Intercostal Artery Perforator Flap for Salvage Breast Reconstruction with Exposed Breast Implants

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Background: Multiple techniques have been described for breast reconstruction surgery after breast implant exposure; breast implant removal and delayed breast reconstruction is the procedure of choice. However, in some mild exposures and infections, we propose an alternative treatment.

Methods: This is a case series of a 14-year study in 16 female patients with mild exposure of a breast implant after breast reconstruction surgery. Salvage surgery was performed on these cases. The defects were between 1 and 6 cm, with a median size of 3.9 × 2.9 cm. Eighteen intercostal artery perforator flaps were used with an island of skin from the inframammary fold; 83.3% were anterior intercostal artery perforator flaps, and 16.7% were lateral intercostal artery perforator flaps.

Results: Thirteen of the 16 patients presented infection (81.25%). There was no necrosis of any flap, and the success rate of salvage surgery was 62.5% of all patients. The success of surgery was 53.8% in patients with breast infection and 100% in patients without infection. Seven patients received chemotherapy and radiotherapy, six received only chemotherapy, and nine patients received only radiotherapy. Five of the six patients whose salvage surgery failed were treated with radiotherapy.

Conclusion: This technique can be used as an alternative when there is exposure of the implant, even in cases with a mild breast infection and in patients undergoing radiotherapy and chemotherapy. (Plast Reconstr Surg Glob Open 2022;10:e4548; doi:10.1097/GOX.0000000000004548; Published online 5 October 2022.)

INTRODUCTION

Breast reconstruction surgery after an oncological or prophylactic mastectomy is a common procedure in plastic surgery; perforator, myocutaneous, and muscular flaps are the most used techniques for such reconstruction. These flaps can be pedunculated or free, de-epithelialized or with an island of skin, and may or may not be accompanied by the placement of a breast implant.1−10 In addition to flaps, lipografts have gained popularity in breast reconstruction in recent years.11

Breast infection and wound dehiscence are the most common postoperative complications associated with breast reconstruction surgery with implants and may occur in up to 35% of these patients. Other possible complications are tissue necrosis, hematomas, and seromas.1,12−15 Although the implants used for breast reconstruction are covered by the muscle, adipose tissue, or acellular dermal matrix, wound dehiscence can lead to implant exposure and to local breast infections.12−16

Breast implant removal and delayed breast reconstruction is the procedure of choice when the implant is exposed, and even more so if there is some degree of infection.1,15,16 Nevertheless, in this study, we kept the implant and salvaged the breast reconstruction as an alternative in those cases where there was a mild local infection of the breast tissue. The dehiscence defect can be covered with multiple locoregional or distant flaps, depending on the site and size of the wound. The reports that have been published are short series with mainly thoracodorsal, intercostal, pedicled, or free latissimus dorsi flaps, among others. This study evaluates the results of this new procedure to solve a common problem in breast reconstruction and to evaluate the feasibility of maintaining the implant in cases of infection.

MATERIAL AND METHODS

After wound dehiscence and breast implant exposure occurred, the patient was scheduled for surgery as soon as
possible. This dehiscence was small or could reach up to a diameter of 6 cm. In cases where the dehiscence was more extensive and the quality of the tissues was poor, reconstruction was not considered, and implant removal was chosen. Then we waited for the tissues to improve so as to perform a late reconstruction.

For this case series, data were collected from patients who underwent breast reconstruction with implants after mastectomy and experienced wound dehiscence with subsequent implant exposure. Data were analyzed in two different clinics in Medellín, Colombia (IQ Interquirófanos and Fundación Clínica Vida), for 14 years, between 2006 and 2020. The reconstruction was performed by the same surgeon, but the mastectomy was performed by four different breast surgeons.

All patients received antibiotic prophylaxis with intravenous cefazolin at a dose of 2 g, administered between 30 minutes and 1 hour before surgery. Procedures longer than 4 hours received an additional booster dose. Ciprofloxacin, clindamycin, and sultamicillin were used in patients with allergy to cefazolin.

These patients underwent a salvage procedure to rescue the reconstruction and cover the breast prosthesis using an intercostal artery perforator flap (ICAP) or a lateral intercostal artery perforator flap (LICAP) with an island of skin from the inframammary fold. Allergan or MENTOR textured silicone gel breast implants (round or anatomical), with a size ranging between 300 cm³ and 425 cm³, depending on the dimensions of the breast to be reconstructed, were used in these reconstructions. Expander implants and acellular dermal matrices (ADM) were not used.

Implants were placed submuscular, below the pectoralis major, and lateral to the serratus anterior. For this approach, the pectoralis major was raised in its lateral region; part of the fascia of the serratus anterior muscle was dissected in continuity with the pectoralis muscle to have greater coverage of the implant. The pectoralis major muscle must be taken off in the sternal and inferior region, and dissection is then continued inferorly, elevating the upper part of the anterior rectus and the obliques in continuity with the pectoralis muscle to form the inframammary fold. Subsequently, in the lateral region, the serratus anterior muscle has to be removed from the ribs, and the dissection is continued laterally up to the anterior axillary line to prevent lateral displacement of the implant. With this technique, no acellular dermal matrix is used, and the coverage of the implant is almost complete.

Oral antibiotics were continued postoperatively until the drain was removed (7–14 days). In those patients who had any symptoms of infection after drain removal such as fever, erythema, or edema with changes in acute phase reactants, cultures were performed, and antibiotic treatment was resumed empirically covering *Staphylococcus aureus*. Photograph registry was made every day until infection resolved so as to confirm adequate evolution.

The patients included in this study were those who, after wound dehiscence, were covered with an ICAP flap [anterior (AICAP) or LICAP] with an island of skin from the inframammary fold; these may be anteriorly or laterally based, depending on the location of the wound. The distance from the inframammary fold to the wound determined the length of the flap (between 10 and 18 cm), and the skin island was determined according to the diameter of the wound and the length of the flap. The defects were between 1 and 6 cm of length with an average size of 3.9 x 2.9 cm (Fig. 1).

A lateral centimeter of subcutaneous tissue was added to this flap from the edge of the skin or dermis. This is done to give greater perfusion to the edges of the wound where the flap had to be closed. The flap was somewhat longer than the distance measured between the base of the flap and the defect to avoid tissue traction and subcutaneously cover more area to increase the lateral perfusion of the areas around the wound (Figs. 1, 2). We did not use Doppler in this study to evaluate perfusion.

Once the flap was designed, it was elevated from distal to proximal, including the fascia. The mammary capsule was opened near the base of the flap, and the flap was introduced into the cavity. The flap was then placed under the defect, and the defect was marked on the skin of the flap. Subsequently, it was removed from the cavity.

**Takeaways**

**Question:** How to treat exposure of breast implants after postmastectomy breast reconstruction?

**Findings:** We propose this technique as a salvage procedure and even more so in patients with infection. This technique can be used as an alternative to not remove the implant, which is considered the only option available by many.

**Meaning:** In patients with postmastectomy breast reconstruction with exposure of the breast implant in the postoperative period, explantation can be avoided by performing a flap with excellent results; it would also be indicated in cases with minor infections.
and the flap was repositioned in the original place to de-epithelialize the skin of the flap, except for the marked skin (Fig. 2).

The implant was removed from the breast and washed with a saline solution containing 1g of gentamicin and left in this solution until it was replaced. A capsulotomy was then performed and the cavity was curetted. Then the cavity was flushed with gentamicin saline, and a vacuum drain was placed into the cavity and the implant repositioned (Fig. 3). The de-epithelialized flap with the skin island was passed back into the cavity, and the skin island was sutured to the edges of the defect.

The implants were exchanged for new ones in only two patients. These two implants that were placed were smaller than the ones they had previously, due to some degree of capsular contracture.

Not all implants were changed because the patient’s insurers did not approve them. Patients had their drains removed 7 to 14 days after surgery, depending on the volume of fluid in the drain and the healing time of the skin island.

The variables analyzed were age, patient comorbidities and adjuvant treatments, time of onset of wound dehiscence, presence or absence of infection, viability and characteristics of the flap, and surgical technique. The data were analyzed in SPSS, v.21.

RESULTS

In these 16 patients, wound dehiscence with breast implant exposure occurred on 18 occasions in 17 different breasts (in one breast it occurred on two occasions at different times). The median age was 44 years (IQR 40.5–50.25). The patients were evaluated between 2006 and 2020, and the follow-up of the patients was between 2 and 15 years.

Regarding comorbidities, hypothyroidism is mentioned in two patients, active smoking in two patients, neutropenia in one patient, and rheumatoid arthritis in one patient.

Eight of 16 patient underwent unilateral mastectomy and 8 underwent bilateral mastectomy; of the eight patients with bilateral mastectomy, six of them presented on one occasion wound dehiscence in one of the breasts (Fig. 1), and in two of them, the implant was finally removed. One patient in this bilateral mastectomy group had dehiscence in the same breast on two different occasions (Figs. 4, 5), and another patient in this same group had dehiscence in both breasts at the same time after breast reconstruction (Fig. 6).
Wound dehiscence occurred between 2 weeks and 6 months after surgery, with an average of 9.25 weeks. Fourteen breasts presented clinical signs of infection, which corresponded to an infection rate of 81.25% (13/16) of the total number of patients.

These patients presented erythema, warmth, redness, and cellulitis of the breast (Fig. 7). The patients who presented collection within the breast were drained under ultrasound and the material was sent for cultures. After this, antibiotic therapy was started to cover *Staphylococcus aureus* and other germs commonly reported in infections of this type, until the laboratory result or clinical improvement was awaited.

*Staphylococcus aureus* was isolated in four patients and *Staphylococcus epidermidis* in one; in the other patients, no germ was isolated before or during surgery. This could be because patients had been taking antibiotics a few days before. This therapy management was maintained for at least 2 weeks until the patient’s clinical and laboratory tests improved. Six of the 14 infected implants (42.8%) had to be removed (Table 1). Three of them were reconstructed between 6 and 9 months later, and the other three did not want any type of reconstruction. The salvage technique was successful in all cases without infection, four cases in three patients (Table 1).

The reconstruction technique used to close the dehiscence was an AICAP flap with an island of skin in 83.3% of cases, and in the remaining 16.7% the flap used was LICAP. All flaps showed 100% viability without any type of flap necrosis.

Breast reconstruction after mastectomy was immediate in 83.3% of cases (15/18) and late in 16.7% (3/18). The success rate of salvage surgery was 66.7% in cases with immediate reconstruction and 66.7% in cases with late reconstruction (Tables 2, 3).

**Table 1. Relationship of Flaps Postmastectomy (n:16)**

| Breast Mastectomy | # Dehiscence | Flaps | Success | % |
|-------------------|-------------|-------|---------|---|
| Unilateral        | 8           | 6     | 4       | 50% |
| Bilateral         | 8           | 6     | 4       | 66.7% |
|                   | 1 in both sides | 2 | 100% |
|                   | 1 twice in same side | 2 | 100% |
Delayed 3 17.7% 2/3 66.7%

This procedure benefits patients who do not have infection, dehiscence and breast implant exposure, as part of post-vage surgery was successful in 53.8% (7/13). However, in infection’ and among these patients with infection, sal-

sion and ultimately lead to failure of the surgical proce-

Of the 16 patients, seven patients required chemotherapy and radiotherapy, six patients required only chemother-

apy and only two patients required only radiotherapy. The remaining patient did not receive adjuvant treatment; of the patients who received radiotherapy, five of them underwent this treatment before reconstructive surgery.

In the six patients in whom salvage was unsuccessful, four patients received chemotherapy and radiotherapy, one patient received only chemotherapy, and another only radiotherapy. Overall, the salvage surgery evaluated in this study had a success rate of 66.7% for affected breasts (12/18) and 62.5% for patients (10/16). The success rate was 53.8% in patients with breast infection and 100% in patients without infection. In the six cases where salvage surgery failed, the implants were removed because they extruded due to poor tissue quality and not because of flap problems.

## DISCUSSION

Wound dehiscence with exposure of breast implants is a rare complication of cosmetic breast augmentation surgery and is only seen in 1.1% to 2.5% of cases. In con-

trast, wound dehiscence is common in postmastectomy breast reconstruction surgery and can occur in up to 35% of patients. It can be aggravated by the presence of infec-

## Table 2. Breast Infections

| Breast Infection | Patients Infected | Implant Removed | Success |
|------------------|-------------------|-----------------|---------|
| Yes: 14 (18)     | 15 (16)           | 6 (14)          | 100%    |
| No: 4 (18)       | 3 (16)            | 0 (4)           | 100%    |

## Table 3. Breast Reconstruction after Mastectomy

| Reconstruction  | Flaps % | # Success | % Success |
|-----------------|---------|-----------|-----------|
| Immediate       | 15 83.3%| 10/15     | 66.7%     |
| Delayed         | 3 17.7% | 2/3       | 66.7%     |

It is important to note that our salvage approach was unsuccessful in some cases where infection occurred, and chemotherapy or radiation therapy was used before or after surgery. These therapies were necessary for patients despite the fact that the healing process could be altered.

When comparing the success outcome between immediate and delayed reconstruction, there was no difference in outcome, and the success rate was similar: 66.7% for both cases. There was also no difference in the success rate between patients with unilateral or bilateral breast reconstruction surgery.

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including those who have received chemotherapy and/or radiation therapy.

Patients with an infection could also benefit, but the chance of a successful outcome is lower than in patients without infection. The salvage procedure should be offered before implant removal is considered and as soon as possible after implant exposure to prevent infection.

We do not recommend salvage surgery in patients undergoing late breast reconstruction with radiotherapy. In these patients, the quality of the tissue must be improved with flaps or lipografts before breast reconstruction, to avoid failure and a second exposure of the implant.

In the two smokers and in the rheumatoid arthritis patient, salvage surgery worked very well. It is important to mention that the two smoking patients stopped smoking when the dehiscence began despite having been previously warned to stop smoking. Studies of wound dehiscence with implant exposure are scarce. In most of these published studies, the treatment of the patients depended on the presence or absence of a breast infection. If infection was present, the authors removed the implant and performed delayed breast reconstruction; some performed a flap if there was a coverage defect secondary to dehiscence in the breast and 6 to 9 months they placed the implant again to wait for the tissue to improve.

In recent years, some studies have been published related to the exposure of implants after mastectomy without breast infection, and in these cases, attempts have been made to cover the implant with flaps such as LICAP, TRAM, free or pedicled latissimus dorsi and other free flaps of the gluteal region, DIEP, or perforating artery flaps among others with good results. However, some of these flaps have functional and aesthetic consequences for patients in the donor area.

Thoracodorsal flaps from the inframammary fold have also been used, but with a different design than the one we use, but with a lateral pedicle. We did not find published studies with large series using AICAP flaps in this type of reconstruction and neither with the presence of breast infection. 

Regarding the diameter of the dehiscence defect, it ranged from 1 to 6 cm, with a median of 3.9 x 2.9 cm. For its coverage, the flap was designed wider than the defect, and longer taking the measurements from the inframammary fold. In no case was the island of the skin removed after surgery and no patient requested its resection.

It is important to note that our salvage approach was unsuccessful in some cases where infection occurred, and chemotherapy or radiation therapy was used before or after surgery. These therapies were necessary for patients despite the fact that the healing process could be altered.

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Finally, it is essential to highlight that the flap evaluated here is safe, easy to perform, and has excellent aesthetic results in the donor area and, therefore, in the
breast. In addition, the flap improves the irrigation of the area where it is placed.

We consider that the sample size is a limitation of our study. However, to the best of our knowledge, there is no similar work in the literature.

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