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# Timing of radiation and outcomes in implant-based breast reconstruction☆

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**KEYWORDS**
Breast reconstruction;
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**Summary** *Objective:* Limited data exist regarding the effect of radiation timing on complications of tissue expander/implant-based breast reconstruction. This study seeks to compare outcomes of tissue expander/implant reconstruction in patients undergoing postmastectomy radiotherapy, those with previous radiation therapy following breast conservation therapy, and those who did not receive radiation therapy.
*Methods:* The records of the patients of a single surgeon were reviewed from January 2007 to July 2013. All patients undergoing tissue expander/implant breast reconstruction were placed into one of three groups based on the timing of radiation therapy: postmastectomy (Current), previously following breast conservation therapy (Prior), and no radiotherapy (No XRT). Medical records were reviewed for any reported complications, and statistical analysis was performed.
*Results:* A total of 210 patients (265 breasts) were included in the analysis. Current patients were more likely than No XRT patients to experience expander infection (20% vs. 2.6%, $p = 0.001$) and expander removal (26% vs. 8.3%, $p = 0.007$). Prior patients were more likely than No XRT patients to undergo conversion to tissue flap reconstruction (10.5% vs. 0.6%, $p = 0.031$). No significant differences were found between groups with respect to cellulitis, abscess formation, hematoma, seroma, skin flap necrosis, expander exposure, implant exposure, or implant infection.
*Conclusions:* This study supports the relative safety of tissue expander/implant breast reconstruction in selected groups of patients who have received radiation therapy. Differences in

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rates of expander infection, expander removal, and conversion to tissue flap reconstruction represent potential areas for further research.


## Introduction

Plastic surgeons and their patients face a significant dilemma when considering how to achieve optimal results in reconstructing the radiated breast. One of the most common scenarios resulting in this dilemma is a patient with a prior history of breast conservation therapy and radiation who is now facing salvage mastectomy following recurrence. The estimated recurrence rates following breast conservation therapy range from 8.8%[1] to 13% over a 15- to 20-year period.[1,2] Although there has been an increase in mastectomy,[3] in our experience conservative therapy continues to be a very common treatment choice for patients faced with in situ or early-stage breast cancer.

A second and perhaps increasingly common scenario is a patient presenting for reconstruction who faces the possibility of undergoing postmastectomy radiotherapy (PMRT). Guidelines published by Recht et al., in 2001 for the American Society of Clinical Oncology recommend the use of PMRT in patients with four or more positive axillary lymph nodes, as well as in patients with T3 or stage III disease.[4] As these criteria rely on pathologic staging for their recommendations, it is often unknown at the time of mastectomy whether or not the patient will be a candidate for PMRT. This leaves the plastic surgeon with a dilemma in counseling patients who are undergoing any type of immediate reconstruction.

Prior studies have demonstrated that the use of tissue expander/implant reconstruction (TE/I) in these populations is feasible. As Alderman et al. note in the American Society of Plastic Surgeons (ASPS) Clinical Practice Guidelines, certain risk factors such as smoking and a body mass index (BMI) of $\geq$25 are associated with an increased risk of complications in all expander/implant reconstructions,[5] but there is a paucity of level I or II studies regarding patient characteristics that increase the likelihood of a successful outcome in radiated breasts.[6] The goal of this study was to chronicle a single surgeon's experience using two-stage TE/I in radiated breasts, both with history of radiation and concurrent radiation, with the aim of identifying risk factors associated with complications and failure of TE/I.

## Patients and methods

### Study design

We performed a retrospective cohort study of all patients undergoing TE/I by the principal investigator (H.T.S.) from January 2007 to July 2013. Patients were categorized into three groups: those presenting for reconstruction who had previously been treated with breast radiation (Prior), those who were facing mastectomy and would undergo postmastectomy radiation (Current), and those who never received breast radiotherapy (No XRT). All patients undergoing TE/I were included. The sole exclusion criterion was if a patient had received radiation at two different time periods, thus meeting criteria for both Current and Prior groups. This study was conducted and reported in accordance with the STROBE guidelines.[7]

### Demographic variables and complications

Information regarding patient demographics, comorbidities, and complications was obtained from medical records. This included BMI, age, expander capacity, smoking status, presence of diabetes mellitus, and whether the patient received chemotherapy. Major complications were defined as expander or implant removal, hematoma or seroma requiring return to the operating room, and cellulitis requiring inpatient antibiotic therapy. Failure of TE/I was also recorded, with failure defined as lack of completion of the second stage of reconstruction, or permanent implant removal without replacement.

### Data analysis

Demographics and complication rates were compared between groups. A one-way analysis of variance (ANOVA) with Tukey post hoc test was used for continuous variables. Chi-squared and Fisher's exact tests were used for categorical variables. Logistic regression analyses were performed to detect risk factors for major complications and failure of reconstruction. In Current and Prior patients undergoing bilateral reconstruction who received unilateral radiotherapy, only the radiated breasts were included in the analysis. All analyses were performed using Statistical Package for Social Science (SPSS) v. 21 (IBM Corp., Armonk, New York, NY, USA).

## Results

Upon institutional review board's approval, we found 211 patients meeting inclusion criteria. One patient was excluded for meeting criteria for both the Current and Prior groups. A total of 210 patients (265 breasts) were included in the final analysis. The mean follow-up time for all patients was 19.6 months (range: 3.1—68.8 months, with one outlier at 1.7 months). No differences were found among treatment groups with respect to BMI. Differences were noted between groups with respect to age ($p = 0.002$), with the Prior group being older than the other groups (Table 1).