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REVIEW ARTICLE

Oncoplastic Surgical Techniques for Personalized Breast Conserving Surgery in Breast Cancer Patient with Small to Moderate Sized Breast

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Oncoplastic surgery has revolutionized the field of breast conserving surgery (BCS). The final aims of this technique are to obtain an adequate resection margin that will reduce the rate of local recurrence while simultaneously improving cosmetic outcomes. To obtain successful results after oncoplastic surgery, it is imperative that patients be risk-stratified based on risk factors associated with positive margins, that relevant imaging studies be reviewed, and that the confirmation of negative margins be confirmed during the initial operation. Patients who had small- to moderate-sized breasts are the most likely to be dissatisfied with the cosmetic outcome of surgery, even if the defect is small; therefore, oncoplastic surgery in this population is warranted. Reconstruction of the remaining breast tissue is divided into volume displacement and volume replacement techniques. The use of the various oncoplastic surgeries is based on tumor location and excised breast volume. If the excised volume is less than 100 g, the tumor location is used to determine which technique should be used, with the most commonly used technique being volume displacement. However, if the excised volume is greater than 100 g, the volume replacement method is generally used, and in cases where more than 150 g is excised, the latissimus dorsi myocutaneous flap may be used to obtain a pleasing cosmetic result. The local recurrence rate after oncoplastic surgery was lower than that of conventional BCS, as oncoplastic surgery reduced the rate of positive resection margins by resecting a wider section of glandular tissue. If the surgeon understands the advantages and disadvantages of oncoplastic surgery, and the multidisciplinary breast team is able to successfully collaborate, then the success rate of BCS with partial breast reconstruction can be increased while also yielding a cosmetically appealing outcome.

Key Words: *Defect, Oncoplastic surgery, Personalized medicine, Personalized, Repairing*

INTRODUCTION

The increased use of screening mammography, as well as campaigns to raise awareness regarding breast cancer, have resulted in improvements in the early detection of breast cancer, resulting in improved prognosis for this condition. In the management of small breast cancers, breast conserving surgery (BCS) with adjuvant radiation therapy is the standard of care [1]. Large studies have shown that this approach for managing breast cancer is safe and has equivalent survival outcomes to that of mastectomy, although the incidence of local disease recurrence is slightly higher [2,3]. Women who undergo BCS have better body image and might have less adverse physical sequelae, due to asymmetry, chest wall adhesions, and numbness associated with mastectomy.

Although the overall cosmetic results seem to be significantly improved with BCS compared with mastectomy, 4% to 20% of all patients with BCS may still be dissatisfied with their final cosmetic outcome [4]. Poor cosmetic results following BCS are not uncommon and occur more frequently with tumors that are large with respect to the size of the breast or unfavorable tumor location [5]. Shape is further compromised when wide resection margins are required to obtain optimal oncologic control and often result in a deformed breast that is different in size compared with the contralateral side.

Oncoplastic surgery is a relatively new but increasingly used technique in the treatment of breast cancer. This method combines principles of oncological surgery and plastic surgery to obtain oncologically sound and aesthetically pleasing results in women who require partial mastectomy, as a result of breast cancer. The primary advantage of this surgical technique is the

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increased distance of the resection margin and the improved cosmetic outcome. Not all patients with breast cancer may need oncoplastic surgery. Eligible patients usually have an unfavorable breast: tumor size ratio, as well as tumor locations that would result in large visible scars and deep breast defects if BCS were to be performed.

The approach used in partial breast reconstruction is to consider different techniques based on tumor location and excised volume. A variety of techniques have been proposed, many of which are specific to the location of the tumor within the breast. This review will categorize oncoplastic techniques based on the location of the primary tumor and excised breast volume.

PREOPERATIVE PREPARATION

Imaging consideration: determine cancer distribution

To obtain satisfactory results from BCS, it is imperative that the surgeon selects the appropriate patient using the patient's characteristics and assessment of relevant imaging data. Tumor palpation by the physician is not always sensitive in the detection of non-palpable occult or multicentric lesions or in differentiating malignant tissue from fibrosis. Palpation for malignant lesions is especially challenging in young women, as the breast tissue tends to be much denser, which makes surgery based on palpation of the tumor alone inadequate for complete treatment. Perioperative imaging to detect tumors, including occult lesions, is absolutely necessary for successful BCS and impacts the surgeon's ability to obtain negative margins [6].

Mammography

Preoperative mammography is currently the most common, inexpensive, and easy screening tool available. Mammography gives data concerning tumor size, location, multifocality, multicentricity, and microcalcification, which is considered to be a sign for the presence of ductal carcinoma *in situ* (DCIS) [7, 8]. The role of mammography for detecting and estimating the extent of microcalcification, which cannot be seen on ultrasonography (USG), as well as non-formed masses, is important. The sensitivity and specificity rates of mammography are reported to be 94% and 61%, respectively [9].

Ultrasonography

The purposes of diagnostic USG are to characterize specific findings and to differentiate solid and cystic lesion in patients who have abnormalities in their clinical examination and mammography, as well as to reduce the rate of unnecessary breast biopsies. In Western countries, the incidence of breast cancer is high in patients of advanced age; therefore, breast screening is performed by mammography. However, in Asia, USG is used more frequently because the prevalence of breast cancer in young women is higher than that in Western countries; there is an also increased rate of dense breast tissue in this population [10]. The sensitivity of mammography in extremely dense breast tissue is reduced by 40%. USG is more accurate with respect to estimating tumor size and growth pattern, especially for non-palpable tumors, small nodules and lesions in dense breast tissue, which are not easily found using mammography [11]. There have been many advances in USG; however, it has numerous disadvantages, including its inability to differentiate consistently between benign and malignant tumors, as well as its lack of objective standards for describing tumors.

Magnetic resonance imaging

Magnetic resonance imaging (MRI) which adopts dynamic contrast to enhance an image, is useful not only for finding occult, multifocal breast cancer but also for determining the staging and surgical approach that is most appropriate for a particular lesion by assessing the extent of breast cancer more accurately. Indeed, MRI has received attention as a noninvasive method that reduced the rate of unnecessary biopsies. In addition, MRI-guided biopsies can be performed to obtain tissue from suspicious lesions that cannot be visualized by USG. Another advantage of breast MRI is that it is more sensitive in detecting multiple breast cancers in the fibroglandular or dense breast; indeed, MRI has been reported to be superior in measuring the extent of DCIS around an invasive cancer than other conventional studies [12,13]. In addition, a number of studies have reported that MRI is the most sensitive method for detecting multifocal or multicentric and contralateral cancer, as it can increase the diagnosis of additional cancer by 15% to 54% [14]. It has been proposed that the risk of local recurrence is caused by incomplete removal of the cancer in the setting of complete removal of the lesion, as suggested by the observation of additional occult lesions on preoperative MRI [14]. However, MRI is not without its disadvantages, as it is difficult to differentiate between benign and malignant tumors, which can result in more extensive resections than is actually needed and an increased risk of inappropriately performing a total mastectomy [15]. Breast MRI is of high utility in determining which patients would be appropriate for BCS, determining the nature of the BCS and determining the extent of the surgery based on 3D reconstruction in the patient with breast cancer who wants to have BCS, especially the patient who is planning to have oncoplastic BCS.

Positron emission tomography/computed tomography

Positron emission tomography/computed tomography (PET/CT) is known to have a role in the detection of breast cancer,

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the determination of metastasis in axillary lymph nodes and distant sites, the finding of recurrent lesions, and the assessment of therapeutic response. The factors influencing the sensitivity of PET/CT in the detection of breast cancer are the size of the breast tumor, which is the most important factor, as well as the histological type, the nuclear grade, and the proliferation index. It has been reported that PET/CT is more sensitive in discovering multiple breast cancer lesions and does so with higher specificity and positive predictive value than mammography or USG; however, PET/CT is less sensitive than MRI and may miss tumors smaller than 1 cm in size [16,17].

Patient selection

Patients who have had BCS are good candidates for oncoplastic surgery. In particular, patients who have independent risk factors for a positive margin (multifocal disease, large tumor size, diffuse microcalcification, presence of an extensive intraductal component, younger age, estrogen receptor negativity, lobular histology) require a wider margin of excision to obtain a negative margin. However, a wider excision margin may result in poor cosmetic outcomes; therefore, oncoplastic surgery may be more appropriate in such patients [6,18]. Patients who have had locally advanced breast cancer with good response to neoadjuvant chemotherapy may have a more extensive range of resection and may need to undergo oncoplastic surgery to correct defects in the appearance of the breast. In cases for which more than 20% of the breast volume was resected, and the tumor was located in the lower, inner and subareolar area, oncoplastic surgery may also be warranted, as the alterations in appearance are accentuated.

Operative planning

Not all patients require oncoplastic surgery. However, in the case of Asian women who have comparatively smaller breasts than Western women, many cases of BCS may result in an unsatisfactory outcome, especially in women for whom BCS reduces the size of the breast or women with larger breasts for whom there are noticeable scars or deformity of the breast. Because such results are highly predictable when the excised volume is large, more satisfactory results can be achieved if a plan is made prior to surgery by considering the size of the breast, the excised volume, and the location of the tumor. Patients with relatively large-sized breasts, e.g., many Western women, and with excised volume measuring less than 20% can achieve satisfactory cosmetic results with glandular reshaping [19], however, for patients with small- to moderate-sized breasts, which are defined as less than 300 g of tissue in the breast, there is generally insufficient tissue to perform glandular reshaping, even if the excision volume is not so large [5]. Therefore, during pre-operation planning, the size of the breast and the excised volume should be considered together to determine the appropriate oncoplastic technique to be used. In conventional BCS, depressed area or scars may be easily accentuated based on the site of the excision compared to oncoplastic BCS. However, oncoplastic BCS using plastic surgical techniques, e.g., glandular reshaping and reduction mammoplasty technique, improves the cosmetic result by locating the scars on unnoticeable surfaces, such as the nipple-areolar complex or the lower pole of the breast after surgery, and depending on whether the nipple or areolar complex are resected, immediate or delayed reconstruction can be performed [20]. In cases of tumors located at the upper part of the breast using methods such as the round block technique, the tennis racket method, the rotation flap, and the reduction mammoplasty using an inferior pedicle can provide good results. In cases of tumors located at the central part of the breast, the possibility of multifocal or multiple breast cancers, the possibility of direct invasion to nipple-areolar complex and aesthetics are reluctant after removal of nipple-areolar complex, which also should be considered. In cases of tumors located at the lower part of the breast, unfavorable results after removal due to lack of tissue, e.g., distortion, skin retraction, and malposition, where the nipple-areolar complex is being pulled downward, can occur, which should be acknowledged.

PSYCHO-ONCOLOGICAL FACTORS

The method of oncoplastic BCS used to treat the patient's breast cancer should consider the patient's psychological stability and satisfaction, as at the time of surgery, the patient must consider both a cosmetic reconstructive and breast cancer treatment surgery simultaneously. The surgeon performing the surgery must thoroughly explain to the patient that re-excision may be necessary in the setting of a positive resection margin and that additional surgery, e.g., total mastectomy with reconstruction, may also be needed after the initial operation. Active addressing of such issues reduces the anxiety of patients concerning the surgery and helps to increase subsequent satisfaction with the reconstructive surgery. However, not all of the patient's psychological stress can be relieved by improving the patient's cosmetic result after the surgery. Therefore, psychological support provided via active counseling is needed both before the surgery and during the adjuvant systemic therapy following the surgery.

INTRAOPERATIVE SURGICAL MARGIN STATUS

In Western countries, a second operation can be conducted after determining the result of a permanent pathologic biopsy

of the margin without the frozen section analysis. However, oncoplastic surgery, which uses such techniques as glandular reshaping, changes the location of the surgical margin, making it difficult to determine the margin if re-excision should need to occur secondary to a positive margin. Thus, it is important to confirm the surgical margin during the initial operation.

Frozen section analysis (FSA)

FSA is reported as the most commonly applied technique in confirming the surgical margin of tumors during surgery and has a sensitivity and specificity of 65% to 78% and 98% to 100%, respectively [21,22]. FSA significantly reduces the rate of re-operation by confirming the surgical margin during the first surgery. The disadvantage of the technique, however, is that operation time can be prolonged for 20 to 30 minutes and the use of FSA may compromise the accurate assessment of permanent pathology by the pathologist.

Specimen radiography

Specimen mammography

Patients with a non-palpable tumor can proceed to lumpectomy after inserting a hook wire in the area with suspicious radiograph findings. After the resection of an adequate amount of breast tissue around the needle without exposure of the needle, the surgeon confirms whether the tissue contains the shadow lesion found on mammography by examining the specimen using additional mammography. If there continues to be a breast mass or suspicious microcalcification present, re-excision is required and can be helpful in marking the specimen with a clip.

Evaluation of tumor margins by high frequency ultrasound examination

For non-palpable breast masses observed on USG, the margin can be evaluated using USG of the specimen after the surgeon performs an excisional biopsy under needle localization [23]. For breast masses close to the margin of excision, an additional resection may be necessary to secure the surgical margin.

SELECTION OF ONCOPLASTIC SURGICAL TECHNIQUES

The selection of the oncoplastic surgical technique that will yield a cosmetically appealing result is done by determining the patient's breast size and lesion location prior to surgery and being mindful of the excised volume and volume of the remaining breast tissue during the surgery. Reconstruction of the breast tissue can be done in one of two ways, as follows: the volume displacement technique uses the remaining breast tissue, while the second, the volume replacement technique, uses other autologous tissue to supplement the insufficient breast tissue [24]. However, for small-sized breasts, the remaining breast tissue may be insufficient for reconstruction, even if the excised volume was small. In such cases, applying volume replacement techniques can result in a satisfactory cosmetic result. The typically used techniques are included in Table 1.

Volume displacement techniques

The volume displacement technique rearranges the remaining breast tissue and minimizes the impact of wide local excision using glandular reshaping and the reduction mammoplasty technique. Volume displacement surgery is less extensive than the volume replacement technique, and there is no donor-site morbidity. However, the breast is smaller after reconstruction than before surgery, and a procedure on the contralateral side is often required to obtain symmetry of the breasts.

Glandular reshaping

In glandular reshaping, the surgeons can minimize the depression around the defects and subsequently perform a sim-

Table 1. Partial mastectomy reconstruction techniques

Volume displacement techniques	Volume replacement techniques
Glandular reshaping	Local flaps
Linear suture	Adipofascial flap
Parallelogram mastopexy lumpectomy	Lateral thoracodorsal flap
Purse string suture	Thoracoepigastric flap
Round block technique	ICAP flap
Batwing mastopexy	Distant flaps
Tennis racket method	TDAP flap
Rotation flap	LD myocutaneous flaps
Reduction mammoplasty techniques	
Inverted T	
Vertical type	

ICAP = intercostal artery perforator; TDAP = thoracodorsal artery perforator; LD = latissimus dorsi.

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ple primary closure. When the additional defects caused by the breast cancer are less than moderate and the remaining breast tissue is sufficient, broad dissection of the breast parenchyma around the defects from the skin and chest wall can be performed, and the defects are subsequently filled using a full-thickness segment of fibroglandular breast tissue advancement, rotation, and transposition [25].

Reduction mammoplasty techniques

Reduction mammoplasty techniques have the disadvantage of leaving many scars but are indicated in patients with relatively large-sized breasts or patients with ptotic breasts who may have breast tumor in a reduced specimen. In most cases, symmetrization can be obtained by performing reduction mammoplasty or mastopexy to the contralateral breast [26].

Volume replacement techniques

Volume replacement techniques use autologous tissues as the forms of flaps to import tissue when an insufficient volume of remaining breast tissue remains to perform a reconstruction. This technique can be divided into local flap and distant flap techniques based on the type of flap used. A major disadvantage of volume replacement procedures is the need for a donor site and the increased time for recovery that may follow harvesting the autologous tissue.

Local flap

The local flap is a one-stage operation that completes the reconstruction of the deficit using an adjacent flap that has the same size and length. Filling of the defect around the breast is done by elevation of local flaps, e.g., the lateral thoracodorsal flap, the thoracoepigastric flap, and the intercostal artery perforator (ICAP) flap. These techniques are easier to learn as compared to distant flaps, have shorter surgeries, have decreased donor site scars and deterioration of function, and provide similar color and texture to the breast [27].

Distant flap

The distant flap imports the insufficient volume using flaps, e.g., the thoracodorsal artery perforator (TDAP) flap and the

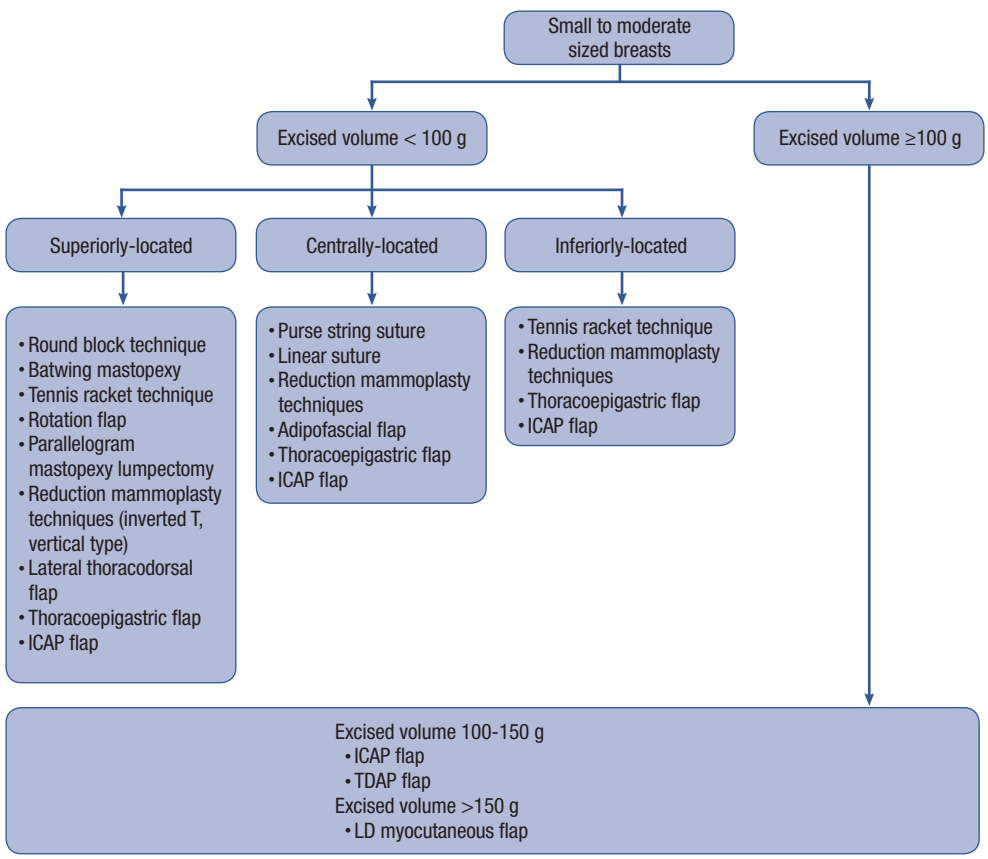

Figure 1. This figure shows an algorithm of oncoplastic surgical techniques for personalized BCS in small- to moderate-sized breasts based on the excised breast tissue volume and tumor location.
ICAP = intercostal artery perforator; TDAP = thoracodorsal artery perforator; LD = latissimus dorsi; BCS = breast conserving surgery.

latissimus dorsi (LD) myocutaneous flaps, which have donor sites distant to the breast. In some cases, to ensure a smooth blood supply, the free flap can be performed by harvesting the flap from the donor site and obtaining blood supply via microvascular anastomosis at the recipient site.

MANAGEMENT ALGORITHM FOR REPAIR OF PARTIAL MASTECTOMY

Oncoplastic surgery was first applied to Western women who had large-sized breasts and had cosmetic satisfaction only with glandular reshaping. However, for Asian women who have small- to moderate-sized breasts, even when the size of the defect is small, they have relatively more severe deformities, and mostly volume replacement techniques are required. Given the cosmetic outcome, there is a tendency to perform total breast reconstruction after skin-sparing or nipple-sparing mastectomy, rather than BCS. However, reconstruction after partial mastectomy can satisfy both the desire to preserve the patient's breast and ensure a satisfactory cosmetic outcome. The algorithm determining the oncoplastic surgical techniques being performed at Kyungpook National University Medical Center are based on the tumor location and the excised volume; the exact algorithm is included in Figure 1.

The authors first considered the excised volume and tumor location as the means by which to select the appropriate oncoplastic surgical techniques, as most Korean women who have small- to moderate-sized breast had unsatisfactory cosmetic results even if the defect size is small.

Most importantly, if the excised volume is less than 100 g, the tumor location is used to determine which technique should be used. For tumors located in superior aspects of the breast, the tennis racket technique or rotation flap may be useful. In cases of centrally located tumors, the purse string suture or linear suture had been used. In case of inferiorly-located tumors, the tennis racket technique or reduction mammoplasty technique can be used. In case of an excised volume greater than 100 g, the volume replacement technique has primarily been applied; however, these cases can be divided into groups in which the excised volume is 100 to 150 g and above 150 g. In cases of excised volume between 100 g and 150 g, ICAP flap or TDAP flap may be applied, and in cases of excised volume greater than 150 g, the LD flap may be applied to achieve satisfactory cosmetic results.

COSMETIC IMPROVEMENT

Repositioning of nipple-areolar complex

To obtain breast symmetry, the role of the location and size of the nipple is important, and for most cases, it is difficult to obtain perfect symmetry without manipulating the other side of the breast. In cases where the nipple-areolar complex is removed, due to direct and indirect invasion of the subareolar area, immediate or delayed reconstruction can be performed, and in cases where the tumor is located at the upper part or lower part of the breast, malposition of the nipple-areolar complex can occur, which is due to distortion, such as skin retraction, even if the proper redistribution of breast or other tissues is obtained.

Surgery to contralateral breast

After oncoplastic surgery, differences in the nipple-areolar complex, in breast size or in the degree of ptosis of both breasts can be the causes of asymmetry. The symmetry of both breasts can be obtained using various plastic surgeries on the contralateral breast [28]. If the difference is mild, periareolar symmetrical de-epithelization may be performed to adjust the location of nipple-areolar complex. If the excised volume is small, a similar amount of glandular resection on the similar location can be performed on the contralateral breast [29]. In cases where the ptosis is present in a moderate- to large-sized breast, symmetry can be obtained using mastopexy or reduction mammoplasty. In addition, there is an advantage of discovering the occult carcinoma in early stages by performing an examination on the contralateral breast specimen.

Additional procedure to reconstructed breast

Correction for the local depressed area that occurs after oncoplastic surgery can be conducted via fat grafting with local anesthesia, which is more simple and reproducible than more invasive approaches. According to Rigotti et al. [30], the grafted fat not only repairs the volume loss, but also, especially in irradiated fields, improves the quality of the overlying skin. If the nipple-areolar complex had been excised together during the tumor excision, reconstruction using the C-V flap or the Hammond flap can be performed after chemotherapy and radiotherapy is completed if necessary [31,32]. Approximately 2 months later, tattooing for pigmentation can be performed.

How to reduce complication of oncoplastic surgery

Fat necrosis and scar formation can appear as a post-operative complication after oncoplastic surgery. To prevent fat necrosis, maintenance of the blood supply to the elevated flap, including the glandular flap between the chest wall and the skin envelope. Prevention of skin retraction is most important, which is also highly related to reductions in scar formation. Performing oncoplastic surgery may extend the donor site scar, but it will be camouflaged by placing the donor site incision in

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inconspicuous places, such as the periareolar area or the inframammary fold. Scar widening can also be minimized by using layered sutures to reduce skin tension and by maintaining the blood supply of the skin envelope during the undermining.

TIMING OF REPAIR

Radiation therapy and margin status are important factors in deciding the time at which to conduct partial breast reconstruction after BCS. A second operation must be considered if the margin is positive after partial breast reconstruction, although it is a considerable burden on patients who have already developed a large scar, have undergone a long operation, and have spent a great deal of money. Therefore, oncoplastic partial breast reconstruction can be classified into three categories according to the time at which it is implemented: 1) Immediate partial breast reconstruction, which can be implemented during BCS, 2) Delayed-immediate partial breast reconstruction after checking the margin status several weeks post-operation, and 3) Delayed partial breast reconstruction, which can be implemented several months or years after adjuvant radiotherapy [33,34].

In cases of delayed reconstruction, this approach can reduce the risk of reoperation caused by positive margins; however, the scar, radiation changes, and fibrosis that occur after radiation therapy can cause problems for patients during reconstruction [35]. Furthermore, there is a greater risk of complications for this surgery, such as skin necrosis, fat necrosis, infection, dehiscence, partial or total areola necrosis and other complications, than with immediate reconstruction. Because smoking and obesity are associated with factors that cause the complications mentioned above, the timing of partial breast reconstruction must be considered with an understanding of the individual quality of the patient [35].

FOLLOW-UP AFTER ONCOPLASTIC SURGERY

Oncologic outcome: local recurrence

In conventional BCS, local recurrence rates have been reported to be 10% to 14%, while local recurrence rate for oncoplastic surgery are 2% to 9%. Differences between local recurrence rates are due to the oncological safety of oncoplastic surgery, as the frequency of positive margins using a wider glandular resection that includes the breast cancer reduces rates [36,37]. Rainsbury [38] reported local recurrence for volume displacement to be 0% to 7%, and of volume replacement to 0% to 5%. Many cases of deformity within the breast after oncoplastic surgery can be seen. Therefore, the differential diagnosis between postoperative glandular change and local recurrence after partial breast reconstruction becomes important. An active approach is needed, if abnormalities are found in follow-up imaging studies after the operation [34].

Fat necrosis

Fat necrosis is due to surgical or radiation-induced tissue damage after BCS and can occur in 4% to 25% of patients. Post-surgical fat necrosis occurring is considered to be a minor complication but can cause cosmetic problems and discomfort to the patient and can bring about anxiety and inconvenience when an additional study is needed, as differentiation benign lesions from local recurrence of breast cancer can be difficult [39,40]. Abnormalities found in imaging studies, such as mammography, USG, and MRI, after the operation require that the patient undergo fine needle aspiration, core needle biopsy or excisional biopsy to determine whether local recurrence has occurred. However, most abnormalities were confirmed as such phenomena as fat necrosis, fluid collection, or dystrophic calcification [34]. Small fat necrosis less than 2 cm can be resolved using conservative management and massage as time passes; in addition, non-steroidal anti-inflammatory drugs can be helpful if constant pain occurs. Surgical excision may be needed in only 2% to 7% of cases [40]. Improvement in symptoms using ultrasound-assisted liposuction occurs in more than 80% of cases, and complete resolution or reduction of sizes in large fat necroses has been reported recently [39,40].

CONCLUSIONS

The rate of BCS in Asian women with breast cancer is 50% to 60%, while in America or Europe, it is 70% to 80%. This difference is due to the volume of breast tissue in Western women, who tend to have larger breasts relative to Asian women, who tend to have small- to moderate-sized breasts, rather than differences in surgical approach. Another large difference is that 80% to 90% of the operations used in America or Europe are the reduction mammoplasty, while in Asia, the implementation of reduction mammoplasty is difficult, as the size of the breast is small, and the cosmetic impact is amplified. Consequently, immediate reconstruction after mastectomy is suggested. If many BCS with partial breast reconstruction techniques that are introduced in this study are implemented, the frequency of BCS in patients with small breasts can be increased with a consequent improvement in cosmetic outcomes.

Nevertheless, good results can be brought about if: 1) The advantages and disadvantages of BCS are well understood, 2) Breast care team consists of many specialists, including a breast surgeon, plastic surgeon, radiologist, medical oncologist, who are willing to collaborate and to select appropriate patients and

implement operations appropriately, and 3) Make the decision to perform partial and total reconstruction in breast cancer patients. Implementation of suitable oncoplastic techniques depends on the size of the breast, the location of the breast tumor, the amount of the partial resection and the defect size. The personalized BCS based on factors which are alluded to above in patient with small to moderate sized breast is very crucial.

The breast surgeon must understand plastic and reconstructive surgery and must be willing to have close discussions with the plastic surgeon, and the plastic surgeon must increase his/her knowledge of breast cancer and be well-informed on patient care along with the breast surgeon. The author hopes that a training course in which both breast and reconstructive surgeons work together to be educated and trained will result in an increase in the number of oncoplastic breast surgeons.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

REFERENCES

1. Arriagada R, Lê MG, Guinebretiore JM, Dunant A, Rochard F, Tursz T. Late local recurrences in a randomised trial comparing conservative treatment with total mastectomy in early breast cancer patients. Ann Oncol 2003;14:1617-22.
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. 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.
4. Al-Ghazal SK, Blamey RW. Cosmetic assessment of breast-conserving surgery for primary breast cancer. Breast 1999;8:162-8.
5. Clough KB, Cuminet J, Fitoussi A, Nos C, Mosseri V. Cosmetic sequelae after conservative treatment for breast cancer: classification and results of surgical correction. Ann Plast Surg 1998;41:471-81.
6. Pleijhuis RG, Graafland M, de Vries J, Bart J, de Jong JS, van Dam GM. Obtaining adequate surgical margins in breast-conserving therapy for patients with early-stage breast cancer: current modalities and future directions. Ann Surg Oncol 2009;16:2717-30.
7. Cho KR, Seo BK, Kim CH, Whang KW, Kim YH, Kim BH, et al. Noncalcified ductal carcinoma in situ: ultrasound and mammographic findings correlated with histological findings. Yonsei Med J 2008;49:103-10.
8. Ikeda DM, Andersson I. Ductal carcinoma in situ: atypical mammographic appearances. Radiology 1989;172:661-6.
9. Rauscher GH, Johnson TP, Cho YI, Walk JA. Accuracy of self-reported cancer-screening histories: a meta-analysis. Cancer Epidemiol Biomarkers Prev 2008;17:748-57.
10. Kaplan SS. Clinical utility of bilateral whole-breast US in the evaluation of women with dense breast tissue. Radiology 2001;221:641-9.
11. Kolb TM, Lichy J, Newhouse JH. Occult cancer in women with dense breasts: detection with screening US--diagnostic yield and tumor characteristics. Radiology 1998;207:191-9.
12. Morris EA, Liberman L, Dershaw DD, Kaplan JB, LaTrenta LR, Abramson AF, et al. Preoperative MR imaging-guided needle localization of breast lesions. AJR Am J Roentgenol 2002;178:1211-20.
13. Hata T, Takahashi H, Watanabe K, Takahashi M, Taguchi K, Itoh T, et al. Magnetic resonance imaging for preoperative evaluation of breast cancer: a comparative study with mammography and ultrasonography. J Am Coll Surg 2004;198:190-7.
14. Houssami N, Ciatto S, Macaskill P, Lord SJ, Warren RM, Dixon JM, et al. Accuracy and surgical impact of magnetic resonance imaging in breast cancer staging: systematic review and meta-analysis in detection of multifocal and multicentric cancer. J Clin Oncol 2008;26:3248-58.
15. Lim HI, Choi JH, Yang JH, Han BK, Lee JE, Lee SK, et al. Does pre-operative breast magnetic resonance imaging in addition to mammography and breast ultrasonography change the operative management of breast carcinoma? Breast Cancer Res Treat 2010;119:163-7.
16. Avril N, Rosé CA, Schelling M, Dose J, Kuhn W, Bense S, et al. Breast imaging with positron emission tomography and fluorine-18 fluorodeoxyglucose: use and limitations. J Clin Oncol 2000;18:3495-502.
17. Walter C, Scheidhauer K, Scharl A, Goering UJ, Theissen P, Kugel H, et al. Clinical and diagnostic value of preoperative MR mammography and FDG-PET in suspicious breast lesions. Eur Radiol 2003;13:1651-6.
18. MacDonald S, Taghian AG. Prognostic factors for local control after breast conservation: does margin status still matter? J Clin Oncol 2009;27:4929-30.
19. Bulstrode NW, Shrotria S. Prediction of cosmetic outcome following conservative breast surgery using breast volume measurements. Breast 2001;10:124-6.
20. Bae SG, Yang JD, Lee SY, Chung KH, Chung HY, Cho BC, et al. Oncoplastic techniques for treatment of inferiorly located breast cancer. J Korean Soc Plast Reconstr Surg 2008;35:680-6.
21. Cendán JC, Coco D, Copeland EM 3rd. Accuracy of intraoperative frozen-section analysis of breast cancer lumpectomy-bed margins. J Am Coll Surg 2005;201:194-8.
22. Olson TP, Harter J, Muñoz A, Mahvi DM, Breslin T. Frozen section analysis for intraoperative margin assessment during breast-conserving surgery results in low rates of re-excision and local recurrence. Ann Surg Oncol 2007;14:2953-60.
23. Haid A, Knauer M, Dunzinger S, Jasarevic Z, Köberle-Wührer R, Schuster A, et al. Intra-operative sonography: a valuable aid during breast-conserving surgery for occult breast cancer. Ann Surg Oncol 2007;14:3090-101.
24. Yang JD, Bae SG, Chung HY, Cho BC, Park HY, Jung JH. The usefulness of oncoplastic volume displacement techniques in the superiorly located breast cancers for Korean patients with small to moderate-sized breasts. Ann Plast Surg 2011;67:474-80.
25. Anderson BO, Masetti R, Silverstein MJ. Oncoplastic approaches to partial mastectomy: an overview of volume-displacement techniques. Lancet Oncol 2005;6:145-57.
26. Losken A, Hamdi M. Partial breast reconstruction: current perspectives. Plast Reconstr Surg 2009;124:722-36.

http://dx.doi.org/10.4048/jbc.2011.14.4.253

27. Almasad JK, Salah B. Breast reconstruction by local flaps after conserving surgery for breast cancer: an added asset to oncoplastic techniques. Breast J 2008;14:340-4.
28. Petit JY, De Lorenzi F, Rietjens M, Intra M, Martella S, Garusi C, et al. Technical tricks to improve the cosmetic results of breast-conserving treatment. Breast 2007;16:13-6.
29. Veronesi U, Volterrani F, Luini A, Saccozzi R, Del Vecchio M, Zucali R, et al. Quadrantectomy versus lumpectomy for small size breast cancer. Eur J Cancer 1990;26:671-3.
30. Rigotti G, Marchi A, Galiè M, Baroni G, Benati D, Krampera M, et al. Clinical treatment of radiotherapy tissue damage by lipoaspirate transplant: a healing process mediated by adipose-derived adult stem cells. Plast Reconstr Surg 2007;119:1409-22.
31. Losken A, Mackay GJ, Bostwick J 3rd. Nipple reconstruction using the C-V flap technique: a long-term evaluation. Plast Reconstr Surg 2001; 108:361-9.
32. Dolmans GH, van de Kar AL, van Rappard JH, Hoogbergen MM. Nipple reconstruction: the "Hammond" flap. Plast Reconstr Surg 2008;121: 353-4.
33. Kronowitz SJ, Kuerer HM, Buchholz TA, Valero V, Hunt KK. A management algorithm and practical oncoplastic surgical techniques for repairing partial mastectomy defects. Plast Reconstr Surg 2008;122:1631-47.
34. Losken A, Styblo TM, Carlson GW, Jones GE, Amerson BJ. Management algorithm and outcome evaluation of partial mastectomy defects treated using reduction or mastopexy techniques. Ann Plast Surg 2007; 59:235-42.
35. Munhoz AM, Aldrighi CM, Montag E, Arruda E, Brasil JA, Filassi JR, et al. Outcome analysis of immediate and delayed conservative breast surgery reconstruction with mastopexy and reduction mammaplasty techniques. Ann Plast Surg 2011;67:220-5.
36. Rietjens M, Urban CA, Rey PC, Mazzarol G, Maisonneuve P, Garusi C, et al. Long-term oncological results of breast conservative treatment with oncoplastic surgery. Breast 2007;16:387-95.
37. Urban C, Lima R, Schunemann E, Spautz C, Rabinovich I, Anselmi K. Oncoplastic principles in breast conserving surgery. Breast 2011;20 Suppl 3:S92-5.
38. Rainsbury RM. Surgery insight: oncoplastic breast-conserving reconstruction--indications, benefits, choices and outcomes. Nat Clin Pract Oncol 2007;4:657-64.
39. Hassa A, Curtis MS, Colakoglu S, Tobias AM, Lee BT. Early results using ultrasound-assisted liposuction as a treatment for fat necrosis in breast reconstruction. Plast Reconstr Surg 2010;126:762-8.
40. Trombetta M, Valakh V, Julian TB, Werts ED, Parda D. Mammary fat necrosis following radiotherapy in the conservative management of localized breast cancer: does it matter? Radiother Oncol 2010;97:92-4.