

# Application value of laparoscopy in radical mastectomy and omental breast reconstruction

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**Abstract.** Application value of laparoscopy in radical mastectomy and omental breast reconstruction was explored. The medical records of 104 patients undergoing radical mastectomy and omental breast reconstruction from July 2015 to August 2017 in Inner Mongolia Xing'an League People's Hospital were retrospectively analyzed. Fifty-three patients undergoing laparoscopic surgery were the experimental group and 51 patients undergoing open surgery were the control group. The surgery conditions, upper limb function, postoperative complications, volume similarity between unilateral subcutaneous glands and autologous omentum, cosmetic excellent rate and treatment satisfaction were observed. The surgical duration of the patients in the experimental group was significantly longer than that in the control group, but the intraoperative blood loss was less and hospital stay was significantly shorter than that in the control group ( $P < 0.05$ ). The improvement of upper limb function in the experimental group was significantly better than that in the control group ( $P < 0.05$ ). The cosmetic excellent rate in the experimental group was significantly higher than that in the control group ( $P < 0.001$ ). The incidence of postoperative complications in the experimental group was significantly less than that in the control group ( $P < 0.001$ ). The satisfaction degree of patients in the experimental group was significantly higher than that in the control group ( $P < 0.001$ ). Filling the autologous omentum while excising the unilateral mammary gland is an equivalent replacement, which can make the appearance of the breast on the operation side similar to that on the healthy side, thus improving the excellent rate of breast beauty and patient satisfaction.

## Introduction

As a malignant tumor, breast cancer is highly prevalent in females and seriously affects their physical and mental

health (1). It has long been treated by traditional total mastectomy that has a high success rate and low local recurrence rate (2,3). However, severe asymmetry caused by postoperative absence of unilateral or bilateral breasts leads to physical and psychological disorders, which may seriously affect the physical and mental health of the patient (4). The greater omental tissue is soft and muscle-free, which is close to the breast cancer tissue and does not cause disuse atrophy, so it is the ideal breast reconstruction filler for female patients after radical mastectomy (5). The first application of greater omentum for breast reconstruction after radical mastectomy was in 1963, which was not promoted because open wounds for the extraction of the greater omentum resulted in a large trauma to the patient (6). However, according to a study in 2002, laparoscopy was used to obtain the greater omentum in order to fill the breasts, which effectively reduced the trauma and was widely recognized (7).

The traditional radical mastectomy is an open surgery, which causes a great trauma to the patient and is not conducive to postoperative recovery. Additionally, papillary necrosis, incisional scar proliferation and slow gastrointestinal motility and other postoperative complications have been difficult problems in clinical practice (8,9). With the development of medical technology, laparoscopy has gradually been applied in breast diseases due to its simple operation and small trauma (10). Currently, there are few studies on the application of laparoscopy in radical mastectomy and omental breast reconstruction, the applied value of which is therefore evaluated in this study.

## Patients and methods

*General information.* A retrospective analysis was made on the data from 104 patients receiving radical mastectomy and omental breast reconstruction from July 2015 to August 2017 in Inner Mongolia Xing'an League People's Hospital (Ulanhot, China). The patients were divided into two groups: 51 patients in the control group, who had open surgery of radical mastectomy and omental breast reconstruction was performed, and 53 patients in the experimental group who had radical mastectomy and omental breast reconstruction was performed assisted by a laparoscope. The two groups of patients were comparable since they were not significantly different in terms of age, BMI and clinical stage ( $P > 0.05$ ) (Table I).

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Table I. General information.

Factors	Experimental group (n=53)	Control group (n=51)	t/ $\chi^2$ value	P-value
Age			0.000	0.979
≤40	30 (56.60)	29 (56.86)		
>40	23 (43.40)	22 (43.14)		
BMI (kg/m <sup>2</sup> )			0.003	0.960
≤21	20 (37.74)	19 (37.25)		
>21	33 (62.26)	32 (62.75)		
Marital status			0.174	0.895
Married	41 (77.36)	40 (78.43)		
Unmarried	12 (22.64)	11 (21.57)		
Pathological type			0.203	0.977
Papillary carcinoma	15 (28.30)	14 (27.45)		
Medullary carcinoma	13 (24.53)	13 (25.49)		
Mucinous adenocarcinoma	12 (22.64)	13 (25.49)		
Adenoid cystic carcinoma	13 (24.53)	11 (21.57)		
Tumor diameter (mm)	18.75±2.96	18.65 ±2.81	0.177	0.860
Tumor stage			0.049	0.826
Stage I	24 (45.28)	22 (43.14)		
Stage II	29 (54.72)	29 (56.86)		
Childbearing history			0.014	0.905
Yes	40 (75.47)	39 (76.47)		
No	13 (24.53)	12 (23.53)		

*Inclusion and exclusion criteria.* Inclusion criteria were: Patients with pathological diagnosis of breast cancer; patients with single tumor and with a maximum diameter of 3 cm; patients aged over 18 years; patients with surgical indications. Exclusion criteria were: Patients with severe liver and kidney dysfunction; patients with a predicted survival time of less than 1 year; patients unsuitable for surgery; patients with distant metastases of tumor; patients with a history of radiotherapy or chemotherapy.

This study was carried out with the approval of the Ethics Committee of Inner Mongolia Xing'an League People's Hospital and an informed consent from all the patients and their families.

*Surgical methods.* General anesthesia was performed in both groups. The specific surgical methods of the experimental group were the following: Holes were separately made on the tumor side at the patient's axillary, the outer edge of the breast, the outer surface of the areola, and the inframammary fold as the laparoscopic operation holes, and the lymph nodes of the axillary was cleaned through the three holes at the outer surface of the areola, the outer edge of the breast, and the inframammary fold. The mammary gland was removed through the holes at the axillary, the inframammary fold, and the outer edge of the breast. An extension of 4 cm was made at the inframammary fold incision, through which the mammary gland and the axillary lymph nodes were taken out, and two drainage tubes were separately connected to the incision of inframammary fold and the remaining cavity of mammary gland. Three operation holes

were made respectively at the lower part of the right costal margin, and at the right and left locations 7 cm away from the umbilicus, and an observation hole in the abdomen was established to observe the size and adhesion of the omentum. Next, an ultrasonic scalpel was used to separate the omentum on the transverse colon with every possible effort to retain all three branches of the omentum. A 25 cm longitudinal tunnel was then prepared below the xiphoid to get subcutaneous connection with the extended incision of the inframammary fold, and the separated omentum was dragged into the breast through the tunnel. After confirming a good beating of the branches of the omentum and a satisfactory breast filling, the extended incision was sutured and all the puncture holes were closed. Finally, the bandaging was carried out without pressing the breast.

The specific surgical methods of the control group were the following: A 25 cm incision on the tumor side from the axillary to the inframammary fold was finished to clean and remove the lymph nodes and mammary gland. The omentum was separated through an incision 7 cm away from the upper abdomen, then the same steps as in the tunnel establishment and breast filling in the experimental group were performed.

*Observation indicators.* i) The operation time, blood loss during the operation, and hospitalization time of the two groups. ii) The edema, physical feeling, and ability of abduction activity of the upper extremities within 2 months after the surgery. iii) The cosmetic effects on the treated breast were classified into four grades: excellent (with same shape as, similar color and touch feel to the healthy breast, and very

Table II. Comparison of surgical duration, intraoperative blood loss and hospital stay in two groups.

Items	Experimental group (n=53)	Control group (n=51)	t value	P-value
Surgical duration (min)	112.51±16.43	76.22±8.54	14.05	<0.001
Intraoperative blood loss (ml)	54.17±13.79	102.65±18.26	15.32	<0.001
Hospital stay (days)	9.61±2.52	14.93±3.71	8.58	<0.001

Table III. Cosmetic results of the breast of the patients in the two groups [n (%)].

Items	Experimental group (n=53)	Control group (n=51)	$\chi^2$ value	P-value
Excellent	39 (73.58)	11 (21.57)	28.17	<0.001
Good	8 (15.09)	13 (25.49)	1.743	0.187
Acceptable	6 (11.32)	20 (39.22)	10.79	<0.001
Poor	0	7 (13.73)	6.48	<0.050
Success rate	47 (88.68)	24 (47.06)	20.78	<0.001

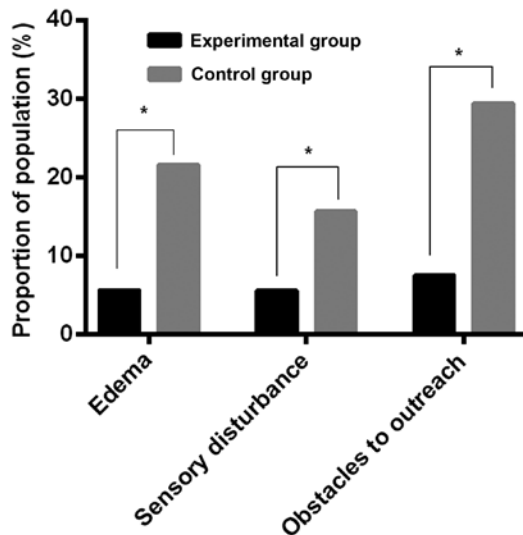


Figure 1. Comparison of upper limb function two months after operation. The ratio of the patients with edema, sensory disorder, and obstacles to outreach in upper limb function in the experimental group was significantly lower than that in the control group, and the improvement of upper limb function in the experimental group was significantly better than that in the control group, and the difference was statistically significant ( $P<0.05$ ).

few surgical marks), good (with similar shape to and slightly different color and touch feel from the healthy breast), acceptable (with slight unsymmetry, different touch feel from the healthy breast, and obvious surgical marks), and poor (with substantial unsymmetry, rough hand feeling, breast atrophy or greatly changed breast shape). iv) The similarity between the volumes of unilateral subcutaneous mammary gland and autologous omentum in the two groups of patients. v) Complication during the follow-up in the two groups, including flap necrosis, subcutaneous effusion, and post-operative infection of omental transplantation. vi) Patients' satisfaction of the treatment according to the questionnaire which was classified into three grades: very satisfied, satisfied and dissatisfied. All indicators were recorded and compared between the two groups.

*Statistical analysis.* In this experiment, SPSS 18.0 software (Beijing ND Times Technology Co., Ltd.) was used for statistical analysis. The enumeration data were measured by Chi-square test. The measured data were expressed as mean  $\pm$  SD. The comparison between the two groups was conducted by independent t-test.  $P<0.05$  indicated a statistically significant difference.

## Results

*Comparison of surgical duration, intraoperative blood loss and hospital stay of the patients in the two groups.* The surgical duration in the experimental group was significantly longer than that in the control group, and the difference was statistically significant ( $P<0.05$ ). However, the intraoperative blood loss and hospital stay in the experimental group were significantly better than those in the control group, and the difference was statistically significant ( $P<0.05$ ) (Table II).

*Comparison of upper limb function two months after operation.* The ratio of the patients with edema, sensory disorder, and obstacles to outreach in upper limb function in the experimental group was 5.66, 5.66, and 7.55%, respectively, which in the control group was 21.57, 15.69, and 29.41%, respectively. The improvement of upper limb function in the experimental group was significantly better than that in the control group, and the difference was statistically significant ( $P<0.05$ ) (Fig. 1).

*Comparison of cosmetic results of the breast.* The number of the patients whose cosmetic results were excellent, good, acceptable, and poor in the experimental group was 39, 8, 6, and 0, respectively with a success rate of 88.68%. The number in the control group was 11, 13, 20, and 7, respectively with a success rate of 47.06%. The cosmetic excellent rate in the experimental group was significantly higher than that in the control group, and the difference was statistically significant ( $P<0.05$ ) (Table III).

Table IV. Incidence of postoperative complications.

Items	Experimental group (n=53)	Control group (n=51)	$\chi^2$ value	P-value
Skin flap necrosis	2 (3.77)	4 (7.84)	0.792	0.374
Subcutaneous effusion	1 (1.89)	7 (13.73)	5.130	<0.050
Postoperative infection of omental transplanted	2 (3.77)	6 (11.76)	2.337	0.126
Total incidence	5 (9.43)	17 (33.33)	8.901	<0.050

Table V. Comparison of treatment satisfaction [n (%)].

Items	Experimental group (n=53)	Control group (n=51)	$\chi^2$ value	P-value
Very satisfied	35 (66.04)	21 (41.18)	6.464	<0.050
Satisfied	17 (32.08)	14 (27.45)	0.266	0.606
Dissatisfied	1 (1.89)	16 (31.37)	16.52	<0.001
Total satisfaction	52 (98.11)	35 (68.63)	16.52	<0.001

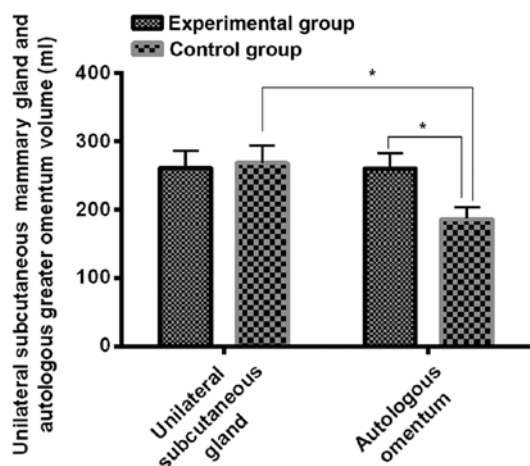


Figure 2. Comparison of the volume of unilateral subcutaneous mammary gland and autologous omentum. In the experimental group, there was no significant difference in the volumes of unilateral subcutaneous mammary gland and autologous omentum ( $P>0.05$ ), but in the control group, the volume of autologous omentum was significantly smaller than that of unilateral subcutaneous mammary gland, and the difference was statistically significant ( $P<0.05$ ).

*Comparison of the volume of unilateral subcutaneous mammary gland and autologous omentum.* In the experimental group, the volume of unilateral subcutaneous mammary gland and autologous omentum was respectively  $261.45 \pm 24.83$  and  $268.59 \pm 25.11$  ml, and was respectively  $260.71 \pm 21.35$  ml, and  $186.35 \pm 18.26$  ml in the control group. There was no significant difference in the unilateral subcutaneous mammary gland in the two groups ( $P>0.05$ ). In the experimental group, there was no significant difference in the volumes of unilateral subcutaneous mammary gland and autologous omentum ( $P>0.05$ ), but in the control group, the volume of autologous omentum was significantly smaller than that of unilateral subcutaneous mammary gland, and the difference was statistically significant ( $P<0.05$ ) (Fig. 2).

*Incidence of postoperative complications.* In the experimental group, the number of the patients with skin flap necrosis, subcutaneous effusion and postoperative infection of omental transplanted was 2, 1, and 2, respectively, with a total incidence of the complications of 9.43%. The number in the control group was 4, 7, and 6, respectively, with a total incidence of the complications of 33.33%. The total incidence in the experimental group was significantly lower than that in the control group, and the difference was statistically significant ( $P<0.05$ ) (Table IV).

*Comparison of treatment satisfaction.* The number of the patients who were very satisfied, satisfied and dissatisfied in the experimental group was 35, 17, and 1, respectively, with a total satisfaction of 98.11%. The number in the control group was 21, 14, and 16, respectively, with a total satisfaction of 68.63%. The total satisfaction in the experimental group was significantly higher than that in the control group, and the difference was statistically significant ( $P<0.05$ ) (Table V).

## Discussion

Surgery is the main treatment for breast cancer, but traditional surgery is not advised because of large trauma and bleeding, as well as slow recovery. Moreover, the absence of breast brings a great impact on physical and mental health of patients (11). With the development of minimally invasive technologies, laparoscopic surgery can promote the recovery of patients and reduce the incidence of complications (12).

In this study, the surgical duration in the experimental group was significantly longer than that in the control group because of complicated procedures of laparoscopic radical mastectomy and omental filling compared with the traditional surgery. However, the intraoperative blood loss and hospital stay in the experimental group were significantly better than those in the control group, indicating that laparoscopic surgery can reduce the amount of bleeding and promote the

recovery of patients. Previous studies have demonstrated that laparoscopic surgery was effective in promoting the recovery of patients (13,14). Moreover, upper limb function recovery in the experimental group was significantly better than that in the control group and complications were significantly lower than that in the control group. The study suggested that laparoscopic radical surgery and omental breast reconstruction was safer than the traditional surgery for treating breast cancer (15).

The mere use of minimally invasive techniques to remove breast cancer glands does not solve the problem of breast loss. Traditional breast conserving therapy (BCT) uses a transferred muscle flap for breast reconstruction, which not only causes large trauma, but also complications such as muscle atrophy, thus affecting the appearance of the breast (16). Some scholars put forward that omentum with similar touch feel to breast could be applied for breast filling in that omentum is rich in blood supply and can reduce the chance of skin flap necrosis, becoming the most suitable materials (17,18). In radical mastectomy, the removal of unilateral subcutaneous mammary gland and the filling of residual cavity with pedicled omentum can reconstruct the breast that is similar to the original one (19). In terms of free donor, the use of endoscope in reconstruction makes the incision design under the fold of the breast. Papilla and areola is similar to the contralateral one (20). More importantly, omentum with high survival rate and flexibility can reconstruct the contralateral breast of the original type (21). The current surgical concept is that under the premise of mastering indications and ensuring the cure of lesions, do a good job of one-stage breast reconstruction, conserve the breasts as much as possible and carry out breast reconstruction if they cannot be conserved (22). According to the comparison of the unilateral subcutaneous mammary gland with the autologous omentum with respect to volume, there was no significant difference in the experimental group, but the autologous omentum was significantly smaller than the unilateral subcutaneous mammary gland in the control group. This may be due to the fact that during open surgery, the greater omentum was exposed insufficiently at both ends of the surgical field, which resulted in an insufficient cut of the greater omentum and eventually smaller reconstructed breasts. It is believed that with the help of this relationship during laparoscopy, the fully dissociative pedicled omentum can be used to reconstruct the breasts basically the same as the original breasts in terms of size, shape and hand feel. Currently, there is no relevant literature for similar reports. In this study, the treatment satisfaction in the experimental group was significantly higher than that in the control group. It is believed that the higher treatment satisfaction in the experimental group is closely related to the fast recovery, less complications and better laparoscopic breast reconstruction with greater omentum.

Compared with the traditional open surgery, laparoscopy in radical mastectomy and free omental breast reconstruction has a longer surgical duration, but it can improve the postoperative recovery and reduce the effect of surgery on upper limb function. It was also found that the greater omentum can only be fully dissociated by endoscopic surgery, and the volume of the free omentum is similar to that of unilateral mammary gland. Filling the autologous omentum while excising the unilateral mammary gland is an equivalent replacement, which can make

the appearance of the breast on the operation side similar to that on the healthy side, thus improving the excellent rate of breast beauty and patient satisfaction. Therefore, laparoscopy is worth popularizing in radical mastectomy and free omental breast reconstruction.

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#### **Availability of data and materials**

The datasets used and/or analyzed during the present study are available from the corresponding author on reasonable request.

#### **Authors' contributions**

GS wrote the manuscript, analyzed and interpreted the patient data. XY performed the experiment, designed the study and was responsible for the analysis and discussion of the data. Both authors read and approved the final manuscript.

#### **Ethics approval and consent to participate**

The study was approved by the Ethics Committee of Inner Mongolia Xing'an League People's Hospital (Ulanhot, China). Patients who participated in this study had complete clinical data. Signed written informed consent was obtained from the patients and guardians.

#### **Patient consent for publication**

Not applicable.

#### **Competing interests**

The authors declare that they have no competing interests.

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