"Lipoabdominoplasty assessment in patients with a high body mass index.”

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Short Running Head (no more than 40 characters in length):

Lipoabdominoplasty and High BMI

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Assisted in data collection, surgeries, and follow-ups, contributed to writing, prepared photos, discussions, paper layout, and preparation for publication.

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**Abstract:**

**Background:** Abdominoplasty and liposuction are considered the most common body contouring procedures, but they are associated with complications, particularly in obese patients. Lipoabdominoplasty, not only combines abdominoplasty and liposuction but also includes limited abdominal dissection to preserve abdominal blood supply and overcome the perfusion-associated complications of traditional abdominoplasty. This procedure has typically been applied to ideal and overweight patients. What about patients with high Body mass index (BMI)? Is this procedure applicable and safe for them? The aim of this study was to assess the safety of lipoabdominoplasty in patients with High BMI.

**Method:** We performed a prospective study of 24 patients with BMIs ranging from 32-43 kg/m2who underwent lipoabdominoplasty between January 2018 and June 2021. Patients were followed-up for more than 6 months to assess esthetic results, complications, satisfaction rates, and recoveries.

**Results:** In the majority of cases, we achieved significant reduction in skin and adipose tissue, which encouraged patients to reduce weight and improve body contour. Of the patients, 4.2% experienced major complications and 62.7% experienced minor complications, with the most common being wound dehiscence. Large wound dehiscence (> 5 cm), minor wound dehiscence (< 5 cm), and seroma occurred in 4 (16.7%), 7 (29.2%), and 2 (8.4%) of cases, respectively. Most patients (91.7%) were satisfied with the results and would repeat the procedure.

**Conclusion:** Lipoabdominoplasty for patients with High BMI is associated significant changes in the body shape and contour with high satisfaction rate and it is considered a safe procedure with Acceptable complication rate in compared with traditional abdominoplasty for obese patients or Bariatric surgery followed by body contouring surgery.

**Keywords**

Lipoabdominoplasty, abdominoplasty, liposuction, body contouring, wound dehiscence.

**Introduction**

Increased obesity rates, weight fluctuations, and pregnancies, many of which may present as localized fat accumulation, cutaneous flaccidity, or diastasis of the rectus abdominal muscles, have contributed to abdominal deformities.1 Worldwide, in 2016, more than 1.9 billion adults were overweight, and of these, more than 650 million were obese.2 Obesity has become one of the most significant health issues worldwide and has been defined by the World Health Organization (WHO) as a condition of excessive fat accumulation in the body to the extent that health and well-being are adversely affected.2 Interestingly, body mass index (BMI) can predict surgical complications and has been identified as a negative predictor of wound healing after abdominal surgery.3 Therefore, a variety of surgical approaches are required to treat patients with different BMI ranges and deformities.1,4

Globalization and the widespread use of social media have impacted the population’s understanding of beauty, leading to increased patient expectations about body contouring surgery and putting tremendous pressure on surgeons to meet patients’ demands while reducing surgery times and costs and maintaining safety standards.

Previously, abdominoplasty and liposuction were discouraged in significantly overweight and obese patients because they may be associated with significant complications.4,5 As such, patients are advised to lose weight in preparation for surgery. For individuals who are unable to lose weight, there is a two-stage procedure, abdominoplasty followed by liposuction or vice versa, which are suggested at least 6 months apart. Regardless of which technique is performed first, this process is associated with significant limitations and complications. If liposuction leads to reduced fat accumulation in the abdominal wall but induces fibrosis, subsequent abdominoplasty may be difficult. In contrast, when abdominoplasty is performed first followed by liposuction, obese patients have a high rate of complications resulting in lax and redundant skin.5,6 The combination of these two procedures is controversial.5 Matarasso studied this combination and described four significant safety zones: the flanks and back (considered safe for aspiration), the lateral area (not considered safe), and the supraumbilical triangle (considered at high risk of devascularization); thus, based on knowledge of the blood supply, the abdomen is contraindicated for liposuction following abdominoplasty in obese patients. 6,7,8 surgeons who Do lipoabdominoplasty,performs this procedure mostly on patients with average BMIs.

In the literature, there is limited data about the extent of abdominal size reduction, safety, and complication rates with lipoabdominoplasty in patients with high BMIs.

Combining liposuction with abdominoplasty is not a two-in-one procedure, it’s a new concept; extending this procedure to patients with high BMIs is a new, undefined field.

The aim of this study was to evaluate the safety, efficacy, and complication rates of lipoabdominoplasty in patients with high BMIs.

 **Patients and Methods**

In this prospective study conducted between January 2018 and June 2021, a total of 24 patients (23 women and 1 man) were selected for lipoabdominoplasty. Patients’ ages ranged between 25–50 years. All patients had BMIs ranging from 32 to 43 kg/m2 (Table 1). Patients who were candidates for classic abdominoplasty (i.e., patients with excess fat excess in both the upper and lower abdomen, laxity of skin, and poor muscle tone) were included in this study. Patients with excess fat and good skin/muscle tone, were excluded from this study. We also excluded patients who had post-bariatric abdominal wall contour deformities, BMIs < 32 kg/m2, and diabetes with poor glycemic control (HbAIC > 7%). Three out of 24 patients were smokers, and 16 had infraumbilical incisions from a hysterectomy, appendectomy, or cesarean section. Preoperative evaluation of patients included a detailed history of their general fitness, lifestyle, associated comorbidities, smoking, any previous abdominal surgery, history of allergies, and drug use (mainly oral contraceptives and anticoagulants). All patients were assessed for deep venous thrombosis (DVT) using the Caprini score,9,10 and precautions were taken.

All patients were of low to moderate bleeding risk (Caprini score of 1–2: low risk, 3–4: moderate risk) (Table 1). As such, only mechanical prophylaxis using intraoperative intermittent pneumatic compression and early postoperative ambulation were used. No pharmacological agents, such as low molecular weight or unfractionated heparin, were used.

Assessment of the abdominal wall began with the evaluation of redundant skin. The excess skin was elevated to identify existing scars and the degree of mons pubis descent. The quality of the skin, intertrigo, and striae were also documented. Fat deposition was evaluated based on the concentration of fat distribution, and all patients had excess fat deposition in the center of the abdomen, flank, and back. Abdominal wall integrity and umbilicus position were evaluated, and the trunk was measured at levels below the inframammary fold, waist, umbilicus, and below the umbilicus. Patients’ baseline measurements are presented in Table 1. Routine preoperative tests, including hemoglobin level, bleeding profile, virology screening, abdominal ultrasound, and chest X-ray, were conducted for all patients. Details on the history of COVID-19 infection or any recent contact were obtained. All patients with a negative history of COVID-19 were routinely sent for a polymerase chain reaction test and chest computed tomography. Photographs were taken after patients gave preoperative consent.

**Operative technique**

Preoperative marking in standing position, all surgeries were performed under general anesthesia.

Infiltration of wetting solution consisted of 1L of warm normal saline with 10 mL of 2% xylocaine and 1 mg epinephrine (1:1000). Injected by pump to the abdomen, flanks, and back. Usually, 5-7 L used. After 20–30 min of delay, power-assisted liposuction (PAL) was used to do liposuction to all infiltrated areas the amount of aspiration (between 5–14 L) mean 9L , patient’s resuscitation must be considered, and the infiltration, intravenous fluid, blood transfusion, and urine output should be monitored according to the following equation:

input (maintenance fluid + infiltration solution + blood transfusion + 2 L ringer or normal saline) = output (aspiration + Urinary Output (U.O.P))

To maintain ±10 mmHg change in resting blood pressure, we considered one unit of blood transfusion for every 3 L of aspiration. (11)

Then abdominoplasty is performed as described by Saldanha ( 1 )with limited tunnel dissection in the supraumbilical area, while plication of the rectus sheath is challenging in these cases as we need very wide plication ranging between 7–22 cm while we have narrow upper tunnel. Then trimming of excess skin while the hip is flexed 60 degrees with no tension on the flap, new umbilical position choosed then 4 drains placed 2 to the back and 2 to the abdomen, closure in 3 layers. The dressing was fixed using an adhesive bandage. An abdominal binder was used over the dressing.

Various factors were measured and statistically analyzed, including the volumes of infiltrate, aspirate, and aspirated fat, flap thickness, supra- and infraumbilical rectus sheath plication, length of the excised skin flap on the right and left sides, weight of resected soft tissue, number of drains, and the operative, hospitalization, and drain durations. These parameters an idea of the effort needed to accomplish the procedure (Table 2).

Patients were hospitalized for 24–52 h, average 34 h. Injectable third-generation cephalosporin was administered during hospitalization and patients were continued on oral antibiotics for at least 1 week postoperatively. Patients were instructed to ambulate early (within 4–6 h of the operation) while leaning forward to reduce tension on the closure site. The drains were removed at 5–9 postoperative days, and the subcuticular suture was removed on the 14th day postoperatively.

Patients had regular follow-ups at 1, 2, and 3 weeks and at 2, 4, and 6 months postoperatively. Most of our patients were followed up for at least 6 months, with some up to 20 months.

**Evaluations and Statistics**

Our evaluation of the results depended on the change in truncal measurements (the upper abdomen, waist, umbilicus, and below the umbilicus), the presence of complications, patient satisfaction, and demand for surgical revision. Patient satisfaction was scaled as follows: very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, and very dissatisfied. We categorized the complications as either major complications that required reoperation or readmission (e.g. DVT, Pulmonary Embolism, major flap necrosis, major wound dehiscence) or minor complications that were manageable via outpatient treatment( e.g. seroma, hematoma, wound dehiscence, infections).12,13

This study was reviewed and approved by the University of Basrah, College of Medicine’s ethics committee. written informed consent was obtained from all patients included in this study.

The statistical analysis of the data was performed using SPSS Version 20. Changes in pre- and postoperative truncal measurements were assessed for normal distribution and then compared using a paired sample t-test, P-values < 0.05 were considered significant.

**Results**

Although body contouring procedures are not considered as a means of weight reduction, the changes in body contour and improved quality of life encourage patients to further reduce their weight, resulting in significant changes in weight and truncal measures. We found that the mean weight reduction was (12.088 kg), while the mean changes in the upper abdominal circumference was 12.22% (12.029 cm), at the waist was 12.22% (19.23 cm), and at the umbilicus was 20% (23.91 cm). The greatest change was at the level below the umbilicus 21.35% (23.12 cm) (Table 3).

Among the 24 patients, there was only one case of major flap necrosis (4.2%), one case of partial flap necrosis (4.2%), two cases of seroma (8.4%) that required surgical drainage under local anesthesia, and four cases of large wound dehiscence (16.7%), mainly in the suprapubic region, that required debridement and primary wound closure. Minor wound dehiscence occurred in seven cases (29.2%) that allowed secondary healing and did not require revision. No cases resulted in hematoma or wound infection, including those with associated comorbidities, and no major complications such as DVT, pulmonary embolism, or death occurred (Table 4).

The overall satisfaction rate was high with 22 patients (91.7%) reporting that they were very satisfied or satisfied with the postoperative results, only one patient (4.2%) reporting dissatisfaction, and one patient (4.2%) reporting being neither satisfied nor dissatisfied with the results (Table 5). Patients who were very satisfied or satisfied observed improvement in their abdominal contour, a significant reduction in excess skin and adipose tissue, a pleasing position of the umbilicus, and acceptable scarring. They also noticed an improvement in their quality of life after surgery. All patients reported retained skin sensation after a period of 4–6 months. Figures 1-3 show the pre- and post-operative results after at least 6 month follow up period.

 **Discussion**

In this study, we adopted the Saldanha technique of lipoabdominoplasty for treatment of 24 patients; however, we specifically prioritized BMI as a factor. Saldanha selected patients who were overweight and demonstrated a significant reduction in the complication rates compared with that of abdominoplasty. Our study was different in two aspects. First, we selected patients with a high BMI, ranging between 32–43 kg/m2,which would theoretically increase potential complications. The combined complication rates of liposuction and abdominoplasty in patients with high BMIs could increase the surgeon’s burden and require careful perioperative resuscitations with very closed intraoperative, postoperative monitoring of fluid input, and increase the necessity of a highly equipped hospital. Second, the operative time, which is approximately 2 h in the Saldanha technique, ranged from 4–7 h in our study. Our longer operative time was because we added liposuction of the flanks and back for all patients to improve the trunk esthetics. The increased operative time is associated with a higher complication rate, and an intervention of 4 h or more significantly increased postoperative morbidity.1, 14, 15

In this discussion, we relied on data regarding abdominoplasty in patients with high BMIs and lipoabdominoplasty in obese patients as there is limited data in the literature about lipoabdominoplasty in patients with high BMIs.

In this study, patients saw significant changes ranging from 12%-21%, depending on the area, which was reflected in the truncal esthetics and patient satisfaction. Using liposuction, it is easy to sculpt the trunk if the 2.5 cm superficial fat layer is untouched. By aspirating the lower abdomen, flanks, and back, there was a 21% circumferential change in the infraumbilical region. The waist and inframammary regions also show dramatic changes, but here the intra-abdominal fat will play an important role in the final result. This fat is untouched during surgery, and plication of the rectus sheath pushes the pressure up to the umbilicus and above, leading to fullness and precluding the appearance of a scaphoid abdomen.

The safety complication rates for lipoabdominoplasty in patients with high BMIs (i.e., seroma, hematoma, and flap necrosis) were comparable to those of abdominoplasty in patients with high BMIs and lipoabdominoplasty in obese patients, and no wound infections were recorded (Tables 4,6).

In this study, the most common complication was wound dehiscence (45.9%), which was significantly higher than the incidence of wound dehiscence observed in abdominoplasty in overweight and obese patients (9.5% and 11.29%, respectively) and in lipoabdominoplasty in overweight and obese patients (8% and 12.5%, respectively). We attributed the increased rate of wound dehiscence to the high tension placed on the wound closure, with the patients having a 45°–60° hip flexion position to avoid subsequent vertical laxity revealed over time, especially at 6-months postoperatively. We have since modified our technique and recommend applying no tension on the skin flap while still placing the patient in a 45°–50° hip flexion position during skin flap trimming.

Major complications, including DVT, Pulmonary Thrombosis, and death, were not reported in this study. Unfortunately, although we maintained a 2-2.5 cm flap in all cases, we reported a patient with major flap necrosis (4.2%) who tested positive for COVID-19 after she developed symptoms, and we are uncertain whether this extensive necrosis resulted from the coagulopathic effect of COVID-1916 or because of extensive liposuction.

The final results showed satisfactory outcomes in terms of patient satisfaction (91.7% very satisfied or satisfied), which can reflect the changes those patients experience with their shape, correction of a distorted body image, improved self-esteem, changes in the quality of life (physical and sexual), and their psychology. Additionally, they have the motivation to further reduce their weight, and they no longer need bariatric surgery. (Example figure 2 lost 30 kg at the end of the first year from surgery),

The potential benefit of this study is that it shifts a high percentage of our consulting patients from bariatric surgery to lipoabdominoplasty, making a single-stage surgery correction of truncal obesity possible, which is the main goal of most of those patients, and avoiding the risks of bariatric surgery, reducing the time to reach their weight goal, and lowering costs.

In our experience, the main disadvantages of lipoabdominoplasty are that it is difficult to learn and requires extensive training, requires more time to perform (4–7 h) in patients with High BMI, needs teamwork and is not a “single surgeon procedure”, is associated with a high rate of minor complications compared with the same procedure in non-overweight patients, and should not be performed in patients with large ventral abdominal hernias.

The limitations of this study were the sample size, which needs to be increased to have a better understanding of the procedure, the lack of a predictable methods to measure intraabdominal fat, which is very detrimental in the final esthetic outcome of the abdomen and trunk.

In addition, the use of BMI as a predictor of truncal obesity is misleading and inaccurate, as different patients have different fat distributions. BMI is not a precise, scientific predictor of central obesity, but it provides a clue of the severity of fat accumulation.

 **Conclusions and Recommendations**

 Lipoabdominoplasty in patients with high BMIs is considered a safe, secure, versatile, and a more physiological procedure that can dramatically reduce the complications associated with traditional abdominoplasty. This procedure is associated with better esthetic results and higher patient satisfaction, including greater changes in abdominal measures with better body contouring, as well as quality of life, and could encourage further weight reduction. The high incidence of minor complications results from a high rate of dehiscence, which can be reduced by minimizing tension on the wound closure. Finally, the procedure was associated with a low rate of revision but requires a steep learning curve for mastery.

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**Figures legends**

**Figure 1** Pre- and 6-month postoperative photos for patient (BMI of 43) who underwent lipoabdominoplasty and flank and back liposuction.

**Figure 2**. Pre- and 8-months postoperative photos for patient (BMI of 36) who underwent lipoabdominoplasty, flank and back liposuction, and gluteal fat grafting.

**Figure 3**. Pre- and 1-year postoperative photos for a patient (BMI of 37) who underwent lipoabdominoplasty and flank and back liposuction. This is an example of a large amount of intra-abdominal fat.