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# Breast Augmentation after Conservation Surgery and Radiation Therapy

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**Background:** There is a paucity of data regarding outcomes for patients undergoing breast augmentation with implants after breast conservation surgery (BCS) and radiotherapy. This retrospective study examined outcomes for patients with breast implant-only augmentation after BCS and radiotherapy..
**Methods:** Between June 1998 and December 2010, 671 women underwent prosthetic breast reconstruction. Nineteen patients (2.8%) underwent an augmentation after BCS and radiotherapy. The mean age was 55.8 years (range, 40–69 years). Sixteen of these patients underwent one-stage implant-only breast augmentation, whereas 3 patients underwent two-stage expander and then implant augmentation.
**Results:** All surgeries were successful. The average size of breast implant used was 258.7 g. Seven patients also received contralateral augmentation with an average implant size of 232.2 g. One patient received oral antibiotics for minor wound infection. Patients were judged to have an excellent (14/19; 73.7%), good (3/19; 15.8%), or fair (2/19; 10.5%) cosmetic result.
**Conclusion:** The breasts of selected patients with breast cancer after BCS and radiotherapy. with asymmetry can be adequately augmented with breast implants alone.
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It was established in the mid-1980s that breast conservation surgery (BCS) and radiotherapy is as effective as a total mastectomy for treatment of breast cancer, after publication of large randomized trials from the United States, Europe, and Scandinavia.[1,2] However, although the aim of BCS is to preserve the breast form while at the same time removing all the cancer with a clear margin, studies have reported up to 50% significant deformity and asymmetry after BCS and radiotherapy.[3–5] As these patients have undergone radiotherapy, implant-only volume replacement is generally considered contraindicated and most reports of reconstruction efforts concentrate on reorganizing the remaining breast tissue by methods such as breast reduction or addition of volume with an autologous flap.[6–9]

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Here, we present data from an alternative approach that has been rarely reported; this approach involves inserting a silicone implant as a one-stage procedure or with an initial expander followed by a subsequent silicone implant as a two-stage procedure. For small-breasted women, this could be a unilateral or bilateral augmentation, and for large-breasted women, the approach would be a combination of unilateral augmentation and contralateral breast reduction. We discuss the utility of this option as a more cost-effective alternative for patients concerned about retraction after earlier breast-conserving procedures of prosthetic breast augmentation after BCS and radiotherapy in a series of patients treated by 1 surgeon in the western region of Sydney, New South Wales, Australia.

## PATIENTS AND METHODS

Between June 1998 and December 2010, a dedicated plastic surgeon (T.L.) was part of a multidisciplinary team that offered breast reconstructions (BRs) by expander and/or implant or autologous flap for all eligible patients and conducted corrective surgery after breast conservation or mastectomy for primary or recurrent breast cancer. In total, 837 patients with breast cancer underwent BRs after their diagnosis.

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A retrospective review showed that of the 837 patients, 671 (80.2%) underwent prosthetic BRs, and 19 of these women (2.8%) had prior conservation surgery and radiation therapy. The radiotherapy technique has been described elsewhere, but in short generally involved a dose of 50 Gy in 25 fractions to the whole breast (±regional nodes) followed by an electron or photon boost to a dose of 10 Gy in 5 fractions.[10] Sixteen of the 19 patients (84.2%) underwent a one-stage implant augmentation alone, whereas 3 patients (15.8%) underwent two-stage augmentation with initial insertion of a tissue expander before a permanent implant after a period of inflation.

**Surgical Technique**

The majority of patients underwent a new inframammary crease incision, and a submammary or a submuscular plane was developed, similar to a standard breast augmentation. This allowed the whole breast, together with the previous lumpectomy scar that is often tethered or indented, to be lifted as 1 piece. A saline-filled inflatable sizer was used to assess the volume required to achieve symmetry with the contralateral breast (with or without augmentation), and then, an appropriately sized silicone breast implant was inserted. The wound was then closed with suction drainage.

Clinical data, demographic characteristics, and complications were recorded for each patient. Assessment of the final cosmetic outcome was made using a 4-tier grading: "excellent"—good cosmetic result *with* good symmetry to the contralateral breast (Fig. 1); "good"—good cosmetic result but *not* symmetrical to the contralateral breast (Fig. 2); "fair"—average result and not symmetrical to the contralateral breast (Fig. 3); "poor"—failed reconstruction with removal of the prosthesis. Patients were not asked to rate their implant particularly as it has been reported that patient scores are systematically higher than a physician's score and nipple symmetry was not recorded.[3,11] We also did not record the extent of the initial surgical resection but have previously reported this is as one of the major factors affecting cosmetic outcome.[11]

This study was approved by the Western Sydney Local Health District Human Research Ethics Committee.

## RESULTS

The clinical and demographic characteristics of the 19 patients are given in Table 1. The mean age at breast augmentation was 55.8 years (range, 40–69 years), with the majority of patients over 50 years of age (n = 14; 73.7%). The median time between initial surgery and subsequent reconstructive surgery was 77.7 months (range, 13–238 months). The average length of follow-up was 35.6 months (range, 1–115 months). Three patients (15.8%) were current smokers, 2 (10.5%) were ex-smokers, and 14 (73.7%) never smoked. The bra size of the patients was recorded preoperatively: A cup (n = 4; 21.1%), B cup (n = 6; 31.6%), C cup (n = 6; 31.6%), or D cup (n = 3; 15.8%). Of the 7 patients who underwent concomitant contralateral breast augmentation, 3 had preoperative size of A cup, 1 had B cup, and 3 had C cup.

There were 14 (73.7%) right-sided cancers, and the remaining 5 (26.3%) were on the left. All patients had developed primary breast cancer and underwent a unilateral wide local excision followed by adjuvant radiotherapy, for invasive ductal (n = 15; 78.9%) or lobular (n = 1; 5.3%) or ductal carcinoma in situ (n = 3; 15.8%). Six patients had

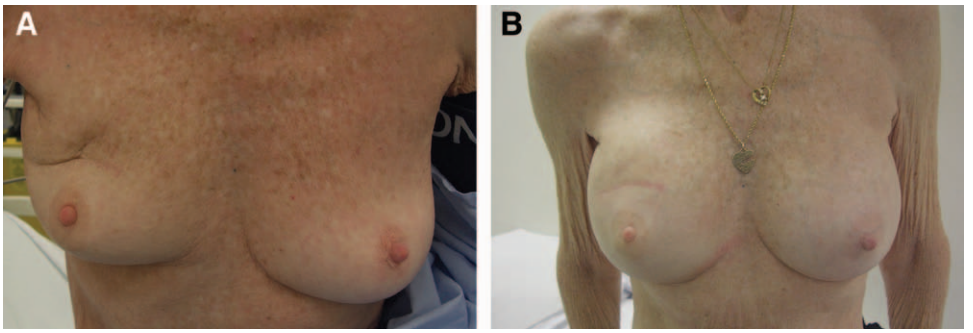


**Fig. 1.** A, Before reconstruction (57 year old). B, Excellent result—57 year old with 375 g round gel implant reconstruction of right breast and 325 g left-breast augmentation.

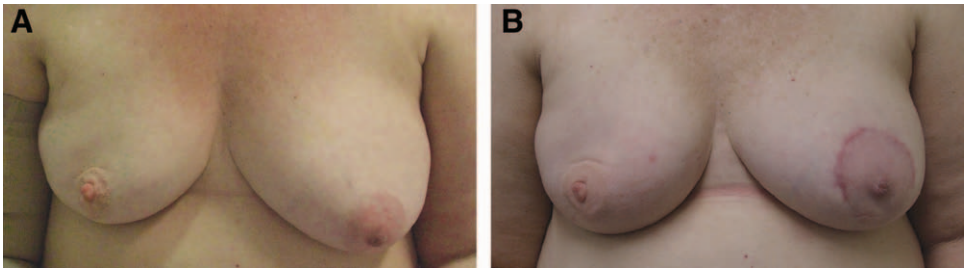


**Fig. 2.** A, Before reconstruction (46 year old). B, Good result—46 year old with 265 g round gel implant reconstruction of right breast and left mastopexy.

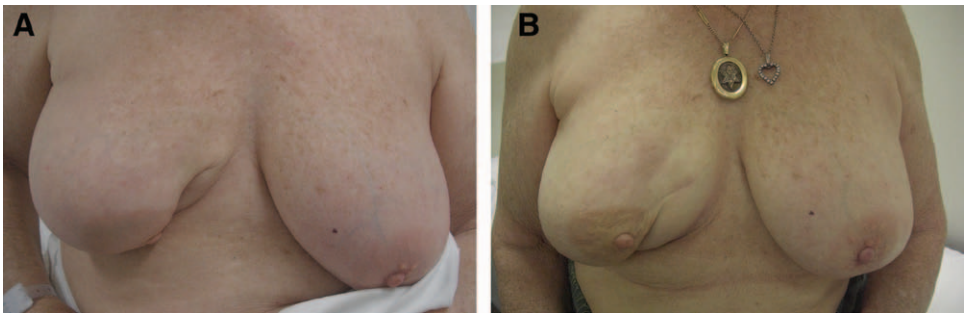


**Fig. 3.** A, Before reconstruction (68 year old). B, Fair result—68 year old with 180 g round gel implant reconstruction to right breast.

**Table 1. Clinical and Demographic Characteristics of Patients**

| Characteristics | Mean (Range) | n (%) |
|---|---|---|
| Age, y | 55.8 (40–69) | |
| <50 | | 5 (26.3) |
| ≥50 | | 14 (73.7) |
| Time to BR, mo | 77.7 (13–238) | |
| Follow-up, mo | 35.6 (1–115) | |
| Smoking | | |
| Current smoker | | 3 (15.8) |
| Ex-smoker | | 2 (10.5) |
| Nonsmoker | | 14 (73.7) |
| Bra cup size (preoperative) | | |
| A | | 4 (21.1) |
| B | | 6 (31.6) |
| C | | 6 (31.6) |
| D | | 3 (15.8) |
| Laterality of breast cancer | | |
| Right | | 14 (73.7) |
| Left | | 5 (26.3) |
| Primary cancer | | |
| Invasive ductal | | 15 (79.0) |
| DCIS | | 3 (15.7) |
| Lobular | | 1 (5.3) |
| Nodal status | | |
| Negative | | 9 (47.4) |
| Positive | | 7 (36.8) |
| Not known | | 3 (15.8) |
| Previous chemotherapy | | |
| Yes | | 8 (42.1) |
| No | | 11 (57.9) |

DCIS, ductal carcinoma in situ.

**Table 2. Results of Implant Breast Augmentation after BCS and Radiotherapy**

| Characteristics | n (%) | Mean (Range) (g) |
|---|---|---|
| Type of BR | | |
| One-stage implant only | 16 (84.2) | |
| Two-stage expander/implant | 3 (15.8) | |
| Incision | | |
| Inframammary fold | 16 | |
| Lumpectomy scar | 3 | |
| Pocket | | |
| Subglandular | 15 | |
| Subpectoralis | 4 | |
| Shape of implant | | |
| Round | 13 (68.4) | |
| Anatomical | 6 (31.6) | |
| Size of implant | | |
| Overall | | 258.7 (125–405) |
| One stage | | 244.4 (125–345) |
| Two stages | | 335 (210–405) |
| Contralateral | | 232.2 (175–290) |
| Contralateral procedure | | |
| Augmentation | 7 (36.8) | |
| Change of old implant | 2 (10.5) | |
| Reduction | 1 (5.3) | |
| Mastopexy | 3 (15.8) | |
| Nil | 6 (31.6) | |
| Cosmesis | | |
| Excellent | 14 (73.7) | |
| Good | 3 (15.8) | |
| Fair | 2 (10.5) | |
| Poor | 0 (0) | |

lymph node metastases (mean, 2.7; range, 1–5), and 9 patients also received adjuvant chemotherapy. Two patients had previous breast implants for cosmetic reasons before developing breast cancer.

The surgical details and results of implant breast augmentation after BCS and radiotherapy are given in Table 2. Sixteen patients (84.2%) underwent implant augmentation alone, whereas 3 (15.8%) patients had two-stage augmentation with initial insertion of a tissue expander followed by an implant after a period of inflation. Two of the 3 patients who had an expander inserted had a central breast cancer necessitating the removal of the nipple at the time of initial BCS surgery. Both of them went on to nipple reconstruction after implant augmentation. The mean weight of the implant inserted was 258.7 g (range, 125–405 g). The 2 largest implants (390 and 405 g) used were both in the two-stage reconstruction group, 1 of whom had a contralateral augmentation whereas the other had an old implant replaced. The third patient in this two-stage group had a 210-g implant inserted without contralateral augmentation. When the two-stage breast augmentation group is excluded, the one-stage implant group's average implant size was 244.4 g (range, 125–345). All implants were silicone filled and comprised 13 round and 6 anatomical shaped implants.

All procedures were successful. One patient developed a minor wound infection that was successfully treated with oral antibiotics. Seven patients also underwent contralateral breast augmentation with an average implant size of 232.2 g (range, 175–290 g), which was smaller than the treated side (Table 2). Two further patients had their old contralateral implants replaced, 1 with a simultaneous mastopexy. None of the patients with contralateral implants developed any complications. One patient had the contralateral breast reduced, and 3 others underwent a contralateral mastopexy only.

Three patients underwent revisional surgery to the augmented breast that had undergone BCS and radio-

therapy. One patient who developed minor infection had to have her implant pocket lowered 8 months later. Two patients underwent revision of augmentation to larger implants 18 months later and 9 years later, respectively. One further patient had her augmented contralateral noncancer breast lifted as a later procedure. Another patient developed a recurrent breast cancer in the augmented breast 2 years later and underwent a mastectomy and further two-stage prosthetic BR.

Using our criteria as listed above, 14 (73.7%) patients were judged to have an excellent cosmetic result (Fig. 1), whereas 3 (15.8%) were good (Fig. 2) and 2 (10.5%) fair (Fig. 3). As there was no loss of implant, none were judged to be poor.

## DISCUSSION

BCS and radiotherapy has been widely accepted as an effective treatment for most patients with early stage breast cancer for many years.[1,2] The aim of BCS is to remove the breast cancer adequately, with conservation of the breast shape and symmetry to the contralateral breast. However, as Slavin et al[4] pointed out, "although the theoretical benefit of breast conservation therapy is preservation of breast form, residual deformity and asymmetry are not uncommon. Breast aesthetics may be adversely affected by radiation." On the other hand, although finding that "asymmetry and contour and abnormalities are far more common than noted in the radiation therapy literature," Matory et al[3] reported an analysis of surgical contributions to the cosmetic result as well.

For patients undergoing BCS and radiotherapy, imbalance and asymmetry can occur for several reasons. Many patients gain weight naturally as they move from the premenopausal to postmenopausal state or as a result of their treatments including chemotherapy and hormonal therapy. Patients typically deposit fat on their contralateral side, and the treated breast often has less ptosis resulting in troublesome asymmetry for clothes and bras. Secondly, although 80% of patients have an excellent or good cosmetic result after their treatment,[3] factors such as more extensive surgery, higher radiation dose, large breasts, or inhomogeneous radiation doses, can result in significant breast retraction for up to 5% of patients and moderate retraction in 15% of patients.

Strategies to correct asymmetry include bra-stuffing on the treated side, wearing specialized external breast prostheses on the treated side, or undergoing a mastopexy (breast lift) on the contralateral normal side. In rare circumstances, patients are so unhappy with their treated breast that they prefer a total mastectomy and immediate transverse rectus abdominis myocutaneous or latissimus dorsi flap reconstruction. More recently, autologous fat grafts have been used.[12]

When deformity and asymmetry occurs, conventional teaching is that, after radiotherapy, autologous tissue BR is recommended.[6–9] However, most patients are understandably concerned about lengthier surgery and the risk of complications including flap necrosis and are reluctant to have further scarring from their donor site in their abdomen or posterior chest wall.

The literature is replete with reports of BR after mastectomy and more recently about the issues of BR after mastectomy and radiotherapy, especially in relation to prosthetic BR.[13–17] However, there is a paucity of data on breast augmentation after BCS and radiotherapy in relation to the use of implants. In a recently published systematic review of immediate two-stage prosthetic BR, we found that many case series were small, and the authors often combine several different groups of patients under the broad heading of BR after radiotherapy, which makes it difficult to delineate treatment outcomes by surgical technique.[18] In only 1 of the reviewed reports included in the systematic review did the authors clearly distinguish 4 separate groups, 1 of which included 7 cases of breast augmentation with saline implants after BCS and radiotherapy. Four of these 7 patients (57.1%) eventually required salvage with a latissimus dorsi flap.[15] In another report of 18 available cases, which included 4 patients who had previous latissimus dorsi miniflaps, of implant-based augmentation mammaplasty after BCS and radiotherapy, the mean implant volume used was 140 mL with 10 complications recorded.[19]

This retrospective study examined the outcome of patients with implant-only breast augmentation after BCS and radiotherapy. Among 671 consecutive cases of prosthetic BR over a 12.5-year period, we have only 19 cases of augmentation after BCS and radiotherapy, which means that it is only a small proportion of the BR cohort. However, it may be that many patients accept some asymmetry and do not seek BR compared with those who are missing the whole breast after a mastectomy. It is also likely that some patients may have been advised by their breast surgeons that they can only have autologous flap augmentation after radiotherapy and are not willing to undergo this procedure.

### Previous Breast Augmentation Mammoplasty

Breast augmentation has become one of the most commonly performed cosmetic surgical procedures. With the increase in the incidence of breast cancer, it is not unexpected that some women will develop breast cancer after previous breast augmentation mammoplasty (BAM) although the risk has been reported to be lower than that in an average woman.[20,21] In suitable cases, BCS and radiotherapy can be performed in this group of patients, but capsular contracture of the implant after radiotherapy is of the order of over 50%, and most of these cases are judged to have fair or poor cosmetic result.[22–24] Once again, a "special topic" report on breast cancer in the previously augmented breast recommended autologous tissue augmentation of the lumpectomy defects where indicated.[25]

We have found that where possible, an implant-only BAM after BCS and radiotherapy is a simple procedure, not dissimilar to a standard breast augmentation. As we are more familiar with two-stage BR with submuscular pockets for the tissue expanders, we had initially inserted the implants in a submuscular pocket. However, as the defect is glandular, we have changed to place all the implants in a subglandular pocket and have found the overlying

tissue pliable enough to provide a good cosmetic result and have since placed the implants in the subglandular pocket after our initial 4 cases (Table 2). In fact, it is often said that the muscle is more susceptible to radiation damage and it is the fibrosis in pectoral muscles that makes a totally submuscular tissue expander difficult to inflate after mastectomy for recurrent breast cancer after previous BCS and radiotherapy. As a result, an implant-only breast augmentation after BCS and radiotherapy submuscularly would be best avoided. In addition, it is even less onerous for those considering bilateral breast augmentation when compared with bilateral flap augmentation. These are also patients who would have considered implants only, rather than flap options, especially those who have already underwent prior BAM. A further advantage of implant-only breast augmentation after BCS and radiotherapy is that should a recurrence of the breast cancer occur at a later date and a salvage mastectomy is performed, none of the potential reconstructive autologous options have been used and are thus available for reconstruction of the whole breast.

In our series, with a mean follow-up of 35.6 months, there were only 3 (15.8%) patients who underwent revisional surgery to the augmented breast after BCS and radiotherapy. The patient who developed minor infection eventually had to have her implant pocket lowered 8 months later. The other 2 patients requested even larger augmentation and are therefore not strictly revisions. There was no loss of implant or failed reconstruction, similar to our findings in 22 patients who underwent immediate two-stage prosthetic BR after mastectomy for recurrent breast cancer subsequent to previous BCS and radiotherapy.[26] It would seem that the radiotherapy effects on a breast after BCS are dissimilar to those on the breast skin after a full mastectomy and more like those on the untreated breast. This is most likely due to the lower doses on the skin with breast conservation as tissue-equivalent bolus is not used. However, the dose to the pectoral muscle would be identical in both clinical settings, and the frequent presence of pectoral fibrosis from radiation makes subglandular implants technically easier.

In summary, we have found that breast cancer patients after BCS and radiotherapy with asymmetry can be adequately corrected by augmentation with breast implants, with low morbidity and pleasing results. This provides the plastic surgeon with a cost-effective, low-risk option for selected patients who have previously undergone conservative surgery and radiation therapy of their breast cancer without significant skin radiation changes and are willing to accept an implant rather than the more complicated and expensive "gold standard" of an autologous flap reconstruction.

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