Staged breast reconstruction with immediate tissue expander (TE) placement following mastectomy offers advantages, making it strongly favored over delayed reconstruction at many institutions.1–3 Staging allows patients to contemplate breast reconstruction options, and placement of a TE does not preclude the patient from the final reconstruction of their choosing. Additionally, timed expansions permit gradual stretching of the breast pocket and skin envelope. The reconstructive surgeon is provided with a larger breast pocket for the eventual implant or autologous transfer, resulting in better aesthetic outcomes.4–6 Staged breast reconstruction with TE placement can provide all of

**Introduction:** Impaired vascular perfusion in tissue expander (TE) breast reconstruction leads to mastectomy skin necrosis. We investigated factors and costs associated with skin necrosis in postmastectomy breast reconstruction.

**Methods:** Retrospective review of 169 women with immediate TE placement following mastectomy between May 1, 2009 and May 31, 2013 was performed. Patient demographics, comorbidities, intraoperative, and postoperative outcomes were collected. Logistic regression analysis on individual variables was performed to determine the effects of tissue expander fill volume and mastectomy specimen weight on skin necrosis. Billing data was obtained to determine the financial burden associated with necrosis.

**Results:** This study included 253 breast reconstructions with immediate TE placement from 169 women. Skin necrosis occurred in 20 flaps for 15 patients (8.9%). Patients with hypertension had 8 times higher odds of skin necrosis [odd ratio (OR), 8.10, \( P < 0.001 \)]. Patients with TE intraoperative fill volumes >300 cm³ had 10 times higher odds of skin necrosis (OR, 10.66, \( P = 0.010 \)). Volumes >400 cm³ had 15 times higher odds of skin necrosis (OR, 15.56, \( P = 0.002 \)). Mastectomy specimen weight was correlated with skin necrosis. Specimens >500 g had 10 times higher odds of necrosis and specimens >1000 g had 18 times higher odds of necrosis (OR, 10.03 and OR, 18.43; \( P = 0.003 \) and \( P < 0.001 \), respectively). Mastectomy skin necrosis was associated with a 50% increased inpatient charge.

**Conclusion:** Mastectomy flap necrosis is associated with HTN, larger TE volumes and mastectomy specimen weights, resulting in increased inpatient charges. Conservative TE volumes should be considered for patients with hypertension and larger mastectomy specimens. (Plast Reconstr Surg Glob Open 2015;3:e450; doi: 10.1097/GOX.0000000000000408; Published online 14 July 2015.)

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the above without interrupting oncologic therapy. TEIs do not interfere with delivery or efficacy of adjuvant chemotherapy, although there is conflict in the literature in regard to cosmesis and timing of TE placement or expansion with chest wall radiation. 7–10

Although immediate TE placement following mastectomy is a desirable option for many patients, the procedure is not without risk. Complications include implant failure and rupture, fat necrosis, skin necrosis, and infection. 4,16,20–22 Causes of impaired vascular perfusion via the microcirculation can lead to inadequate oxygenation of the overlying skin flap. 23–26 Microcirculation is impaired with comorbidities such as smoking, hypertension, hyperlipidemia, and obesity. 27,28 Impaired oxygenation can lead to mastectomy skin necrosis acutely. 4,16,20

Severe mastectomy skin necrosis can lead to infection, reoperation, and implant removal. Necrosis-associated complications can result in emotional distress and additional financial costs to a patient already facing the psychological and physical stress associated with breast cancer.

The incidence of mastectomy skin necrosis varies in the literature between 10% and 40%. 26,29–32 Although the precise etiology underlying mastectomy skin necrosis as it relates to mastectomy specimen weight and intraoperative TE fill volume remains disputed, we hypothesized that increased mastectomy specimen weights and larger intraoperative TE fill volumes would correlate with wound healing complications. 33–37 We also hypothesized that patients with known surgical comorbidities would have higher rates of wound healing complications. In a retrospective review, this study investigated factors associated with mastectomy skin necrosis in breast reconstruction and its associated costs.

**PATIENTS AND METHODS**

This study was approved by the Johns Hopkins Medicine Institutional Review Board, and a representative sample of patients having TE placement following mastectomy at Johns Hopkins Hospital between May 1, 2009, and May 31, 2013, were retrospectively reviewed. Patients who met the following inclusion criteria were included: (1) having bilateral or unilateral postmastectomy TE placement, (2) receipt of a simple total, modified radical, or nipple-sparing mastectomy, (3) any history of adjuvant chemotherapy or radiotherapy. Patients were excluded if: (1) the TE was not immediately placed postmastectomy, (2) they were <30 days postoperatively at the time of this review, (3) the breast specimen weights and/or intraoperative TE fill volumes were not recorded, or (4) they were lost to follow-up.

All clinic, operative, and emergency room notes were reviewed. Patient demographics and comorbidities were documented. We recorded intraoperative parameters including mastectomy specimen weight and the initial intraoperative TE fill volume. We considered small mastectomy specimens as ≤500 g and large specimens as those weighing >500 g. Divisions were also made to account for extremely large mastectomy specimens, which we considered as any specimen >1000 g. We considered a conservative intraoperative fill as ≤300 cm³ while large fills were considered anything >500 cm³ to ≤400 cm³. Very large intraoperative fills were those >400 cm³.

Postoperative outcomes included major complications of mastectomy flap necrosis, reoperation, debridement, removal of the implant, or hospital readmission for infection management. Minor complications included infection requiring outpatient antibiotics, seroma, or hematoma. Our primary outcome of interest was mastectomy flap necrosis, which we defined as full-thickness tissue loss leading to eschar formation, and was documented by nurse practitioners in the Johns Hopkins Breast Center. Treatment was documented for patients who developed necrosis. Aggressive treatment included reoperation and debridement with implant removal. Conservative treatment included topical Silvadene (Pfizer, New York, N.Y.), local excision in office, or oral antibiotics.

Billing data were obtained for all women to determine the additional financial burden associated with necrosis. Patients who developed necrosis requiring reoperation, debridement, and implant removal were matched to 1–2 control patients in the same sample who did not develop necrosis by self-reported race, age ± 5 years, surgery within one calendar year, type of mastectomy, body mass index (BMI) category (or weight within a 15-pound range if BMI was unavailable), smoking status, and hypertension status. For both case and control patients, total operating room and inpatient stay charges were combined and averaged for all stays within 30 days of TE placement.

**Statistical Analysis**

All data were managed using REDCap software 38 (Version 4.13.1—©2012 Vanderbilt University,
Nashville, Tenn.). Statistical analysis was performed in Stata, Version 11.0 (StataCorp, College Station, Tex.). Statistical analysis was performed per patient as well as per breast. Frequencies were calculated for categorical and binary variables, and means and SDs are provided for continuous variables. Fisher’s exact test was used to compare binary and categorical data between patients with and without mastectomy skin necrosis, whereas Wilcoxon rank-sum test was used for the same analysis among continuous variables. Logistic regression analysis on individual variables for each outcome was performed. For breast-dependent outcomes, standard errors were adjusted for within-patient correlation for bilateral operations using clustering within simple logistic regressions. Odds ratios (ORs) were calculated using simple logistic regressions and reported with a 95% confidence interval. Multivariable logistic regression was used to explore the relationship between mastectomy specimen weight and intraoperative TE fill volume in an effort to isolate the variables as potential founders for mastectomy skin necrosis.

**Surgical Technique**

A dedicated breast surgeon performed all mastectomies. Mastectomy specimens were weighed by nurses and recorded by the attending reconstructive surgeon before TE placement. All TEs were placed subpectoral and filled as described in the literature. The use of acellular dermal matrix (ADM) was recorded. Not all TEs were filled at the time of placement. For TEs that were filled, the intraoperative volumes were determined by the clinical judgment of the attending reconstructive surgeon. Perfusion after placement and filling of the TE was also determined by clinical assessment of the attending reconstructive surgeon.

**RESULTS**

This study included 253 staged breast reconstructions with immediate TE placement from 169 women (bilateral reconstruction, \( n = 84 \); unilateral reconstruction, \( n = 85 \)). Patient demographics and comorbidities are documented in Table 1. Intraoperative parameters and postoperative outcomes are documented in Tables 2 and 3. Median inpatient

| Table 1. Patient Demographics |
|-------------------------------|
| Population (\( n = 169 \)) | + Skin Necrosis (\( n = 15 \)) | - Skin Necrosis (\( n = 154 \)) | \( P \)-value | Odds Ratio |
| White | 133 (79%) | 12 (7%) | 121 (72%) | 0.992 | 1.00 |
| African American | 22 (13%) | 2 (1%) | 20 (12%) | 0.837 | 1.01 |
| Other race | 14 (8%) | 1 (1%) | 13 (8%) | 0.814 | 0.77 |
| BMI | 25.7 ± 6.0 | 30.6 ± 5.9 | 25.2 ± 5.7 | 0.006 | 2.55 |
| Diabetes | 7 (4.1%) | 0 (0.0%) | 7 (4.5%) | — | — |
| Hypertension | 25 (14.7%) | 7 (43.7%) | 18 (11.6%) | <0.001 | 8.10 |
| Age at surgery | 48.4 ± 10.7 | 55.4 ± 10.2 | 47.7 ± 10.5 | — | — |
| Former or current smoker | 40 (23.6%) | 6 (40.0%) | 34 (22.0%) | 0.458 | 1.61 |
| Bilateral procedure | 84 (49.7%) | 8 (53.3%) | 78 (50.6%) | 0.952 | 0.97 |

Race, age, BMI, and preoperative comorbidities were recorded for all 169 patients in the sample. Demographics and comorbidities were analyzed on a per-patient basis. Percentages are given based on the total number of patients in the sample. Patients with hypertension had an 8 times higher odds of developing skin necrosis compared with those who did not. BMI was correlated with skin necrosis for patients with a BMI > 30. There was no association between smoking status and skin necrosis in our sample.

| Table 2. Breasts with Skin Necrosis |
|-----------------------------------|
| Values Given for 253 |
| Total Breasts | Total Cases | + Skin Necrosis | \( P \)-value | Odds Ratio |
| Breast TE fill volume initial | | | | |
| \( \leq 300 \text{ cm}^3 \) | 215 | 11 (4%) | 0.704 | 1.55 |
| \( >300 \text{ cm}^3 \leq 400 \text{ cm}^3 \) | 26 | 6 (2%) | 0.010 | 10.66 |
| \( >400 \text{ cm}^3 \) | 12 | 3 (1%) | 0.002 | 15.56 |
| Breast specimen weight | | | | |
| \( \leq 500 \text{ g} \) | 131 | 2 (1%) | 0.002 | 0.09 |
| \( >500 \text{ g} \leq 1000 \text{ g} \) | 104 | 14 (6%) | 0.003 | 10.03 |
| \( >1000 \text{ g} \) | 18 | 4 (2%) | <0.001 | 18.43 |

The influence of tissue expander intraoperative fill volume and mastectomy specimen weight on the development of skin necrosis was analyzed on a per-breast basis, with clustering to account for within-patient correlation. The initial volume of saline injected into the tissue expander after it was placed and the postmastectomy breast specimen weight were recorded for each breast. These values were subsequently divided into categories. The total number of breasts within each category is listed as well as the number of breasts in each category that developed necrosis. Percentages are given over total number of breasts. Larger tissue expander fill volumes and larger mastectomy specimen weights were associated with significantly higher odds of mastectomy skin necrosis.
stay was 1 day (range, 1–2 days). Skin necrosis occurred in 20 skin flaps for 15 patients (8.9%). Two cases of necrosis occurred in African American patients (1%), 1 case in a patient of undisclosed race (1%), and the remaining 12 patients were white (7%). Mean time to documentation of skin necrosis was 17.6 days (range, 5–36 days). Weights of all mastectomy flaps and volumes for all intraoperative TE fills are described in Tables 3 and 4.

Data were first analyzed on a per-patient basis. Patients with a previous diagnosis of hypertension had 8 times the odds of developing skin necrosis compared with patients without hypertension (OR, 8.10; P < 0.001; Table 1). BMI was found to be proportional to both increasing TE fill volumes and larger mastectomy specimen weights. However, BMI was not correlated with necrosis until patients reached a BMI > 30 (P = 0.0034). Patients with and without necrosis were comparable in relation to other causes of surgical comorbidities, age, race, and proportion of bilateral procedures. Ninety-six percent (n = 242) of breasts were reconstructed with ADM. Breasts reconstructed with (n = 242) or without (n = 11) ADM had no significant difference in rates of necrosis or other complications.

To elucidate the relationship between TE fill volumes, mastectomy specimen weights, and skin necrosis, our data were reanalyzed per breast with clustering to account for within-patient bias. When adjusted for hypertension status, mastectomy skin flaps receiving large TE fill volumes were found to have significantly higher rates of mastectomy skin necrosis. Intraoperative TE fill volumes ranged from 0 to 500 cm³ (mean = 201 cm³). There were 215 breasts with intraoperative fills ≤300 cm³, 26 breasts >300 cm³ to ≤400 cm³, and 12 breasts >400 cm³ (Table 2). Eleven of the 215 TEs filled up to 300 cm³ developed mastectomy necrosis; however, this was not statistically significant (OR, 1.55; P = 0.704). Mastectomy skin flaps receiving intraoperative TE fills >300 cm³ to ≤400 cm³ had 10 times greater odds of developing necrosis when compared with conservative fill volumes (OR, 10.66; P = 0.010). Once intraoperative TE fill volumes reached >400 cm³, mastectomy skin flaps had 15 times greater odds of developing necrosis (OR, 15.56; P = 0.002). No patients in our study developed mastectomy skin necrosis if their TE was placed and remained unfilled (n = 13; Tables 3 and 4).

Mastectomy specimen weights were recorded from 54 to 2040 g (mean = 522g). As described in Table 2, there were 131 cases of specimens weighing ≤500 g; only 2 of those flaps developed necrosis (1.5%). Mastectomy skin flaps had 15 times greater odds of developing necrosis when compared with smaller specimens, and specimens weighing >1000 g (n = 104) had 10 times higher odds of developing skin necrosis compared with smaller specimens (OR, 15.56; P = 0.002). No patients in our study developed mastectomy skin necrosis if their TE was placed and remained unfilled (n = 13; Tables 3 and 4).

Mastectomy specimen weights were recorded from 54 to 2040 g (mean = 522g). As described in Table 2, there were 131 cases of specimens weighing ≤500 g; only 2 of those flaps developed necrosis (1.5%). Mastectomy skin flaps had 15 times greater odds of developing necrosis when compared with smaller specimens, and specimens weighing >1000 g (n = 104) had 10 times higher odds of developing skin necrosis compared with smaller specimens (OR, 15.56; P = 0.002). No patients in our study developed mastectomy skin necrosis if their TE was placed and remained unfilled (n = 13; Tables 3 and 4).

Analysis showed that patients with skin necrosis were at increased risk for other surgical morbidities. Patients developing necrosis had 15 times higher

### Table 3. Per Patient Mastectomy Characteristics

|                         | Population (n = 169) | + Skin Necrosis (n = 15) | − Skin Necrosis (n = 154) |
|-------------------------|----------------------|-------------------------|--------------------------|
| **Mean/SD specimen weight** | 535 ± 316           | 846 ± 420               | 504 ± 288                |
| **Median specimen weight** | 478                  | 750                     | 452                      |
| **Specimen weight range** | 54–2040              | 390–2040                | 54–1555                  |
| **Mean/SD fill volume**  | 208 ± 121            | 313 ± 125               | 198 ± 116                |
| **Median fill volume**   | 200                  | 300                     | 200                      |
| **Fill volume range**    | 0–500                | 50–500                  | 0–500                    |

Weights are expressed in grams and volumes in cm³. Means, medians, SDs, and ranges for mastectomy specimen weights and the initial tissue expander fill volumes are expressed on a per-patient basis. For patients with bilateral procedures, breast specimen weights and tissue expander fill volumes were averaged. Patients with mastectomy skin necrosis had higher median flap weights and larger median tissue expander fill volumes.

### Table 4. Per Breast Mastectomy Characteristics

|                         | Population (n = 253) | + Skin Necrosis (n = 20) | − Skin Necrosis (n = 233) |
|-------------------------|----------------------|-------------------------|--------------------------|
| **Mean/SD specimen weight** | 522 ± 301           | 814 ± 387               | 497 ± 280                |
| **Median specimen weight** | 474                  | 749                     | 450                      |
| **Specimen weight range** | 54–2040              | 300–2040                | 54–1555                  |
| **Mean/SD fill volume**  | 201 ± 119            | 315 ± 115               | 191 ± 115                |
| **Median fill volume**   | 200                  | 300                     | 200                      |
| **Fill volume range**    | 0–500                | 50–500                  | 0–500                    |

Weights are expressed in grams and volumes in cm³. Means, medians, SDs, and ranges for mastectomy specimen weights and the initial tissue expander fill volumes are expressed on a per-breast basis. Breasts with skin necrosis had larger median mastectomy specimen weights and larger median tissue expander fill volumes.
odds of developing a postoperative infection (OR, 15.12; \( P < 0.001 \)) and almost 16 times higher odds of requiring their TE to be prematurely removed (OR, 15.83; \( P < 0.001 \)). Of the 15 patients with necrosis, 10 required readmission with intravenous antibiotics and reoperation with surgical debridement and removal of their TE (67%). All 15 patients who developed necrosis were treated with antibiotics, Silvadene, and/or reoperation, debridement, and removal. Patients with mastectomy skin necrosis had a 15 times higher odds of developing an infection requiring intervention and an almost 16 times higher odds of requiring their tissue expander to be prematurely removed (OR, 15.12 and 15.83; \( P < 0.001 \) for both).

## DISCUSSION

Immediate TE placement in staged breast reconstruction is often preferred to improve cosmesis and patient satisfaction. Postmastectomy TE placement allows patients to receive adjuvant chemotherapy as needed. Because expansions can

### Table 5. Postoperative Outcomes

| Population (n = 169) | + Skin Necrosis (n = 15) | \( P \) | Odds Ratio |
|---------------------|-------------------------|-------|-----------|
| Infection           | 15                      | 15 (9%) | <0.001    | 15.12     |
| Intravenous antibiotics | 10                | 10 (6%) | —         | —         |
| Oral antibiotics    | 15                      | 15 (9%) | —         | —         |
| Topical cream (Silvadene) | 2                 | 2 (1%)  | —         | —         |
| Readmission         | 10                      | 10 (6%) | —         | —         |
| Reoperation         | 10                      | 10 (6%) | —         | —         |
| Debridement         | 10                      | 10 (6%) | —         | —         |
| TE removal           | 10                      | 10 (6%) | <0.001    | 15.83     |
| Seroma               | 11                      | 11 (6%) | —         | —         |
| Hematoma            | 3                       | 3 (2%)  | —         | —         |

Postoperative outcomes data were recorded for all patients and are shown for patients with mastectomy skin necrosis. Adverse outcomes were only identified in patients who developed mastectomy skin necrosis. Once identified, mastectomy skin necrosis was treated with antibiotics, Silvadene, and/or reoperation, debridement, and removal. Patients with mastectomy skin necrosis had a 15 times higher odds of developing an infection requiring intervention and an almost 16 times higher odds of requiring their tissue expander to be prematurely removed (OR, 15.12 and 15.83; \( P < 0.001 \) for both).

### Table 6. Cost of Inpatient Stay

| With Necrosis and Debridement | Matched Controls |
|-------------------------------|------------------|
| Patient | Necrosis Cost (USD) | Patient | No Necrosis Cost (USD) |
|---------|---------------------|---------|------------------------|
| Case 1  | 31,735              | Control 1 | 26,500                |
| Case 2  | 52,512              | Control 2 | 7,983                 |
| Case 3  | 46,001              | Control 4 | 23,096                |
| Case 4  | 28,460              | Control 5 | 27,632                |
| Case 5  | 22,011              | Control 6 | 28,180                |
| Case 6  | 33,928              | Control 7 | 17,184                |
| Case 7  | 34,146              | Control 8 | 18,723                |
| Case 8  | 26,815              | Control 9 | 21,929                |
| Case 9  | 24,640              | Control 10 | 18,587               |
| Case 10 | 30,885              | Control 11 | 20,126               |
| Average | 33,113              | Control 12 | 27,632               |
| Difference between patients with and without necrosis | 11,076 | 22,038                |

The total inpatient and operating room charges for each patient who developed mastectomy skin necrosis were obtained, and the combined charges for all of the patients with mastectomy skin necrosis were averaged. Each patient was matched to 1 or 2 control patients based on self-identified race, smoking status, hypertension status, age, BMI category, bilateral procedure, tissue expander fill volume category, and mastectomy specimen weight category. If 2 control patients were available per case patient, the 2 control patients’ charges were combined and averaged. Patients who developed mastectomy skin necrosis were charged $33,113 more on average, which is a 50% increase in cost.
often be continued during this time, immediate TE placement is also highly efficient; it contributes to improving patient quality of life by allowing patients to more quickly move beyond the emotional distress associated with a breast cancer diagnosis and treatment.41,42

Although the type of mastectomy required for oncologic treatment and the margin of breast tissue removed are dictated by TNM Classification of Malignant Tumors and clinical assessment, the amount of saline initially injected into the TE after it is placed is at the discretion of the attending reconstructive surgeon.43,44 Often this decision is dictated by a combination of patient request or concern about aesthetic outcome, the reconstructive surgeon’s concerns with temporary aesthetic outcome, and/or the reconstructive surgeon’s ability to approximate the edges of the skin envelope without compromising vascular perfusion and venous drainage.45,46

We demonstrated that when larger mastectomy specimens are removed for oncologic purposes, there are significantly higher odds of skin necrosis. We also illustrated that larger intraoperative TE fill volumes are associated with mastectomy skin necrosis. Of note, 100% of the TEs placed without fills were without necrosis 30 days postoperatively. One may presume that removing larger mastectomy specimens leaves larger mastectomy skin flaps that require larger TE volumes; however, that is not always the case based on each patient’s individual body habitus and their mastectomy needs for oncologic purposes. As the relationship between these parameters has not been fully elucidated in the literature, our study found the effects of the mastectomy specimen weight and TE fill volume on mastectomy skin necrosis to be independent of one another. We hypothesized that BMI may be a common factor between the two; however, in our study, BMI only increased the probability of developing mastectomy skin necrosis and the relationship is only significant for patients with BMIs > 30 (P = 0.0034).

Thus, postmastectomy TEs must be filled to optimize aesthetic outcomes and ensure the viability of the remaining mastectomy skin flap. Several studies have shown surgical outcomes to be dependent on operator experience.47–52 Although questions have been raised about operator use, quality of the mastectomy skin flaps, and surgical outcomes in breast reconstruction, our study found no association between skin necrosis and the type of mastectomy performed or between necrosis and the attending surgical oncologist or reconstructive surgeon placing and filling the TE (data not shown). Further, there was no association between placement of acellular dermal matrix and necrosis.

Historically, the literature has been mixed as to whether neoadjuvant chemotherapy or a history of chest wall radiation increases the odds of wound healing complications.13,15,17,20,53,54 Our sample showed no association between skin necrosis and a patient’s history of chemotherapy or radiation, confirming studies that have shown staged breast reconstruction with TE placement to be not contraindicated with oncologic therapy (data not shown).

Hypertension has long been a predictor of wound healing complications.27,29,55–58 Our study was able to demonstrate that patients with hypertension had 8 times higher odds of developing necrosis. Race has previously been documented to be associated with fat necrosis in staged breast reconstruction due to difficulty in clinically evaluating perfusion.24 In our study, race demonstrated no statistically significant association with skin necrosis. Similarly, other known causes of surgical morbidity, including smoking and diabetes mellitus, showed no statistically significant association with mastectomy skin necrosis.30,55,56,59–61 We hypothesize that these associations cannot be confirmed due to our small sample size of patients who developed necrosis and were smokers, the small number of African American, Asian, and Hispanic women in our study, and a lack of patients developing necrosis who were diabetic.

We found mastectomy skin necrosis to lead to 15 times higher odds of postoperative infection, 16 times higher odds of reoperation, and a 50% increase in inpatient charges. As receiving a breast cancer diagnosis, undergoing oncologic treatment, and consenting for breast reconstruction are documented to cause significant psychological challenges, emotional trauma, and lead to posttraumatic stress disorder in some patients, further complications from mastectomy skin necrosis likely have a negative psychosocial impact and should be mitigated where possible.62–65 Further, with reimbursements threatened and increased pressure on surgeons and hospitals to reduce readmissions from surgical site infections under the Affordable Care Act, clinicians should be cognizant of these additional complications, their associated costs, and ways to prevent them.66–68

The strengths of this study include the ability to provide clear clinical parameters for intraoperative TE filling in patients with larger mastectomy specimens, larger BMIs, and known surgical comorbidities. Patients with hypertension, BMIs > 30, and/or mastectomy specimens weighing > 500 g should be considered for more conservative TE fill volumes of < 300 cm³ to mitigate mastectomy skin necrosis. The main limitations of this study include a retrospective study design, the small number of African American women in our study population (n = 22, with only 1%
of those women developing skin necrosis), and a low incidence rate of necrosis (8.9%). We hypothesize that these limited our ability to uncover correlates between BMI and other known surgical morbidities that could likely be described by a larger sample size.

CONCLUSIONS

Breast reconstruction with TE placement is a viable breast reconstruction option. However, as with any surgical intervention, placement of a TE is not without some surgical morbidity. Wound healing complications from impaired vascular perfusion can lead to mastectomy skin necrosis, infection, and implant failure. Our study found hypertension to be associated with mastectomy skin necrosis. BMIs >30 were associated with increased probability of developing skin necrosis. Patients receiving intraoperative TE fill volumes >300 cm³ and patients with mastectomy specimens weighing >500g have significantly higher odds of developing necrosis. Additionally, patients with necrosis suffered significantly higher odds of developing a postoperative infection and requiring reoperation with surgical debridement to remove the TE. These additional surgical interventions were associated with 50% higher inpatient charges. As such, conservative intraoperative TE fill volumes <300 cm³ should be considered for patients with known surgical comorbidities, larger BMIs, and mastectomy specimens weighing >500g. Reoperation due to mastectomy skin necrosis poses a significant financial and emotional burden to the patient with breast cancer that can potentially be avoided with guided clinical judgment. Improved surgical outcomes, patient quality of life, along with reduction in financial burdens can be obtained using these parameters as guidelines in staged breast reconstruction with immediate TE placement.

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