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Review Article

Breast reconstruction: a review

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ABSTRACT

Surgeons in the late 19th - 20th century performed radical mastectomies as the only possible treatment for breast cancers. Since then, the medical-surgical/scientific community has been constantly encouraged to develop and study different less invasive alternatives in breast reconstruction. Over time, locoregional perforator flap options have served as practical alternatives to implant-based reconstruction and abdominal flaps, especially in the setting of patients who have received radiation therapy or have a history of failed reconstruction, as they effectively fill the missing volume and respect the musculature of the donor site. Breast reconstruction using strategies with one of the different locoregional flaps can preserve the musculature and innervation of the post-mastectomy site, which manages to reduce possible adverse events. In addition to evaluating the anatomical characteristics of the defect and affected quadrant, it is essential to assess the patient's body constitution and the skills of the surgical team as well as microsurgery training when designing a reconstructive plan. Different research protocols should be developed in the study and development of new medical-surgical therapeutic alternatives; we suggest joint development with tissue engineering.

Keywords: Breast reconstruction, Mastectomy, Local tissue rearrangement, Oncoplastic reduction mammoplasty, Microsurgical tissue transfers

INTRODUCTION

Surgeons in the late 19th - 20th century performed radical mastectomies as the only possible treatment for breast cancers.[1] Since then, the medical-surgical/scientific community has been constantly encouraged to develop and study different less invasive alternatives in breast reconstruction.[2] Over time, locoregional perforator flap options have served as practical alternatives to implant-based reconstruction and abdominal flaps, especially in the setting of patients who have received radiation therapy or have a history of failed reconstruction, as they effectively fill the missing volume and respect the musculature of the donor site.[3] This category of flaps has been shown to reduce operative time, pain, and length of hospital stay. Depending on the volume and dimensions of the resected tissue following a breast-conserving (BCS) procedure, a large variety of reconstructive approaches is available. Specifically, pedicled perforator flaps allow for single-stage reconstruction and spare the need for microsurgery.

Examples include the thoracodorsal artery perforator (TDAP) flap, the lateral intercostal artery perforator (LICAP) flap, and the internal mammary artery perforator (IMAP) flap.[2] After mastectomy, breast reconstruction with the use of implants is the most frequently performed therapeutic option, using the traditional 2-stage approach with tissue expansion, or the single-stage approach (direct with implant). These options produce highly aesthetic breasts with different sizes.[4] Some authors consider the immediate placement of a tissue expander or a permanent implant a priority at the time of mastectomy, especially for the best aesthetic results; however, delayed breast reconstruction is also possible and continues to be performed routinely.[5]

The placement of tissue expanders and implants that are used in postmastectomy reconstruction can be placed in different anatomical planes; from the submuscular plane (under the pectoralis major muscle and the serratus anterior muscle or fascia), dual plane (under a combination of the pectoralis major muscle and acellular muscle), or prepectoral. The main benefits of prosthetic breast reconstruction are the ability of patients to choose the size of their reconstructed breasts as well as a quick recovery and return to their ordinary/work activities. Autologous breast reconstruction is also an option for most patients, where you need a combination of skin, fat, and muscle to rebuild and replace the missing skin and breast tissue.[6] This option involves the use of tissue from the abdomen deep inferior epigastric perforator, transverse rectus abdominis flaps, inner or outer thighs (transverse upper gracilis, profunda artery perforator flaps), gluteal area (superior gluteal artery perforator, inferior gluteal artery perforator flaps), or back (latissimus dorsi flap).[5] Most of these autologous procedures are performed with microsurgery by free tissue transfer, as this procedure allows the harvesting of very little muscle from the donor site, which leads to less donor site morbidity and better perfusion.

NIPPLE-SPARING MASTECTOMY

Because in recent years the indications for nipple-sparing mastectomy have increased significantly and this factor has improved the appearance of the results of breast reconstruction, since the retention of the native nipple/areola complex results in greater patient satisfaction with higher scores obtained in quality-of-life surveys, although this technique is recommended for patients with a breast mass of less than 800 g and grade 1 or 2 preoperative ptosis.[7-9] For those patients whose preoperative breast size or ptosis is too large, a multistage split approach is possible; the first stage, a pre-mastectomy breast reduction or mastopexy to reduce the size of the breasts, lift the areola/nipple complex, and tighten the skin envelope. In patients with ductal carcinoma in situ or stage 1 invasive cancer, this may be accompanied by a partial mastectomy at the time of reduction/mastopexy. After healing, a nipple-sparing mastectomy can be performed in a second stage, with a smaller, lifted breast with the nipple/areola complex in the correct position. At that time, breast reconstruction can be started or completed. The incisional approach to nipple-sparing mastectomy is essential to determine clinical and cosmetic results. The inframammary fold incision is the most commonly used, especially in patients with smaller breasts and minimal preoperative breast ptosis. However, for patients with preoperative grade 2 ptosis, a periareolar incisional approach is recommended as it allows for a crescent pattern mastopexy that will also allow for correction of 1 to 2 cm of nipple/areola complex ptosis with mastectomy.[5]

PREPECTORAL BREAST RECONSTRUCTION

Prosthetic breast reconstruction after mastectomy involved the use and placement of a tissue expander or permanent implant under the pectoralis major muscle. This was also assisted in coverage by incorporation of the serratus anterior fascia or muscle, or more recently by the use of acellular dermal matrix (ADM) for additional coverage.[10] The purpose of submuscular placement of prosthetic devices is the association with lower rates of capsular contracture, in relation to subcutaneous placement. In recent years, with the advent of ADM there has been an increase in the incidence of prepectoral breast reconstruction especially as it manages to completely avoid any dissection or elevation of the pectoralis or serratus muscle and instead uses only ADM for coverage. of soft tissue expanders or implants, which are placed anterior to the pectoralis major muscle. The prepectoral approach has resulted in numerous benefits for patients, including decreased pain levels and possible deformities.[10,12] In addition, since there is no involvement of the pectoralis major muscle in the reconstructive process, it is related to a greater aesthetic definition of the reconstructed breast (because the position of the implant is no longer inhibited by the anatomy of the pectoralis muscle) and no loss of strength in the upper part of the breast. body (due to complete muscle preservation).[5] However, it is necessary to assess the contraindications for this procedure, since this technique is reserved for patients in whom the mastectomy skin flaps are viable and well perfused. Thin skin flaps can still undergo prepectoral breast reconstruction based on a tissue expander, provided they are found to be viable and well perfused. In addition, additional risk factors should be assessed, such as patients with uncontrolled metabolism such as poorly controlled diabetes mellitus, obesity, active smoking, as well as deep mammary tumors that reach less than 0.5 cm from the chest wall, or those with inflammatory breast cancer (IBC).[5]

ONCOPLASTIC (POST-LUMPECTOMY) BREAST RECONSTRUCTION

Although post-mastectomy breast reconstruction continues to be the most commonly performed oncological reconstruction technique, the number of procedures related to oncoplastic breast reconstruction has been increasing, mainly due to post-lumpectomy breast defects, which is

why 2 oncoplastic techniques are currently used at the time of mastectomy. partial mastectomy: local tissue rearrangement, and oncoplastic reduction mammoplasty.

Local tissue rearrangement is often performed in patients with small breasts, small tumors, or who present with minimal preoperative breast ptosis. With this technique, after completion of the partial mastectomy, the remaining healthy surrounding breast parenchyma is mobilized as vascularized parenchymal flaps, advanced and inserted into the lumpectomy cavity.[13] Oncoplastic breast reduction (mammoplasty) is performed in patients with preoperative breast size (C to D cup), who have grade 2 or 3 ptosis and require a large size skin resection. This procedure is performed on both breasts to maintain postoperative symmetry. This technique makes it possible to plan a lumpectomy as a standard breast reduction, with removal of the necessary quadrant of the chest, so the final result is a highly aesthetic breast mound, with correction of ptosis and avoidance of any contour deformity.[14]

MICROSURGICAL TISSUE TRANSFERS IN BREAST RECONSTRUCTION

Prior to describing the features of individual locoregional flaps, it is important to first note that patient body habitus and surgeon preference are strongly weighed when making surgical decisions and devising a treatment plan. Further, for anatomical reasons, the use of one flap may prevent the future use of another flap. For example, the use of a latissimus dorsi (LD) flap following mastectomy may be limited in a patient who has previously undergone breast-conserving (BCS) using thoracodorsal artery perforator (TDAP). In the setting of axillary lymph node dissection, perforator flap selection may also be limited by the ligation of the lateral thoracic artery perforator (LTAP) and lateral intercostal artery perforator (LICAP).[2]

The first publication of free tissue transfer for breast reconstruction was in 1978 by Serafín and Georgiade, performed an inguinal flap with an implant used to reconstruct the breast after a radical mastectomy.[15] Hans Holmstrom subsequently published an article regarding the availability of the abdominal pannus for breast reconstruction using microsurgical techniques and currently the abdominal donor is still considered as the mainstay of work in reconstructive microsurgery.[16] The deep inferior epigastric perforator (DIEP) flap was introduced in 1994 and is now the accepted "gold standard" in autologous breast reconstruction.[17] The transverse upper gracilis (TUG) flap and lumbar artery perforator (LAP) flap is a useful second option when the abdomen is not available. The first reported LAP free flap for breast reconstruction was in 2003 by de Weerd et al.[18] Since then, the use of the LAP flap for breast reconstruction has slowly gained popularity. Although the donor site is aesthetically ideal, the technical difficulty of the procedure has a comparatively high reported complication rate compared to other methods, the procedure is technically challenging, and is best performed by microsurgeons who have significant experience with complex microsurgery of the perforator flap (Figure 1).[19] Gluteal artery perforator (GAP) flaps are considered as there are no other options. Without a doubt, the breast microsurgeon has a definitive role in the near future, since his attention is not only focused on achieving high-quality results, but also on ensuring the efficiency of these microsurgical reconstructions, with the possibility of becoming a practice. common in all breast reconstruction centers.[20] The LAP flap is an excellent option in autologous breast reconstruction when the abdominal donor site is not available. When the microsurgeon has extensive experience and if it is performed correctly, the elevation of this flap produces an excellent contour both in the breast and in the donor site, so it is recommended that two microsurgeons perform the procedure, thus improving efficient and safe execution. of LAP flap breast reconstruction, especially considering that LAP breast reconstruction is a technically challenging procedure with a relatively high failure rate (6% to 10%) reported for this procedure, as well as seroma formation and changes postoperative sensory at the donor site. The size and position of the skin island limit the utility of the LAP flap in patients who require extensive skin coverage. Due to the rigorous nature of this procedure and the complexity of the surgery, bilateral simultaneous LAP flap reconstruction should be reserved for surgeons already experienced with LAP flap surgery. A symmetrization procedure is often performed several months after unilateral reconstructions to directly excise or liposuction fat in the contralateral lumbar distribution.[19] The thoracodorsal artery is the main pedicle of the TDAP flap, branches from the subscapular artery and courses along the thoracodorsal nerve. In a small number of patients, the thoracodorsal artery branches directly from the lateral thoracic or axillary arteries.[21] All perforators emit perpendicular muscular branches on their way to supply the subcutaneous fat and overlying layers of skin.[22] The septocutaneous perforator is the most frequently removed perforator for the purposes of the TDAP flap.[23] Perforating vessels originating from the descending branch are preferable to those from the transverse branch. There are numerous breast reconstruction procedures that can be performed post mastectomy. Free flap procedures should be highly considered as a primary surgical option when undergoing breast reconstruction as it demonstrates overall good postoperative outcomes and low donor site morbidity. Understanding the risks associated with autogenous flap transfers can be helpful for surgeons who may want to utilize an alternative procedure to minimize postoperative complications.[24] While abdominally based free tissue transfer remains the gold standard for autologous breast reconstruction, there are several robust and well-studied options for flap options of the thigh and trunk. The limitations of the thigh-based flaps (i.e., gracilis, PAP and LTP flaps) include a lack of adequate volume for a single flap to provide, often necessitating "stacking" flaps to achieve the desired result. Additionally, scar placement can be challenging in that it can be conspicuous and/or painful while sitting. Trunk-based flaps (SGAP/IGAP,

LAP) are also reasonable options though with significant limitations. These flaps have short pedicles that commonly require vein grafts. Additionally, the surgery requires position changes, which is time-consuming.[25] Figure 2 summarizes surgical treatments suggested by quadrants.[20]

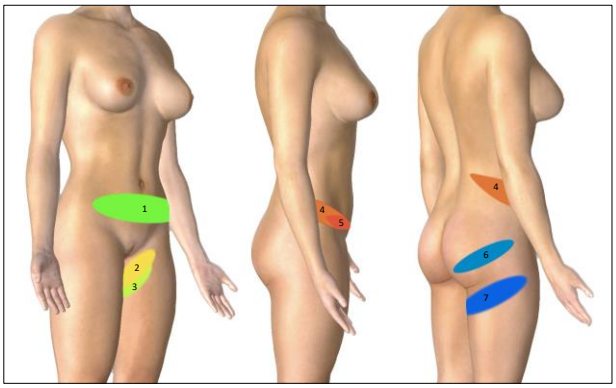

Figure 1: Alternatives for microsurgical breast reconstruction. Alternatives for microsurgical breast reconstruction. 1. SIEA, superficial inferior epigastric artery; 2. TUG, transverse upper gracilis. 3. PAP, profunda artery perforator; 4. LAP, lumbar artery perforator; 5. DCIA, deep circumflex iliac artery; 6. SGAP, superior gluteal artery perforator; 7. IGAP, inferior gluteal artery perforator.

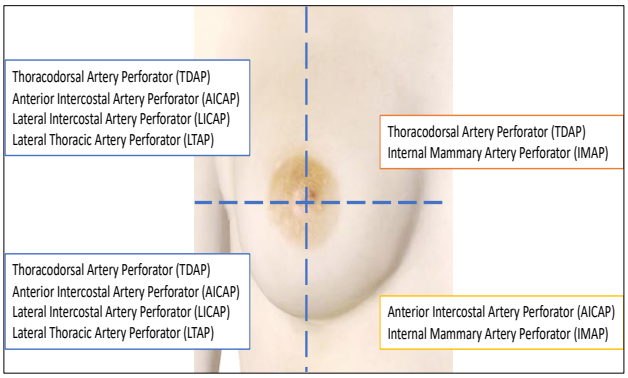

Figure 2: Some of the surgical alternatives according to the corresponding quadrant.

CONCLUSION

Breast reconstruction using strategies with one of the different locoregional flaps can preserve the musculature and innervation of the post-mastectomy site, which manages to reduce possible adverse events. In addition to evaluating the anatomical characteristics of the defect and affected quadrant, it is essential to assess the patient's body constitution and the skills of the surgical team as well as microsurgery training when designing a reconstructive plan. Different research protocols should be developed in the study and development of new medical-surgical therapeutic alternatives; we suggest joint development with tissue engineering.

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