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Short-Term Quality of Life after Autologous Compared with Alloplastic Breast Reconstruction: A Prospective Study

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Background: The aim of this prospective multicenter study was to evaluate whether *autologous* breast reconstruction (BR) leads to lower short-term quality of life (QoL) compared with *alloplastic* BR, due to the more physically demanding surgery and increased risk of severe complications of autologous BR.
Methods: Changes in QoL after BR were measured in this prospective multicenter study using the BREAST-Q questionnaire, which was administered preoperatively and at 6 weeks and 6 months postoperatively. Characteristics and complications, classified according to Clavien-Dindo, were compared between alloplastic and autologous groups. Profile plots and generalized linear regression models were constructed to analyze the BREAST-Q subscales over time for both BR groups.
Results: Preoperatively, women undergoing autologous BR scored lower on all BREAST-Q scales compared with women undergoing alloplastic BR, regardless of whether they underwent immediate or delayed BR. Women undergoing autologous BR scored higher at 6 weeks and 6 months postoperatively on the Satisfaction with Breasts ($P = 0.001$), Psychosocial Well-Being ($P = 0.024$), and Sexual Well-Being ($P = 0.007$) subscales. Postoperative Physical Well-Being: Chest score was similar between the groups ($P = 0.533$). Clavien-Dindo grade III or higher complications occurred more often among women in the autologous group (27% versus 12%, $P = 0.042$). Complications were not associated with worse BREAST-Q scores on any of the subscales.
Conclusions: In contrast to the authors' expectations, and despite the higher incidence of severe complications and lower preoperative breast satisfaction and QoL scores, women undergoing autologous BR had higher levels of breast satisfaction and psychosocial and sexual well-being, both at 6 weeks and 6 months after BR, compared with women undergoing alloplastic BR. *(Plast. Reconstr. Surg.* 152: 55S, 2023.)
CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, II.

Breast cancer is the most common cancer occurring in women.[1] As treatment options have improved significantly in the last decades, disease-free survival rates have increased, which has resulted in a greater emphasis on ways to improve quality of life (QoL) after mastectomy.[2] This has increased the demand for both autologous and alloplastic breast reconstruction (BR). Autologous BR leads to a higher physical burden than alloplastic BR, due to the significant longer operation time and larger and multiple surgical wounds compared with alloplastic BR. This leads to longer physical recovery time

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and often longer hospital stays.[3,4] In addition, more and more severe complications have been reported after autologous BR than after alloplastic BR (~50% compared with ~25% and ~30% versus ~18%, respectively).[5] A patient's choice between alloplastic and autologous BR is often dictated by the patient's general condition and personal preference, body type, and cosmetic concerns.[6] The surgeon also plays an influencing role, and shared decision-making can be challenging. Therefore, thorough counseling of each patient is of great importance with regard to autologous versus alloplastic BR, with their associated advantages and disadvantages, and is needed to manage the patient's expectations of each technique.

In a systematic literature review, we analyzed patient satisfaction and QoL after BR, measured with the BREAST-Q, and found that QoL after autologous BR is higher than that after alloplastic reconstruction.[7] The mean follow-up reported in these articles was 26 months (range, 3 to 60 months). No data were available in the first weeks after BR, and most of the studies lacked preoperative QoL data.

The aim of this study was to investigate how postoperative breast satisfaction and QoL are affected by autologous and alloplastic BR during the first 6 months after surgery. We analyzed data collected before surgery and 6 weeks and 6 months after surgery, and hypothesized that women undergoing autologous BR would have lower BREAST-Q scores at 6 weeks postoperatively compared with women who were treated with alloplastic surgery. We based this hypothesis on the higher incidence of complications and the more profound impact on physical health associated with autologous BR compared with alloplastic BR.[3–5,8–11]

METHODS

Study Design and Participants

This study was a prospective multicenter cohort study in women (aged 18 years and older) undergoing autologous or alloplastic BR between 2012 and 2019 at a university hospital (University Medical Center Groningen), a teaching hospital (Medical Center Leeuwarden), and a general hospital (Nij Smellinghe Drachten Hospital). This prospective research study was approved by the medical ethics committee (approval no. 2010.191).

Procedure

Study participants were recruited at the outpatient clinics of the study hospitals. Written informed consent was obtained from all participants. Data containing patient characteristics and details regarding the surgery and postoperative complications were collected and registered in an electronic patient record system. All study participants were asked to fill out the BREAST-Q reconstruction module, the 36-Item Short-Form Health Survey (SF-36), and the Hospital Anxiety and Depression Scale (HADS) at three time points: preoperatively, and at 6 weeks and 6 months after BR.

Questionnaires and Scoring

The BREAST-Q reconstruction module consists of numerous scales that assess patient satisfaction and QoL, using 42 preoperative and 116 postoperative patient-reported outcome measures. The preoperative scale consists of the following subscales: Satisfaction with Breasts, Psychosocial Well-Being, Sexual Well-Being, and Physical Well-Being (Chest and Abdomen). The postoperative scale also includes Satisfaction with Outcome and Satisfaction with Care (ie, with information, surgeon, medical team, office staff, and so on). Each individual BREAST-Q scale is scored independently and converted into scores ranging from 0 to 100, with high scores representing higher patient satisfaction and QoL.[12] The minimal important difference per BREAST-Q scale is four points. Except for Physical Well-Being, here, the minimal difference is three points.[13]

The SF-36 was used in this study as an indicator of participants' general health perception. The SF-36 makes use of eight domains to evaluate health-related QoL. The concepts covered are physical function, limitations due to physical or emotional health, energy/fatigue, emotional well-being, social functioning, bodily pain, general health, and perceived changes in health. Each item of the survey is scored from 0 to 100, with a higher score indicating lower disability. The final scores are averages of the items within each scale.[14]

The HADS was used as an indicator of participants' mental health status, with high scores indicating possible emotional disorders and more complaints. The scores of the two categories—anxiety and depression—are calculated by adding up all items, and the total score is categorized as normal (0 to 7), borderline abnormal showing symptoms (8 to 10), or abnormal/severe symptoms of anxiety or depression (11 to 21).[15]

Primary and Secondary Outcomes

The primary outcome in this study was the Satisfaction with Breasts subscale; the

secondary outcomes were the BREAST-Q Psychosocial Well-Being, Sexual Well-Being, and Physical Well-Being scales. The scores of the remaining BREAST-Q scales were presented but not further analyzed statistically within this study.

Definitions

Age was calculated in years. Body mass index (BMI) was calculated in kilograms per square meters, and smoking status was rated either "yes" or "no." Alloplastic BR included direct implant (one stage), tissue expander followed by implant (two stages), or tissue expander/implant combined with a latissimus dorsi flap. The autologous technique was a deep inferior epigastric perforator (DIEP) flap BR. BR was either unilateral or bilateral and was performed either immediately after the mastectomy (immediate) or in a second surgery after mastectomy (delayed). Women underwent BR to treat either a current or past breast cancer diagnosis (therapeutic), gene mutation carriership, or an otherwise increased risk of developing breast cancer (prophylactic). Adjuvant breast cancer therapies included (neo) adjuvant treatment with radiotherapy, chemotherapy, or hormonal therapy. Comorbidities included hypertension, hypothyroidism, pulmonary disease, diabetes, and rheumatic disease. The SF-36 subscale scores were converted into a SF-36 total score, and the mean (SD) was calculated for both groups at all three time points. The HADS outcomes were divided into normal (score of 0 to 7) and abnormal (score of 8 to 1) for both the anxiety and depression scales at all three time points.

Complications

All complications occurring within 6 months after reconstruction were registered by the plastic surgeon during the outpatient clinic visits. The type of complication was categorized based on the area involved (eg, breast, abdomen, or general). The severity of the complications was graded according to the Clavien-Dindo classification system.[16] Clavien-Dindo grade I consists of self-limiting complications. Grade II complications require pharmacological treatment. In Grade III, surgical, endoscopic, or radiological interventions are needed. Grade IV are life-threatening complications that require management on the intensive care unit. Grade V indicates death of the patient.[13] In this study, severe complications were classified as grade III or higher complications.

Power Analyses

Based on previous research, an estimation was made of the number of participants that needed to be included in the study. This calculation was based on the observation that women in the alloplastic group would have a BREAST-Q score of 66 (SD 18)[17] and the assumption that women in the autologous BR group would score, on average, 10 points lower at 6 weeks after BR. Given an alpha of 0.05 and a power of 0.80, a two-tailed power analysis resulted in a required sample size of 52 per BR group for this study.

Statistical Analyses

Preoperative clinical and demographic characteristics were stratified by reconstruction technique (alloplastic and autologous BR) and compared using descriptive statistics. For continuous variables, the Student *t* test was applied; in case of nonnormally distributed variables, the Mann-Whitney *U* test was applied. The chi-square test was applied on categorical variables. In addition, the complications occurring within 30 days of the BR were classified by Clavien-Dindo grade and compared between groups using the Pearson chi-square test or Fischer exact test in groups with fewer than five participants. To evaluate the BREAST-Q scores over time, BREAST-Q scales were presented as means and standard deviations, stratified by reconstruction technique. Profile plots were constructed to depict the estimated marginal mean scores for alloplastic and autologous BR groups over time for the primary and secondary outcomes. Generalized linear regression models were constructed with the dependent variable being the Satisfaction with Breasts scale. The model included an indicator for reconstruction technique (alloplastic BR as reference) and an indicator for time (preoperative as reference). Using the rule of thumb, we set the maximum number of variables to be included in the statistical model at 10. Based on the literature, the following covariates were selected as potential confounders: age, BMI, radiotherapy (before or after reconstruction), immediate or delayed reconstruction, Clavien-Dindo grade III or higher, SF-36 total scores, and HADS anxiety score greater than or equal to 8 to 21.[18,19] The model was built using backward selection and assessing the Akaike information criterion and the −2 log likelihood. To evaluate the stability of the results given the heterogeneity of the alloplastic group, a sensitivity analysis was performed in which women treated

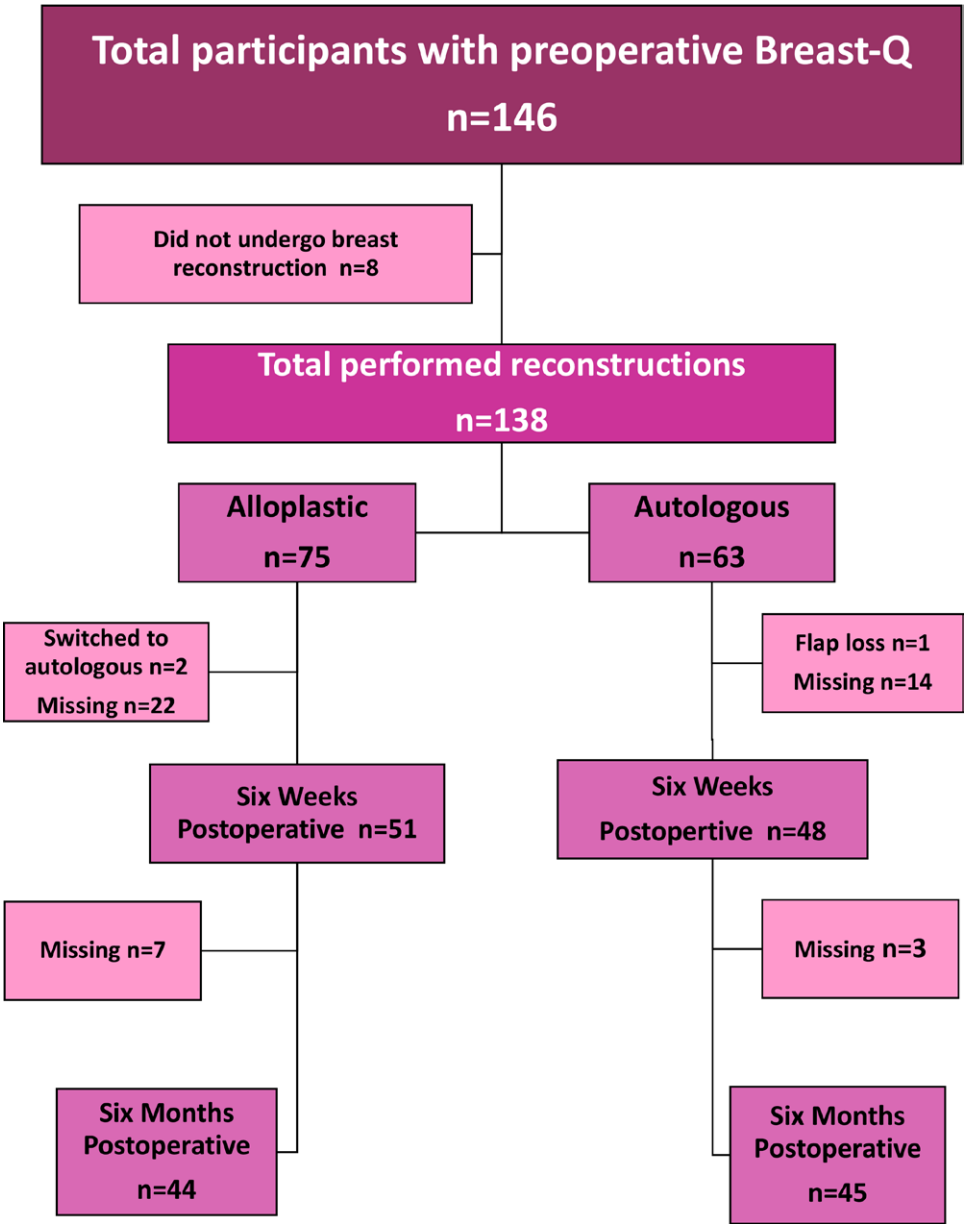

Fig. 1. Flowchart of study participants who completed the BREAST-Q over time.

with an additional latissimus dorsi (LD) flap were excluded from the regression analyses. In addition, subgroup analyses were performed on one-stage versus two-stage alloplastic BR and satisfaction with breasts at 6 weeks and 6 months after reconstruction. All analyses were adjusted for center of treatment. Statistical analysis was performed using SPSS 26.0. $P < 0.05$ was considered statistically significant.

RESULTS

In total, 146 patients signed informed consent forms; 75 underwent alloplastic BR and 63 underwent autologous BR (51% and 43%, respectively), and they filled out the questionnaires at all time points. Eight patients (6%) filled out preoperative questionnaires but never underwent BR and, thus, were excluded from this study (Fig. 1). In the alloplastic BR group, 67% underwent two-stage BR, 25% underwent one-stage BR, and six women underwent LD flap + implant reconstruction (8%). All but two patients who underwent two-stage BR (4%) had received the definitive breast implant at 6 weeks after the initial surgery. Eleven women (22%) had received the definitive breast implant at 6 months. All women treated with autologous

BR were reconstructed using the DIEP flap technique. In two patients (3%), a tissue expander was initially inserted but was replaced by a DIEP flap; those patients only filled out the preoperative questionnaires.

There were some differences in clinical and demographic characteristics between the groups (Table 1). The patients who received alloplastic treatment had a significantly ($P = 0.010$) lower BMI compared with the autologous patients at intake. Most women (67%) underwent BR for a recent or past breast cancer diagnosis. More women in the alloplastic group underwent immediate BR compared with those in the autologous group (63% versus 29%, $P < 0.001$).

Forty-one women (28%) underwent radiotherapy mostly before BR, but in seven cases of alloplastic BR, radiotherapy was administrated postoperatively. Preoperatively, women in the autologous group scored significantly higher on the total SF-36 mean score and had fewer symptoms of anxiety compared with the alloplastic group (77 versus 72, $P = 0.038$; and 44% versus 60%, $P = 0.001$, respectively). See Supplemental Digital Content 1 for all independent SF-36 subscales. (**See Table, Supplemental Digital Content 1**, which shows SF-36 subscale scores of autologous and alloplastic reconstruction groups preoperatively and 6 weeks and 6 months after breast reconstruction, ***http://links.lww.com/PRS/G169***.)

Complications

Of the 75 women treated with alloplastic BR, 50.7% (38 of 75) experienced complications, compared with 61.9% (39 of 63) in the autologous group ($P = 0.141$) (Table 2). The incidence of Clavien-Dindo grades I and II was about equal for both groups ($P = 0.119$ and $P = 0.844$, respectively). Grade III complications occurred more often in the autologous BR group than in the alloplastic group ($P = 0.042$). Postoperative kidney failure, grade IVa, occurred in one autologous patient, leading to 27% of grade III or higher complications in the autologous group versus 12% in the alloplastic group ($P = 0.025$).

Satisfaction with Breasts over Time

Women about to undergo autologous BR had lower preoperative Satisfaction with Breasts scores (mean, 49 versus 59) (Table 3 and Fig. 2). This score was not influenced by the timing of reconstruction (immediate BR: autologous mean, 63 versus alloplastic mean, 66; delayed BR: autologous mean, 44 versus alloplastic mean, 52). Women who underwent autologous BR had higher Satisfaction with Breasts scores both at 6 weeks and 6 months after BR compared with women who underwent alloplastic BR (β, 10.5; 95% CI, 5.3 to 15.8; $P < 0.001$) (Fig. 2). High BMI and radiotherapy (before or after reconstruction) were negatively associated with Satisfaction with Breasts score (β, –0.6; 95% CI, –1.2 to –0.3; $P = 0.002$; and β, –7.6; 95% CI, –14.6 to –0.5; $P = 0.036$, respectively). Immediate BR was positively associated with Satisfaction with Breasts (β, 7.0; 95% CI, 0.5 to 14.1; $P = 0.048$) (Table 4). See Supplemental Digital Content 2 and 3 for Satisfaction with Breasts scores in women who underwent immediate versus delayed BR. [**See Figure, Supplemental Digital Content 2**, which shows BREAST-Q Satisfaction with Breasts subscale scores per breast reconstruction timing (immediate and delayed) preoperatively and at 6 weeks and 6 months postoperatively for the whole cohort, ***http://links.lww.com/PRS/G170***. **See Figure, Supplemental Digital Content 3**, which shows BREAST-Q Satisfaction with Breasts subscale scores per breast reconstruction timing (immediate and delayed) preoperatively and at 6 weeks and 6 months postoperatively for autologous and alloplastic reconstruction separately, ***http://links.lww.com/PRS/G171***.] Women who underwent one-stage versus two-stage BR had similar Satisfaction with Breasts scores both 6 weeks and 6 months after BR (Student t test, $P = 0.762$ and $P = 0.831$, respectively). Supplemental Digital Content 4 provides a visual overview of satisfaction with breasts in one-stage versus two-stage BR. [**See Figure, Supplemental Digital Content 4**, which shows BREAST-Q Satisfaction with Breasts subscale scores per alloplastic breast reconstruction subtechnique (one stage versus two stages) preoperatively and at 6 weeks and 6 months postoperatively for the whole cohort, ***http://links.lww.com/PRS/G172***.] After excluding the women with an additional LD flap from the alloplastic group, we found similar results. [**See Table, Supplemental Digital Content 5**, which shows the sensitivity analysis: generalized linear regression models on Satisfaction with Breasts, Psychosocial Well-Being, Sexual Well-Being, and Physical Well-Being: Chest for autologous versus alloplastic breast reconstruction (without women treated with implant/tissue expander and LD flap), ***http://links.lww.com/PRS/G173***. **See Table, Supplemental Digital Content 6**, which shows Akaike's information criterion (*AIC*) and the –2 log likelihood comparison of the models built with various variables and the final model

Table 1. Patient Demographics per Reconstruction Group

Characteristics	Alloplastic, *n* (%)	Autologous, *n* (%)	*P*[a]
Total no. who underwent reconstruction	75 (51)	63 (43)	0.404
Mean age (SD), yr	47 (11)	49 (9)	0.273
Median BMI (IQR), kg/m^2	25 (22–30)	27 (25–30)	0.010[b]
Smoker	16 (11)	1 (1)	<0.001[b]
Side of operation			0.334
Unilateral reconstruction	43 (31)	42 (30)	
Bilateral reconstruction	31 (22)	21 (15)	
Reconstruction indication			0.164
Preventive mastectomy	26 (19)	15 (11)	
Breast cancer mastectomy	45 (33)	48 (35)	
Gene mutation			0.006[b]
Yes	30 (22)	12 (8)	
BRCA1	13	6	
BRCA2	15	6	
Other[c]	2	0	
Unknown, or tested negative	45 (33)	51 (37)	
Reconstruction timing			<0.001[b]
Immediate reconstruction	47(35)	18 (12)	
Delayed reconstruction	28 (20)	45 (33)	
Reconstruction technique			—
One-stage reconstruction[d]	25 (33)	NA	
Two-stage reconstruction[e]	50 (67)	NA	
(Neo)adjuvant therapies[f]			
Preoperative radiotherapy	27 (20)	7 (5)	} 0.025[b,g]
Postoperative radiotherapy	7 (5)	0 (0)	
Chemotherapy in the past	8 (6)	28 (20)	<0.001[b]
Preoperative chemotherapy	8 (6)	6 (4)	} 0.018[b,h]
Postoperative chemotherapy	14 (10)	2 (1)	
Hormonal therapy	25 (18)	29 (21)	0.128
Comorbidities			0.869
Yes	28 (20)	18 (13)	
Cardiovascular disease	13	7	
Hypothyroidism	4	8	
Pulmonary disease	6	3	
Diabetes	4	0	
Rheumatic disease	1	0	
SF-36 total score, mean (SD)			
Preoperative (67 ALL, 57 AUT)	72 (26)	77 (22)	0.038[b]
6 weeks (47 ALL, 48 AUT)	61 (25)	63 (24)	0.406
6 months (42 ALL, 44 AUT)	73 (25)	80 (20)	0.014[b]
Anxiety (HADS score 8–21)			
Preoperative (73 ALL, 63 AUT)	45 (60)	28 (44)	0.001[b]
6 weeks (56 ALL, 52 AUT)	17 (30)	7 (13)	0.029[b]
6 months (47 ALL, 49 AUT)	11 (23)	13 (27)	0.454
Depression (HADS score 8–21)			
Preoperative (73 ALL, 63 AUT)	27 (36)	21 (33)	0.396
6 weeks (56 ALL, 52 AUT)	16 (29)	9 (17)	0.123
6 months (47 ALL, 49 AUT)	15 (32)	6 (12)	0.018[b]

ALL, alloplastic; AUT, autologous; NA, not applicable to autologous group.
[a]Student *t* tests were applied on continuous variables and chi-square tests on categorical variables.
[b]Significant, with $P < 0.05$.
[c]Other: one patient had a *BRCA1* and *BRCA2* mutation, and one patient had a *CHECK2* mutation.
[d]Six patients were treated with an additional latissimus dorsi flap.
[e]One patient was treated with an additional latissimus dorsi flap.
[f]For neoadjuvant therapies, "preoperative" and "postoperative" refer to the reconstruction, not the mastectomy.
[g]Preoperative + postoperative radiotherapy compared between groups.
[h]Preoperative + postoperative chemotherapy compared between groups.

Table 2. Complications within 30 Days of Autologous and Alloplastic BR Using the Clavien-Dindo Grading Classification System[a]

Clavien-Dindo Grade	Alloplastic (Total $n = 75$), n (%)	Autologous (Total $n = 63$), n (%)	P
Any complication	38 (51)	39 (62)	0.141
Grade I: Any deviation from the normal postoperative course without the need for treatment	21 (28)	16 (25)	0.119
Seroma breast	15		
Infection breast	1		
Partial necrosis breast	1		
Bleeding breast	1		
Hematoma breast	1	6	
Wound-healing problem breast		1	
Seroma abdomen		1	
Hematoma abdomen		3	
Necrosis abdomen		1	
Grade II: Requiring pharmacological treatment with drugs; blood transfusions and total parenteral nutrition are also included	3 (4)	4 (6)	0.844
Seroma breast	1		
Infection breast	2	1	
Infection abdomen		1	
Lung embolus		1	
Grade III: Requiring surgical, endoscopic, or radiological intervention	9 (12)	16 (25)	0.042[b]
IIIa: Intervention not under general anesthesia	2	6	
Seroma breast	1	0	
Partial necrosis breast	1	2	
Abdominal necrosis		1	
Hematoma breast		2	
IIIb: Intervention under general anesthesia	7	10	
Partial necrosis breast	1	1	
Infection breast	3	1	
Bleeding breast	1	2	
Hematoma breast		2	
Partial necrosis breast			
Tissue expander leaks	2		
Flap ischemia		1	
Loss of flap		1	
Lung embolus		1	
Grade IV: Life-threatening complication requiring IC management	(0)	1 (2)	X
IVa: Single organ dysfunction (kidney failure)	0	1	
IVb: Multiorgan dysfunction	0	0	
Grade V: Death of a patient	NA	NA	NA

IC, intensive care; NA, not applicable for this study; X, no statistics computable.
[a]All complications occurred within 6 months after BR. The most severe event per patient was scored and is noted in this table.
[b]Significant, with $P < 0.05$.

used for the statistical analysis of this study, ***http://links.lww.com/PRS/G174***.]

Psychosocial, Sexual, and Physical Well-Being over Time

Women who underwent autologous BR had higher BREAST-Q scores on the Psychosocial Well-Being and Sexual Well-Being subscales ($P = 0.006$ and $P = 0.002$, respectively) (Figs. 3 and 4). There was no difference in Physical Well-Being: Chest scores between the women who underwent autologous and alloplastic BR ($P = 0.533$). The Physical Well-Being: Chest score decreased significantly at 6 weeks postoperatively ($P = 0.001$) and increased again at 6 months postoperatively ($P = 0.465$) for the whole cohort (Table 4 and Fig. 5). The Physical Well-Being: Abdomen scale showed a similar trend (Fig. 6). Excluding women with an LD flap did not change the results with regard to psychosocial, sexual, and physical well-being (**see Table, Supplemental Digital Content 5**, ***http://links.lww.com/PRS/G173***).

Table 3. BREAST-Q Scales with Mean Scores of Autologous and Alloplastic Reconstruction Groups Preoperatively and 6 Weeks and 6 Months Postoperatively

BREAST-Q Subscale	Preoperative Score, mean (SD)	6 Weeks Postoperative Score, mean (SD)	6 Months Postoperative Score, mean (SD)
Satisfaction with Breasts			
Alloplastic total group	59 (22)	51 (18)	57 (19)
Autologous total group	49 (17)	62 (15)	68 (17)
Satisfaction with Outcome			
Alloplastic	NA	71 (22)	71 (19)
Autologous	NA	73 (22)	74 (23)
Psychosocial Well-Being			
Alloplastic	63 (16)	60 (23)	67 (17)
Autologous	56 (15)	68 (18)	71 (21)
Sexual Well-Being			
Alloplastic	53 (22)	50 (21)	51 (21)
Autologous	46 (18)	57 (25)	56 (26)
Physical Well-Being: Chest			
Alloplastic	79 (15)	61 (15)	73 (13)
Autologous	68 (18)	68 (14)	74 (18)
Physical Well-Being: Abdomen			
Alloplastic	83 (17)	NA	NA
Autologous	85 (16)	62 (19)	78 (18)
Satisfaction with Nipples			
Alloplastic	NA	NA	84 (23)
Autologous	NA	NA	77 (21)
Satisfaction with Information			
Alloplastic	NA	87 (24)	70 (20)
Autologous	NA	94 (18)	76 (15)
Satisfaction with Surgeon			
Alloplastic	NA	91 (15)	90 (17)
Autologous	NA	94 (11)	96 (9)
Satisfaction with Medical Staff			
Alloplastic	NA	90 (17)	89 (21)
Autologous	NA	92 (16)	90 (21)
Satisfaction with Office Staff			
Alloplastic	NA	93 (15)	90 (17)
Autologous	NA	89 (17)	88 (21)

NA, not applicable to either the preoperative BREAST-Q module or the alloplastic reconstruction group.

DISCUSSION

The aim of this study was to investigate how patient satisfaction and QoL change from preoperatively to 6 weeks and 6 months after autologous and alloplastic BR. Our findings indicate that, in contrast to our hypothesis, women treated with autologous BR scored higher on the Satisfaction with Breasts, Psychological Well-Being, and Sexual Well-Being scales at both 6 weeks and at 6 months after reconstruction, compared with women who underwent alloplastic BR treatment ($P < 0.05$).

Interpretation of Results and Comparison with the Literature

In our study, preoperative BREAST-Q scores were higher among women who planned to undergo immediate alloplastic BR compared with those who would be treated by autologous BR. This finding coincides with previously published preoperative BREAST-Q data,[18] and could be explained by a higher number of women undergoing immediate BR in the alloplastic group compared with in the autologous group (35% versus 12%, $P < 0.001$). However, women about to undergo immediate autologous BR seemed to score lower compared with the women about to undergo immediate alloplastic BR (63 versus 66). It is possible that the differences in preoperative scores are not merely explained by the timing of reconstruction; perhaps they are also related to body type and to self-perceived body image and body satisfaction. Women in the autologous group had a higher BMI and more (abdominal) fat surplus, which is correlated to overall lower self-esteem and a lower body image.[20–23] High BMI has been reported to negatively impact BREAST-Q scores,[21] which

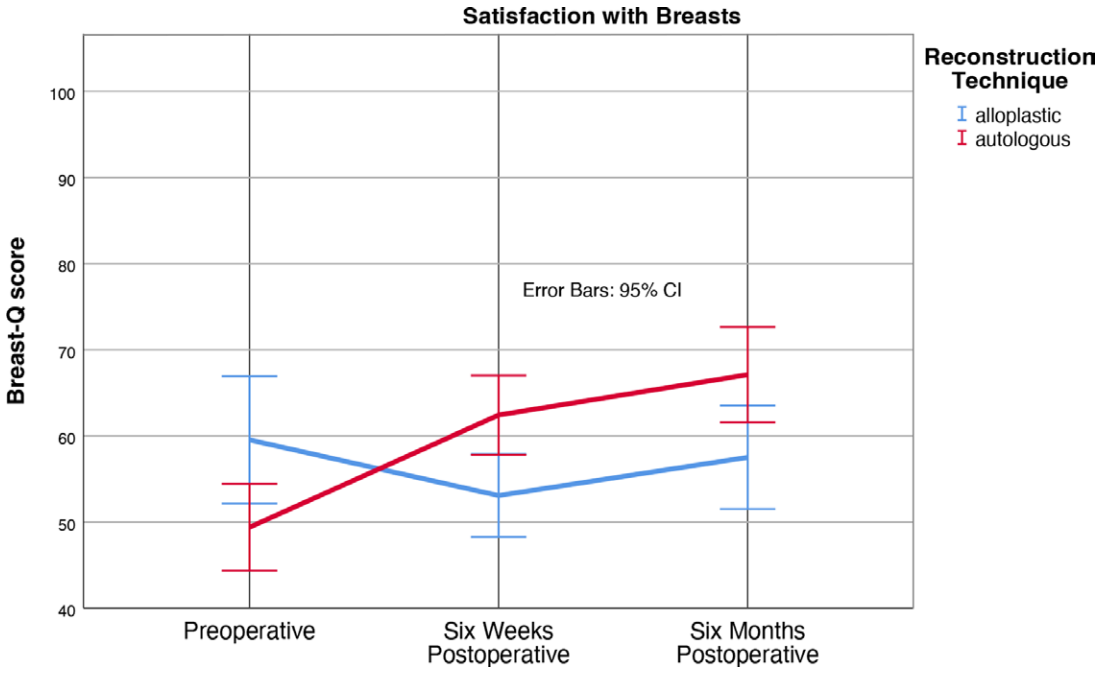

Fig. 2. BREAST-Q Satisfaction with Breasts subscale scores per BR group (autologous and alloplastic) preoperatively and at 6 weeks and 6 months postoperatively.

was supported in our findings, in which women with a higher BMI scored lower on Satisfaction with Breasts (P = 0.002). Furthermore, accordingly we found higher Satisfaction with Breasts scores among women undergoing immediate BR (P = 0.048)[24] and lower Satisfaction with Breasts scores among women who underwent radiotherapy (P = 0.036).[25,26] Other factors, such as anxiety and depression, did not correlate with Satisfaction with Breasts scores. However, previous research has found a correlation between lower Satisfaction with Breasts scores and a history of mental illness.[27] In this study, mental illness was not defined, so it is difficult to compare their results to ours.

Our overall incidence of complications was comparable with that found in the literature,[9,10] and was not significantly different between our two groups (autologous, 61.9%, versus alloplastic, 50.7%; P = 0.141). Women in the autologous group required more medical and surgical interventions to treat their complications (27% versus 12.0%, P = 0.025). This finding was not unexpected because autologous BR requires significant longer operative times, which is associated with a higher risk of thromboembolic events and involves multiple surgical sites, therefore increasing the opportunities for and severity of possible complications.[11] In addition, the higher BMI in the autologous group was probably also one of the factors causing a higher incidence of more severe complications in this group.[28] Surprisingly, severe complications were not negatively associated with Satisfaction with Breasts score or any of the other BREAST-Q subscale scores analyzed in our regression models.

Strengths and Limitations

This longitudinal prospective study is one of the few studies to implement the BREAST-Q, which uses preoperative BREAST-Q data.[18,29] The differences in BREAST-Q scores between women undergoing autologous and alloplastic BR before reconstruction highlight the importance of preoperative data in the interpretation of patient-reported outcome data. Another strength, and unique addition, is the use of the SF-36 and the HADS to investigate the effect of general and mental health perception on BREAST-Q scores, which has not been done before. Though the cohort is very well defined, and the initial sample size was adequate, it can be considered a limitation that there was a drop-out from patients. However, as this was at least in part caused by the occurrence of metastatic disease in some participants, we consider this drop-out as part of real-world data sets.[30] Unfortunately, the sample was not large enough to perform subgroup analysis on the subtechniques used in the alloplastic group. For example, only seven patients underwent alloplastic BR with an additional LD flap. However, excluding these women from our generalized linear regression

Table 4. Generalized Linear Regression Models on Satisfaction with Breasts, Psychosocial Well-Being, Sexual Well-Being, and Physical Well-Being: Chest for Autologous versus Alloplastic BR[a]

	Satisfaction with Breasts		Psychosocial Well-Being		Sexual Well-Being		Physical Well-Being: Chest	
Variable	**β (95% CI)**	***P***	**β (95% CI)**	***P***	**β (95% CI)**	***P***	**β (95% CI)**	***P***
Intercept	66.7 (44.4; 89.1)	<0.001	45.2 (23.6; 66.7)	<0.001	54.1 (25.6; 82.6)	<0.001	97.3 (77.1; 117.5)	<0.001
Alloplastic	Reference	—	Reference	—	Reference	—	Reference	—
Autologous	10.5 (5.3; 15.8)	<0.001[b]	7.8 (2.6; 13.3)	0.006[b]	11.9 (4.4; 19.3)	0.002[b]	1.6 (– 3.4; 6.5)	0.533
Preop (baseline)	Reference	—	Reference	—	Reference	—	Reference	—
6 weeks postop	2.8 (–2.7; 8.2)	0.315	4.3 (–1.1; 9.8)	0.115	5.8 (–0.3 (11.8)	0.061	–9.0 (–14.4; –3.5)	0.001[b]
6 months postop	5.7 (–0.6; 12.1)	0.078	7.0 (13.1; 11.1)	0.001[b]	2.4 (–3.3; 8.0)	0.407	1.5 (–2.6; 5.6)	0.465
Age in years	0.0 (–0.3; 0.3)	0.869	0.3 (0.0; 0.5)	0.030[b]	–0.3 (–0.8; 0.1)	0.171	–0.2 (–0.4; –0.0)	0.040[b]
BMI	–0.6 (–1.2; –0.3)	0.002[b]	–0.4 (–0.8; 0.1)	0.098	–0.2 (–0.8; 0.5)	0.622	–0.3 (–0.8; 0.2)	0.231
Complications grade <III[c]	Reference	—	Reference	—	Reference	—	Reference	—
Complications grade ≥III[c]	0.9 (–4.7; 6.5)	0.752	–0.9 (–7.4; 5.5)	0.779	–0.6 (–10.0; 8.8)	0.897	–1.5 (–7.5; 4.4)	0.605
No radiotherapy	Reference	—	Reference	—	Reference	—	Reference	—
Radiotherapy[d]	–7.6 (–14.6; –0.5)	0.036[b]	–9.2 (–14.7; –3.7)	0.001[b]	–10.7 (–17.9; –3.5)	0.005[b]	–4.4 (–9.5; 0.6)	0.083
Delayed BR	Reference	—	Reference	—	Reference	—	Reference	—
Immediate BR	7.0 (0.5; 14.1)	0.048[b]	10.0 (3.9; 16.1)	0.002[b]	6.6 (–1.2; 14.3)	0.096	1.1 (–3.7; 6.0)	0.649
SF-36[e]	0.1 (–0.1; 0.2)	0.371	0.1 (–0.3; 0.3)	0.117	0.1 (–0.0; 0.3)	0.099	–0.1 (–0.2; 0.1)	0.399
HADS anxiety score 0–7	Reference	—	Reference	—	Reference	—	Reference	—
HADS anxiety score 8–21	–2.6 (–8.1; 2.9)	0.349	–3.2 (–7.3; 0.8)	0.117	0.6 (–6.0; 4.8)	0.827	–1.0 (–5.2; 3.3)	0.655

[a]Results were corrected for center in which patients were treated.
[b]Significant, with $P < 0.05$.
[c]Complications were classified according to the Clavien-Dindo grading system.
[d]Radiotherapy before or after reconstruction.
[e]Total mean score.

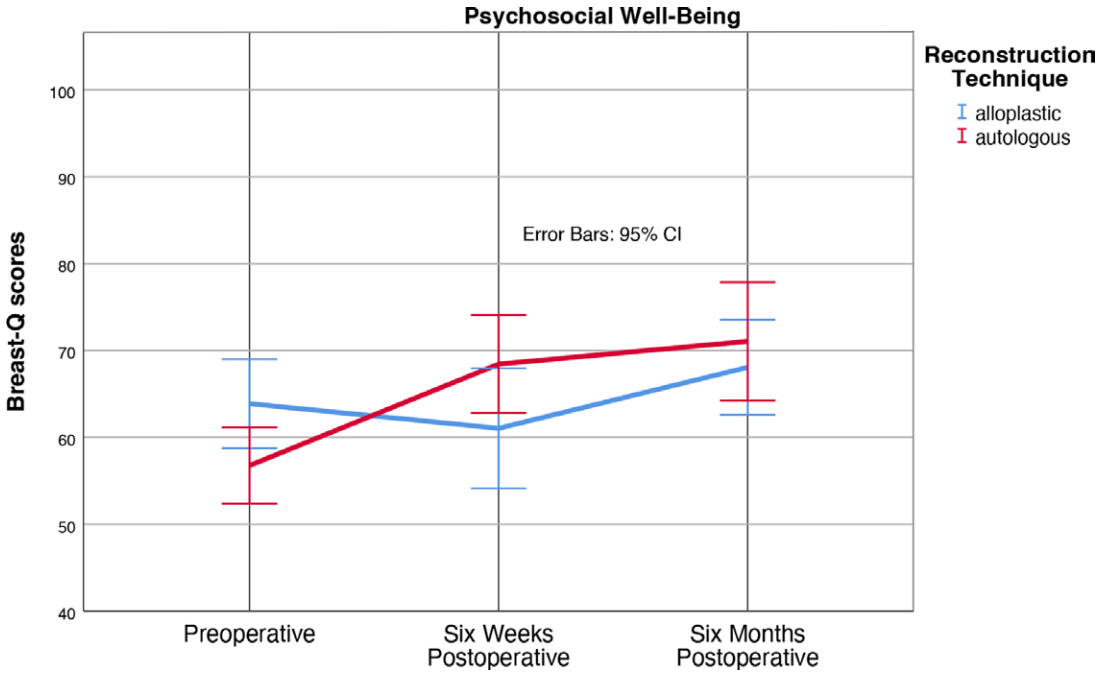

Fig. 3. BREAST-Q Psychosocial Well-Being subscale scores per BR group (autologous and alloplastic) preoperatively and at 6 weeks and 6 months postoperatively.

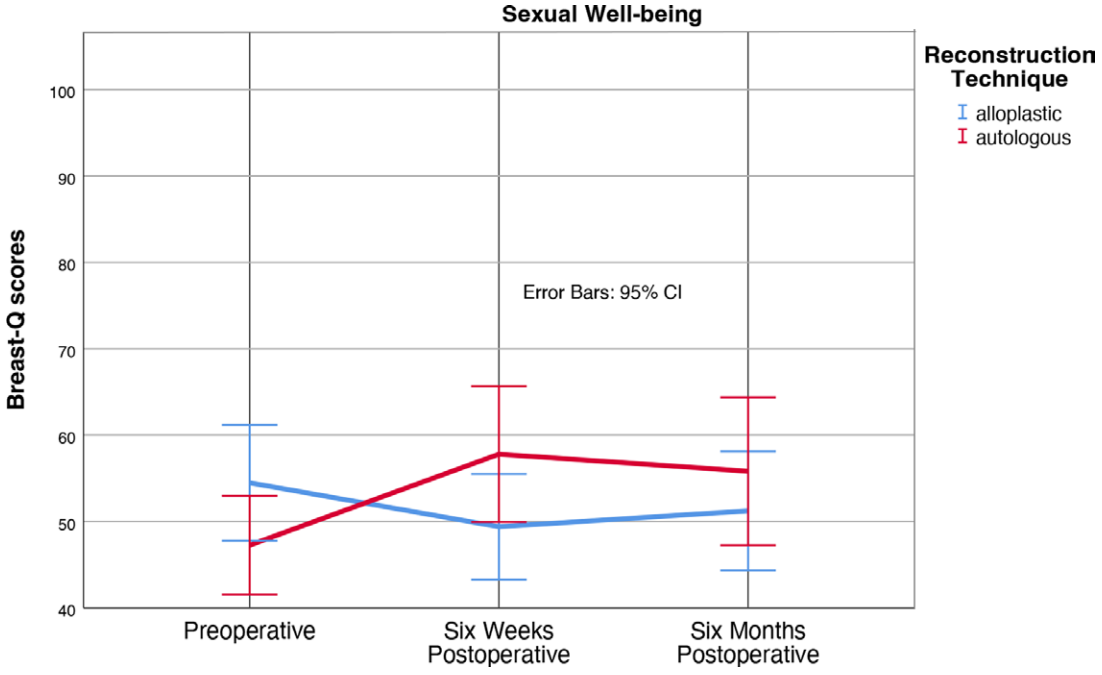

Fig. 4. BREAST-Q Sexual Well-Being subscale scores per BR group (autologous and alloplastic) preoperatively and at 6 weeks and 6 months postoperatively.

models did not change the results or conclusions of this study.

Implications and Future Research

We hypothesized that BREAST-Q scores would be lower in the autologous group at 6 weeks after BR when compared with the alloplastic group, due to the physically more demanding procedure and increased risk for (severe) complications. Unexpectedly, we found the opposite, with higher Satisfaction with Breasts, Psychosocial Well-Being, and Sexual Well-Being scores in the

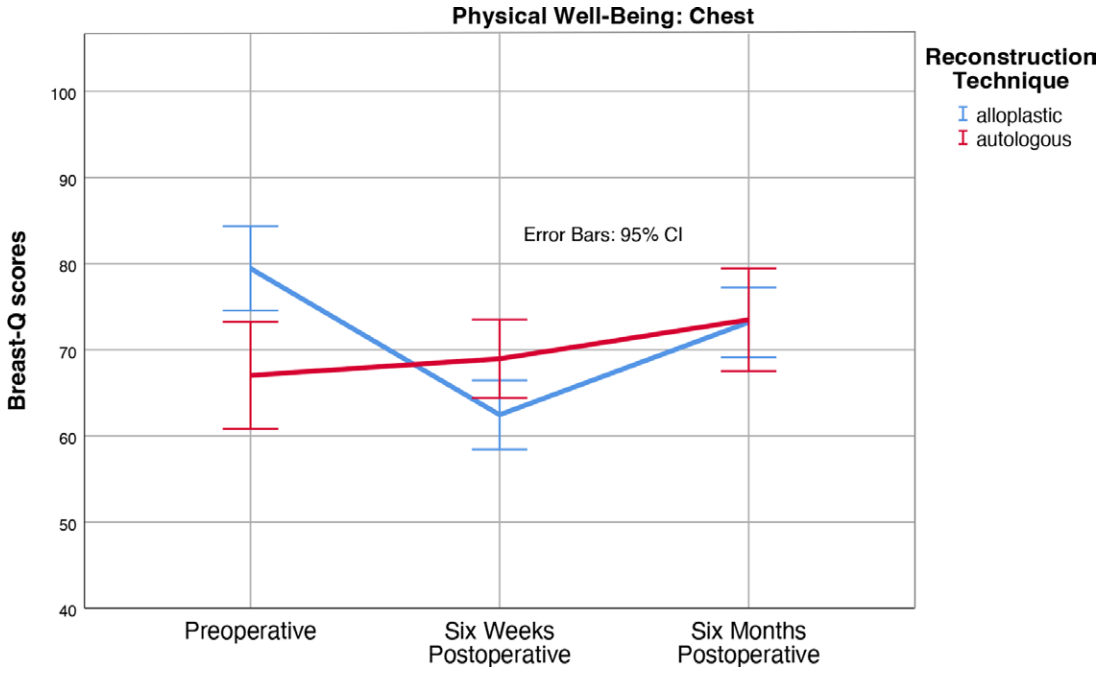

Fig. 5. BREAST-Q Physical Well-Being: Chest subscale scores per BR group (autologous and alloplastic) preoperatively and at 6 weeks and 6 months postoperatively.

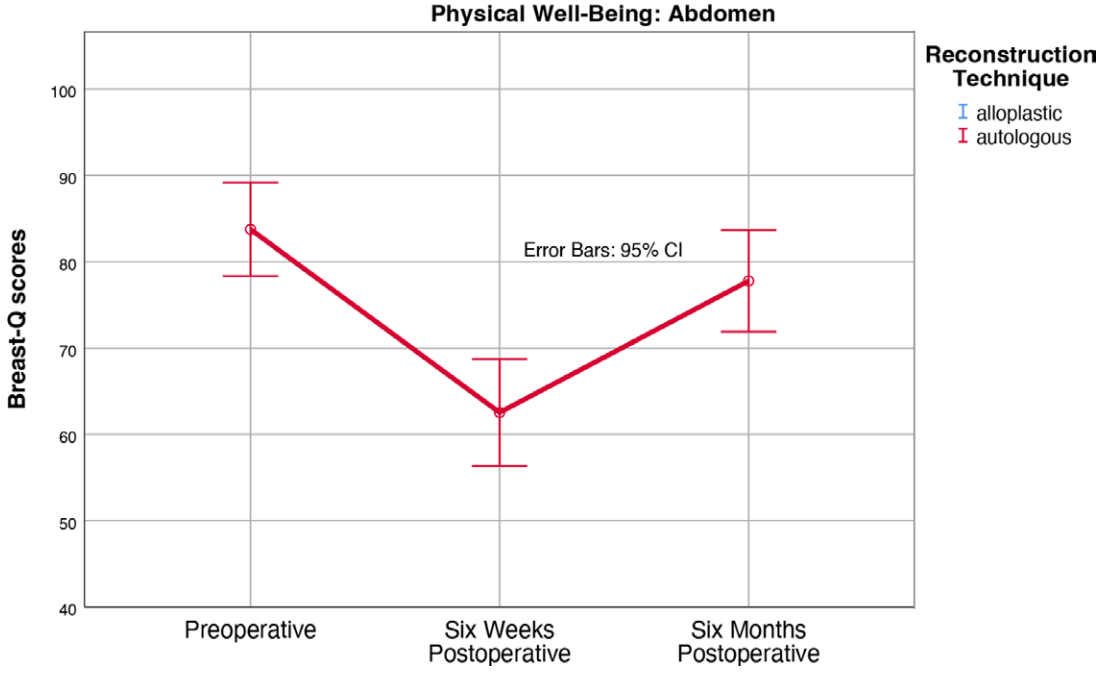

Fig. 6. BREAST-Q Physical Well-Being: Abdomen subscale scores for the autologous group preoperatively and at 6 weeks and 6 months postoperatively.

autologous group, both at 6 weeks and 6 months after BR. With regard to Physical Well-Being: Chest, we found no statistically significant difference between both groups, which suggests that, at 6 weeks postoperatively, discomfort regarding the chest area is similar after autologous BR compared with alloplastic BR. Women undergoing autologous BR also filled out questionnaires regarding

the abdomen. Results were similar to those found regarding the chest and indicate almost full physical recovery of the abdominal wound 6 months after autologous BR using the DIEP flap. Severe complications did not negatively affect satisfaction and QoL in this study. These findings are important and can be used when informing patients considering autologous or alloplastic BR about what to expect in the first months after surgery.

Lower Satisfaction with Breasts scores in the alloplastic group can probably be explained in part by the fact that most women in this cohort underwent two-stage alloplastic BR (67%) and that, 6 weeks postoperatively, the majority did not yet have the definitive breast implant. When evaluating the BREAST-Q scores of women who underwent one-stage versus two-stage BR, we did not observe a difference in Satisfaction with Breasts at 6 weeks. However, this might be related to the relatively small number of women per subgroup who filled out the BREAST-Q at 6 weeks (one-stage, $n = 13$, versus two-stage, $n = 33$). Another explanation could be the higher number of women who underwent radiation therapy in the alloplastic group. Radiation therapy has been found to be a cause of higher dissatisfaction, and this was confirmed in this study.[31] With regard to our hypothesis, it could be that at 6 weeks postoperatively, the damage caused by the harvest of an autologous flap has already faded by the time the Satisfaction with Breasts and the other BREAST-Q subscales are completed. Though randomization of the women over both reconstruction techniques would be the optimal way to evaluate which breast is the best, this is not feasible, as not all women can undergo autologous BR. Future prospective studies, with larger patient samples, more detailed subgroup analysis, and, for example, statistical analysis implementing propensity score matching, are needed to really understand how patient satisfaction and QoL are affected by the different BR techniques in the first months following surgery.

CONCLUSIONS

In contrast to the hypothesis that short-term patient satisfaction QoL is lower after autologous BR due to the physically more demanding procedure and increased risk for (severe) complications, we found higher levels of breast satisfaction, psychosocial well-being, and sexual well-being at both 6 weeks and 6 months after reconstruction in women who underwent autologous BR compared with women who underwent alloplastic BR. Postoperative complications were not associated with reduced patient satisfaction and QoL in this cohort.

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DISCLOSURE

Prof. Werker is SERB member for Fidia Ltd., Milan, Italy. All the other authors have no financial interest to declare in relation to the content of this article.

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