

Ten years experience with breast reconstruction after salvage mastectomy in previously irradiated patients: analysis of outcomes, satisfaction and well-being

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Abstract. – OBJECTIVE: Reconstruction following mastectomy offers women an opportunity to mollify some of the emotional and aesthetic effects of this devastating disease.

PATIENTS AND METHODS: The authors reviewed the files of 83 patients who underwent immediate postmastectomy reconstruction with tissue expander between January of 2003 and June of 2012 at our hospital. The patients were divided into two groups: Group A (study group) included 30 patients with previous quadrantectomy and radiotherapy who underwent salvage mastectomy after local recurrence; Group B (control group) included 53 patients submitted to primary radical mastectomy. We submitted Breast-Q reconstruction post-operative module to all of our patients.

RESULTS: The median follow-up time for the whole group was 36 months (range = 12-144 months). Between group A and group B, there were no significant differences. In the group A, the median time from RT to reconstruction was 24 months (range = 9-192 months). The overall rate of complications was not similar between the two groups (66.6% vs. 58.5%; $p = \text{NS}$). However, the major complications occurred mostly in the irradiated group, showing a trend of statistical significance (53.3% vs. 32.0%; $p = 0.07$). In this group, the occurrence of major complications was not different according to time from RT to reconstruction ($p = 0.313$). In particular, patients from the irradiated group (group A) had a significantly higher risk of grade III-IV capsular contracture (relative risk 3.75, $p = 0.02$) and autologous salvage reconstruction (relative risk 10.4, $p = 0.02$).

CONCLUSIONS: The results of this study prove that heterologous reconstruction is still possible following salvage mastectomy in previously irradiated patients.

Key Words:

Mastectomy, Radiation, Implants, BREAST-Q, Breast.

Introduction

Breast cancer is, unfortunately, a common disease affecting millions of women, often at a relatively young age. Reconstruction following mastectomy offers women an opportunity to mollify some of the emotional and aesthetic effects of this devastating disease. Although varying techniques of alloplastic and autologous techniques are available, all strive to achieve the same goal: the satisfactory restoration of a breast mound that appears as natural as possible without clothing and almost normal under clothing^{1,2}. Autologous, abdominal-based reconstructions have had the highest satisfaction for the patients due to long lasting results³.

Carefully selected patients who have had prior breast conservation therapy and require salvage mastectomy can successfully complete post mastectomy tissue expander/implant reconstruction. The rate of early complications in this patient group is higher than in the non-irradiated cohort but remains acceptable⁴⁻⁷.

The aim of this report is to analyze surgical outcomes, complications, satisfaction and well-being in ten years' experience of two-stage implant breast reconstruction after salvage mastectomy in previously irradiated patients in our Plastic and Reconstructive Surgery Unit.

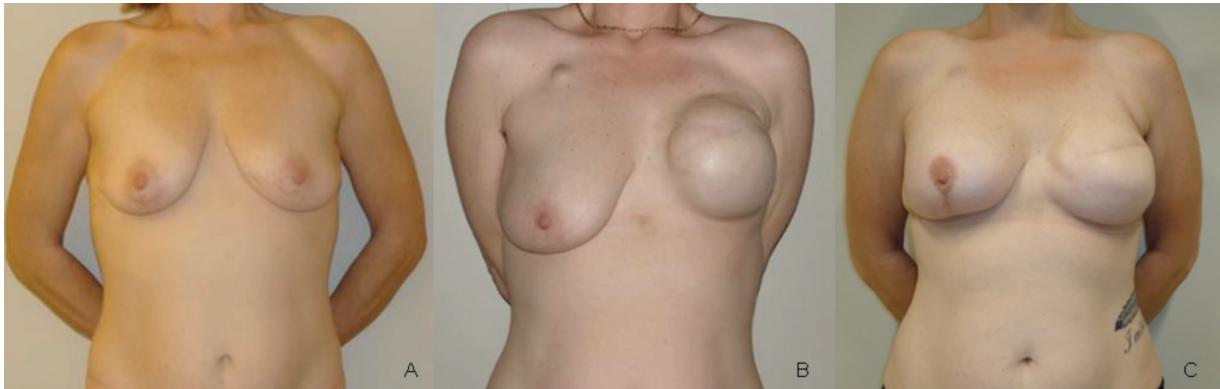


Figure 1. Patient with previous quadrantectomy and radiotherapy who underwent salvage mastectomy after local recurrence (A), pre-operative frontal view before mastectomy (B), post-operative frontal view of fully filled expander (C), 10 months post-operative frontal view after permanent implant exchange.

Patients and Methods

Patients Selection

83 patients, who underwent immediate post-mastectomy reconstruction with tissue expander between January of 2003 and June of 2012, at our hospital, were selected for this study.

The patients were divided into two groups: Group A (study group) included 30 patients with previous quadrantectomy and radiotherapy, who underwent salvage mastectomy after local recurrence (Figure 1). Group B (control group) included 53 patients who were submitted to primary radical mastectomy (Figure 2). Demolitive procedures were performed by different surgeons; breast reconstruction was always performed by the same reconstructive team. The oncologist surgeons, the reconstructive surgeon and radiotherapists participated in the patients' follow-up. Patients' follow-up was at least one year from the second surgical stage.

Age, smoking habits, diabetes mellitus, body mass index, tumor stage, histological type, chemotherapy (after either quadrantectomy or mastectomy) hormone-therapy, expander volume and follow-up time were recorded for all patients. Continuous data normality was tested using the Shapiro-Wilk test (median value showed if normality was not reached). Preliminarily, statistical uniformity of the two groups was verified. Fisher's exact test was conducted in order to compare patients data distribution; Student's *t*-test for independent groups was also conducted to compare the age and BMI. The risk of postoperative complications was reported for both groups. Risk ratios were obtained for all complications and analyzed with Fisher's exact test. A value of $p < 0.05$ was considered to be significant. Mann-Whitney test was used to evaluate the incidence of major complications according to time from radiotherapy to reconstruction.



Figure 2. Contralateral healthy breasts were often treated to obtain final symmetry with reduction mammoplasties, mastopexies or breast augmentations. A, Pre-operative frontal view before mastectomy; B, Post-operative frontal view of fully filled expander; C, 1 year after permanent implants exchange.

Table I. Patients' general data.

	Group A	Group B	Fisher exact test for not coupled data	Student's <i>t</i> -test
Total	30	53		
Age, yrs (mean ± SD)	55.4±9.91	53.3±10.50		$p = 0.38$ $t = 0.87$ $df = 81$
BMI, kg/m ² (mean ± SD)	23.9±3.33	23.15±2.43		$p = 0.24$ $t = -1.17$ $df = 81$
Active smoker	12 (40%)	16 (30.2%)	$p = 0.4693$	
Diabetes	3 (10%)	3 (5.66%)	$p = 0.6625$	
Stage I	17 (56.7%)	23 (43.4%)	$p = 0.1745$	
Stage IIA	10 (33.3%)	16 (30.2%)	$p = 1.0000$	
Stage IIB	3 (10%)	14 (26.4%)	$p = 0.0939$	
Ductal histology	25 (83.3%)	47 (88.7%)	$p = 0.5154$	
Any chemotherapy	28 (93.3%)	50 (94.3%)	$p = 1.0000$	
Hormonotherapy	23 (76.6%)	39 (73.6%)	$p = 0.7993$	
Expander volume ≤400 cc	4 (13.3%)	5 (9.4%)	$p = 0.7164$	
500 cc	7 (23.3%)	14 (26.4%)	$p = 0.7993$	
600 cc	7 (23.3%)	8 (15.0%)	$p = 0.1463$	
>700 cc	12 (40.0%)	26 (49.0%)	$p = 0.4953$	
Follow-up months (median, range)	24 (12-144)	36 (12-120)	$p = 0.891^*$	

*Mann-Whitney test used.

All patients have answered to the BREAST-Q reconstruction post-operative module, and we included all data in an Excel file to calculate the percentage of satisfaction.

Ethics Approval

This study was approved by the Ethics Committee of the Campus Bio-Medico University of Rome, Italy.

Each subject provided written informed consent before participating in the study.

Results

The median follow-up time for the whole group was 36 months (range= 12-144 months). Between group A and group B, there were no significant differences in terms of age, body mass index, comorbidities, pathological stage, and treatments data (Table I). Complications rates by different

groups are listed in Table II. In the group A, the median time from RT to reconstruction was 24 months (range = 9-192 months).

The overall rate of complications was not different between the two groups (66.6% vs. 58.5%; $p = NS$). However, the major complications occurred mostly in the irradiated group, showing a trend of statistical significance (53.3% vs. 32.0%; $p = 0.07$). In this group, the occurrence of major complications was not different according to time from RT to reconstruction ($p = 0.313$). Particularly, patients from the irradiated group (group A) had a significantly higher risk of grade III-IV capsular contracture (relative risk 3.75, $p = 0.02$) and of autologous salvage reconstruction (relative risk 10.4, $p = 0.02$).

No significant difference in the total number of capsular contractures observed and in the number of I and II-degree capsular contracture (56.7% vs. 43.4%, $p = NS$; 16.7% vs. 28.3%, $p = NS$), was recorded between the two groups.

Table II. Complications, capsule contractures and type of reconstruction.

Complications	Group A (n=30)	Group B (n=53)	RR	95% CI	p
Total	22 (73.3%)	29 (54.7%)	1.42	0.56-3.62	0.49
Minor	6 (20.0%)	12 (22.6%)	0.85	0.28-2.57	0.78
Major	16 (53.3%)	17 (32.0%)	2.42	0.96-6.08	0.07
Contracture					
I- II	5 (16.7%)	15 (28.3%)	0.51	0.16-1.57	0.29
III- IV	12 (40.0 %)	8 (15.1%)	3.75	1.31-10.7	0.02*
Total	17 (56.7%)	23 (43.4%)	1.71	0.69-4.21	0.26
Type of reconstruction					
Autologous	5 (16.67%)	1 (1.88%)	10.4	1.15-93.8	0.02*
Polyurethane	2 (6.67%)	4 (7.55%)	0.88	0.15-5.08	0.88
Debridement	4 (13.33%)	1 (1.88%)	0	-	0.96
Expander removal	2 (6.67%)	1 (1.88%)	3.71	0.32-42.8	0.30

*Statistically significant.

In Group A, 25/30 patients (83.33%) completed heterologous reconstruction. In 5 patients (16.67%), was needed a conversion to combined or solely autologous reconstruction. Revision surgery was performed in 9 patients (30%): in 2 patients (6.67%) with severe capsular contracture the silicone gel prostheses were replaced by polyurethane-coated implants; in other 2 cases (6.67%) of severe capsular contracture, a secondary TRAM flap was used, one decorticated and the other myocutaneous; 4 patients (13.33%) required surgical debridement for mastectomy flap necrosis (two undergoing expander removal following exposure); a *latissimus dorsi* muscular flap was used in 3 cases with chronic cutaneous fistulas, in 2 cases through the mastectomy scar, in one case through a zig-zag incision along the anterior axillary line.

In the group B, 52/53 patients (98.11%) completed heterologous reconstruction. In 1 case (1.88%), the expander was removed due to infection and an autologous reconstruction was performed. Revision surgery was needed in 5 patients (9.4%). In 4 patients with severe capsular contracture (7.55%), a polyurethane-coated prosthesis was placed following capsulectomy. These patients preferred this procedure to autologous reconstruction. In 1 patient (1.88%), surgical debridement was necessary for the mastectomy flap necrosis. Within major complication subgroups, no significant difference was observed between groups A and B with regard to silicone prosthesis replacement with a polyurethane-coated implant, surgical debridement or prosthesis removal (Table II).

Analysis of post-operative satisfaction with Breast-Q post-operative module

Patients require more attention in presurgical consultations and that clear communication should be prioritized to ensure that the surgeon understands the patient's expectations⁸, so we used Breast-Q to evaluate patient's satisfaction following reconstruction procedures.

Results (%) of the BREAST-Q in patients of group A: psychosocial well-being mean score was 62 ± 11 , sexual well-being mean score was 69 ± 12 , physical well-being mean score was 67 ± 18 , satisfaction with breast mean score was 75 ± 10 , satisfaction with outcomes mean score was 70 ± 7 , with a total satisfaction results of 65 ± 9 .

Results (%) of the BREAST-Q in patients of group B: psychosocial well-being mean score was 74 ± 10 , sexual well-being mean score was 72 ± 9 , physical well-being mean score was 82 ± 8 , satisfaction with breast mean score was 85 ± 10 , satisfaction with outcomes mean score was 80 ± 10 , with a total satisfaction results of 83 ± 10 .

Discussion

Breast-conserving surgery followed by adjuvant whole breast radiotherapy is an established treatment for early-stage breast cancer and long-term follow-up has demonstrated equivalent survival to mastectomy⁹. It has shown to decrease any recurrences of 15.7% at 10-years and to reduce cancer-related mortality of 3.8% at 15 years¹⁰.



Figure 3. Case of 10-year experience on immediate expander reconstruction after salvage mastectomy. **A**, Pre-operative frontal view before mastectomies; **B**, Post-operative frontal view of fully filled expanders. **C**, 2 year after implant exchange and NAC reconstruction.

As radiation therapy becomes more prevalent in the treatment of breast cancer, more patients requesting breast reconstruction for mastectomy defects is going to have a history of radiation therapy. As Ribuffo affirmed¹¹ the higher rate of complications reported by plastic surgeons and not by other specialists can be explained with the greater attention to aesthetic details, such as capsular contractures, that our community has. Radiotherapy on permanent implant can alter the result of the reconstruction, increasing for examples capsular contracture rate¹².

The goal of this study was to report a single surgery group 10-year experience on immediate expander reconstruction (Figure 3) after salvage mastectomy in a selected group of previously irradiated patients. Overall complications (either major or minor) of this study group (group A, previously irradiated patients) were described and compared to a control group.

As in medical literature the majority of studies conducted on implant breast reconstruction and radiation therapy include very heterogeneous groups of patients in terms of previous or adjuvant radiotherapy, different medical centers, different techniques and time intervals between surgery and radiotherapy¹³⁻¹⁵ we performed a preliminary heterogeneity analysis between the study group and the control group, showing no differences between the two groups (Table I).

Even though skin quality, in terms of thickness and elasticity, was poorer in the study group, as reported in the medical literature⁴, expansion was still accomplished, and adequate implant protection was guaranteed in twenty-five patients (83.33%) of group A vs. 52 (98.11%) of group B. The overall rate of complications was

not different between the two groups (73.3% vs. 58.5%; $p = \text{NS}$). However, major complications occurred mostly in the irradiated group, showing a trend of statistical significance (53.3% vs. 32.0%; $p = 0.07$). These results are consistent with some previous studies. In a large single institution experience reported by Cordeiro et al⁶, the occurrence of perioperative complications was significantly higher in the irradiation group than in the control group (29.7% vs. 15.5%, $p < 0.001$); however the authors concluded that tissue expander/implant reconstruction is safe and reliable option for breast reconstruction if patients are well selected.

Recently, a systematic review by Momoh et al¹⁶ showed a pooled major complication rate of 49% in this patient's population which was higher but not statistically different when compared to the complication rate of patients irradiated after two-stage reconstruction.

In the current study, no significant difference in the number of I and II-degree capsular contracture (16.7% vs. 28.3%, $p = \text{NS}$), was recorded between the two groups; however, patients from the irradiated group (group A) had a significantly higher risk of grade III-IV capsular contracture (relative risk 3.75, $p = 0.02$). This latter data is confirmed by the literature data¹⁷, even if the observed capsular contracture rates both in Group A and B were higher than those in the international literature. The capsular contracture of any degree, in the control group, was observed in 43.40% of patients, while literature percentages¹⁸ vary from 15 to 20%. This may be due to the low patient number of our study or to capsule contracture assessment, which is personal and difficult to objectivise.

When revision surgery was needed, it is worth noting that conversion to the autologous method was more frequent in Group A (16.6% vs. 1.88% $p = 0.02$). Particularly, in this study group, previous tissue expansion supported the autologous reconstruction in fact the presence of implant permitted to avoid post-mastectomy skin shrinkage and its adhesion to ribs. As a matter of fact, all *latissimus dorsi* flaps were muscular and one tram flap was decorticated: skin cover was facilitated by previous tissue expansion. No difference in the prevalence of major complications was observed according to time from breast RT to two-stage reconstruction supporting that this procedure can be done any time from radiotherapy if an accurate evaluation of skin, soft tissue, and scar distributions is performed before reconstruction.

Conclusions

With Breast-Q, we performed an analysis of post-operative satisfaction of the two group and we noticed that in control group we had a higher satisfaction for all items of the questionnaire. In our future experience, we would like to adopt the new protocol presented by Cordeiro et al¹⁹, because although the risk of reconstructive failure is significantly higher for tissue expander-Radiotherapy compared to definitive implant-Radiotherapy patients and the aesthetic results and capsular contracture rates are slightly better.

Conflicts of interest

The authors declare no conflicts of interest.

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