Subcutaneous Nipple-Sparing Mastectomy and Immediate Breast Reconstruction

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Keywords

Breast cancer · Immediate breast reconstruction · Mastectomy, nipple-sparing

Summary

Background: Without a doubt, nipple-sparing mastectomy affords a better cosmetic result than modified radical mastectomy. However, the surgical safety, radicality, complications, indications, and psychological benefits associated with this method are controversially discussed. **Patients and Methods:** We carried out a retrospective analysis of 35 patients (study group) who underwent nipple-sparing mastectomy between 2000 and 2008. Indications, incision selection, postoperative complications, recurrence, morbidity rate, and psychological status were recorded and assessed. **Results:** The survival outcome (5.7 vs. 6%; $p = 0.35$) and complication rate (5.7 vs. 19%; $p = 0.062$) of patients who underwent subcutaneous nipple-sparing mastectomy and immediate breast reconstruction with prosthesis were similar to those of patients who underwent modified radical mastectomy. Most patients in the study group were completely satisfied with the aesthetic results (immediately, $p < 0.001$; < 1 year, $p < 0.001$; > 1 year, $p < 0.001$), and no serious psychological disorders or stress were detected relative to patients with traditional mastectomy. **Conclusion:** Subcutaneous nipple-sparing mastectomy was beneficial and safe in this cohort of breast cancer patients. The approach is suitable for patients with isolated lesions located ≥ 2 cm from the nipple, as well as for patients with multiple lesions who are anxious about a good cosmetic appearance.

Schlüsselwörter

Mammakarzinom · Sofortige Mammarekonstruktion · Mastektomie, brustwarzenerhaltend

Zusammenfassung

Hintergrund: Zweifelsohne erzielt die brustwarzenerhaltende Mastektomie ein besseres kosmetisches Ergebnis als die modifizierte radikale Mastektomie. Chirurgische Sicherheit, Radikalität, Komplikationen, Indikationen und psychologische Vorteile der Methode werden jedoch kontrovers diskutiert. **Patienten und Methoden:** 35 Patienten (Studiengruppe), bei denen zwischen 2000 und 2008 eine brustwarzenerhaltende Mastektomie durchgeführt wurde, wurden retrospektiv analysiert. Indikationen, Wahl der Inzision, postoperative Komplikationen, Rezidive, Morbiditätsrate und psychologischer Status wurden aufgenommen und beurteilt. **Ergebnisse:** Hinsichtlich des Überlebens (5,7 vs. 6%; $p = 0,35$) und der Komplikationsrate (5,7 vs. 19%; $p = 0,062$) bestand kein Unterschied zwischen Patienten mit subkutaner brustwarzenerhaltender Mastektomie und sofortiger Mammarekonstruktion mittels Prothese und Patienten mit modifizierter radikaler Mastektomie. Die meisten Patienten in der Studiengruppe waren mit dem ästhetischen Ergebnis vollkommen zufrieden (sofort, $p < 0,001$; < 1 Jahr, $p < 0,001$; > 1 Jahr, $p < 0,001$), und verglichen mit Patienten mit einer traditionellen Mastektomie wurden keine ernststen psychologischen Erkrankungen oder Stress beobachtet. **Schlussfolgerung:** In unserer Studiengruppe war die subkutane brustwarzenerhaltende Mastektomie eine positive und sichere Maßnahme. Die Methode ist für Patienten mit isolierten, ≥ 2 cm von der Brustwarze entfernten Läsionen sowie für Patienten mit multiplen Läsionen, denen ein gutes kosmetisches Erscheinungsbild sehr wichtig ist, geeignet.

Introduction

Breast cancer is the most common cause of death in adult women [1]. The incidence increases year by year, and there is a trend for younger individuals to be affected at an increasing rate. The 5-year survival rates of patients with TNM stage 0–I and II are 96.8 and 73.7%, respectively [2]. Following modified radical mastectomy, disfigurement of the chest wall may severely affect a patient's quality of life. As a result, some young patients refuse to undergo this procedure, even though it provides a potential cure in the early stages of breast cancer. In recent years, breast reconstruction has been required in a significant proportion of patients with breast cancer [3, 4]. Although breast conservation has been accepted worldwide, the proportion of breast-conserving mastectomies performed accounted for less than 10% of the total amount of mastectomies in China between the years of 2001 and 2004. This figure is greater than 50% in America, 70–80% in Singapore, and 60% in Japan [5]. Because doctors and patients are concerned with recurrence due to residual mammary tissue, en bloc resection of the mammary gland is often performed, with radio-

therapy offering optimal postoperative treatment. However, not all patients are candidates for conservative surgery. Exclusion criteria include diffuse, suspicious, or malignant-appearing microcalcifications as detected by mammography, widespread disease, tumors ≥ 3 cm, and positive pathologic margins. As the treatment of patients with breast cancer is based on clinical data of both the patient and the existing lesions, subcutaneous nipple-sparing mastectomy with immediate breast reconstruction (IBR) has emerged as an alternative approach to breast conservation and can be employed following failure of breast-conserving surgery [6].

Materials and Methods

Study Group and Control Group

We performed a retrospective analysis of 35 patients who were treated with subcutaneous nipple-sparing mastectomy and IBR between 2000 and 2008. 100 patients randomly selected as the control group underwent modified radical mastectomy during the same time interval. Table 1 exhibits the clinical demographics of the patients in both groups. The study was approved by the ethics committee of The First Hospital of Jilin University, and informed consent was obtained from all patients. Breast cancer was confirmed using pathological methods, and cases with evidence of distant metastasis were excluded from the study. Some patients preferred one surgical approach over the other for aesthetic reasons. Intraoperative biopsies of mammary gland specimens resected from below the nipple-areola complex (NAC) confirmed that both the NAC and the skin were not cancerous. None of the patients suffered from other life-threatening or chronic diseases, such as ischemic heart disease, hypertension, chronic pulmonary diseases, diabetes mellitus, or polyvalent allergies. Likewise, patients in the control group did not have distant metastases or other diseases. All patients in the control group were assigned to undergo radical modified mastectomy between 2000 and 2008.

Surgery

Preoperative preparation included the assessment of breast volume to determine the size of the prosthesis. A combination of epidural and general anesthesia was used for the procedure. 3 types of incision were used: an S-shaped incision ending at the inferior border of the breast parallel to the areola (figs. 1 and 2), a fusiform incision with a radial incision to the areola extending in the direction of the axilla on the lateral breast (fig. 3), and an arc-shaped incision parallel to the axillary folds as made for mastoscopy (fig. 4). Following en bloc tumor removal, a pathological examination was performed to determine the pathological TNM stage and ensure that the cancerous tissue had been completely removed. The breast skin was then moved upward to the inferior clavicle margin and downward to the superior border of rectus abdominis, internal to the parasternal line and external to the leading edge of the latissimus dorsi muscle. The fascia was peeled from the surface of the pectoralis major muscle, and the prosthesis was implanted between the pectoralis major and pectoralis lesser. Axillary fat and lymph nodes were removed. The prosthesis and drainage tubes were placed, and the skin was sutured. In addition to surgery, patients in both groups received adjuvant treatment as recommended by the National Comprehensive Cancer Network (NCCN) guidelines [7], including chemotherapy regimens consisting of FAC (5-fluorouracil + adriamycin + cyclophosphamide), TAC (taxol + adriamycin + cyclophosphamide), or CMF (cyclophosphamide + methotrexate + 5-fluorouracil). Radiotherapy with a total dose of 50 Gy in 25 fractions was optimal for all patients in the study group, and it was up to the senior physician to determine whether or not postoperative radiotherapy was warranted. In the control group, patients with tumors ≥ 3 cm in

Table 1. Clinical demographics of patients

	Study group (n = 35)	Control group (n = 100)
Age, median, years	35.6	50.8
	Patients, n (%)	
Location		
Left	13 (37.1)	58 (58.0)
Right	20 (57.1)	39 (39.0)
Bilateral	2 (5.7)	3 (3.0)
Multifocal	3 (8.6)	5 (5.0)
Tumor size		
T1	14 (40.0)	34 (34.0)
T2	19 (54.3)	62 (62.0)
T3	2 (5.7)	4 (4.0)
Clinical stage		
I	12 (34.3)	28 (28.0)
II	18 (51.4)	63 (63.0)
III	5 (14.3)	9 (9.0)
Pathology		
Intraductal carcinoma	2	7
Intralobular carcinoma	0	1
Microinvasive ductal carcinoma	0	8
Microinvasive lobular carcinoma	0	2
Invasive ductal carcinoma	28 (80.0)	55 (55.0)
Invasive lobular carcinoma	1	8
Special pathological type		
Mucinous adenocarcinoma	2	5
Medullary carcinoma	1	8
Comedocarcinoma	0	1
Cribriform carcinoma	0	1
Paget's disease	0	2
Cystosarcoma phyllodes	1	1
Estrogen receptor		
Positive	25 (71.4)	62 (62.0)
Negative	10 (28.6)	38 (38.0)
Progesterone receptor		
Positive	18 (51.4)	54 (54.0)
Negative	17 (48.6)	46 (46.0)
HER-2		
Positive	16 (45.7)	37 (37.0)
Negative	19 (54.3)	63 (63.0)

Fig 1. Bilateral breast cancer (stage I) 60 months after reconstruction with implant.

Fig 2. Side view of the S-form incision.

Fig 3. Right breast cancer (stage I) 24 months after reconstruction with implant (fusiform incision above the tumor with radial incision to the areola).

Fig 4. Right breast cancer 12 months after reconstruction using endoscope-assisted axillary incision which is not visible.

diameter and metastatic axillary lymph nodes were treated with radiotherapy. Hormonal therapy was indicated for estrogen receptor-positive and/or progesterone receptor-positive patients (table 1).

Follow-Up

Follow-up was performed over the telephone or during an outpatient clinic visit. All patients were followed up over the course of 10–104 months. The median follow-up time was 68 months. All patients were evaluated once a year, and clinical data were collected over the telephone or during outpatient clinic visits. In total, 23 patients were followed for more than 54 months.

Statistical Methods

Statistical analysis was performed using SPSS 18.0 (SPSS Inc., Chicago, IL, USA). An χ^2 test was performed, and the log-rank test was applied to compare survival. A p value ≤ 0.05 was considered statistically significant.

Results

As shown in table 2, following surgery, 2 patients presented with seroma and infection, and 1 patient suffered from hematoma and infection. Seroma and flap necrosis occurred in 4 patients. There was no significant difference between the study group and the control group in terms of surgical rate of postoperative complications, local relapse, or distant metastasis.

Poor outcomes were correlated with age and axillary lymph node metastasis, and were not related to the surgical approach (table 3). Patients receiving breast reconstruction in our study were more satisfied with the postsurgical aesthetic appearance compared to those in the control group (table 4). The patients with subcutaneous nipple-sparing mastectomy and

IBR had higher levels of self-confidence as well as social and sexual activity than those who had undergone modified radical mastectomy. Psychological disorders in the study group were less common than in the control group (table 5). Implantation of a prosthesis prolonged the surgical time by only 17 min on average (table 6).

The median follow-up time was 68 months (range 10–104 months), and no severe complications were observed in either group. There was no significant difference detected in the clinicopathologic data between both groups. 94.3% of the patients were satisfied with the aesthetic outcome following breast reconstruction. Moreover, in the study group, 33 patients (94.3%) were still alive at the end of the study.

Two patients in the study group had local recurrence; 1 had supraclavicular lymph node metastasis and the other presented with metastatic lesions in the areola area and the NAC 4 years after she had refused postoperative radiotherapy and was treated only with CMF chemotherapy and hormonal therapy. Both patients survived the recurrence. 2 patients in the study group had distant metastasis; 1 patient with involved axillary lymph nodes presented with lung and bone metastases

9 months after surgery, and 1 patient with 10 involved axillary lymph nodes died of multiple organ metastases 2 years following surgery. Compared with the randomly selected patients treated with modified radical mastectomy, there were no statistically significant differences in the rates of distant metastasis, recurrence, or death.

Discussion

NAC-sparing surgery is associated with better cosmetic outcome compared to modified radical mastectomy [8]. Subcutaneous mastectomy that spares the NAC plus IBR has been advocated for patients with early-stage breast cancer [9]. However, many surgeons and patients are concerned about potential relapse and resectability [10]. Unfortunately, some mammary tumors are still difficult to completely resect despite the choice of mastectomy procedures. According to recent studies [11–13], relapse rate and resectability are similar between traditional modified radical mastectomy and NAC-sparing mastectomy.

In our 35 cases with subcutaneous nipple-sparing mastectomy and IBR, the prosthesis had translocated upward in 2 cases of which 1 required removal of the implant because of severe infection. All of the others had good cosmetic outcomes with satisfaction rates of 94.3%. The incidences of subcutaneous edema and hemorrhage were significantly lower in the study group compared to the control group. However, subcutaneous infection was more common in the study group, although this trend did not reach statistical significance. 1 patient who presented with a positive sentinel lymph node received a second surgery with a second pathological examination to confirm the diagnosis. Regardless of the surgical procedure, the number of operations is an independent factor for infection [14]. As surgical techniques and instruments improve, infection rates are gradually declining [14, 15]. Compared with the latissimus dorsi and rectus abdominis flap,

Table 2. Postoperative complications, recurrence, and morbidity rate

Complications	Patients, n (%)		p
	study group (n = 35)	control group (n = 100)	
Seroma	1 (2.9)	14 (14.0)	0.135 ^a
Hematoma	0 (0.0)	2 (2.0)	1.000 ^b
Flap necrosis	2 (5.7)	7 (7.0)	1.000 ^a
Infection	2 (5.7)	3 (3.0)	0.832 ^a
Total complications	2 (5.7)	19 (19.0) [*]	0.062 ^a
Local relapse	2 (5.7)	5 (5.0)	1.000 ^a
Metastasis	2 (5.7)	7 (7.0)	1.000 ^a
Deaths	2 (5.7)	6 (6.0)	0.350 ^c

^a χ^2 test.

^bFisher's exact probability test.

^cLog-rank test.

Table 3. Outcome of 13 patients with recurrence and metastases

Group	Age, years	TNM	ER	PR	HER-2	Adjuvant treatment	Metastasis location	TTR, months	Status
Study	21	T2N2M0	positive	negative	positive	CMF+R+H	lung and bone	9	dead
Study	29	T1N3M0	negative	positive	positive	CAF+R	liver	11	dead
Study	30	T2N0M0	positive	positive	negative	CMF+R+H	supraclavicular	72	alive
Study	34	T2N0M0	negative	positive	negative	CMF+H	areola-nipple complex	48	alive
Control	47	T2N2M0	negative	negative	positive	ATC+R+H	brain	20	dead
Control	54	T2N1M0	negative	negative	positive	CAF+H	bone	14	dead
Control	38	T2N1M0	positive	negative	positive	CAF+R+H	liver	18	dead
Control	51	T2N1M0	positive	positive	negative	CAF+R+H	bone and liver	17	dead
Control	50	T2N0M0	negative	negative	positive	C+R+H	supraclavicular	29	alive
Control	53	T1N1M0	negative	positive	negative	CMF+R	supraclavicular	24	alive
Control	34	T2N0M0	negative	negative	positive	CMF+R+H	supraclavicular	15	dead
Control	34	T2N1M0	positive	negative	positive	TAC+H	chest wall	18	dead
Control	67	T2N1M0	negative	negative	positive	CMF	chest wall	30	alive

ER = Estrogen receptor; PR = progesterone receptor; TTR = time to recurrence; H = hormone therapy; R = radiotherapy; C = chemotherapy;

CMF = cyclophosphamide, methotrexate, fluorouracil; CAF = cyclophosphamide, adriamycin, fluorouracil; ATC = adriamycin→taxol→cyclophosphamide; TAC = taxol, adriamycin, cyclophosphamide.

Table 4. Local aesthetic satisfaction

	Immediately		< 1 year		> 1 year	
	yes	no	yes	no	yes	no
Study group, n	34	1	33	2	33	2
Control group, n	20	80	33	67	56	44
χ^2	64.286		38.970		16.917	
p	< 0.001		< 0.001		< 0.001	

Table 5. Psychological status

	Social activity		Pressure		Emotion worse		Confidence		Sexual satisfaction	
	yes	no	yes	no	yes	no	yes	no	yes	no
Study group	35	0	4	31	0	35	33	2	31	4
Control group	60	40	41	59	9	91	30	70	82	18
χ^2	19.895		10.202		2.084		40.504		0.410	
p	< 0.001		0.001		0.149		< 0.001		0.522	

Table 6. Surgical time (mean $\pm$ standard deviation)

	Study (n = 35)	Control (n = 100)	t	p
Time, min	125.86 $\pm$ 14.394	108.73 $\pm$ 13.510	6.154	< 0.001

prosthesis implantation is simpler and less time-consuming, and thus a more suitable choice for IBR [16].

In traditional radical mastectomy, modified radical mastectomy, or skin-conserving radical mastectomy, 20% of the mammary gland is retained [17]. Several studies have reported no significant difference in recurrence rates among the surgical approaches. Gerber et al. [10] compared patients who underwent NAC-conserving surgery to patients treated with radical mastectomy, and found that the former exhibited lower complication rates and more satisfactory cosmetic results. As long as the tumor was ≥ 2 cm from the areola, the recurrence rate was not affected. Hence, breast-conserving surgery appears to be a safe and reliable method of tumor treatment. In our study, only a small number of patients with a relatively short follow-up period were included, and conclusions concerning the operational safety should therefore be drawn with care.

As a technique, subcutaneous nipple-sparing mastectomy allowed resection of almost all of the breast parenchyma and skin overlying or adjacent to invasive carcinoma. The traditional incision [18] used for subcutaneous nipple-sparing mastectomy is a circumareolar incision with lateral extension to include an upper outer quadrant biopsy site. A separate incision may be necessary for resecting local tumor and skin overlying the tumor site, although this is not optimal due to visible scarring (figs. 1–3).

Endoscopy offers several advantages, such as the presence of a clear visual field, making it useful for subcutaneous nipple-sparing mastectomy [19]. The incision is made only in

the lateral axilla and is used for resection of the mammary gland, axillary dissection, and insertion of the saline-filled prosthesis. The average incision length in our cohort was 7 cm, and patient satisfaction was increased (fig. 4).

IBR by prosthesis implantation is a simple and suitable approach for breast reconstruction. Either a synthetic implant or the patient's own tissue, including musculocutaneous flaps, are used for reconstruction. Implantation of the prosthesis took very little time, and on average lengthened the total surgery time by only 17 min, as compared to no prosthesis implantation. The patients in the study group, who received breast reconstruction, felt more satisfied with the resultant aesthetic appearance than those in the control group. Psychologically, they had higher levels of social and sexual activity than patients who underwent radical mastectomy based on our observations. Breast reconstruction is successful in maintaining patients' self-confidence post surgery.

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Disclosure Statement

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