Reduction Mammoplasty in Conjunction with Breast Conservation

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ABSTRACT

Breast conservation therapy, consisting of lumpectomy or segmental mastectomy with negative margins followed by breast irradiation, has become a standard and safe alternative to mastectomy in selected patients with early-stage breast cancer. As the inclusion criteria for breast conservation therapy have continued to evolve to include lower quadrant tumors, very large breasts, and central tumors, the potential for significant disfigurement after breast conservation therapy has increased. Bilateral reduction mammoplasty in conjunction with tumor-directed partial mastectomy is a surgical approach that can benefit these patients by creating symmetric, aesthetically pleasing breasts in a single-stage operation.

KEYWORDS: Breast conservation surgery, breast conservation therapy, reduction mammoplasty

Breast conservation surgery along with radiation has become an accepted alternative to total mastectomy for selected patients with early-stage breast cancer because of its comparable overall survival rate and positive impact on quality of life. The majority of patients treated with breast conservation therapy (BCT) achieve an acceptable cosmetic result with minimal distortion or asymmetry. However, some patients may be left with a significant breast deformity following BCT, thus requiring that they live with disfigurement or undergo reconstruction. Plastic surgeons are available early in the planning stage of this treatment to help anticipate cosmetic problems and attempt to prevent them. The ultimate recommendations regarding surgical, oncological, and reconstructive management depend on the experience and expertise of the surgical team, the location and nature of the tumor, the size and anatomy of the breast, and the overall health and body habitus of the patient.¹ BCT should ideally aim to remove all involved tissue with adequate margins, provide a natural and cosmetically acceptable breast, and limit the risk of

recurrence. Hence, in its most ambitious form, BCT should not be limited to simply leaving the breast in close resemblance to the way it was, but rather restore it to an improved state where improvements from its original state are warranted. Many institutions have developed new ways to address correction and prevention of breast disfigurement as part of the BCT program. Terms such as “tumor-specific immediate reconstruction” and “oncoplastic surgery” have been coined to describe a cosmetic approach to breast conservation surgery.² This philosophy of surgeons developing strategies to improve patient survival while also optimizing breast shape, symmetry, and overall cosmetic appearance represents BCT taken to the next level.

Historically, some of the contraindications for BCT have been large tumor/breast ratio, large breast size and tumor location beneath the nipple, and history of collagen vascular disease. Patients with breast cancer and larger breasts have historically faced a very difficult decision. They had to choose between a mastectomy, which ultimately led to an unacceptable degree of

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asymmetry, with poor-fitting prosthesis, and BCT, which could cause radiation toxicity with breast asymmetry, distortion, and wound breakdown. The criteria for breast conservation have expanded, however, over the years to include larger tumors, central breast tumors, larger breasts, and more advanced disease. These patients, once excluded from BCT, are now offered this option. These inclusions have led, however, to an increased potential for significant disfigurement and asymmetry. Postradiation sequelae such as fibrosis and retraction are correlated with large breast volume, which require higher radiation doses to penetrate the tumors.³

ADVERSE EFFECTS OF RADIATION ON PATIENTS WITH LARGER BREASTS FOLLOWING BREAST CONSERVATION SURGERY

The adverse effects of macromastia on outcome following BCT and radiation have already been established in the literature.⁴ Radiation toxicity is the major cause of long-term breast asymmetry and disfigurement. Clarke and colleagues reported excellent results following breast conservation surgery and radiation in 100% of A bra cup patients after long-term follow-up but only in 50% of D bra cup patients.⁵ Ray and Fish in their study reported excellent cosmetic results in 92% of A and B bra cup patients versus 64% of C bra cup patients.⁶ Although large fatty breasts are easier to screen with mammography and usually provide for a better cosmetic result after tumor resection, they pose a potential problem for the radiation oncologist. To penetrate these large breasts high doses of radiation are required, which can lead to radiation toxicity to the skin and fibrosis of the breast parenchyma. Postradiation sequelae contribute significantly to the long-term breast asymmetry in these patients. Some forms of chemotherapy are believed to worsen the effect of radiation.⁷ Radiation-induced fibrosis is thought to be greater in women with larger breasts, given the dosing inhomogeneity.⁸ Brierley et al demonstrated a late radiation fibrosis occurring 36% of the time in patients with larger breasts, compared with 3.6% for smaller breasts.⁹ These deformities and additional scarring can be difficult to manage, frequently requiring secondary reconstruction with autologous tissue, implants, or some form of mammaplasty.¹ Unlike many of the other risk factors that contribute to poor outcome, such as patient age, tumor size and location, and need for adjuvant therapy, macromastia patients could benefit from coincidental reduction, which would reduce their risk of poor outcome. Reduction mammaplasty as a technique for breast conservation surgery offers an added benefit of tumor removal with wide surgical margins, a reduction in breast weight for better penetrance of radiation therapy, improvement of neuromuscular symptoms from large pendulous breasts, a large breast-tissue speci-

men from the contralateral breast, and all as part of the BCT process.

REDUCTION MAMMAPLASTY FOLLOWING BCT

Reduction mammaplasty has been shown to be a safe reconstructive technique following BCT, but it is clear from the literature that surgery on the radiated breast can lead to increased complications and yield a diminished cosmetic result as compared with the nonradiated breast.¹⁰ Handel and associates report a case of breast reduction following breast conservation using a free nipple graft with a good outcome but delayed healing and some loss of the nipple.¹¹ Spear and colleagues found that although the cosmetic results were acceptable, the radiated breast results were generally less attractive following reduction mammaplasty. The healing process also was different between the radiated and nonradiated breast, with the radiated breast having more and longer induration and swelling than the nonradiated side.¹² The specific technique used (i.e., McKissock), inferior and superior pedicle techniques, appeared to be relatively inconsequential. Emphasis on wider flaps with less or no undermining with a limited pedicle length proved effective in avoiding complications such as nipple or flap necrosis.¹²

Mammography should be performed after treatment to obtain a baseline mammogram because the architecture of the breast is changed by the procedure. The higher complication rate, diminished cosmetic result, and concern about serious complications from operating on a radiated breast has led many surgeons to perform reduction mammaplasty at the time of breast conservation surgery and prior to irradiation of the breast.

REDUCTION MAMMAPLASTY AS BREAST CONSERVATION SURGERY PRIOR TO RADIATION

Reduction mammaplasty has been found in several studies to improve BCT in patients with macromastia. Only recently has reduction mammaplasty been considered as an option for patients during their primary breast conservation surgery. Several surgeons feared the possibility of positive specimen margins after surgery, which could make it difficult to locate the residual tumor after tissue manipulation. Others wondered whether reduction after lumpectomy would complicate the delivery of radiation therapy.¹²

Several studies have already proven the safety and efficacy of reduction mammaplasty as a breast conservation surgery prior to irradiation of the breast. Newman and colleagues in their study of 28 patients found no local recurrence in their reduction mammaplasty patient

population after a median follow-up of 23.8 months.¹³ Intraoperative margin assessment was performed by pathology evaluation of the specimen sections, accompanied by a specimen mammogram. Surgical clips were placed at the perimeter of the tumor resection site only if the tumorectomy bed was not located within the mammoplasty field. Postirradiation sequelae showed no notable adverse effects except mild erythema. Of these patients 86% reported being very satisfied with their final cosmetic result. Smith and colleagues¹⁴ in their study of 10 women who underwent bilateral reduction mammoplasty with breast conservation surgery followed by irradiation found no local recurrent malignancies and good to excellent results on all their patients. They had an average follow-up of 37 months and reported only one complication of fat necrosis with partial mastectomy skin loss on the oncological side prior to irradiation.

In a study of 11 patients who underwent breast conservation surgery followed by breast reconfiguration and bilateral reduction mammoplasty, Spear and associates found no local recurrences and one death from distant metastasis with an average 24-month follow-up.² All the patients underwent radiation therapy following surgery. There were eight minor complications in six patients, which included one small hematoma, one keloid, one radiation burn, two cases of nipple hypopigmentation, and three cases of fat necrosis. None of the complications, however, were considered significant. When asked to rate their aesthetic satisfaction on a scale of 1 to 4, the mean score for 7 of the 11 patients who responded was 3.3.

Clough and colleagues in their series of 20 patients found the 4-year local recurrence and survival rates were identical to those of conventional conservative treatment consisting of lumpectomy and radiotherapy.³

Figure 1 A 44-year-old female with left breast ductal carcinoma in situ and infiltrating ductal carcinoma. (A) Preoperative bra cup size 34DD and patient weight of 180 pounds. (B) Preoperative markings. Patient underwent left lumpectomy with axillary dissection immediately followed by breast reduction with free nipple graft on left and superomedial pedicle reduction on right breast. (C) Two weeks postoperative with bra size 34D. Postoperatively patient received radiation with 5040 Gy to left breast. (D) Two years postradiation to left breast, patient is disease-free.

The cosmetic result was good in 75% and good or very good in 91% of patients in the group in which mammoplasty was performed prior to irradiation. There were no cases of wound breakdown or glandular or cutaneous necrosis. There was one case of local recurrence and four cases of metastases. The versatility of mammoplasty reduction surgery allows for tumor resection in virtually any quadrant of the breast including tumors behind the nipple areola.

PREOPERATIVE PLANNING

Patients with D cup or larger breasts should be offered reduction mammoplasty as a method of reconstruction as part of their breast conservation surgery. Preoperative planning and markings are performed after discussions with the surgical oncologist regarding the location of the tumor, location and length of incisions, and need for separate axillary incisions. Any axillary incision should be performed judiciously because of the potential risk to the vascularity of the lateral skin flap. The versatility provided by the variety of standard reduction mammoplasty

techniques (superomedial, superolateral, inferior, etc.) allows the reconstruction of virtually any excision. The choice of which procedure to use is based on the location of the tumor and surgeon preference because often several reduction pedicles could be used to rearrange or reconstruct the breast in any given case.¹ Losken¹⁵ in his study has developed an algorithm for determining potential pedicle techniques by tumor location. The free nipple reduction technique can also be used when pedicle vascularity may be compromised, particularly in those patients with gigantomastia. Preoperative markings are performed with the patient in the upright position using either the standard Wise pattern design or a periareolar or circumvertical mastopexy plan. The location of the base of the pedicle is determined by placing it in such a way so as to avoid the location of the tumor. This may result in an inferior, superomedial, or lateral pedicle. The biopsy scar and lumpectomy scar are incorporated within the pattern of the skin to be excised whenever possible. The preoperative markings are important in guiding the oncological surgeon in avoiding unnecessary incisions, damage to the

Figure 2 A 48-year-old female with right breast carcinoma in situ and infiltrating ductal carcinoma. (A) Preoperative bra cup size was 42DDD and patient weighed 230 pounds. (B) Preoperative markings. Patient underwent a right quadrantectomy immediately followed by bilateral amputation type reduction and free nipple grafts. (C) Postoperative bra size 42B. Postoperatively patient received radiation with 5040 Gy to right breast. (D) Fourteen months postirradiation, patient is disease-free.

Figure 3 A 54-year-old female with left infiltrating ductal carcinoma. (A) Preoperative bra cup size 40DDD with patient weight of 190 pounds. Patient underwent left quadrantectomy and right lumpectomy (benign mass) followed by bilateral amputation type reduction with free nipple grafts. Postoperatively patient received radiation with 5040 Gy to left breast. (B) Six months after radiation, patient is disease-free.

skin flaps, or damage to the pedicle of the nipple-areolar complex.

SURGICAL APPROACH

The timing of the breast-reduction portion of the plan can be adjusted to suit the situation. The reduction may immediately follow the lumpectomy and axillary lymph node dissection procedure if obtaining a clear margin is not an issue. In other cases when obtaining a clear margin is an issue, it is probably wiser to defer the reduction until permanent sections have been reviewed by the pathologist. This is important even if the frozen sections appear clear of tumor. In these cases, the timing of the reduction is often 1 to 2 weeks after the lumpectomy. This approach should settle any concerns that a premature reduction might interfere with obtaining clear margins or delivering radiation therapy. The weight of the breast-tissue specimen removed during the lumpectomy is recorded to determine the amount of additional breast tissue to be removed on the ipsilateral side and total amount to be removed on the contralateral side. A breast reduction is first performed on the ipsilateral side, incorporating the lumpectomy defect within the breast tissue removed. The pedicle in the affected breast should in essence fill the defect created by the breast conservation surgery. A superomedial pedicle, for example, would therefore be a good option for a patient with an inferior or lateral tumor. On the opposite side, a reduction is then performed using whatever pedicle the surgeon prefers. The weight of the breast tissue removed from both sides is weighed to ensure symmetry. The weight of the breast tissue removed from the normal breast should approximate that of the lumpectomy specimen plus any breast tissue removed during the reduction of the cancer side. Radiation follows later at the same interval as it would following any lumpectomy (Figs. 1, 2, 3).

CONCLUSION

Bilateral reduction mammoplasty as part of BCT can potentially improve the efficacy of radiation therapy in women with excessively large breasts. It can also alleviate the symptoms that can accompany macromastia, improve the cosmetic outcome of breast conservation, and widen the application of breast-preserving surgery for breast cancer patients. The efficacy and safety of performing reduction mammoplasty as an adjunct to breast conservation surgery has been demonstrated well in several studies, mostly in Europe. By adding breast reduction and other plastic surgery techniques to breast conservation, patients have the opportunity for an improved cosmetic outcome and overall improved quality of life.

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