Wound Infections in Body Contouring Mastopexy with Breast Reduction After Laparoscopic Adjustable Gastric Bandings: The Role of Smoking

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Abstract

Background We retrospectively reviewed charts of 42 postbariatric patients who underwent mastopexy and breast reduction for body contouring to determine whether a significant relationship existed between cigarette smoking and postoperative wound infections and to determine the relative risk given by cigarettes and a cut-off value to predict infections.

Methods We excluded patients with ongoing clinical infections, recent bariatric surgery (within 1 year), recent antibiotic courses, or systemic diseases such as arteriosclerosis and diabetes mellitus.

Results All patients underwent bariatric surgery with the laparoscopic adjustable gastric bending technique and mastopexy with breast reduction for body contouring. Postoperative infections were present in 35.7% (n=15) of patients, and 60% of these (n=9) were superficial. Furthermore, 66.7% of them occurred in smoker patients, and 41.7% of smokers vs. 27.8% of nonsmokers developed infections. Significant differences between infected vs. infection-free patients were present for the number of pack years (p<0.001) and the overall estimated cigarettes smoked (p<0.001). A cut-off value of approximately 6.85 pack years (50,000 overall estimated cigarettes) distinguished between infections vs. infections-free patients, with 25% of false positives and 8% of false negatives. Relative risk conferred by smoking was 3.8.

Conclusions The incidence of infections in our series of postbariatric patients undergoing mastopexy and breast reduction is 35.7%. A cut-off of 6.85 pack years (50,000 estimated overall cigarettes) was determined and, according to this value, the relative risk conferred by smoking was 3.8.

Keywords Postobesity · Postbariatric patients · Body contouring · Mastopexy · Breast reduction · Smoking complications · Postoperative infections

Introduction

Morbid obesity has reached epidemic proportions in developed countries. As the number of patients undergoing bariatric surgery increases, the consequent massive weight loss leads to functional and aesthetic deformities that can be corrected only with the body contouring surgery. The management of the postbariatric patient is complex, and multiple operations are usually required. Among these, mastopexy is a common procedure, used to lift the breast and reposition the nipple, and is often associated in operations of body contouring with breast reductions for the removal of the excessive skin and fat.

However, both operations are not completely free from postoperative complications. Mastopexy has the same incision of breast reductions, the vertical T incision, but few studies report data on wound infections. In a small series of five massive weight loss patients, Kwei and colleagues reported no wound infections [1]. On the contrary, a case report of Poucke and colleagues described
a severe pyoderma gangrenosum infection after bilateral mastopexy [2]. Breast reductions have a high wound complication rate, 15–50% in reported series [3–6], and numerous studies found a consistent association with different risk factors (shoulder strap groovings, vertical incisions, obesity, older age, smoking history, resection weight, and a history of diabetes mellitus) [6–13]. When present, these factors delay the healing process, increase morbidity, and endanger the final aesthetic outcome. Among complications, wound infections are present in 1–20% of cases [5, 6, 14–16] and are related with the amount of tissue removed (cut-off of 1,000 g) and the BMI [8].

In this retrospective study, we analyzed our postbariatric patients undergoing mastopexy and breast reduction to determine whether a significant relationship existed between cigarette smoking with wound infections and possibly define a cut-off value of an increased risk.

Materials and Methods

We retrospectively selected all subjects that underwent breast reduction and mastopexy after massive weight loss obtained with bariatric surgery. We excluded patients (1) with ongoing clinical infections, (2) that received a complete antibiotic course in the last 6 months prior to operation, (3) under steroid therapy or (4) with systemic diseases that could impair wound repair (arteriosclerosis, diabetes mellitus), (5) within 1 year after bariatric surgery, and (6) that smoked cigars and pipes. Prior to surgery, patients were investigated with questions about smoke habits, specifically the number of cigarettes smoked/day and the overall years of smoking, adopting a simplified version of the WHO’s MONICA Manual Smoking Questionnaire [17]. The smoking status was also confirmed by relatives. At this point, smokers were invited to quit at least 4 weeks before surgery and those that failed (after confirmations of relatives) had their operation postponed until 4 weeks of smoking cessation was obtained. Every operation was performed at the Dolan Park Hospital (Bromsgrove, Birmingham, UK) by one surgeon (AA).

Preoperative Care

Patients were in hospital for two nights. According to standard prophylaxis measures of deep venous thrombosis (DVT), low-molecular-weight heparin (4,000 U/day s.c.) was administered with elastic stockings/mechanical calf compression until complete postoperative mobilization was reached. Infection prophylaxis was administered with one dose of i.v. cefuroxime 750 mg (erythromycin – 1 g i.v. – if specific allergies were referred) 10–30 min before the operation.

Postoperative Care

Antibiotics were administered during the first two postoperative days. Tramadol was usually given on the patient’s request as analgesic. Early mobilization was solicited after 4 to 8 h from the operation, and DVT prophylaxis continued until mobilization was reached (usually on the first postoperative day). Drains were kept in place for at least 48 h and removed only when the total amount of fluid aspirated was less than 200 ml/day for each breast. Patients without complications were discharged 48 h after surgery. Outpatient follow-up visits (physical examination) were planned at the 7th, 14th, and 30th postoperative day and after 6 months. Postoperative infections were defined on the basis of clinical signs (cellulitis, pain, swelling, drainage, elevation of white blood cells, fever) and with exudates cultures. Superficial infections were defined as those involving the skin and subcutaneous tissues and deep infections as those involving the fascia, muscles, or breast abscesses. Superficial infections were managed with antibiotic solution cleanings and local antibiotic creams three times per day. When indicated (signs of sepsis, i.e., fever or white blood count raise), an oral antibiotic course was started. In cases of deep infections, wound dehiscences, or pus discharge, the patient was readmitted to the hospital, an intravenous antibiotic course was started, and a surgical debridement was performed. The wound was closed with fascial, subcutaneous, and dermal sutures, and a 12-mm surgical drain was left in place for 12 h. Finally, patients were discharged with a prescription of a 4-day oral antibiotic course.

The aim of this retrospective study was to assess the role of smoking status on the incidence of postoperative wound infections in patients undergoing mastopexy/breast reduction for body contouring after weight loss. We recorded the sex and age of patients; height; prebariatric, postbariatric, and postplastic surgery weight and BMI; the amount of fat aspirated; smoking status; number of cigarettes smoked per day; years of smoking; estimated overall cigarettes smoked (cigarettes/day × years of smoking × 365) and the number of pack years (according to the National Cancer Institute Definition of Pack Year); and overall infections, superficial and deep.

Statistical Analysis

All data analyses and calculation of sample size were performed using the Statistical Package for the Social Sciences Windows version 13.0 (SPSS, Chicago, IL, USA). Descriptive statistics for quantitative continuous variables were the mean and standard deviation (SD) for those parametric and median and range (minimum and
maximum) for nonparametric. Normality assumptions were demonstrated with histograms and Kolmogorov/Smirnov and Shapiro Wilk testings. Descriptive statistics for qualitative categorical variables were presented with frequencies. Homogeneity between groups was verified in continuous variables with the z test for comparison of means and the Levene’s test for comparison of variances and with the Chi-square test in categorical variables. Complications occurrence in smokers vs. nonsmokers was evaluated with the Chi-square or the Fisher’s exact test when cells count was inferior to 5. In smokers, comparison between those that developed infections and those that did not regarding the estimated overall cigarettes smoked until operation and the number of pack years was performed with the Mann–Whitney test. A cut-off value of the amount of cigarettes smoked and for the number of pack years was determined and relative risk (RR) calculated. All p values were considered significant if inferior to 0.05.

**Results**

We followed CONSORT criteria for the development and description of this trial [18]. We retrospectively reviewed charts from January 2006 to January 2007 of patients operated for body contouring surgery after massive weight loss. We selected, according to the inclusion and exclusion criteria, 42 patients, 18 nonsmokers (42.9%) and 24 smokers (57.1%). All of them were female and underwent bariatric surgery with the laparoscopic adjustable gastric bending (LAGB) technique and the LAP-BAND® device without postoperative complications. None were lost to

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Data regarding the estimated overall number of cigarettes until surgery and the number of pack years between those with infections vs. those infections-free.
follow-up. Patients were operated on for mastopexy/breast reduction after a mean of 14.7±2.5 months (range 12–17 months) following LAGB.

Descriptive statistics are summarized in Table 1. All tests used for normality confirmation proved a normal distribution for all variables except for the estimated overall cigarettes smoked (Table 1). In infected patients, nine were superficial (60%) and six were deep (40%). Two seromas (13.3%) and one postoperative bleeding (6.7%) occurred in infected patients, one seroma (3.7%) in occurred in noninfected patients. These occurrences were not significant between infected vs. infection-free patients (Fisher’s exact test; p>0.05).

The analysis of smoking status vs. complications produced no significant differences: 10 infections (5 superficial and 5 deep) and 2 seromas occurred in smokers and 5 infections, (4 superficial and 1 deep), 1 seroma, and 1 postoperative bleeding occurred in nonsmokers. The RR conferred by the smoking status on wound infection occurrence was 1.5 ([10/24]/[5/18]). The analysis in smokers showed significant differences between patients that developed infections vs. those infection-free for the number of pack years and the overall estimated cigarettes smoked (Mann-Whitney test; p<0.001), and all values were higher in patients with infections (Table 2). Among these patients, those with deep infections had the highest values when compared to those with superficial infections, although this difference was not significant (Mann-Whitney test; p>0.05).

The comparison between infected patients vs. those infection-free produced a prognostic cut-off value for the number of pack years (Fig. 1) and the overall estimated cigarettes smoked (Fig. 2). The ends of boxes are quartiles (25 and 75), the horizontal line is the median value and the vertical line represents the range. Cut-off line: 6.85 pack years. Two outliers in patients without infections (10 and 25 pack years) were not showed in the graph.

**Statistical Analysis**

The t test confirmed that both groups (infected vs. noninfected) were homogeneous for all variables analyzed, except for the number of pack years and the estimated overall cigarettes smoked (Table 1). In infected patients, nine were superficial (60%) and six were deep (40%). Two seromas (13.3%) and one postoperative bleeding (6.7%) occurred in infected patients, one seroma (3.7%) in occurred in noninfected patients. These occurrences were not significant between infected vs. infection-free patients (Fisher’s exact test; p>0.05).

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**Fig. 1** Box plot graphs comparing smokers that developed infections and those infection-free for the number of pack years. The ends of boxes are quartiles (25 and 75), the horizontal line is the median value and the vertical line represents the range. Cut-off line: 6.85 pack years. Two outliers in patients without infections (10 and 25 pack years) were not showed in the graph.

**Fig. 2** Area of ROC curves referred to cut-off of pack years in all patients (left panel) and smokers (right panel).
cigarettes. This value (6.85 pack years—50,000 estimated cigarettes smoked) was determined with ROC curves to find the greatest areas of sensitivity and specificity: it corresponded in all patients to an area of 0.744 (sensitivity=0.60; specificity=0.89) and in smokers to an area of 0.843 (sensitivity=0.90; specificity=0.79) (Fig. 2). The cut-off produced three false positives (9/12; 25%) and six false negatives (6/30; 20%) in all patients and three false positives (9/12; 25%) and one false negative (1/12; 8%) in smokers only (Fig. 3). According to this cut-off, RR for the incidence of postoperative infections was 3.8 ([(9/12) / (6/30)], and the difference for all infections occurrence and for deep infections was significantly different between great smokers (>6.85 pack years) vs. small smokers (Chi-square test; \(p=0.001\)).

Discussion

Mastopexy and breast reductions are two important operations for body contouring, but the high rate of postoperative wound complications, especially infections, often endangers the final aesthetic outcome [2–6]. The analysis of our patients showed that postoperative infections were present in 35.7% (15/42) of patients, and this incidence was higher than that reported in literature (1–20%) [5, 6, 14–16] where series have low incidences of smokers. Furthermore, in our study, 66.7% of infections (10/15) occurred in smokers and 41.7% of smoking patients (10/24) experienced wound infections, compared to 27.8% (5/18) of nonsmokers.

Numerous reports confirm the detrimental role of smoking on wound healing processes [19–26]. Principal components of tobacco (nicotine, nitric oxide, and carbon monoxide) can determine these phenomena [27–30]. Furthermore, cutaneous vascular beds have the highest sympathetic innervation and the least self-regulatory control, factors that expose them to the vasoconstrictive effects of cigarette smoking (mediated by the sympathetic innervation through alpha receptors) [31, 32]. Smoking also increases the serum level of carboxyhemoglobin, which leads to a reduced oxygen-carrying capacity of blood [33], and platelet adhesiveness [34], which leads to microangiopathic thromboses. Finally, fibrinogen and hemoglobin levels are usually higher in smokers and increase blood viscosity that, along with a decreased fibrinolytic activity and augmented endothelial injury, contribute to a reduced circulation and an impaired wound healing [35, 36]. Reports of major flap necrosis after abdominoplasty in smokers support these ideas [37].

We divided our series of 42 patients in two groups according to their smoking habit. The initial analysis confirmed that the more the estimated overall cigarettes smoked until surgery and the number of pack years, the greater the association with infections. The infections occurrence was not significant between smokers vs. nonsmokers (Chi-square test; \(p=0.143\)) but the classification of small vs. great smokers according to the cut-off of 6.85 pack years (50,000 cigarettes) allowed a statistical significance (Chi-square test; \(p<0.05\)), assuming that nonsmokers behave like “small” smokers for their risk to develop wound infections. This value conferred a 3.8 increase for the risk of developing wound infections in great smokers vs. small + nonsmokers. Furthermore, 8% of false negatives in smokers is still acceptable, even considering that 75% of infected smokers would be...
detected. The cut-off value is simple, easy to calculate, and gives an important prognostic information on the risk of wound infections. These data, if confirmed by future larger studies, could be useful to stratify patients according to their risk to develop wound infections and follow them with specific measures.

Finally, given the occurrence of 15 infections in smokers even with a smoking-free window of 4 weeks, we believe that this period of time is not enough to prevent postoperative infections and, again, future studies need to specifically address this issue, possibly comparing patients with different “smoking-free” windows and with objective proofs of their abstinence (i.e., urine nicotine or blood carbon monoxide levels), to analyze the incidence of postoperative infections.

Conclusions

The incidence of infections in our series of postbariatric patients undergoing mastopexy with breast reduction is 35.7%. A cut-off value of 6.85 pack years (50,000 estimated overall cigarettes) was determined, with only 8% false negatives in smokers. The RR conferred by smoking was 3.8. Future studies need to confirm these data to stratify patients according to their risk to develop wound infections and adopt specific preventive measures.

References