



# Hybrid Fat Transfer, Breast Implants, and Fat

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## 26.1 Hybrid Breast Reconstruction

The goal of modern breast reconstruction is to restore a breast shape that is as close to “normal” as possible. Reconstructive procedures should be based on the replace-like-with-like principle. Breast reconstruction modalities are based on allogenic materials, autologous tissue transfer, or a combination of both.

The breast is a subcutaneous structure: gravity, aging, and posture influence breast volume distribution and its contour. Microsurgical autologous tissue transfer guarantees long-lasting and natural results, but despite its advantages, to date, implant-based breast reconstructions are out-numbering autologous reconstructions [1]. In autologous reconstructions the transplanted tissue adapts to its new environment because of its unique plasticity. In implant-based reconstructions, prosthesis do not adapt to its new surroundings, affect the remaining tissues, and they are the major manipulator of the aesthetic outcome. Lipofilling is now a universally accepted technique to correct soft-tissue deficiencies or to improve contour irregularities. Total prosthesis replacement with fat in breast reconstruction is desirable but is achievable at the moment only for small breast sizes [2].

Capsular contracture, with an incidence of 0.6–30%, is the most common complication following reconstructive

breast surgery [3]. Nava et al. showed how radiotherapy increases the risk of complications by more than 40% in implant-based reconstructions, increasing the rate of capsular contractures to between 25% and 30% of patients [4]. Moreover, even the best implant-reconstructed breast will lack the soft-tissue envelope of natural breasts, leading to possible implant-related complications, such as implant visibility, rippling/wrinkling or depression of the skin [5]. To reduce these aspects soft tissue coverage through acellular dermal matrices (ADMs) and autologous fat grafting have been widely used with improvement of postoperative patients’ satisfaction [6, 7].

In recent years, the concept of hybrid reconstruction has been developed. For hybrid breast reconstruction (HBR), we mean a technique that combines the use of autologous tissues and heterologous devices (prostheses or expanders).

Historically, the most common approach to hybrid reconstruction was the association of pedicled flap (i.e., latissimus dorsi, TRAM, etc.) or free flap (i.e., DIEP flap) and prosthetic implant [8–10]. In this approach, the transfer of well-vascularized soft tissue allows the reconstruction of natural breast ptosis and the addition of an implant provides the desired projection, but without being associated with complications related to flap transfer [11].

Nowadays, hybrid breast reconstruction combines breast implants with fat transfer to the breasts. This procedure is becoming increasingly popular with women and surgeons alike.

Fat is a filler with ideal properties: it naturally integrates into tissues, is autologous and in 100% biocompatible.

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However, this is not the only function of lipofilling; fat is an active and dynamic tissue composed of several different cell types, including adipocytes and pre-adipocytes [12]. It displays regenerative potential and therapeutic effects that go beyond simple filling capability. Adipose-derived stem cells (ASCs) have a differentiation potential similar to that of other mesenchymal stem cells [13].

The advantages of combining fat grafting with prosthetic implants are:

- The ability of fat grafting to focally augment overlying soft tissue coverage and shape the breast beyond the limitations of an implant.
- Mask implant edges in thin patients and to improve the cleavage.
- Permit surgeons to select more superficial planes, rather than submuscular planes, for implant placement in patients with more limited soft tissue coverage [14, 15].
- Improve the texture of the irradiated skin by enhancing its vascular supply [13]. Literature has highlighted an important role of fat grafting in patients who underwent radiotherapy [16–18]. The chronic ischemic status of the irradiated tissue represented the rationale for the applicability of adipose-derived adult stem cell therapy, and the mechanisms of action of fat grafting were widely described in 2007 by Rigotti et al. [19].
- Improve the outcome for capsular contracture after breast implant reconstruction: capsular contraction is one of the most common causes of reoperation after breast augmentation or implant-based reconstruction, with a prevalence of 0.6–30% and is more frequent in patients who underwent radiotherapy [3, 4, 6, 16, 20]. The HBR protocol is associated with lower rate of capsular contracture, less breast pain at long follow-up times, and lower overall rates of revision surgery compared to standard expander-implant reconstruction [6, 16].

Calabrese et al. proposed a HBR protocol wherein fat grafting is performed during the course of the expander/implant reconstruction [16]: after unilateral mastectomy and immediate reconstruction with an expander, the patients

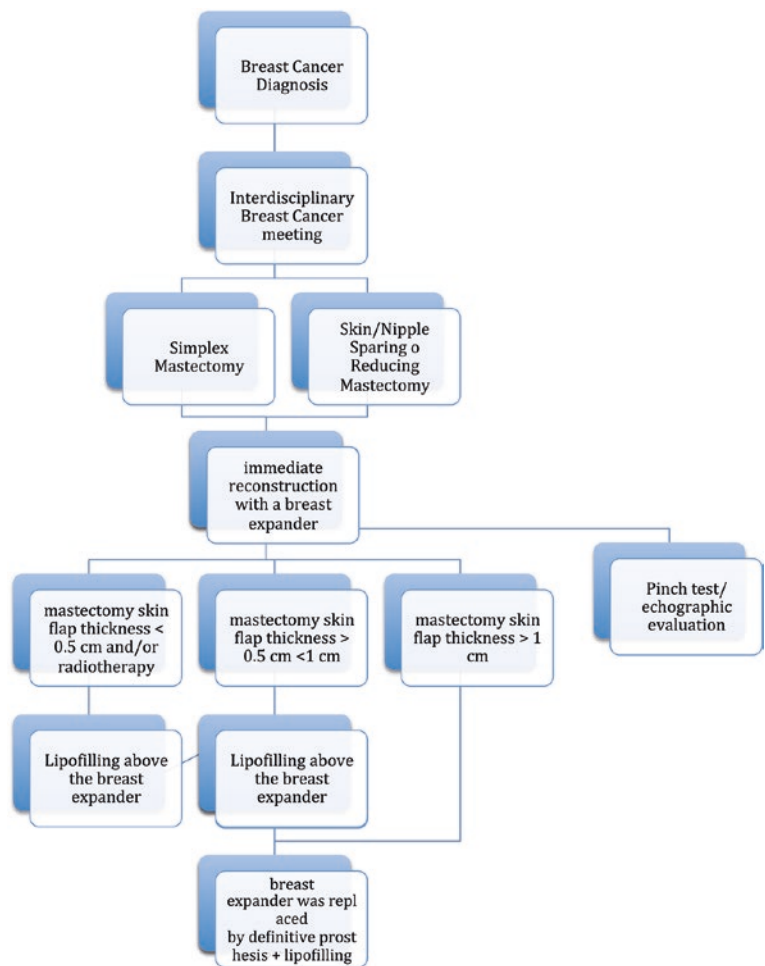
were submitted to one to three serial deflation-lipofilling procedures. Positioning of a definitive prosthesis was performed during the last lipofilling session (Fig. 26.1). Although it is true that performing an intermediate lipofilling, or more, before the TE substitution determines a greater cost, as well as greater stress for the patient. However, as confirmed by several authors, one more intermediate procedure generates a better overall result of the reconstruction [1, 6]. This adjunct treatment permits us to obtain a result more natural and decrease the rate of future complications [13]. In fact, an additional procedure determines a greater engraftment of the fat with an increased subcutaneous thickness and less visibility of the prosthesis.

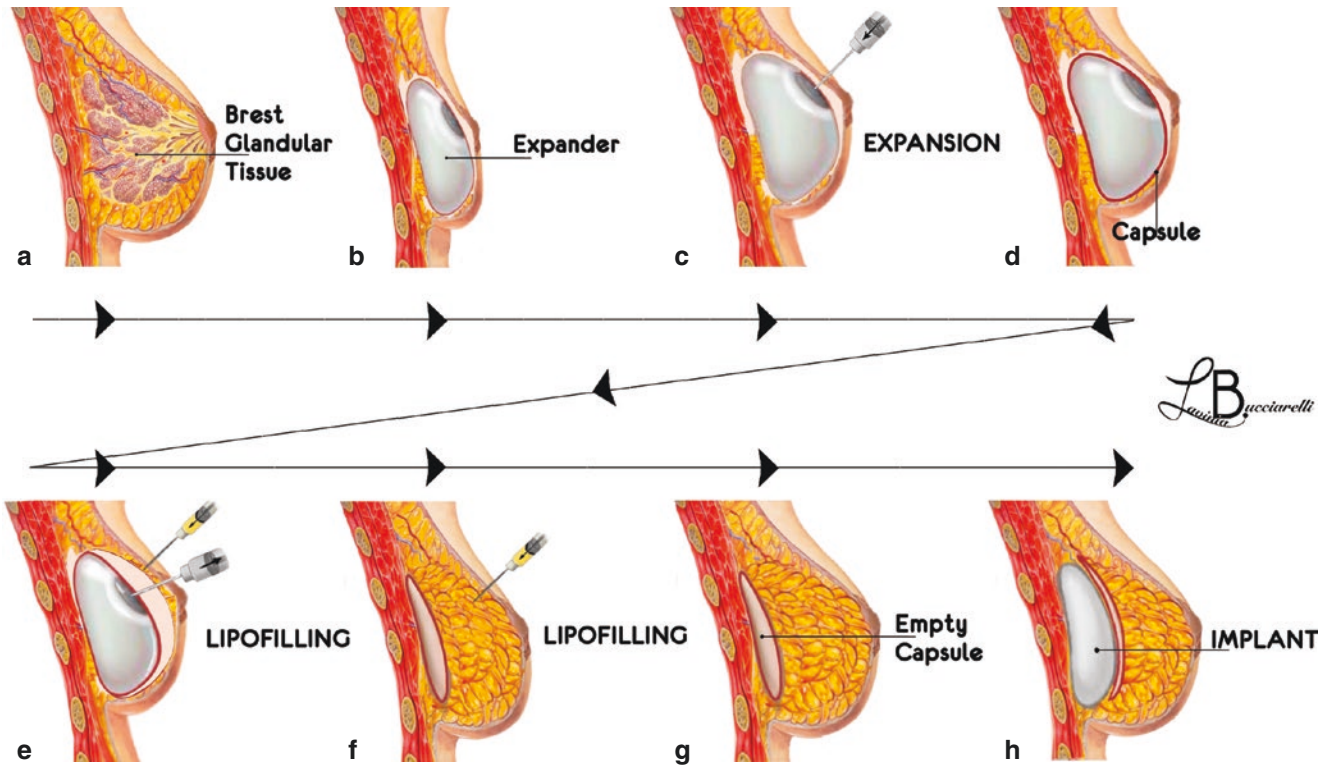
The surgical technique of hybrid breast reconstruction with fat is well described by Stillaert et al. [1], and it is characterized by four steps (Fig. 26.2):

- First: at the time of mastectomy a two-stage reconstruction is planned, and a tissue expander is inserted, preferably in prepectoral position.
- Second: about 2–4 weeks after surgery expansions are started.
- Third: a series of fat grafting to restore the subcutaneous tissue are performed, partially deflating the expander. Fat grafts are placed in the space between the skin and the capsule. This is a well-defined space that supports the survival of grafted fat. Fat grafting sessions are performed with a 3-month interval until an acceptable volume is obtained.
- Fourth: obtained the desired subcutaneous tissue thickness, an implant insertion to provide additional volume and core projection is performed. Implants used in this case are smaller than implants normally used without subcutaneous thickening derived by fat graft (Fig. 26.3).

Hybrid breast reconstruction can be performed also as immediate breast reconstruction and not only as two-stage technique [15]. In this case, a smaller implant has been chosen, and the desired volume is obtained through one or more planned lipotransfers.

**Fig. 26.1** The HBR protocol: the association of lipofilling and implant during the two-stage expander/implant procedure following mastectomy





**Fig. 26.2** Schematic drawing of the HBR approach with initial skin expansion followed by serial fat grafting sessions to augment the subcutaneous tissue layers. Depending on the skin thickness and previous radiotherapy, an average of 1–3 deflation-lipofilling sessions can be programmed. Normal breast anatomy (a). An expander is positioned in the prepectoral plane (b). By serial inflation of the tissue expander with

saline (c), sufficient tissue cover was achieved for a second operative placement of a definitive breast implant. Capsule formation as a normal physiological response (red line) (d). Serial deflation and fat grafting in the subcutaneous plane (e–g). Removal of the expander with retained capsule and placement of definitive prosthesis (h). (Drawing ©Lavinia Bucciarelli, All Rights Reserved)



**Fig. 26.3** (a) Preoperative pictures of a 42-year-old patient who underwent nipple-sparing mastectomy and expander immediate reconstruction. (b) Postoperative result after the first lipofilling session above the

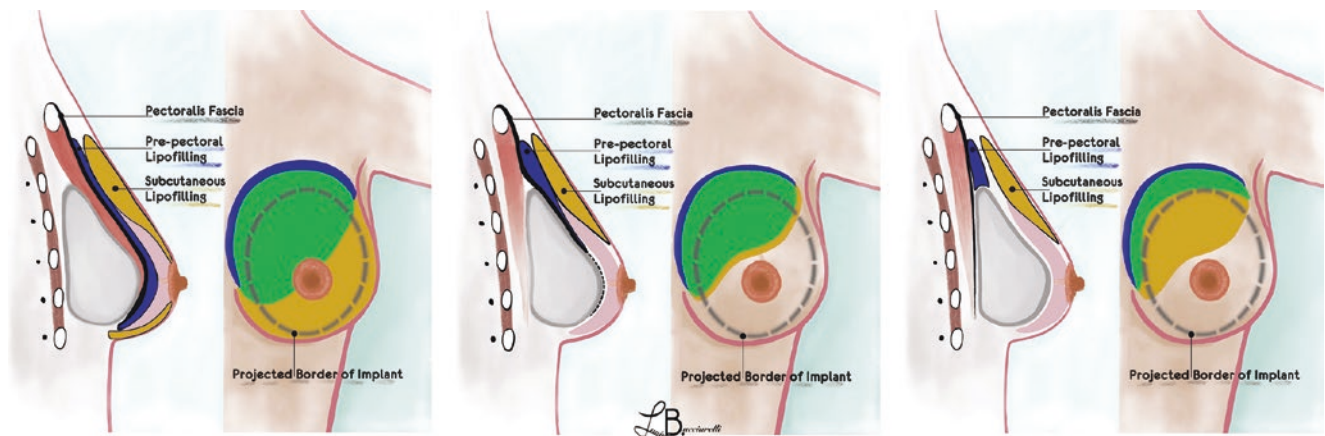
expander. (c) Postoperative result after 24 months from the second surgical step of expander/implant exchange procedure. The patient had one lipofilling session during the latter surgery

## 26.2 Hybrid Breast Augmentation

Even in breast implant augmentation, lipofilling has a well-recognized role [6, 16–18].

Fat grafting has emerged as a modality capable of addressing many of the limitations in techniques used in breast surgery. Kling et al. evidenced in their work how about

one-fourth of American plastic surgeons use lipofilling in aesthetic breast surgery [21]. Cosmetic indications for fat grafting to the breast include primary breast augmentation without the need of a prosthetic device, volume restoration following implant removal, and concomitant injection alongside breast implant placement to disguise rippling and address visible step-offs that can sometimes be seen in thin



**Fig. 26.4** Frontal and lateral views of the three potential routes of implant insertion in composite breast augmentation: the (*left*) submuscular, (*center*) subfascial, and (*right*) subglandular routes of insertion. (Drawing ©Lavinia Bucciarelli, All Rights Reserved)

patients with subglandular implant [22, 23]. Overall, fat grafting to the breasts for cosmetic purposes appears to be a generally safe, increasingly popular procedure with high levels of patients' satisfaction. It represents nowadays a fundamental, easy, fast, and effective complementary procedure integrating the traditional surgical approach to breast augmentation [24].

What prompted the increase in the use of hybrid reconstruction is the research of an adequate soft tissue coverage of the implant, particularly in thin patients with severe hypomastia. A paucity of breast tissue and subcutaneous fat can portend a poor cosmetic result despite excellent enhancement of volume and projection, due to the inability to hide the presence of the prosthesis under the patient's native tissue. This mismatch between size and soft tissue coverage results in implant palpability, edge visibility, and often rippling. This unnatural result often disconcerts patients and surgeons.

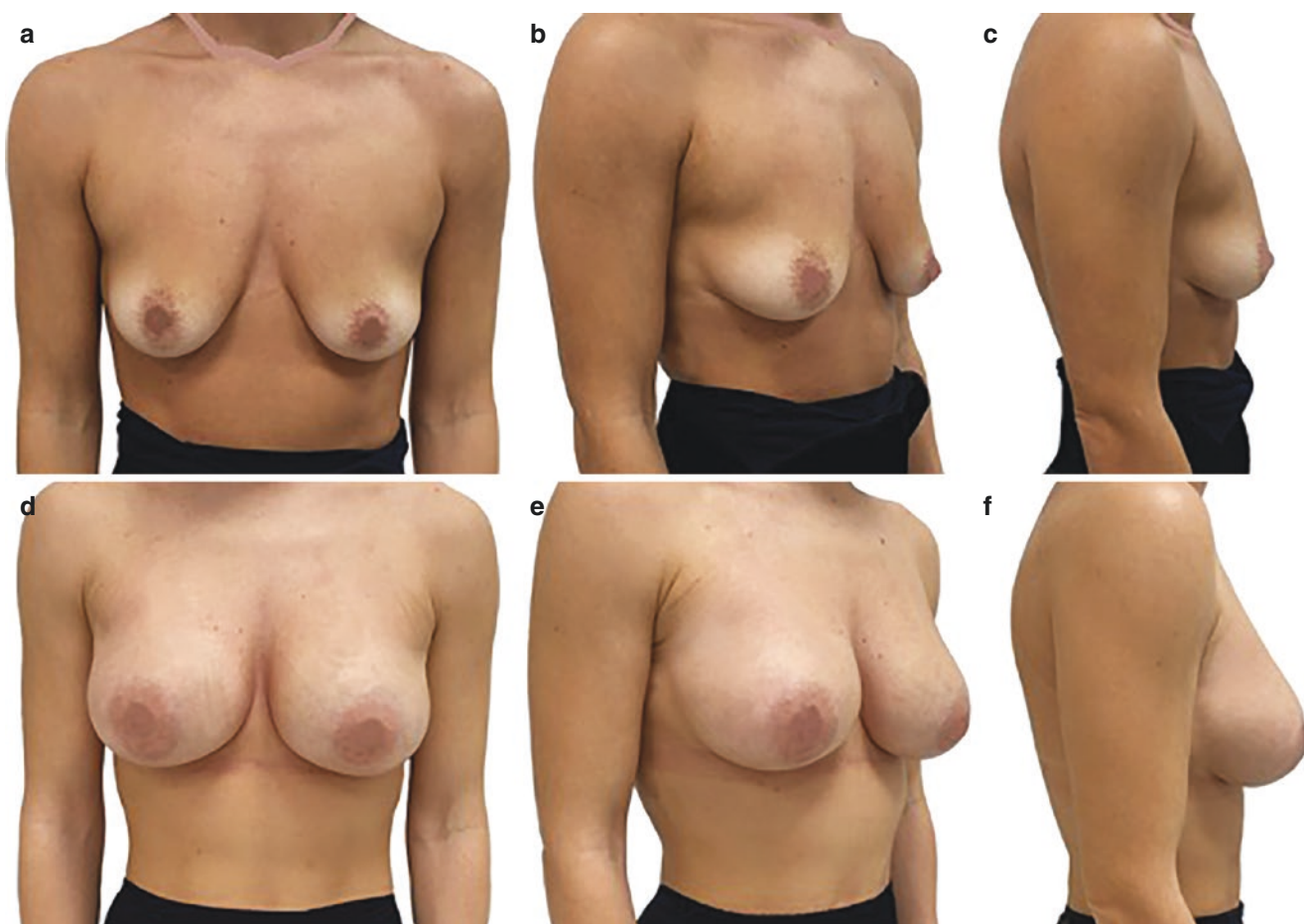
To date, prospective comparison of techniques (implant only vs composite/hybrid augmentation) is challenging. Additional studies retrospectively comparing composite breast augmentation to patients with similar BMI, ptosis, and breast size that underwent implant-only augmentation may further reinforce benefits of fat grafting with regards to minimizing sequelae of a deficient soft tissue envelope [25].

Historically, different techniques were proposed to give the best natural aspect to the augmented breast. Tebbets, in 2001, introduced the dual-plane technique: implants are placed in the subpectoral space, utilizing a dual plane pocket [26]. This technique increases overlying soft tissue coverage under varying amounts of the pectoralis major. Moreover, the introduction of highly cohesive, form-stable anatomic implants demonstrated decreased rates of wrinkling and rippling, as seen by Hedén [27]. And also, acellular dermal matrices have been proposed in aesthetic breast augmentation to improve soft tissue coverage and address soft tissue

envelope complications [28]. Breast augmentation using only adipose tissue is not completely satisfactory. There is a natural limitation to the projection achieved with fat alone due to its soft nature: breast projection using only fat comes at the cost of a wide breast footprint, often wider than desired [29]. This technique remains a good option in limited and selected cases, when patients desire breast enhancement but do not want a prosthesis, also if this procedure gives limited breast projection.

The potential advantage of composite breast augmentation stems from the ability of the surgeon to impart customized shape and size change by working with two versatile and complementary media in two distinct planes (Fig. 26.4). In hybrid breast augmentation, one can manage the core volume projection of an implant and achieve the natural look and feel of fat, with overlay and preferential fill where additional volume is required. And if there are asymmetries of soft-tissue, volume can be addressed with equal-sized implants and differential fat transplantation [30]. Implants can be potentially placed in three spaces (Fig. 26.5):

1. *Subpectoral space*: pectoralis major muscle separates the implant from fat. Fat can be injected in a third space from within the pectoralis muscle and the superficial subcutaneous tissue. The deeper the implant insertion plane, the larger the volume and greater the footprint coverage of the fat overlay.
2. *Subfascial space*: the pectoralis fascia separates the implant from the fat, which can be placed in a third space from immediately above the fascia and the superficial subcutaneous tissue.
3. *Subglandular space*: implants lie above the pectoralis fascia and under the gland. The third space, where fat can be placed, is limited to the superficial subcutaneous tissue. Deeper injection risks migration of fat into the implant pocket.



**Fig. 26.5** (a–c) Preoperative view of a 30-year-old woman with bilateral mammary hypoplasia. (d–f) Postoperative view 12 months after subfascial breast augmentation and simultaneous lipofilling of the upper pole

Hybrid breast augmentation allows the use of subfascial and subglandular spaces for breast augmentation also in patients with inadequacy of soft tissue coverage, sparing the pectoralis muscle from overlay duties and avoiding potential animation and lateral drift deformities. Furthermore, by avoiding any retro-muscular dissection, patients rarely complain of pain being a significant issue in their postoperative course [20]. In patients with adequate breast soft tissue and favorable esthetics, there is no need for additional fat overlay. In this case, for Auclair et al., the best result can be obtained with implants alone [30].

There are some advantages in Hybrid Breast Augmentation:

- Combining breast implants with fat transfer allows a smaller size implant to be used since a portion of the desired volume will come from the patient’s own fat.
- It enables the surgeon to increase volume while also correcting asymmetry between the breasts.
- It allows patients to further customize their result by making small adjustments with targeted fat transfers (i.e.,

patients wish to add a little extra volume to the upper part of the breast to accentuate cleavage).

- It allows a layer of natural fat to be transferred on top of the implants to provide a cushion, helping to disguise the implant and create a more natural look. It offers a special advantage to women who are older and/or have thinner overlying skin and tissues (small wrinkles or rippling of breast implants might show through their tissues because they are so thin).

Breast augmentation with fat has been condemned, during years, as causing calcifications and oil cysts that cannot be distinguished from malignancy, resulting in confusion, patient fear, and unnecessary biopsies. Current findings suggest that the incidence of cysts and calcifications in fat grafting is low and the radiologic ability to effectively discern them is technique-dependent [29, 31]. This problem is also reduced in hybrid breast augmentation than in fat augmentation due to low fat quantities transplanted.

Overall, implants and fat, working together, provide the best attributes each has to offer: the core volume projection of implants and the natural look and feel of fat.

As seen by Maximiliano et al. [32], hybrid breast augmentation technique may be limited by the volume of autologous fat that can be grafted, since there is an inverse relationship between the autologous fat graft volume and fat integration.

### 26.3 Breast Implants and Fat

As described by Bach et al., implants have been proposed as solution when autologous reconstructions failed to give a satisfactory result in terms of symmetry, shape, and projection [29]. But if the relationship between implants and autologous flaps has been largely studied, the relationship between them and fat graft is already under investigation.

Total breast reconstruction with fat only is desirable, but not reachable at the moment. The use of implants will continue to be necessary unless new technologies are discovered to stabilize the shape of full-fat reconstructed breasts, achieving better fat survival through fat enhancement techniques or through dedicated scaffolds to drive cell regeneration and shape definition [15].

The development of fat-injection techniques to refine the results of implant-based breast reconstructions or breast augmentation is changing the outcomes of breast surgery [15].

The advantages of fat grafting in implant-based reconstruction or breast augmentation are well described. Papadopoulos et al. observed better breast sensation, reduced foreign body sensation, reduced tension after radiotherapy, and reduced feeling of cold breast in patients treated with fat grafting. They also reported fat grafting can be used for pain relief due to capsular formation, regardless of the implant position to the pectoral muscle [33]. Roca et al. first evaluated the efficacy of autologous fat grafting in a porcine model as a treatment for capsular contracture [34]. Moreover, they confirmed that fat grafting, due to its regenerative properties, can ameliorate fibrotic damage in particular in implant-based reconstruction and successive radiation therapy. These results confirmed the trend of the past decade, when radiotherapy damage has been treated with autologous fat cell transplantation [35].

What implant has to be used with fat grafting is a debated argument. Maximiliano et al. obtained the ideal shape for hybrid breast augmentation using round implants and adding fat graft in a pattern similar to a cone shape on the upper portion of the implant [20]. In this way, they could calculate the accurate fat volume required for each of the three different

implant projections. For example, for moderate profile implants, which have a proportionally larger base diameter, larger fat volumes were expected.

The evolution of silicone implants led to the introduction of new surfaces and viscoelastic gel properties. Smooth and micro/nanotextured implants were created with the aim to have very low roughness to avoid tissue ingrowth, minimize bacteria adhesion, and finally have the best natural aspect. Another reason strongly moved this evolution. During the past years, a new defined form of neoplasm, called BIA-ALCL, has been introduced. This rare form of lymphoma has been seen associated with macrot textured breast implants, but the physiopathology is still not completely clear to date. Chronic inflammation generated by these types of implants (probably caused by biofilm born on textured surface) is the main cause investigated [36, 37]. For this reason, smooth implants have been now re-evaluated, macrot textured implants have been removed in a lot of countries, and micro/nanotextured implants have been strongly developed as alternatives to smooth ones.

Breast augmentation recently had significant progress in aesthetic outcomes after the introduction of new-generation silicone gel implants and advances in fat grafting. Most surgeons associate fat grafting in the upper, medial and lateral areas of the breast, where thin tissue provides insufficient coverage and leads to implant visibility.

Fat grafting technique is a substantially safe procedure, but the result is unpredictable, with long-term retention rates varying between 10% and 80% [38].

If major complications occur in the first postoperative weeks, minor complications occur up to 6 months after surgery. The most common complication of fat grafting is fat necrosis, which can hesitate in oil cyst formation and calcifications. Palpable masses can develop due to fat necrosis.

The formation of cystic lesions, with the consequent functional and aesthetic manifestations to the patient, is mostly probably related to the massive transfer of fat clumps in the breast tissue, which led to fat necrosis and encapsulation [39]. Fat transplantation in the breast parenchyma might be another reason for this complication. Maintaining the viability of the harvested fat cells is crucial. The chances of survival are higher the less the fat graft is manipulated and the more quickly it is reinjected.

Ørholt et al. described an overall 2.1% of complications after hybrid breast augmentation [40]. In particular, they observed 1.6% of major complications (as seroma, hematoma, and infection) and 0.5% of minor complications (palpable cysts), but none of the patients underwent surgical revision.



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