Hybrid Breast Reconstruction

Subjects: Surgery
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Lipofilling is a commonly performed procedure worldwide for breast augmentation and correction of breast contour deformities. In breast reconstruction, fat grafting has been used as a single reconstructive technique, as well as in combination with other procedures.

breast reconstruction | oncoplastic surgery | hybrid breast reconstruction | lipofilling | fat grafting

1. Introduction

Breast cancer is the most common malignancy in women, with a global incidence of 2,088,849 new cases and 626,679 related deaths reported in 2018 [1]. The highest incidence is predominately in Western regions including Australia, Europe, and USA [1].

The percentage of U.S. women who opted to undergo breast reconstruction after breast cancer was estimated at 43.3% based on data from NSQIP 2014 [2].

Among different types of breast reconstruction, fat grafting has been used not only as a single reconstructive technique, but also in combination with other procedures. Lipofilling might not only be useful in improving breast contour after implant-based reconstruction, but also in increasing mastectomy flap thickness prior to or associated with immediate breast reconstruction. In some cases, adjuvant lipofilling is performed after tissue expansion or at the time of expander/implant substitution, but also in autologous breast reconstruction [3].

Although initial skepticism has surrounded the oncological safety of fat grafting in breast reconstruction, studies found strong evidence demonstrating no increase in breast cancer recurrence or mortality [4][5][6][7][8].

Autologous fat transplant (AFT) has been associated with increased skin trophism and vascularization, reduced post-operative pain, and improved cosmetic results [9][10][11]. However, the debate is still ongoing over fat grafting in breast reconstruction due to some important limitations. First, the variable resorption rate makes the outcome of this procedure unpredictable. Second, the amount of fat tissue that can be grafted in a single session (especially in low volume recipient sites) is limited, which makes multiple fat grafting procedures often necessary in order to achieve satisfying outcomes [3].

Lipofilling is a commonly performed procedure worldwide for breast augmentation and correction of breast contour deformities [12]; however, heterogeneous data exist on the combination of implant-based breast reconstruction and ancillary lipofilling.

2. Hybrid Breast Reconstruction

Microsurgical tissue transfer is generally considered the gold standard for breast reconstruction in the case of a previously irradiated breast or anticipated necessity for breast irradiation. Furthermore, recent studies have found that autologous reconstruction yields a higher satisfaction with overall outcome and breast [13][14][15]. However, implant-based breast reconstruction is the most common reconstructive procedure, because it involves fewer scars, no donor site morbidity, and less operating time; and it does not require microsurgical skills [16][17]. It is well-known that prosthetic reconstruction is usually avoided in previously radiated breasts; in fact, alloplastic reconstruction in radiated patients carries an increased rate of both poor aesthetic outcomes and short- and long-term complications including pain, capsular contracture, and thinning of the skin, possibly resulting in visible prosthesis, implant deflation, and rupture [18][19][20][21][22][23]. Specifically, capsule contracture represents the most frequent complication experienced in radiated patients reconstructed with implants [18][21][24][25][26]. Ribuffo et al. showed that lipofilling has protective properties, allowing immediate prosthetic breast reconstruction in the setting of postoperative radiotherapy with a significantly lower complication rate [27].

Fat grafting represents another reconstructive option after breast cancer surgery, but it is usually indicated for small-volume breasts or in partial resections such as quadrantectomies and lumpectomies [3]. However, fat grafting has also been advocated as adjuvant treatment in implant-based reconstruction in order to optimize the implant's interaction with the surrounding tissue and improve acquired breast contour deformities [28]. Moreover, fat grafting has been proven effective in revitalizing the microvascular damage and interstitial fibrosis found in chronically radio-damaged tissues [18][29][30][31]; thus, it can be exploited in breast reconstruction for both its regenerative and volumetric properties, allowing for use in lower-volume implants, which remain a foreign body, reducing postmastectomy pain and improving breast contour and consistency, leading to a more natural-looking breast [10][29][32][33][34][35][36].

A hybrid breast reconstruction protocol was proven to be associated with a lower rate of capsular contracture when compared with implant reconstruction, less breast pain at long follow-up times, and lower overall rates of revision surgery compared with standard expander-implant reconstruction [37]. However, these results are tempered by the relatively short mean follow-up period.

Studies have widely demonstrated the oncologic safety of fat grafting for breast reconstruction [5][6][7][38][39].

Researchers were not able to draw any conclusions based on researchers' data regarding oncologic safety because, in the included studies, no mention was made of either oncologic surveillance or cancer recurrence after fat grafting. In a recent experimental study in mice models with residual breast cancer, adipose transfer did not

increase tumor size, proliferation, histologic grade, or metastatic spread, and animals receiving lipofilling showed lower tumor volume and mass after fat engraftment [40].

The well-known main disadvantage of lipofilling is the unpredictable resorption rate [16][32][41]. However, Kim et al. demonstrated a mean resorption rate of 32.9% (range, 25–52%) [35]. One study found the time to reach a steady state of fat graft retention to be as long as 2.2 years [42].

The capsular contracture rate after mastectomy and radiotherapy was not clearly stated by all studies; for this reason, it was separately analyzed from other complications. Capsular contraction was mentioned in 6 out of 12 included studies for a total of 17 cases out of 337 reconstructed breasts (5%) [16][18][29][33][34][43]. Razzouk et al. reported that 11% (15/136 breasts) of the patients developed capsular contracture (follow-up 32 months), and the average satisfaction score was 4.7 on a 5-point Likert scale [33]. Salgarello et al. reported no capsular contracture above stage 1 of Baker (23 months follow-up) [18], Hammond reported three cases (11 months follow-up) (8.3%), Sarfati et al. noticed no major capsular contracture (17 months follow-up) [34], Serra-Renom et al. reported that none of the patients in their cohort presented capsules around the prosthesis, and the Baker's stage was never higher than one (6 months' follow-up) [29], and Stillaert reported that no patient showed signs of capsular contracture at 24 months' follow-up [16]. The overall rate of capsular contracture in studies reporting data on it was 5%, which is significantly lower than the contracture rate after standard implant-based breast reconstruction. Capsular contracture after breast augmentation and reconstruction affects up to 30% of patients [44]. Hammond et al. reported an overall capsular contracture incidence of 9.8%; the rate after postmastectomy radiation therapy (PMRT) was 18.7%, and 7.5% for patients without PMRT. The recent evidence suggests that periprosthetic fat grafting may decrease the capsular contracture rate [44][45][46][47][48].

Although radiotherapy has been proposed as the most important factor associated with the number of lipofilling sessions needed to complete a breast reconstruction and with the rate of complications [49], on the basis of researchers' entry, researchers were not able to stratify the effects of radiotherapy among complications rate or number of sessions needed to achieve satisfying results.

Gronovich et al. [11] and Hammond et al. [43] reported on direct-to-implant reconstruction with acellular dermal matrix (ADM) and tissue expander/implant reconstruction with ADM, respectively. Nothing remarkable was noted in regard to complications, capsular contracture, or aesthetic outcome. No cases of breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) were reported in the included studies. This can be explained by the relatively recent introduction of the hybrid reconstructive technique and the low incidence of BIA-ALCL.

In the reviewed studies, high patient satisfaction was achieved with a reasonably low number of lipofilling sessions, averaging 1.7 sessions (range from 1.3 to 3.2 in different studies) with studies using the Likert scale (4–4.8 mean as rated by the patient, a surgeon, and a nurse on a 1–5 scale). In a study by Cigna E et al. using the VAS scale (range 1–10), the average patient satisfaction went up from 5.2 to 7.9 and surgeon satisfaction went up from 4.9 to 7.7. Studies using BREAST-Q reconstruction questionnaire reported "high" to "very-high" levels of satisfaction with final outcome. These encouraging results are further supported by the findings of Cogliandro et al., showing that

BREAST-Q was significantly better in patients who underwent hybrid breast reconstruction compared with patients who had standard implant-based reconstruction, ameliorating the cosmetic outcome as well as decreasing postoperative pain [50].

A further role of fat grafting may be related to the ability to expand indications for prepectoral breast reconstruction. The prepectoral approach in breast reconstruction is often avoided due to the increased risk for mastectomy flap necrosis and contour deformities [16]. However, fat grafting can potentially improve not only the flap thickness and vascularity but also breast contour. Consequently, it can reduce the risk of complications associated with the prepectoral placement of the implant.

Nonetheless, the combined reconstructive approach has some relevant limitations to be considered. First, several surgical procedures are often necessary to achieve final results, increasing the costs of the reconstruction. Second, it delays the psychological acceptance of the reconstructed breast [34].

Despite the promising results available in the literature and widespread use of hybrid reconstruction techniques in daily practice, researchers' entry is subjected to some limitations. First, researchers have to highlight the lack of comparable interstudy data (e.g., lack of report of standard deviation of the mean lipofilling sessions and injected volume) and heterogeneity in patient-reported outcomes (e.g., only two of the included studies [18][50] reported BREAST-Q scores, not all studies reported data on capsular contracture, and none reported data on oncologic safety or cancer recurrence after fat grafting). Thus, researchers were not able to perform any statistical analysis. Second, in the studies included, no clearly stated correlation between the abovementioned results and breast radiation therapy existed. Furthermore, a lack of information regarding pre- and postoperative mastectomy flap quality, type of implant, and implant position were noted. Researchers therefore encountered a significant lack of high-quality prospective trials demonstrating the superiority of the hybrid breast reconstruction compared with standard implant-based reconstruction, and which is the optimal timing for autologous fat transfer (AFT).

To the best of researchers' knowledge, this is the first entry on the use of implant-based reconstruction associated with fat grafting. Despite this limitation, researchers' entry demonstrates efficacy of the use of fat grafting in addition to prosthetic breast reconstruction. However, researchers confirmed the previously reported lack of evidence in patient-reported quality of life, and researchers point to the need for a high-quality randomized prospective trial comparing hybrid and standard reconstruction [51][52].

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