Delayed Breast Reconstruction

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33.1 Introduction

Delayed breast reconstruction is thought to be the first technique for restoring the physical integrity after mastectomy. Until some decades ago, breast reconstruction could not be performed until 2 or even 5 years after conclusion of oncologic treatment [1, 2]. Today, immediate breast reconstruction can be indicated for most breast cancer patients, but unfortunately the majority of them remain without their breasts. And there are different well-documented reasons for that, such as disparities related to race, sociodemographic factors, and financial and some cultural barriers. Then, delayed breast reconstruction is an option for many patients [3, 4].

Implants and autologous reconstructions are the most important options. Indications for them depend on patient's anatomy, previous radiotherapy, or patient's preferences. Both magnitude of the procedure in terms of invasiveness and morbidity in each individual case are important points to consider. Implant-based breast reconstruction is notable for its surgical simplicity, applicability, and faster recovery time, but it is not allowed in all cases [5]. Despite of that, there are some limitations for such an approach, like previous radiotherapy or Halsted's mastectomy. It is also important to take into account patient's expectations in order to better individualize the decisions.

So, the aim of this chapter was to cover the indications, preoperative evaluation, operative techniques, and complications related to delayed breast reconstruction.

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33.2 Indications and Selection of Patients

33.2.1 Timing of Reconstruction

Delayed breast reconstruction can happen at any time, given that the wound has healed and adjuvant therapy has been already completed. But postradiation acute skin lesions and hematologic effects of chemotherapy should be completely ceased [6]. At the *Hospital Nossa Senhora das Graças* Breast Unit in Curitiba (Brazil), the routine is waited at least 6 months after the conclusion of adjuvant radiotherapy and 30–40 days after the end of chemotherapy. Different from the immediate approach, the delayed one can be indicated even for patients who had impaired perfusion of skin flaps after mastectomy [7]. Therefore, it is useful to be clear for patients who suffer from some medical comorbidities such as active smoking, diabetes, obesity, or cardiopulmonary disease that these conditions might predispose to some additional risks.

Delayed breast reconstructions have some facilities regarding the immediate ones because adjuvant treatment is already concluded. Moreover, there are series demonstrating that delayed has fewer complications [8]. However, the technique might entail other surgeries in order to ameliorate aesthetics, thus prolonging the overall time of treatment for patients, because it provides less cosmetic quality than the immediate reconstruction [7]. Furthermore, delayed reconstruction has limited reconstructive options following radiation therapy.

33.2.2 Implant-Based or Autologous Techniques

Delayed breast reconstructions can be implant-based or autologous-flap-based ones. The first technique involves the use of silicone-filled or saline-filled implants and definitive or temporary expanders beneath the remaining mastectomy skin flaps and the pectoralis major muscle, whereas the autologous reconstructions use musculocutaneous flaps, which consist of a segment of vascularized muscle with the overlying skin

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and fat, which are perfused by perforating vessels from the underlying muscle. It can be with pedicle or free flaps, and sometimes it is also necessary the association of an implant for better volume and projection, as it is the case with latissimus dorsi flap. While for some patients the overall result is more pleasing with musculocutaneous flaps [3, 4, 7], there are some disadvantages, which include longer surgical length and prolonged postoperative recovery when compared to implant-based reconstructions. In Fig. 33.3 there is a nice example of this, in a patient with previous breast cancer and radiotherapy in the thoracic wall and neurofibromatosis. Moreover, with implants there is no donor-site morbidity, reduced operative time, and more rapid postoperative recovery when compared to autologous reconstructions [9, 10]. In addition, with the new generation of breast implants, particularly the anatomical ones, it is possible to achieve good aesthetic outcomes and high rates of patient's satisfaction [20].

33.2.3 Definitive Implants or Temporary Expanders

In patients who were not previously irradiated, the choice of the most appropriate technique requires some specific preoperatory clinical evaluations: skin and musculocutaneous conditions in the mastectomy flap, size and ptosis of the contralateral breast, and patient's expectations about her breast reconstruction. For instance, the complete absence of the pectoralis muscles due to Halsted's mastectomy is a contraindication to this approach [11, 12]. Using a definitive form-stable implant rather than a temporary expander is not frequent in delayed reconstructions. The ideal patient for this approach should have a non-tense cutaneous flaps, a good quality of her pectoralis major muscle, and a small contralateral breast.

The tissue expansion with a temporary expander before to change to a definitive form-stable implant is the most frequent indication for delayed breast reconstruction for non-irradiated patients—the two-stage techniques. The expander is used to distend the cutaneous flaps in order to facilitate the insertion of definitive form-stable implant in a second surgery. The choice of the temporary expander is in a similar way of the definitive ones—basis, height, and desired volume should be considered. Older patients, those with significant medical comorbidities, and women with minimal abdominal tissue in whom the autologous technique would be unsuitable also benefit from this technique. Besides, the expander/implant technique is to be indicated for those patients devoid of sufficient skin or preserved subcutaneous tissue in flaps resulting from mastectomy. This may occur when there is little elasticity of the cutaneous flaps from mastectomy or in the case of a contralateral breast presenting a rather large volume. In these situations, the two-stage implant reconstruction usually yields aesthetically superior outcomes.

There are some cases where two-stage approach is contraindicated, and they are basically the same ones as those for definitive implants, with even more emphasis on the risk of expanders after radiotherapy [13]. Many authors have realized that several postoperative complications can ensue when attempting to distend previously irradiated tissues [13–16], since the radiation decreases the tissue elastic distension capacity. In these cases, the most frequent complications are painful and difficult expansion with possible extrusion of the expansion device or periprosthetic capsule. Even though one achieves the final stage of expansion, the cutaneous coverage of the prosthesis becomes too thin and fragile to protect the definitive implant. Recently, the addition of lipofilling in breast reconstruction armamentarium is allowing to expand irradiated tissues in selected cases, but it is necessary to have more data in this specific approach.

A practical flowchart for decisions in delayed breast reconstruction is shown in Fig. 33.1.

33.3 Preoperative Evaluation

The aim of breast reconstruction is to obtain symmetry [17, 18]. For this reason, it is essential to carry out a preoperative plan that includes a detailed analysis of the healthy breast's characteristics in order to make the correct choice of the most suitable technique to reconstruct the other breast [19]. It is important to remember that the reconstructed breast, most of the times, will have low projection in the upper pole and no ptosis. With these characteristics in mind, the contralateral breast should be planned to have an intervention for symmetry in the same surgery or in a second one (after the change of the temporary expander for a definitive implant).

Clinical and radiologic preoperative evaluations are crucial in order to clarify the patient's risks for the surgery. Diabetes, hypertension, obesity, and tobacco-using patients have higher risks for bad aesthetic outcomes and for implant or expander's extrusions. It is also important that a detailed oncologic evaluation be performed, surveying the following topics of the past treatment: type, localization, and size of tumor; number of positive lymph nodes; type of surgical procedure performed; chemotherapy; radiotherapy; hormone therapy; follow-up period; and the most recently performed radiologic and blood exams. Furthermore, the evaluation of the contralateral breast is also mandatory in order to exclude bilateral neoplasm and should include mammographic and ultrasound exams. In high-risk patients with hereditary breast cancer syndromes such as BRCA 1/2 mutations, it is necessary to add breast MRI. These exams are important because contralateral breast surgery—a reduction mammoplasty, mastopexy, or augmentation mammoplasty—is frequently required to obtain a more pleasing symmetry.

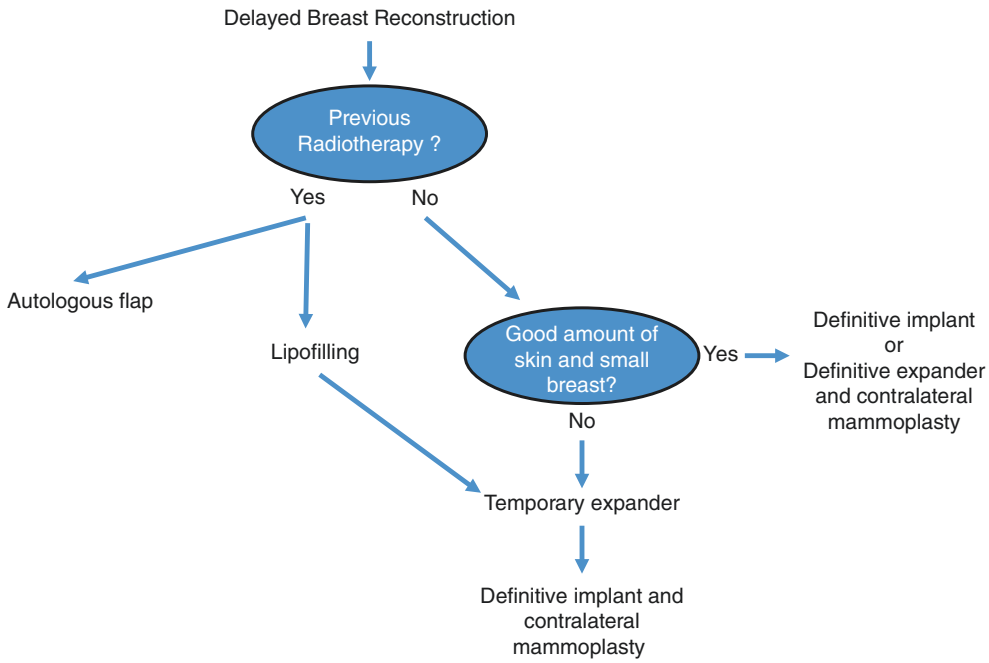


Fig. 33.1 A practical flowchart to guide decisions in delayed breast reconstruction

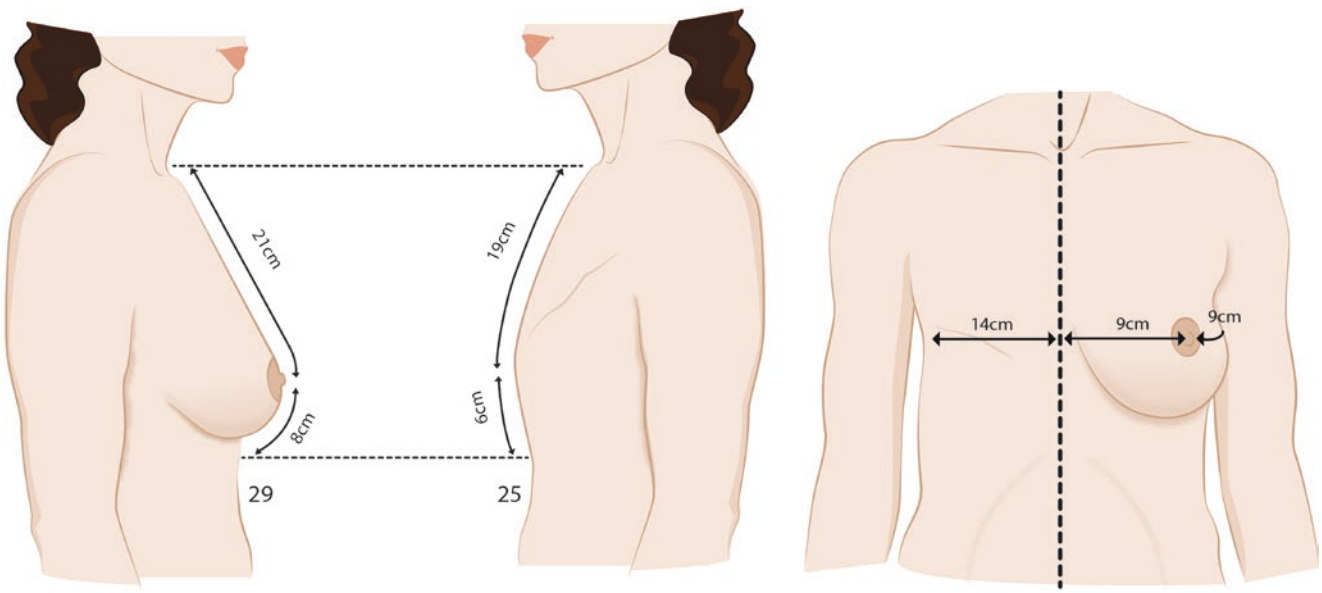


Fig. 33.2 Pre-operatory measurements for surgical planning and choice of the expander and implant

33.4 The Day Before the Operation

In the day before the operation, the whole procedure is explained to the patient again, and then the informed consent form is obtained. The patient is then placed standing, and photographs are taken in profile, in partial profile, and in forward-facing position. It is useful to make precise measurements of the contralateral breast in this occasion, such as base width, thickness of subcutaneous adipose tissue, and height as well as anterior projection (Fig. 33.2).

33.4.1 Choosing the Correct Expander and Implant

Concerning the decision as to which implant one should use, it is important to compare the contralateral breast with the future implant with regard to the parameters of base, height, and anterior projection. This is done during the preoperative period in order to choose two or even more models and sizes of implants that are most likely to be used during the surgical procedure. The final decision can be

made at the intraoperative stage, sometimes with the help of samples. Surgeons should pay attention to whether samples are prohibited in the country they work in. In Brazil there are some specific norms for that, and at the European Union, for instance, the re-sterilization of samples is strictly forbidden. Nevertheless, the non-sterilized implants can be thoroughly coated with a highly adherent and resistant sterile plastic envelope, therefore permitting their repeated usage. This technique for choosing the implants based on the aforementioned measures is precise and particularly useful in the cases in which it is necessary to use an expander/implant and, subsequently, perform a contralateral augmentation mammoplasty [20–22]. In cases of definitive implants with mastopexy or reduction mammoplasty in the contralateral breast, the decision as to the type and volume of the implant must also take in account the volume reduction, the change of shape, and the reduction of the breast base. These calculations can be based on augmentation mammoplasty papers [23, 24], which employ these methods to calculate the volume and shape of implants for aesthetic improvement, on samples, and in surgeon's personal experience (Figs. 33.3, 33.4, 33.5, and 33.6).

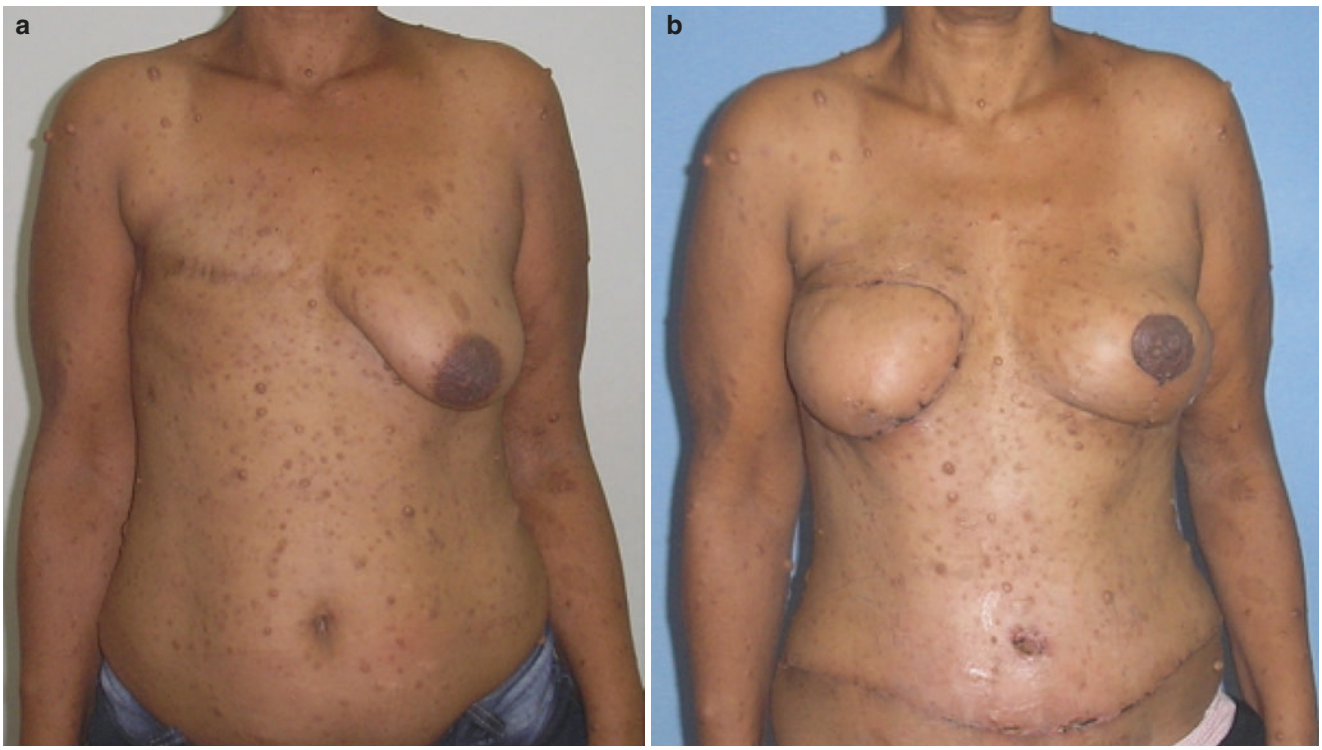


Fig. 33.3 Young patient with previous mastectomy, thoracic wall radiotherapy, and neurofibromatosis

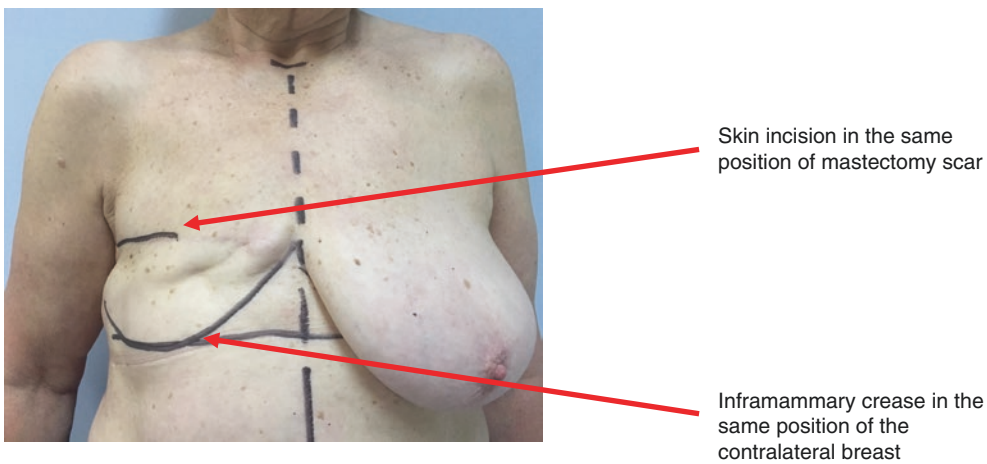
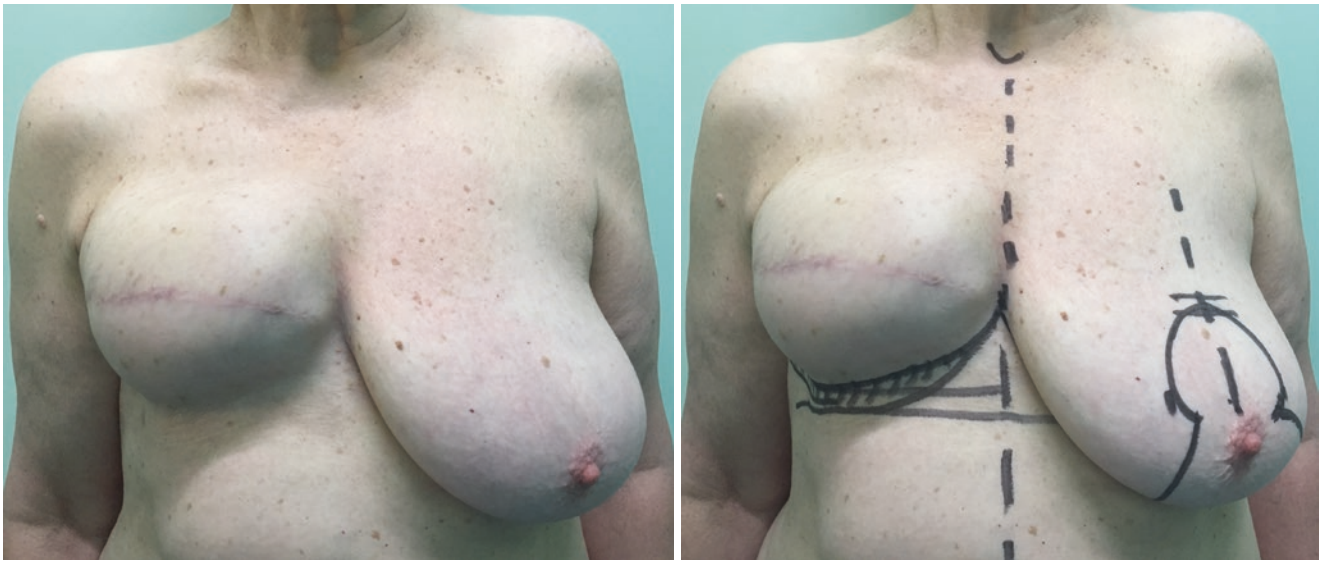


Fig. 33.4 Pre-operatory view with planning draws of a 70-year-old patient for delayed breast reconstruction with temporary expander



Final result after reconstruction with temporary expander

Pre-operatory draws for changing by definitive implant and contra-lateral breast reduction

Fig. 33.5 Pre-operatory view before changing temporary expander by definitive implant and contralateral breast reduction

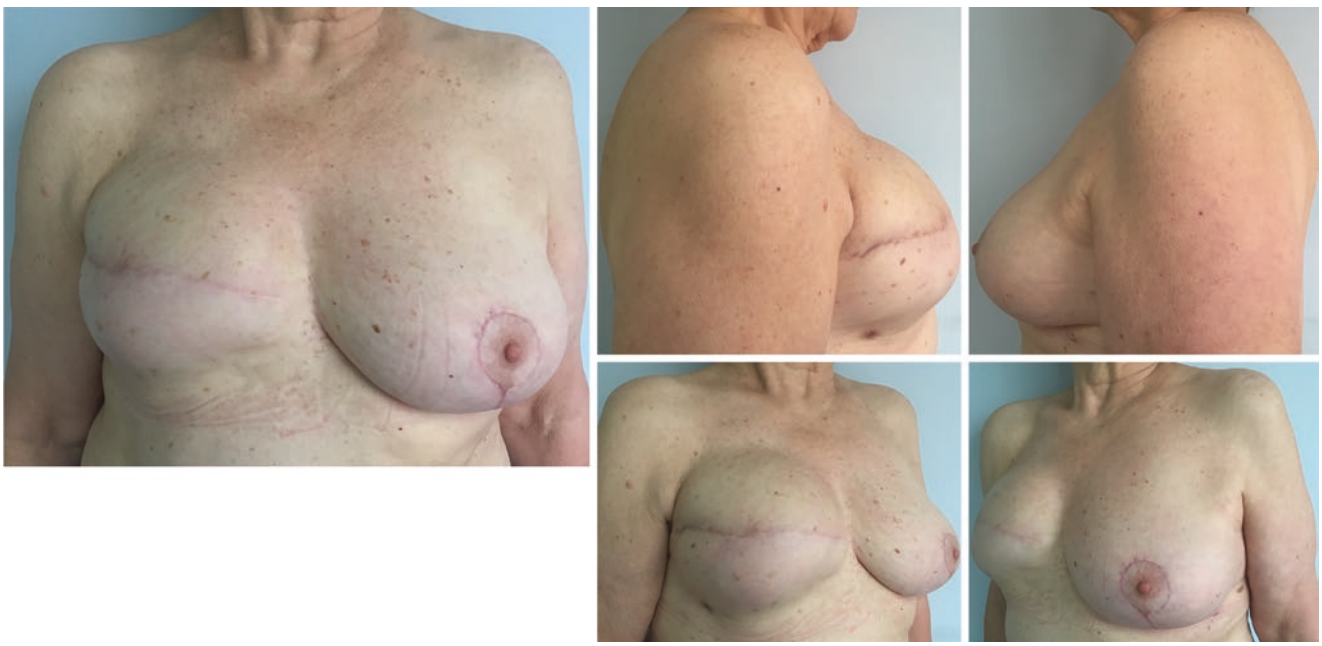


Fig. 33.6 Final outcome after definitive anatomical implant in the right breast and contralateral mammoplasty

33.4.2 Surgical Markings

Afterward, lines are drawn on the patient's chest to assure the correct understanding of the anatomic conditions. There should be drawn a median line from the sternal notch to the xiphoid appendix, and the inframammary fold should be placed at the same height and shape of the contralateral breast.

33.5 Surgical Technique

33.5.1 Before Skin Incision

In the operating room, patient is placed in supine position, keeping her arms parallel to the trunk. The operating table must be set in a way the patient can be placed in a 90-degree position, i.e., sitting, at the end of the procedure.

33.5.2 Skin Incision and Scar Excision

In cases of autologous flap delayed reconstruction, it is possible to remove part of the mastectomy flap, in order to replace that for the flap's skin and to shape the new breast. But with implants, the incision should be most of the times in the preceding mastectomy scar and, if possible, in the pectoralis major muscle. This technical detail allows for a safer suture of the prosthetic pocket in two layers, namely, the muscular and the cutaneous layers. Incision with either partial or complete removal of the scar is chosen based on three clinical situations:

- Wide scar with a good amount of skin in the mastectomy flap—in this case the exeresis of the scar is indicated.
- Narrow scar with little tense flap—here it is not necessary to remove the scar.
- Wide scars without much skin when it has already been decided to use an expander—scar can be removed completely or almost completely but extra care must be taken when expansion is performed, as a too sudden distension could widen the scar again.

33.5.3 Operative Technique

Autologous flap reconstruction is described in other chapters in this book. After incising the skin, an inferior and lateral subcutaneous undermining must be performed in order to do the contour of the inframammary fold. This is required to set the prosthetic pocket, which can be located subcutaneously in this region or under the serratus muscle, in case the skin or the adipose subcutaneous tissue in the inferior lateral region is too fragile. As a result of this maneuver, one can see the lateral edge of the pectoralis major muscle, which is then lifted to set the submuscular pocket. This pocket can be made via a digital undermining in the upper portion, where no perforating vessels are found. In the inferior and medial regions, a light retractor is required so that the efficient hemostasis of large internal mammary pedicles found in this region is performed. The pectoralis major muscle then must be completely detached from the costal plan about 4 or 5 cm above the medial extremity of the inframammary fold. This dissecting procedure is mandatory so that a nonaesthetic movement of the implant can be prevented when the pectoralis major muscle contracts. Preparation of the inframammary fold demands great technical attention, as it is an anatomic landmark crucial to the long-term aesthetic result [5]. There are two possible variants:

- Without an upper abdominal skin flap—It is used in cases either when there is great elasticity of the skin, which allows the insertion of a definitive prosthesis, or, if a decision has been made for a reconstruction in two surgical steps, of a temporary expander. In such cases, the subpectoral dissection must reach no more than the inframammary fold level, and then an incision into the aponeurosis of the rectus abdominis muscle must be performed to achieve a better projection of the lower mammary pole. There is no need for an undermining maneuver lower than the projection of the inframammary fold; otherwise, the prosthesis might end up being placed below the inframammary crease, producing asymmetry.
- Using an upper abdominal skin flap—This autogenous tissue reconstruction technique is recommended for those cases in which a definitive implant is applied and the skin flaps from mastectomy are not very elastic. A rectus abdominis muscle aponeurosis (made according to the projection of the inframammary fold) can be used if there is good elasticity of the skin in the upper abdominal area (just below the inframammary fold). The subpectoral dissection must reach the inframammary fold level followed by incision of the undermining of the supra-aponeurotic region 2–3 cm below the inframammary fold. A cutaneous advancement flap can be easily performed if the patient is placed in a semi-sitting position. The inframammary fold is reconstructed with spread stitches of nonabsorbable thread, suturing the superficial aponeurosis at the upper limit of the aponeurosis of the rectus abdominis muscle medially and laterally at the serratus muscle.

After the prosthetic pocket is set up, an internal irrigation is performed with either pure or with an antiseptic product-added saline solution. At this point, rigorous skin cleaning and change of gloves of the whole team before contact with the implant is mandatory. Such care helps to reduce the risk of microcontamination of the implants and therefore reduces the risk of postoperative infection or the formation and development of a peri-prosthetic capsule [25]. The implant, i.e., either the definitive implant or temporary expander, is carefully inserted into the prosthetic pocket.

Finally, a tubular multiperforated aspirating drain is inserted into the prosthetic pocket as a safety measure. Then, suture is done in two plans. The first suture is done in the subcutaneous tissue with absorbable monofilament stitches of 3-0, and the second is an intradermal cutaneous suture with absorbable monofilament stitches of 4-0.

33.6 Post-Operatory Care

Some surgeons apply a dressing with elastic straps, making a moderate compression for 3 days. Others choose a lighter dressing with no compression and also advise the patient to

wear a sports-type bra, medium compression, right on the first postoperative day. This second option allows an easier control of a possible postoperative hematoma and avoids risks of allergy and cutaneous lesions that might occur when adhesive elastic straps are used. The drain is removed when the drained fluid is serous and its volume is lower than 50 cc in the past 24 h. If a temporary expander is chosen, an expansion with a variable volume of saline solution is the usually recommended each 3 weeks. The correctly instilled volume should not cause tightness or erythema or disrupt the patient's comfort or skin quality. As the aim of the expansion is to surpass the quality of a one-stage definitive implant, an augmentation of 25% is needed to achieve this purpose, with ideal skin drape and recoil [5].

33.7 Association with Fasciocutaneous Thoracodorsal Flap

This technique was initially described by Holmstrom [10], who advocates the use of a rotational fasciocutaneous thoracic dorsal flap to improve the projection of the lower pole of the reconstructed breast. This technique can be applied in those cases of an oblique mastectomy scar, and the graft must be grounded on epigastric vascular pedicles, which cross the anterior aponeurosis of the rectus abdominis muscle. The flap must be designed with two thirds of the base above the future inframammary fold and a third below. After the preparation of the fasciocutaneous flap, an upper rotation of the flap is performed, and the donor zone is covered with the inferior rotation of the lateral triangular flap together with the advancing of the upper abdominal skin flap. The implant is inserted below the pectoralis major muscle in the upper internal region and below the flap in the inferior lateral region. This technique is not routine due to the vascular fragility of the flap. It can be used when applying more complex techniques such as when the latissimus dorsi or the transverse rectus abdominis myocutaneous (TRAM) flaps are contraindicated.

33.8 Complications

Complications related to breast reconstruction of any type can be classified into immediate (until 2 months after the surgery) or secondary (after the aforementioned period) [5]. The most frequent complications comprise hematomas, seromas, infection, flap necrosis, and capsular contracture. Capsular contracture rates may be lessened by the use of implants with a textured shell rather than a smooth shell, by placement of the implant in a submuscular rather than subcutaneous location, and by avoiding the use of this technique in women who need radiotherapy [26, 27]. Obesity, diabetes, age older than 65, smoking, and hypertension are risk factors for complications following breast reconstructions [28, 29].

Conclusions

Delayed breast reconstruction can achieve satisfactory cosmetic outcomes with low rate of complications. Temporary expanders and implants are surgical procedures that represent minor risks and, sometimes, can even be performed under day surgery. Overall, this is the most used technique due to its practicability, lower risk of complications than musculocutaneous flaps, and satisfactory aesthetic outcomes with the various anatomic implants available nowadays. Patients who were previously irradiated are better for autologous flaps or lipofilling.

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