

## ORIGINAL RESEARCH

# Effects of oncoplastic breast-conserving surgery on the psychological status, quality of life and survival prognosis of patients with early-stage breast cancer

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**Abstract**

To explore the effect of oncoplastic breast-conserving surgery (OBCS) on the psychological status, quality of life (QoL) and survival prognosis of patients with early breast cancer (BC). In this study, one hundred BC patients with early breast cancer were divided into two groups according to the random number table method. They were treated with traditional breast conserving surgery (BCS) and OBCS. The results showed that compared with the traditional BCS treatment group, the operation time of OBCS treatment group was significantly longer, while the intraoperative blood loss, postoperative drainage and hospital stay were significantly shorter; in terms of cosmetic effect, the excellent and good rate of OBCS (92.00%) was significantly higher than that of traditional BCS (74.00%); the Hamilton Anxiety Rating (HAMA) and Hamilton Depression Rating (HAMD) scores of patients in the postoperative OBCS were significantly lower than those in the traditional BCS; the scores of all items in the OBCS were significantly higher than those in the traditional breast conserving surgery treatment group; the total complication rate of OBCS was significantly lower than that of traditional BCS; within 1 year of follow-up, there was no significant difference in the recurrence rate and metastasis rate between the two groups ( $p > 0.05$ ). It can be seen that compared with BCS, OBCS has better cosmetic effect, improves the poor psychological state of patients, improves the quality of life of patients, and has fewer complications.

**Keywords**

Breast cancer; Traditional breast conserving surgery; Oncoplastic breast conserving surgery; Psychological state; Quality of life

## 1. Introduction

According to the 2022 Cancer Report released by the National Cancer Center, cancer prevalence and mortality continue to rise in China, with lung cancer and breast cancer (BC) being the most common cancers in males and females, respectively [1]. BC is typically characterized by a painless lump in the breast, and its pathophysiology is related to aberrant expression of estrogen [2]. Middle-aged and elderly females aged 40–60 years are at high risk of BC [3]. Surgical treatment is still the preferred treatment for breast cancer patients, but the choice of surgical methods should comprehensively evaluate the breast cancer stage and physical conditions, such as breast preservation surgery is generally suitable for patients, the maximum diameter of the tumor is less than 3 cm, and can retain the appropriate breast volume and good breast shape after surgery. Related research points out that the prognosis of breast cancer is closely related to the development stage of disease, the earlier the disease detection, the greater the chance of survival in five years, according to the international cancer organization, breast cancer patients 5 years relative survival

rate is 89.9%, including cancer *in situ* 5-year survival rate is 98.8%, invasive cancer 5-year survival rate is 85.5%, postoperative survival is satisfactory [4]. Breast-conserving surgery (BCS) is a common and highly curative treatment for early-stage BC that allows resection of the lesion while preserving the breasts. However, traditional BCS is highly traumatic and results in unsatisfactory aesthetic outcomes for the breasts [5]. With the development and application of cosmetic technologies in recent years, oncoplastic BCS (OBCS) has emerged as a novel surgical concept that intricately integrates the theory and techniques of cosmetic surgery with BCS. Unlike traditional BCS, OBCS does not require direct suture of the mammary glands after mass resection nor complete mastectomy for breast reconstruction. In addition, large pieces of donor tissues or prosthetics are also not required for this procedure [6]. OBCS not only retains the breast-conserving advantages of traditional BCS, such as complete tumor resection and breast preservation, but also preserves the natural shape and aesthetics of the breasts. It has been reported that OBCS is minimally invasive and has lower incidence of complication and faster postoperative recovery than breast reconstruction

[7, 8]. Although the aesthetic outcomes of OBCS have been ascertained through its increased clinical application in recent years, the effects of OBCS on the psychological status, quality of life (QoL) and survival prognosis of BC patients have seldom been examined [9]. Therefore, the present study aims to evaluate the effects of OBCS on these aspects in order to provide support for the selection of treatment in early-stage BC.

## 2. General data and methods

### 2.1 General data

Clinical data were collected from early-stage BC patients who were admitted and treated at our hospital. Inclusion criteria: (1) Stage I–II unilateral BC confirmed by surgery and pathology [10] without distant metastasis; (2) Had symptoms that met the clinical indications for BCS (<3 cm tumor, tumor margin >2 cm from the areolar margin), retained good breast appearance after surgery and voluntarily underwent BCS; (3) Has smart phones, able to complete self-reported questionnaires, has high adherence and no communication barrier; (4) Has stable conditions after BCS and able to complete recent study follow-ups; (5) Has complete clinical data, was informed of the study contents and has voluntarily signed the informed consent form for study participation. Exclusion criteria: (1) Comorbid with other malignant tumors, acute or chronic infectious diseases or severe organ dysfunction; (2) Mental illness, poor adherence or inability to complete follow-up; (3) Advanced stage BC or distant metastases, extensive or multifocal tumor lesions, diffused malignant calcification that prevents marginal resection or achieving an ideal appearance or inflammatory BC; (4) Pregnant or breastfeeding females; (5) Incomplete data or unwillingness to sign informed consent form and participate in study after informed consent. A final total of 100 patients were selected and randomized into the traditional BCS group (n = 50) and OBCS group (n = 50) using the random number table. The general patient characteristics were comparable between the two groups. This study was conducted in compliance with the Declaration of Helsinki (1964).

### 2.2 Treatments

#### 2.2.1 Traditional BCS

Patients in this group were treated with conventional traditional breast preservation, conventional preoperative preparation, imaging examination, supine position, disinfection, napkin laying and general anesthesia, which should take into account the convenience of surgical anatomy and postoperative physical effect. Tumor resection and axillary dissection were performed as recommended by the National Surgical Breast and Bowel Cancer Program (NSABP). The incision design of tumor resection should be centered on the nipple, and the breast should be divided into the upper and lower parts in the upper part with the radial incision centered at the nipple; the incision of the axillary anatomy should be designed as an oblique incision parallel to the axillary fold line (about 5–6 cm long). Lymph node dissection was performed according to relevant diagnosis and treatment guidelines. Sentinel

lymph node biopsy (SLNB) was performed to ensure the accuracy of dissection and avoid unnecessary damage. If SLN biopsy is negative, axillary lymph node dissection may not be performed. At the end of the operation, the patient's vital signs were closely followed, and routine washing, suture, anti-infection, drainage tube placement, local pressure dressing and incision were given. For breast cancer removal, the age, fertility history and lactation history should be fully considered to ensure the best filling effect, but not for all patients with breast cancer.

#### 2.2.2 OBCS

OBCS was performed on the patients, which involved conventional preoperative preparations and radiological examinations. Mainly include gland remodeling method and plastic surgery based on breast and breast lift, gland remodeling method is suitable for small-medium breast, breast without sagging or only I degree droop, and smaller tumor patients, based on breast and breast lift surgery is suitable for medium or large and with sagging breasts. It mainly includes tennis racket method, bat wing method and double ring method, tennis racket method is one of the most commonly used plastic surgery, the quadrant where the tumor is located and the relationship with the nipple areola complex and the lower wrinkle, which can have a lot of improved changes. For tumors in the lower quadrant outside the breast, the long axis of the wedge is not necessarily straight, and it can be curved along the direction of the skin pattern; if the extensive removal of the tumor in the lower quadrant of the nipple and the T incision; the incision is a Z-shaped incision. The author believes that the vertical incision method in breast and the J-shaped incision method in the tumor is located outside. Bat wing method is suitable for tumor small and close to the nipple and areola complex patients, especially in the tumor in the nipple, the traditional breast-conserving surgery often due to the defect of the lower nipple gland nipple mouth deformity, and the operation due to special bat wing incision design behind the nipple gland and incision to the gland, the nipple rear support, thus eliminating the deformity. The double ring method is suitable for small or medium sized breasts, and breasts with I sagging, especially for patients with large areola. It is suitable for tumors close to the areola and located in any quadrant of the breast, but it works better for the upper and lateral tumors of the breast. After the completion of breast plastic surgery, that is, suture gland, suspension to fix the breast, breast or non-breast tissue as far as possible by filling, rotation, lift, plastic and other ways, the application of gland remodeling method to the shape of the breast is not changed, often do not need the healthy side of the breast symmetry surgery. However, breast conserving plastic surgery based on breast shrinkage and breast lifting has a great change to the appearance of the breast, so the healthy breast often needs symmetrical surgery at the same time to achieve better appearance effect. The postoperative treatment is similar to the traditional BCS group.

Approximately six weeks after surgery, all patients receive radiotherapy of the affected breast. Patients younger than 50 years old are treated with whole breast irradiation (50 Gray (Gy) in 25 fractions) including a simultaneously integrated boost (SIB), for a total dose of 68.75 Gy. Patients over 50 years

old receive 40 Gy in 15 fractions with a SIB, for a total dose of 50.25 Gy. Radiotherapy strategies may vary slightly according to institutional guidelines. If necessary, a medical oncologist is consulted for the administration of systemic therapy. Adjuvant therapy is administered according to national guidelines. When multiple axillary lymph node metastases are diagnosed, patients will receive adjuvant therapy prior to radiotherapy.

## 2.3 Outcome measures

### 2.3.1 Perioperative measures

The surgery time, intraoperative bleeding volume, postoperative drainage volume and length of stay (LOS) were compared between the two groups.

### 2.3.2 Aesthetic outcomes

The breasts of patients were aesthetically assessed at 6 months post-surgery based on the following criteria: (1) Excellent: symmetrical breasts,  $\leq 2$  cm difference in bilateral nipple height, affected breast was similar to healthy breast with normal appearance and normal skin; (2) Good: symmetrical breasts,  $\leq 3$  cm difference in bilateral nipple height, affected breast appears generally normal or slightly smaller than healthy breast with lightened or bright skin; (3) Poor: asymmetrical breasts,  $> 3$  cm difference in bilateral nipple height, affected breast is deformed and significantly smaller than the healthy breast with thickened and rough skin. The aesthetic effect of treatment was measured by the excellence rate [11].

### 2.3.3 Psychological status

Anxiety and depression scores at 6 months post-surgery were compared between the two groups. Anxiety was assessed using the HAMA scale [12], which divides the symptoms of anxiety into physical and mental. The scale consists of 14 items, each rated on a 5-point scale wherein 0 is not present, 1 is mild, 2 is moderate, 3 is severe and 4 is very severe. A score of  $< 7$  points indicates no anxiety, and the severity of anxiety increases as the total score increases by every 7 points. Depression was evaluated using the HAMD scale [13], which has a 7-factor structure that contains 17 items, each rate on a 5-point scale similar to the HAMA scale. A total score of  $> 24$  points indicates severe depression, 17–24 points indicates definite depression, 7–17 points indicates probable depression, and  $< 7$  points indicates no depression.

### 2.3.4 Quality of life

The QoL of patients at 6 months post-surgery was measured using the Functional Assessment of Cancer Therapy (FACT) scale [14]. This scale consists of 5 domains and 36 items, each rated on a 5-point scale. A high score for each domain indicates high QoL.

### 2.3.5 Postoperative complications and 1-year recurrence

The incidences of subcutaneous hemorrhage, subcutaneous effusion, upper limb lymphedema and mild skin flap necrosis at 6 months post-surgery, as well as recurrence and metastasis rates at 1-year post-surgery were determined for the two groups

of patients.

## 2.4 Statistical analysis

Data were tabulated and analyzed using SPSS 23.0 (SPSS Inc., Chicago, IL, USA). Measurement data that meet the sample mean requirement, such as perioperative measures, psychological status and QoL scores, were compared using the independent sample *t*-test. Aesthetic outcomes, postoperative complications, and recurrence and metastasis rates were compared using the chi-square test. A  $p < 0.05$  was considered statistically significant.

## 3. Results

### 3.1 General patient data

In the traditional breast conserving surgery treatment group, the average age was  $(43.46 \pm 3.16)$  years, the average tumor diameter was  $(1.45 \pm 0.36)$  cm, and the tumor location: 32 cases in the outer upper quadrant, 7 cases in the inner upper quadrant, 6 cases under the areola and 5 cases in the outer lower quadrant. Clinical stage of tumor: 22 patients with stage I and 28 patients with stage II. Fertility status: 38 cases have given birth and 12 cases have not given birth. The average age of patients in the plastic and breast conserving surgery treatment group was  $(44.27 \pm 3.96)$  years old, the average tumor diameter was  $(1.57 \pm 0.38)$  cm and the tumor location: 30 cases in the outer upper quadrant, 7 cases in the inner upper quadrant and 7 cases under the areola and 6 cases in the outer lower quadrant. Clinical stage of tumor: 24 patients with stage I and 26 patients with stage II. Fertility: 35 cases have given birth and 15 cases have not given birth.

### 3.2 Perioperative measures

The perioperative measures of the two group are summarized in Table 1. The OBCS group had significantly longer surgery time but lower intraoperative bleeding volume, postoperative drainage volume and LOS than the traditional BCS group (all  $p < 0.05$ ).

### 3.3 cosmetic result

The aesthetic outcomes of the two groups are shown in Table 2. Poor outcomes were observed in 13 patients in the traditional BCS group and 4 patients in the OBCS group. The excellence rate was significantly higher in the OBCS group (92.00%) than in the traditional BCS group (74.00%) ( $p < 0.05$ ).

### 3.4 Psychological status

The anxiety and depression scores of patients before and after surgery are shown in Table 3. HAMA and HAMD scores were similar between the two groups before surgery ( $t = 0.307$  and  $1.744$ ;  $p = 0.706$  and  $0.084$ ) but were significantly decreased in both groups after surgery. Furthermore, HAMA and HAMD scores were significantly lower in the OBCS group than in the traditional BCS group ( $p < 0.05$ ).

**TABLE 1. Comparison of perioperative measures ( $\bar{x} \pm s$ ).**

Group	Number of patients	Surgery time (min)	Intraoperative bleeding volume (mL)	Postoperative drainage volume (mL)	Length of stay (d)
Traditional BCS	50	108.96 ± 19.53	139.09 ± 15.38	220.16 ± 28.95	5.61 ± 0.59
OBCS	50	142.84 ± 18.13	103.22 ± 12.09	151.94 ± 32.03	4.78 ± 0.70
<i>t</i>		8.990	12.965	11.174	6.401
<i>p</i>		<0.001	<0.001	<0.001	<0.001

BCS: breast-conserving surgery; OBCS: oncoplastic breast-conserving surgery.

**TABLE 2. Comparison of cosmetic result.**

Group	Number of patients	Excellent	Good	Poor	Excellence rate
Traditional BCS	50	21 (42.00)	16 (32.00)	13 (26.00)	74.00%
OBCS	50	33 (66.00)	13 (26.00)	4 (8.00)	92.00%
$\chi^2$					5.741
<i>p</i>					0.017

BCS: breast-conserving surgery; OBCS: oncoplastic breast-conserving surgery.

**TABLE 3. Comparison of negative emotions ( $\bar{x} \pm s$ ).**

Group	Number of patients	Time	HAMA (points)	HAMD (points)
Traditional BCS	50	Before surgery	25.29 ± 3.09	36.96 ± 2.94
		After surgery	17.48 ± 2.01	27.42 ± 3.09
OBCS	50	Before surgery	25.08 ± 3.83	37.96 ± 2.80
		After surgery	13.99 ± 2.40	22.68 ± 2.96
<i>t</i>			7.871	7.816
<i>p</i>			<0.001	<0.001

BCS: breast-conserving surgery; OBCS: oncoplastic breast-conserving surgery; HAMA: Hamilton Anxiety Rating; HAMD: Hamilton Depression Rating.

### 3.5 QoL

The pre- and post-surgery QoL scores of the 100 BC patients are summarized in Table 4. QoL scores for the 5 domains were similar between the two groups before surgery ( $t = 0.998, 1.322, 0.300, 1.096$  and  $0.396; p = 0.321, 0.189, 0.764, 0.276$  and  $0.693$ ) and were increased after surgery. In addition, post-operative QoL scores were significantly higher in the OBCS group than in the traditional BCS group ( $p < 0.05$ ).

### 3.6 Postoperative complications

As shown in Table 5, there were no significant differences in the incidences of subcutaneous hemorrhage, subcutaneous effusion, upper limb lymphedema and mild skin flap necrosis between the two groups after surgery (all  $p > 0.05$ ). However, the total incidence of complications was significantly lower in the OBCS group (18.00%) than in the traditional BCS group (48.00%) ( $p < 0.05$ ).

### 3.7 Recurrence and metastasis at 1 year post-surgery

In the 1-year postoperative follow-up, local recurrence and distant metastases were observed in 3 and 4 patients of the

traditional BCS group and 2 and 2 patients of the OBCS group, respectively. There were no significant differences in the 1-year recurrence and metastasis rates between the two groups ( $\chi^2 = 0.211$  and  $0.709; p = 0.646$  and  $0.400$ ).

## 4. Discussion

BC is the most common malignancy in females and is prevalent in about 11% of the global population. In China, BC is found in about 16% of the population and ranks first among malignancies in female patients [15, 16]. BC is caused by the aberrant proliferation of breast epithelial cells due to the effects of carcinogens. Early-stage BC is mainly characterized by mild symptoms such as breast lump and nipple discharge and is hence easily overlooked. However, as BC progresses to the advanced stage, cancer cells metastasize and invade multiple organs such as the lungs, pleura, bones and liver, which consequently causes multiorgan damage and poses a serious threat to the health of the patients [17]. Treatment plans can vary greatly among BC patients with different staging and conditions. Breast conserving surgery is a surgical method for early breast cancer. The choice of breast conserving surgery and plastic surgery needs to fully consider the size of the breast,

**TABLE 4. Comparison of QoL ( $\bar{x} \pm s$ ).**

Group	Number of patients	Time	Physical	Social/family	Emotional	Functional well-being	Additional concerns
Traditional BCS	50	Before surgery	12.76 $\pm$ 1.83	15.37 $\pm$ 1.53	13.02 $\pm$ 1.39	11.25 $\pm$ 3.03	16.48 $\pm$ 1.88
		After surgery	16.10 $\pm$ 1.40	17.70 $\pm$ 1.43	15.75 $\pm$ 1.44	15.35 $\pm$ 2.32	20.63 $\pm$ 3.07
OBCS	50	Before surgery	13.09 $\pm$ 1.51	15.75 $\pm$ 1.37	12.94 $\pm$ 1.08	11.81 $\pm$ 1.89	16.33 $\pm$ 2.06
		After surgery	17.99 $\pm$ 1.56	20.44 $\pm$ 1.39	18.11 $\pm$ 1.47	16.51 $\pm$ 1.66	23.17 $\pm$ 2.03
<i>t</i>			6.378	9.697	8.091	2.859	4.884
<i>p</i>			<0.001	<0.001	<0.001	0.005	<0.001

BCS: breast-conserving surgery; OBCS: oncoplastic breast-conserving surgery.

**TABLE 5. Comparison of postoperative complications.**

Group	Number of patients	Subcutaneous hemorrhage	Subcutaneous effusion	Upper limb lymphedema	Mild skin flap necrosis	Total incidence
Traditional BCS	50	5 (10.00)	7 (14.00)	8 (16.00)	4 (8.00)	48.00%
OBCS	50	2 (4.00)	3 (6.00)	3 (6.00)	1 (2.00)	18.00%
$\chi^2$		1.362	1.778	2.554	1.895	10.176
<i>p</i>		0.240	0.182	0.110	0.169	0.001

BCS: breast-conserving surgery; OBCS: oncoplastic breast-conserving surgery.

the location of the tumor, and whether the breast cancer has spread to the axillary lymph nodes and other sites. The most important thing is to respect the patient's personal wishes. However, studies found that patients who had traditional BCS alone have significantly lower QoL than those who had post-BCS breast reconstruction [18, 19]. De la Cruz Ku *et al.* [20] showed that physiological and psychological integrity are key measures for evaluating QoL, and breast morphology is an important factor that influences the psychological state of the patients. Therefore, choosing the appropriate surgical method is very important for early-stage BC patients. Although traditional BCS has become the preferred treatment for early-stage BC, its invasiveness, high incidence of postoperative complications, and impact on postoperative breast appearance have substantially decreased patient satisfaction [21]. In addition, traditional BCS not only results in unsatisfactory breast restoration but is also susceptible to cancer recurrence, which consequently increases the psychological pressure of female patients and seriously affects their QoL [22, 23]. With the increased application of minimally invasive medicine, OBCS has emerged as a new surgical approach that is gradually being adopted in the clinical treatment of early-stage BC. OBCS has demonstrated favorable efficacy in BC, especially in terms of breast aesthetics and patient satisfaction, and is hence more easily accepted by patients [24]. A study by Oh *et al.* [25] showed that unlike traditional BCS, OBCS can meet the breast aesthetic requirements of most patients and minimally affect the patients' life and work.

In the present study, we compared the effect of traditional BCS versus OBCS on the perioperative parameters, aesthetic outcomes, psychological status, QoL, postoperative complications, and cancer recurrence and metastasis of early-stage BC patients. Our results demonstrated that during the perioperative period, OBCS resulted in significantly lower intraop-

erative bleeding volume, postoperative drainage volume and LOS than traditional BCS. Though, surgery time was significantly prolonged in OBCS and may be related to the successive performance of tumor resection and breast reconstruction. The lower intraoperative bleeding volume and postoperative drainage volume may be attributed to the three small incisions (5–10 mm) required by OBCS, which can promote postoperative recovery and prevent significant scarring [26]. Consistent with previous findings, we demonstrated that OBCS increases postoperative breast aesthetics [27, 28]. In traditional BCS, the residual cavity is generally not sutured to maintain breast aesthetics, and filling with fibrin and serum can increase residual cavity pressure and incision tension, which are unfavorable for or can delay wound healing and can thereby prolong postoperative recovery time and LOS [29]. On the other hand, OBCS leverages cosmetic surgery techniques to preserve the breasts. Despite its prolonged surgery time, OBCS combines the repair of residual cavity by non-cancerous gland rearrangement with breast filling and shaping, which together improves postoperative breast aesthetics [30].

Assessments of psychological status and QoL at 6 months post-surgery demonstrated that the OBCS group had significantly lower anxiety and depression scores and higher QoL than the traditional BCS group. Through follow-up visits and conversations with the patients, patients who received traditional BCS suffered from unsatisfactory breast aesthetics and were especially afraid to wear flattering clothes, leading to decreased self-esteem in front of other female colleagues. In addition, sexually active patients had drastically reduced sexual QoL and markedly increased self-abasement. In contrast, OBCS encompasses both tumor resection and cosmetic breast reconstruction, which allows removal of breast tissue from the affected side through breast lift or reduction or adjustment of postoperative symmetry of the breasts to enhance

postoperative aesthetics. OBSC emphasizes that postoperative aesthetics is equally as important as anticancer efficacy. This surgical technique enables surgeons to minimize the risk of cancer recurrence while preventing significant breast deformity and ensuring satisfactory aesthetic outcomes. We found that compared with traditional BCS, OBSC had significantly lower total incidence of postoperative complications, which may be related to the use of the gland rearrangement technique rather than of filling with other substances. Furthermore, 1-year follow-up of patients showed that tumor recurrence and metastasis rates were similar between the two groups, confirming that OBSC can achieve good local tumor control.

## 5. Conclusions

In summary, OBSC is a surgical approach that not only enhances postoperative recovery and breast aesthetics, but also improves psychological status, increases postoperative QoL, lowers postoperative complications and exerts satisfactory local tumor control in early-stage BC patients. The limitation of this paper is that the research content is through the questionnaire form, did not check patients serological indicators, in addition, in this study, only short-term follow-up was performed for time, but subsequent for further evaluation of breast cancer recurrence, should consider 3 years and 5 years, so to explore the clinical value of plastic surgery, subsequent we will further expand the number of study samples, do further exploration.

## AVAILABILITY OF DATA AND MATERIALS

The authors declare that all data supporting the findings of this study are available within the paper and any raw data can be obtained from the corresponding author upon request.

## AUTHOR CONTRIBUTIONS

XPZ—designed the study and carried them out. XPZ and PPJ—supervised the data collection, analyzed the data, interpreted the data. XPZ and JY—repared the manuscript for publication and reviewed the draft of the manuscript. All authors have read and approved the manuscript.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Ethics Committee of Qingdao Municipal Hospital (Approval no. 2024-LW-002). Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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