

Table 2. Recurrence Rate Following SSM and Non-SSM

	Year	SSM (n)	Non-SSM (n)	LR (%) SSM	LR (%) NSSM	Follow-up period (M)
Yano <i>et al.</i>	2007	124	NE	2.4	NE	33.6
Margulies <i>et al.</i> ¹²⁾	2005	50	NE	0.0	NE	7.9
Greenway <i>et al.</i> ¹³⁾	2005	225	1022	1.7	1.5	49
Downes <i>et al.</i> ¹⁴⁾	2005	38	NE	2.6	NE	52.9
Fersis <i>et al.</i> ¹⁵⁾	2004	60	NE	6.6	NE	52
Gerber <i>et al.</i> ¹⁶⁾	2003	112	134	5.4	8.2	59
Carlson <i>et al.</i> ⁶⁾	2003	565	NE	5.5	NE	65.4
Medina-Franco <i>et al.</i> ⁷⁾	2002	176	NE	4.5	NE	73
Foster <i>et al.</i> ⁵⁾	2002	67	NE	4.0	NE	49.2
Carlson <i>et al.</i> ⁴⁾	2001	118	NE	2.7	NE	42.7
Rivadeneira <i>et al.</i> ¹⁷⁾	2000	71	127	5.6	3.9	49
Kroll <i>et al.</i> ¹⁸⁾	1999	114	40	7.0	7.5	66
Toth <i>et al.</i> ¹⁹⁾	1999	50	NE	0.0	NE	57
Simmons <i>et al.</i> ²⁰⁾	1999	77	154	3.9	3.25	20.2
Newman <i>et al.</i> ²¹⁾	1998	372	NE	6.2	NE	50
Slavin <i>et al.</i> ³⁾	1998	51	NE	2.0	NE	44.8
Kroll <i>et al.</i> ²²⁾	1997	104	27	6.7	7.4	67.2

SSM, skin-sparing mastectomy; LR, local recurrence; NE, not evaluated

extensive calcification, cases of multiple tumors and intraductal progression. Whether to perform SSM is determined by clinical pathology factors.

The line of incision is very commonly circum-areolar in European and American reports. Slavin *et al.* divided them into four types: 1) periareolar incision, 2) periareolar incision with lateral extension, 3) elliptical incision centered on the areola, and 4) periareolar incision with medial and lateral extensions⁸⁾. Other methods based on breast reduction surgery have also been reported⁹⁾. For an areola-preserving mastectomy, in which only the nipple is excised, four types of incision lines have been reported: 1) transverse incision across the areola with extra-areolar extension, 2) S-shaped intra-areolar incision, 3) inverted T-shaped incision consisting of a downward incision from the nipple and incision of the infra-mammary crease, and 4) incision of the infra-mammary crease⁹⁾. SSM that preserves both the areola and nipple has been reported, in which the entire mammary gland is excised via a lateral breast incision or incision of the infra-mammary crease, but this procedure is rare in the UK¹⁰⁾.

In principle, we use a lateral breast incision to preserve the areola and nipple as far as possible, avoid scarring of the surface of the breast if possible, and choose a line of incision that is useful for reconstruction. Whether to excise the areola and nipple or not is determined by a quick periopera-

tive pathological examination, and the amount of skin to be excised from the biopsy site and directly above the tumor is judged by the surgeon.

Esthetically, SSM is an excellent breast cancer surgical technique, but there are two problems. One is the problem of necrosis of the preserved breast skin due to poor circulation, and the other is local recurrence of breast cancer.

We encountered partial necrosis of the breast skin in 4 of 124 cases of SSM during the last 5 years. In 2 cases, it healed with scar formation by conservative treatment, 1 case was reconstructed with a LDM flap because of extensive necrosis in all layers, and the other case required surgical excision and suturing because the area was small. Thinning and poor blood circulation in the skin flap directly above the tumor is sometimes unavoidable, but if care is taken not to damage the subdermal vascular network with the electric scalpel, this is usually not a problem.

Many recent reports have stated that the recurrence rate is not high following SSM compared with non-SSM techniques (Table 2). During a mean follow-up period of 7.9-73 months, the recurrence rate after SSM was 0-6.7% and that after non-SSM was 1.50-8.2%, without significant difference. Simple comparison is not possible because the disease period and tissue types of SSM in the patients differ and the duration of post-operative follow-up observation is not uniform, but

the theory that SSM will result in an increase rate of recurrence seems to be refuted. We have encountered 3 cases of recurrence (2.4%, 3/124), and in 2 cases mastectomy, including the reconstructed tissue, had to be performed, while in the other case only the breast skin including the site of recurrence was excised. We plan to continue careful follow-up.

Regarding the method of reconstruction, the point is to implant an amount of soft filler that corresponds to the amount lost into the subcutaneous pocket formed by excision of the mammary gland. As filler, we have three options, namely, a DIEP flap, a LDM flap, or a breast implant. We decide the method of reconstruction after consultation with the patient.

The DIEP flap, originally developed by Koshiba & Soeda¹³⁾, is a skin flap including fat fed by blood vessels without the muscle itself from the rectus abdominis muscle. Before using this skin flap, we also mainly used an ordinary pedicled TRAM flap, but taking the muscle and fascia requires strict postoperative bed rest. Nevertheless, a mild bulge in the lower abdomen formed postoperatively in many cases due to opening of the rectus sheath. With the DIEP flap, the rectus abdominis muscle function is preserved because the intercostal nerves are carefully preserved, and no lower abdominal bulge develops because the sheath is also completely preserved. The subcutaneous fat in the lower abdomen does not ordinarily present a quantitative problem, and is sufficient for reconstruction even in cases of macromastia. However, if a perforator from the lateral row is used, the blood circulation in zone II can be unstable and reconstruction must be done using only zones I and III. For the vascular pedicle, about 12 cm can be collected by tracing the perforator to the bifurcation of the external iliac vessels, which is long enough to reach the thoracodorsal vessels. In immediate reconstruction, the thoracodorsal vessels are already exposed and the vascular anastomosis is advantageous. In reconstruction using the DIEP flap, there was no atrophy of the transplanted tissue, it retained its very soft condition, and it was the best reconstruction method compared to the other two methods.

With the LDM flap, we cannot deny the possibility that the reconstructed breast will shrink because of reduced muscle due to postoperative disuse atrophy. However, it is effective for patients with moderate or smaller breasts because it is a

comparatively simple procedure which places only a small burden on the patient.

Breast implants are used for patients with moderate or larger breasts whose lower abdominal subcutaneous fat is exceptionally thin, or for young patients who wish to bear children. Because the breast skin flap is very thin in SSM, it is necessary to place the breast implant beneath the pectoralis major muscle. If various breast implants are prepared, it may be possible to directly place the breast implant immediately, but at present a TE is temporarily implanted and replaced with the breast implant when the size is determined. This necessitates a second operation, but the size is more accurately determined and positioning can be corrected at replacement, and it seems to be useful.

Conclusion

SSM preserves the native breast skin and submammary sulcus, and is an extremely useful breast cancer surgery when conducting breast reconstruction. It is already widespread in Europe and America, and it is reportedly not much different from the other operative procedures with regard to local recurrence. We believe strongly that skin-sparing mastectomy with immediate reconstruction is a significant advance in the treatment of breast cancer: it provides patients with an improved cosmetic outcome with less emotional trauma and morbidity. We think it is a procedure which should be performed at more facilities conducting breast reconstruction.

References

- 1) Toth BA, Lappert P: Modified skin incisions for mastectomy: The need for plastic surgical input in preoperative planning. *Plast Reconstr Surg* 87: 1048-1053, 1991.
- 2) Yano K, Hosokawa K, Nakai K, Kubo T, Hattori R, Taguchi T, Tamaki Y, Noguchi S: Skin-sparing mastectomy and immediate reconstruction with a deep inferior epigastric perforator flap. *Breast Cancer* 10(3): 275-280, 2003.
- 3) Cunnick GH, Mokbel K: Skin-sparing mastectomy. *Am J Surg* 188: 78-84, 2004.
- 4) Carlson GW, Losken A, Moore B, Thornton J, Elliott M, Bolitho G, Denson DD: Results of Immediate breast reconstruction after skin-sparing mastectomy. *Ann Plast Surg* 46: 222-228, 2001.
- 5) Foster RD, Esserman LJ, Anthony JP, Hwang ES, Do H: Skin-sparing mastectomy and immediate breast reconstruction: A prospective cohort study for the treatment of advanced stages of breast carcinoma.

- Ann Surg Oncol* 9: 462-466, 2002.
- 6) Carlson GW, Styblo TM, Lyles RH, Bostwick J, Murray DR, Staley CA, Wood WC: Local recurrence after skin-sparing mastectomy: tumor biology or surgical conservatism? *Ann Surg Oncol* 10: 108-112, 2003.
 - 7) Medina-Franco H, Vasconez LO, Fix RJ, Heslin MJ, Beenken SW, Bland KI, Urist MM: Factors associated with local recurrence after skin-sparing mastectomy and immediate breast reconstruction for invasive breast cancer. *Ann Surg* 235: 814-819, 2002.
 - 8) Slavin SA, Schnitt SJ, Duda RB, Houlihan MJ, Koufman CN, Morris DJ, Trovan SL, Goldwin RM: Skin-sparing mastectomy and immediate reconstruction: Oncologic risks and aesthetic results in patients with early-stage breast cancer. *Plast Reconstr Surg* 102: 49-62, 1998.
 - 9) Simmons RM, Hollenbeck ST, Latrenta GS: Areola-sparing mastectomy with immediate breast reconstruction. *Ann Plast Surg* 51: 547-551, 2003.
 - 10) Sotheran WJ, Rainsbury RM: Skin-sparing mastectomy in the UK - a review of current practice. *Ann R Coll Surg Engl* 86: 82-86, 2004.
 - 11) Koshima I, Soeda S: Inferior epigastric artery skin flap without rectus abdominis muscle. *Br J Plast Surg* 42: 645-648, 1989.
 - 12) Margulies AG, Hochberg J, Kepple J, Henry-Tillman RS, Westbrook K, Klimberg VS: Total skin-sparing mastectomy without preservation of the nipple-areola complex. *Am J Surg* 190: 907-912, 2005.
 - 13) Greenway RM, Schlossberg L, Dooley WC: Fifteen-year series of skin-sparing mastectomy for stage 0 to 2 breast cancer. *Am J Surg* 190: 918-922, 2005.
 - 14) Downes KJ, Glatt BS, Kanchwala SK, Mick R, Fraker DL, Fox KR, Solin LT, Bucky LP, Czerniecki BJ: Skin-sparing mastectomy and immediate reconstruction is an acceptable treatment option for patients with high-risk breast carcinoma. *Cancer* 103: 906-913, 2005.
 - 15) Fersis N, Hoenig A, Relakis K, Pinis S, Wallwiener D: Skin-sparing mastectomy and immediate breast reconstruction: incidence in patients with invasive breast cancer. *The Breast* 13: 488-493, 2004.
 - 16) Gerber B, Krause A, Reimer T, Muller H, Kuchenmeister I, Makovizky J, Kundt G, Friese K: Skin-sparing mastectomy with conservation of the nipple-areola complex and autologous reconstruction is an oncologically safe procedure. *Ann Surg* 238: 120-127, 2003.
 - 17) Rivadeneira DE, Simmons RM, Fish SK, Gayle L, La Trenta GS, Swistel A, Osborne MP: Skin-sparing mastectomy with immediate breast reconstruction: A critical analysis of local recurrence. *Cancer J* 6: 331-335, 2000.
 - 18) Kroll SS, Khoo A, Singletary SE, Ames FC, Wang BG, Reece GP, Miller MJ, Evans GR, Robb GL: Local recurrence risk after skin-sparing and conventional mastectomy: a 6-year follow-up. *Plast Reconstr Surg* 104: 421, 1999.
 - 19) Toth BA, Forley BG, Calabria R: Retrospective study of the skin-sparing mastectomy in breast reconstruction. *Plast Reconstr Surg* 104: 77-84, 1999.
 - 20) Simmons RM, Fish SK, Gayle L, La Trenta GS, Swistel A, Christos P, Osborne MP: Local and distance rates in skin-sparing mastectomies compared with non-skin-sparing mastectomies. *Ann Surg Oncol* 6: 676-681, 1999.
 - 21) Newman LA, Kuerer HM, Hunt KK, Kroll SS, Ames FC, Ross MI, Feig BW, Singletary SE: Presentation, treatment, and outcome of local recurrence after skin-sparing mastectomy and immediate breast reconstruction. *Ann Surg Oncol* 5: 620-626, 1998.
 - 22) Kroll SS, Schusterman MA, Tadjalli HE, Singletary SE, Ames FC: Risk of recurrence after treatment of early breast cancer with skin-sparing mastectomy. *Ann Surg Oncol* 4: 193-197, 1997.

Postoperative Seroma Formation in Breast Reconstruction With Latissimus Dorsi Flaps

A Retrospective Study of 174 Consecutive Cases

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Abstract: The latissimus dorsi flap has been widely used in breast reconstruction surgery. Despite its potential advantages such as low donor morbidity and vascular reliability, the complication of donor-site seroma formation frequently occurs. Consecutive 174 patients who underwent breast reconstruction with the latissimus dorsi flap from 2001 to 2006 were retrospectively reviewed. The age, body mass index (BMI), smoking history, timing of reconstruction, type of breast surgery and nodal dissection, and several other intraoperative data were analyzed. The overall incidence of postoperative seroma was 21%. Increased age (>50 years) and obesity (BMI >23 kg/m²) were significant risk factors for seroma formation ($P = 0.02$ and 0.004 , respectively). The patients who underwent skin-sparing mastectomy or modified radical mastectomy had higher incidence of seroma formation (28% and 33%, respectively) as compared with those who had breast-conservative surgery (11%). A significant correlation was found between the type of breast surgery and the incidence of seroma ($P = 0.04$). The type of nodal dissection did not affect the incidence of postoperative seroma ($P = 0.66$). We concluded that increased age, obesity, and invasive breast surgery are risk factors for donor-site seroma formation after breast reconstruction with the latissimus dorsi flap. Close attention should be paid to prevent development of postoperative seroma when operating on such high-risk patients.

Key Words: donor-site seroma, latissimus dorsi flap, breast reconstruction, risk factor

(*Ann Plast Surg* 2007;59: 149–151)

Autologous latissimus dorsi flap has become a standard procedure for breast reconstruction since its first description in the late 1970s.^{1,2} At our institution, it has become the

most frequently used flap for its advantages, including low donor-site morbidity, reliable vascularity, and no need for microvascular procedures. The rate of major flap and donor-site complications is relatively low as compared with the other autologous flaps, such as partial necrosis of the transverse rectus abdominis musculocutaneous flap. On the other hand, as many previous reports mentioned, postoperative seroma develops as a minor donor-site complication at a high rate, ranging from 11.8% to 79%.^{3–8} Despite such a high incidence, little information is available regarding the risk factors for donor-site seroma formation. The purpose of this study was to investigate the relation between various factors and the incidence of donor-site seroma, which possibly contributes to predicting and even preventing postoperative seroma formation. A series of 174 consecutive patients operated upon by a single surgeon was retrospectively examined.

PATIENTS AND METHODS

In this study, 174 patients who underwent breast reconstruction with latissimus dorsi flap from January 2001 through August 2006 at Osaka University Hospital were retrospectively reviewed. Data regarding age at the time of operation, body mass index (BMI, normal/underweight, <23; overweight/obese, >23), smoking history, flap harvest side, timing of reconstruction, type of breast surgery (skin-sparing mastectomy, modified radical mastectomy, radical mastectomy, or breast-conservative surgery), type of nodal dissection (axillary or sentinel node dissection), design of skin paddle (transverse, oblique, or vertical), total operation time, and total blood loss were collected for each patient. All reconstruction procedures were performed by the senior author (K.Y.) using identical dissection technique, except the skin paddle design. All the latissimus dorsi flaps were harvested by judicious use of electrocautery, and a vacuum drainage tube was placed at the donor site at the end of the operation. No quilting stitches were performed at the donor site. The drains were removed when drainage was less than 20 mL/24 hours; otherwise, they were removed at 2 weeks postoperatively. After removal of the drains, interventional drainage was performed once a week when there was liquid fluctuation at the donor site. In this study, seroma formation was defined as the persistence of seroma more than 4 weeks postoperatively.

Received September 24, 2006, and accepted for publication, after revision, October 19, 2006.

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ISSN: 0148-7043/07/5902-0149

DOI: 10.1097/SAP.0b013e31802c54ef

Statistical analysis was performed using a statistical software (Statcel version 2). The data were analyzed using the χ^2 test. A value of $P < 0.05$ was considered significant.

RESULTS

The overall data of the incidence of donor-site seroma are summarized in Table 1. Among the 174 patients, 37 (21%) developed a postoperative seroma. The patients younger than 50 years of age had a significantly lower incidence of postoperative seroma (22 of 129 patients; 17%), as compared with those older than 50 years of age (15 of 45 patients; 33%) ($P = 0.02$). Of the 134 patients with BMI <23 , 22 (16%) developed a seroma, as compared with 15 of 40 patients (38%) with BMI >23 ($P = 0.004$). Although the National Institutes of Health defines the subjects with BMI >25 as overweight, we defined those with BMI >23 as overweight or obese, considering the Asian woman's constitution.

The patients who underwent skin-sparing mastectomy and modified radical mastectomy demonstrated a higher incidence of postoperative seroma (28% and 33%, respectively) than those who underwent breast-conservative surgery (11%). There was a significant correlation between the type of breast surgery and the incidence of seroma ($P = 0.04$). The other variables, such as smoking history, timing of reconstruction, or type of nodal dissection, did not affect the incidence of seroma formation.

All the patients who developed a seroma were successfully treated without surgical intervention, except for 1 patient who showed a persistent seroma formation for 4 years. After unsuccessful conservative treatments, including repeated punctures and sclerotherapy, complete capsulectomy of the seroma cavity and quilting stitches did eventually achieve healing.

DISCUSSION

Following the use of the latissimus dorsi musculocutaneous flap for breast reconstruction, donor-site seroma formation became the most common complication. In addition to destruction of many small blood and lymphatic vessels during flap harvest, insufficient immobilization of the donor site, which is essential for proper wound healing, makes its treatment difficult. Although some attempts were made to reduce the incidence of donor-site seroma such as use of quilting sutures,^{7,9} scalpel dissection instead of electrocautery dissection,⁷ or fibrin glue,^{3,10} with some positive results, these procedures result in prolonged operation time and increased hospital fees. Therefore, it is rational to perform such procedures in selected cases if we can pre- or intraoperatively identify the patients at high risk of postoperative seroma formation. Thus, to determine the predictors for seroma formation is clearly warranted.

Recently, several authors have attempted to analyze the potential risk factors for donor-site seroma formation.^{4,5} However, the detailed data about the patients' profiles and operative procedures are still insufficient. In our large series of 174 consecutive patients with latissimus dorsi flap breast reconstructions, the overall incidence of donor-site seroma was 21%. We attributed this relatively low incidence (as compared with the previous reports³⁻⁸) not only to the differences in the technique of flap harvest and the definition of seroma formation but also to the small number of obese patients in our study population. Obesity has been regarded as a potential risk factor for seroma formation,^{5,8,11-13} as well as advanced age.^{4,14,15} Indeed, in our study, obese patients had a significantly higher incidence of donor-site seroma as compared with the nonobese patients. Similarly, the patients older than 50 years of age had a risk of seroma formation greater than those younger than 50 years of age.

We also paid attention to the type of breast surgery since recent treatments of breast cancer have shown a trend toward less invasive surgery, such as the breast-conservative surgery.¹¹ In fact, about 90% of the patients in our study underwent either breast-conservative surgery or skin-sparing mastectomy. The current data clearly revealed a decreasing tendency of seroma formation in less invasive breast surgery.

TABLE 1. Comparison of the Incidence of Donor-Site Seroma

Variables	No. Cases	No. Seroma (%)	<i>P</i>
Overall	174	37 (21)	
Age			0.02
<50	129	22 (17)	
>50	45	15 (33)	
Body mass index			0.004
<23 kg/m ²	134	22 (16)	
>23 kg/m ²	40	15 (38)	
Smoking history			0.99
No	141	30 (21)	
Yes	33	7 (21)	
Flap harvest side			0.23
Left	93	23 (25)	
Right	81	14 (17)	
Timing of reconstruction			0.92
Immediate	156	33 (21)	
Delayed	18	4 (22)	
Type of breast surgery			0.04
Skin-sparing mastectomy	83	23 (28)	
Modified radical mastectomy	18	6 (33)	
Radical mastectomy	3	0	
Breast-conservative surgery	70	8 (11)	
Nodal dissection			0.66
Axillary node dissection	70	15 (21)	
Sentinel node dissection	91	18 (20)	
No nodal dissection	13	4 (31)	
Design of skin paddle			0.21
Transverse	109	19 (17)	
Oblique	44	11 (25)	
Vertical	21	7 (33)	
Total operation time			0.35
<270 min	87	16 (18)	
>270 min	87	21 (24)	
Total blood loss			0.22
<210 mL	86	15 (17)	
>210 mL	88	22 (25)	

The possible reason for this finding is easy to understand as follows. Reconstruction of a large defect demands a large flap, which consequently results in a wide dissection and a large dead space at the donor site. The same explanation might be applied to obese patients, whose breast volumes are generally larger than those of the nonobese patients.

An unexpected finding in our study was that the nodal dissection did not affect the incidence of donor-site seroma formation, irrespective of the type of nodal dissection. An axillary seroma reportedly develops in 15% to 50% of the patients after axillary node dissection and in 0% to 7% after sentinel node dissection.¹⁵⁻¹⁸ Regarding the donor-site seroma, Randolph et al⁴ reported that the patients who underwent prior or concurrent nodal dissection had a higher incidence of seroma formation (52%) as compared with those who underwent no nodal dissection (25%), but the difference was not significant. Although we have currently no suitable explanation for the discrepancy between our study results and those of a previous study, additional data such as the total number of axillary lymph node removed might be helpful to assess the significance of this variable.

To the best of our knowledge, this is the largest-scale study concerning the donor-site seroma formation after breast reconstruction with the latissimus dorsi flap. The significant risk factors for seroma formation included increased age, obesity, and invasive breast surgery. We believe that of the best countermeasure for donor-site seroma formation will be prevention. Besides a careful flap dissection and postoperative compressive garments, additional intraoperative procedures such as quilting stitches, scalpel dissection, or use of fibrin glue should be considered, especially in the "high-risk" patients.

REFERENCES

1. Schneider WJ, Hill HL Jr, Brown RG. Latissimus dorsi myocutaneous flap for breast reconstruction. *Br J Plast Surg.* 1977;30:277-281.
2. Bostwick J 3rd, Vasconez LO, Jurkiewicz MJ. Breast reconstruction after a radical mastectomy. *Plast Reconstr Surg.* 1978;61:682-693.
3. Weinrach JC, Cronin ED, Smith BK, et al. Preventing seroma in the latissimus dorsi flap donor site with fibrin sealant. *Ann Plast Surg.* 2004;53:12-16.
4. Randolph LC, Barone J, Angelats J, et al. Prediction of postoperative seroma after latissimus dorsi breast reconstruction. *Plast Reconstr Surg.* 2005;116:1287-1290.
5. Munhoz AM, Aldrighi CM. Prediction of postoperative seroma after latissimus dorsi breast reconstruction. *Plast Reconstr Surg.* 2006;118:567.
6. Menke H, Erkens M, Olbrisch RR. Evolving concepts in breast reconstruction with latissimus dorsi flaps: results and follow-up of 121 consecutive patients. *Ann Plast Surg.* 2001;47:107-114.
7. Schwabegger A, Ninkovic M, Brenner E, et al. Seroma as a common donor site morbidity after harvesting the latissimus dorsi flap: observations on cause and prevention. *Ann Plast Surg.* 1997;38:594-597.
8. Delay E, Gounot N, Bouillot A, et al. Autologous latissimus breast reconstruction: a 3-year clinical experience with 100 patients. *Plast Reconstr Surg.* 1998;102:1461-1478.
9. Titley OG, Spyrou GE, Fatah MF. Preventing seroma in the latissimus dorsi flap donor site. *Br J Plast Surg.* 1997;50:106-108.
10. Akhtar S, Spyrou GE, le Fourie R. Our early experience in the use of tissue glue to reduce the incidence of seroma formation from the latissimus dorsi flap donor site. *Plast Reconstr Surg.* 2005;116:347-348.
11. Munhoz AM, Montag E, Fels KW, et al. Outcome analysis of breast-conservation surgery and immediate latissimus dorsi flap reconstruction in patients with T1 to T2 breast cancer. *Plast Reconstr Surg.* 2005;116:741-752.
12. Chang DW, Youssef A, Cha S, et al. Autologous breast reconstruction with the extended latissimus dorsi flap. *Plast Reconstr Surg.* 2002;110:751-759; discussion 760-751.
13. Kim JY, Ross MI, Butler CE. Reconstruction following radical resection of recurrent metastatic axillary melanoma. *Plast Reconstr Surg.* 2006;117:1576-1583.
14. Burak WE Jr, Goodman PS, Young DC, et al. Seroma formation following axillary dissection for breast cancer: risk factors and lack of influence of bovine thrombin. *J Surg Oncol.* 1997;64:27-31.
15. Wilke LG, McCall LM, Posther KE, et al. Surgical complications associated with sentinel lymph node biopsy: results from a prospective international cooperative group trial. *Ann Surg Oncol.* 2006;13:491-500.
16. Giuliano AE, Haigh PI, Brennan MB, et al. Prospective observational study of sentinel lymphadenectomy without further axillary dissection in patients with sentinel node-negative breast cancer. *J Clin Oncol.* 2000;18:2553-2559.
17. Burak WE, Hollenbeck ST, Zervos EE, et al. Sentinel lymph node biopsy results in less postoperative morbidity compared with axillary lymph node dissection for breast cancer. *Am J Surg.* 2002;183:23-27.
18. Schrenk P, Rieger R, Shamiyeh A, et al. Morbidity following sentinel lymph node biopsy versus axillary lymph node dissection for patients with breast carcinoma. *Cancer.* 2000;88:608-614.

Cosmetic outcome and patient satisfaction after skin-sparing mastectomy for breast cancer with immediate reconstruction of the breast

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Purpose. We conducted a retrospective study to assess the safety, cosmetic outcome, and patients' satisfaction after skin-sparing (SSM) and nipple-sparing mastectomy (NSM) for breast cancer with immediate reconstruction of the breast (SMIBR).

Methods. The subjects were patients, who underwent SMIBR, breast-conserving surgery (BCS), and total mastectomy (MST) between 2000 and 2004 at Osaka University Hospital. Cosmetic outcome was estimated by 4 reviewers by scoring postoperative photographs of the patients. Patient satisfaction was evaluated with a questionnaire for assessment of quality of life for Japanese breast cancer patients.

Results. Of the 74 patients who had undergone SMIBR, 4 developed local recurrences (5%). The local recurrence rate for SMIBR patients was greater than that for BCS (4/178) and MST (3/178, $P = .10$). The distant recurrence rate was similar for all three types of patients (5% for SMIBR, 5% for BCS, and 9% for MST). The median averaged score by 4 reviewers for the estimated cosmetic outcomes was 7.8 for the SMIBR and 7.5 for the BCS group ($P = .20$), and for age-adjusted patients, the corresponding scores were 8.2 and 8.0 ($P = .70$). There was no difference in cosmetic outcome between the SSM and NSM subgroups ($P = .09$). Average scores for patient satisfaction (social activity, physical aspects, and general condition) were the same for the 3 groups. For body image, the BCS and SMIBR groups had higher scores than the MST group ($p < 0.05$). Average scores for questions relating to bodily pain and sexual aspects were higher for the BCS than the MST group, but were not different between SMIBR and BCS groups. Similar trends for the 3 groups were observed when patients were divided into subgroups by tumor size or axillary dissection.

Conclusions. SMIBR is safe with a comparatively low local recurrence rate and the same distant recurrence rate as for BCS and MST. Moreover, it results in objective cosmetic outcome and patient satisfaction as good as those for BCS, and greater patient satisfaction with body image than that for MST. (Surgery 2008;143:414-25.)

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BREAST SURGERY has changed drastically in the last two decades. Currently, breast-conserving surgery has become a standard procedure for early breast cancer and improves quality of life (QOL).^{1,2} For patients with large tumors, multiple tumors, or wide-spread ductal carcinoma in situ (DCIS),

breast-conserving surgery is considered to be contra-indicated. To improve QOL of such patients, preoperative chemotherapy has been used for patients with large invasive cancers and has led to an increase in the ratio of breast-conserving surgery for such patients.³⁻⁵ The cosmetic outcome depends on the size of the residual tumor, and often the results are poor for patients with small breasts. In contrast, for patients with multiple tumors, wide-spread DCIS, and multicentric residual tumors after preoperative chemotherapy, mastectomy is inevitable, and breast reconstruction is the only way to preserve the shape of the breast. Consequently, skin-sparing mastectomy (SSM) and nipple-sparing mastectomy (NSM), combined with

Accepted for publication October 12, 2007.

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0039-6060/\$ - see front matter

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doi:10.1016/j.surg.2007.10.006

immediate breast reconstruction (SMIBR), have been performed for increasing numbers of patients, resulting in better physical and psychological satisfaction.⁶ This procedure is a good choice for Japanese women, many of whom have small breasts, because of severe deformity of the breast often observed after breast-conserving surgery.

We report our experience with SMIBR for Japanese women with breast cancer, which confirmed the safety and good cosmetic outcome of SMIBR as well as high patient satisfaction in comparison with breast-conserving surgery and total mastectomy.

PATIENTS AND METHODS

Patients. The study subjects were patients who underwent operation for primary breast cancer at Osaka University Hospital between 2000 and 2004. Patients older than 70 years and those who received primary systemic chemotherapy were excluded from this study, because these factors might affect the prognosis.

After consent for the operation had been obtained, skin-sparing mastectomy or nipple-sparing mastectomy with immediate breast reconstruction (SMIBR) was performed for patients with DCIS, invasive ductal carcinoma with extensive intraductal components, or multiple tumors. SMIBR was performed for 74 women (SSM = 41, NSM = 33) during the 2-year period. SSM and NSM were performed by surgeons, and IBR by a plastic surgeon (K.Y.). The nipple and the areola were preserved when both of the following 2 conditions were met. One was that the tumor had been diagnosed by means of pre-operative image analysis as DCIS or as a small invasive cancer without tumor extension to the nipple. The other was confirmation of the absence of tumor components at the cut-end of the subareolar tissue by means of immediate intra-operative pathologic examination of frozen sections. Sentinel lymph node biopsy (SLNB) was performed for patients with T1-2 (<3 cm) N0 tumors who had expressed their desire for this procedure and given their consent. Axillary dissection was omitted for subjects without metastasis in the sentinel nodes examined by frozen sections. Other patients, who did not desire SLNB and with metastasis in the sentinel nodes underwent axillary completion. SSM was performed through a skin incision around the tumor and the nipple as described previously,⁷ and sentinel lymph node biopsy and axillary dissection were performed through another incision in the axilla. NSM was carried out through a hemi-circular incision around the

areola and a 10-cm incision from the axilla to the lateral edge of the breast. The areola was preserved as a thin flap dividing the ductal tissue. Material for reconstruction, such as the latissimus dorsi myocutaneous (LDMC) flap, the deep inferior epigastric perforator (DIEP) flap, the transverse rectus abdominis myocutaneous flap, and prosthetic materials, were selected before surgery by the plastic surgeon according to the size and shape of the breast and taking the patient's request and condition into consideration. In some, skin defects were patched with the skin of the flaps, and some patients underwent reconstruction of the nipple and areola immediately or several months after the initial operation. Two patients whose tumor showed extensive lymphatic vessel invasion or who had 4 or more metastatic axillary lymph nodes received 50 Gr of post-operative adjuvant radiation therapy to the reconstructed breast and the chest wall including the axilla and supraclavicular area. Chemical and/or hormonal adjuvant treatment was administered to patients with invasive cancers depending on the estimated risk factors. All patients were followed every 3 mo by both a breast surgeon and a plastic surgeon using physical and laboratory examinations, and reconstructed breasts were also examined by means of mammography or ultrasonography if deemed necessary.

Breast-conserving surgery (BCS) was performed for 178 patients with breast cancers smaller than 3 cm who did not desire immediate reconstruction. The tumors were removed through a hemi-circular incision around the areola with/without 1 to 2 cm lateral extension of the wound. Sentinel node biopsy and axillary dissection were performed through a separate incision in the axilla. All except 5 of these patients received 50 Gr of postoperative adjuvant radiation therapy to the conserved breast, and those with positive or close margins received an additional boost of 10 Gr to the tumor bed. Four of the 5 patients refused radiation therapy, and for one, who had scleroderma, radiation therapy was contra-indicated. Another 178 patients who did not desire either BCS or SMIBR underwent conventional total mastectomy (MST). Eight of these patients with 4 or more metastatic axillary lymph nodes received 50 Gr of post-operative adjuvant radiation therapy to the chest wall in the same manner as described above. The patients with BCS and MST were also given adjuvant treatment and were followed by breast surgeons every 3 to 6 months using physical and laboratory examinations. Patient characteristics are summarized in Table I.

Table I. Characteristics of the patients for the study

<i>Type of surgery*</i>		<i>SMIBR (%)</i>			<i>BCS (%)</i>	<i>MST (%)</i>
		<i>SSM</i>	<i>NSM</i>	<i>SSM + NSM</i>		
Number of patients	Total	41	33	74	178	178
Tumor stage	Tis	2 (5)	5 (15)	7 (9)	9 (5)	13 (7)
	T1	20 (49)	12 (36)	32 (43)	123 (69)	58 (33)
	T2	18 (44)	15 (45)	33 (45)	46 (26)	103 (58)
	T3	1 (2)	1 (3)	2 (3)	0 (0)	4 (2)
Nodal status	N0	40 (98)	31 (94)	71 (96)	169 (95)	152 (85)
	N1	1 (2)	1 (3)	2 (3)	8 (4)	22 (12)
	N2	0 (0)	1 (1)	1 (1)	1 (1)	4 (2)
Reconstruction#	LDMC	21 (51)	24 (73)	45 (61)	-	-
	DIEP	16 (39)	8 (24)	24 (32)	-	-
	TRAM	4 (10)	0 (0)	4 (5)	-	-
	Implant	0 (0)	1 (3)	1 (1)	-	-
Axillary dissection§	SLNB	31 (76)	25 (76)	56 (76)	142 (80)	98 (55)
	ALND	10 (24)	8 (24)	18 (24)	36 (20)	80 (45)
Adjuvant therapy&	CT	8 (20)	8 (24)	16 (22)	32 (18)	60 (34)
	ET	22 (54)	21 (64)	43 (58)	128 (72)	120 (67)
	RT	1 (2)	1 (3)	2 (3)	173 (97)	8 (4)
Age (years)	Mean	47	44	45.7	52	55
Follow-up (months)	Mean	47	53	50	56	54

*SMIBR; skin-sparing and nipple-sparing mastectomy with immediate reconstruction, BCS; breast-conserving surgery, MST; total mastectomy, SSM; skin-sparing mastectomy, NSM; nipple-sparing mastectomy.

#LDMC; latissimus dorsi myocutaneous flap, DIEP; deep inferior epigastric perforator flap, TRAM; transverse rectus abdominis myocutaneous flap.

§SLNB; sentinel lymph node biopsy without axillary dissection, ALND; completion of axillary lymph node dissection.

&CT; chemotherapy, ET; endocrine therapy, RT; radiation therapy.

Assessment of cosmetic outcome for patients with SMIBR. Cosmetic outcome for 74 patients with SMIBR was assessed and photographs of those who had given their consent were taken by the plastic surgeon during routine follow-up physical examination. Eighteen patients did not visit our hospital, because they had changed to another hospital or had ceased to visit for their physical examination. Eventually, 56 patients were eligible for assessment with photographs taken from the standard 3 directions, comprising 1 frontal and 2 oblique views. For control, 70 patients were selected randomly among the 178 patients who underwent BCS, and photographs were taken in the same manner as above by a breast surgeon; however, 23 patients did not appear on the scheduled day during the study period from June 2004 to May 2005, and we could not contact

year-old female breast surgeon (S.U.) and the other a 50-year-old male plastic surgeon (K.Y.), and by 2 female nurses, 22 and 28 years old, all from the department of breast surgery. Inconspicuousness of the scar and symmetry of volume and shape of the breast, in addition to size, color, and position of the nipple-areola complex, as well as symmetry of position of the inframammary line, were evaluated on the photographs, and scored on a scale established by the Japanese Breast Cancer Society (Table II). The score for each item was then totaled by each reviewer for a maximum of 10 points per patient, and an averaged total score was obtained from the 4 total scores. Visual assessments of patients were then categorized based on the average total score: "Excellent" (≥ 9 points), "Good" (7-8 points), "Fair" (5-6 points) and "Poor" (≤ 4 points).

Table II. Scoring criteria for cosmetic assessment

Score (points)	2	1	0
Breast			
Symmetry of volume	Symmetric	Slightly asymmetric	Asymmetric
Symmetry of shape	Symmetric	Slightly asymmetric	Asymmetric
Visibility of scar	Inconspicuous	Slightly conspicuous	Conspicuous
Nipple-areolar complex			
Symmetry of size	-	Symmetric	Asymmetric
Symmetry of position	-	Difference < 2 cm	Difference \geq 2 cm
Equality of color	-	Almost equal	Different
Inframammary line			
Symmetry of position	-	Difference < 2 cm	Difference \geq 2 cm

Cosmetic outcome of each patient was assessed with photographs using a scoring system shown above. The score for each item was then totaled for a maximum of 10 points in each patient by each reviewer, and an averaged total score was obtained for each case from the four total scores. Visual assessments of patients were then categorized based on the averaged total score: "Excellent" (≥ 9 points), "Good" (7-8 points), "Fair" (5-6 points) and "Poor" (≤ 4 points).

item), bodily pain (6 items), body image (2 items), sexual aspects (1 item), and motherhood aspects (4 items) (Table III). Questions were answered by patients using a 5-grade system. A score of 1 represents the worst condition or dissatisfaction, while a score of 5 represents the best condition or complete satisfaction.

The questionnaire was mailed out at least 6 mo after completion of adjuvant chemotherapy and radiation therapy (median: 16 mo), with a request for the patients to fill it out anonymously and to post it in an enclosed envelope to our office. Some patients were excluded from the study for a variety of reasons and were not sent the questionnaire. Twelve patients with recurrence of breast cancer, two with other malignancies after operation and two with serious autoimmune diseases were excluded from the study because, for example, pain from bone metastases or discomfort caused by chemotherapy might affect the results. Three patients had changed to another hospital and could not be contacted. Patients with some mental and/or social problems (31 patients), for example, depression caused by the disease, excessive apprehensions about how the doctor behaved, and distress caused by financial or family trouble, were also excluded, because these problems might affect the results relating to body image and sexual aspects. The exclusion was based on the suggestion by the doctor in charge.

Statistical analysis. SPSS software (SPSS Japan

for quality of life assessment by the Japanese Breast Cancer Society. Questions were answered by patients using a 5-grade system, from 1 to 5, and evaluated by scoring on the basis of 100 points. For example, when an answer (A) was 4, the score (B) was calculated by the formula, $B = (A-1) \times 25$, to equal 75 points. For some grouped questions, the total score obtained was converted to a score based on 100 points. For example, when the total score for questions 1 to 6 was 460 out of 600 points, the converted score based on the 100 point system was 76.7 points. Average scores for each item were compared among patient groups and analyzed with Student's *t* test.

RESULTS

Prognosis for patients with SMIBR. The mean follow-up period was 50 months for the SMIBR, 54 months for the MST, and 56 months for the BCS group. Four local recurrences (5%) and 4 distant recurrences (5%) were observed in the 74 patients with SMIBR, 3 local (2%) and 16 distant (9%) recurrences in the 178 with MST, and 4 local (2%) and 9 (5%) distant recurrences in the 178 with BCS. In-breast recurrence rate was not statistically different for the SMIBR than the BCS group ($P = .19$). There was no difference in the distant recurrence rate among these groups. Five-year distant disease-free survival rates for the 3 groups were similar (91% for SMIBR, 94% for BCS and 90% for MST; $P = .387$).

Table III. The questionnaire

Social activities

1. Can you do everything need for your daily life?
5. Everything 4. Almost everything 3. Sufficient 2. Somewhat 1. Not at all
2. Can you go out without any assistance?
5. Definitely 4. Easily 3. Rather easily 2. With difficulty 1. Not at all
3. Can you go for a walk for about 30 minutes?
5. Definitely 4. Easily 3. Rather easily 2. With difficulty 1. Not at all
4. Is it difficult for you to walk a short distance?
5. Not difficult at all 4. Not so difficult 3. A little difficult 2. Difficult 1. Very difficult
5. Can you use the stairs?
5. Very easily 4. Easily 3. Rather easily 2. With difficulty 1. Not at all
6. Can you take a bath without any assistance?
5. Very easily 4. Easily 3. Rather easily 2. With difficulty 1. Not at all

Physical aspects

7. How is your condition recently?
5. Very good 4. Good 3. Rather good 2. Not bad 1. Bad
8. How is your appetite?
5. Very good 4. Good 3. Rather good 2. Not bad 1. Bad
9. Do you enjoy your meals?
5. Very much 4. A lot 3. Moderately 2. A little 1. Not at all
10. Do you have to vomit?
5. Never 4. Seldom 3. Occasionally 2. Sometimes 1. Often
11. Have you lost weight?
5. Not at all 4. A little 3. Not so much 2. Much 1. Very much

General

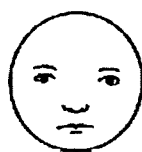
12. Please select a face best expresses your condition recently.



5



4



3



2



1

Bodily pain

13. Do you feel any pain and/or numbness in your breast, armpit and arm on the side of the operation?
5. Not at all 4. A little 3. Not so much 2. Much 1. Very much
14. Do you have any swelling in your arm on the side of the operation?
5. Not at all 4. A little 3. Not so much 2. Much 1. Very much
15. Can you raise your arm on the side of the operation?
5. Very easily 4. Easily 3. Rather easily 2. A little 1. Not at all
16. Do you have any trouble with the skin of the breast on the side of the operation, for example, redness, swelling or itching?
5. Not at all 4. A little 3. Not so much 2. Much 1. Very much
17. Do you have any pain related to your disease or operation?
5. Not at all 4. A little 3. Not so much 2. Much 1. Very much
18. Are you satisfied with the result of the operation as far as the scar and shape of the breast are concerned?
5. Very much 4. Very 3. Rather 2. A little 1. Not at all

Table III. (Continued)

Motherhood aspects

22. Do you worry about your family suffering the same disease as you?
5. Not at all 4. A little 3. Not so much 2. Much 1. Very much
23. Do you worry about not spending enough time with your child?
5. Not at all 4. A little 3. Not so much 2. Much 1. Very much
24. Do you worry about not taking enough care of your baby?
5. Not at all 4. A little 3. Not so much 2. Much 1. Very much
25. Do you worry about having a/another baby?
5. Not at all 4. A little 3. Not so much 2. Much 1. Very much

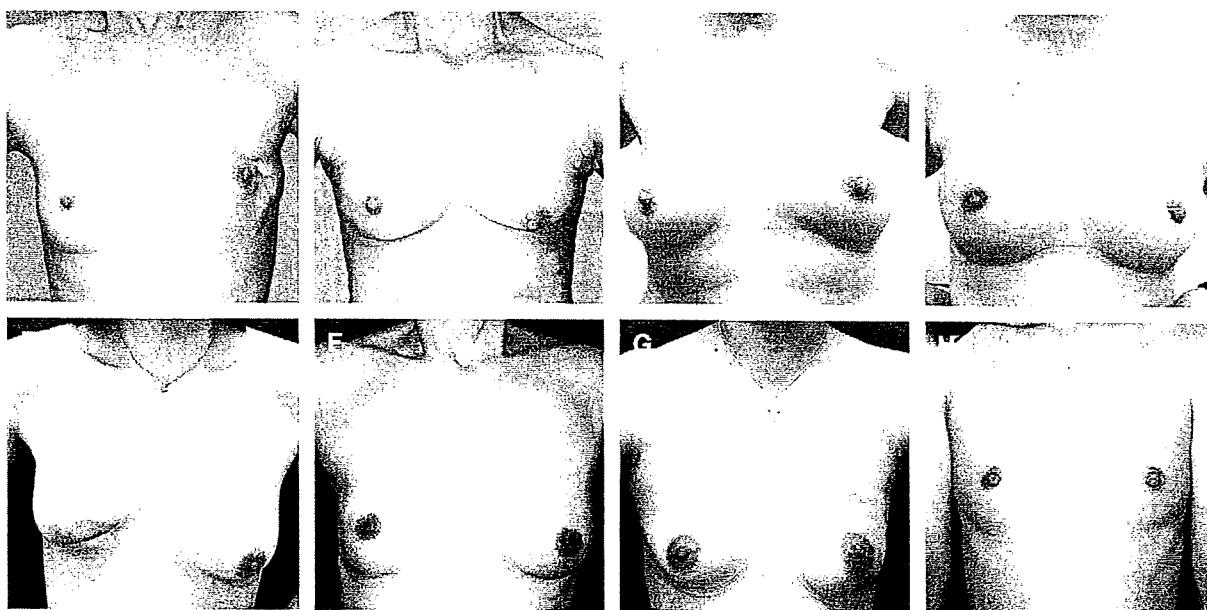


Figure. Assessment of cosmetic outcome. Cosmetic outcome was assessed with the aid of photographs for patients with BCS (A to D) and SMIBR (E to H) according to a scoring system by which patients with over all scores of 0 to 4 points were categorized as "Poor" (A, E), with 5 to 6 points as "Fair" (B, F), with 7 to 8 points as "Good" (C, G) and with 9 to 10 points as "Excellent" (D, H).

areola and was treated with mastectomy and axillary dissection. Pathologic examination after the second operation found an invasive tumor with intraductal components spreading beneath the areola. Another woman with DCIS which had spread widely in the upper quadrants of the left breast underwent NSM and IBR with DIEP flap; 38 months after the initial surgery, she developed a small lump near the sternum, treated with additional resection. Retrospective review of magnetic resonance imaging (MRI) and computed tomography (CT) results for these patients before the first operation revealed subtly enhanced lesions spreading to the subdermal tissue or to the inner edge of the mammary gland. Their relapses were considered to have been caused by incomplete resection of the gland.

The third patient underwent SMIBR with removal of the skin overlying the tumor followed by DIEP-flap reconstruction. Thirty-four months after the primary operation, a recurrent tumor was observed near the scar where the skin over the tumor was removed. Pathologic examination indicated that the tumor was located in the subdermal tissue and was surrounded by subcutaneous fat tissue. A photograph taken on the first day of the patient's visit to our hospital showed a faint scar of core-needle biopsy performed in a previous hospital at the same site as that of the recurrence. Since the scar was not noticed during the primary operation, it was not removed. This observation suggests that such recurrence may be caused by the implantation of tumor cells during core-needle

Table IV. Characteristics of patients for cosmetic assessment

Type of surgery*		SMIBR (%)			BCS (%)
		SSM	NSM	SSM + NSM	
Number of patients	Total	28	28	56	47
Tumor stage	Tis	1 (4)	5 (18)	6 (11)	3 (6)
	T1	15 (54)	12 (43)	27 (48)	31 (66)
	T2	11 (39)	10 (36)	21 (38)	13 (28)
	T3	1 (4)	1 (4)	2 (4)	0 (0)
Reconstruction#	LDM	14 (50)	19 (68)	33 (59)	-
	DIEP	10 (36)	8 (29)	18 (32)	-
	TRAM	4 (14)	0 (0)	4 (7)	-
	Implant	0 (0)	1 (4)	1 (2)	-
Axillary dissection\$	SLNB	22 (79)	25 (89)	47 (84)	44 (94)
	ALND	6 (21)	3 (11)	9 (16)	3 (6)
Postoperative radiation		1 (4)	0 (0)	1 (2)	46 (98)
Period after operation (months)	Median (range)	13 (5-36)	12.5 (4-26)	13 (4-36)	22 (6-54)

*SMIBR; skin-sparing and nipple-sparing mastectomy with immediate reconstruction, BCS; breast-conserving surgery, MST; total mastectomy, SSM; skin-sparing mastectomy, NSM; nipple-sparing mastectomy.

#LDMC; latissimus dorsi myocutaneous flap, DIEP; deep inferior epigastric perforator flap, TRAM; transverse rectus abdominis myocutaneous flap.

\$SLNB; sentinel lymph node biopsy without axillary dissection, ALND; completion of axillary lymph node dissection.

biopsy. This patient, therefore, underwent additional local excision of the recurrent tumor and radiation therapy for the breast.

The last patient with local recurrence had undergone SMIBR with resection of both the nipple-areola complex and the skin overlying the tumor followed by DIEP-flap reconstruction. Pathologic examination found extensive lymphatic invasion of tumor cells in the specimen of the main tumor, although only one axillary lymph node showed metastasis. Six months after operation, while the patient was receiving postoperative adjuvant chemotherapy, she discovered a hard lump in the area near where the primary tumor had been located. This recurrence was considered to have been caused by remnant tumor cells in subcutaneous lymphatic vessels. The patient underwent total mastectomy and additional chemotherapy.

Assessment of cosmetic outcome. Cosmetic outcome was assessed on the basis of 56 photographs of the patients with SMIBR and 47 of those with BCS, which were scored according to the scale referred to above. Representative cases are shown in the Figure. Patient characteristics are summarized in Table IV, and the assessment results in Table V. There was no significant difference between SMIBR and BCS groups ($P = .2$), although the percentage patients assessed "Poor" was less in the SMIBR (9%) than in the BCS group (21%). Comparison of patients with SMIBR in the SSM and NSM group showed no difference in cosmetic outcome ($P = .2$). Statistical analysis of 30 pairs of age-adjusted patients from the BCS and SMIBR groups showed no significant

difference in total score ($P = .8$), while age-adjusted patients in the SSM group showed no significant disadvantage in cosmetic outcome from those in the NSM group ($P = 1.0$).

Assessment of patient satisfaction. The questionnaire was sent to 71 patients with SMIBR, 158 with MST and 154 with BCS. The response rates were 70% for SMIBR (50 patients), 77% for MST (121) and 81% for BCS (125) (Table VI). The median of the age of the patients with SMIBR was less than that of the BCS and MST patients ($P < .05$). Axillary dissection was performed more often for patients with MST than for the other groups, while postoperative chemotherapy was also administered to more patients with MST than to the other groups ($P < .05$). The QOL-ACD responses indicated that these differences did not affect social activity, physical aspects, or general quality of life. According to the QOL-ACD-B response, the average score for patient satisfaction with body image was the same for the SMIBR group as for the BCS group and significantly greater than for MST group ($P < .05$). In particular, the average scores for Q19 ("Do you worry about choosing clothes that suit you?") and Q20 ("Are you reluctant to be seen naked in a public bath or spa?") were greater for both the SMIBR and BCS groups than for the MST group. The average score for response to the latter question by the BCS group was greater than that by the SMIBR group. The BCS group also showed significantly greater scores for questions about bodily pain and sexual aspects than did the MST group, while the SMIBR group did not.

Table V. Results of cosmetic estimation

Type of surgery*	SMIBR			BCS
	SSM	NSM	SSM + NSM	
All patients (%)	28 (100) ^a	28 (100) ^a	56 (100) ^b	47 (100) ^b
Excellent	3 (11)	6 (21)	9 (16)	8 (17)
Good	14 (50)	15 (54)	29 (52)	18 (38)
Fair	9 (32)	4 (14)	13 (23)	11 (23)
Poor	2 (7)	3 (11)	5 (9)	10 (21)
Age-adjusted patients	15 (100) ^c	15 (100) ^c	30 (100) ^d	30 (100) ^d
Excellent	1 (7)	1 (7)	4 (13)	6 (20)
Good	4 (27)	2 (13)	18 (60)	13 (43)
Fair	7 (47)	11 (73)	6 (20)	8 (27)
Poor	3 (20)	1 (7)	2 (7)	3 (10)

*SMIBR; skin-sparing and nipple-sparing mastectomy with immediate reconstruction, BCS; breast-conserving surgery, MST; total mastectomy, SSM; skin-sparing mastectomy, NSM; nipple-sparing mastectomy.
aP = .239, bP = .238, cP = .967, dP = .772.

Table VI. Results of survey of patients' satisfaction

Type of surgery*	SMIBR			BCS	MST
	SSM [§]	NSM ^{&}	SSM + NSM		
Number of respondents (%)	24 (57)	26 (79)	50 (70)	125 (80)	121 (77)
Median of age (year)	47	45	46 ¹	52 ¹	55 ¹
Median of period (month)#	6	17	12	18	16
ALND (%)	4 (17)	7 (27)	11 (22) ²	25 (20) ²	56 (46) ²
Chemotherapy (%)	3 (1)	6 (23)	9 (18) ³	21 (17) ³	42 (35) ³
Endocrine therapy (%)	15 (63)	18 (69)	33 (66)	93 (74)	79 (65)
Patients' satisfaction					
QOL-ACD score					
Social activity, Q1-Q6	92	95	94	94	95
Physical aspects, Q7-Q11	83	88	86	88	88
General condition, Q12	74	79	77	77	78
QOL-ACD-B score					
Bodily pain, Q13-Q18	77	76	77	81 ^a	76 ^a
Body image, Q19	85	87	84 ^b	88 ^c	70 ^{b,c}
Q20	53	60	50 ^{d,e}	65 ^{d,f}	25 ^{e,f}
Sexual aspects, Q21	64	60	62	66 ^g	54 ^g
Family aspects, Q22	-	-	55	55	46
Motherhood aspects, Q23-Q25	-	-	38	47	68

*SMIBR; skin-sparing and nipple-sparing mastectomy with immediate reconstruction, BCS; breast-conserving surgery, MST; total mastectomy.

[§]Skin-sparing mastectomy.

[&]Nipple-sparing mastectomy.

[#]Period from surgery to survey by the questionnaire.

¹P < .05, ²P < .05, ³P < .05.

aP = .027, bP = .004, cP < .001, dP = .009, eP < .001, fP = <0.001, gP = .028.

In contrast, there was no significant difference in patient satisfaction between the SSM and NSM group of the patients with SMIBR.

Dividing the patients into 2 groups based on tumor size (T0-1 and T2-3) showed that in the T2-3 group the response to Q19 was the same for SMIBR as BCS, and superior to that for MST, while the response to Q20 for SMIBR and BCS were

superior to MST (Table VII). The same tendency was observed for the T0-1 group. The average score for questions related to physical aspects and bodily pain was less for SMIBR patients than for BCS patients in the T2-3 group.

For patients with sentinel lymph node biopsy, the average score by the SMIBR group for Q19 and Q20 was better than that by the MST group (Table VIII).

Table VII. Patient satisfaction varied in subgroups of patients with T0-1 and T2-3 tumors

Type of surgery*	T0-1			T2-3		
	SMIBR	BCS	MST	SMIBR	BCS	MST
Number of respondents	24	89	54	26	36	67
QOL-ACD score						
Social activity, Q1-Q6	96	94	95	91	95	95
Physical aspects, Q7-Q11	91	87	88	80 ^{a,b}	89 ^a	89 ^b
General condition, Q12	83	79	77	71	71	78
QOL-ACD-B score						
Bodily pain, Q13-Q18	81	81	77	73 ^c	81 ^c	76
Body image, Q19	83	89 ¹	67 ¹	86 ^d	85 ^c	73 ^{d,e}
Q20	58 ²	68 ³	24 ^{2,3}	42 ^f	57 ^g	26 ^{f,g}
Sexual aspects, Q21	69	67 ⁴	51 ⁴	54	63	55
Family aspects, Q22	59	56	52	50	52	42
Motherhood aspects, Q23-Q25	65	42	88	22 ^h	66 ^h	38

*SMIBR; skin-sparing and nipple-sparing mastectomy with immediate reconstruction, BCS; breast-conserving surgery, MST; total mastectomy.

1P = .001, 2P = .001, 3P = .001, 4P = .001.

aP = .022, bP = .026, cP = .036, dP = .038, eP = .034, fP = .027, gP = .001, hP = .031.

DISCUSSION

Since the first report by Toth et al on skin-sparing mastectomy (SSM) with immediate breast reconstruction in 1991,¹⁰ many studies have been published.¹¹⁻¹⁵ Local recurrence rates have varied from 0 to 7%,⁶ which is similar to those for conventional mastectomy without breast reconstruction, while survival rates were also similar.¹⁵ This procedure has become a good option for breast cancer treatment, especially for patients with multi-centric invasive cancer, cancer with wide-spread ductal components and large DCIS, and even for high-risk patients with large tumors.^{16,17} For further improvement of cosmetic outcome, NSM with immediate breast reconstruction has been performed for selected patients.¹⁸⁻²⁰ SSM and NSM with immediate reconstruction can achieve successful cancer control and superior cosmetic outcomes for patients in whom mastectomy is inevitable. Furthermore, for a woman with small breasts, SMIBR is an alternative for breast preservation, because breast-conserving surgery can achieve good cosmetic outcome only when the tumor is small enough in comparison with the whole breast. For this reason, SMIBR can be a desirable option for Japanese women with breast cancer, because they generally have small breasts. We performed SMIBR for 74 patients who were not candidates for breast-conserving surgery and evaluated the cosmetic and oncological outcomes.

For objective assessment of cosmetic outcome, 2 doctors and 2 nurses assessed patients' photographs by using the same scoring system. The results indicate that cosmetic outcome after SMIBR was as good as that after BCS. The same results were obtained for age-adjusted patients. Although 66%

of the patients in the BCS group had T1 tumors, the outcomes for 21% were rated as "Poor." In contrast, only 7% of the patients with SMIBR were assessed as having a "Poor" cosmetic outcome, even though 40% had T2 and T3 tumors. As a potential explanation of this discrepancy, Cocquyt et al. reported that cosmetic outcome was better for patients with immediate breast reconstruction than for those with BCS.²¹ Even though the tumor size in the BCS group was larger than in the reconstruction group in their study, SMIBR provided at least as good a cosmetic outcome as BCS, and possibly achieved better cosmetic results than BCS for patients with large tumors and small breasts.

In contrast, Dian et al also used a questionnaire to compare esthetic results for patients with mastectomy and autologous breast reconstruction and those with BCS; their findings indicated that cosmetic outcome and satisfaction for the 2 groups were almost the same.²² Interestingly, the assessments of cosmetic outcome by patients, medical experts, and non-medical laypersons differed. Patient self-assessment showed the best results, because they did not compare themselves with others, while assessment by laypersons was the worst. In our study, the assessment was performed by 2 doctors and 2 nurses with the aid of photographs. The doctors' assessment tended to be better than that of the nurses, and the older nurse gave lesser scores for some patients than the other 3 judges (data not shown). For more objective assessment of cosmetic results of SMIBR, assessment by more and different types of people may be needed, although patient satisfaction should remain the most important outcome criterion.

Table VIII. Patient satisfaction varied in subgroups of patients with sentinel node biopsy and axillary dissection

Type of surgery*	Sentinel node biopsy			Axillary dissection		
	SMIBR	BCS	MST	SMIBR	BCS	MST
Number of respondents	39	100	65	11	25	56
QOL-ACD score						
Social activity, Q1-Q6	96	95	97	85	92	93
Physical aspects, Q7-Q11	88	88	89	78	86	87
General condition, Q12	80	77	78	64	76	77
QOL-ACD-B score						
Bodily pain, Q13-Q18	79	83 ¹	75 ¹	67 ^a	71	77 ^a
Body image, Q19	84 ²	90 ³	72 ^{2,3}	86	80	69
Q20	49 ^{4,5}	66 ^{5,6}	27 ^{4,6}	52 ^b	60 ^c	24 ^{b,c}
Sexual aspects, Q21	62	66	54	63	67	53
Family aspects, Q22	58	56	47	43	50	45
Motherhood aspects, Q23-Q25	52	51	100	18	38	59

*SMIBR; skin-sparing and nipple-sparing mastectomy with immediate reconstruction, BCS;breast-conserving surgery, MST; total mastectomy.
1P = .001, 2P = .042, 3P = .001, 4P = .001, 5P = .010.
aP = .041, bP = .005, cP = .001.

Preservation of the nipple-areola complex is an important issue for cosmetic outcome. Mori et al. reported that no difference was observed in photographic assessment between SSM and NSM with immediate reconstruction, because they did not assess the nipple-areola complex when it was not reconstructed.²³ Our study also could not detect any difference in cosmetic outcome between the 2 groups for the whole study population and for age-adjusted cases, although we assessed the nipple-areola complex for all patients examined. Nipple-areola reconstruction was used for 26 of 28 patients with SSM, but the scoring system we used may not be capable of showing the difference as defined by scars on the breast.

Patient satisfaction was surveyed with a questionnaire for QOL prepared for Japanese patients, which is similar to other questionnaires used elsewhere,^{24,25} but contains some detailed questions for several aspects of QOL and has been adapted to Japanese culture, as in "Q20. Are you reluctant to be seen naked in a public bath or spa?" The average score for individual items was almost equal for the 3 groups for QOL-ACD questions. Patient satisfaction in the SMIBR group was generally high, and there was no difference between the SSM group and NSM group. For questions about body image and sexual aspects, patient satisfaction in the SMIBR group was significantly greater than the MST group, while for Q20 (see above) more patients with SMIBR answered positively than did those with BCS. The same tendency was observed in the T2-3 subgroup and those who received sentinel lymph node biopsy. Although the shape of

the breasts of SMIBR patients was as good as that of BCT patients, which contributed to high patient satisfaction, large scars on the breast and donor-site may account for the difference.

As for bodily pain, patient satisfaction in the SMIBR group was almost equal to that in the MST group, but lower than that in the BCS group. In the T2-3 subgroup, the average score for bodily pain by the SMIBR group was less than that by the BCS group and the MST group for patients who had undergone axillary dissection. This difference is likely to be caused by the large wound due to the reconstruction method. In our study, 73 of 74 patients underwent reconstruction with an autologous tissue flap, which requires a large wound outside the breast for harvesting the flap. In particular, 61% of the patients with SMIBR underwent reconstruction with a latissimus dorsi myocutaneous flap, which may have caused some axillary pain after axillary dissection. In contrast, Dian et al. reported no differences in bodily pain between patients who underwent mastectomy with autologous breast reconstruction and those with BCS.²⁶ This discrepancy may be the result of differences in the surgical procedure, the interval between operation and survey, and the assessment instruments. The conclusion that previous reports and ours have in common that SMIBR with autologous tissue can achieve as good cosmetic results as BCS for patients who used to be treated with mastectomy, although it may cause bodily pain due to the surgical wounds at the donor site.

One way to improve postoperative bodily pain is to use implants, and our results might have been

different if they had been used for more patients. Subcutaneous mastectomy with immediate breast reconstruction using an implant can achieve good cosmetic outcome and high patient satisfaction²⁷; unfortunately, reconstruction with implants is not covered by national medical insurance in Japan and requires a second operation to replace the tissue expander with a silicone prosthesis. For these reasons, only a few patients in our study wanted reconstruction with implants.

Primary systemic chemotherapy is one option to be considered for breast conserving surgery, because it increases the possibility of breast conserving surgery for patients with a large invasive breast cancer.³⁻⁵ We often find residual tumor cells widely dispersed in the breasts of patients who showed partial response to the chemotherapy. For such patients, BCS is often difficult to perform, because wide excision is needed for complete resection of the tumor, and this can result in poor cosmetic outcome for those with comparatively small breasts. Patients who need to undergo primary systemic chemotherapy also often have lymph node metastasis with severe lymphatic vessel invasion, which is likely to be a cause of local recurrence. For this reason, we excluded patients with primary systemic chemotherapy from candidates for SMIBR in our study. Gouy et al reported that immediate breast reconstruction after primary systemic chemotherapy did not affect local relapse-free survival.²⁸ SMIBR may become an alternative to BCS for patients with widespread tumor residuals after primary systemic chemotherapy.

As for oncologic outcome, the 3 groups showed no differences in the risk of distant recurrence, although the follow-up period was not long enough to reach a definite conclusion. The local recurrence rate of four among the 74 patients with SMIBR (5%) was comparable to reoccurrence reported elsewhere.^{12,15,18,29,30} Two of these 4 patients had DCIS throughout the mammary gland. Small components of the DCIS remained beneath the areola and at the edge of the gland because of incomplete resection of the gland. For complete resection of the gland a thinner skin flap is better,³¹ although it increases the risk of flap necrosis. For such patients, it remains controversial whether the skin overlying the tumor and the nipple-areola complex can be preserved. Gerber et al reported that intraoperative frozen sections of 46% of patients who underwent subcutaneous mastectomy showed a positive margin at the nipple-areola complex.¹⁸ Frozen sections of our patients were negative at the cut end, but resulted in incomplete resection. A retrospective review of MRI and CT

showed enhancing lesions spreading to the subareolar tissue or to the inner edge of the mammary gland. If widely-spreading DCIS is detected, careful resection with accurate pathologic examination of the cut end is needed. Furthermore, postoperative or intraoperative radiotherapy can be an additional option for local control. Considering the adverse effect of radiation on the skin of the reconstructed breast, intraoperative radiation of the nipple-areola complex seems an attractive method,³² but long-term follow-up with more patients is needed to determine its feasibility.

Another of our patients had a local recurrence, which was thought to have originated from a core-biopsy scar. Although we always remove all biopsy scars when performing SMIBR, in this patient the scar was not noticed during the operation. Urriburu et al reported 3 local recurrences in patients with skin-sparing mastectomy after core needle biopsy.³³ These findings suggest that operative resection should be performed with great care, including adequate resection of the skin over the tumor as well as of any biopsy scars.

The last patient with local recurrence developed recurrence during postoperative adjuvant chemotherapy. While SMIBR for patients with high-risk breast cancer is considered safe,^{16,17} for patients with extensive lymph node metastases and/or lymphatic vessel invasion, SMIBR should be performed with special attention to the prevention of local recurrence.

In conclusion, our study showed that SMIBR is safe with low local recurrence rates when performed for selected patients with breast cancer. SMIBR can provide good objective cosmetic outcome and adequate patient satisfaction in comparison with BCS and MST.

REFERENCES

1. Veronesi U, Cascinelli N, Mariani L, Greco M, Saccozzi R, Luini A, et al. Twenty-year follow-up of a randomized study comparing breast-conserving surgery with radical mastectomy for early breast cancer. *N Engl J Med* 2002;347:1227-32.
2. Fisher B, Anderson S, Bryant J, Margolese RG, Deutsch M, Fisher ER, et al. Twenty-year follow-up of a randomized trial comparing total mastectomy, lumpectomy, and lumpectomy plus irradiation for the treatment of invasive breast cancer. *N Engl J Med* 2002;347:1233-41.
3. Powles TJ, Hickish TF, Makris A, Ashley SE, O'Brien ME, Tidy VA, et al. Randomized trial of chemoendocrine therapy started before or after surgery for treatment of primary breast cancer. *J Clin Oncol* 1995;13:547-52.
4. Rouzier R, Mathieu MC, Sideris L, Youmsi E, Rajan R, Garbay JR, et al. Breast-conserving surgery after neoadjuvant anthracycline-based chemotherapy for large breast tumors. *Cancer* 2004;101:918-25.
5. van der Hage JA, van der Velde CJ, Julien JP, Tubiana-Hulin M, Vandervelden C, Duchateau L. Preoperative

- chemotherapy in primary operable breast cancer: results from the European Organization for Research and Treatment of Cancer trial 10902. *J Clin Oncol* 2001;19:4224-37.
6. Chagpar AB. Skin-sparing and nipple-sparing mastectomy: preoperative, intraoperative, and postoperative consideration. *Am Surg* 2004;70:425-32.
 7. Carlson GW. Skin sparing mastectomy: anatomic and technical consideration. *Am Surg* 1996;62:151-5.
 8. Shimozuma K, Sonoo H, Ichikawa K, Kurebayashi J, Miyake K, Yoshikawa K, et al. Analysis of factors associated with quality of life in breast cancer patients after surgery. *Breast Cancer* 1994;1:123-9.
 9. Okamoto T, Shimozuma K, Katsumata N, Koike M, Hisashige A, Tanaka K, et al.; Task Force of the Japanese Breast Cancer Society for 'The Development of Guidelines for Quality of Life Assessment Studies of Breast Cancer Patient'. Measuring quality of life in patients with breast cancer: a systematic review of reliable instruments available in Japan. *Breast Cancer* 2003;10:204-13.
 10. Toth BA, Lappert P. Modified skin incisions for mastectomy: the need for plastic surgical input in preoperative planning. *Plast Reconstr Surg* 1991;87:1048-53.
 11. Newman LA, Kuerer HM, Hunt KK, Kroll SS, Ames FC, Ross MI, et al. Presentation, treatment, and outcome of local recurrence after skin-sparing mastectomy and immediate breast reconstruction. *Ann Surg Oncol* 1998;5:620-6.
 12. Fersis N, Hoening A, Relakis K, Pinis S, Wallwiener D. Skin-sparing mastectomy and immediate breast reconstruction: incidence of recurrence in patients with invasive breast cancer. *Breast* 2004;13:488-93.
 13. Margulies AG, Hochberg J, Kepple J, Henry-Tillman RS, Westbrook K, Klimberg S. Total skin-sparing mastectomy without preservation of the nipple-areola complex. *Am J Surg* 2005;190:920-6.
 14. Greenway RM, Schlossberg L, Dooley WC. Fifteen-year series of skin-sparing mastectomy for stage 0 to 2 breast cancer. *Am J Surg* 2005;190:918-22.
 15. Simmons RM, Fish SK, Gayle L, Trenta GSL, Swistel A, Christos P, et al. Local and distant recurrence rates in skin-sparing mastectomies compared with non-skin-sparing mastectomies. *Ann Surg Oncol* 1999;6(7):676-81.
 16. Foster RD, Esserman LJ, Anthony JP, Hwang ES, Do H. Skin-sparing mastectomy and immediate breast reconstruction: a prospective cohort study for the treatment of advanced stages of breast cancer. *Ann Surg Oncol* 2002;9:462-6.
 17. Downes KJ, Glatt BS, Kanchwala SK, Mick R, Fraker DL, Fox KR, et al. Skin-sparing mastectomy and immediate reconstruction is an acceptable treatment option for patients with high-risk breast cancer. *Cancer* 2005;103:906-13.
 18. Gerber B, Krause A, Reimer T, Müller H, Küchenmeister I, Makovitzky J, et al. Skin-sparing mastectomy with conservation of the nipple-areola complex and autologous reconstruction is an oncologically safe procedure. *Ann Surg* 2003;238:120-7.
 19. Crowe JP, Kim JA, Yetman R, Banbury J, Patrick RJ, Baynes D. Nipple-sparing mastectomy: technique and results of 54 procedures. *Arch Surg* 2004;139:148-50.
 20. Petit JY, Veronesi U, Luini A, Orecchia R, Rey PC, Martella S, et al. When mastectomy becomes inevitable: The nipple-sparing approach. *Breast* 2005;14:527-31.
 21. Cocquyt VF, Blondeel PN, Depypere HT, Van de Sijpe KA, Daems KK, Monstrey SJ, et al. Better cosmetic results and comparable quality of life after skin-sparing mastectomy and immediate autologous breast reconstruction compared to breast conservation treatment. *Br J Plast Surg* 2003;56:462-70.
 22. Dian D, Schwenn K, Mylonas I, Janni W, Jaenicke F, Friese K. An esthetic result among breast cancer patients undergoing autologous breast reconstruction versus breast conserving surgery. *Arch Gynecol Obstet* 2007;275:445-50.
 23. Mori H, Umeda T, Osanai T, Hata Y. Esthetic evaluation of immediate breast reconstruction after nipple-sparing or skin-sparing mastectomy. *Breast Cancer* 2005;12:299-303.
 24. Elder EE, Brandberg Y, Björklund T, Rylander R, Lagergren J, Jurell G, et al. Quality of life and patient satisfaction in breast cancer patients after immediate reconstruction: a prospective study. *Breast* 2005;14:201-8.
 25. Drucker-Zertuche M, Robles-Vidal C. A 7 year experience with immediate reconstruction after skin sparing mastectomy for cancer. *Eur J Surg Oncol* 2007;33:140-6.
 26. Dian D, Schwenn K, Mylonas I, Janni W, Friese K, Jaenicke F. Quality of life among breast cancer patients undergoing autologous breast reconstruction versus breast conserving therapy. *J Cancer Res Clin Oncol* 2007;133:247-52.
 27. Al-Ghazal SK, Blamey RW. Subcutaneous mastectomy with implant reconstruction: cosmetic outcome and patient satisfaction. *Eur J Surg Oncol* 2000;26:137-41.
 28. Gouy S, Rouzier R, Missana MC, Atallah D, Youssef O, Barreau-Pouhaer L. Immediate reconstruction after neoadjuvant chemotherapy: effect on adjuvant treatment starting and survival. *Ann Surg Oncol* 2005;12:161-6.
 29. Rivadeneira DE, Simmons RM, Fish SK, Gayle L, La Trenta GS, Swistel A, et al. Skin-sparing mastectomy with immediate breast reconstruction: a critical analysis of local recurrence. *Cancer J* 2000;6:331-5.
 30. Howard MA, Polo K, Pusic AL, Cordeiro PG, Hidalgo DA, Mehrara B, et al. Breast cancer local recurrence after mastectomy and TRAM flap reconstruction: incidence and treatment options. *Plast Reconstr Surg* 2006;117:1381-6.
 31. Torresan RZ, Santos CC, Okamura H, Alvarenga M. Evaluation of residual glandular tissue after skin-sparing mastectomies. *Ann Surg Oncol* 2005;12:1037-44.
 32. Petit JY, Veronesi U, Orecchia R, Luini A, Rey P, Intra M, et al. Nipple-sparing mastectomy in association with intraoperative radiotherapy (ELIOT): a new type of mastectomy for breast cancer treatment. *Breast Cancer Res Treat* 2006;96:47-51.
 33. Uriburu JL, Vuoto HD, Cogorno L, Isetta JA, Candas G, Imach GC, et al. Local recurrence of breast cancer after skin-sparing mastectomy following core needle biopsy: case reports and review of the literature. *Breast J* 2006;12(3):194-8.

各論 外科療法

乳房再建術後の整容性

Cosmetic results after breast reconstruction

矢野健二

Key words : 乳房再建, 整容性, 広背筋皮弁, 深下腹壁動脈穿通枝皮弁, 人工乳房

はじめに

乳房再建術後の整容性において最も何が重要であるかという点、乳房の左右の対称性である。両側性の乳癌は特殊であるが、片側性の乳癌では健側の乳房が再建におけるお手本となる。そして、健側と同様な乳房を様々な材料を駆使して作り直せばいいわけである。したがって、健側乳房との対比が乳房再建術後の整容性の評価につながる。

今回は乳房再建術後の整容性の指標となる要素および整容性を向上させるための再建時の注意点について詳述したい。

1. 方法

乳癌学会班研究(沢井班)¹⁾において、乳癌術後の整容性の評価法が検討され、最終案が報告された(表1)。この評価法を元にして、乳房再建術後の整容性を項目別に検討した。また、著者が現在までに経験した症例について評価を行い、乳房再建術後の整容性に最も影響を与える要因および術式について検討した。

2. 乳癌術後の整容性に関する検討項目

a. 乳房の大きさ

乳房の大きさは個人差があるが、再建を行う際には健側の乳房の大きさや切除された乳腺組

表1 乳房再建術後の整容性評価法

乳房の大きさ	2点(ほぼ等しい), 1点(少し差がある), 0点(かなり差がある)
乳房の形	2点(ほぼ等しい), 1点(少し差がある), 0点(かなり差がある)
瘢痕	2点(目立たない), 1点(少し目立つ), 0点(かなり目立つ)
乳房の硬さ	2点(柔らかい), 1点(やや硬い), 0点(かなり硬い)
乳頭乳輪の大きさ・形	1点(左右差なし), 0点(左右差あり)
乳頭乳輪の色調	1点(左右差なし), 0点(左右差あり)
乳頭の位置(胸骨切痕からの距離の左右差)	1点(2cm未満), 0点(2cm以上)
乳房最下垂点の位置(高さの左右差)	1点(2cm未満), 0点(2cm以上)
(総合評価) 12-11点: excellent, 10-8点: good, 7-5点: fair, 4-0点: poor	

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織の量に応じて充填する量を決定する。自家組織による再建では量を減じて微調整をすることは可能であるが、量が不足する場合は大きさを揃えるのが困難となる。再建乳房が小さくなる場合は、健側乳房の縮小術により大きさを揃えることも可能である。シリコンバッグなどの人工乳房による再建では、健側乳房の大きさに合わせたバッグを挿入することができるため乳房の大きさを揃えることは自家組織よりも容易である。

b. 乳房の形

乳房の形は様々であるが、健側に合わせた形を作らなければならない。自家組織による再建であれば皮弁の厚さを変えたり折り畳んだりして自由に形を作製することができる。その中でも最も容易に形を合わせることができるのは、乳癌術式が乳房温存手術や skin-sparing mastectomy (SSM) の場合である²⁾。乳房温存手術や SSM は乳房皮膚の大半が温存されており、乳房皮膚でできた皮下ポケットにそれに見合うだけの量の組織を充填するのみで良好な形を再現することができる。それに比べて乳房皮膚が欠損している場合は、再建材料としての皮弁の位置的自由度が低くなり再建の難易度が高くなる。一方、人工乳房による再建では、バッグの種類が豊富になりいろいろな形の乳房に使用しやすくなってきたが、下垂した乳房を形成するのは非常に困難である。

c. 瘢痕

瘢痕は、乳房領域内の手術に関連する手術瘢痕である。乳癌を切除するための切開創や皮膚欠損創に当てはめた皮弁周囲の瘢痕などが検討対象となる。通常、正面から見える乳房表面の瘢痕は目立ちやすく、乳房の輪郭に沿わせた瘢痕は目立ちにくい。その点から、乳房温存手術や SSM は瘢痕が目立ちにくく、皮膚切除を伴う乳房切除術は瘢痕が目立ちやすい。

d. 乳房の硬さ

再建乳房の硬さに関与するのは乳房内に充填した充填物の硬さである。自家組織による再建の場合、充填物は脂肪か筋肉である。筋肉は非常に柔らかく、硬さに関しては乳房の充填物と

して最適である。脂肪は部位によって硬さが異なり、下腹部の脂肪は非常に柔らかいが背部の脂肪は比較的硬い。したがって、広背筋皮弁による再建で皮膚の再建が不要の場合は脂肪を内側、筋肉を外側として筋肉で脂肪を包むようにして充填する方が柔らかい。一方、皮弁の血流不全により脂肪が部分的に壊死に陥り脂肪硬化を来した場合は再建乳房が部分的に硬くなる。乳癌の術後経過観察にもある程度支障を来すことになる。脂肪硬化を来した脂肪組織は小さい場合は1-2年で吸収され柔らかくなることが多いが、大きい場合は長年にわたり硬さが継続する。人工乳房充填による再建では人工乳房の硬さが乳房の硬さに反映する。シリコンバッグはほど良い硬さであり乳房の硬さに近似するが、生食バッグは柔らかすぎる嫌いがある。

e. 乳頭乳輪の大きさ・形

乳輪再建は術者が大きさ・形を決めて植皮をしたり刺青を加えたりするので、あまり左右不均一となることはないが、乳輪の大きさを決定したときの健側の乳輪が収縮しているか弛緩しているかにより若干大きさが異なるので要注意である。乳頭再建は健側の乳頭の部分移植か再建部位の皮弁を立ち上げて作製するかのいずれかである。健側乳頭部分移植は生着が良ければ左右対称的な大きさや形態を得ることができるが、生着が悪い場合は移植乳頭が萎縮し平坦な乳頭となる。皮弁により作製した乳頭は年月とともに縮小する傾向があるため、作製時は健側よりも大きく作製する必要がある。特に背部皮膚よりも腹部皮膚の方が薄く縮小しやすいため、腹部皮弁の上に作製した乳頭はより大きく作製する必要があり、場合によっては皮弁内に軟骨などの支持物を挿入することもある。

f. 乳頭乳輪の色調

乳輪は大腿基部からの全層植皮により再建されることが多いが、色調は健側の乳輪と近似することが多い。ただし、年々再建乳輪の色調が薄くなっていくことがあるため注意が必要である。刺青により乳輪を作製する場合は色素の調合により近似した色を作製することができる。乳頭は健側乳頭部分移植で生着が良ければ左右