Oncoplastic Surgery in Breast-Conserving Treatment: Patient Profile and Impact on Quality of Life

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Keywords

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Abstract

Background: Breast-conserving treatment (BCT) provides better quality of life (QL) than mastectomy without reconstruction. Oncoplastic surgery (OS) encompasses a series of surgical techniques, increasing the indications for BCT, but few studies have evaluated the impact on QL in patients who undergo BCT with OS. **Materials and Methods:** A prospective, cross-sectional study was conducted in women who underwent BCT. We evaluated the characteristics of patients who underwent BCT with and without OS and the associated QL. QL was assessed through the EORTC QLQ-30, EORTC QLQ-BR23, and Breast Cancer Treatment Outcome Scale (BC-TOS) questionnaires. **Results:** A total of 300 patients underwent BCT, 72 underwent breast OS, and 37 underwent bilateral surgery. Patients who underwent OS were younger ($p = 0.004$), had a higher level of education ($p = 0.01$), had a smaller time interval since the end of treatment ($p = 0.02$), had tumours with greater dimensions ($p = 0.003$), and were more likely to receive neoadjuvant chemotherapy ($p = 0.05$). Based on the QL questionnaires, no difference was observed between the groups. Breast symmetry was not associated with

high patient satisfaction ($p = 0.55$). **Conclusion:** Despite the fact that OS was performed in patients with worse tumour conditions and in more demanding patients, OS allowed similar cosmetic results to classical BCT.

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Introduction

Breast cancer is the most common type of cancer that affects women both worldwide and in Brazil, with the exception of non-melanoma skin cancer [1]. For many years, the only surgical treatment offered for breast cancer therapy was mastectomy. It is now known that it is safe to treat malignant neoplasia of the breast with conservative surgery, that is, preserving the breast and adding radiotherapy as an adjuvant tool. Patients who undergo conservative surgical treatment have the same overall survival as patients who undergo mastectomy [2, 3].

Radiation therapy is indicated in the absolute majority of patients undergoing conservative surgical treatment of the breast, including surgery for carcinoma in situ [4], but may be omitted in some special cases, such as in elderly patients [5, 6]. It has long been thought that adjuvant radiotherapy only has a role in the locoregional control of breast cancer and in the reduction in local recurrence, but

Fig. 1. Main factors related to BCT-OS (breast-conserving treatment with oncoplastic surgery).

it is already known that in some subgroups of patients, radiotherapy can lead to a reduction in breast cancer mortality [7].

Once the oncological safety of conservative breast surgery was confirmed, surgeons attempted to improve the cosmetic quality of the procedure. Up to 30% of patients undergoing quadrantectomy require late repair due to unsatisfactory aesthetic results [8].

Oncoplastic surgery (OS) is defined as the use of plastic surgery techniques with the aim of improving the aesthetic result of oncologic surgery, which may occur after mastectomy or after breast-conserving treatment (BCT) [9]. The indication for BCT with OS (BCT-OS) is increasing in clinical practice and is related to tumour location, high tumour volume (>20%), large tumour size, macromastia, patients who seek breast reduction, and those with ptosis. From an oncological point of view, the ease of wide resection is possible, with the opportunity for wide margins, and it is also performed in patients who are not candidates for mastectomy and in those who desire conservative treatment [10]. This procedure allows a low index of involved margins [11] and a large amount of resected tissue without aesthetic damage [12]. Many patients who are not initially considered for BCT [13] may be subjected to this procedure and to OS [14], such as in cases where tumours larger than 5 cm are present and in those with localized cutaneous infiltration, provided that the margins are satisfactory and that the breast volume allows this procedure [14]. The analysis of cancer treatment extends beyond purely oncological outcomes, such as disease-free survival and locoregional recurrence, for

which the results have been shown to be similar [14–16]. As surgeons acquire experience with different OS techniques [10], the indication for BCT-OS increases [17] and is associated not only with tumour aspects but also with cosmetic outcomes, so the rate of bilateral surgery (symmetrization) increases [18].

Additionally, an increasing number of patients are concerned about quality of life (QL) after treatment. Quality of Life Questionnaires (QLQs) measure the physical, social, and emotional impacts of breast cancer treatment [19]. There are several different questionnaires: generic (e.g., EORTC QLQ-C30, FACT-G), those specific to breast cancer (e.g., EORTC QLQ-BR23, FACT-B) [19], those referring to breast reconstruction (e.g., MAS, MBROS, BREAST-Q), and those referring to BCT (e.g., BCTOS, BREAST-Q module BCT) [20]. No specific questionnaire has been developed for the evaluation of OS, representing a significant gap in the literature that needs to be filled since this type of surgery corresponds to a great variety of oncological and surgical repair procedures that involve mastectomy and BCT. Studies evaluating QL in patients who undergo BCT-OS are limited, and the results are controversial [21–23] considering the diversity of procedures and the difficulty in matching the patients.

When evaluating BCT-OS, we must assess the main points about this type of surgery, as it is important to evaluate the indications, factors related to the technique, cosmetic results, and QL (Fig. 1). Thus, the present study aims to evaluate the indications for BCT-OS and its impact on QL in patients with a long follow-up.

Table 1. Comparison of continuous variables between groups

	BCT	Mean (95% CI)	Median (SD)	Variation	<i>p</i>
<i>Patient</i>					
Age at 1st surgery, years	Classical BCT	52.6 (51.4–53.9)	52.5 (9.3)	29.7–77.3	0.002
	BCT-OS	48.7 (46.3–51.1)	47.6 (10.2)	20.7–70.4	
Current age, years	Classical BCT	59.8 (58.6–60.98)	59.6 (9.2)	32.8–87.5	<0.0001
	BCT-OS	54.7 (52.4–57.1)	57.8 (10.1)	25.8–75.5	
<i>Tumour</i>					
Tumour size, total, cm	Classical BCT	2.2 (2.0–2.4)	2.0 (1.21)	0.3–7.5	<0.0001
	BCT-OS	3.1 (3.0–3.5)	2.6 (2.0)	0.6–11	
Tumour size, invasive, cm	Classical BCT	2.1 (2.0–2.3)	2.0 (1.8)	0–7	<0.0001
	BCT-OS	2.9 (2.5–3.4)	2.6 (1.8)	0.3–10	
<i>Follow-up</i>					
Surgery time	Classical BCT	7.14 (6.60–7.68)	7.00 (4.18)	1.00–20.19	0.031
	BCT-OS	6.00 (5.08–6.94)	5.00 (3.95)	1.29–19.5	

BCT, breast-conserving treatment; BCT-OS, breast-conserving treatment with oncoplastic surgery; CI, confidence interval; SD, standard deviation.

Materials and Methods

A cross-sectional, prospective study was approved by the Ethics Research Committee and included patients with breast cancer who were randomly selected at the Mastology and Breast Reconstruction outpatient clinic of the Hospital de Câncer de Barretos (HCB) from May 2015 to June 2016. All patients received adjuvant radiotherapy.

Patients who were treated at the HCB and who had undergone BCT (quadrantectomy) and radiotherapy for more than 1 year and patients who agreed and signed the free and informed consent form were considered for initial inclusion. Patients with metastatic disease, those with recurrence, those under chemotherapeutic treatment, those with bilateral or male breast cancer, and those with a high number of comorbidities were excluded. This series was described in a previous study that validated the Breast Cancer Treatment Outcome Scale (BCTOS) questionnaire and sought to evaluate its global aspects [24]. In contrast, the present study aimed to evaluate aspects exclusively related to BCT-OS.

The patients submitted to complete the QLQ, EORTC QLQ-C30, EORTC QLQ-BR23, and BCTOS, which were combined with a clinical consultation [24]. The data in the medical records were retrospectively evaluated through standardized records. The BCTOS is a specific questionnaire that was translated into the Brazilian Portuguese language for use in patients who undergo BCT [25]. This questionnaire contains 22 questions divided into 4 domains (functional, cosmetic, pain, and oedema); the cosmetic domain consists of 8 questions. The questions compare the surgical results of the treated breast versus the untreated breast on a scale of 1–4 (1 = no difference, 4 = large difference) [26]. The BCTOS for Brazilian Portuguese was validated in this group of patients [24].

The HCB is a public healthcare hospital in which all patients are referred by the Brazilian Unified Health System (Sistema Único de Saúde – SUS). Over the last 10 years, surgeries have been performed by a single team with OS experience (5 surgeons). BCT with OS was defined as the use of techniques different from the traditional method proposed by Veronesi. No defined criteria have been developed to select the surgical technique. Patients who underwent bilateral surgery, which was performed synchronous to BCT surgery or later, were considered for the symmetrization group.

The time from the date of the first surgery until the date of the consultation was considered the treatment time. Regarding the tumour size assessment, the total tumour size and the size of the invasive tumour were considered.

The patients were evaluated according to the quality of the cosmetic result using BCCT.core software [27, 28]. In the patients who underwent central quadrantectomy using the plug-flap technique with a circumferential skin island, the central point was chosen as representative of the areola.

The data were initially dichotomized according to the occurrence of BCT-OS (classical or OS) and later as a function of breast symmetrization (unilateral or bilateral surgery). The χ^2 test was used to evaluate categorical variables, whereas the Mann-Whitney test was used to evaluate continuous variables. The known groups selected by breast OS and breast symmetrization were evaluated for QL. Variables with *p* values <0.10 were selected for the multivariate calculation. Significant continuous variables were transformed into categorical variables, and as long as their significance was maintained, they were chosen for evaluation. The multivariate analysis was performed through the conditional model of variable withdrawal.

Results

Three hundred patients were evaluated, 72 (24%) of whom underwent some type of OS technique; of these, 37 (51.4%) underwent bilateral surgery and 29 (40.3%) underwent concomitant (synchronous) procedures. Of the patients who underwent OS, 34 (47.2%) underwent pedicle surgery, 8 (11.1%) underwent a central plug-flap procedure, 12 (16.7%) underwent a dermoglandular flap or a local flap procedure, 7 (9.7%) underwent a periareolar procedure, 6 (8.3%) underwent reconstruction with the latissimus dorsi muscle, 2 (2.8%) underwent remodelling, 2 (2.8%) underwent fat grafting (lipofilling), and 1 (1.4%)

Table 2. Comparison (χ^2) of factors related to treatment and indications for BCT-OS

Variable	Category	Classical BCT	BCT-OS	Total	<i>p</i>
<i>Patient</i>					
Age at surgery	<40 years	20 (62.5)	12 (37.5)	32 (10.7)	0.02
	40 to 49 years	69 (69.0)	31 (31.0)	100 (33.3)	
	50 to 59 years	92 (82.1)	20 (17.9)	112 (37.3)	
	≥60 years	47 (83.9)	9 (16.1)	56 (18.7)	
Education	≤4 years	117 (83.6)	23 (16.4)	140 (46.7)	0.03
	5 to 8 years	37 (74.0)	13 (26.0)	50 (16.7)	
	High school	39 (66.1)	20 (33.9)	59 (19.7)	
	Higher education	35 (68.6)	16 (31.4)	51 (17.0)	
<i>Tumour</i>					
Tumour size	<2 cm	125 (85.0)	22 (15.0)	147 (49.0)	<0.0001
	2 to 5 cm	93 (70.5)	39 (29.5)	132 (44.0)	
	>5 cm	10 (47.6)	11 (52.4)	21 (7.0)	
CS TNM	EC 0	8 (66.7)	4 (33.3)	12 (4.0)	0.03
	EC I	57 (87.7)	8 (12.3)	65 (21.7)	
	EC II	120 (75.9)	38 (24.1)	158 (52.7)	
	EC III	43(66.2)	22 33.8)	65 (21.7)	
CS TNM	Initial (0+I)	65 (84.4)	12 (15.6)	77 (25.7)	0.05
	Other	163 (73.1)	60 (26.9)	223 (74.3)	
CS-T TNM	Tis	8 (66.7)	4 (33.3)	12 (4.0)	<0.0001
	T1	104 (83.9)	20 (16.1)	124 (41.3)	
	T2	101 (77.4)	30 (22.9)	131 (43.7)	
	T3	10 (43.5)	13 (56.5)	23 (7.7)	
	T4	5 (50.0)	5 50.0)	10 (3.3)	
CS-T Early	Tis and T1	112 (82.4)	24 (17.6)	136 (45.3)	0.02
	Other	116 (70.7)	48 (29.3)	164 (54.7)	
CS-N TNM	N0	105 (78.4)	29 (21.6)	134 (4.7)	0.67
	N1	92 (72.4)	35 (27.6)	127 (42.3)	
	N2	18 (78.3)	5 (21.7)	23 (7.7)	
	N3	13 (81.2)	3 (18.8)	16 (5.3)	

CS, clinical stage; BCT, breast-conserving treatment; BCT-OS, breast-conserving treatment with oncoplastic surgery.

received a breast implant. The cosmetic result, as assessed by BCCT.core software, was good or excellent in 30.0% of patients and reasonable in 45.5%.

When the patients who underwent OS were compared with others (Table 1), with respect to the continuous variables, it was observed that patients who underwent OS were younger at the time of surgery ($p = 0.002$) and at present ($p < 0.0001$), had a larger total tumour size ($p < 0.0001$) and a larger invasive tumour size ($p < 0.0001$), and had a shorter time since the OS procedure ($p = 0.03$). Evaluating categorical variables (Tables 2, 3), we observed that patients who underwent OS were younger ($p = 0.02$), had higher education levels ($p = 0.03$), had larger tumours ($p < 0.0001$), had higher TNM stages ($p = 0.03$), had higher T-TNM stages ($p < 0.001$), and more frequently received neoadjuvant chemotherapy ($p = 0.05$) than other patients.

In the simple logistic regression analysis (Table 4), the variables age at surgery, total tumour size, and time of surgery were also significant when transformed into categorical variables, and we opted to use exclusively cate-

gorical variables for assessment. In the univariate model, it was noted that among the main findings, patients aged less than 40 years had a 3.13-fold increased risk of OS; the risk was 2.47-fold higher in patients with higher education levels (high school and higher education) and 6.25-fold higher in patients with tumours larger than 5 cm. In the multivariate model (Table 4), the main factors related to OS were education and tumour size.

Regarding the EORTC QLQ-C30 questionnaire, one patient did not respond to the question regarding appetite loss; in the EORTC QLQ-BR23 questionnaire, 158 (52.7%) patients did not respond to the complementary item of sexual enjoyment, and 174 (58.0%) did not respond to the question regarding hair loss. Subsequently, using the EORTC QLQ-C30, EORTC QLQ-BR23, and BCTOS QLQ, patients who underwent OS ($n = 72$) were compared with patients who did not undergo this procedure ($n = 228$), but no relationship between OS and QL was observed in this group of women (Table 5). The only variable of interest ($p = 0.07$) was sexual function, which

Table 3. Comparison (χ^2) of factors related to treatment, quality results, and self-reported quality of life

Variable	Category	Classical BCT	BCT-OS	Total	<i>p</i>
<i>Treatment</i>					
Quadrants	1 quadrant	156 (76.8)	47 (23.2)	203 (67.7)	0.67
	2 quadrants	72 (74.2)	25 (25.8)	97 (32.3)	
Axillary surgery	SLN	55 (79.7)	14 (20.3)	69 (23.0)	0.52
	AL	173 (74.9)	58 (25.1)	231 (77.0)	
Chemotherapy	Absent	41 (82.0)	9 (18.0)	50 (16.7)	0.05
	Adjuvant	170 (76.9)	51 (23.1)	221 (73.7)	
	Neoadjuvant	17 (58.6)	12 (41.4)	29 (9.7)	
Hormone	Absent	60 (75.9)	19 (24.1)	79 (26.3)	0.73
	Adjuvant	166 (75.8)	53 (24.2)	219 (73.0)	
	Neoadjuvant	2 (100.0)	0	2 (0.7)	
SCF-RXT*	Absent	157 (78.5)	43 (21.5)	200 (67.1)	0.15
	Present	69 (70.4)	29 (29.6)	98 (32.9)	
Follow-up	<5 years	76 (69.7)	33 (30.3)	109 (36.3)	0.09
	5–10 years	83 (76.9)	25 (23.1)	108 (34.7)	
	>10 years	69 (83.1)	14 (16.9)	83 (27.7)	
<i>Quality of results</i>					
BCCT.core ^a	Excellent	13 (72.2%)	5 (27.8%)	18 (6.1%)	0.39
	Good	55 (77.5%)	16 (22.5%)	71 (23.9%)	
	Reasonable	97 (71.9%)	38 (28.1%)	135 (45.5%)	
	Bad/poor	60 (82.2%)	13 (17.8%)	73 (24.6%)	
<i>Quality of life</i>					
Modified BCTOS [24]	Good	93 (80.2%)	23 (19.8%)	116 (38.7%)	0.24
	Intermediate	86 (71.1%)	35 (28.9%)	121 (40.3%)	
	Poor	49 (77.8%)	14 (22.2%)	63 (21.0%)	

SLN, sentinel lymph node; AL, axillary lymphadenectomy; SC-RXT, supraclavicular fossa radiotherapy; BCT, breast-conserving treatment; BCT-OS, breast-conserving treatment with oncoplastic surgery. ^a Minimal missing data were excluded from the analysis.

was lower in patients who underwent OS than in those who did not. Due to the heterogeneity of the group, we sought to group the patients who underwent OS with those who underwent unilateral OS ($n = 263$) and compare them with the patients who underwent bilateral OS ($n = 37$); the results are presented in Table 5. As shown in this population, bilateral surgery (breast symmetrization) was not associated with changes in QL.

Discussion

When evaluating patients who undergo BCT-OS, we have to consider that the indications can be related to the relation between tumour size and breast volume, surgeon experience, and patient characteristics [10, 18]. Multiple factors are associated with the decision to perform BCT-OS; these can be associated with the indication/patient condition, surgery to be performed, potential quality of cosmesis, and QL (Fig. 1).

In a previous series with a large number of patients ($n = 801$), it was observed that the patients who underwent

OS, in general, were younger, premenopausal, had more tumours in the inferior retroareolar area, had a higher percentage of multifocal and multicentric disease, were associated with increased use of neoadjuvant chemotherapy, had larger tumours, and had a higher clinical stage than those who did not [29]. A similar finding was observed in a Dutch population study ($n = 824$), where an association with large tumours in the caudal half of the breast was observed, as was a high frequency of adjuvant treatment (chemotherapy or hormone therapy) [30]. A study in Hungary ($n = 900$) [31] observed that OS was associated with pathological stage II tumours, a high N1 status, and triple-negative tumours. A meta-analysis comparing BCT ($n = 5,494$) and BCT-OS ($n = 3,165$) observed that in the second group, the weight specimen was larger, the positive margin was lower, and the rate of re-excision was lower, but completion to mastectomy was more common [32]. BCT-OS is performed more often in younger patients and in those with more advanced tumours [33]. This fact may be related to the worse tumour conditions related to BCT-OS. In the present study ($n = 300$), the patients who underwent OS were younger and had larger tumours, a find-

Table 4. Univariate logistic regression of variables related to BCT-OS

		OR	95% CI	Variable <i>p</i>	<i>p</i> category
<i>Univariate</i>					
Age	≥60 years	1.00	Reference		0.02
	50–59 years	1.13	0.48–2.68	0.77	
	40–49 years	2.35	1.02–5.38	0.04	
	<40 years	3.13	1.14–8.60	0.03	
Education	≤4 years	1.00	Reference		0.01
	5–8 years	1.79	0.82–3.88	0.14	
	High school and higher education	2.47	1.36–4.50	0.003	
Tumour size	<2 cm	1.00	Reference		<0.0001
	2–5 cm	2.38	1.32–4.29	0.004	
	>5 cm	6.25	2.37–16.47	<0.0001	
Clinical stage	Initial (0+I)	1.00	Reference		0.05
	Other	2.00	1.01–3.95	–	
Early EC-T	Tis and T1	1.00	Reference		0.02
	Other	1.93	1.11–3.36	–	
Chemotherapy	Absent	1.00	Reference		0.06
	Adjuvant	1.37	0.62–3.01	0.44	
	Neoadjuvant	3.22	1.14–9.03	0.03	
Follow-up	>10 years	1.00	Reference		0.10
	5–10 years	1.48	0.72–3.08	0.29	
	<5 years	2.14	1.06–4.33	0.03	
<i>Multivariate</i>					
Education	≤4 years	1.00	Reference		0.004
	5–8 years	1.93	0.86–4.33	0.11	
	High school and higher education	2.90	1.54–5.46	0.01	
Tumour size	<2 cm	1.00	Reference		<0.0001
	2–5 cm	2.42	1.33–4.40	0.004	
	>5 cm	8.00	2.91–22.03	<0.0001	

ing that possibly reflects a more advanced clinical stage and the need for neoadjuvant chemotherapy. The higher education levels observed in our public hospital may be associated with the availability of surgeons and patient desires. This possible selection bias may influence QL.

When the time that elapsed since surgery was evaluated, the length of time was shorter in patients who underwent OS, since OS is a historically new surgical option that has been increasingly employed in daily clinical practice. Surgeons with more experience with breast surgery were more likely to perform OS, and one of the barriers to not performing OS was a lack of training [34].

OS involves a set of surgeries that may include BCT with OS techniques and reconstructive mastectomy. Thus, when comparing patients who undergo BCT to those who undergo OS, multiple techniques are grouped, and the small number of patients makes comparisons difficult simply because of the sample size. The indication to perform OS depends on the condition of the hospital (private, public), time needed to perform the surgery, training of the surgeon with different techniques, tumour volume/breast size, breast shape (ptosis and symmetry), patient desire, and time after primary treatment associated with breast asym-

metry. The present study aimed to evaluate only patients who underwent BCT ($n = 300$), with a representative number of patients in the BCT-OS group ($n = 72$). Regarding breast symmetrization surgery, 37 (51.4%) underwent bilateral surgery, whereas 29 (40.3%) underwent both surgeries concomitantly (immediate symmetrization). It is observed that breast asymmetry does not always lead to symmetrization surgery. For this to occur, the patient should feel dissatisfied, or the surgeon may consider that marked asymmetry is an indication for a new surgery. In our public hospital, OS is performed by breast surgeons, and treatment surgeries compete in the same field as reconstructive surgeries. The symmetrization is usually performed only when the patient desires it or when possible at the time of the first surgical treatment. Patients with a high number of comorbidities, patients with satisfactory results, and older patients with asymmetry do not often undergo symmetrization. This finding may reflect the high rate of patients evaluated by BCCT.core software who reported reasonable (45.5%) or poor (24.6%) results. In general, the studies do not present objective data regarding breast symmetry, and many do not describe the rate of symmetrization, which should be a part of studies related to BCT and OS.

Table 5. Comparison of BCT-OS in the quality of life questionnaires

Questionnaire	Domain	Classical BCT, mean (SD)	BCT-OS, mean (SD)	<i>p</i>	Unilateral surgery, mean (SD)	Bilateral surgery, mean (SD)	<i>p</i>
EORTC QLQ-C30	Global health	78.3 (21.7)	79.0 (21.0)	0.77	78.2 (21.9)	78.8 (20.1)	0.99
	Physical capacity	79.3 (18.4)	82.2 (16.8)	0.27	79.4 (18.6)	83.1 (14.6)	0.45
	Functional capacity	79.7 (27.1)	84.7 (22.5)	0.19	80.6 (26.6)	85.1 (21.8)	0.39
	Emotional ability	60.9 (31.8)	63.8 (32.1)	0.44	60.7 (32.1)	67.1 (29.9)	0.29
	Cognitive ability	67.5 (31.9)	72.7 (32.4)	0.13	68.6 (34.5)	70.3 (35.4)	0.43
	Social capacity	91.6 (19.3)	93.1 (18.1)	0.47	91.9 (18.8)	91.9 (20.3)	0.90
	Fatigue	22.6 (26.9)	17.6 (21.8)	0.22	21.7 (26.2)	19.2 (22.3)	0.77
	Nausea and vomiting	5.9 (14.9)	4.9 (12.9)	0.55	6.1 (14.9)	3.1 (10.3)	0.18
	Pain	31.8 (31.8)	26.6 (29.6)	0.22	31.3 (31.1)	26.6 (25.9)	0.61
	Dyspnoea	11.1 (24.9)	7.4 (20.3)	0.34	10.5 (24.4)	8.1 (19.9)	0.90
	Insomnia	31.1 (39.0)	25.0 (33.9)	0.34	30.6 (38.8)	24.3 (32.0)	0.58
	Appetite loss	11.3 (27.2)	8.8 (22.4)	0.76	10.8 (26.7)	9.9 (22.0)	0.60
	Constipation	22.6 (35.3)	21.3 (34.2)	0.96	22.7 (35.4)	18.9 (31.9)	0.68
	Diarrhoea	7.0 (21.9)	5.1 (19.9)	0.26	7.2 (22.4)	4.5 (19.5)	0.29
	Financial difficulties	16.5 (32.8)	18.1 (35.3)	0.77	16.5 (33.1)	18.9 (35.6)	0.64
EORTC QLQ-BR23	Body image	80.1 (26.6)	78.0 (30.6)	0.12	82.2 (25.5)	77.0 (31.7)	0.36
	Sexual functioning	55.4 (19.9)	54.5 (16.8)	0.07	75.2 (26.2)	71.2 (26.2)	0.35
	Sexual enjoyment	52.2 (31.1)	54.5 (30.8)	0.50	46.2 (30.4)	41.7 (26.2)	0.60
	Future perspective	47.1 (39.5)	42.4 (36.8)	0.22	55.9 (40.9)	49.5 (34.8)	0.28
	Side effects	34.7 (18.8)	24.2 (20.5)	0.15	25.5 (20.7)	19.0 (15.8)	0.11
	Breast symptoms	27.9 (25.5)	15.1 (15.3)	0.75	20.4 (23.1)	17.6 (14.9)	0.76
	Arm symptoms	32.1 (25.0)	29.3 (34.1)	0.73	27.4 (28.3)	27.3 (25.2)	0.71
	Hair loss	27.5 (36.0)	15.1 (31.1)	0.21	29.5 (39.1)	13.9 (26.4)	0.18
BCTOS	Functional	1.8 (0.84)	1.78 (0.72)	0.64	1.8 (0.8)	1.8 (0.8)	0.66
	Cosmetic	2.22 (0.77)	2.30 (0.74)	0.40	2.2 (0.8)	2.2 (0.7)	0.59
	Breast-specific pain	1.92 (0.90)	2.04 (0.83)	0.14	1.9 (0.9)	2.0 (0.8)	0.42
	Oedema	1.59 (0.72)	1.59 (0.67)	0.75	1.6 (0.7)	0.6 (0.6)	0.42

SD, standard deviation; BCT, breast-conserving treatment; BCT-OS, breast-conserving treatment with oncoplastic surgery.

In the literature, it is difficult to compare objective results evaluated through objective and reproducible instruments in relation to QL. Exner et al. [35] used the breast analysing tool to objectively evaluate the symmetry among the breasts of 101 patients who underwent BCT and correlated the results with QL as measured by the Body Image Scale (BIS) and EORTC QLQ-BR23. They found no direct association between symmetry and QL. A study performed in the present sample that compared objective data evaluated through BCCT.core software and self-reported data from patients reported that patients tended to be a better judge of their own cosmetic results [36]. The degree of satisfaction does not necessarily reflect the degree of symmetry. Women with normal breasts may find themselves dissatisfied with their breasts [37]. On the other hand, patients with high expectations could have less satisfaction, even with good results [18]. In general, QL is not associated with objective results, and when the patients who underwent OS were evaluated, selection bias may have occurred. This may have been be-

cause, despite the apparent similarity between the groups, previous choices had already been made, and patients who were more educated, younger, and asked more questions may have been selected for OS.

Traditionally, oncology-related studies have been concerned primarily with questions regarding overall survival, disease-free survival, and recurrence, while less attention has been given to QL. The constant improvement in oncological treatment (higher cure rates) causes patients to demand not only prolonged survival but also improved QL [20]. No consensus concerning the best instrument to use, the best way to collect the data, or how to interpret the results has been established. In practice, this makes it extremely difficult to use QL measures [19].

The QL 1 year after treatment was compared using the QLQ-C30 and QLQ-BR23 questionnaires and included 485 patients who underwent BCT, 46 who underwent mastectomy and immediate reconstruction, and 87 who underwent mastectomy without reconstruction. We observed better scales related to social function, general function,

and body image in patients who underwent BCT and immediate reconstruction. However, when these 2 groups (BCT and reconstruction groups) were compared, no difference in the objective cosmetic effects was observed, except for body image in QLQ-BR23 [38]. Another study on QL was conducted using the QLQ-C30 and QLQ-BR23 questionnaires and included 76 patients who underwent BCT, while the remainder underwent mastectomy with ($n = 16$) or without ($n = 20$) reconstruction. We observed that patients who underwent BCT presented a better body image and were more satisfied than patients in the other groups [39]. When QL is evaluated using questionnaires, the groups should be properly evaluated, and it should be recognized that BCT is related to better results in relation to body image. Pukancsik et al. [40] performed a similar study, evaluating 200 patients who underwent BCT. The QL was evaluated at 1 month after surgery and 12 months after radiotherapy. A deterioration in QL was observed with an increase in breast volume removed, but the study did not consider OS and/or symmetrization as an endpoint.

Kaviani et al. [41] conducted a review in which they showed that OS had a positive impact on the QL of patients, but many of the aspects that make OS advantageous, especially in the aesthetic aspect, seemed to be lost over time. In the present study, we attempted to evaluate the different groups, but the follow-up was longer than 5 years in both groups (average 7.4 years). As the follow-up was long, unsatisfied patients and those with great asymmetry may have undergone a second surgery.

The questionnaires and the evaluation of cosmesis were collected prospectively, but the identification of patients was retrospective; thus, the time between the surgical procedure and data collection may have differed between the groups. It is known that time changes a person's body image and the perception of his or her own body, and thus, it is appropriate to evaluate the time between surgeries. Veiga et al. [23] compared 42 patients who underwent classical BCT and 45 patients who underwent OS. The patients with OS were prospectively evaluated at 6 and 12 months, while the control group was evaluated at a median time of 36 months (range 12–123 months). This study used the Short-form-36 and the Rosenberg-EPM Self-Esteem Scale. When the groups were compared, the patients who underwent OS had better scores than patients in the control group, which suggests positive aspects associated with OS [23], a finding that may have influenced the results.

One study evaluated QL after a long follow-up period in patients who exclusively underwent BCT or OS ($n = 944$), and in this study, a questionnaire on patient satisfaction outcome (patient-reported outcome) was given by phone. The questionnaire was based on a 6-point Likert scale, which consisted of very good, good, satisfactory, poor, insufficient, and unsatisfactory. The surgical technique was determined according to the location of the

tumour, and the primary techniques used were glandular remodelling and tumour-based mastopexy. A total of 70.7% of patients answered the questionnaire, of whom 55% reported a very good result, 23% reported a good result, and 80.3% perceived a small difference between the treated and untreated breast. The mean resection volume was 32 g, and contralateral surgery was required in only 1.9% of patients [42]. Small resected volumes do not lead to high symmetry, a finding revealed by the small number of patients who underwent symmetrization surgery and who had high satisfaction levels. However, the lack of a control group hindered the generalization of the results.

Mátrai et al. [21], using EORTC QLC-BR23, compared 60 patients who underwent classic BCT with 60 patients who underwent OS; they observed the superiority of OS in relation to cosmetic results and patient satisfaction. Ojala et al. [22] assessed 637 patients who underwent BCT and sought to evaluate the aesthetic and functional outcomes. Of these patients, 59% (379) answered a questionnaire and 23% (86) underwent OS. In this general population, most patients presented with tumours that were T1-TNM, and the median resected volume was less than 85 g; moreover, 6.2% of patients underwent symmetrization, which was superior in the group of patients who underwent OS (23%). Patients who underwent OS had larger tumours and thus had greater tissue resection volumes than those who did not. Patients with large-diameter tumours, those whose tumours were multifocal, those with large resection volumes, and those who underwent OS presented poor cosmetic effects. The median size of the tumours was less than 16 mm, and 86.0% of tumours were Tis and T1-TNM. The degree of good satisfaction, as evaluated by the BCTOS (<2), was high, especially in patients who received conventional treatment [22]. In the present study, a lower percentage of patients were satisfied (38.7%), but the median tumour size was 2.1 cm (range 0.3–11 cm), and only 49.6% of the tumours were Tis and T1-TNM. This indicates major resections, which may reflect the high rate (70.1%) of patients with reasonable and poor cosmetic results. However, when the group of patients who underwent OS was compared with the control group, no change in QL was observed, as assessed through the categorized BCTOS ($p = 0.243$).

It may seem intuitive that the performance of OS, which indicates the use of plastic surgery techniques associated with oncologic surgery, results in greater good patient satisfaction and, consequently, better QL. According to the QLQ-BR23, OS was associated with better aesthetic outcome [31]. However, in the present study, OS was not associated with improved QL, as evaluated by the QLQ-C30, QLQ-BR23, and BCTOS questionnaires, even in patients who underwent contralateral surgery for symmetrization. The BCTOS was developed before the OS era, but it evaluates patient satisfaction with breast cosmesis, a fact that enriches this publication. Although

the patients who underwent OS were younger and more educated, which likely increases the degree of demand for better aesthetic results, they presented with larger tumours with a more advanced stage. Moreover, after a long follow-up period (average over 5 years), their cosmetic results were similar, a finding that may have influenced the similar QLQ measures.

The Breast-Q is a validated QLQ. In the past, BCT and OS were evaluated using the Breast-Q reduction/mastopexy module, and patients who underwent BCT-OS with reduction mammoplasty reported good QL, but they did not compare the results with patients who underwent tumourectomy [29]. At present, we have the Breast-Q BCT surgery module, which was not used in this study. It was published [43] after this project began and is now being translated into Brazilian Portuguese.

Our study has limitations primarily because it was a non-randomized study that compared clearly heterogeneous groups. Although it was a prospective study, the evaluation of the medical records was retrospective, since the study was not designed to evaluate OS. No clear criteria define which patients should undergo OS, and this is a problem observed in the literature in general. No clear criteria in the literature indicate or contraindicate OS; therefore, it is difficult to compare results between different studies. Thus, although the selection of patients for OS was random, it was possible to use 3 questionnaires on QL and evaluate the cosmetic results of the patients, measures that indicate time and patient disposition. In studies conducted through a telephone questionnaire [22, 42] in patients selected from a cohort, it is generally observed that patient loss may be high, which is a finding that may compromise the results, given the possibility of bias. Despite the aforementioned limitations, this work has expressive casuistry and included questionnaires validated in the literature that are associated with reproducible methodology against the evaluation of breast symmetry.

One of the major limitations of studies on OS is the wide number of surgical procedures covered by this term. Some studies even consider mastectomies with breast reconstruction to be OS. Even if we consider only conservative surgeries, a reduction mammoplasty based on the superior pedicle, volume replacement with a myocutaneous flap, and local rotation of the dermoglandular flap are very different procedures, although all are considered OS; however, standardization among these procedures is lacking. Due to ethical issues, it is also extremely difficult to perform a randomized clinical trial that compares OS and BCT, and thus, it is very important to carefully analyse retrospective studies and prospective cohorts for conclusions about the importance of OS on QL in patients who undergo BCT. The standardization of criteria and questionnaires to be used will greatly facilitate future comparisons and careful evaluations of the validity of OS in BCT

[44, 45]. Thus, when comparing QL between patients who undergo exclusively BCT with those who also undergo OS, we suggest that the following data be collected: clinical characterization of the patients prior to treatment, treatment performed, time between the procedure and application of the questionnaire, type of questionnaire, performance of breast symmetrization, and objective evaluation of the results (as performed in the present study).

Conclusion

It is necessary to standardize the criteria used in BCT-OS studies. Despite the fact that OS is performed in more educated patients (which could be exigent with the results) and regardless of large lesions, multicentric tumours, or tumours located on unfavourable parts of the breast (such as the central and lower quadrants), OS allowed similar aesthetic results to the classical conservative breast surgery.

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Statement of Ethics

This prospective study was approved by the Research Ethics Committee of the Barretos Cancer Hospital (NO. 782/2014). All patients included signed the free and informed consent.

Disclosure Statement

The authors declare no conflicts of interest.

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Author Contributions

Study concepts: R.A.C. Vieira, F.C.B. da Silva, and A.J. Sarri. Study design: I. de Oliveira-Junior, R.A.C. Vieira, F.C.B. da Silva, and A.J. Sarri. Data acquisition: F.C.B. da Silva, J.J. da Silva, and R.A.C. Vieira. Quality control of data and algorithms: R.A.C. Vieira, I. de Oliveira-Junior, and F.C.B. da Silva. Data analysis and interpretation: R.A.C. Vieira, C.E. Paiva, I.A. da Silva, and I. de Oliveira-Junior. Statistical analysis: R.A.C. Vieira and I. de Oliveira-Junior. All authors were involved in the preparation, editing, and review of the manuscript.

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