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## Body Contouring

### Featured Operative Technique

# Drainless Abdominoplasty Using Barbed Progressive Tension Sutures

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### Abstract

We describe our current technique of drainless abdominoplasty using barbed progressive tension sutures. The perioperative management and detailed steps of procedure are outlined, including indications for concomitantly performing liposuction and repair of diastasis of the rectus abdominis muscles. This approach reliably improves abdominal contour, minimizes complications, and is straightforward to learn and perform.

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Abdominoplasty aims to correct abdominal contour deformities. The technique has evolved from a purely excisional procedure to excision combined with liposuction to further enhance the aesthetic result.<sup>1–15</sup>

A frequently reported complication following abdominoplasty is seroma. The reported incidence ranging from 1% to 57%<sup>13,16–20</sup> with an average incidence of 10%.<sup>21</sup> Complications secondary to seroma formation include wound dehiscence, skin necrosis, infection, and capsule formation necessitating reoperation. Numerous risk factors have been suggested for seroma formation. Some potential etiologic include dead space resulting from undermined areas, shearing forces between the abdominoplasty flap and the smooth surface of the deep fascia, higher weight of resected tissue, dissection of lymphatics, and release of inflammatory mediators postoperatively.<sup>21–30</sup> A multitude of strategies have been proposed to decrease the incidence of seroma including using drains, limited undermining, preservation of sub-Scarpal fat on the deep fascia, avoiding liposuction, avoiding the use of electrocautery, and use of tissue glues.<sup>23,24,31,32</sup> More recently, use of progressive tension sutures has been described to prevent seroma formation.<sup>33,34</sup>

Since 2009, we have performed drainless abdominoplasty using barbed progressive tension sutures. In this article, we describe our current technique for abdominoplasty along with indications for concomitantly performing liposuction or repair of diastasis of the rectus abdominis muscles. The guiding principles on the Declaration of Helsinki were strictly applied and adhered to in this study. The straightforward and safe approach presented in this article consistently improves abdominal contour while minimizing complications.

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## PATIENT SELECTION AND PREOPERATIVE ASSESSMENT

Patients presenting for abdominoplasty have a combination of several anatomical deformities:

- 1) Abdominal skin excess.
- 2) Abdominal subcutaneous fatty excess.
- 3) Diastasis of the rectus abdominis muscles and laxity of the musculoaponeurotic layer of the abdominal wall.
- 4) Poor umbilical shape and/or malposition.
- 5) Mons pubis ptosis.
- 6) Abdominal wall hernia.

During the initial consultation, physical exam focuses on identifying which of the aforementioned anatomical deformities are present and these will dictate the technical details required for abdominoplasty.

Patients must be nonsmokers. Patients must have a stable weight over a 6-month period preceding surgery and have a body mass index (BMI) of less than 35 kg/m<sup>2</sup>. In some patients following massive weight loss, the BMI may be more than 35 kg/m<sup>2</sup> if they have lost a significant amount of weight and their weight has plateaued.

## SURGICAL TECHNIQUE

The operative sequence for drainless abdominoplasty is reviewed in Table 1. A detailed video demonstrating the procedure may be viewed in Video 1 (available as Supplementary Material at [www.aestheticsurgeryjournal.com](http://www.aestheticsurgeryjournal.com)).

### Preoperative Preparation

In the preoperative room, our warming protocol is started and continued throughout surgery and while in the recovery room.<sup>35</sup> One hour prior to surgery, the patient is premedicated with oral gabapentin 600 mg (Pfizer, Kirkland, Quebec, Canada), celecoxib 200 mg (Pfizer, Kirkland, Quebec, Canada), acetaminophen 1000 mg (Johnson & Johnson, Markham, Ontario, Canada), and ondansetron hydrochloride dehydrate 8 mg (Novartis Pharmaceuticals Canada Inc., Dorval, Quebec, Canada) to reduce intraoperative opioid requirements and postoperative nausea and vomiting. All patients receive lower extremity compression stockings and sequential compression devices. Venous thromboembolism (VTE) risk stratification is performed for each patient and prophylaxis is instituted according to the assessment of exposing and predisposing risk factors.<sup>36</sup> Chemoprophylaxis for VTE risk reduction is planned for patients with very high risk for VTE (Caprini/Davison risk assessment model score > 5 or abdominoplasty combined with

**Table 1.** Operative Sequence for Drainless Abdominoplasty Using Barbed Progressive Tension Sutures

Step	Details
1	Marking
2	Infiltration
3	Liposuction (if indicated)
4	Umbilical dissection
5	Infraumbilical dissection with sub-Scarpal fat preservation
6	Supraumbilical dissection
7	Excision of sub-Scarpal fat where diastasis recti repair will be performed (if indicated)
8	Diastasis recti repair with two layered, continuous barbed suture (if indicated)
9	Marking and excision of excess skin
10	Marking and incision of new position for the umbilicus
11	Creating midline definition
12	Local anesthesia infiltration and insertion of pain pump catheters
13	Barbed progressive tension sutures
14	Barbed three-point suspension sutures of the lower abdominal incision
15	Closure of lower abdominal incision and inset of umbilicus
16	Application of dressings and abdominal binder

another surgery of estimated duration over 45 minutes). Chemoprophylaxis with subcutaneous dalteparin sodium 5000 IU (Pfizer, Kirkland, Quebec, Canada) is commenced the morning of postoperative day 1 and continued for a total of 14 days.

### Markings

Preoperative markings are made with the patient standing. The midline of the abdomen is marked from the xiphoid to the pubic symphysis. The inferior abdominal incision is marked starting in the midline. Superiorly directed traction is placed on the lower abdominal skin so that the mons pubis is on maximal stretch while the inferior abdominal incision is marked 6 to 7 cm above clitoral hood or base of the penis. This will address laxity of the mons pubis while preventing an excessively high scar. The central aspect of the inferior abdominal incision is marked as a horizontal line with the skin on maximal stretch to the medial aspect of the inguinal crease. The inferior abdominal incision is then gently curved superiorly to parallel to the inguinal ligament towards a point, typically 2 to 3 cm, inferior to the anterior superior iliac spine with the skin on maximal stretch. We prefer to maintain a final scar that is very



**Figure 1.** This 51-year-old woman had abdominoplasty approximately 20 years prior to presentation for secondary abdominoplasty. Note the high position of the lower abdominal scar.

low on the abdomen so that it can be hidden with most styles of underwear and bathing suits. In cases where it may be impossible to excise the skin to a point superior to the umbilicus, we keep the scar inferior and plan for an inverted T-shaped scar instead of marking the patient so that the scar ends more superiorly on the abdomen (Figure 1).

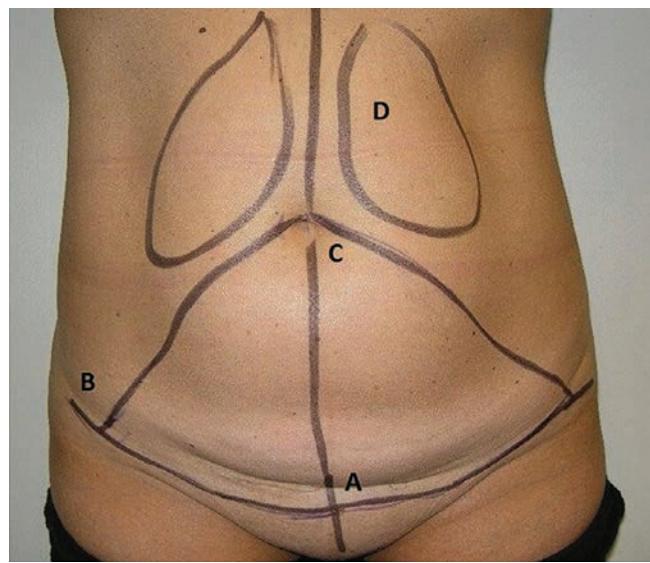
The estimated superior extent of the resection is also marked. This will serve as a reference line to ensure symmetrical scar location when the superior extent of the resection is remarked intraoperatively after the elevation of the abdominoplasty flap is completed. The estimated superior incision is usually located just superior to the umbilicus in the midline and gently curves inferiorly to meet the inferior abdominal markings.

The inferior abdominal incision marking is extended laterally beyond the estimated area of resection to allow for intraoperative extension of the skin resection to prevent dog-ear formation, if necessary (Figure 2).

The areas for liposuction are also marked preoperatively.

## Positioning

The patient is positioned supine with the upper extremities abducted to 90 degrees at the shoulders. At the beginning of the procedure, the operating table is adjusted so that the patient is extended at the waist to approximately 20 degrees from neutral to make the abdominal wall taut. This may help to prevent intraabdominal injury during infiltration and liposuction.



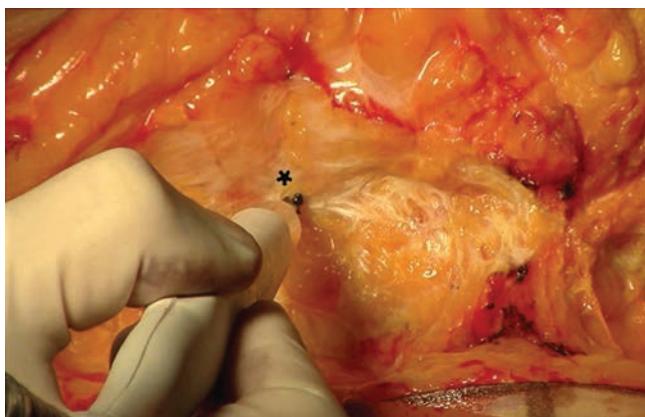
**Figure 2.** Preoperative markings are made in the standing position. (A) The inferior abdominal incision is marked starting in the midline with superiorly directed traction so that the mons pubis is on maximal stretch. The inferior abdominal incision is marked 6 to 7 cm above the clitoral hood. (B) The inferior abdominal incision marking is extended laterally beyond the estimated area of resection to allow for intraoperative extension of the skin resection, if required, to prevent dog-ear formation. (C) The estimated superior extent of the resection is also marked and this will serve as a reference line to ensure symmetrical scar location when the superior extent of the resection is remarked intraoperatively after the elevation of the abdominoplasty flap. (D) If indicated, the areas for liposuction are marked.

## Infiltration

The abdomen is infiltrated with a solution of 1L of lactated Ringer's with 1 mL of 1:10,000 epinephrine. If liposuction is required, infiltration of the upper and lateral abdomen is performed first to allow time for vasoconstriction. Use of infiltration helps to decrease blood loss. Additionally, the fluid may help to dissipate heat from electrocautery used during the dissection limiting thermal damage that can contribute to seroma formation.

## Liposuction (if Indicated)

In patients with excess fatty tissue in the supraumbilical skin and lateral abdominal skin, liposuction is performed to enhance abdominal contour. Power-assisted liposuction (Microaire Surgical Instruments, Charlottesville, VA) is performed in the central and lateral upper abdomen with a 4 mm cannula. Liposuction is performed in the middle and deep thirds of the subcutaneous tissue, aspirating adipose tissue both superficial and deep to Scarpa's fascia. Liposuction of the skin that will be excised is unnecessary.



**Figure 3.** Infraumbilical dissection with preservation of sub-Scarpa fat. Elevation of the abdominoplasty flap is just deep to Scarpa's fascia (indicated by the asterisk).



**Figure 4.** Dissection of abdominal flaps with preservation of sub-Scarpa fat only in the region below umbilicus. Above the umbilicus, the region of dissection is limited to the lateral edges of the rectus abdominis muscles and the depth is just superficial to the musculoaponeurotic plane.

## Dissection and Elevation of Abdominoplasty Flap

The umbilicus is incised with a no.11 blade in an oval shape superiorly and inverted V-shape inferiorly. The umbilical stalk is separated from the surrounding subcutaneous tissues down to the deep fascia. The umbilical stalk should not be skeletonized to ensure adequate blood supply.

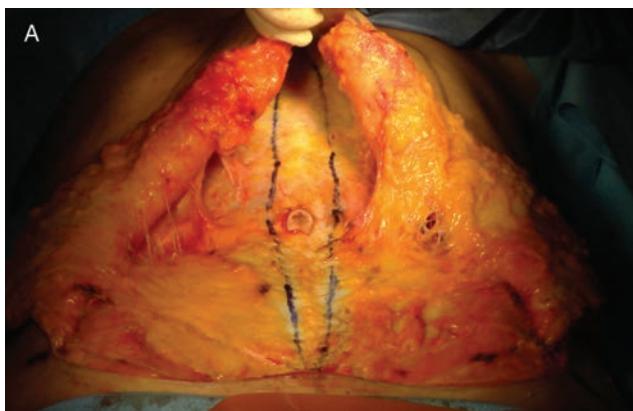
The lower abdominal incision is performed through the skin and Scarpa's fascia. The abdominoplasty flap is incised in the midline from the umbilicus to the lower abdominal incision to facilitate exposure during flap elevation. The abdominoplasty flap is elevated just deep to Scarpa's fascia, leaving sub-Scarpa fat on the abdominal deep fascia in the infraumbilical area (Figure 3). In the infraumbilical area, the width of the undermined area extends the entire length of the lower abdominal incision. Superior to the level of the umbilicus, the dissection is continued on the abdominal deep fascia and the extent of the dissection is limited to the linea semilunaris laterally. This preserves blood supply to the abdominoplasty flap and limits the amount of dead space in the supraumbilical area (Figure 4).

## Diastasis Recti Repair with Continuous Barbed Suture (if Indicated)

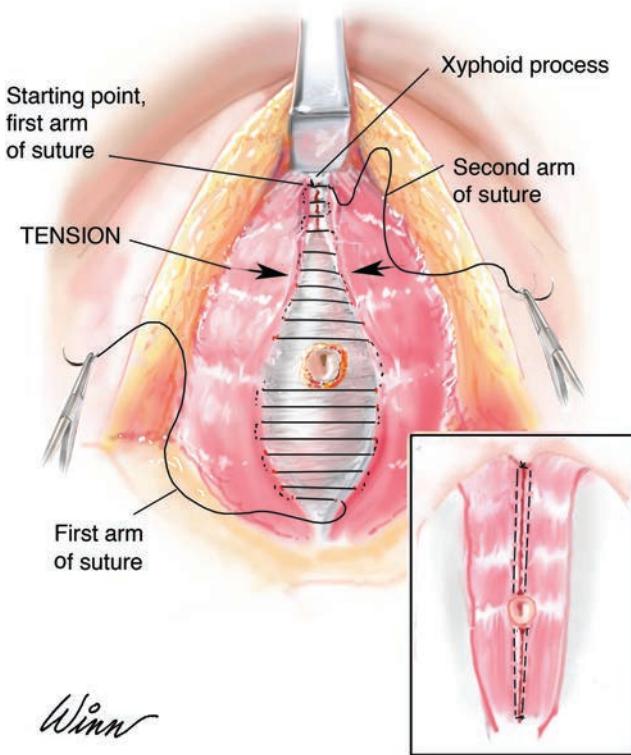
After elevation of the abdominoplasty flap, the abdominal fascia is inspected and if diastasis recti is present then repair is performed. If a hernia is present, this should be repaired prior to diastasis recti repair.

Diastasis recti will present as an increased distance between the medial edges of the rectus abdominis muscles; typically greater than 2 cm at the widest point. The

goal of repair is reapproximating the medial edges of the rectus abdominis muscles in the midline. The planned width of the repair is marked with ink as a fusiform shape along the medial edges of rectus abdominis muscles from xiphoid to pubic symphysis (Figure 5). In the infraumbilical region, the sub-Scarpa fat is resected off of the abdominal deep fascia located between the medial edges of rectus abdominis muscles. This ensures fascia to fascia approximation without fatty tissue interposed within the repair. The repair is performed with #2 polydioxanone (PDO) Stratafix (Johnson & Johnson, Markham, Ontario, Canada). This is a bidirectional barbed suture. Prior to using the barbed suture, it is immersed in a chlorhexidine solution and kept on a sterile glove package. When using barbed suture, contact of the suture with the skin, drapes, and any other material with fibers should be avoided. This will prevent contamination of the suture with debris which can cause extrusion and infection.<sup>37</sup> The suture is passed through the fascia in the midline just inferior to the xiphoid. A two layered diastasis recti repair is performed using each arm of the bidirectional suture. The first arm is passed as a continuous, horizontal mattress suture from the xiphoid to the pubic symphysis. The suture should pass within the fascia and spanning sutures should be avoided. At the level of the umbilicus, the suture is passed around on one side within the fascia and then the continuous, horizontal mattress suture is performed again inferior to the umbilicus to the pubic symphysis. The suture is then continued back in a superior direction to lock it in place. The second arm of the bidirectional suture is passed as the second layer of the diastasis recti repair from the xiphoid to the pubic symphysis. The suture should be passed on the same side of the umbilicus that the first arm was passed to avoid strangulation (Figure 6).



**B Diastasis Repair**



**Figure 5.** (A) Photographed and (B) illustrated planned width of diastasis recti repair with barbed suture plication. Denuding the fascia of sub-Scarpal fat in the area for rectus diastasis repair. Removal of this tissue is necessary to ensure edge-to-edge approximation of fascia during the barbed suture plication.

### Marking and Excision of Excess Skin

The operating table is adjusted so that the patient is flexed to approximately 135 degrees at the waist. The abdominoplasty flap is split in the midline until the appropriate degree of tension is achieved in the midline.

A towel clip is used to temporarily secure the abdominoplasty flap to the skin of the lower abdominal incision in the midline. The lateral tissue in the abdominoplasty flap is redraped medially to prevent formation of dog ears laterally. Using a Lockwood flap demarcator (Accurate Surgical & Scientific Instruments Corporation, Westbury, NY), the position of the lower abdominoplasty incision is transposed and marked along the abdominoplasty flap. To ensure symmetry, the newly marked superior extent of skin excess is compared with the preoperative markings and the contralateral side. The resection of the excess skin is performed perpendicular to the skin surface through the subcutaneous tissue. If there is excess sub-Scarpal fat, this can be excised from the distal aspect of the abdominoplasty flap.

### Creating Midline Definition

Superficial to the linea alba, there is a midline, fibrous condensation of the subcutaneous tissues. To create a defined midline, this fibrous condensation is intermittently scored from the superior extent of the undermining to superior to the new position of the umbilicus. Electrocautery is used to create partial thickness scores of this fibrous condensation every 1 to 2 cm along the midline (Figure 7). Disrupting this fibrous condensation allows effacement of the subcutaneous tissue resulting in a midline depression.

### Marking and Incision of New Position for the Umbilicus

The new position of the umbilicus is marked in the midline by putting superiorly directed traction of the umbilicus and transposing the location of the umbilicus to the skin surface. This is typically about 2 cm superior to the level of the iliac crest. An inverted V-shaped incision is made with a no.11 blade scalpel and the fat deep to the incision is excised to create a depression for the umbilicus. An inverted V incision is preferred as this results in superior hooding. The inferiorly based skin flap created by the inverted V-shaped incision will be inset into the split in the inferior aspect of the umbilicus in a tongue-and-groove manner. This creates a pleasing umbilical contour while helping to avoid circumferential scar contracture of the umbilicus.

### Local Anesthesia Infiltration and Insertion of Pain Pump Catheters

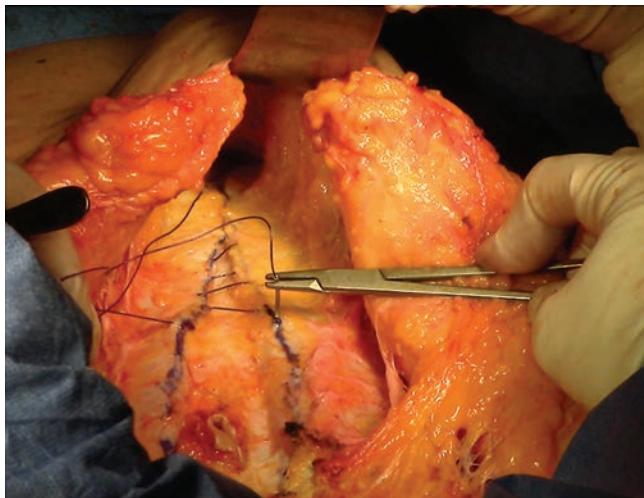
To provide optimal postoperative pain management, 20 mL of 0.25% marcaine are injected into the abdominal fascia. Two marcaine pain pump catheters (Alpha 200

Infusion Pump, Advanced Infusion, San Dimas, CA) are inserted deep to the anterior rectus sheath for continuous infusion of marcaine, postoperatively. The pain pump is loaded with 80 mL of 0.5% marcaine mixed with 32 mL of 0.9% sodium chloride solution. It is administered at a rate of 4 mL/hour for 12 hours total.

## Barbed Progressive Tension Sutures

Progressive tension sutures are used to fixate the abdominoplasty flap to the abdominal deep fascia to help prevent seroma formation by obliteration of dead space and preventing shearing of the abdominoplasty flap from the abdominal deep fascia.

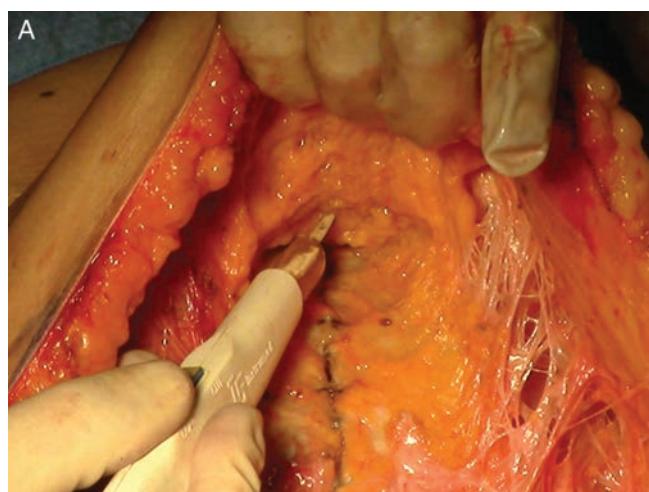
The planned location of the first barbed progressive tension suture is marked with ink as a longitudinal line over



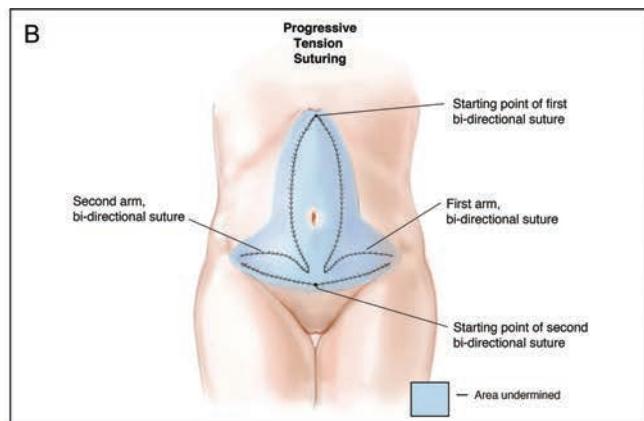
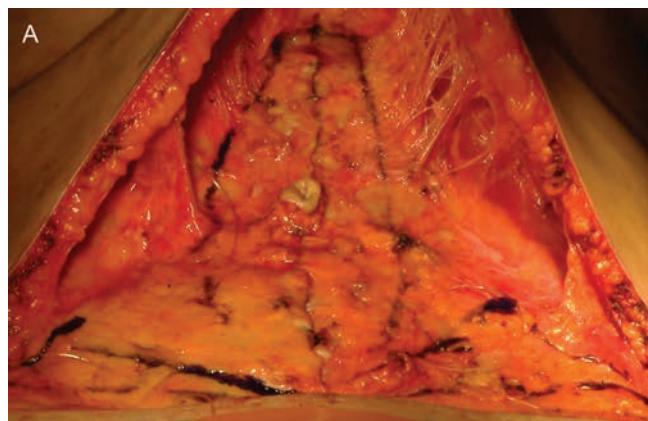
**Figure 6.** Plication of the fascia is performed with a two layer continuous #2 PDO Stratafix barbed suture.

the lateral aspects of each rectus abdominis muscles from the xiphoid to the mons pubis and continued laterally to the lateral extent of the lower abdominal incision (Figure 8). The lateral extensions curve superiorly and then inferiorly so the suture ends up halfway between the lower abdominal incision and the superior extent of undermining. The second barbed progressive tension suture is marked along the lower abdominal incision and is described later. Progressive tension sutures are performed using 0 PDO Stratafix.

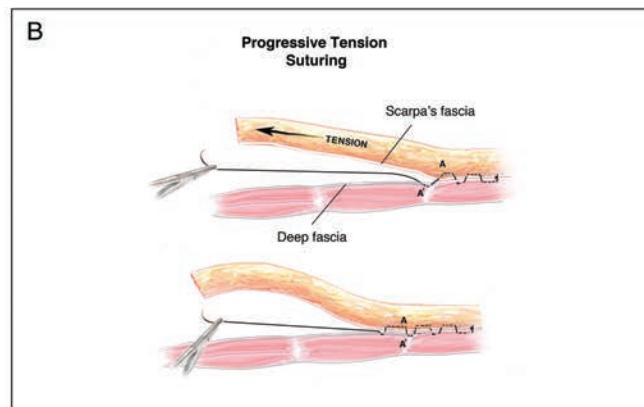
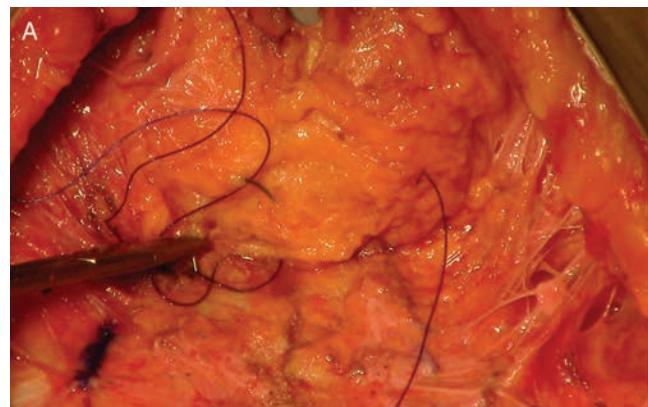
When performing the progressive tension suture, the suture should be passed through Scarpa's fascia in the abdominoplasty flap and the abdominal deep fascia to have adequate purchase. The suture should not be placed superficially in the abdominoplasty flap as this will result in dimpling of the skin that will not resolve with time (Figure 9). Careful placement of the barbed suture through Scarpa's fascia is critical to avoid dimpling of the skin. The first suture is placed at the superior extent of undermining in the midline. Each arm of the bidirectional suture is continued in an inferior direction to the right and the left of the midline to close the dead space in the paramedian area. The suture should pass within the tissues and spanning sutures should be avoided. It is important to reassess where each suture should be placed by redraping the abdominoplasty flap onto the abdominal fascia after each suture pass. During the vertical component of the first progressive tension suture, between the xiphoid and mons pubis, the sutures are placed more medially on abdominoplasty flap and more laterally on the abdominal deep fascia to appropriately redrape the flap and prevent skin bulging in the midline, thereby creating a smoother contour. During the horizontal component of the first progressive tension suture, along the lower abdominal incision, the sutures are placed more laterally on abdominoplasty flap and more medially on



**Figure 7.** (A) Intermittent scoring of the fibrous condensation in the midline with cautery creates a concavity which accentuates (B) midline definition.



**Figure 8.** (A) Photographed and (B) illustrated marking of the abdominal musculoaponeurotic layer where the progressive tension sutures will be performed for obliteration of dead space and inset of abdominal flaps.



**Figure 9.** (A) Photographed and (B) illustrated progressive tension suturing between the abdominal musculoaponeurotic layer and Scarpa's fascia.

the abdominal deep fascia to appropriately redrape the lateral abdominal skin and help prevent dog ear formation at the lateral extent of the lower abdominal incision. Provisionally closing the lower abdominal incision with towel clips will help to ensure appropriate redraping of the abdominal skin while performing progressive tension sutures in the lower abdomen. The towel clips are intermittently removed and replaced as the progressive tension suture is performed medial to lateral to ensure precise insetting of the lower abdominal flap.

### Barbed Three-Point Suspension Sutures of the Lower Abdominal Incision

The lower abdominal incision is closed with a 0 PDO Stratafix, continuous three-point suture between Scarpa's fascia of the superior and inferior wound edges and the deep fascia. The suture is started in the midline and performed in a medial to lateral direction bilaterally. Ensuring that Scarpa's fascia is secured with each pass of the suture is especially important to ensure correction of mons pubis

ptosis. Additionally, closure with this long absorbing suture will prevent scar widening and migration.

### Closure

The skin is reapproximated with 3-0 Vicryl (Johnson & Johnson, Markham, Ontario, Canada) interrupted, inverted deep dermal sutures followed by a continuous, horizontal mattress deep dermal suture. Staples are used on the skin.

The umbilicus is inset with 4-0 Monocryl Plus (Johnson & Johnson, Markham, Ontario, Canada) interrupted, inverted deep dermal sutures followed by a continuous, intradermal suture. The continuous suture should not be pulled tight or this will lead to circumferential scar contracture of the umbilicus (Figure 10).

### Application of Dressings and Abdominal Binder

The pain pump is secured and activated. The incisions are dressed with petroleum gauze and ABD pads (Medline,

Mundelein, IL). An abdominal binder is placed over the dressings.

## Postoperative Care

The multimodal postoperative oral analgesia regime continues with celecoxib 200 mg once daily for five days, and oxycodone hydrochloride 5 mg/acetaminophen 325 mg (Bristol-Myers Squibb, Montreal, Quebec, Canada) one to two tablets every four to six hours as needed. Most patients are encouraged to discontinue narcotic pain medicine within one week following surgery. Additionally, ondansetron hydrochloride dehydrate 8 mg three times daily is continued for one day following surgery to prevent postoperative nausea and vomiting and docosate sodium 100 mg (Apotek, Toronto, Ontario, Canada) twice daily is continued while taking any narcotic pain medicine. Patients take Arnica montana 12C (Boiron, Saint-Bruno-de-Montarville, Quebec, Canada) five pellets three times daily for 10 days to help with ecchymosis and swelling.

All abdominoplasty surgeries alone or in combination with other procedures are performed as ambulatory surgery. Typically, the patient ambulates with assistance within one hour after completion of surgery.

Routine follow-up is scheduled at 1 day, 6 days, 2 weeks, 4 weeks, 6 weeks, 3 months, and 1 year after surgery. During the postoperative day 1 visit, the dressings are changed and the Marcaine pain pumps are removed. The abdominal binder is discontinued and a compression garment is placed and worn at all times except during showers for 6 weeks postoperatively. Patients are encouraged to shower once daily starting postoperative day 2 and apply antibiotic ointment to the incisions three times daily. At the postoperative day 6 visit, the staples are removed and SteriStrips (3M, St. Paul, MN) are applied. Patients begin massaging the abdomen to help with edema and desensitization. Silicone treatment of the scars is started once the incisions have completely healed, typically between 2 to 4 weeks postoperatively, and continued for 4 to 6 months after surgery. Patients typically resume normal activity at

2 weeks postoperatively and strenuous activity at 6 weeks postoperatively.

## CLINICAL EXPERIENCE

### Patient Demographics and Procedural Characteristics

This technique for drainless abdominoplasty has been performed by one of the senior authors (F.L.) since 2009. However, it was during 2011 when the second senior author (J.A.) joined the practice and we began to examine outcomes. We performed a retrospective chart review of all abdominoplasty surgery performed by the senior surgeons (F.L. and J.A.) with our technique for drainless abdominoplasty using barbed progressive tension sutures.

Between September 2011 and October 2015, 502 patients underwent abdominoplasty ([Figures 11 and 12](#)). The mean age was 41 years (range, 18-70 years) and 488 patients (97.2%) were female. The mean BMI was 25.4 kg/m<sup>2</sup> (range, 17.1-40.9 kg/m<sup>2</sup>). Liposuction was performed in 232 cases (46.2%) while repair of the diastasis recti was performed in 393 cases (78.3%). Two hundred and thirty-seven patients (47.2%) had abdominoplasty combined with another procedure.

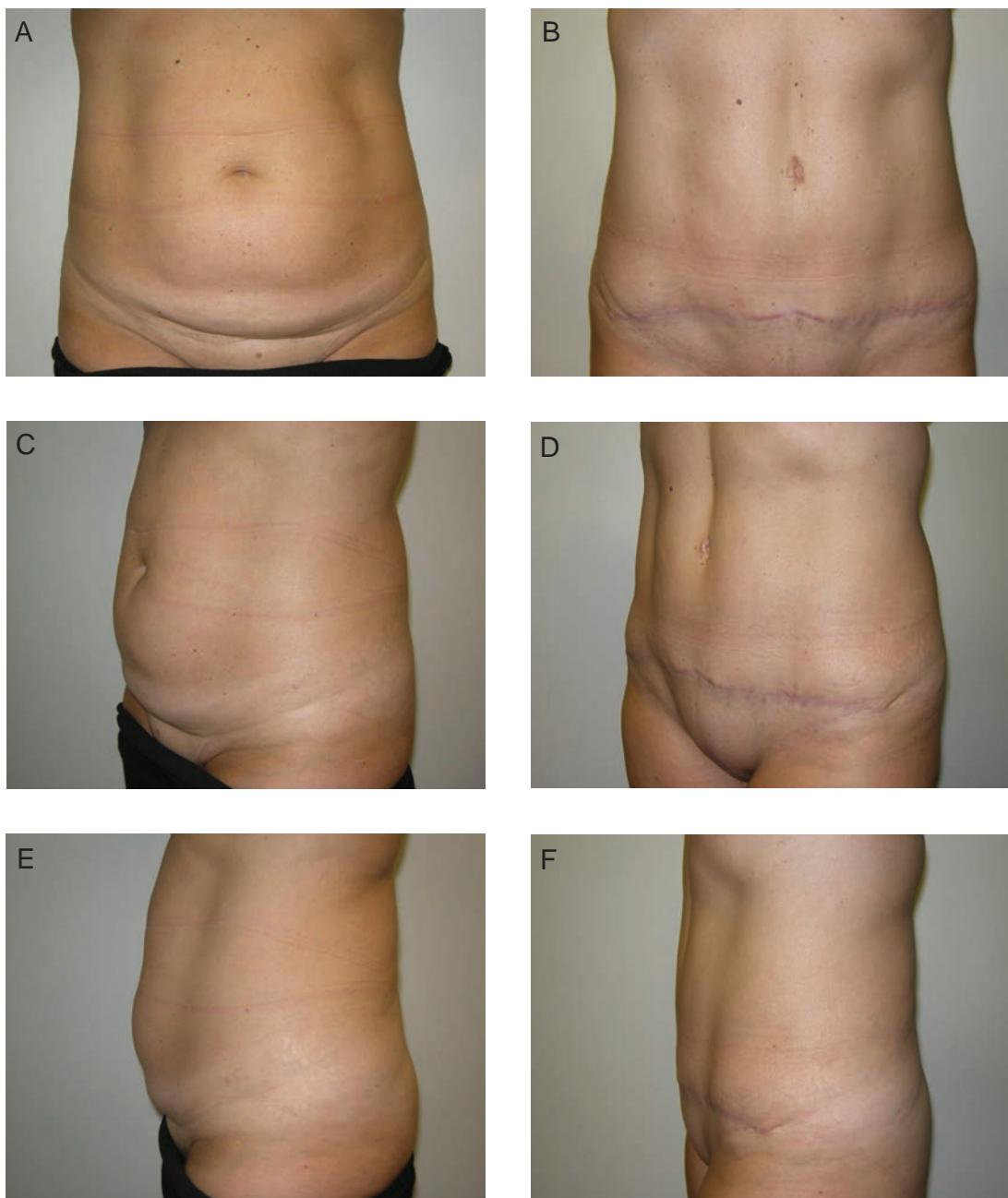
### Complications

The most common complication was seroma experienced by 20 patients (4.0%). All were treated with percutaneous needle aspiration every 3 to 7 days in clinic until they resolved; none required reoperation. Seromas were most commonly detected in the infraumbilical region around the 2-week postoperative visit. A range of 1 to 4 percutaneous aspirations every 3 to 7 days were required for resolution of the seromas ([Video 2](#), available as Supplementary Material at [www.aestheticsurgeryjournal.com](http://www.aestheticsurgeryjournal.com)). The number of aspirations required for resolution did not appear to correlate with the volume of seroma on initial detection.

Infection occurred in 4 patients (0.8%). Hematoma occurred in 1 patient (0.2%) and this required reoperation for drainage. Interestingly, the size of the hematoma was limited by the surrounding progressive tension sutures which restricted the potential space and acted to tamponade the bleeding. One patient (0.2%), who underwent abdominoplasty in combination with breast augmentation-mastopexy, experienced a pulmonary embolism that occurred on postoperative day 11. This was treated and did not result in any long-term sequelae. No persistent dimpling of the abdominal flap was noted by the surgeons nor the patients.



**Figure 10.** Appearance of abdomen after final wound closure.



**Figure 11.** (A, C, E) Preoperative and (B, D, F) 6-month postoperative photographs of a 52-year-old woman who underwent drainless abdominoplasty using barbed progressive tension sutures. Her BMI is  $25 \text{ kg/m}^2$ . She had liposuction and rectus diastasis repair. Her surgery is shown in Video 1.

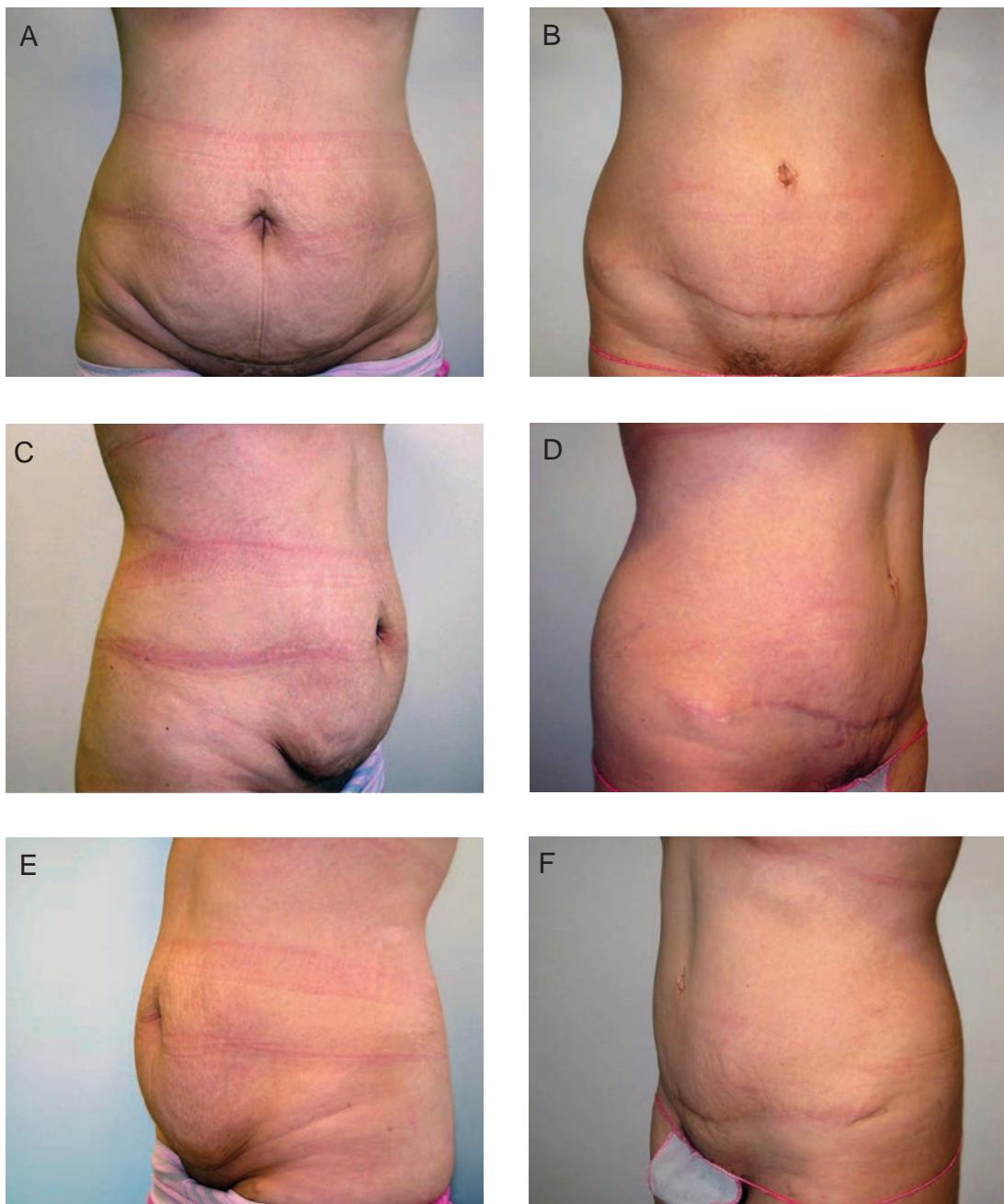
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## DISCUSSION

The etiology of seroma formation following abdominoplasty is multifactorial. In our technique for drainless abdominoplasty, multiple strategies are employed to reduce this complication. Highlighted strategies include preservation of sub-Scarpal fat, limited undermining of the abdominal flap, and barbed progressive tension sutures. Preservation of sub-Scarpal fat may help obliteration of dead space and help adherence of the

abdominal flap to the musculopaponeurotic abdominal wall. The limited undermining is necessary for preservation of vascular supply of the abdominal flap allowing liposuction, if indicated, to be safely combined with abdominoplasty. Additionally, the limited undermining limits dead space.

Performing progressive tension sutures is a critical step in our drainless abdominoplasty technique. This strategy aims to reduce seroma formation through obliteration of dead space and prevention of shearing



**Figure 12.** (A, C, E) Preoperative and (B, D, F) 3-year postoperative photographs of a 45-year-old woman underwent drainless abdominoplasty using barbed progressive tension sutures. Her BMI is  $26 \text{ kg/m}^2$ . She had liposuction and rectus diastasis repair.

between the abdominoplasty flap and musculoaponeurotic abdominal wall. The suture used is a PDO Stratafix and was specifically chosen to allow for an expeditious and reliable closure. The presence and bidirectionality of the barbs in the PDO Stratafix suture facilitate execution and speed of the maneuver by maintaining the tension of the suture in the tissue as it is progressively placed interfascial or between the fascial and subcutaneous tissues. This absorbable Polydioxanone suture is essentially absorbed

between 180 and 220 days, which is nearly double the length of time the suture is retained compared to other available absorbable barbed sutures composed of polyglycolide-polycaprolactone.<sup>38</sup>

Several techniques using barbed sutures have been described for progressive tension sutures during abdominoplasty. Warner and Gutowski<sup>39</sup> described using Quill barbed suture (Angiotech Pharmaceuticals, Inc., Vancouver, British Columbia, Canada) for progressive tension sutures. They examined the time taken to perform progressive tension

sutures with Quill barbed suture and found that the use of barbed suture decreased the time taken to perform this aspect of abdominoplasty compared with interrupted progressive tension sutures. With their technique, they place multiple vertically oriented rows of progressive tension barbed sutures. They did not go into detail on the amount of undermining of the abdominoplasty flap or if there was any preservation of the sub-Scarpal fat, which may also help to decrease seroma formation. Additionally, they did not use a three-point barbed suture closing along inferior incision.

Rosen<sup>40</sup> compared the effect of using Quill barbed sutures without drains to non-barbed sutures with drains for abdominoplasty closure on operative time, closure cost, and complications. There was no seroma in the barbed suture group and 1 seroma in non-barbed suture group. This article focused on a comparative analysis between the two groups and not on the other technical aspects which may also contribute to decreasing seroma formation.

In this article, we have attempted to describe all of the technical strategies that may contribute to reducing the incidence of clinically significant seroma formation. The major strategies in our abdominoplasty technique including sub-Scarpal preservation of fat, limited undermining of the abdominal flap, and progressive tension sutures to close dead space.

## CONCLUSIONS

Based on our series, this is a safe, reliable drainless abdominoplasty technique utilizing barbed progressive tension sutures. It consistently improves abdominal contour while minimizing complications.

## Supplementary Material

This article contains supplementary material located online at [www.aestheticsurgeryjournal.com](http://www.aestheticsurgeryjournal.com).

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