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CASE REPORT
Breast

Breast Reconstruction with a Lateral Breast Free Flap: A New Application of Breast-sharing

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Summary: Breast reconstruction using contralateral autologous tissue, also known as breast sharing, is a viable option previously described in the literature, whereby flaps based on perforators of the internal mammary artery (internal mammary artery pedicle) are used. We report a postoncological breast reconstruction case using a microvascular flap taken from the lateral pole of the contralateral breast. We highlight the importance of preserving the medial pole of the donor breast for improving cosmesis, avoiding symmastia, and preserving the intermammary sulcus, as a difference with flaps based on the internal mammary artery pedicle flaps. Breast sensation could be recovered by neurotization of the lateral intercostal nerve, which may be included in the contralateral breast flap to be transferred. Contralateral breast free flaps could be an alternative to reconstruct the breast in selected patients. Oncological risk factors are discussed. Advances in genetic testing and tumor cell biology could help us to select the accurate candidates for this reconstructive technique. *(Plast Reconstr Surg Glob Open 2020;8:e2701; doi: 10.1097/GOX.0000000000002701; Published online 24 March 2020.)*

INTRODUCTION

Breast reconstruction with autologous tissue offers advantages over implant reconstruction.[1–3] It provides a natural, softer breast, better tolerance to radiation therapy,[4,5] and avoids implant-related complications.[6–8] Advances in perforator flap design provide us with different donor areas to reconstruct the breast[9–11] with less morbidity of the donor areas as compared to musculocutaneous flaps.[12–14] We report a case of postoncologic breast reconstruction with a free flap harvested from the contralateral breast.

CASE REPORT

A 35-year-old woman presented with a palpable lump in the lateral pole of her right breast. A biopsy revealed a breast angiosarcoma. She underwent a quadrantectomy with an oncoplastic periareolar approach. The pathologic study reported angiosarcoma with resection margins close to the tumor. Oncologic surgeons decided to perform a mastectomy with resection of a wide central skin ellipse including the nipple and areola. A 550 cc CPX 4 Siltex Style 9300 breast expander (Mentor, Santa Barbara, Calif.) was inserted during the mastectomy. Intensity-modulated radiation therapy was administered with a total dose of 5,000 cGy.

After 20 radiation therapy sessions, cephalic displacement of the tissue expander capsular contracture was observed (Fig. 1). Lymphedema was not found either before or after the radiation therapy. The patient had a left breast macromastia, she did not want abdominal scars, and she requested a breast reduction surgery before the reconstruction. The medical team decided to perform a breast-sharing reconstruction procedure. Abdominal wall computed tomographic angiography was performed using a 16-MDCT Scanner (Bright Speed, General Electric, Chicago, Ill.). The patient was placed in a supine position. Contrast media (80 cc) (Omnipaque, General Electric) was administered through 1 antecubital vein. Images were acquired during arterial phase with a 0.5 gantry rotation speed, 0.75-mm collimation and with image reconstructions done with a 1-mm interval, observing the presence of 3 perforators entering the donor breast at the lateral pole, branches of the thoracodorsal vessels, serratus anterior

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muscle perforators, and lateral thoracic perforators (**see figure, Supplemental Digital Content 1**, which displays angiotac imaging of the perforators entering the lateral breast, **http://links.lww.com/PRSGO/B329**).

The case was widely discussed by the breast cancer board of our clinic, and it was approved to perform a lateral pedicle breast free flap surgery based on the perforators identified. Patient consent was obtained to perform the procedure.

A left breast reduction was planned based on a wise pattern design with a nipple–areola upper and medial pedicle[15] and planning to transfer the dermoglandular tissue usually discarded in the reduction mammoplasty as a flap pedicled in branches of the thoracodorsal, perforators of the serratus muscle, and lateral thoracic vessels. Dissection began in the left breast, with an incision extending from the lateral submammary incision in a curved line towards the midaxillary line ending in the axilla. Dissection proceeded from lateral to medial, carefully preserving the anterior perforators of the thoracodorsal artery and serratus branch perforators, following the main trunk of the thoracodorsal pedicle. Medially we dissected the lateral thoracic perforators which entered the mammary gland, and following them proximally to the lateral thoracic pedicle. The dermoglandular flap was raised in a plane above the pectoralis fascia, preserving the pedicles previously dissected (Fig. 2). The flap pedicle to be anastomosed was chosen after observing clinical flap perfusion in situ by selective clamping of 2 of the 3 pedicles. The pedicle selected was the lateral thoracic artery and vein. The flap measured 25 × 11 cm, and the distal 3 cm of the flap was removed because of distal venous congestion. The recipient site is prepared, choosing the internal mammary artery and vein as recipient vessels. Flap pedicles were sectioned and the vessels were irrigated with heparinized solution (**see figure, Supplemental Digital Content 2**, which displays the breast flap in the operating table, showing the 3 pedicles dissected, **http://links.lww.com/PRSGO/B330**).

Microvascular anastomoses were performed under the operating microscope. A donor site closure is performed as a wise pattern reduction mammaplasty. She was discharged from the hospital on the fourth postoperative day, without any complications. Tattooing of the nipple and areola was done 3 months later (Fig. 3). MRI breast imaging at 6 months showed a normal glandular architecture of both donor and recipient breasts with postoperative scar changes without fat necrosis (**see figure, Supplemental Digital Content 3**, which displays a breast MRI performed 6 months postoperatively, showing

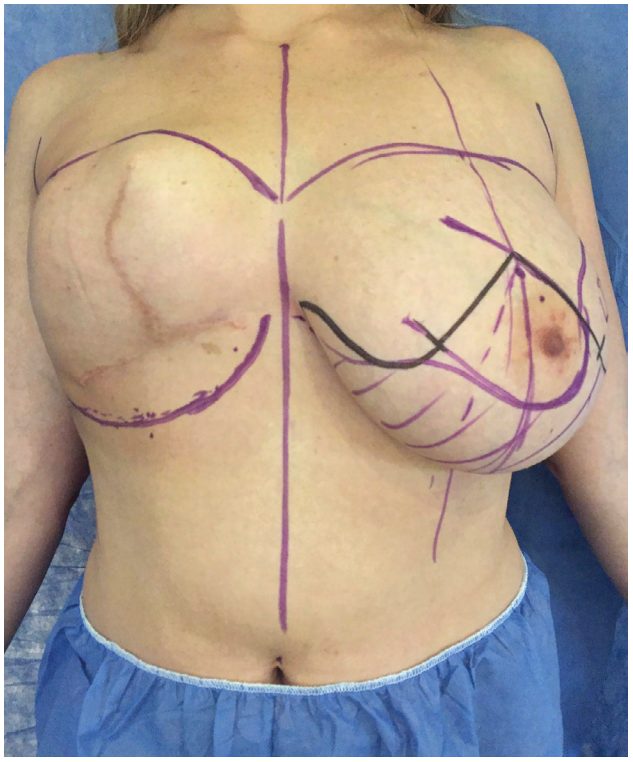

Fig. 1. Postoperative of right mastectomy and expander reconstruction, there is cephalic displacement of the expander and left mammary hypertrophy. Design of superomedial pedicle left reduction mammoplasty. Striped area corresponds to the skin and breast tissue discarded in a breast reduction and to be used as the breast free flap to be transferred.

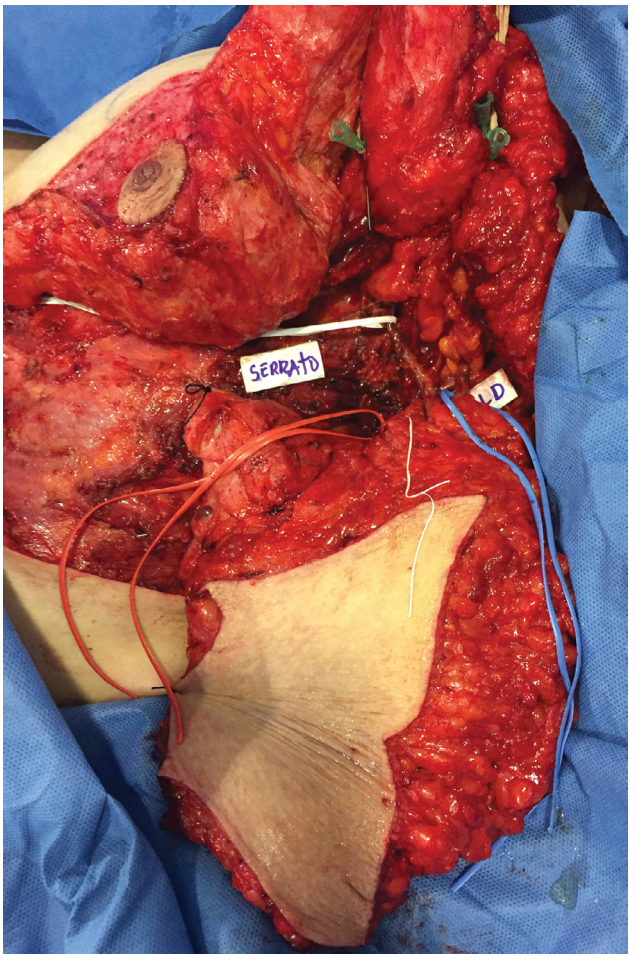

Fig. 2. Intraoperative flap dissection with the nipple and the areola in a superior medial dermoglandular pedicle, and the inferior lateral flap to be transferred based on 3 available pedicles: perforators of anterior thoracodorsal artery, serratus anterior artery perforator, and lateral thoracic artery.

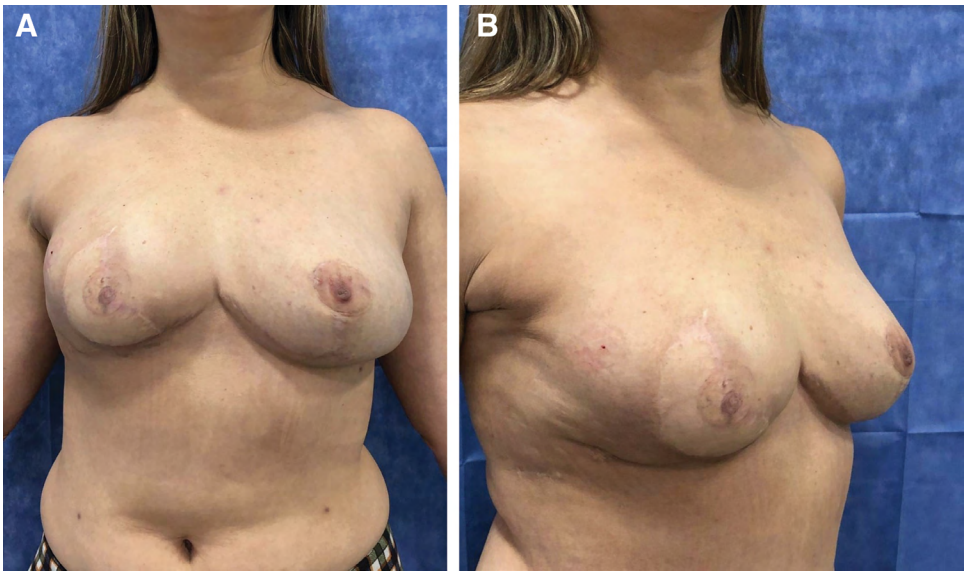

Fig. 3. Postoperative result after tattoo nipple and areola reconstruction. A, Frontal view. B, Oblique view.

normal breast architecture on both sides, **http://links.lww.com/PRSGO/B331**).

DISCUSSION

Advances in autologous breast reconstruction allow us to obtain highly satisfied patients with breasts that last forever, natural shaped and softer to touch, as compared to implant-based reconstruction.[16] Microvascular perforator flaps, although technically demanding, reduce considerably donor area morbidity. There is increasing experience in the use of other flaps in breast reconstruction when the abdominal flaps are not available, although still with morbidity in different donor areas such as a visible scar, delayed wound healing, and contour defects.

Breast reconstruction with the contralateral breast as a donor follows the Gillies principle of "replace it with like"[17] and it has been reported before. Marshall et al[18] used pedicled, staged breast flaps; this concept was further refined by Schoeller et al,[19] with a one-stage split breast contralateral flap based on perforators of the internal mammary vessels [internal mammary artery perforator (IMAP)]. The IMAP flap has also been widely used in chest wall coverage and for reconstruction of partial mastectomy defects.[20–23] Mitz[24] described a lateral thoracic free flap for correction of a unilateral breast hypoplasia. Villegas[25] also presented a case for aesthetic breast augmentation. Morritt et al[26] employed this flap to reconstruct postmastectomy defects.

The flap we described is composed of the dermoglandular tissue usually discarded in a routine superomedial pedicle reduction mammaplasty. The flap could be irrigated by 3 potential pedicles: anterior perforators of the thoracodorsal artery, perforators of the serratus muscle, or perforators of the lateral thoracic vessels. Those perforators could be preoperatively identified by angio-CT scan imaging, or they might be dissected as a free-style free flap. The pedicle chosen for microvascular anastomoses depends on the intraoperative flap perfusion observed in situ after selective clamping of the pedicles dissected.

As in any surgical procedure, this technique has limitations: anatomic variability, the need of a contralateral breast hypertrophy, and the risks of transferring breast tissue to other areas to be discussed.

The lateral thoracic artery anatomic variability was described by Taylor and Daniel[27] and Mc Culley et al[28] found the presence of this vessel in 85% of his clinical cases, and in patients without this artery, he always found a direct cutaneous branch from the thoracodorsal artery or an accessory lateral thoracic artery. Harii et al[29] described in the lateral thoracic free flap performed the presence of this pedicle in 81% of the cases, and if it not found, the flap was raised with branches of the thoracodorsal pedicle. He also reported a branch of the lateral thoracic artery entering the breast tissue, but he did not state its frequency. It is important to be aware of the anatomic variability of the pedicles found during the procedure and to have a B plan to reconstruct the breast if flap perfusion is not adequate after raising it, and performing the donor breast closure with the reduction mammaplasty needed. The learning curve could be improved with cadaver laboratory dissections. The patients must be informed about the risk of failure of this flap, highlighting the risk of not obtaining a good pedicle to irrigate it. Our patient agreed to have a left reduction mammaplasty if it would happen, and to do a right breast reconstruction with implants. She did not want any abdominal scars and she wanted the left reduction mammaplasty indicated.

It is important to consider that it needs a donor breast size that allows harvesting a flap to reconstruct the contralateral breast but leaving the donor breast with good shape, volume, and symmetry. The result obtained in our case could be improved with an autologous fat transfer in the reconstructed breast to improve lateral volume and contour.

Contralateral autologous breast tissue transplantation has oncologic issues to be considered related to the risk of contralateral cancer. This risk has been previously calculated. The overall annual risk of contralateral breast cancer is 0.5%–0.75%.[30] With the advent of hormonal therapy, this risk is reduced by 50%.[31] Quan et al[32] reported a lesser annual incidence of contralateral breast cancer in 0.1%, a reduction due to the widespread use of adjuvant hormonal therapy. There are patients with higher risk of development of contralateral breast cancer such as BRCA1 and gene mutations, strong familiar history of breast and ovarian cancer, medullary and lobular type histology, and negative hormonal tumor receptors[33] It is also important to know that although prophylactic mastectomy in this high-risk group of patients lessens the risk of developing metacronous contralateral breast cancer by 96%, it does not have any effect in overall survival[34,35] The tumor reported in our case is an angiosarcoma, which does not have concerns about risk of developing a contralateral metacronous tumor, as it could be in some patients with breast carcinoma. Although the risks of transferring breast tissue to the opposite breast are not known, we think the tissue transferred needs follow-up with clinical examination, ultrasound, mammography, and or MRI as in patients with breast sparing surgery for breast cancer.

We do not recommend using this flap in patients with high risk of developing contralateral breast cancer, such as patients with BRCA1 and 2 mutating genes, a strong family history of breast cancer, negative estrogen/progesterone receptor tumors, young patients with higher incidence of genetic-based breast cancer, and lobular or medullary type carcinomas. Most of those high-risk patients should be candidates of a prophylactic mastectomy instead. We think breast-sharing techniques might be used in carefully selected breast cancer patients with preoperative meticulous risk scoring of contralateral breast cancer, including familiar history, age, tumor histology, immunohistochemistry, and genetic tests for BRCA1/2 mutations and other genetic tests, such as for Cowden Syndrome (PTEN), TP53 gene mutations (Li-Fraumeni syndrome), and nonsyndromic genes as PALB2, ATM, CHEK2 Y CDH1, all of them associated with moderate to high risk of development of breast cancer.[36] In patients with indications of postmastectomy radiation therapy, it is also advisable to delay the reconstruction, to avoid radiation of the healthy contralateral breast tissue to be transferred.

Anatomic location and variability of the perforators are essential in the flap design and harvest. The preoperative angio-CT scan is helpful in identifying those perforators. There is an anatomical and radiological study in progress at our institution to describe the frequency, location, and diameter of those perforators in our population. We have found in previous cadaver dissections a long branch of the fourth lateral intercostal nerve entering the flap. This nerve could be anastomosed to a sensory nerve in the recipient area to improve breast sensation as described by Knackstedt et al[37] (**see figure, Supplemental Digital Content 4**, which displays a cadaver dissection of the vascular anatomy of the lateral breast flap, **http://links.lww.com/PRSGO/B332**).

The flap we described preserves the medial pole of the donor breast, which is important for breast cosmesis, avoiding symmastia and bulging in the midline usually observed in the IMAP flap. The flap employed could be based on the perforators of the lateral thoracic artery, thoracodorsal and serratus branch perforators. According to flap nomenclature, this is a lateral thoracic artery perforator flap, or the external mammary artery peforator breast flap), which could be easily remembered and associated with the IMAP breast flap as previously described.

The ideal technique to reconstruct the breast should give a good cosmesis, symmetry, shape, volume and avoid additional scars, minimize donor site morbidity, and employ excess tissue that could be removed. Using the lateral pole of the breast as a donor, the medial pole is preserved, which is important in donor breast aesthetics.[38] Medial flaps based on the perforators of the internal mammary vessels are now widely employed, but usually the bulge of the flap pedicle must be removed in additional procedures. Contralateral breast tissue usually discarded in patients with breast hypertrophy could be an ideal donor free flap for breast reconstruction in selected patients.

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