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Comparison of Oncoplastic Breast-Conserving Therapy and Standard Breast-Conserving Therapy in Early-Stage Breast Cancer Patients

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Background: The aim of this study was to compare the efficacy and safety of oncoplastic breast-conserving therapy (OBCT) and SBCT (standard breast-conserving therapy) in breast cancer surgery.

Material/Methods: We enrolled 192 breast cancer patients who underwent breast-conserving surgery during January 2015 to April 2018. The surgery strategies of OBCT and SBCT were performed according to the patients' condition. For measurement of surgical cosmetic effects, the Harris scale, the modified objective scores, and the subjective evaluation were all used. The basic clinical characteristics, intraoperative indices, postoperative complications, metastasis, and recurrence during the 2-year follow-up were recorded.

Results: The mean surgical time was remarkably longer and the resected volume was markedly larger in the OBCT group than in the SBCT group. The excellent and good ratios of Harris scale, the modified objective scores, and the ratio of very satisfied and satisfied patients by subjective scale were all significantly higher in the OBCT group than in the SBCT group. The occurrence rates of seroma and poor incision healing were remarkably lower in the OBCT group. No significant difference was found for metastasis and recurrence.

Conclusions: OBCT had better cosmetic effects, fewer complications, and no adverse effects on metastasis and recurrence.

MeSH Keywords: Cosmetic Techniques • Inflammatory Breast Neoplasms • Postoperative Complications

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Background

Breast cancer surgery has significantly improved breast cancer patient survival, but traditional radical mastectomy does not consider the beauty of the breast and may cause the patient to experience negative emotions [1–3]. Breast cancer patients are at high risk of depression, and it is reported about 20%~45% of breast cancer patients have anxiety or depression [4,5].

Breast-conserving therapy can reduce these problems and improves patient quality of life and psychological health. A long-term study reported that breast-conserving therapy and radical mastectomy had the same effect on overall survival, metastasis, and recurrence [6]. In a comparison study including 7565 breast cancer patients, the authors compared mastectomy and breast-conserving therapy and found that patients who received breast-conserving therapy had better local control of cancer lesions and lower 10-year recurrence rates [7]. Another study, including 11 859 breast cancer patients under age 40 years, found patients who received breast-conserving therapy showed remarkably higher 10-year overall survival than patients receiving mastectomy [8]. All these studies indicate the better long-term prognosis of breast-conserving therapy.

The standard breast-conserving therapy (SBCT) retains the basic shape of the breast but does not perform tissue transfer filling [9–11]. In recent years, oncoplastic breast-conserving therapy (OBCT) using breast tissue transfer filling or assisted breast-conserving with non-breast tissue transfer replacement has gradually been applied in breast cancer surgeries [12]. Generally, it is thought OBCT may provide better cosmetic effects for breast [13]. However, studies comparing SBCT and OBCT are still inadequate.

In the present study, we compared the efficacy and safety of OBCT and SBCT in breast cancer surgery. It was found OBCT had better cosmetic effects and fewer complications, with no increase in metastasis and recurrence. Our results provide more clinical evidence supporting the use of OBCT in treatment of breast cancer.

Material and Methods

Subjects

The present prospective non-randomized controlled study included 192 breast cancer patients who underwent breast-conserving surgery from January 2015 to April 2018. All patients were diagnosed as having breast cancer with TMN stage I~II. All patients meeting the inclusion criteria were consecutively enrolled during the study period. The inclusion criteria were: 1) the diagnosis of breast cancer was confirmed by histological analysis; 2) the tumor was located in only 1 side of the breast; and 3) patients agreed to cooperate and wanted to receive breast-conserving therapy. The following patients were excluded: 1) patients with recurrent breast cancer; 2) patients who had received chemotherapy or radiotherapy before the surgery; and 3) patients who had other surgical contraindications such as severe liver, renal, or cardiovascular disease. Written informed consent was obtained from all patients. The present study was approved by the Ethics Committee of the Affiliated Hospital of Jiaxing University.

Surgery

The surgery strategies were selected according to the patients' condition. The tumor volume and the breast volume were measured by MRI. OBCT was performed for patients with a lesion in the center breast, patients with a lesion in the non-center breast and the tumor volume ≥20% of the breast volume, and patients with a lesion in the lateral skin area of the breast. SBCT was conducted for patients with a lesion in the non-center breast and non-lateral skin area of the breast, and tumor volume ≤10% of the breast volume. For patients with a lesion in the non-center breast and tumor volume 10~20% of the breast volume, surgical methods were chosen according to patients' choice and the surgeons' judgement. The incisal edge was set to 1 cm and the histological analysis was performed. When the incisal edge tested as positive twice and more incision could not achieve the cosmetic effect, the surgery would be given up.

For selection of the incision, the incision of SBCT was set along the Langer line as an arc when the tumor was above the nipple plane and as a radial incision when the tumor was below the nipple plane, according to our experience and the recommendation of the National Surgical Adjuvant Breast and Bowel Project (NSABP) [14]. The incision of OBCT was according to the size and location of the tumor, the skin invasion condition, the incision of biopsy, and selection of the operation methods [15].

For SBCT, 2 methods were used according to patients' condition. One was the extended local incision, in which the incisal edge was set to ≥1 cm and the fascia of the pectoralis major basalis was resected. The other one was quadrantectomy, in which the tissue and skin and the deep pectoralis major myofascia in the breast quadrant of the tumor were resected and acceptable appearance was retained.

For OBCT, the surgical strategies were chosen according to the patients' condition. Strategies included breast-conserving with breast tissue transfer filling and assisted breast-conserving with non-breast tissue transfer replacement. In breast-conserving with breast tissue transfer filling, the breast tissue was rearranged through rotation, lifting, and suspension using free or

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Table 1. The modified objective scores for cosmetic effects after surgery.

Variables *vs.* the healthy side	2 points	1 point	0 points
Breast size	Almost the same	Different (within 1/4)	Very different (>1/4)
Breast shape	Almost the same	Different	Very different
Scar	Not obvious	Obvious	Very obvious
Breast hardness	Almost the same	Harder	Very hard
Size and shape of nipple and areola	–	Almost the same	Obviously different
Color of nipple and areola	–	Almost the same	Obviously different
The position change of nipple	–	<2 cm	>2 cm
Difference between the lowest points of both breasts	–	<2 cm	>2 cm

partial free normal breast tissue around the original tumor. In assisted breast-conserving with non-breast tissue transfer replacement, non-breast tissue was used for the above procedures, including adjacent tissue transfer (e.g., latissimus dorsi flap and fatty fasciocutaneous flap) or distant tissue transfer (e.g., free fatty flap and greater omentum). The surgical methods included pedicled mammary tissue flap repair (when direct suture was difficult), upper mammary pedicle inverted T plastic method (when the tumor was located in the middle and lower part, the outer and lower part, the inner and lower part, and the adjacent part of the fold under the breast), lower mammary pedicle inverted T plastic (when the tumor was in the middle and upper part of the areola), ring areola plastic (when the tumor was at the position of the adjacent areola), lateral mammary plastic (when the tumor was at outer or outer superior of the areola), medial mammary plastic (when the tumor was at the medial areola), and bat wing plastic (when the tumor was at the upper quadrant near the areola). For patients with axillary lymph nodes metastasis, the axillary lymphadenectomy was performed intraoperatively after ultrasound-guided needle aspiration cytology of axillary lymph nodes. All surgeries were conducted by the same surgical team according to the same protocol.

After surgery, all patients received the same adjuvant chemotherapy or radiotherapy by the same team according to the same treatment protocol.

Data collection and measurement

For measurement of surgical cosmetic effects, both the Harris scale and the modified objective scores modified by our team were used. The objective scores are listed in **Table 1**. On the Harris scale, excellent means the size and shape of the operative breast were almost the same as the other breast after surgery; good means the breast retraction and/or skin changes were less than 1/4 of the original; fair means the breast retraction and/or skin changes were within 1/2~1/4; and bad means the breast retraction and/or skin changes were >1/2. Both the Harris and the objective scores were measured 3 months after the surgery. The subjective evaluation was also performed using very satisfied, satisfied, fair, and not satisfied.

We also collected data on the basic clinical characteristics of the patients, including age, BMI, tumor position, histological type, and axillary lymph nodes metastasis condition. The intraoperative indices, including surgical time, blood loss, and the lymphadenectomy condition, were recorded. After surgery, postoperative complications during 2-year period were recorded. All patients were followed up for 2 year after surgery. Patients who were lost to follow-up or quit the study were already excluded.

Statistical analysis

Data are expressed as mean±SD. The chi-square test was used for comparing rates. Comparison among the 2 groups were performed by *t* test. Recurrence was analyzed by Kaplan-Meier curve. *P* value <0.05 was considered to be statistically significant. All calculations were made using SPSS 22.0 (SPSS, Inc., Chicago, USA).

Results

Basic characteristics of all patients

Among the patients, the OBCT group included 99 cases, with mean age 48.44±11.34 years, and the SBCT group included 93 cases, with mean age 47.83±11.31 years. Among all patients, the mean tumor size was 3.03±1.13 (1~5 cm), and 14 cases (7.29%) were intraductal carcinoma and 178 cases (92.71%) were invasive carcinoma. A total of 107 cases (55.73%) were with axillary lymph nodes metastasis. No significant difference was found between the indices of age, BMI, tumor size, pathological type, or axillary lymph nodes metastasis (**Table 2**).

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Table 2. Basic characteristics of all patients.

Variables	OBCT, n=99	SBCT, n=93	*P* value
Age, year	48.44±11.34	47.83±11.31	0.711
BMI, kg/m^2	21.43±1.99	21.32±1.87	0.682
TNM stage, n (%)			0.831
I	43 (43.43)	39 (41.94)	
II	56 (56.57)	54 (58.06)	
Tumor size, cm	3.06±1.12	3.01±1.16	0.751
Pathological type, n (%)			0.657
Invasive carcinoma	91 (91.92)	87 (93.55)	
Intraductal carcinoma	8 (8.08)	6 (6.45)	
Axillary lymph nodes metastasis, n (%)			0.805
Yes	56 (56.57)	51 (54.84)	
No	43 (43.43)	42 (45.16)	

Table 3. Intraoperative indices and postoperative treatment of the patients.

Variables	OBCT, n=99	SBCT, n=93	*P* value
Surgery time, min	97.94±7.25	84.67±5.62	<0.001
Blood loss, mL	13.29±2.67	12.71±2.87	0.153
Axillary lymphadenectomy, n (%)			0.952
Yes	56 (56.57)	51 (54.84)	
No	43 (43.43)	42 (45.16)	
Re-excision, n (%)	6 (6.06)	5 (5.38)	
Resected volume, ml	100.38±8.81	54.79±8.09	<0.001

Comparison of intraoperative indices

Next, we compared the intraoperative indices. It was found the mean surgical time was 97.94±7.25 min in the OBCT group, remarkably longer than in the SBCT group (84.67±5.62 min) (P<0.05, **Table 3**). The resected volume was also markedly larger in the OBCT group than in the SBCT group (P<0.05). No significant difference was found in blood loss, lymphadenectomy condition, or the ratio of patients with re-excision.

Comparison of cosmetic effects

The cosmetic effects were compared using both subjective and objective scales. As shown in **Table 4**, the excellent ratios of Harris scale were significantly higher in the OBCT group than in the SBCT group (P<0.05). The modified objective scores were also remarkably higher in the OBCT group than in the SBCT group (P<0.05). For subjective scale, the ratio of very satisfied patients was markedly higher in the OBCT patients than in the SBCT patients (P<0.05). All these results indicated that OBCT achieved better cosmetic effects than SBCT.

Comparison of complications, metastasis, and recurrence

We compared the postoperative complications and metastasis and recurrence during the 2-year follow-up. As shown in **Table 5**, the occurrence ratios of seroma and poor incision healing were remarkably lower in the OBCT group than in the SBCT group (P<0.05). However, no significant difference was found for other complications. In OBCT patients, metastasis was found in 4 cases (4.04%) and recurrence was found in 5 cases (5.05%), while in the SBCT group, metastasis was found in 3 cases (3.23%) and recurrence was found in 4 cases (4.30%). No significant difference was found for metastasis or recurrence. The Kaplan-Meier curve also showed no significant difference in recurrence or metastasis-free survival time (**Figure 1**).

Discussion

In addition to the therapeutic effect of breast cancer, the cosmetic effect is now another evaluation standard for breast cancer surgery. Research showed that about 20~45% of breast

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Table 4. Comparison of cosmetic effects.

Variables	OBCT, n=99	SBCT, n=93	*P* value
Harris scale, n (%)			<0.001
Excellent	56 (56.57)	7 (7.53)	
Good	32 (32.32)	34 (36.56)	
Fair	10 (10.10)	39 (41.94)	
Bad	1 (1.01)	13 (13.98)	
Modified objective scores	8.56±2.29	5.73±2.86	<0.001
Subjective scale, n (%)			<0.001
Very satisfied	59 (59.60)	12 (12.90)	
Satisfied	34 (34.34)	32 (34.41)	
Fair	4 (4.04)	30 (32.26)	
Not satisfied	2 (2.02)	19 (20.43)	

Table 5. Comparison of the complications, metastasis, and recurrence during the 2-year follow-up.

Variables	OBCT, n=99	SBCT, n=93	*P* value
Complication, n (%)			
Seroma	15 (15.15)	51 (54.84)	<0.001
Infection	2 (2.02)	4 (4.30)	0.363
Poor incision healing	4 (4.04)	17 (18.28)	0.001
Necrosis of skin margin	1 (1.01)	2 (2.15)	0.518
Metastasis, n (%)	4 (4.04%)	3 (3.23%)	0.760
Recurrence, n (%)	5 (5.05%)	4 (4.30%)	0.802

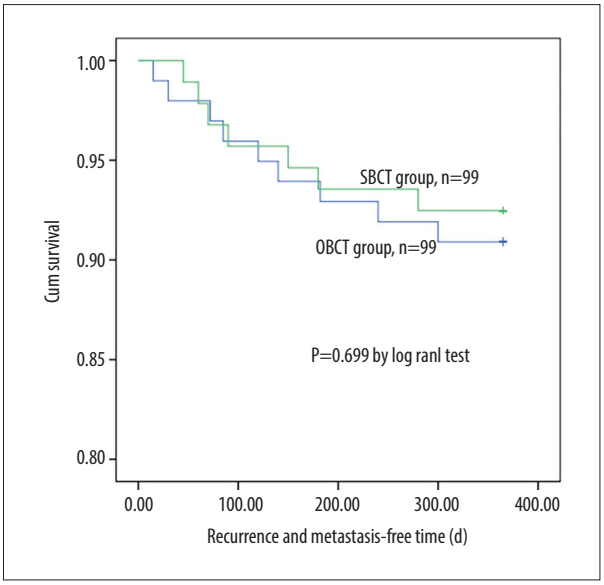

Figure 1. Kaplan-Meier curve for recurrence and metastasis-free survival time

cancer patients and about 50~60% of cervical cancer patients develop postoperative depression, partly due to the effect on beauty and the adverse effects of chemotherapy, such as alopecia [16–18]. Breast-conserving therapy, especially surgeries for cosmetic effect, can reduce these problems and improve the quality of life. During the last 10 years, it was reported the rate of patients receiving breast-conserving therapy increased significantly, from 3.6% in 2004 to 62.4% in 2014 [8]. When a re-operation is requested due to unsatisfactory cosmetic results, a delay of adjuvant treatment might occur, as well as additional surgical complications, with poorer cosmetic outcomes. Thus, precise preoperative lesion localization and intraoperative margins assessment are mandatory to obtaining clear margins [19]. However, few studies have compared the efficacy and safety of oncoplastic breast-conserving therapy *vs.* standard breast-conserving therapy. In the present study, we demonstrated that OBCT could achieve better cosmetic effect with fewer complications than SBCT, with no effects on recurrence and metastasis.

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SBCT is a widely used method in breast cancer surgery. The comparison between SBCT and radical mastectomy has also been reported. In a clinical trial with 20-year follow-up, Litière et al. demonstrated that BCT and mastectomy showed no significant difference in metastasis and overall survival [20]. Tsai et al. compared the quality of life of patients who underwent breast-conserving therapy *vs.* mastectomy and found that the surgical modality did not influence the quality of life except for body image [21]. However, in a recent meta-analysis, Zhang et al. showed that postoperative depression was not significantly different between SBCT and mastectomy [22]. In our research, we also found SBCT could achieve good cosmetic effect, but not better than OBCT.

OBCT is now used in many surgeries and studies. In a meta-analysis, Haloua et al. demonstrated that OBCT achieved good cosmetic outcomes in 84~89% of patients [23]. Malhaire et al. compared OBCT and mastectomy and showed that margin involvement, re-intervention rate, and equivalent rate of microcalcifications clearance were not different between OBCT and mastectomy [24]. In a systematic review, Lucy et al. demonstrated that OBCT had high rates of overall survival and disease-free survival with low local recurrence, distant recurrence, positive margin rate, re-excision rate, CMR, and complication rates [25]. In recent research, Kelsall et al. showed OBCT with mastectomy had significantly better body image scale scores and self-rated breast appearance than the immediate breast reconstruction [26]. However, few studies have compared OBCT *vs.* SBCT. In the present study, we demonstrated that OBCT could improve the cosmetic effect and reduce the postoperative complications compared to SBCT. Our study also has some limitations. First, it was a non-randomized design study. Secondly, the sample size was limited. Finally, the follow-up duration was only 2 years. Further research is needed to confirm our results.

Conclusions

In conclusion, we conducted a non-randomized controlled study to compare the efficacy and safety of OBCT and SBCT. Results showed OBCT could improve the cosmetic effect and reduce the postoperative complications compared to SBCT, with no increase in recurrence and metastasis. Our results may provide more clinical evidence supporting the use of OBCT in treatment of breast cancer.

Conflicts of interest

None.

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