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ORIGINAL ARTICLE   **BREAST SURGERY**

Use of the BREAST-Q™ Survey in the Prospective Evaluation of Reduction Mammaplasty Outcomes

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Abstract

Introduction BREAST-Q™ is a patient-reported outcomes survey instrument with a specific module that evaluates breast reduction surgery. It allows assessment of patient's satisfaction with received treatment and evaluates the impact of surgery on different aspects of the patient's quality of life. This article aims to assess the satisfaction and quality of life of patients who underwent reduction mammaplasty.

Materials and Methods Women aged between 18 and 60 years, with a body mass index ranging from 19 to 30 kg/m^2, who were already scheduled for reduction mammaplasty, were included in the study. The Brazilian version of the BREAST-Q™ Reduction/Mastopexy Module (preoperative 1.0 and postoperative 1.0 versions) was self-applied preoperatively and 1 and 6 months after the operation.

Results One hundred and seven patients were included in the study and completed the 6-month follow-up. The median age was 33 years, and the median preoperative body mass index was 25 kg/m^2. The superomedial pedicle was used in 96.3% of the cases, and the total median weight of the resected breast was 1115 g. There was a significant improvement in the scores of the scales: *Psychosocial well-being, Sexual well-being, Physical well-being,* and *Satisfaction with the breasts* compared to the preoperative assessment ($p < 0.0001$). The scales *Satisfaction with the NAC* and *Satisfaction with the outcome*, available only in the postoperative version, demonstrated high satisfaction rates at the two postoperative periods evaluated.

Conclusion Reduction mammaplasty improved the quality of life and provided high levels of patient satisfaction with outcomes 1 and 6 months postoperatively.

Level of Evidence IV This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Breast · Surgery, plastic · Mammaplasty · Outcome assessment · Quality of life · Patient satisfaction

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Introduction

Symptoms associated with breast hypertrophy include neck, shoulder, and spine pain, headache, intertrigo within the inframammary fold, difficulty in performing activities of daily living, paresthesia in the hands (due to weight on the anterior chest wall and compression of the brachial plexus), difficulty in exercising, low self-esteem, and body

dissatisfaction [1–9]. Non-surgical measures such as weight loss, physical therapy, breast support, and medications are insufficient to relieve symptoms associated with breast hypertrophy [5, 10]. Thus, the plastic surgeon is responsible for providing, through reduction mammaplasty, an opportunity for increased patient well-being and a more satisfactory body shape.

The prevalence of breast hypertrophy is unrecorded; however, reduction mammaplasty is one of the most common procedures performed by plastic surgeons worldwide [9, 11–13]. This operation is considered safe and highly effective, and its benefits for sexual function, body image, and quality of life have been widely studied using numerous validated instruments, such as the Female Sexual Function Index (FSFI) [2], the Health Assessment Questionnaire (HAQ-20) [4], the Female Sexual Quotient (FSQ) [9], the Rosenberg's Self-Esteem Scale [14], among many others.

The BREAST-Q[TM] Reduction/Mastopexy Module is a patient-reported outcome survey instrument that evaluates patient satisfaction with the results and the impact of this procedure on the patient's quality of life. Developed by Pusic et al. in 2009, it has been used by several authors to assess reduction mammaplasty outcomes [15–17]. The Brazilian version of the survey instrument was published in 2013 by Cordantonopoulos et al. [18], but, to our knowledge, no prospective study has used this survey instrument to assess reduction mammaplasty results in the Brazilian population.

Materials and Methods

This prospective study was conducted in the Hospital das Clínicas Samuel Libânio—Universidade do Vale do Sapucaí. All surgeries were performed by the Brazilian Public Health System (SUS), at no cost to the participants. All patients with breast hypertrophy who were scheduled to undergo reduction mammaplasty between June 2013 and May 2015 and met the eligibility criteria were invited to participate in the study. Breast hypertrophy was classified based on criteria of Sacchini et al. (1991) [19] and Franco and Rebello (2002) [20].

The study was approved by the Research Ethics Committee of the Universidade do Vale do Sapucaí, and all participants signed an informed consent form. Women aged 18–60 years and with a body mass index (BMI) of 19–30 kg/m^2 were included in the study. Women who underwent prior reconstructive or aesthetic breast surgical procedures, who were unable to read the survey instruments applied, or refused to participate, were excluded.

The Brazilian version of the BREAST-Q[TM] Reduction/Mastopexy Module (preoperative 1.0 and postoperative 1.0 version) was used to evaluate the surgical outcomes

[18, 21–23]. The BREAST-Q[TM] is a copyright-protected survey instrument, which was developed based on the international guidelines for the development of instruments in 2009 by Pusic et al. [24], and was translated and validated for use in Brazil [18]. The copyright holders kindly provide it for scientific purposes, under requestment. The objective of the survey instrument is to evaluate satisfaction and quality of life of patients who underwent breast surgery. Each module is divided into multiple scales that can be used independently. The score for each question ranges from 0 to 5. The answers to each scale are processed through the *Q-Score*, providing a total score ranging from 0 to 100. The higher the score, the higher the satisfaction or the better the quality of life [21–23].

The patients underwent reduction mammaplasty via conventional technique, under general anesthesia, with a resultant inverted T-scar. The pedicle more frequently used to raise the nipple-areolar complex (NAC) was the superomedial. The same surgical team performed all procedures. Figures 1 and 2 illustrate pre- and postoperative of 1 and 6 months. The BREAST-Q[TM] was self-applied in a private room before surgery and in the 1- and 6-month postoperative periods. The *Psychosocial well-being, Sexual well-being,* and *Physical well-being* scales were used to assess quality of life, and the scales *Satisfaction with breasts, Satisfaction with the NAC,* and *Satisfaction with the outcome* were used to assess patient's satisfaction.

Statistical Analysis

SPSS 22.0 (*Statistical Package for Social Sciences*, Inc., Chicago, IL, USA) and Bioestat 5.0 (Mamirauá Sustainable Development Institute, Belém, PA, Brazil) software packages were used in the statistical analysis, with the level of significance set at 5% ($p < 0.05$). Descriptive statistics were presented as range, median, mean, and standard deviation for numerical variables and number and percentages for categorical variables. Pearson's correlation coefficient was used to measure the degree of correlation between two variables. Friedman's analysis of variance was used to compare the preoperative and 1- and 6-month postoperative periods. When the result was significant, the analysis was complemented by the multiple comparisons test. The Wilcoxon test was applied to compare the 1- and 6-month postoperative periods regarding *Satisfaction with the NAC* and *Satisfaction with the outcome* scales [25].

Results

A total of 107 patients met the eligibility criteria and were included in the study. All of them completed the 6-month follow-up. The patients' ages ranged from 18–60 years
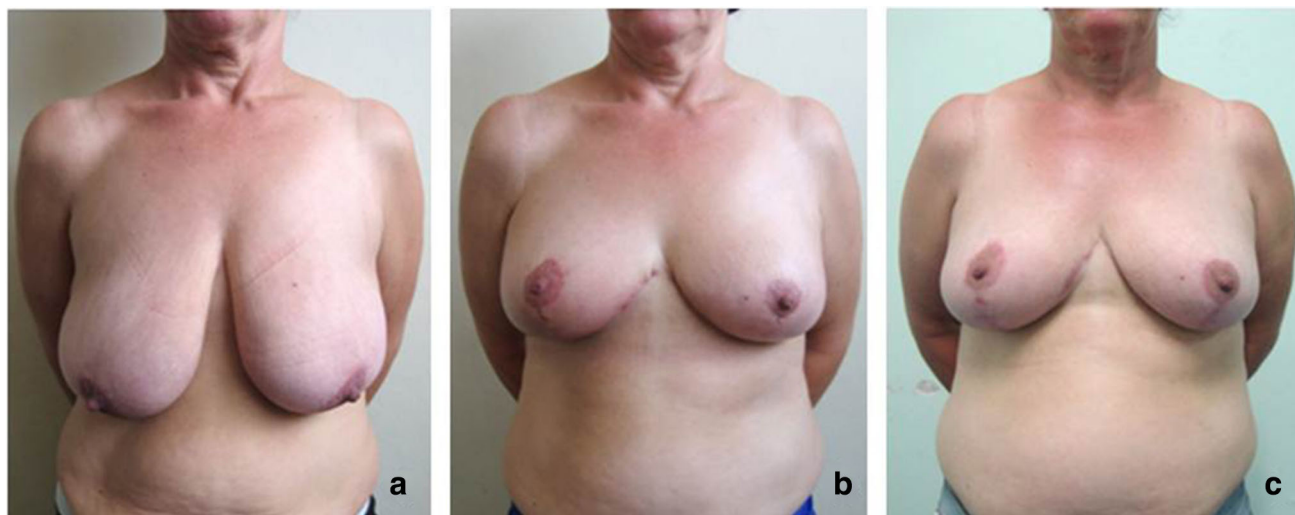
Fig. 1 Breast hypertrophy patient. Preoperative view (**a**); 1-month after reduction mammaplasty (**b**); 6-months postoperatively (**c**)
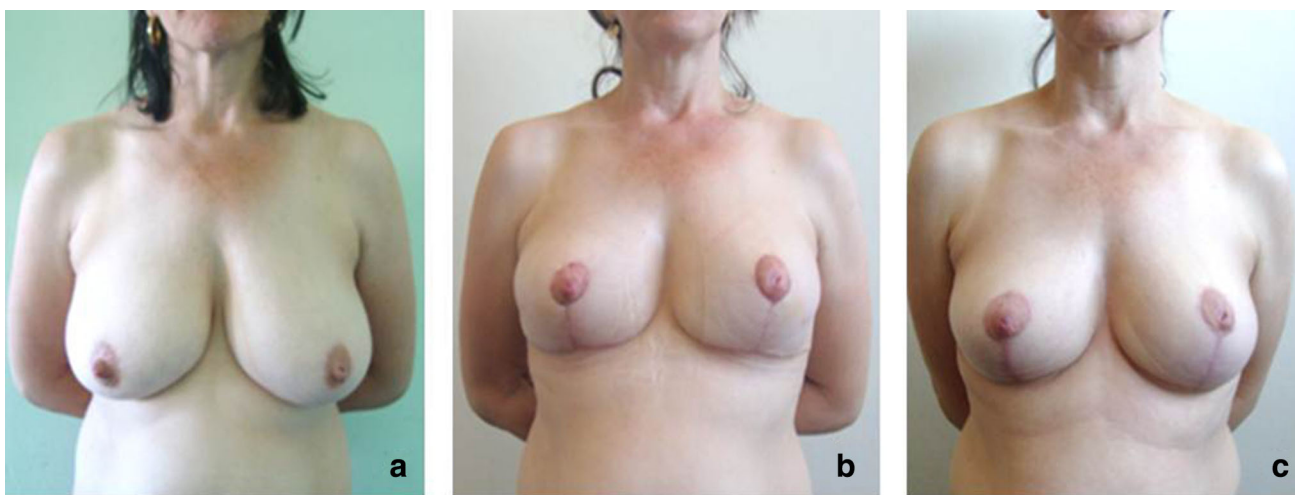
Fig. 2 Breast hypertrophy patient. Preoperative view (**a**); 1-month after reduction mammaplasty (**b**); 6-months postoperatively (**c**)

(median, 33; mean $\pm$ standard deviation, 34 $\pm$ 11.6), and the majority (74%; $n = 79$) were Caucasian. The preoperative BMI ranged from 19 to 30 kg/m^2 (median, 25; mean $\pm$ standard deviation, 25 $\pm$ 2.0).

According to the classification of Franco and Rebello, 4.7% ($n = 5$) were classified as grade I, 83.2% ($n = 89$) as grade II, and 12.1% ($n = 13$) as grade III. The median Sacchini index of both breasts and their preoperative and 6-month postoperative comparison by the Wilcoxon test are presented in Table 1. The superomedial pedicle was used in 96.3% ($n = 103$) versus the superior pedicle in 3.7% ($n = 4$) of women. The total median weight of the resected breast was 1115 g (mean $\pm$ standard deviation, 1207 $\pm$ 765.2).

There were no relevant complications during the procedure or the hospitalization period, and all patients were discharged on the first postoperative day. Twelve patients (11.2%) had minor complications during the follow-up period; they are presented in Table 2. No re-interventions were necessary during the 6-month follow-up period.

The results obtained for scales that assess quality of life (*Psychosocial, Sexual, and Physical well-being*) are presented in Table 3. There was a significant improvement in the scores of all three scales in both post-surgery periods ($\rho < 0.0001$).

The results obtained for scales that assess patient satisfaction (with the breasts, NAC, and outcome) are presented in Table 4. There was a significant improvement in the scores of the *Satisfaction with the breasts* scale compared to the preoperative assessment ($p < 0.0001$). The scales *Satisfaction with the NAC* and *Satisfaction with the outcome,* present only in the postoperative version, generated high satisfaction rates at the two time points they were evaluated. The satisfaction rate was higher in the 1-month assessment, for both scales.

Table 1 Sacchini Index[19] of both breasts and their preoperative and 6-month postoperative comparison by the Wilcoxon test

	Right breast		Left breast	
	Preoperative	Postoperative	Preoperative	Postoperative
Range	11.1–17.0	8.8–12.3	11.1–18.0	9.0–12.8
Median	14.5	10.8	14.5	11.0
Mean ± SD[a]	14 ± 1.7	11 ± 0.7	14 ± 1.8	11 ± 0.7
P value	< 0.0001	< 0.0001		

[a]SD standard deviation

The clinical data correlated with the scores obtained for the BREAST-Q™ scales using Pearson's coefficient are presented in Tables 5, and 6 presents the correlation between the *Satisfaction with the outcome* scale and the other BREAST-Q™ scales.

Table 2 Postoperative complications

Complication	N	%
Suture dehiscence	6	50
Fat necrosis	1	8
Partial nipple loss	3	25
Surgical site infection	2	17
Total	12	100

Discussion

The World Health Organization defines health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" [26]. Based on this definition, this study affirms the important role of reduction mammaplasty on the integral health of women because this surgery has positive impacts on several analyzed scales detailed below.

The *Psychosocial well-being* scale evaluates the self-esteem and confidence of women in social gatherings. Breast appearance affects women's self-esteem and may interfere with their appreciation and confidence during social and professional meetings [27]. The improvement of

Table 3 Scores of the BREAST-Q™ scales that assess quality of life in the preoperative and 1- and 6-month postoperative periods and comparison by the Friedman test

Scale	Preoperative	1-m postoperative	6-m postoperative
Psychosocial well-being			
Range	0–83	0–100	0–100
Mean ± SD[a]	31 ± 15.6	83 ± 23.0	74 ± 34.5
Median	32	92	87
P value[b]		< 0.0001	
		Pre < 1-m and 6-m	
Sexual well-being			
Range	0–100	0–100	0–100
Mean ± SD[a]	31 ± 17.3	77 ± 30.2	69 ± 35.9
Median	32	91	84
P value[b]		< 0.0001	
		Pre < 1-m and 6-m	
Physical well-being			
Range	0–87	0–100	0–100
Mean ± SD[a]	54 ± 15.9	70 ± 18.8	69 ± 31.8
Median	56	71	79
P value[b]		< 0.0001	
		Pre < 1-m and 6-m	

[a]SD standard deviation

[b]Friedman test, complemented by the multiple comparisons test

Table 4 Scores of the BREAST-Q™ scales that assess patient satisfaction in the preoperative and 1- and 6-month postoperative periods and comparison by the Friedman test

Scale	Preoperative	1-m postoperative	6-m postoperative
Satisfaction with the breasts			
Range	0–80	0–100	0–100
Mean ± SD[a]	19 ± 12.9	82 ± 24.3	72 ± 33.9
Median	18	84	84
P value[b]		< 0.0001	
		Pre < 1-m and 6-m	
Satisfaction with the nipple-areola complex			
Range	–	0–100	0–100
Mean ± SD[a]	–	86 ± 28.9	73 ± 37.6
Median	–	100	100
P value (Wilcoxon test)		< 0.0001	
Satisfaction with the outcome			
Range	–	0–100	0–100
Mean ± SD[a]	–	91 ± 22.2	80 ± 35.3
Median	–	100	100
P value (Wilcoxon test)		0.0004	

[a] *SD* standard deviation

[b] Friedman test, complemented by the multiple comparisons test

Table 5 Correlation between clinical variables and BREAST-Q™ scores (Pearson correlation coefficient) at preoperative and 6-m postoperative periods

	Psychosocial well-being		Sexual well-being		Physical well-being		Satisfaction with the breasts		Satisfaction with the NAC[a]	Satisfaction with the outcome
	Pre[b]	PO 6m[c]	Pre[b]	PO 6m[c]	Pre[b]	PO 6m[c]	Pre[b]	PO 6m[c]	PO 6m[c]	PO 6m[c]
Age	0	0.2	− 0.1	− 0.1	− 0.1	− 0.1	0	0.2	0.2	0.2
BMI[d]	− 0.1	0	0.1	− 0.1	0.1	− 0.1	0	0	0	0
Weight of resected breast	0	0	− 0.1	− 0.1	− 0.1	− 0.1	0	− 0.1	0	− 0.1

[a] *NAC* nipple-areola complex

[b] Pre: pre-operative period

[c] PO 6m: 6-month post-operative period

[d] BMI: body mass index

these scores highlights the role of breast reduction surgery in the higher self-confidence of the operated women.

The breasts are admired in sexual and aesthetic manners and play an important role in the sexual health of women [2, 28]; the improvement in the scores of the *Sexual well-being* scale in the present study confirms this.

The *Physical well-being* scale, which evaluates physical problems generated by the breasts, also achieved significant improvement, indicating that reduction mammaplasty effectively relieves symptoms caused by breast hypertrophy [5, 10]. The physical improvement presented by these patients highlights the functional aspect of this procedure.

In addition to physical disorders [1, 2, 5, 16], pain in the neck, shoulder and spine [3, 6, 10], chronic headaches [4] and difficulty in performing activities of daily living and in exercising [14, 27], breast hypertrophy may cause discomfort and dissatisfaction with the breast's appearance. Reduction mammaplasty corrects asymmetry and fills the upper pole of the breasts and, despite the scars generated, an important improvement in the scores of *Satisfaction with the breasts* was noted in the 1- and 6-month postoperative scores compared to the preoperative scores.

The NAC is a highly specialized and essential part of the beauty of the breast; however, the hypertrophic breast often

Table 6 Correlation between the *Satisfaction with the outcome* scale and the other BREAST-Q^{TM} scales (Pearson correlation coefficient)

Scale	r
Psychosocial well-being	0.9
Sexual well-being	0.9
Physical well-being	0.9
Satisfaction with breasts	0.9
Satisfaction with the nipple-areola complex	0.8

presents the areola with an increased diameter and the NAC directed downward. Here, we perceived high levels of satisfaction in relation to the NAC appearance in accordance with the *Satisfaction with the NAC* scale scores in the 1- and 6-month postoperative periods.

The *Satisfaction with the outcome* scale merits attention because it measures the evaluation of women regarding surgical outcomes in general, encompassing their expectations and the impact of the surgery on their life. In this study, high levels of satisfaction with the outcomes of breast reduction surgery may be noted as demonstrated by the *Satisfaction with the outcome* scale scores in the 1- and 6-month postoperative periods.

In clinical practice, patient satisfaction with the outcomes of reduction mammaplasty may be observed. It is true that a large portion of this satisfaction is related to improved appearance. However, aesthetic results should not be allowed to diminish functional gains such as improvements in postural, respiratory, and circulatory problems, as well as the positive effects on sexual function, body image, and quality of life [2, 7–9, 29]. This set of benefits makes reduction mammaplasty a comprehensive treatment, a fact that should increase the importance of this surgery in health policies and should stimulate increased funding for reduction mammaplasty by private and public health services.

The desire for success makes plastic surgeons consider factors that can predict satisfactory results or prevent poor outcomes of reduction mammaplasty. Some factors, such as age, BMI, and weight of the operated breast, have already been evaluated in other studies [15–17, 30]. In our study, the correlation between this clinical and surgical data and the scores presented in the studied scales were analyzed using Pearson's coefficient to identify factors that have the highest impact on the scales scores. Also, given that patient satisfaction seems to be the most important surgical outcome, the *Psychosocial well-being, Sexual well-being, Physical well-being, Satisfaction with the breasts*, and *Satisfaction with the NAC* scales scores were correlated with the *Satisfaction with the outcome* scale scores.

The significant influence of the breasts on the physical and psychological aspects of women makes breast hypertrophy a complex condition and prevents a single factor from becoming central to its success. The analysis by Pearson's coefficient, in this study, showed a weak correlation between the clinical variables (age, BMI, and weight of the resected breast) and the scores of the BREAST-Q^{TM} scales. In contrast, there was a strong correlation between the *Satisfaction with the outcome* scale and the other BREAST-Q^{TM} scales.

This information is important to refute the position that a certain amount of breast tissue must be removed or that a certain BMI must be achieved for surgery to be indicated [3, 17, 31–33]. In addition, the strong correlation between the satisfaction scale with the scores of the quality of life, satisfaction with the breasts, and satisfaction with the NAC scales demonstrates that functional benefits are as important as aesthetic benefits to obtain satisfaction with the reduction mammaplasty results.

The evaluation of the surgical results via clinical parameters, photographic analysis, and history of complications is considered part of the plastic surgeon's routine. However, in plastic surgery, a surgical specialty dedicated to the improvement of appearance and function, survey instruments that consider the patient's opinion provide valuable information about the effectiveness of surgical interventions [22].

Among the various studies that have evaluated reduction mammaplasty results among Brazilian patients, the present study is unique because of its prospective evaluation using BREAST-Q^{TM}, a tool extensively evaluated via psychometric tests which provides a specific module for reduction mammaplasty [34]. However, the study has several limitations, such as its non-randomized design and the absence of a control group. We also believe that studies with larger samples are needed to allow stratification of the patients based on clinical and sociodemographic parameters.

Conclusion

Reduction mammaplasty resulted in an improved quality of life in women with breast hypertrophy, with positive changes in relation to psychosocial, sexual, and physical well-being. Satisfaction with outcomes was high after 1 month and 6 months postoperatively. The correlation analysis did not reveal any association between age, BMI, or weight of the resected breast with the scores of the scales that represent patient quality of life and satisfaction, but showed a positive relationship between satisfaction with the overall outcome and the scores of *psychosocial, sexual, and physical well-being, satisfaction with the breasts,* and *satisfaction with the NAC*.

Author Contributions IVC and DFV conceived the study and participated in study design, surgical procedures, and manuscript draft. ESG, RNS, JVF and NLLP participated in surgical procedures and patients' follow-up, and contributed to acquisition and interpretation of data. YJ participated in the analysis and interpretation of data. LMF participated in the design and coordination of the study. All authors read and approved the final version of the manuscript.

Compliance with Ethical Standards

Conflict of interest All the authors state no conflicts of interest.

Ethical Approval The Ethical Committee of the Universidade do Vale do Sapucaí has reviewed and approved the study protocol (protocol number CAEE30798114.3.0000.5102).

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