Effect of Obesity on Complications in Short-Scar Breast Reduction: A Retrospective Study of 236 Consecutive Patients

L'effet de l'obésité sur les complications de la réduction mammaire avec petite cicatrice : une étude rétrospective auprès de 236 patientes consécutives

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Abstract

Background: Prior studies have examined the relationship between obesity and adverse outcomes after reduction mammoplasty, suggesting a correlation between increasing body mass index (BMI) and postoperative complications. However, there is little data published regarding such correlation with respect to short-scar technique. **Methods:** A total of 236 patients underwent short-scar mammoplasty with a superomedial pedicle from 2008 to 2014. The procedure was performed by a single surgeon at an academic medical center. Adverse outcomes included delayed healing, major wounds, nipple necrosis, fat necrosis, seroma, hematoma, infection, revision, and dog ear deformities. Univariate and multivariate logistic regression analyses were used to calculate crude and adjusted odds ratios for the association of BMI category with the development of any adverse outcome. **Results:** Patients were grouped by the following BMI categories: <25 kg/m² (n = 27), 25 to <30 kg/m² (n = 71), 30 to <35 kg/m² (n = 73), 35 to <40 kg/m² (n = 45), and >40 kg/m² (n = 20). The mean follow-up period was 260 days. The total complication rate in each group was 22.2%, 23.9%, 27.4%, 33.3%, and 45.0%, respectively. Although the proportion of patients experiencing at least 1 adverse outcome increased across the ascending BMI categories (P trend = .145), there was no statistically significant difference between the groups. **Conclusion:** This study of 236 patients who underwent short-scar reduction mammoplasty found a positive trend in the incidence of adverse outcomes as BMI increased. However, this was not statistically significant.

Résumé

Historique : Des études antérieures ont porté sur le lien entre l'obésité et les événements indésirables après une mammoplastie de réduction, laissant supposer un lien entre l'augmentation de l'indice de masse corporelle (IMC) et les complications postopératoires. Cependant, peu de données sont publiées sur cette corrélation et la technique à petite cicatrice. **Méthodologie :** Entre 2008 et 2014, un total de 236 patientes a subi une mammoplastie avec petite cicatrice à l'aide d'un pédicule supéromédian. Un seul chirurgien a effectué l'intervention dans un centre hospitalier universitaire. Les événements indésirables incluaient le retard de la cicatrisation, les plaies majeures, la nécrose du mamelon, la nécrose des graisses, le sérome, l'hématome, l'infection, la révision et les déformations cornées. Les chercheurs ont utilisé l'analyse par régression logistique univariée et multivariée pour calculer le rapport de cotes (RC) brut et rajusté et établir l'association entre la catégorie d'IMC et l'apparition d'événements indésirables. **Résultats :** Les patientes étaient regroupées selon les catégories d'IMC suivantes : moins de 25 kg/m² (n = 27), 25 à moins de 30 kg/m² (n = 71), 30 à moins de 35 kg/m² (n = 73), 35 à moins de 40 kg/m² (n = 45) et plus de 40 kg/m² (n = 20).

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La période de suivi moyenne était de 260 jours. Dans chaque groupe, le taux total de complications s'élevait à 22.2 %, 23.9 %, 27.4 %, 33.3 % et 45.0 %, respectivement. Même si la proportion des patientes qui présentaient au moins un événement indésirable augmentait en fonction des catégories d'IMC ascendantes, (tendance $P = 0,145$), les différences n'étaient pas statistiquement significatives entre les groupes. **Conclusions :** La présente étude auprès de 236 patientes qui ont subi une mammoplastie avec petite cicatrice a déterminé que l'incidence d'événements indésirables augmentait proportionnellement à l'IMC. Cette observation n'était toutefois pas statistiquement significative.

Keywords

short-scar mammoplasty, obesity, complications after breast reduction

Introduction

Breast reduction surgery alleviates physical and psychosocial symptoms of breast hypertrophy. Despite the commonality of this procedure and relative overall safeness, it can lead to complications such as infection, delayed wound healing, fat necrosis, or nipple areola complex necrosis, particularly in obese patients. This is potentially due to impaired wound healing and increased risk of postoperative infections.^{1,2} The effects of body mass index (BMI) on complications following breast reduction have not been clearly defined.³ Previous literature suggests that patients with a higher BMI are more likely to experience delayed healing, wound dehiscence, and infection.^{4,5} One study showed that a BMI above 27 increased complication rates in breast reduction surgery compared to BMI below the mean.⁶ However, it is clear that obesity should not restrict patients' access to breast reduction when their macromastia is symptomatic, as these patients still greatly benefit from the procedure and report positive aesthetic results.^{3,7-9} Therefore, the ability to minimize the incidence of postoperative complications in this patient population is of utmost importance.

Currently, most patients with obesity undergo Wise-pattern reduction, which emphasizes skin excision.¹⁰ Alternatively, short-scar (or vertical) technique employing a superomedial pedicle may reduce scarring, sustain breast projection, and produce high patient satisfaction.^{11,12,13} Concerns that this procedure may lead to nipple necrosis and delayed wound healing have mainly limited its use to smaller reductions.¹⁴ A recent study suggests that short-scar mammoplasty may be used in breast reductions of over 1000 g with low rates of complications and good aesthetic results.¹⁵ There is limited data on postoperative complications after short-scar breast reduction among obese patients.

In this retrospective case series, we examine the association of BMI with postsurgical complications among patients undergoing bilateral breast reductions with the vertical scar technique.

Patients and Methods

This retrospective case series consisted of 236 consecutive patients who underwent bilateral short-scar mammoplasty by

a single surgeon at an academic medical center from 2007 to 2014. Clinical and sociodemographic data were abstracted from medical records including age, weight, BMI, breast cup size, history of macromastia-related symptoms such as pain and skin rash, history of hypertension, diabetes, and smoking, clavicle to nipple distance (cm), inframammary fold to nipple distance (cm), and breast resection weight (tissue + liposuction, g).

Postoperative outcome data were collected from clinical notes following the procedure. The data from postoperative visits included delayed healing, wound breakdown, fat necrosis, infection, hematoma, seroma, nipple necrosis, and revision of dog ears. The data were stratified by BMI categories, in accordance with the National Institute of Health definitions of normal weight (18.5-24.7 kg/m²), overweight (25.0-29.9 kg/m²), obese (30.0-34.9 kg/m²), very obese (35.0-39.0 kg/m²), and morbidly obese (≥ 40 kg/m²). The institutional review board of our academic center approved this study.

Statistical Analysis

We described baseline characteristics according to BMI category using means and standard deviations (SDs) for continuous variables with normal distributions; medians and interquartile ranges for continuous variables with substantially skewed distributions; and percentages for categorical variables. The distribution of baseline characteristics across BMI categories was assessed using linear trend tests and Cochran-Armitage trend tests for continuous and categorical variables, respectively.

We compared the incidence proportions of each, as well as any, postoperative complication of interest across categories of increasing BMI using Cochran-Armitage tests for trend. We could not perform regression analyses to examine the association of each outcome with BMI category due to an insufficient outcome. Instead, we examined the association of preoperative BMI category with whether a patient experienced any form of adverse outcome using logistic regression to calculate unadjusted and adjusted odds ratios (ORs) and 95% confidence intervals. For our regression analyses, we pooled together patients who were normal weight or overweight (ie, BMI = 18.5-24.9 kg/m²) due to the very small number of complications occurring among patients with normal weight. We adjusted for age, smoking history, and procedure year as potential confounders.

Table 1. Baseline Characteristics of Consecutive Recipients of Short-Scar Reduction Mammoplasty (N = 236) at a Single Academic Medical Center (2007-2014) According to BMI.

Characteristic n (col %)	Normal (BMI = 18.5-24.9 kg/m ²), n = 27	Overweight (BMI = 25.0-29.9 kg/m ²), n = 71	Obese (BMI = 30.0-34.9 kg/m ²), n = 73	Very Obese (BMI = 35.0-39.9 kg/m ²), n = 45	Morbidly Obese (BMI ≥ 40.0 kg/m ²), n = 20	P Trend	Whole Sample (N = 236)
Mean age (SD), years	38.3 (13.1)	38.6 (14.9)	38.4 (11.7)	36.0 (9.9)	42.5 (10.2)	.817	38.3 (12.5)
Medical history							
Diabetes mellitus	1 (4)	0 (0)	3 (4)	1 (2)	3 (15)	.036	8 (3)
Hypertension	0 (0)	10 (14)	11 (15)	10 (22)	5 (25)	.010	36 (15)
Smoking	5 (19)	15 (21)	21 (29)	11 (24)	7 (35)	.180	59 (25)
Mean total reduction and liposuction (SD), g	526 (204)	685 (272)	816 (343)	1122 (515)	1180 (378)	<.001	823 (409)
Median follow up time (Q1, Q3), days	160 (50, 263)	176 (88, 341)	200 (53, 363)	167 (42, 356)	349 (44, 436)	.300	176 (51, 355)

Abbreviations: BMI, body mass index; SD, standard deviation.

Table 2. Complications After Receipt of Short-Scar Reduction Mammoplasty at a Single Academic Medical Center (2007-2014) According to Body Mass Index (BMI).

Complication n (%)	Normal (BMI = 18.5-24.9 kg/m ²), n = 27	Overweight (BMI = 25.0-29.9 kg/m ²), n = 71	Obese (BMI = 30.0-34.9 kg/m ²), n = 73	Very Obese (BMI = 35.0-39.9 kg/m ²), n = 45	Morbidly Obese (BMI ≥ 40.0 kg/m ²), n = 20	P Trend	Whole Sample (N = 236)
Delayed healing or major wound	1 (4)	6 (8)	10 (14)	8 (18)	2 (10)	.118	27 (11)
Fat necrosis	0 (0)	5 (7)	7 (10)	2 (4)	4 (20)	.079	18 (8)
Infection	1 (4)	2 (3)	2 (3)	4 (9)	3 (15)	.034	12 (5)
Hematoma	3 (11)	1 (1)	2 (3)	1 (2)	1 (5)	.397	8 (3)
Seroma	1 (4)	0 (0)	2 (3)	1 (2)	1 (5)	.457	5 (2)
Nipple necrosis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-	0 (0)
Revision of dog ears	2 (7)	7 (10)	7 (10)	3 (7)	1 (5)	.587	20 (8)
Any complication ^a	6 (22)	17 (24)	20 (27)	15 (33)	9 (45)	.048	67 (28)

^a A single patient may have experienced more than 1 complication.

Table 3. Adjusted and Unadjusted Odds of Experiencing a Complication After Receipt of Short-Scar Reduction Mammoplasty at a Single Academic Medical Center (2007-2014).

Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI) ^a
Body mass index ^b		
Normal/overweight (18.5-29.9 kg/m ²)	Ref.	Ref.
Obese (30.0-34.9 kg/m ²)	1.23 (0.61-2.47)	0.99 (0.47-2.06)
Very obese (35.0-39.9 kg/m ²)	1.63 (0.75-3.54)	1.21 (0.52-2.81)
Morbidly obese (≥40.0 kg/m ²)	2.67 (0.98-7.23)	1.68 (0.58-4.84)
P trend	.043	.359

Abbreviations: 95% CI, 95% confidence interval; OR, odds ratio.

^a Due to limited number of outcomes among normal-weight patients.

^b Adjusted for age (≤30, 31-40, 41-50, >50 years), smoking history, year (2007/2008, 2009/2010, 2011/2012, 2013/2014).

Results

Between 2007 and 2014, a total of 246 women received short-scar reduction mammoplasty for macromastia consecutively by a single surgeon (M.A.); of these 236 (96%) were included for analysis. The 10 individuals were excluded due to lack of follow-up and incomplete data. In the study sample, the mean age at the time of the procedure was 38 years (range, 25-51 years), and median length of follow-up was 176 days (range, 51-355 days). There were no statistically significant differences in the distribution of age and the proportion of patients with smoking history across the categories of BMI. However, the proportion of patients with diabetes mellitus and hypertension significantly increased across increasing categories of BMI (P trend = .036 and .010, respectively). The total amount

Figure 1. Pre-operative and 6-months post-operative images, patient with BMI <25 kg/m².

Figure 2. Pre-operative and 6-months post-operative images, patient with BMI 30–34.9 kg/m².

Figure 3. Pre-operative and 6-months post-operative images, patient with BMI 35–39.9 kg/m².

of breast tissue resected increased as BMI increased (P trend $<.001$; Table 1).

Overall, 67 (28%) patients experienced at least 1 postsurgical complication. These included delayed healing/wound breakdown (11%), dog ears requiring revision (8%), fat necrosis (8%), hematoma (8%), infection (5%), and seroma (2%). No patients experienced nipple necrosis. The proportion of patients experiencing each of the outcomes of interest did increase across increasing categories of BMI, with the exception of infection (P trend = .034). The proportion of patients experiencing any complication significantly increased across categories of increasing BMI (P = .048; Table 2).

No statistically significant differences were found in the odds of patients in the higher categories of BMI experiencing any type of postsurgical complication as compared to normal weight/overweight patients (P > .05 for all comparisons). Table 3 shows unadjusted and adjusted ORs of experiencing any postsurgical complication of obese, very obese, or morbidly obese patients as compared to patients who were normal of weight or overweight. However, the magnitude of the point estimate for experiencing a complication increased across categories of increasing BMI in unadjusted (P = .043) but not in adjusted analyses (P = .359).

Discussion

Studies investigating the incidence of complications following breast reduction procedures using the Wise-pattern inferior pedicle technique have found that increasing BMI significantly increased the risk of adverse events in the postoperative period.^{4,5} Currently, for patients with higher BMI, the traditional Wise-pattern reduction has been employed as the standard. While this design is well known for its reproducibility, it also has several downfalls, which may be rectified with a short-scar reduction mammoplasty approach. Specifically, the latter has been shown to improve breast projection and minimize scarring.^{11,13} The use of this technique has been typically limited to patients requiring smaller reductions. A recent study from our institution demonstrated that a vertical pattern

mammoplasty could be performed in patients undergoing larger reductions (>1000 g) with minimal complications and good aesthetic outcomes.¹⁵

The current study investigated the rate of complications with increasing BMI to better understand the safety of performing a short-scar reduction mammoplasty in obese patients and larger volume reductions. Overall, there was a general trend for increased risk of complications with increased BMI. This positive trend is not unexpected. Previous research has shown that obesity is associated with an overall risk of increased postoperative complications.¹⁶ However, our patient outcomes were not significantly different across BMI categories, and thus, there is no clear indication to avoid using the short-scar technique in this population.

The risk of individual complications was not statistically significant in our series, with the exception of postoperative infection. The risk of postoperative infections in the obese population is well established. Previous studies have demonstrated a connection between decreased oxygen tension in tissue and increased risk of surgical site infection. The adipose tissue in obese patients has been shown to be hypoperfused, and as a result, the normal defence mechanisms that require oxygenation do not function appropriately, thus increasing the risk of infection.^{17–19} There is also the confounding variable of increased likelihood of having diabetes and/or being a smoker in patients with increased BMI. These factors could also increase the risk of infection in this patient population.

The current study has several limitations. The small number of patients in each BMI category limited the power of the study. Because the data collected represented a single surgeon's experience at a single university setting, the sample size was restricted. As a result, any occurrence of a complication significantly altered the data outcomes. Further study with larger sample sizes for each BMI category is warranted to determine whether higher BMI is a significant risk factor for complications following short scar mammoplasty. It should also be noted that the patients who underwent surgery were already preselected as good surgical candidates. Thus, the obese patients with significant comorbidities may have

already been excluded based on their surgical risk. Additional studies comparing short-scar technique to other standard breast reduction techniques in patients with varying BMIs will also directly demonstrate the different effects of BMI seen with unique techniques.

Conclusion

This study of 236 patients who underwent short-scar reduction mammoplasty found a positive trend in the incidence of adverse outcomes as BMI increased. However, this was not statistically significant. Thus, short-scar mammoplasty, employing the superomedial pedicle, is a safe option for patients with higher BMI. Further study with larger sample sizes for each BMI category is warranted to determine whether higher BMI is a significant risk factor for complications following short-scar mammoplasty.

Declaration of Conflicting Interests

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