Using a Single Internal Mammary Artery as Retrograde and Antegrade Flow for Bilateral Deep Inferior Epigastric Artery Perforator Reconstruction: A Case Report

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Abstract

Keywords

- DIEP
- internal mammary artery
- antegrade
- retrograde
- breast reconstruction

Deep inferior epigastric artery perforator (DIEP) flaps have become an attractive option for autologous breast reconstruction. The internal mammary artery (IMA) is the usual artery of choice for reconstruction. Unfortunately, there are certain situations when the IMA may not be suitable for usage as in previous radiation or diminutive size. Several options have been documented, such as using the thoracodorsal vessels. In this case report, we report usage of the distal and proximal ends of a contralateral single mammary artery to supply antegrade and retrograde flow to bilateral DIEP flaps. With increasing complexity of patient populations, the use of alternate approaches to recipient vessel in DIEP reconstruction becomes essential for effective outcomes.

Breast reconstruction has progressed significantly over the years. The initial use of silicone implant, which progressed to tissue expanders, pedicled flaps, and now free flaps are at the forefront of breast reconstruction. Pedicled transverse rectus abdominus muscle (TRAM) flaps have been replaced with free TRAM flaps and deep inferior epigastric artery perforator (DIEP) flaps because of donor site morbidity. TRAM flaps are associated with loss of abdominal wall function and inability to undertake activities of daily living as well as increased incidence of hernias.¹ Both free TRAM and DIEP flaps spare the amount of rectus abdominus muscle harvest, thus limiting these complications.

The internal mammary artery (IMA) is one of the most commonly used recipient blood vessels because of its luminal diameter and location. However, the IMA may not be available or may be insufficient in several situations. In one series, the IMA was deemed unusable because the diameter was less than 1 mm rendering an insufficient arterial flow and instead circumflex scapular vessels were used.² Several variations

have been described for donor vessels in DIEP reconstruction. The thoracodorsal vessels have been described as alternate sources of recipient vessels.³ In another case, dual flaps perfused by a single mammary artery have been used to reconstruct a single breast.⁴ Bilateral flaps based off of a single mammary artery have also been described.⁵ Alternatively, end-to-side anastomoses at the IMA have been used to preserve flow in the mammary artery.⁶ Here, we present a patient with unusable mammary vessels likely secondary to radiation damage. The retrograde and antegrade portions of the contralateral IMA were used to perfuse bilateral DIEP flaps.

Case Report

Our patient is a 62-year-old female who had previously underwent right breast conserving lumpectomy and adjuvant chemoradiation. A year later, she underwent total abdominal hysterectomy and salpingo-oophorectomy and right

colectomy for metastatic recurrence. She presented 5 years later with a new lesion initially found on computed tomographic (CT) chest in the right breast. She then underwent magnetic resonance imaging (MRI) of the chest and a suspicious lesion was found in the right lateral breast and a probable benign lesion in the left breast. A biopsy was performed which was consistent with infiltrating ductal carcinoma. The patient opted for bilateral mastectomy with immediate reconstruction. As part of preoperative planning, the patient underwent perioperative CT angiogram of the abdominal wall, which demonstrated adequate perforators.

Bilateral simple mastectomy with sentinel lymph node biopsy was performed with a circumareolar incision. The right breast had changes suggestive of adverse effects of radiation—fibrotic appearing pectoralis fascia and muscle inferiorly with loss in breast volume. DIEP flaps were harvested concomitantly with mastectomy. Superficial epigastric vessels were preserved. Upon exposure of the right internal mammary vessels, the internal mammary and thoracoacromial vessels appeared fibrotic and small in size likely secondary to history of radiation, making them unsuitable for anastomosis. Because of these limitations in recipient site vessels, it was decided to proceed with vascular anastomosis using the left IMA only. Upon transection of the left IMA, good pulsatile flow from both ends was evident. The proximal IMA was chosen as the recipient vessel for the left side and the distal IMA for the right side, bringing the right deep inferior epigastric pedicle (donor vessel) through a subcutaneous tunnel across the sternum. The end–end arterial and venous anastomosis was performed with a 9–0 nylon suture with running technique. Patient did well postoperatively and underwent nipple reconstruction 4 months later.

Discussion

DIEP reconstruction currently is a popular means of breast reconstruction in this era. Excellent aesthetic outcomes and decreased donor site morbidity make DIEP flap a natural choice. Classically, these flaps are based on IMA as recipient vessels. If the IMA is deemed unsuitable because of decreased size, decreased flow, or absence, alternative sites have been explored. The subscapular

vessels, the thoracodorsal vessels, and modifications to the IMA (e.g., end-to-side anastomosis) have also been reported.^{4,6} The use of multiple flaps for unilateral reconstruction has also been an indication for modifications to the mammary, modifications to the epigastrics, and alternate recipient vessels. Here, we discuss the utility of retrograde and antegrade IMA to supply bilateral DIEP flaps successfully. We have found two reported cases for using a single IMA to perfuse two free flaps. In one article, the IMA was used to perfuse bilateral DIEP flaps and in the second article, the single IMA was used to perfuse a DIEP flap and a gluteal artery flap. With increasing complexity of patient population, the utility of alternate approaches to recipient vessel in DIEP reconstruction becomes essential for effective outcomes. In the era of increasing coronary artery disease, an alternative advantage of utilizing solitary IMA with antegrade and retrograde recipient vessels would be to preserve the contralateral IMA for future harvest (e.g., coronary artery bypass graft).

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