Reducing Seroma in Outpatient Abdominoplasty: Analysis of 516 Consecutive Cases

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Abstract

Background: Over the past 30 years, the preferred techniques and settings for abdominoplasty have evolved considerably, but controversy remains regarding the surgical and postoperative approaches that best limit serious complications such as seroma.

Objective: The authors evaluate their 28-year experience with abdominoplasty and suggest a technique (progressive tension sutures without placement of drains) for reducing the overall complication rate, most significantly with regard to seroma.

Methods: A retrospective review was conducted of 517 consecutive abdominoplasty cases in the senior author’s clinic. The cases were divided into five groups based on operative setting, postoperative care, and surgical technique. Concurrent procedures and complications were also reviewed.

Results: The authors found that the last group of patients, in whom abdominoplasty with progressive tension sutures (but without drains) was performed as an outpatient procedure, had the lowest incidence of seroma. Specifically, the incidence of clinically significant seroma formation requiring aspiration was 9.6% in early groups, when abdominoplasty was performed as an inpatient procedure; the rate was 24% when it was performed as an outpatient procedure without the placement of progressive tension sutures, but was then reduced to 1.7% with the placement of progressive tension sutures and no drains.

Conclusions: Abdominoplasty can be safely performed with other concomitant procedures (such as liposuction) in a strictly outpatient setting when surgical time is limited. Despite controversy in the previous literature, the authors’ data support the conclusion that the placement of progressive tension sutures without drains dramatically decreases overall complication and seroma rate during abdominoplasty.

Keywords

abdominoplasty, seroma, progressive tension suture, outpatient

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tension sutures without drains and those who had drains alone. Therefore, many surgeons have concluded that the placement of progressive tension sutures may reduce time for drain removal, but that the overall support for reduced complication rates is not significant enough to change their practice by adding progressive tension sutures and eliminating drains.13

**METHODS**

To better understand the factors associated with seroma formation in abdominoplasty, we have performed a retrospective review of 517 consecutive abdominoplasties by a single plastic surgeon (ARA). During the study interval, the protocol changed from inpatient treatment to strictly outpatient surgery. The number and types of concomitant procedures, including liposuction, have increased. The author also now operates with progressive tension sutures and has discontinued the placement of drains, as described by Pollock and Pollock.9

The inferior incision was marked immediately below the lower abdominal skin crease, above the pubis, and extended laterally as needed to remove the excess of abdominal skin. The patient was asked to flex at the hips to evaluate the amount of skin that could safely be excised without excess tension. The superior incision was usually placed just above the umbilicus, but varied depending on amount of skin laxity. The umbilicus, was preserved with the attached pedicle; alternatively, a neoumbilicus was made if the umbilical pedicle was longer than the thickness of the abdominal flap, had an excessive amount of prior scarring, or had compromised viability.

Excision of the panniculus was carried out with dissection above the abdominal fascia, along the entire extent of skin incision. For superior abdominal flap elevation, lateral dissection was never extended to the costal margin. In this way, lateral row perforators from the epigastric artery were preserved. Above the umbilicus, perforating vessels from the epigastric arteries along the lateral rectus sheath and intercostal perforators were preserved whenever possible to maximize blood supply to the flap. Therefore, elevation of the abdominal flap was only performed centrally to the level of the xyphoid process as needed, to allow plication of any diastasis recti.

When selected as a concurrent procedure, liposuction was performed prior to flap elevation along the entire flap, except the area to be removed. The wet technique was applied and the author took particular care to perform the liposuction in a gentle manner, so as not to excessively traumatize the flap.

For closure, the author performed the progressive tension suture technique as described by Pollock and Pollock,9 which included sequential tension suturing beginning along the midline, just below the xyphoid process, with...
interrupted 2-0 Vicryl sutures (Ethicon, Inc., Somerville, New Jersey). At the umbilicus, additional adipose tissue was excised, which allowed tensionless fixation of the umbilicus to the abdominal fascia and also resulted in an aesthetic inversion. Progressive tension sutures were placed immediately proximal and distal to the umbilicus to relieve tension and protect blood flow to the umbilicus. Several rows of lateral progressive tension sutures (Figures 1 and 2) were then placed; the author took care to advance the flap while relieving tension from the suture line. Drains were unwarranted; there was no space in which to place them (Figures 3 and 4).

Clinical results can be seen in Figures 5, 6, and 7. A video of the author’s technique can also be found at www.aestheticsurgeryjournal.com.

RESULTS

During the study period, a total of 517 patients underwent abdominoplasty (Figure 8). Both female (n = 508; 98.3%) and male (n = 9; 1.7%) patients were included. The female patients averaged 2.48 pregnancies, and only 11 patients (2.19%) were nulliparous (Table 1).

The 517 consecutive abdominoplasty procedures were retrospectively divided into five groups based on trends in postoperative stay duration and procedure technique (Table 2). In the early group, from 1980 to 1990, all procedures were performed in a hospital setting and the patients remained hospitalized for an average of 4.3 days (group A: 124 patients). Patients in the middle group, from 1991 to 1994, were kept for overnight observation in the hospital and/or clinic (where they were monitored by a registered nurse) for an average of 1.4 days (group B: 71 patients). From 1995 to 2005, procedures were performed almost exclusively in an outpatient office-based facility accredited by the American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF), with the only exceptions being patients who had other simultaneous gynecological procedures; during this time, the average hospital stay decreased to 0.31 days (group C: 242 patients). Procedures performed from 2006 to 2008 were exclusively outpatient and were divided between those performed with progressive tension sutures and drains (group D: 22 patients) and those performed with progressive tension sutures but without drains (group E: 58 patients).

The five groups were also reviewed in terms of concomitant procedures. Ventral hernia repair was the most common simultaneous procedure in the early group. Over the years, liposuction increased in prevalence and is now routinely performed along with abdominoplasty; it was performed in 43% of our cases from group E (Table 3).

Seroma formation was the most frequent complication for groups with inpatient care, short stay, and outpatient surgery with drains only. Clinically significant seromas are those requiring aspiration. An increased rate of seroma formation was observed when we changed our protocol from inpatient abdominoplasty to short stay and outpatient procedures without progressive tension sutures. A seroma incidence of 24% in group C was reduced to 1.7% in group E, when progressive tension sutures were placed as described by Pollock and Pollock6 without drains (Table 4). Of the last 58 patients in this series, only one who underwent abdominoplasty with progressive tension suturing without drains developed a seroma. This case resolved with a single aspiration, whereas earlier patients who had been treated without progressive tension sutures required multiple needle aspirations (average, 3.5; standard deviation, 2.6). When evaluated with a Student t test (P < .05), our results showed a significant reduction in the number of needle aspirations required to resolve a seroma when comparing patients with progressive tension suturing to those without it. These data support the conclusion that, although rare, the seromas formed when progressive tension sutures have been placed are less complex and easier to treat.

DISCUSSION

Although our study shows a significant reduction in the rate and significance of seroma formation with progressive tension sutures, these findings are in contrast to other studies,13 which did not find significant benefit with abdominal plication. The number of sutures placed during closure, as well as the areas in which they are placed, might explain the disparity in these reports. In our series, the sutures were placed exactly as described by Pollock and Pollock.9 To be successful in the placement of progressive tension sutures without drains, the approximation of Scarpa’s fascia to the deep abdominal fascia must be adequate. By the time the skin is ready for closure, no space should remain in which to place a drain. Additional benefits are reduced tension at the skin closure, which may reduce other complications such as wound dehiscence and scar widening, although this observation is merely anecdotal and remains unproven at this time. We believe that the most important part of the closure is the midline, after which we proceed with the lateral aspects. Again, at the conclusion of the procedure, there is no area in which to place a drain.

In addition to progressive tension suture placement, factors influencing outcomes in this study include the extent of abdominal flap dissection, the addition of liposuction to the abdominal flap, and the change from inpatient to outpatient surgery. During the earlier cases in this series, the dissection was more extensive and was carried out to the costal margin. These patients also spent more time in the hospital and experienced a higher rate of seroma. In the period in which we began performing
Figure 5. (A, C) This 29-year-old woman presented for treatment of her abdominal region. (B, D) One month after abdominoplasty with progressive tension sutures (no drains) and 300cc liposuction of the epigastric region. Care was taken to maximize blood flow to the flap during liposuction. Above the umbilicus, flap undermining was primarily central and not carried out to the costal margin, therefore preserving epigastric artery flaps.
Figure 6. (A, C) This 39-year-old woman presented for treatment of her abdominal region. (B, D) One month after abdominoplasty with progressive tension sutures (no drains) and 300cc of liposuction to the abdominal flap. The patient also underwent donut mastopexy breast augmentation.
Figure 7. (A, C) This 34-year-old woman presented for treatment of her abdominal region. (B, D) One month after abdominoplasty with progressive tension sutures (no drains).
abdominoplasty as an outpatient procedure, during which we saw an increase in seroma to 24%, undermining was also less extensive. From this, one could conclude that the initial lack of ambulation during hospitalization correlates with decreased seroma formation; conversely, when patients were sent home early, the increase in mobilization may have led to increased seroma formation. Over the duration of the study, liposuction continued to be the most common concurrent procedure, which continued during the addition of progressive tension suture placement. We were hesitant to discontinue drain placement, especially after liposuction, but our data clearly demonstrate that the seroma rate decreased drastically when we did so.

**CONCLUSIONS**

Abdominoplasty is an outpatient procedure that is commonly performed with other adjunct surgical procedures, the most common of which in our study was liposuction. In our series, the addition of progressive tension sutures

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**Table 2. Patient Population by Group**

<table>
<thead>
<tr>
<th></th>
<th>Average Inpatient Hospital Days, Mean (SD)</th>
<th>Number of Patients</th>
<th>Number of Drains Used, Mean (SD)</th>
<th>Days Drains Used, Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A: early group (all inpatient procedures)</td>
<td>4.3 (0.99)</td>
<td>124</td>
<td>2</td>
<td>4.5 (1.1)</td>
</tr>
<tr>
<td>Group B: most patients kept for observation</td>
<td>1.4 (2.1)</td>
<td>71</td>
<td>1.9 (0.23)</td>
<td>5.2 (3.1)</td>
</tr>
<tr>
<td>Group C: mostly outpatient</td>
<td>.31 (0.96)</td>
<td>242</td>
<td>1.61 (0.50)</td>
<td>7.08 (2.94)</td>
</tr>
<tr>
<td>Group D: progressive tension sutures (with drains)</td>
<td>0</td>
<td>22</td>
<td>1.5 (0.6)</td>
<td>5.9 (1.79)</td>
</tr>
<tr>
<td>Group E: progressive tension sutures (no drains)</td>
<td>2006-2008</td>
<td>0</td>
<td>58</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 3. Concurrent Procedures Performed With Abdominoplasty**

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Population size, n</td>
<td>124</td>
<td>71</td>
<td>242</td>
<td>22</td>
<td>58</td>
</tr>
<tr>
<td>Concurrent procedure, %</td>
<td>34.6</td>
<td>60.5</td>
<td>60.7</td>
<td>72.7</td>
<td>55.2</td>
</tr>
<tr>
<td>Suction-assisted lipectomy, %</td>
<td>3.2</td>
<td>19.7</td>
<td>36.4</td>
<td>63.6</td>
<td>43.1</td>
</tr>
<tr>
<td>Breast procedure, %</td>
<td>8.01</td>
<td>18.3</td>
<td>15.3</td>
<td>22.7</td>
<td>15.5</td>
</tr>
<tr>
<td>Breast augmentation, %</td>
<td>4</td>
<td>1.4</td>
<td>6.5</td>
<td>13.6</td>
<td>6.9</td>
</tr>
<tr>
<td>Mastopexy, %</td>
<td>0</td>
<td>2.8</td>
<td>4.2</td>
<td>4.5</td>
<td>3.4</td>
</tr>
<tr>
<td>Augmentation/mastopexy, %</td>
<td>3.2</td>
<td>0</td>
<td>3.2</td>
<td>4.5</td>
<td>5.2</td>
</tr>
<tr>
<td>Breast reduction, %</td>
<td>0.8</td>
<td>11.3</td>
<td>0.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hysterectomy, %</td>
<td>6.45</td>
<td>12.7</td>
<td>4.9</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Ventral hernia repair, %</td>
<td>20.2</td>
<td>9.9</td>
<td>5.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Blepharoplasty, %</td>
<td>0.8</td>
<td>1.4</td>
<td>1.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rhinoplasty, %</td>
<td>0</td>
<td>1.4</td>
<td>0.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Brachioplasty, %</td>
<td>0</td>
<td>1.4</td>
<td>0.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tubal ligation, %</td>
<td>1.6</td>
<td>0</td>
<td>2.3</td>
<td>4.5</td>
<td>1.7</td>
</tr>
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PTS, progressive tension sutures.
was associated with a marked decrease in seroma formation. When the sutures were placed in the manner described by Pollock and Pollock, there did not appear to be any benefit to the addition of drains. In our experience, liposuction can be a safe and effective adjunct when performed conservatively across the anterior abdominal wall and when excessive undermining is not performed. The blood supply to the abdominal flap must be maximized. Above the level of the umbilicus, the abdominal flap was only elevated at the midline, to allow for plication of the rectus muscle. Perforators were preserved whenever possible.

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**REFERENCES**