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Bipedicle-conjoined perforator flaps in breast reconstruction

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ABSTRACT

Background: For some patients seeking autologous breast reconstruction, there may be insufficient abdominal skin and soft tissue to reconstruct an adequately sized breast. Perfusion from a single-pedicle deep inferior epigastric perforator artery flap has a high degree of variability across the midline, and this further limits perfusion. We have found that bipedicle-conjoined abdominal perforator flaps are a novel and reliable technique for reconstruction in these women, and this study examines our experience.

Materials and methods: A retrospective review was performed over a 2-y period of bipedicle-conjoined abdominal perforator flaps in 28 patients. For each reconstruction, the pedicle of one flap was anastomosed to the anterograde internal mammary artery vessels and the pedicle of the second flap to a side branch of the primary flap or the retrograde internal mammary vessels.

Results: Mean age and body mass index were 50.2 y (standard deviation, 8.0) and 25.9 kg/m^2 (standard deviation, 2.8), respectively. In total, 15 patients (53.6%) received radiation therapy before surgery. There were no flap losses; fat necrosis was found in one flap (3.2%). The large contiguous skin island of the bipedicle-conjoined deep inferior epigastric perforator flaps allowed for extensive replacement of damaged or absent breast skin when necessary. Aesthetically satisfactory results were achieved in all patients.

Conclusions: Bipedicle-conjoined abdominal perforator flaps represent a novel technique in select patients seeking breast reconstruction. The added complexity was safe and reliable in this series of patients. Compared to unipedicle flaps, the increased skin and volume allow greater flexibility to achieve the desired shape and projection.

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1. Introduction

Autologous free-flap breast reconstruction has become a common and reliable method for immediate and delayed reconstruction of the female breast [1]. Despite recent reports indicating a paradigm shift toward implant-based procedures after mastectomy, advances in microsurgical techniques have continued to develop, rendering autologous tissue transfer an excellent option for reconstructing a natural appearing breast [2]. Currently, the deep inferior epigastric perforator (DIEP) flap is considered the gold standard in microsurgical breast reconstruction owing to its favorable donor site morbidity, complication rates, and patient satisfaction [3–9]. In 2012, DIEP flap reconstruction was shown to be the most widely used method of autologous breast reconstruction in the United States [10]. The American Society of Plastic Surgeons reported on 95,589 breast reconstruction procedures in 2013, of which 7220 (8.1%) involved DIEP flap reconstruction [11].

To perform a satisfactory autologous reconstruction, sufficient skin and subcutaneous fat is necessary to create a teardrop-shaped natural-looking breast with adequate volume to match the contralateral breast. For some patients, the single-pedicle DIEP artery flap does not adequately satisfy one or more critical components necessary to achieve an aesthetically satisfactory breast reconstruction, namely the restoration of the "footprint," "conus," and "skin envelope." [12] Satisfying all three of these critical elements is particularly challenging in women who have relatively scant abdominal tissue in the distribution of a single-pedicle DIEP flap and for those undergoing delayed reconstruction where there is a significant skin deficiency, especially after radiotherapy. Alternatively, implant-based reconstruction could be considered; however, this method does not adequately resolve inadequacies of the skin envelope, particularly in irradiated patients, leading to further shortfalls in shape and ptosis [13]. In addition, recently published data describe a higher risk of reconstructive failure and surgical site infection in tissue expander with implant reconstruction relative to abdominal free-flap tissue transfer [14].

To address these challenges in breast reconstruction, an increasing number of studies describe the use of bipedicled DIEP flaps [15–19]. The bipedicled concept relies on the entire lower abdominal flap with perfusion based on two sets of perforators, with at least one perforator on each side of the midline. This approach can be considered when a patient presents with the need for unilateral breast reconstruction and only has adequate adipocutaneous tissue when all or most of the entire lower central abdominal wall is used. We have extended the bipedicle-conjoined DIEP flap concept to capture volume and skin over the flank region in women requiring bilateral autogenous reconstructions by conjoining one DIEP flap with one deep circumflex iliac artery (DCIA), superficial circumflex iliac artery (SCIA) or superficial inferior epigastric artery (SIEA) perforator flap from each side of the abdomen.

In this study, we describe our experience with bipedicle-conjoined abdominal perforator flap reconstruction in post-mastectomy breast reconstruction. We have found that bipedicle-conjoined abdominal flaps can be reliably used to achieve aesthetically satisfactory unilateral and bilateral breast reconstructions in women who would otherwise have a paucity of tissue using single-pedicle DIEP flaps.

2. Methods

2.1. Patient selection

We performed a retrospective review of women undergoing unilateral or bilateral breast reconstruction using bipedicle-conjoined abdominal perforator flaps at two institutions between December 2012 and December 2014. All surgeries were performed by two plastic surgeons (D.T.G. and H.A.E.). The study received institutional review board approval before data recruitment. Data on patient demographics, relevant comorbidities (smoking, coronary artery disease, hypertension, diabetes, hypertension, and coagulopathy), preoperative and intraoperative imaging, and postoperative outcomes (flap failure, breast and/or abdominal hematoma, breast and/or abdominal seroma, breast and/or abdominal delayed wound healing, breast and/or abdominal infection, and fat necrosis) were collected from medical records and stored in a comprehensive database.

2.2. Preoperative planning

Routine workup at our institutions included assessment of patient risk factors associated with increased risk of complications. Volume and quality of the abdominal tissue were assessed clinically to determine the possibility of reconstructing an aesthetically shaped new breast of the desired size. Treatment options were discussed, including tissue expander placement and autologous breast reconstruction. At the time of consultation, the operating surgeon determined if a unipedicle abdominal perforator or a bipedicle-conjoined abdominal perforator flap would be needed to reconstruct the breast or breasts.

Preoperative perforator mapping was performed with either multiple-detector computed tomography angiography or magnetic resonance angiography.

2.3. Surgical technique

Before surgery, skin markings were made according to previous described studies on DIEP reconstruction where conjoined DIEP + DIEP flap were planned [19,20]. When bilateral conjoined flaps were planned, the bilateral DIEP flaps were marked along with the distribution of the secondary flaps. When a DIEP + DCIA or DIEP + SIEA or DIEP + SCIA flap was planned, the skin incisions were modified to create a longer ellipse incorporating the distribution of the additional vessels (Fig. 1).

Perforator selection was based predominantly on preoperative imaging; however, direct intraoperative observations, and in select cases, the results of intraoperative fluorescence angiography, were also taken into account. In cases of immediate breast reconstruction, the mastectomy was performed by a breast surgeon, whereas the abdominal perforator dissection was performed simultaneously.