BREAST-Q Patient-reported Outcomes in Different Types of Breast Reconstruction after Fat Grafting

Meir Retchkiman, MD
Arij Elkhatib, MD
Johnny I. Efanov, MD
Alain Gagnon, MD
Joseph Bou-Merhi, MD
Michel Alain Danino, MD, PhD
Christina Bernier, MD

Background: Breast reconstruction after mastectomy improves patient quality of life. Independently of the type of reconstruction, ancillary procedures are sometimes necessary to improve results. Fat grafting to the breast is a safe procedure with excellent results. We report patient-reported outcomes using the BREAST-Q questionnaire after autologous fat grafting in different types of reconstructed breasts.
Methods: We performed a single-center, prospective, comparative study that compared patient-reported outcomes using the BREAST-Q in patients after different types of breast reconstruction (autologous, alloplastic, or after breast conserving) who subsequently had fat grafting.
Results: In total, 254 patients were eligible for the study, but only 54 (68 breasts) completed all the stages needed for inclusion. Patient demographic and breast characteristics are described. Median age was 52 years. The mean body mass index was 26.1 ± 3.9. The mean postoperative period at the administration of BREAST-Q questionnaires was 17.6 months. The mean preoperative BREAST-Q was 59.92 ± 17.37, and the mean postoperative score was 74.84 ± 12.48 ($P < 0.0001$). There was no significant difference when divided by the type of reconstruction.
Conclusion: Fat grafting is an ancillary procedure that improves the outcomes in breast reconstruction independently of the reconstruction type and heightens patient satisfaction, and it should be considered an integral part of any reconstruction algorithm. (*Plast Reconstr Surg Glob Open 2023; 11:e4814; doi: 10.1097/GOX.0000000000004814; Published online 22 February 2023.*)

INTRODUCTION

Breast reconstruction after mastectomy has many physical and psychological benefits for the patient, including improved sexual well-being and body image.[1,2] In addition, advances in autologous and implant-based breast reconstruction techniques have enhanced aesthetic outcomes in recent years.[3,4] Nonetheless, to achieve better standards, ancillary procedures are sometimes necessary even after autologous or alloplastic reconstructions.[5]

The first description of free fat autotransplantation in humans was by Neuber in 1893.[6,7] Although fat grafting was used to fill breast defects by Czerny in 1895,[6,7] the concept of lipofilling with traditional liposuction techniques was introduced only a century later.[8–10] Coleman popularized the procedure, and the method has become widespread for correction of contour and volume deficits and deformities.[9] Autologous fat grafting is an attractive option for enhancing reconstructed breast shape and volume. The procedure is relatively easy and provides long-lasting results with low complication rates.[11]

One area of concern surrounding autologous fat grafting to the reconstructed breast has been the oncologic safety of the procedure, with the dual concern that the addition of fat stem cells may result in cancer recurrence; and that calcifications caused by lipofilling would be confused for or mask the pathognomonic calcifications indicative of breast cancer on breast screening.[8,12–19] These concerns have resulted in active research on the technique, with many studies reporting oncologic recurrence, fat graft survival, procedure complications, and subsequent oncologic screening after autologous fat grafting.[8,12–19] In addition, the changing perception of autologous fat grafting in breast reconstruction is witnessed by the evolving position of the American Society of Plastic

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Surgeons toward it; after having prohibited it in 1987, an ASPS Fat Grafting Task Force in 2009 exhibited a more tolerant viewpoint.[10,20]

Few studies, however, looked at patient-reported outcomes after autologous fat grafting. Therefore, this study evaluates the utility of autologous fat grafting after breast reconstruction in improving patients' perception of the different types of reconstructed breasts.

PATIENTS AND METHODS

Study Population

A single-center, prospective, comparative, patient-reported outcomes study was performed in patients who underwent fat grafting as an ancillary treatment after breast reconstruction at the Centre Hospitalier de l'Université de Montréal. This study was approved by the institutional ethics review board, and recruited patients scheduled for fat grafting after breast reconstruction between February 2016 and July 2018.

The same group of plastic surgeons performed all procedures. The indications for lipofilling were one or more of the following: hollowness (cavity), deformity (disruption of the form or shape of the breast), asymmetry, volume deficit, visible implant, rippling, or lack of projection.

Eligible patients included patients aged 18 years and older with an indication of fat grafting after breast-conserving surgery or total mastectomy with an implant or flap-based reconstruction. Patients who did not provide consent for the study, did not complete preoperative and postoperative BREAST-Q questionnaires, or were lost to follow-up were excluded.

Operative Technique

Lipofilling was performed according to the Coleman technique.[9] The donor sites (abdomen/flanks/thighs) as marked preoperatively were infiltrated with a solution consisting of 50 mL of 1% xylocaine and 1:100,000 epinephrine and 15 mL of 8.4% bicarbonate per 1 L of normal saline solution (0.9% NaCl). Infiltration was performed following the super-wet technique. Total infiltration volumes depended on the size of the donor area and respected the maximal allowable lidocaine dosages per kilogram.

Manual liposuction harvesting of fat was performed using a 4–5 mm liposuction cannula attached to a 60 cm³ syringe. Harvested fat was then washed using the infiltration solution until the solution running off from the harvested fat was clear. The harvested fat graft was then decanted and filled into 10 cm³ syringes for lipofilling. Infiltration of the fat graft was effectuated into areas of the breast marked preoperatively through small incisions in the breast made by a 11 blade. A blunt Coleman cannula was used for lipofilling. Infiltration was preceded by subcision using a sharp 18 gauze needle, where the scar tissue was deemed to warrant a release. Breast defects were over-filled (up to 40% by volume) where possible to allow for graft loss.

Takeaways

Question: What are the patient-reported outcomes after fat grafting in different types of breast reconstruction?

Findings: There was an overall improvement in the BREAST-Q score in all categories and in all the types of breast reconstructions with no difference between them.

Meaning: Fat grafting is an accessory procedure that improves the outcomes in breast reconstruction independently of the type of reconstruction, improves the patient satisfaction, and should be considered as an integral part of any breast reconstruction.

Outcomes Measured

The BREAST-Q is a validated, rigorously developed patient-reported outcome instrument specific to breast surgery.[3,21] Relevant to breast cancer, there are BREAST-Q modules specific to mastectomy, breast-conserving therapy, and breast reconstruction. Each module has preoperative and postoperative scales. There are four scales common to all preoperative modules for breast cancer and reconstruction patients: Satisfaction with Breasts, Psychosocial Well-being, Sexual Well-being, and Physical Well-being. The Reconstruction module also has the Physical Well-being of the abdomen for use in autologous reconstruction patients. Each scale is scored to generate a numeric score on a scale from 0 (worst) to 100 (best), which can then be used to compare patients undergoing different procedures or at other preoperative and postoperative time points. Higher scores correlate with greater satisfaction and quality of life. The BREAST-Q has been in widespread use since its inception in 2009 and has led to significant findings related to breast surgery.[3]

Study subjects provided written informed consent and completed the breast reconstruction module of the BREAST-Q preoperatively and during outpatient visits at 6, 12, or 24 months postoperatively. Demographic and epidemiological data were recorded. Breast reconstructions were stratified by laterality (unilateral or bilateral) and type of reconstruction [autologous, implant-based, and breast-conserving partial mastectomy (lumpectomy) with fat graft only].

In addition to the BREAST-Q, a supplementary self-reported score was given to the patients to rate the effect of the fat grafting on the original main indication, as a single question with multiple-choice answers (deteriorated, unchanged, good improvement, or excellent improvement); this question is referred to as indication-reported scores. The surgeon also rated an indication-reported score during the postoperative visit (very poor, poor, good, or very good). Complications of the lipofilling procedure were also recorded.

Statistical Analysis

We compared mean BREAST-Q scores across the five domains using an independent t test. The mean BREAST-Q scores of the control group were compared with the mean scores of the breast reconstruction patients at two time points: (1) preoperative scores (baseline) and

(2) postoperative scores 12 months after breast reconstruction. We reported means, standard deviations, and *P* values. A subgroup analysis was performed to assess for differences according to patient demographics and indications for lipofilling. All statistical analysis was performed using Stata Version 13.0 (StataCorp, College Station, Tex.).

RESULTS

A total of 254 patients were eligible for the study, but only 54 (21%), comprising 68 reconstructed breasts, completed all the stages needed for inclusion. Patient demographics and breast characteristics are summarized in Table 1. The median age was 52 years (range: 25–70 years). The mean body mass index was 26.1±3.9. The mean postoperative period at the administration of BREAST-Q questionnaires was 17.6 months (6–24 months).

The indications for autologous fat grafting were as follows: hollowness or volume deficit in 39 breasts (57%), deformity in 11 breasts (16%), asymmetry in 13 breasts (19%), lack of projection in three cases (4%), visible implant in one patient (1%), and implant rippling in one case (1%).

Of the 68 breasts that were lipofilled, 24 (35%) were post total mastectomy and autologous reconstruction (8 LD, 12 DIEP, 1 SGAP, 2 TRAM), 33 (49%) were posttotal mastectomy followed by expander/implant reconstruction, and 11 were postpartial mastectomy alone. In addition, 28 (41%) patients were lipofilled bilaterally.

All 68 breasts had at least one fat grafting session (mean of 83.7 mL of fat, 10–250 mL), 19 (28%) required a second fat grafting session (mean 57.9 mL, 11–105 mL), three underwent a third intervention (mean 43 mL, 10–63 mL), and only one needed fourth stage (60 mL), for a total of 90 fat grafting sessions (1.3 sessions per breast) and a mean of 77.4 mL of fat per session. The interval between fat grafting sessions was 10 months (5.7–19 months).

The time interval between the primary reconstruction surgery and autologous fat grafting varied widely among patients, with the shortest time being 9 months and the longest being 18 years. Complications of autologous fat grafting included two cases of oil cyst formation, one case of fat necrosis, and one case of breast abscess that required incision and drainage under local anesthesia. There were no cases of locoregional recurrence of cancer in this patient series.

Regarding fat grafting, the number of sessions and amount of fat can be seen in Table 2. The subgroup of autologous reconstruction had a higher volume of fat grafted per breast in the first session with less subsequent fat grafting.

The mean preoperative BREAST-Q was 59.92±17.37, and the mean postoperative score was 74.84±12.48 (*P* < 0.0001).

Table 1. Patient Demographics and Breast Characteristics

	Total	Autologous	Implant	Fat Only
Number by breast (%)	68 (100%)	24 (35%)	33 (49%)	11 (16%)
Age, y				
Median	52	55.5	48	57
Range	25–0	36–70	25–66	41–67
Mean ± SD	52.2±9.6	54.8±9	48.6±9.7	57±6.9
Body mass index				
Median	25.6	27.4	26.4	25.1
Range	17.3–34.8	19.9–34.8	17.3–33	20–27.7
Mean ± SD	26.1±3.9	27±4.3	26.1±3.9	24.4±2.3
Smoking status				
Nonsmoker	63 (93%)	23 (96%)	30 (91%)	10 (91%)
Current	3 (4%)	1 (4%)	1 (3%)	1 (9%)
Past	2 (3%)	0 (0%)	2 (6%)	0 (0%)
Radiation treatment				
No	39 (57%)	11 (46%)	26 (79%)	2 (18%)
Yes	29 (43%)	13 (54%)	7 (21%)	9 (82%)
Oncological procedure				
Bilateral mastectomy	26 (38%)	5 (21%)	20 (61%)	N/A
Unilateral mastectomy	25 (37%)	16 (67%)	9 (27%)	N/A
Bilateral partial mastectomy	6 (9%)	2 (8%)	2 (6%)	2 (18%)
Unilateral partial mastectomy	12 (18%)	1 (4%)	2 (6%)	9 (82%)
Indication				
Hollowness	32 (47%)	1 (4%)	19 (58%)	3 (27%)
Deformation	11 (16%)	1 (4%)	5 (15%)	4 (36%)
Asymmetry postexpander/implant	13 (19%)	1 (4%)	4 (12%)	3 (27%)
Volume deficit	7 (10%)	0 (0%)	2 (6%)	1 (9%)
Visible implant	1 (1%)	0 (0%)	1 (3%)	0 (0%)
Rippling	1 (1%)	1 (4%)	0 (0%)	0 (0%)
Lack of projection	3 (4%)	0 (0%)	2 (6%)	0 (0%)

Table 2. Fat Grafting Session

	Total	Autologous	Implant	Fat Only
Fat grafting (no. sessions)				
1 session	68 (100%)	24 (100%	33 (100%)	11 (100%)
2 sessions	19 (28%)	6 (25%	9 (27%)	4 (36%)
3 sessions	3 (4%)	1 (4%)	1 (3%)	1 (9%)
4 sessions	1 (1%)	0 (0%)	0 (0%)	1 (9%)
Fat grafting (average injected-mL)				
First session	83.7	102.1	74.6	71
Second session	57.9	74	37.5	85
Third session	43	16	63	50
Fourth session	60	N/A	N/A	60

Table 3. BREAST-Q Results

	Total	Autologous	Implant	Fat Only
Preoperative	59.92±17.37	59.3±15.49	59.8±18.30	61.8±19.09
Postoperative	74.84±12.48	75.8±12.50	73.3±12.70	77.4±14.13
P value	<0.0001	0.0002	0.0009	0.0415

P value significant at ≤0.05.

When divided by type of surgery, it was 59.3±15.49 preoperatively and 75.8±12.50 postoperatively for breasts with total mastectomy and autologous reconstruction (*P* = 0.0002), 59.8±18.30 preoperatively and 73.3±12.70 postoperatively in breasts with total mastectomy and expander/implant reconstruction (*P* = 0.0009), and 61.8±19.09 preoperatively and 77.4±14.13 postoperatively in breasts with partial mastectomy (*P*= 0.0415) (Table 3).

The mean preoperative breast satisfaction score was 43.2. When stratified by the type of reconstruction, we observed that preoperatively, there were no significant differences between all four categories. Satisfaction scores with outcomes before lipofilling were 71.8 for autologous reconstructions, 71.7 for alloplastic reconstructions, and 68.4 for breast-conserving surgery

Improvements in patient-reported outcomes were found in all postoperative BREAST-Q measurements after lipofilling (Satisfaction with Breasts, Psychosocial Well-being, Physical Well-being: Chest, Sexual Well-being) when compared with pre-fat-grafting scores (Table 3). Satisfaction with Breasts improved by a mean of 14.2 (43.2±13 to 57.5±14.3; *P*< 0.0001); Psychosocial Well-being by 13.8 (from 57.9±12 to 71.7±21.3; *P*< 0.0001); Physical Well-being by 8.7 (from 69.6±18.6 to 78.3±18; *P* = 0.0061); Sexual Well-being by 14.1 (from 44.6±13 to 58.7±21.3; *P*< 0.0001).

Regarding the number of fat grafting sessions, we found that patients who underwent two or more fat grafting sessions had higher postoperative BREAST-Q scores in all areas, with more significant results in the Satisfaction with Breasts (55.6±13.9 to 61.9±14.5; *P* = 0.049) and Sexual Well-being (56.1±19.1 to 65.9±11.5; *P* = 0.03) categories. There was no relation between the number of fat grafting sessions and patient or surgeon indication-reported scores.

The timing of fat grafting after the breast reconstruction was on average 3 years (38 months, 8.5–108 months). Patients who had fat grafting within the first 16 months (10 patients) had a trend to higher BREAST-Q scores in Satisfaction with Breasts, Psychosocial Well-being, Physical Well-being, and Sexual Well-being. However, this was not statistically significant.

Patient and surgeon postoperative indication-reported scores are given in Table 4. Patients reported deteriorated breasts in six cases (9%), unchanged results in 22 breasts (32%), good results in 27 cases (40%), and excellent results in 13 patients (19%).

According to the surgeons' ratings, zero breasts (0%) showed very poor results, 14 breasts (21%) were unchanged, 23 breasts (34%) demonstrated a good result, and 31 breasts (46%) demonstrated very good results. Overall, we saw improved results of 59% as perceived by the patients versus 80% from the surgeon's point of view. When divided by subgroups, we found that in the breast-conserving group, we had an improvement of 82% as assessed by the patient and 91% by the surgeon.

DISCUSSION

Only a few other studies discuss the use of BREAST-Q in the context of fat grafting after breast reconstruction. Bennett et al reported on a cohort of 2048 patients who underwent implant or autologous breast reconstruction, amongst whom 165 patients who had significantly lower breast satisfaction scores after breast reconstruction alone were treated by fat grafting to treat volume deficits and contour abnormalities.[22] These patients were then found to have similar satisfaction scores to the rest of the cohort two years postoperatively, showing that fat grafting improved satisfaction in previously unsatisfied patients.[22]

Bayti et al[23] reported high breast satisfaction rates in 68 patients who underwent fat grafting either as a sole reconstruction method or as an ancillary procedure after implant- or flap-based reconstruction. However, the authors of this article did not administer a preoperative BREAST-Q questionnaire, and it is therefore not possible to conclude whether fat grafting caused improvements in patient satisfaction.[23]

Table 4. Patient and Surgeon Indication Measure Scale between Patient and Surgeon

	Total (n = 68)	Autologous (n = 24)	Implant (n = 33)	Fat Only (n = 11)
Deterioration by patient	6 (9%)	2 (8%)	4 (12%)	0 (0%)
Bad result by surgeon	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Unchanged by patient	22 (32%)	7 (29%)	13 (39%)	2 (18%)
Poor result by surgeon	14 (21%)	6 (25%)	7 (21%)	1 (9%)
Good results by patient	27 (40%)	10 (42%)	10 (30%)	7 (64%)
Good results by surgeon	23 (34%)	5 (21%)	14 (42%)	4 (36%)
Excellent result by patient	13 (19%)	5 (21%)	6 (18%)	2 (18%)
Very good result by surgeon	31 (46%)	13 (54%)	12 (36%)	6 (55%)
Good and Excellent	**Total**	**Autologous**	**Implant**	**Fat Only**
By patient	59%	63%	48%	82%
By surgeon	80%	75%	78%	91%

Brown et al[24] analyzed changes in breast satisfaction scores in 48 patients after autologous fat grafting. They found significant improvement in breast satisfaction rates after fat grafting, even though the median of the fat volume transferred in this study was 40 mL, lower than our 83 mL overall. Most significant improvements were observed in patients with breast-conserving surgery compared with implant or flap reconstructions.[24]

Autologous fat grafting is a frequently used and relatively easy technique to master in the armamentarium of the plastic surgeon. It has found a wide array of uses for both volumetric and contour improvements and scar modifications.[25,26] There is a lot to recommend autologous fat grafting for the fine-tuning of breast reconstruction results across all types of reconstructions, especially after the significant concerns of its use in the breast, such as recurrence of breast cancer and confusion regarding mammography calcifications, have been allayed by a substantial body of research.[24,26–28] With the safety and efficacy of the procedure proven, patient-reported satisfaction with the procedure results makes up the next step in its acceptance and utility. Our study, corroborating the major findings of earlier comparable works, shows the high satisfaction rates of autologous fat grafting as an ancillary procedure after breast reconstruction to improve patient satisfaction with the reconstruction.

Results from this study show a significant improvement in breast satisfaction across all BREAST-Q measurements for patients undergoing autologous fat grafting after conservative breast surgery, implant-based reconstruction, and autologous reconstruction, with no difference in satisfaction rates between the groups. Moreover, comparable increases in satisfaction were found regardless of radiotherapy and whether transferred fat volumes were under or over 100 mL.

It has been shown that concerning the timing of the reconstruction, immediate breast reconstruction compared with delayed has beneficial aesthetic results and improvement in quality of life.[29,30] Therefore, we would extrapolate and expect that patients with sooner fat grafting will have better-reported outcomes in quality of life, but this was not the case. This could be because the timing is not necessarily related to the patient's decision or desire to perform the procedure but to the long waiting list in the public medicine service as in our hospital.

In the patient indication-reported score, we found a score of "deterioration" in three patients (six breasts, 9%) and "unchanged" in 22 breasts (32%). Even though 49% of the patient-rated poorly in the indication-reported score, there was an average significant improvement in the postoperative BREAST-Q score, which is a more comprehensive and proved self-reported outcome scale, more important that a single question rating indication improvement only. In the patients with higher indication-reported scores (good or excellent improvement), the improvement in the BREAST-Q scores was more significant.

Interestingly, the group of patients with lower indication-reported scores had lower BREAST-Q scores in the area of Satisfaction with Information, Satisfaction with Surgeon, and Satisfaction with Medical and Office Staff. This could reflect the importance of patient expectations management.[31]

Regarding the discrepancy in "improvement" in the indication-reported score between the patients (59%) versus surgeon (80%), similar to Wu et al,[32] we found that in the group with disparity, their average starting scores in the preoperative BREAST-Q were lower in all categories compared with their counterpart with higher indication-reported scores. Further research could elucidate if there is a cutoff for lower preoperative scores that could predict lower patient-reported scores or the need for better management of expectations.

This study is limited by its small number of patients and its inability to draw broader conclusions about fat graft survival and the role of multiple rounds of fat grafting. As it compares postoperative BREAST-Q results at one point with the preoperative ones, it does not adequately provide an insight into how satisfaction rates with autologous fat grafting may change over time. Future directions for research must include long-term follow-up of patients receiving autologous fat grating to observe a change in satisfaction over time and identify any long-term changes to the grafts and breast appearance.

CONCLUSIONS

Fat grafting is an ancillary procedure that improves the outcomes in breast reconstruction independently of the type of reconstruction and heightens patient satisfaction.

It seems that more than one fat grafting session enhances results. Improving patient education and managing expectations is essential to acquire better patient reported outcomes. Fat grafting should be considered as an integral part of any reconstruction algorithm.

Michel Alain Danino, MD, PhD
Centre Hospitalier de l'Université de Montréal (CHUM)
1051 Rue Sanguinet
Montreal, Quebec
Canada H2X 3E4
E-mail: michel.alain.danino@umontreal.ca

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