TWO-YEAR EXPERIENCE WITH THE AVELAR
ABDOMINOPLASTY

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**ORIGINAL ARTICLE**

**Two-year Experience With the Avelar Abdominoplasty**

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**Objective:** To evaluate our 2-year experience with a modified Avelar abdominoplasty in an outpatient office surgery center setting and to compare our complication rate with other studies reported in the literature.

**Methods:** A retrospective review of the medical charts of 80 patients who underwent a modified Avelar abdominoplasty between June 2005 and June 2007. Seventy-seven patients underwent full abdominoplasties and 3 patients had mini abdominoplasties. Patients included 79 women and 1 man. Their ages ranged from 24 to 76 years. Mean age was 44 years. Of the patients, 47 (59%) had tumescent local anesthesia with conscious sedation. The remaining 33 (41%) patients had tumescent infiltration with general anesthesia.

**Surgical Technique:** The technique presented modifies the Avelar technique by using tumescent anesthesia infiltration and conscious sedation, the Mangubat disruptor, less aggressive liposuction in the lower abdomen, subcutaneous excision of the lower flap down to the fascia in larger patients, a different technique for umbilical transposition, and platelet-rich plasma is sprayed in the flap closure and on the incision to promote healing. With liposuction to help mobilize the skin, the upper flap undermining can be limited to the midline, and blood vessels in the area can be preserved.

**Results:** Most patients were happy with their results, and they especially liked the body sculpting with additional liposuction of their flanks. In the 80 patients who underwent the modified Avelar abdominoplasty, there were 3 cases of skin necrosis (3.7% incidence), 10 seromas (12.5% incidence), 1 episode of aspiration of gastric contents, and 1 episode of postoperative urinary retention requiring Foley catheter placement for 2 days. There were no cases of significant blood loss and no incidence of deep vein thrombosis. Most patients had significantly less pain than occurred with traditional abdominoplasty and most returned to work in 10 to 14 days.

**Discussion:** The Avelar abdominoplasty is touted as a safe procedure with fewer complications than the traditional abdominoplasty because the perforator vessels, nerves, and lymphatics are not damaged during the operation. The few published studies using only the Avelar technique or a modification of it have demonstrated a low complication rate. The seroma rate found in this study of 12.5% falls within the reported rates of 0 to 32%.

Skin necrosis is caused by profound devascularization in the area between the umbilicus and the horizontal scar. Even with sparing of the superior axial vasculature, this area is susceptible to skin necrosis. In the current study 3 patients developed skin necrosis in this area. One patient was a heavy smoker. The second patient was exposed to significant secondhand smoke; and the third patient was obese and had chronic hypertension. All patients had limited dissection in the midline.

**Conclusion:** In the current study, where modifications of the Avelar technique was used, the complication rate was in the low range compared with the complication rates reported in the literature.

Abdominoplasty is a popular and widely used procedure for body contouring. A full abdominoplasty involves an abdominal lipectomy to the umbilicus with transposition. Most patients have upper and lower skin laxity with some degree of fascial flaccidity. Upper and lower abdominal fascial plication can be performed if needed. Liposuction of the flanks is also usually performed with the full abdominoplasty to improve overall body contouring. A mini abdominoplasty involves a lower abdominal skin incision and is typically used for patients who have minimal skin laxity plus or minus fascial diastasis. Fascial plication in the lower abdomen can be performed if needed.
Juarez Avelar first described a new surgical technique that combined liposuction and abdominal lipectomy in 1999.1,2 The then new Alvelar technique avoided the wide undermining that is typically used to advance the upper flap so the skin can be mobilized. 

- The author has modified the original Avelar abdominoplasty procedure and reports in this article the results of a retrospective review of the medical charts of 80 patients who underwent a modified Avelar abdominoplasty between June 2005 and June 20071,2

Review of the Avelar Technique

Avelar’s original technique involves liposuction of the upper and lower abdomen to allow the skin to be advanced without undermining. Liposuction is performed in the deep fat layer in the upper abdomen with a more aggressive full-thickness liposuction in the lower abdomen. Limited dissection is then performed in the midline to allow advancement of the skin over the umbilicus so it can be transfixied. So as not to damage the perforator vessels, a long blunt clamp is used to tunnel in the midline. During the abdominal lipectomy part of the surgery, only the dermis is excised and the subcutaneous structures are left intact. When Avelar first presented his technique, plication of the muscles was not a routine procedure. Now, plication is often performed in the midline above and below the umbilicus and laterally if needed. The superior flap is pulled down and temporarily transfixied in the midline with a temporary stitch. The umbilicus is then transposed, and the surgical wound is closed in 3 or 4 layers. No drains are used after the surgery. When only abdominoplasty is performed, epidural anesthesia and intravenous sedation is preferred. Local infiltration is also performed in the superficial and deep layers.

Methods

A retrospective review of the medical charts of 80 patients who underwent a modified Avelar abdominoplasty between June 2005 and June 2007. Seventy-seven full abdominoplasties and 3 mini abdominoplasties were performed. Patients included 79 women and 1 man. Their ages ranged from 24 to 76 years. The mean age was 44 years.

Surgical Technique: Modified Avelar Abdominoplasty

Prior to liposuction, standard tumescent solution was given to each patient. The lidocaine dose was kept below 50 mg/kg. Standard tumescent solution consists of 500 mg/L of lidocaine, 0.8 mg of 1:1000 of epinephrine, and 10 mg of 8.4% bicarbonate. Of the patients in this study, 47 (59%) had tumescent local anesthesia with conscious sedation. The remaining 33 (41%) patients had tumescent infiltration with general anesthesia.

Fat disruption was performed with the Mangubat disruptor, and this was followed with liposuction. Liposuction was moderate in the upper and lower abdomen. The amount of excess skin was measured and marked. The skin was then sharply excised with a scalpel and a circum-umbilical incision was then made. With larger patients, the subcutaneous fat was also excised during the lipectomy in addition to the skin.

The stromal attachments were then released in the midline up to the xyphoid process. With upper abdominal diastasis, a more aggressive release was performed in the midline. The undermining was kept to the medial borders of the rectus muscles so the superior epigastric vessels would be preserved bilaterally. The fat was swept off the midline superiorly and fascial plication was performed with a permanent suture if needed. If substantial fat was present in the lower abdomen it was debulked sharply with scissors. This is a modification of the original technique where aggressive liposuction is performed in the lower abdomen and only the dermis and not the subcutaneous tissue is excised. Fascial plication is also performed in the lower abdomen if needed. The wound is closed in layers, and the umbilicus is relocated.

For relocating the umbilicus, the author uses Delerm’s technique, which consists of a round incision made on the abdominal flap overlying the excised umbilical stalk. The umbilical stalk is then vertically incised at 12 o’clock down its entire length. The umbilicus and superior flap are then defatted, and the round flap at 6 o’clock is inserted into the triangular gap created and then anchored to the fascia. The skin edges are then sutured. This gives an aesthetically pleasing result with a superior hooded appearance. The superior incision will be camouflaged when the patient is standing.

If significant fat is debulked inferiorly or if the flap is excised down to the fascia, a Jackson-Pratt drain is placed in the lower flap. Activated platelet-rich plasma (Harvest Technologies, Plymouth, Mass) is sprayed in the flap before closure and on the incision. All patients wear pneumatic compression stockings during the surgery, and they all wear knee-high hose for 14 days postoperatively. Lovenox (Aventis Pharmaceuticals Inc., Bridgewater, NJ) is given to high-risk patients for 3 days for deep vein thrombosis prophylaxis.
Results

Most patients were happy with their results, and they especially liked the body sculpting with additional liposuction of their flanks. Figures 1, 2, and 3 show the preoperative and postoperative photos. Complications are shown in the Table and compared with complications described in the literature. Three patients developed skin necrosis (at least 3 × 4 cm in size) in the lower abdomen in the midline (overall rate of 3.7%). Of these 3 patients, one had a 30-year history of smoking 23 packs a year (about ⅓ of a pack per day), one was exposed to secondhand smoke before and after the surgery, and one was obese and had chronic hypertension that was well controlled.

There were 10 seromas (overall rate of 12.5%). One patient had urinary retention and developed dehydration requiring intravenous fluids and bladder catheterization for 2 days. There was one pneumoaspiration near the end of the surgery that required hospitalization, supplemental oxygen, and intravenous antibiotics. There were no cases of significant blood loss and no incidence of deep vein thrombosis. Most patients had significantly less pain than occurred with traditional abdominoplasty and most returned to work in 10 to 14 days.

Discussion

Since Avelar described his technique of minimal superior flap undermining combined with abdominal liposuction at the 36th Brazilian Congress of Plastic Surgery in 1999, several physicians have modified his technique and demonstrated its safety and effectiveness. Few published studies are using only the Avelar technique or a modification of it, but those few published studies have demonstrated a low complication rate.

The seroma rate observed in this study of 12.5% falls within the reported rates of 0 to 32%. Kim and Stevenson found that obese patients and those who had had ultrasound liposuction had a statistically significant higher rate of seroma. Although the seroma rate of 12.5% is higher than some of the studies published on the Avelar technique, this may be caused by the modification of the technique that included extensive fat debulking in the inferior flap and dissection of a thicker subcutaneous inferior flap. As a result the author has now started placing one Jackson Pratt drain horizontally in the inferior flap to minimize the risk of developing seromas. Activated platelet-rich plasma is also sprayed inside the flap and on the skin incision. This is a platelet gel created by adding thrombin and calcium chloride that has been shown to enhance wound healing.
Complication Rates as Reported in the Literature

<table>
<thead>
<tr>
<th></th>
<th>Skin necrosis</th>
<th>Seromas</th>
<th>Deep Vein Thrombosis</th>
<th>Hematoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current study (n = 80)*</td>
<td>3.7%</td>
<td>12.5%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Grazer and Goldwyn 4</td>
<td>9.8%</td>
<td>3.9%</td>
<td>1.9%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Matarasso et al 5</td>
<td>5.4%</td>
<td>n/a</td>
<td>0.06%</td>
<td>1.4%</td>
</tr>
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<td>Chaouat et al 6</td>
<td>6.6%</td>
<td>10.9%</td>
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<td>Mayr et al 7</td>
<td>20%</td>
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<td>0%</td>
<td>13%</td>
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<tr>
<td>Kryger et al 8</td>
<td>1.2%</td>
<td>6.3%</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Stewart et al 9</td>
<td>2.5%</td>
<td>5%</td>
<td>n/a</td>
<td>3%</td>
</tr>
<tr>
<td>Kim and Stevenson 10</td>
<td>n/a</td>
<td>32%</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Lisborg et al 11</td>
<td>1.4%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Mangubat 12 (n = 25)*</td>
<td>4.0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

*A velar abdominoplasty performed; n/a indicates not available.

Skin necrosis is another complication reported with a wide variance of rates. Devascularization or decreased blood flow to an area causes skin necrosis. To illustrate this, Huger 14 divided the abdomen into 3 zones and described the blood supply (Figure 4). Zone I covers the area from the xyphoid process to the pubis and the lateral margins of the rectus sheath. Zone II covers the areas across the lower abdomen below a line drawn at the level of the anterior iliac spine and inferiorly by the pubic and inguinal creases. Zone III covers an area around the flank lateral to Zone I from the costal margin above to the anterior iliac spine level below. Zone I is supplied by the superior and inferior epigastric arteries. Zone II is derived from the external iliac artery at 2 levels and from the deep epigastric vessels. Zone III is derived from the intercostal, subcostal, and lumbar arteries, which arise from the aorta. The vessels in zone III provide most of the blood supply to the flap with a traditional abdominoplasty. Excising a thick or full-thickness lower flap probably compromises the arterial supply to part of zone II along with the inferior epigastric vessels of Zone I.

Graf et al 15 performed a limited upper flap dissection after liposuction and full-thickness excision of the lower flap without liposuction and used Doppler flowmetry to show that the perforator arteries were preserved in the periumbilical area and right upper quadrant. This study showed that there were 5 perforators in the right and left side preoperatively and 3 on either side postoperatively. The size and flow rate increased after surgery by 9% and 56% respectively.

In a series of 153 patients, Kryger et al 8 reported a rate of 1.2%. Mayr et al 7 reported a 20% rate in a study that measured perfusion with laser-fluorescence-videoangiography. With intravenous injection of indocyanine green, Mayer et al 7 were able to assess the blood flow to the skin flaps after surgery. This technique provides the most accurate information on dermal and subdermal microcirculation. The perfusion in zone 1 (the area between the umbilicus and the horizontal scar) in 15 patients was 5–32% of normal with a mean of 17%. Hence, the perfusion rate is decreased by an average of 83%. There is profound devascularization in this area and even with sparing of the superior axial vasculature this area is susceptible to skin necrosis. This was seen in the current study where 3 patients developed skin necrosis in this area. One patient was a heavy smoker who continued to smoke before and after surgery, despite being counseled to quit; the second patient was exposed to significant secondhand smoke; and the third patient was obese and had chronic hypertension. All patients had limited dissection in the midline.

The Germany study by Manassas et al 16 had 54% smokers, and they had a 48% incidence of wound healing complications versus the 15% complication rate for nonsmokers. Manassas et al 16 found a 3 times
increased rate of delayed healing in smokers compared with nonsmokers. Kuri et al.\(^1\) found that patients needed to stop smoking 3 weeks before surgery to reduce the incidence of impaired wound healing in reconstructive head and neck surgery. One patient experienced significant urinary retention that required bladder catheterization for 2 days.

One patient aspirated at the end of the surgery as the laryngeal mask airway was being pulled out. She required hospitalization for aspiration pneumonitis.

Of interest are the anecdotal reports of patients who reported a significant improvement of their stress urinary incontinence. An aggressive pull of the inferior flap must change the urethral-vesical-angle enough to cure some urinary stress incontinence.

Conclusion

The Avelar abdominoplasty technique of combined liposuction with minimal upper abdominal undermining is a safe procedure that can be performed on an outpatient basis with tumescent infiltration and conscious sedation or general anesthesia. Most patients were happy with their results, and they especially liked the body sculpting with additional liposuction of their flanks.

The author’s 2-year experience reveals a lower major complication rate with conscious sedation versus general anesthesia. Modifications of the original technique may have contributed to a slightly increased rate of seroma formation. Adding drain placement should significantly decrease seromas. Skin necrosis can still occur despite the supposition of improved flap vascularity with the limited superior dissection. Further studies are needed to objectively confirm this. Even though this is a safe procedure, patients need to be counseled that it is not without risks, especially in smokers.

Acknowledgments

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References