Complication Rates of Lipoabdominoplasty versus Traditional Abdominoplasty in High-Risk Patients

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Background: Concerns over the safety of combining extensive liposuction with abdominoplasty in a one-stage lipoabdominoplasty procedure persist. This study reports a comparison of the perfusion-related complication rates between lipoabdominoplasty and traditional abdominoplasty among high-risk patients, those more susceptible to complications secondary to a smoking history or previous significant supraumbilical abdominal scar.

Methods: The authors conducted a chart review of 161 patients from the Yale University Cosmetic Clinic who had undergone either lipoabdominoplasty (n = 93) or traditional abdominoplasty (n = 68) between 2004 and 2009. Patients were classified as high-risk patients if they were active smokers or had undergone previous abdominal surgery resulting in a significant supraumbilical abdominal scar. Specific vascularity-related complications were compared between the techniques.

Results: Patients undergoing lipoabdominoplasty had a perfusion-related complication rate of 4.30 percent compared with 11.76 percent in those undergoing traditional abdominoplasty (p = 0.126). Among high-risk patients (26 smokers and 19 patients with significant supraumbilical scars), there was no statistically significant difference for perfusion-related complications, including skin necrosis, wound infection, and wound dehiscence. The need for surgical revision was 10.75 percent in patients undergoing lipoabdominoplasty, whereas 20.58 percent of patients undergoing traditional abdominoplasty needed revision surgery (p = 0.116).

Conclusions: Lipoabdominoplasty is not associated with a statistically significant increase in perfusion-related complication rates as compared with traditional abdominoplasty, despite the fact that it involves potential trauma to the vascularity of the elevated abdominoplasty flap. This holds true even in patients who are at increased risk for perfusion-related complications secondary to a history of active smoking or a previous supraumbilical scar. (Plast. Reconstr. Surg. 125:683, 2010.)

Abdominoplasty, as first described by Kelly in 1899, has undergone various iterations over the years.1–3 Changes in the methods of incision, fixation of abdominal skin and fat, excisional design, and the removal of excess fat by liposuction have led abdominoplasties to become one of the most commonly performed aesthetic procedures in the United States, with 148,410 procedures performed in 2007.3,4 The combination of liposuction with abdominoplasty, termed lipoabdominoplasty, has been a controversial topic because of reports of thrombotic or fat embolic complications, and the potential for liposuction-induced impingement on the vascular supply of the resulting abdominal wall flap.3,5,6 Using Huger’s7 description of the three

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vascular territories of the abdominal wall, studies over the past 18 years have attempted to define what modifications in technique are necessary to make lipoabdominoplasty a safe and effective procedure.\textsuperscript{8–13} Matarasso first described four regions that could be safely treated by liposuction when performing an abdominoplasty, recommending limited and cautious liposuction when combined with a full abdominoplasty, and noted that patients who had vertical scars and extensive flap undermining and who were smokers had the highest potential risk of flap necrosis with the combined procedure.\textsuperscript{8,9} Liposuction was deemed safest in the flanks (safe areas 1 and 2), whereas the suprapubic epigastric triangle (safe area 3) was most at risk for devascularization.\textsuperscript{8} Studies by Saldanha et al. and Lockwood have likewise demonstrated no increase in complications in patients who underwent selective liposuction together with a full abdominoplasty.\textsuperscript{12,13} In the study by Heller et al.,\textsuperscript{11} the authors describe liposuction of the entire abdomen, including the epigastric and mesogastric areas, followed by abdominoplasty, and found no increased complication rates in patients who underwent the combined procedure.

Despite these advancements, concerns persist regarding increased complication rates in patients undergoing lipoabdominoplasty versus traditional abdominoplasty without liposuction, especially for high-risk patients.\textsuperscript{11,14} A history of active smoking or significant surgery in the abdomen above the umbilicus, resulting in a large scar, are thought of as risk factors associated with postoperative complications.\textsuperscript{15–20} Because smoking is known to cause damage to the endothelium and because scarring could disrupt the vascular territories that nourish the abdominal wall, such patients would be at an increased risk for complications such as skin necrosis, wound infection, and wound dehiscence caused by decreased perfusion to the abdominoplasty flap. Local complications including hematoma, seroma, wound dehiscence, and skin necrosis in patients undergoing lipoabdominoplasty have been reported to occur in as many as 52 percent of smokers compared with 32 percent of nonsmokers.\textsuperscript{15} Among patients undergoing abdominoplasty with a previous abdominal scar, local complications were found to increase from 26 percent to 32 percent.\textsuperscript{16}

Heller et al. reported their modification of lipoabdominoplasty to be associated with a lower complication rate (9 percent compared with 42 percent), a lower patient dissatisfaction rate (3 percent compared with 42 percent), and a lower revision rate (3 percent compared with 39 percent) than traditional abdominoplasty in 33 patients.\textsuperscript{11} Our goal in this study was to determine whether this modified one-stage lipoabdominoplasty procedure performed on high-risk patients influenced the complication rate compared with traditional abdominoplasty.

**PATIENTS AND METHODS**

The charts of 161 patients who underwent either lipoabdominoplasty or traditional abdominoplasty from 2004 to 2009 at the Yale University Cosmetic Clinic were reviewed. Ninety-three patients had undergone lipoabdominoplasty and 68 patients had undergone traditional abdominoplasty. High-risk patients were defined as either (1) patients who were current smokers, without active smoking up to 2 weeks or less before surgery; or (2) patients with significant suprapubic scars, such as from open cholecystectomies or midline xiphoid to umbilicus incision. Patients with scars from laparoscopic procedures or infraumbilical scars such as from cesarean section, hysterectomy, or appendectomy were excluded from classification as “significant” abdominal scars.

Details of the surgical techniques used in this study have been detailed in previous studies.\textsuperscript{7–13} Briefly, traditional lower abdominal abdominoplasty consisted of an incision along the inferior border of the skin flap to be removed, with undermining of the skin flap superiorly, and rectus plication if indicated. Lipoabdominoplasty consisted of initial liposuction followed by an inverted-V pattern abdominoplasty, with incision of the superior border of skin to be removed and dissection carried superiorly to the xiphoid with limited lateral dissection to 7.5 cm from the midline.\textsuperscript{11} The superior skin flap was advanced inferiorly with the operating room bed flexed 30 degrees. The degree of tissue removal is determined by the endpoint of flap overlap inferiorly. All patients were indistinguishable preoperatively (i.e., they presented with excess abdominal fat, had excess skin laxity in the suprapubial and infraumbilical regions, and were typically found to have poor muscle tone of the abdominal wall). Both procedures were performed during the study period; patients were separated retrospectively for comparison (Fig. 1).

The mean age of the patients was 39.7 years in the lipoabdominoplasty group and 38.2 years in the traditional abdominoplasty group. The average body mass index for patients undergoing lipoabdominoplasty was 28.95 (attained for 72 of 93 patients). For patients who underwent traditional abdominoplasty, the average body mass index was 27.20 (attained for 56 of 68 patients). The patient
Complication rate was determined for the following complications: deep venous thrombosis, pulmonary embolism, hematoma, seroma, skin necrosis, wound infection, wound dehiscence, and need for revisional surgery. Perfusion-related complications are defined as those involving skin necrosis, wound infection, or wound dehiscence. Complication rates were compared between patients undergoing lipoabdominoplasty versus traditional abdominoplasty and between high-risk patients undergoing the former versus the latter. Statistical analyses were performed using Fisher’s exact test on a 2×2 contingency table, and body mass index comparison was carried out using an independent samples t test. Values of \( p < 0.05 \) were considered statistically significant. With small sample sizes in subgroups, only very strong differences between groups can be detected.

**RESULTS**

**Patient Population Analysis**

Among the 161 patients, 27 were active smokers and 19 presented with significant supraumbilical scars (as described previously). These patients were all considered high-risk patients. The average body mass index (weight/height\(^2\)) for patients undergoing lipoabdominoplasty (body mass index, 28.95) was higher than for patients undergoing traditional abdominoplasty (body mass index, 27.20) \((p = 0.04)\). Patients undergoing lipoabdominoplasty had an average of 2100.60 ± 736.8 cc of liposyringe removed, with an average tumescent infiltrate of 2335.71 ± 578.04 cc.

**Complications among High-Risk Patients**

**Scar Influence**

Among patients with significant abdominal scars (Fig. 2), there was no significant difference in skin necrosis rate (lipoabdominoplasty, 0 percent; traditional abdominoplasty, 12.5 percent; \( p = 0.421 \)), wound infection (lipoabdominoplasty, 9.09 percent; traditional abdominoplasty, 0 percent; \( p = 1.00 \)), or wound dehiscence (lipoabdominoplasty, 9.09 percent; traditional abdominoplasty, 0 percent; \( p = 1.00 \)). The revisional surgery rate for patients with a previous significant abdominal scar who underwent lipoabdominoplasty was 36.36 percent (four of 11) and consisted of additional liposuction for all four patients; one patient underwent re-elevation of the abdominal flap and contouring of abdominal (truncal) deformities and another patient underwent umbilicoplasty. For patients undergoing traditional abdominoplasty, the revisional surgery rate was 0 percent (zero of eight) (Fig. 3). For patients with a previous significant abdominal scar, however, there was no statistically significant difference in the need for revisional surgery between patients undergoing lipoabdominoplasty versus traditional abdominoplasty \((p = 0.103)\) (Table 1).
Influence of Smoking

There were no statistically significant differences in perfusion-associated complication rates between lipoabdominoplasty and traditional abdominoplasty in all subgroups, including among patients who smoked and those with significant abdominal scars. Among smokers, there was no significant difference in skin necrosis rate (lipoabdominoplasty, 0 percent; traditional abdominoplasty, 0 percent), wound infection (lipoabdominoplasty, 5.88 percent; traditional abdominoplasty 0 percent; \( p = 1.00 \)), or wound dehiscence (lipoabdominoplasty, 5.88 percent; traditional abdominoplasty, 10 percent; \( p = 1.00 \)). The revisional surgery rate for patients who smoked and underwent lipoabdominoplasty was 17.65 percent (three of 17) and consisted of more liposuction for all three; one patient received a mons plasty, and a second patient underwent re-elevation of an abdominal flap and contouring of abdominal (truncal) deformities (Fig. 4). For patients undergoing traditional abdominoplasty, the revisional surgery rate was 50 percent (five of 10) and consisted of re-elevation and contouring for three of five patients, one dog-ear excision, and an umbilicoplasty. For patients who were smokers, there was no statistically significant difference in the need for revisional surgery between patients undergoing lipoabdominoplasty versus traditional abdominoplasty (\( p = 0.102 \)) (Table 2).

Complications in Total Patient Population

Examining all patients and comparing the two techniques (lipoabdominoplasty and tradi-
tional abdominoplasty), the rates of skin necrosis (0 percent and 2.94 percent, respectively; \( p = 0.177 \)), wound infection (2.15 percent and 2.94 percent, respectively; \( p = 1.00 \)), wound dehiscence (2.15 percent and 5.88 percent, respectively; \( p = 0.242 \)), and need for revisional surgery (10.75 percent and 20.59 percent, respectively; \( p = 0.116 \)) were consistently lower in the lipoabdominoplasty group compared with the traditional abdominoplasty group, but the difference was not statistically significant. Putting all the perfusion-associated complications together, and including the need for revisional surgery, the complication rate for lipoabdominoplasty was

### Table 1. Complication Rates for Patients with Abdominal Scars*

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<thead>
<tr>
<th></th>
<th>Lipoabdominoplasty (%)</th>
<th>Traditional Abdominoplasty (%)</th>
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<tbody>
<tr>
<td>No. of patients</td>
<td>11</td>
<td>8</td>
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<tr>
<td>Perfusion-related</td>
<td></td>
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<tr>
<td>complications</td>
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<tr>
<td>Skin necrosis</td>
<td>0 (0)</td>
<td>1 (12.5)</td>
<td>0.421</td>
</tr>
<tr>
<td>Wound infection</td>
<td>1 (9.09)</td>
<td>0 (0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Wound dehiscence</td>
<td>1 (9.09)</td>
<td>0 (0)</td>
<td>1.00</td>
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<tr>
<td>Revision surgery†</td>
<td>4 (36.36)</td>
<td>0 (0)</td>
<td>0.103</td>
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*Number (%) of patients with a significant abdominal scar who had complications after surgery. Lipoabdominoplasty and traditional abdominoplasty show no significant difference in complication rates or need for revisional surgery.

†Lipoabdominoplasty revisional surgery consisted of additional liposuction for all four patients, re-elevation and contouring for one, and an umbilicoplasty for another patient.

**Fig. 3.** Preoperative and postoperative traditional abdominoplasty views. Anteroposterior views of patient before surgery (above, left) and 6 weeks after surgery (above, right). Lateral views of patient before surgery (below, left) and 6 weeks after surgery (below, right).
significantly lower when compared with traditional abdominoplasty (lipoadminoplasty, 15.05 percent; traditional abdominoplasty, 30.88 percent; \( p = 0.02 \)).

**DISCUSSION**

In an effort to reduce the need for abdominoplasty revision, the previous recommendation of separating liposuction and abdominoplasty was
challenged. Initial results showed improved outcome and perhaps, surprisingly, fewer complications. To further investigate the safety of this new approach, we analyzed outcomes of lipoabdominoplasty in high-risk patients.

The literature has already established that smoking is associated with increased complications. In creating flaps, the random blood flow to skin and subcutaneous tissue is decreased as vascular territories are divided. When patients already have compromised flow to their peripheral tissues secondary to vessel endothelial damage from smoking, creating flaps is thought to increase the risk for complication. The same holds true in patients with large scars, such as from an open cholecystectomy or midline laparotomy, because of an interruption in the normal blood supply to the abdominal wall.

In previously unoperated, nonsmoking patients, the thought of performing extensive liposuction to the abdominoplasty flap that is to be elevated was discouraged because of the potential risk of increasing perfusion-associated complications. Careful anatomical studies by Huger led to the description of safe zones for cautious liposuction combined with full abdominoplasty. As the work by Saldanha et al. and Lockwood demonstrated no increased complications when liposuction was added to full abdominoplasty, this fear has begun to dissipate, with liposuction plus abdominoplasty becoming a more commonplace procedure.

The second reason has to do with reducing tension on the closure. In extensively liposuctioning the abdominal wall, a more pliable sliding flap is developed. Furthermore, starting with the superior border incision line of the skin flap to be excised, one never needs to pull the skin tighter than what the surgeon judges to be safe, to close the abdominal incision line.

Lastly, tumescent infiltration into the abdominal wall before liposuction plays an important role. The epinephrine in the tumescent solution reduces blood vessel caliber and de-

<table>
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<th>Table 2. Complication Rates for Smokers*</th>
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<td>Lipoabdominoplasty (%)</td>
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<tr>
<td>No. of patients</td>
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<tr>
<td>Perfusion-related complications</td>
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<td>Skin necrosis</td>
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<td>Wound dehiscence</td>
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<td>Revision surgery†</td>
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N/A, not applicable.
*Number (%) of patients with an active smoking history with complications after surgery. Lipoabdominoplasty and traditional abdominoplasty procedures show no significant difference in complication rates or need for revisional surgery.
†Lipoabdominoplasty revisional surgery consisted of more liposuction for all three, a mons plasty for one, and re-elevation and contouring for another. Traditional abdominoplasty revisional surgery consisted of re-elevation and contouring for three of five patients, one dog-ear excision, and an umbilicoplasty.
creases vascular and lymphatic damage during the procedure.\textsuperscript{21,22}

In considering the revisional surgery rate, our case series demonstrates that the majority of revisions consisted of more liposuction and abdominal flap readvancement. High rates of revision are noted in the previous studies and are seen in patients with high body mass indexes.\textsuperscript{11,15,22} We have found that massive weight loss patients tend to have a greater potential for revision, probably because of reduced skin elasticity. To reduce the rate of revision in lipoabdominoplasty patients, these results suggest that more liposuction at the time of the initial surgery may be appropriate for some patients. The endpoint of liposuction is “pinch test” to estimate approximately 1 cm of fat thickness in all sections of revision. As for re-elevation and contouring in traditional abdominoplasty, the addition of liposuction in the combined lipoabdominoplasty may prove to decrease the need for this revision.

**CONCLUSIONS**

In sum, lipoabdominoplasty involves less undermining, decreased suture line tension, and maintained abdominal flap vasculature as compared with traditional abdominoplasty. Successful and safe surgery can be performed in smokers and in scarred abdomens without increased risk and with a high degree of effectiveness.

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**REFERENCES**