

Early versus Delayed Implant Exchange after Periprosthetic Breast Infection: A Single Center Study

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Background: Breast implant infections are challenging problems for both plastic surgeons and patients. They may require readmissions, re-operations, and have the potential to compromise the final result. Our goal was to determine whether early operative intervention (return to the operating room <72 h after diagnosis of infection) or intravenous antibiotics with later operative intervention increased long-term retention of a prosthesis.

Methods: A retrospective review was conducted of patients who were hospitalized or underwent reoperation for an infection from 2006 through 2016. The length of hospitalization, length of IV antibiotic use, and retention of the breast prosthesis at 3-months after reoperation were recorded for each patient.

Results: A total of 43 patients were included in our study. Of these, 33 patients underwent early intervention, and 10 patients underwent delayed intervention. The average length of stay was significantly shorter in the early versus delayed return to OR group (4.1 versus 6.4 days; $P = 0.008$). The average duration of antibiotics was shorter in the early intervention group than the delayed group (5.1 versus 6.4 days; $P = 0.28$). At 3-months postoperatively, a greater proportion of patients in the early intervention group compared with the delayed group retained their breast prostheses (87.5% versus 60%; $P = 0.25$).

Conclusions: The results of this study demonstrate that breast implants may be salvaged after early (<72 hours) or delayed (>72 hours) operative intervention; however, early intervention is associated with a significantly shorter length of stay, and trends toward a shorter antibiotic course and higher rate of implant retention at 3 months. (*Plast Reconstr Surg Glob Open* 2021;9:e3962; doi: [10.1097/GOX.0000000000003962](https://doi.org/10.1097/GOX.0000000000003962); Published online 3 December 2021.)

INTRODUCTION

Periprosthetic infections are reported to occur in as many as 35% of implant-based breast reconstructions and can present a significant challenge for the plastic and reconstructive surgeon.^{1–5} The incidence of infection has been demonstrated to be higher in the irradiated breast^{2–6} and are more common after tissue expander (TE) placement than with permanent implants.^{4,5} With treatment, implant salvage rates after periprosthetic infection have

been reported as high as 58.6%⁵; however, any delay in intervention may result in worsening infection, decrease in implant salvage rates,^{7,8} and increased health care utilization and costs.

Management options for the infected or exposed breast prostheses are based on the severity of presenting symptoms. Options include oral or IV antibiotics with the addition of surgical intervention, including prosthetic removal, breast pocket irrigation and debridement, and possible prosthetic replacement.^{7–9} Some newer studies advise against early implant removal due to high salvage rates with antibiotics, focusing instead on using culture data to guide removal.⁵ As a result, the ultimate decision on management and treatment timing is frequently based purely on clinical judgment.⁹

The aim of the present study was to review our institutional management of patients who developed periprosthetic infections after implant placement, specifically to assess if the timing of operative intervention affected salvage rates. The authors sought to determine if differences in outcomes exist between patients who underwent

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implant exchange with pocket irrigation within 72 hours of hospital admission versus patients who remained on prolonged IV antibiotics and had a delay in surgical intervention.

METHODS

A retrospective review of the data from our institution was performed from 2006 through 2016 involving multiple surgeons within the division of plastic surgery. Patients who underwent implant-based breast surgery were identified using the following CPT codes:

- 19325—Mammaplasty, augmentation; with prosthetic implant
- 11970—Replacement of TE with permanent prosthesis
- 11971—Removal of TE(s) without insertion of prosthesis
- 19340—Immediate insertion of breast prosthesis following mastopexy, mastectomy, or in reconstruction.
- 19342—Delayed insertion of breast prosthesis following mastopexy, mastectomy, or in reconstruction.
- 19357—Breast reconstruction, immediate or delayed, with TE, including subsequent expansion.

Patients who developed infections requiring re-admission for IV antibiotics, re-operations, or both were identified. Patients were divided into two groups based on the timing of surgical intervention: those who underwent surgery for attempted prosthetic salvage within 72 hours of admission, and those who were treated with IV antibiotics greater than 72 hours before surgical intervention. Variables such as length of hospital admission, duration of IV antibiotics, and maintenance of reconstruction at 3-months postintervention were collected. Continuous variables were reported as means and were analyzed with unpaired, two-tailed t-tests. Categorical variables were reported by frequency, percentages, and proportions, and were analyzed with the Fisher exact test or χ^2 test. All tests were two-sided, and a *P* value of less than 0.05 was considered statistically significant. Statistical analysis was performed in SAS 9.4.

RESULTS

There were 1881 documented reconstructive and aesthetic cases involving breast implants performed by our division over the 10-year period. In total, 1292 of these cases were reconstructive (68.7%) and 589 were aesthetic (31.3%). Forty-five reconstructive (3.5%) cases and one (0.17%) aesthetic were hospitalized for suspected infections. Two reconstructive cases were excluded because they resolved with only IV antibiotics, and no surgical intervention was required. The aesthetic case was excluded, as only reconstructive cases were included in our study.

The early operative intervention group consisted of 33 patients who underwent washout within 72 hours, and the delayed group consisted of 10 patients who underwent operative intervention beyond 72 hours from the timing of initial presentation. The two groups did not differ significantly in demographics or comorbidities. White

Takeaways

Question: What is the optimal timing for washing out an infected breast implant?

Findings: Intervention at less than 72 hours is associated with a significantly shorter length of stay and trend toward a shorter antibiotic course and higher rate of implant retention at 3 months.

Meaning: Early washout (<72h) may be associated with improved outcomes when compared with delayed intervention (>72h) for the infected breast prosthesis.

blood cell counts were the only laboratory value/clinical factor that significantly differed between the early and late groups upon presentation (10.2 versus $7.7 \times 10^3/\mu\text{L}$; $P = 0.044$) (Table 1). The type of organisms that grew on culture did not significantly differ between the two groups (Table 2). Both patient groups were started on IV antibiotics after initial diagnosis. The average length of stay was significantly shorter for the early surgical intervention group (4.1 versus 6.4 days; $P = 0.008$) (Table 1). The average duration of IV antibiotics was shorter in the early intervention group than in the delayed group and approached significance (5.1 versus 23.8 days; $P = 0.06$) (Table 1). One patient in the delayed surgery group was found to have osteomyelitis of the rib, requiring prolonged IV antibiotic treatment. Excluding this outlier patient, the average duration of IV antibiotic treatment between the early and delayed treatment groups did not differ significantly (5.1 versus 6.4 days; $P = 0.63$) (Table 1).

The majority (93.9%) of patients in the early operative intervention group required removal of their prostheses. Two patients were found to have superficial, localized cellulitis and underwent debridement alone without violation of the breast capsule or explantation. Roughly 75.7% of the prostheses that were explanted were not replaced due to the severity of infection. A minority (15.2%) of patients had the original prosthesis washed and replaced and fewer still (9.1%) received a new prosthesis.

All 10 patients in the delayed surgical intervention group had their prostheses explanted. Half of these patients were found to have infections too advanced for reimplantation with a prosthesis. Two were treated with antibiotic irrigation catheters while in the hospital. After breast pocket washout and implant replacement, a greater proportion of patients in the early group had maintained their prosthesis at 3 months (87.5% versus 60%, $P = 0.25$) (Table 1).

DISCUSSION

We reviewed our institutional management practices for periprosthetic breast infections in two groups of breast reconstruction patients who underwent either early (<72 hours) or delayed (>72 hours) operative intervention. Our institutional infection rate after breast reconstruction with either TEs or breast implants was 3.5%, which is similar to rates described in the literature (1%–35%).^{1–5} Both the early and delayed intervention groups had similar clinical

Table 1. Characteristics

	Surgery < 72 h (%)	Surgery > 72 h (%)	P
Demographics	n = 33	n = 10	
Age, y	60	55	0.22
BMI	31.23	31	0.1
Smoker			1
Never	21 (63.6)	7 (70)	1
Current	2 (6.06)	0 (0)	
Former	10 (30.3)	3 (30)	
DM	12 (36.4)	1 (10)	0.24
HTN	17 (51.5)	4 (40)	0.72
CVD	11 (33.3)	1 (10)	0.24
CTX	15 (45.5)	3 (30)	0.48
CKD	2 (0.06)	0 (0)	1
XRT	6 (18)	3 (30)	0.42
IMS	7 (21.2)	1 (10)	0.42
Clinical presentation			
Avg. WBC	10.2	7.7	0.044
% Fever	2 (6.1)	1 (10)	0.67
% Cellulitis	24 (72.7)	6 (60)	0.44
% Infected seroma	5 (15.2)	2 (20)	0.72
Management			
Prosthesis removed	31 (93.9)	10 (100)	0.1
Original implant replaced	5 (15.2)	1 (10)	0.68
New prosthesis placed	3 (9.1)	1 (10)	0.02
No prosthesis placed	25 (75.7)	1 (10)	0.12
Irrigation catheter placed	9 (27)	1 (10)	0.64
Outcomes			
Length of stay (d)	4.1	6.4	0.008
Antibiotics duration (d)	5.1	6.4*	0.28
Retention at 3 mo	7 (87.5)	3 (60)	0.25
Retention new prosthesis	3 (100)	2 (50)	0.43
Retention original prosthesis	4 (80)	1 (100)	1

*Outlier excluded.

CTX, chemotherapy; CVD, cardiovascular disease; DM, diabetes mellitus; HTN, hypertension; XRT, radiation; IMS, immunosuppression.

Table 2. Culture Isolates

	Surgery < 72 h (%)	Surgery > 72 h (%)	P
Microorganism	n = 34*	n = 10	0.7677
CNS	2 (6.1)	1 (10)	
<i>E. cloacae</i>	2 (6.1)	1 (10)	
<i>E. coli</i>	0 (0)	1 (10)	
MAI	1 (3)	0 (0)	
MRSA	3 (9.1)	0 (0)	
MSSA	3 (9.1)	2 (20)	
<i>P. mirabilis</i>	2 (6.1)	1 (10)	
<i>P. aeruginosa</i>	4 (12.1)	1 (10)	
<i>S. marcescens</i>	2 (6.1)	0 (0)	
No growth	13 (39.4)	3 (30)	
N/A	2 (6.1)	0 (0)	

*One culture grew two organisms.

CNS, coagulase negative staphylococcus; MAI, *Mycobacterium avium* intracellular; MRSA, methicillin-resistance *Staphylococcus aureus*; MSSA, methicillin-sensitive *Staphylococcus aureus*.

presentations. The only clinical factor that differed at presentation was white blood cell count, which was significantly higher in the early intervention group (Table 1). Both groups were started on IV antibiotics at presentation. The timing of return to OR was based on multiple factors, including physical examination findings, patient laboratories, and clinician perception on the severity of presenting symptoms, which can be a potential source of bias.⁹ Implant retention at 3-months postoperatively was higher in the early intervention group compared with the delayed group (87.5% versus 60%; $P = 0.25$), suggesting

early debridement is beneficial (Table 1). Further, there was no significant difference between salvage or retention rates of patients who received a new prosthesis and those who had their original implants washed and re-placed after breast pocket irrigation and debridement (Table 1). Of note, patients in the early intervention group on average had a shorter hospitalization time and a shorter duration of time spent on IV antibiotics, which may be associated with lower health care resource utilization and costs (Table 1).

A delay in diagnosis and/or treatment of periprosthetic breast infections can lead to significant morbidity, including implant loss, requiring multiple subsequent surgeries and increased health care utilization. Thus, it is important for the plastic and reconstructive surgeon to maintain a high degree suspicion for patients with infections that are clinically worsening. However, such infections are often difficult to diagnose, especially in patients who have a history of radiation therapy, acellular dermal matrix (ADM) placement, or who may have undergone concomitant fat grafting during their initial breast reconstruction procedure. Breast radiation therapy and fat grafting can mimic infections due to the production of erythema, inflammation, induration, discomfort, fluid accumulations, and even low-grade fevers. Further, radiation may blunt the native immune response to infection and impede healing efforts due to the resultant disruption of blood flow. In our study, there was a slightly higher proportion of patients with a history of radiation in the delayed intervention group compared with the early intervention group (Table 1). Placement of ADM can also produce redness in the breast secondary to a delayed hypersensitivity reaction; however, the data are conflicting on veracity of this mechanism and its frequency of occurrence.^{5,10} Patients with a history of radiation therapy, ADM placement, or fat grafting, presenting with a red breast are commonly started on antibiotics without a drastic change in symptoms. This did not seem to be a confounding factor in the present study, as the focus of the study was on patients who underwent operative intervention for culture-positive, periprosthetic breast infections.

True periprosthetic breast infections have a range of presentation, from mild to severe infections with varying degrees of breast implant exposure.^{8,9} The literature has demonstrated that salvage may be attempted, and is often successful, for periprosthetic infections that do not present with overwhelming infection or deficient soft-tissue coverage.^{8,9} However, implant removal without salvage, with subsequent reconstruction in a delayed fashion appears to be the more predictable method of management, although understandably less desirable for most patients.^{8,9} Other literature suggests that culture data may potentially be used to guide implant removal and salvage timing.⁵

Our study supports early identification and surgical intervention (<72 h) as a method for improving salvage rates in patients with periprosthetic breast infections. The generalizability of this preliminary data, however, may be limited due to the small sample size and retrospective data. Further, information on the use of ADM and plane of implant placement will be helpful in future

studies. The fact that provider preference, instead of objective measures, guided the timing of patient treatment can be considered as a possible confounding variable. Future retrospective studies may assess outcomes based on culture data obtained during breast pocket washout and type of antibiotics used. There may also be an added benefit in identifying the difference in demographic and clinical factors between patients who progressed to culture-proven periprosthetic infections and those who did not progress beyond superficial cellulitis.

CONCLUSIONS

Development of protocols to effectively treat periprosthetic infections shows promise to increase rates of implant retention and decrease hospital stays and antibiotic use. Timing of intervention may play a larger role than previously considered in these management algorithms, and early intervention may decrease hospital length of stay, while increasing long-term prosthetic retention rates.

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