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**CLINICAL INVESTIGATION** **Breast**

# POSTMASTECTOMY CHEST WALL RADIATION TO A TEMPORARY TISSUE EXPANDER OR PERMANENT BREAST IMPLANT—IS THERE A DIFFERENCE IN COMPLICATION RATES?

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**Purpose:** The purpose of this study was to evaluate the likelihood of complications and cosmetic results among breast cancer patients who underwent modified radical mastectomy (MRM) and breast reconstruction followed by radiation therapy (RT) to either a temporary tissue expander (TTE) or permanent breast implant (PI).

**Methods and Materials:** Records were reviewed of 74 patients with breast cancer who underwent MRM followed by breast reconstruction and RT. Reconstruction consisted of a TTE usually followed by exchange to a PI. RT was delivered to the TTE in 62 patients and to the PI in 12 patients. Dose to the reconstructed chest wall was 50 Gy. Median follow-up was 48 months. The primary end point was the incidence of complications involving the reconstruction.

**Results:** There was no significant difference in the rate of major complications in the PI group (0%) vs. 4.8% in the TTE group. No patients lost the reconstruction in the PI group. Three patients lost the reconstruction in the TTE group. There were excellent/good cosmetic scores in 90% of the TTE group and 80% of the PI group ($p = 0.22$). On multivariate regression models, the type of reconstruction irradiated had no statistically significant impact on complication rates.

**Conclusions:** Patients treated with breast reconstruction and RT can experience low rates of major complications. We demonstrate no significant difference in the overall rate of major or minor complications between the TTE and PI groups. Postmastectomy RT to either the TTE or the PI should be considered as acceptable treatment options in all eligible patients. 

**Breast reconstruction, Breast implant, Tissue expander, Radiation therapy, Breast cancer.**

## INTRODUCTION

It is well established that postmastectomy radiation therapy (RT) improves survival for selected breast cancer patients (1–3). The results of these prospective trials have led to an increasing number of intermediate- to high-risk patients receiving postmastectomy RT in an effort to improve both locoregional control and survival. Many of these patients also desire breast reconstruction after mastectomy. Two major breast reconstruction options are currently available. One option is an autologous tissue reconstruction that is most commonly performed using a transverse rectus abdominus myocutaneous flap. The other major option is placement of a temporary tissue expander, usually followed by exchange to a permanent implant. Implant reconstruction has a major role in breast reconstruction, because some patients neither wish to undergo a major surgical procedure nor are deemed suitable candidates for autologous reconstruction.

We have previously reported our institution's experience of postmastectomy breast reconstruction and RT (4). We demonstrated an extremely low rate of major complications (0–5%) in both patients undergoing transverse rectus abdominus myocutaneous reconstruction and those having temporary tissue expanders (TTE) or permanent implants (PI). We demonstrated a significantly lower 5-year rate of minor complications of 14% in the TTE/PI group compared with 39% in the transverse rectus abdominus myocutaneous group. However, prior studies have suggested a significant risk of complications and adverse cosmetic results in patients with implants who receive RT (5–9). These series, however, had small patient numbers, and lacked long-term follow-up. The purpose of this study was to evaluate the likelihood of complications and the cosmetic results with extended follow-up among breast cancer patients who underwent modified radical mastectomy and breast reconstruction followed

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by RT to either a TTE or a PI. In addition, we analyzed potential patient-related and treatment-related factors to try to identify predictors of adverse outcome.

## METHODS AND MATERIALS

### *Patients*

Between October 1987 and January 2006, 74 patients diagnosed with breast cancer underwent modified radical mastectomy, followed by breast reconstruction and postmastectomy RT during their course of treatment. A retrospective multidisciplinary chart review of the relevant patient-related and treatment-related factors was performed. Patient demographics, tumor characteristics, and treatment-related information is entered prospectively into a database and maintained and updated by a single data manager. The protocol for collection, storage, and data retrieval is under compliance with the hospital institutional review board and Health Insurance Portability and Accountability Act regulations. Reconstruction consisted of a TTE usually followed by exchange to a PI. RT was delivered to the TTE in 62 patients and to the PI in 12 patients. Intensity-modulated RT was used in 20 of the 62 TTE patients and 5 of the 12 PI patients. The median age was 46 years (range, 30–71 years). The median time from reconstruction to RT was 6 months. The median follow-up for all patients was 48 months (range, 9–200 months).

### *Treatment*

All patients were treated with external beam RT to the reconstructed breast/chest wall using tangential fields. Fifty-seven (76%) patients were treated also with a supraclavicular field. All patients were treated with high-energy photons (6–18 MV). Doses were delivered in 1.8- to 2.0-Gy fractions. The dose to the reconstructed breast/chest wall was 50 Gy. One patient received a scar boost (dose of 10 Gy) with the use of electrons. Tissue equivalent bolus material was place on the skin of the reconstructed breast/chest wall to increase the surface dose in all patients. Bolus was applied every other day during the course of radiation treatments. Sixty-four patients (85%) received a custom wax bolus fashioned to the shape of the reconstruction to eliminate air gaps, and 10 patients (15%) received standard bolus. Sixty-four patients (86%) received chemotherapy, and 44 patients (59%) received endocrine therapy.

### *Complications*

The primary end point of this study was the actuarial incidence of complications involving the reconstruction. Major complications were defined as requiring corrective surgery or loss of the reconstruction. Minor complications included infection, chest wall fibrosis, or contracture. Patients were censored after a complication was scored.

### *Cosmesis*

The secondary end point of this study was cosmetic outcome of the reconstructed breast. This analysis was based on chart review that included all multimodality discipline records (from radiation oncology, medical oncology, surgical oncology, and plastic reconstructive surgery). To minimize interobserver variability, cosmesis was scored as either ''good/excellent'' or ''fair/poor'' at each follow-up visit. Cosmesis was scored using the four-category Harvard Scale and definitions, as follows: excellent, treated breast looks essentially the same as the opposite breast; good, minimal but identifiable effects of radiation on the treated breast; fair, significant effects of radiation on the treated breast; poor, severe normal tissue sequelae secondary to radiation (10).

### *Patient- and treatment-related factors*

In this study, patient-related and treatment-related factors were analyzed to identify predictors of adverse outcome with respect to both the complication rates and cosmesis. Patient-related factors included smoking history, age, and menopausal status. Treatment-related factors included type of reconstruction irradiated (TTE or PI), use of chemotherapy, and use of endocrine therapy. Data regarding the volume or amount of fill expansion for the tissue expanders were not available and therefore unable to be analyzed in this study.

### *Statistics*

The actuarial rates of complications were estimated using Kaplan-Meier methodology (11). Statistical comparisons were made using the log–rank test. Patient-related and treatment-related factors were assessed by univariate analysis for prognostic significance with regard to complication rates using the log–rank test. Differences in cosmesis were analyzed using Fisher's exact test (12). Cox multivariate regression models were used to determine independent predictors of complications (13).

## RESULTS

The 5-year actuarial rate of all complications was 27%, as illustrated in Fig. 1. There was no significant difference in the overall 5-year actuarial complication rates between those patients who had the TTE radiated (24%) vs. those patients who had the PI radiated (48%) ($p = 0.48$).

### *Major complications*

Extremely low rates of major complications were observed in both the TTE group and the PI group. There was no statistically significant difference in the rate of major complications at 5 years between the PI group (0%) compared with 4.8% in the TTE group ($p = 0.21$). Major complications occurred in only 3 patients overall. These 3 patients were part of the 62 patients with the TTE reconstruction that was radiated. All 3 patients had a major complication requiring removal of the TTE. None of the patients who received RT to the PI experienced a major complication.

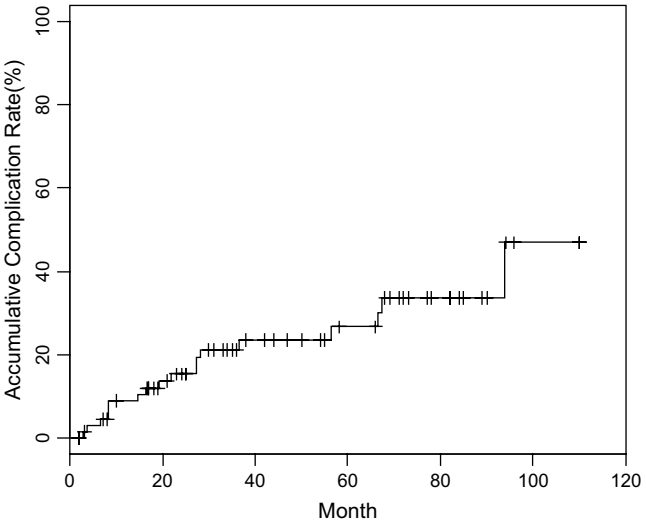


Fig. 1. Five-year actuarial rate of overall complications.