neurotized. The patient underwent removal of bilateral breast implants, bilateral capsulectomy, left breast reconstruction with innervated DIEP flap, and right breast augmentation for symmetry with innervated DIEP flap in June 2020. The abdominal flaps were divided two-thirds from the right abdomen and one-third from the left abdomen (Fig. 2B). Two dominant lateral row perforators supplied the right-sided abdominal flap. The left breast was reconstructed by the transfer of the right hemiabdomen. The right breast was then reconstructed by transfer of the left hemiabdomen. The excess DIEP flap tissue was trimmed down to reduce the size of the flap. The right reconstructed flap was then buried underneath the breast tissue to augment the volume for symmetry to match the opposite site. There were no intraoperative or postoperative complications. The flaps were clinically viable, and the patient was extremely pleased with her results (Fig. 2C).

Case 3

A 36-year-old woman with no significant medical history developed left-sided breast carcinoma and underwent left-sided mastectomy with no reconstruction (Table 1). She was advised to undergo chemotherapy and radiation, which she declined. In addition, she expressed that she did not want breast implants and preferred autologous breast reconstruction. The senior authors discussed a stacked flap option for unilateral reconstruction or a right breast augmentation with a DIEP flap using a small flap and left breast reconstruction with a larger flap. Finally, we explored placing a tissue expander (TE) in the left prepectoral area to allow for burying the flap and utilizing a two-thirds flap for the left breast and one-third flap for the right, which the patient preferred (Fig. 3A). The patient was counseled that neurotization may not be beneficial for buried flaps, but she stated that she still preferred to have her buried flaps neurotized. The patient underwent delayed left breast reconstruction with prepectoral TE placement in preparation for DIEP flap in May 2020. A 300ml Mentor TE was placed with no intraoperative filling. The patient tolerated the procedure well, and TE filling to 150ml was initiated in May 2020. She then underwent removal of the left TE, left capsulectomy, left breast reconstruction with innervated DIEP flap, and right breast augmentation for symmetry with buried innervated DIEP flap in July 2020. The abdominal flaps were divided into two-thirds from the right abdomen and one-third from the left abdomen. The right-sided abdominal flap was supplied by two dominant lateral perforators and was used to

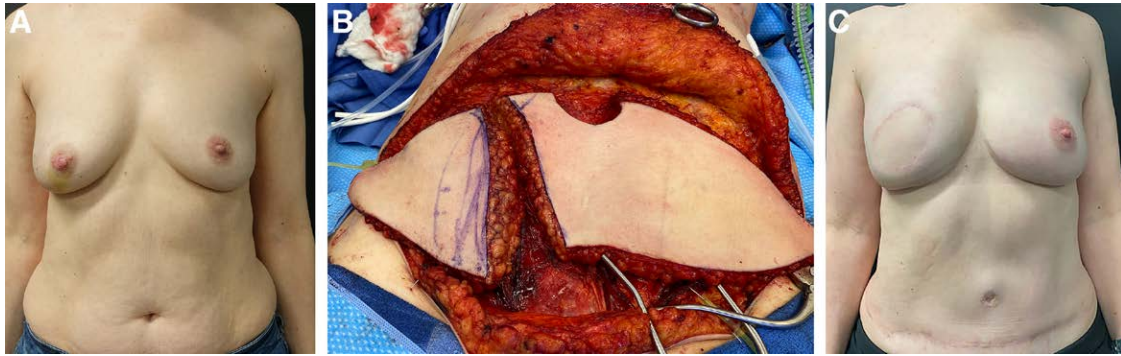


Fig. 1. Case 1. A, Preoperative image of patient with history of bilateral breast augmentation and ductal carcinoma of the right breast. B, Intraoperative image demonstrates the larger flap being utilized for total breast reconstruction and the smaller flap being utilized for augmentation. C, Twelve-month postoperative image after patient underwent right-sided mastectomy, right breast reconstruction with DIEP flap, and left-sided breast augmentation with DIEP flap.

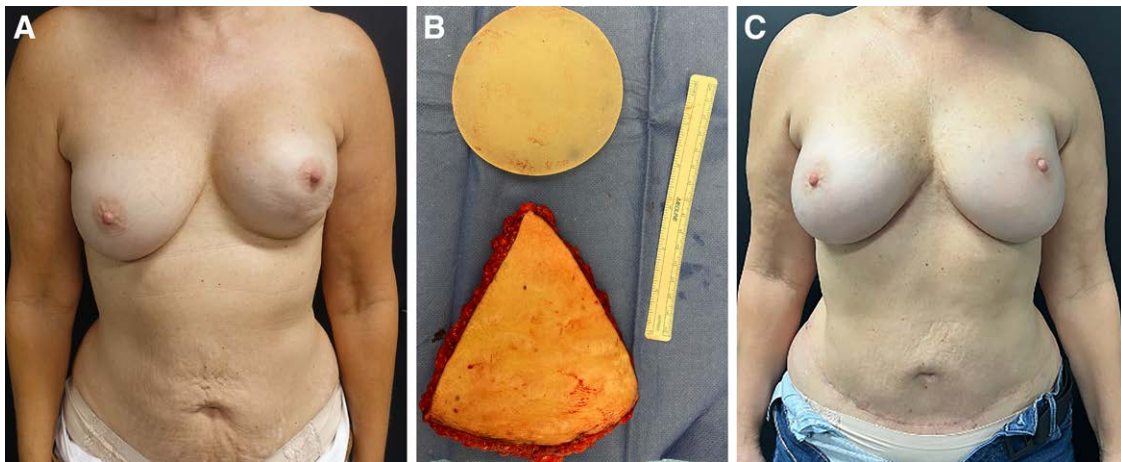


Fig. 2. Case 2. A, Preoperative image of patient with history of left-sided breast carcinoma with left nipple-sparing mastectomy and bilateral implant-based reconstruction. B, Intraoperative image demonstrates side-by-side comparison of the removed breast implant and the harvested DIEP flap with a similar volume. C, Twelve-month postoperative image after patient underwent removal of bilateral breast implants, bilateral capsulectomy, left-sided breast reconstruction with DIEP flap, and right-sided breast augmentation with DIEP flap.

reconstruct the left breast. The left-sided abdominal flap included a lateral and medial row perforator, which was used to reconstruct the right breast. The excess DIEP flap tissue was trimmed down to reduce the flap size. The right reconstructed flap was then buried subglandular to augment the volume for symmetry and match the contralateral breast. There were no intraoperative or postoperative complications. She progressed well postoperatively, and the flaps were clinically viable (Fig. 3B).

Case 4

A 41-year-old woman with a history of stage-two invasive ductal carcinoma of the left breast, with the tumor involvement of the left nipple, and a 15 pack-a-year smoking history presented for consultation of immediate reconstruction following a skin-sparing mastectomy (Table 1; Fig. 4A). Shortly after the mastectomy, the plastic surgery team scrubbed into the case and began inspecting the left mastectomy pocket. Two drains and a tissue expander (Allergan 375 mL) were placed into the subglandular breast pocket. She was discharged the following day without any in-hospital

complications. Eighteen months following her mastectomy and TE placement procedure, the patient presented to our clinic. By this time, she had completed chemotherapy and radiation. After discussing reconstructive options with the patient, a decision was made for her to undergo bilateral DIEP flap with reconstruction to the left breast and augmentation of the right breast. During the flap procedure, the previously placed TE was removed, and the patient underwent bilateral DIEP flap reconstruction. There were no intraoperative or postoperative complications. She was evaluated 6 months following the procedure and was noted to have abdominal scar pain, where the flap was removed. She is pleased with her surgical outcome (Fig. 4B).

Case 5

A 52-year-old woman with a history of stage-two invasive ductal carcinoma of the right breast presented for breast reconstruction consultation (Table 1). The patient had previously undergone chemotherapy and radiation followed by a lumpectomy and fat grafting. However, she developed a breast infection that required

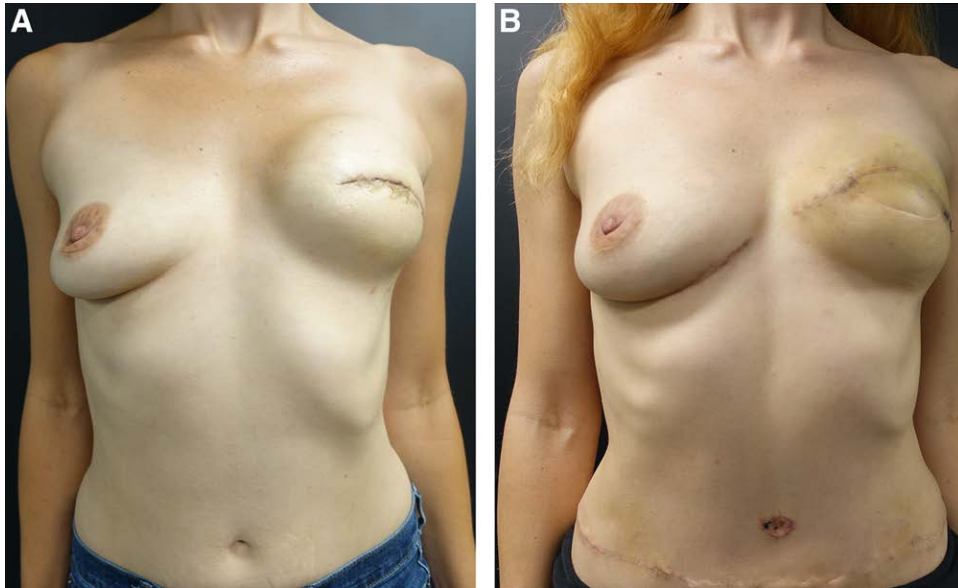


Fig. 3. Case 3. A, Preoperative image of patient with history of left-sided breast carcinoma with left-sided mastectomy with no reconstruction. B, Two-month postoperative image after patient underwent left-sided breast reconstruction with DIEP flap and right-sided breast augmentation with DIEP flap.

serial incisions and drainage. The complication led to dissatisfaction with her current breast appearance, as there was medial protrusion of her nipple, scarring, and unequal size between her breasts (Fig. 5A). After discussing reconstructive options with the patient, a mutual decision was made for the patient to undergo DIEP flap reconstruction of her right breast and augmentation of her contralateral breast with a DIEP flap (Fig. 5B). The patient tolerated the procedure well and did not develop any intraoperative or postoperative complications. Since the procedure, the patient has not encountered any complications. She is extremely pleased with her reconstructive results (Fig. 5C).

Case 6

A 52-year-old woman with stage IA multifocal low-grade tubular carcinoma of the right breast, status postlumpectomy with radiation presented to the clinic for breast reconstruction consultation (Table 1). She had concerns about asymmetry from her previous procedure and wanted to achieve more symmetrical breasts. Physical examination revealed a right lumpectomy scar with contracted post-radiation changes. There was a significant difference in the size between both breasts, with the left breast being around 200–250 mL larger than the right breast (Fig. 6A). The patient endorsed a 30 pack-a-year smoking history. After discussing treatment options with the patient, the patient desired to undergo a DIEP flap autologous reconstruction (Fig. 6B). She successfully underwent bilateral breast reconstruction with DIEP flap and super-charged right venous anastomosis and was discharged 3 days later. There were no intraoperative or postoperative complications. The patient was extremely satisfied with the results (Fig. 6C).

Case 7

A 49-year-old woman with a medical history of gestational diabetes, depression, and stage-one left-sided breast cancer presented to the clinic for breast reconstruction (Table 1). The patient did not require chemotherapy or radiation and had undergone a mastectomy with textured implant reconstruction, which was recalled due to links to lymphoma (Fig. 7A). After consulting with the patient, it was decided that she would undergo left breast reconstruction with DIEP flap, removal of the left implant and left capsulectomy, and right breast augmentation with DIEP flap. There were no intraoperative or postoperative complications, and the patient stated that she was pleased with her surgical outcome (Fig. 7B).

DISCUSSION

There are a variety of methods that can be utilized for patients who would like to undergo both breast reconstruction or breast augmentation. Reconstruction is broken down into two broad categories: implant-based reconstruction and autologous. Flaps that are commonly used for breast reconstruction include TRAM flap, DIEP flap, and superficial inferior epigastric artery flap.¹⁹ In addition to flaps, AFG has demonstrated efficacy from both a reconstructive and a cosmetic standpoint for patients undergoing breast surgery.²⁰ This report documents our experience in utilizing simultaneous contralateral autologous breast augmentation during unilateral breast reconstruction utilizing bilateral DIEP flaps in seven patients who underwent breast reconstruction.

DIEPs have been shown to have similar advantages as the TRAM-free flap, with a few considerable advantages. Most importantly, DIEP flaps avoid the potential of causing abdominal wall weakness due to preservation of the

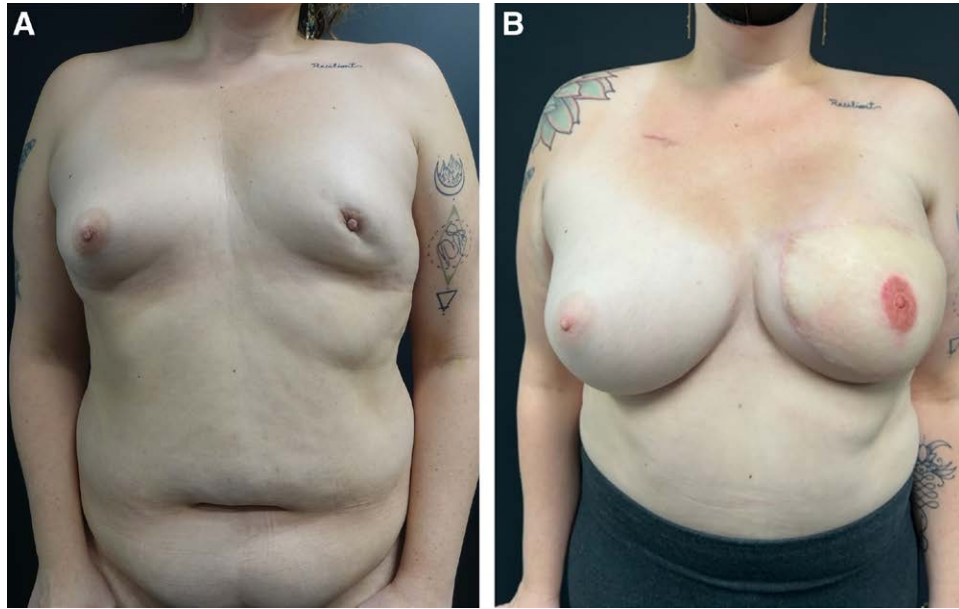


Fig. 4. Case 4. A, Preoperative image of patient with history of left-sided invasive ductal carcinoma. B, Twelve-month postoperative image after patient underwent left-sided breast reconstruction with DIEP flap and right-sided breast augmentation with DIEP flap.



Fig. 5. Case 5. A, Preoperative image of patient with history of right-sided invasive ductal carcinoma along with lumpectomy and fat grafting. B, Intraoperative image demonstrates partial breast reconstruction on the right and partial breast augmentation on the left with DIEP flap. C, Postoperative image after patient underwent right-sided breast reconstruction with DIEP flap and left-sided breast augmentation with DIEP flap.

rectus abdominis, which leads to decreased morbidity and a quicker recovery time.^{21,22} Additionally, a study by Blondeel²² found that DIEP flaps had the ability to lead to quicker recovery times with the potential for sensate reinnervation still being possible. Garvey et al²³ determined that DIEP flaps were less likely to lead to abdominal wall hernias and fat necrosis than TRAM flaps. Utilizing DIEP flaps for both unilateral and bilateral breast reconstruction has been deemed a safe option, with a relatively low rate of complications.²⁴ However, studies have determined that bilateral reconstruction tends to be associated with higher rates of flap loss and complications when compared with unilateral reconstruction.²⁴ A retrospective study by Gill et al¹⁴ found a positive correlation between the number of perforators and the risk of fat necrosis. Other studies have determined that the rate of fat necrosis has a statistically significant relation to patient weight. It is

neither linked to patient age nor preservation of the rectus muscle.²⁵ Finally, a study by Bhullar et al²⁶ found that incorporating two to three perforators with the exclusion of Holm zone III led to decreased rates of fat necrosis. In our patient population, we had no perioperative or postoperative complications. In addition, the lead surgeons in this article tend to utilize it. Furthermore, all patients came from a single surgeon at a single facility, and therefore, the potential for skill bias cannot be discarded.

Our study determined that DIEPs are effective for ipsilateral breast reconstruction with contralateral breast augmentation for various population groups. Our patient population contained a diverse set of patients, including one patient who underwent immediate reconstruction with DIEP flaps, one patient with a history of lumpectomy who underwent delayed partial breast reconstruction, three patients who had delayed unilateral DIEP breast reconstruction with

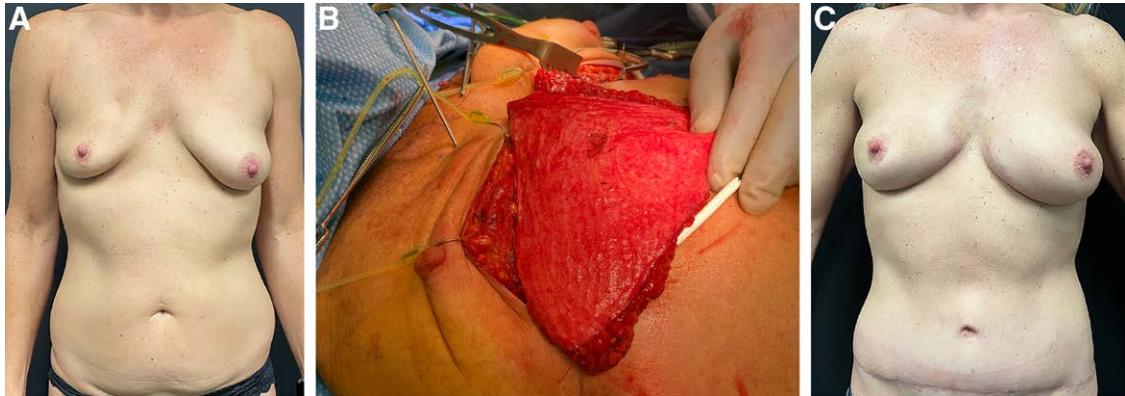


Fig. 6. Case 6. A, Preoperative image of patient with history of right-sided tubular carcinoma with lumpectomy. B, Intraoperative image demonstrates utilization of bilateral DIEP flaps for bilateral breast augmentation. C, Six-month postoperative image after patient underwent right-sided breast reconstruction with DIEP flap and left-sided breast augmentation with DIEP flap.

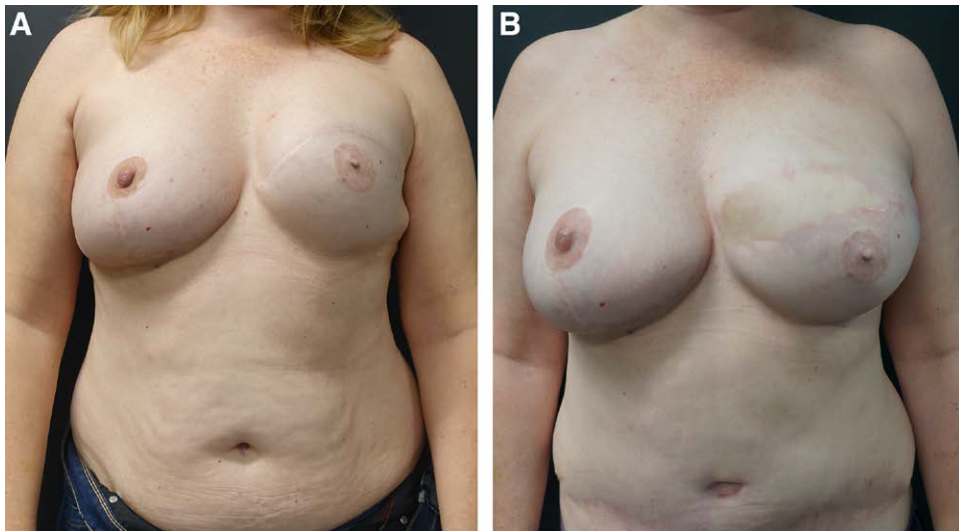


Fig. 7. Case 7. A, Preoperative image of patient with history of left-sided breast cancer along with mastectomy and implant-based reconstruction. B, Nine-month postoperative image after patient underwent implant removal, left-sided breast reconstruction with DIEP flap, and right breast augmentation with DIEP flap.

contralateral breast augmentation, and two patients had previous augmentations that were revised. All patients in this study were satisfied with their surgical outcome and had aesthetically pleasing results. Huang et al²⁷ utilized a similar technique and found that in patients with optimal abdominal tissue, unilateral breast reconstruction with contralateral breast augmentation with DIEP flaps was achievable with significant increases in patients' breast satisfaction, sexual well-being, and psychosocial well-being. Furthermore, their study utilized two split flaps derived from their pedicles but anastomosed to a single pair of internal mammary vessels.²⁷ However, in our study, the patients underwent a technique where flap was anastomosed to the corresponding internal mammary vessels. Additionally, studies have found that DIEP flaps are still a viable flap to be utilized in reconstructive procedures even with the presence of abdominal scars.²⁸

DIEP flaps have a considerable advantage over implant-based reconstruction, especially in patients with BII. BII has

been a well-documented occurrence since the 1960s, causing systemic reactions such as brain fog, joint pain, muscle pain, and gastrointestinal symptoms in certain patients.²⁹ In addition, studies have shown that when there are complications stemming from implant-based reconstruction, most patients can achieve successful reconstruction through the utilization of TRAM or DIEP flaps.³⁰ In a retrospective analysis, Garvey et al³¹ determined that obese patients who were class II or III based on the World Health Organization obesity classification were more likely to experience higher rates of failure with implant-based reconstruction than the utilization of free flaps. In our study, we had one patient who had symptoms of BII, and after undergoing ipsilateral breast reconstruction with contralateral breast augmentation, she experienced resolution of her symptoms.

Our technique can be utilized in patients who have undergone previous prosthetic-based reconstruction techniques that may require a secondary surgery. A study by

Fabrizio et al³² found that immediate implant-based breast reconstruction with an omental flap leads to improved patient satisfaction and quality of health. However, drawbacks include being a laparoscopic procedure and inability to estimate flap volume preoperatively. Another study by Omranipour et al³³ utilized polyvinylidene fluoride mesh with immediate implant-based breast reconstruction that has demonstrated efficacy, although complications such as seroma and necrosis were reported. In our study, flap volume can be determined during physical examination and does not require laparoscopy, and minimal complications were noted, making the technique a possible adjuvant in these patient populations. However, it is critical to note that skill bias and the number of patients in this study are limitations that must be taken into consideration.

CONCLUSIONS

DIEP flaps for ipsilateral breast reconstruction and contralateral breast augmentation are a versatile surgical treatment option that has the potential to be widely generalized. In our study, this surgical technique was applied to patients who required immediate breast reconstruction, delayed breast reconstruction, and an alternative method of reconstruction after failed implant-based reconstruction. The procedure essentially avoids complications related to silicone implants and potential reoperations. However, it is important to note that performing this procedure increases the complexity of the operation, and risks associated with the utilization of the DIEP flap may also be seen on the augmentation side. Furthermore, with the right expertise, ipsilateral breast reconstruction and contralateral breast augmentation with DIEP flaps should be heavily considered in patients undergoing procedures involving the breast.

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PATIENT CONSENT

All patients provided consent for surgical treatment and for the use of their images for research purposes.

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