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Mastectomy skin necrosis after microsurgical breast reconstruction

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ABSTRACT

Background: Mastectomy skin necrosis represents a significant clinical morbidity after immediate breast reconstruction. In addition to aesthetic deformity, necrosis of the native mastectomy skin may require debridement, additional reconstruction, or prolonged wound care and potentially delay oncologic treatment. This study aims to evaluate patient and procedural characteristics to identify predictors of mastectomy skin necrosis after microsurgical breast reconstruction.

Methods: A retrospective review was performed of all immediate microsurgical breast reconstructions performed at a single academic center. Patient records were queried for age, diabetes, active smoking, previous breast surgery, preoperative radiation, preoperative chemotherapy, body mass index, mastectomy type, mastectomy weight, flap type, autologous flap type, and postoperative mastectomy skin flap necrosis.

Results: There were 746 immediate autologous microsurgical flaps performed by three plastic surgeons at our institution during the study period. The incidence of mastectomy skin flap necrosis was 13.4%. Univariate analysis revealed a significantly higher incidence of mastectomy skin necrosis in patients with higher mastectomy weight ($P < 0.001$), higher autologous flap weight ($P < 0.001$), higher body mass index (0.002), and diabetes ($P = 0.021$). No significant association was found for age, smoking, prior breast surgery, preoperative chemotherapy or radiation, or mastectomy type. Multivariate analysis demonstrated statistically significant associations between mastectomy skin necrosis and both increasing mastectomy weight (odds ratio 1.348 per quartile increase, $P = 0.009$) and diabetes (odds ratio 2.356, $P = 0.011$).

Conclusions: Increasing mastectomy weight and coexisting diabetes are significantly associated with postoperative mastectomy skin necrosis after microsurgical reconstruction. These characteristics should be considered during patient counseling, procedure selection, operative planning, and intraoperative tissue viability assessment.

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1. Introduction

Mastectomy skin flap necrosis represents a significant clinical morbidity after immediate breast reconstruction. In addition to aesthetic deformity, necrosis of the native mastectomy skin may require surgical debridement, additional reconstruction, and prolonged wound care. It may also result in delayed initiation of planned oncologic treatments postoperatively and has been shown to negatively impact patient satisfaction and quality of life [1,2].

Native mastectomy flap skin is thought to be especially at risk for hypoperfusion and hypoxia predisposing the tissue to ischemia and subsequent necrosis [3]. The incidence of native mastectomy skin necrosis after breast reconstruction in published literature ranges from 6% to as high as 30% [3–7]. Previous studies have suggested that patient factors including higher body mass index (BMI), hypertension, diabetes, active smoking, prior radiation, and increased age may be associated with a higher risk of mastectomy skin necrosis [1–4,7–10]. Other studies have suggested that surgical factors, such as higher mastectomy weight, tumescent dissection technique, pattern of incision, and type of reconstruction (alloplastic versus autologous), may impact the risk of mastectomy skin necrosis [11–13].

Some authors have hypothesized that the nature of autologous reconstruction provides some degree of protection related to viable tissue underlying the mastectomy skin flaps; however, there is a paucity of published evidence to support this theory [4]. Others have suggested that the longer operative time and potentially increased strain on mastectomy flaps during autologous microsurgical reconstruction could increase the rate of mastectomy skin necrosis in these patients [13]. Still others note that patients with higher BMI and excess abdominal tissue and those who undergo radiation treatment may be preferentially referred for autologous reconstruction, potentially contributing to a higher rate of native skin necrosis in this population. This study aimed to evaluate patient and procedural factors to identify predictors of mastectomy skin necrosis after microsurgical reconstruction to aid surgeons in patient selection, to support preoperative risk counseling, and to help guide the use of intraoperative flap viability assessment techniques.

2. Methods

2.1. Data collection

A retrospective review of a prospectively maintained database was performed for all immediate, microsurgical, autologous breast reconstruction procedures performed at a single academic center between January 2004 and December 2013. Patient records were queried for age, diabetes, active smoking, previous breast surgery, preoperative radiation, preoperative chemotherapy, BMI, mastectomy type, mastectomy weight, flap type, autologous flap type, and postoperative mastectomy skin flap necrosis. All delayed reconstruction cases were excluded. Age was determined as of the date of surgery. Mastectomy weight was collected from operating room documentation as dictated by the primary attending surgeon. Previous breast surgery was defined as any prior operative procedure requiring a skin incision and involving the affected breast; core biopsies were not included. Mastectomy skin flap necrosis was included as specified in postoperative clinic notes by the primary plastic surgeon. Skin flap necrosis was defined as any full thickness loss of skin. The size of full thickness skin loss and treatment plan for patients with mastectomy skin necrosis were also collected. The treatment plan selected was based on surgeon preference and patient factors.

2.2. Statistical analysis

Univariate analysis of patient characteristics was performed using Pearson χ^2 or Fisher exact tests for dichotomous variables and two-sample *t*-tests for continuous variables. Multivariate analysis was subsequently performed using a generalized estimating equation model, adjusted for the repeated measures inherent in bilateral reconstruction cases. Mastectomy weight was analyzed as a continuous variable and divided into quartiles as a categorical variable for improved clinical interpretability. BMI was analyzed as a continuous variable and also stratified as a categorical variable with normal (less than 24.9), overweight (25–29.9), and obese (over 30) groups. A P value of <0.05 was considered statistically significant. Statistical analysis was performed using SPSS 22.0 (IBM Corp, Armonk, NY) and Stata/IC 13 (StataCorp LP, College Station, TX).

3. Results

A total of 746 immediate autologous microsurgical flaps for breast reconstruction were performed by the same three plastic surgeons at our institution during the study period. Patient characteristics and baseline differences between groups are listed in Table 1. Overall mean patient age was 49.5 ± 8.3 y: this was similar between groups (49.4 *versus* 50.1 y, $P = 0.393$). The overall incidence of mastectomy skin flap necrosis was 13.4%. Significantly more patients who experienced mastectomy flap necrosis had diabetes (2.6% *versus* 7.0%, $P = 0.021$). BMI was significantly higher in the mastectomy skin necrosis group (27.9 compared with 29.8, $P = 0.002$). The study groups were similar with respect to smoking, prior breast surgery, preoperative radiation, preoperative chemotherapy, and mastectomy type. Most patients had a skin sparing mastectomy with a circumareolar incision, and there was no difference in the rate of mastectomy skin loss based on the type of mastectomy incision. There was no significant association of type of reconstruction (deep inferior epigastric perforator [DIEP], superficial inferior epigastric artery [SIEA], or free transverse rectus abdominis myocutaneous [TRAM] flaps) with mastectomy skin necrosis by univariate analysis; however, none of the 26 patients who underwent superior gluteal artery perforator flap (SGAP) reconstruction experienced mastectomy skin necrosis ($P = 0.038$; Table 1).

There were 100 patients with mastectomy skin loss, and the majority (87 patients) had defects less than 10 square