Treating the Abdominotorso Region of the Massive Weight Loss Patient: An Algorithmic Approach

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Summary: There has been tremendous growth in the number of patients seeking body contouring procedures after massive weight loss. Most patients desire improvement of the abdominotorso region first. After massive weight loss, there is enormous variability of body proportions, and therefore there have been many surgical options proposed based on the quality of the skin, subcutaneous fat component, and location of the lax tissue. Each area needs to be assessed to see whether there is a significant lower abdominal component, an upper midline abdominal component, or contributions from the buttocks and flanks. An algorithm for treatment is presented to simplify the decision-making process. Patient examples are also shown to demonstrate the usefulness of the algorithm. (Plast. Reconstr. Surg. 121: 1431, 2008.)

A s a result of the increasing popularity of bariatric surgery, plastic surgeons are treating greater numbers of massive weight loss patients. These patients typically lose more than 100 pounds and have significant skin laxity with varying amounts of subcutaneous tissue excess. Commonly, the abdominotorso region is treated first; it often gives patients the most grief. The overhanging pannus may predispose this region to rashes and can make it difficult for patients to wear properly fitted clothing.

Several authors have proposed systems that have become useful tools for classifying and treating patients desiring abdominal contour surgery.1–3 However, these systems do not adequately classify the massive weight loss patients who are now seeking treatment.

Recently, a classification of contour deformities after bariatric weight loss was described by Song et al.4 The system involved evaluating 10 different anatomical regions commonly treated after massive weight loss. A table was used to illustrate preferred treatment plans for different anatomical regions based on this rating system, but details regarding the different treatment plans were not elucidated.

It is rare for a massive weight loss patient to undergo just a full abdominoplasty; treatment of the flanks and buttocks has become common. Therefore, many patients require a more involved procedure such as a circumferential abdominoplasty or even one that uses a fleur-de-lis approach. It stands to reason that a new system is necessary to classify and treat this subset of abdominotorso contour patients. In a fashion similar to the approach for arm contouring described by Appelt et al.,5 the author has developed an algorithm for treatment and classification of the abdominotorso region specifically for the massive weight loss patient. Included are descriptions of the procedures and patient examples illustrating the usefulness of the algorithm (Fig. 1).

PREOPERATIVE EVALUATION

A discussion with the patient is performed regarding their surgical goals, the various surgical treatment options, and the impact that their medical conditions can have on the surgical outcome. Surgery is usually delayed until the weight loss has

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plateaued; for a bariatric surgery patient, this is usually after at least a 100-pound weight loss or longer than 1 year after the gastric procedure. Sometimes, surgery is performed sooner for a patient who requires a panniculectomy to assist in the management of other conditions.

The patient is first examined in supine position and evaluated for hernias and the extent of rectus diastasis. A patient that has had an open abdominal procedure has an increased risk of hernia formation. A massive weight loss patient may have an excess subcutaneous fat component, which can make palpation of a hernia difficult. Therefore, the hernia can remain occult until the time of surgery.

The patient is then examined in the standing position. The abdominal region is evaluated for skin laxity and the extent of the subcutaneous fat component. Often, the patient will have striae, poor skin elasticity, and recalcitrant rashes not amenable to conservative treatment. A pinch test is performed in a horizontal fashion to evaluate the amount of tissue that can be excised. The horizontal pinch is performed on the lower transverse abdominal tissue that would be excised commonly during a routine full abdominoplasty. The laxity and quality of the skin are evaluated in a vertical dimension in the supraumbilical region as well. Using the vertical upper abdominal midline as a reference point, a vertical pinch is performed pinching tissue from each side of the midline to evaluate the upper abdominal midline excess and laxity. If a vertical pinch improves the upper abdominal waistline and can eliminate supraumbilical fullness, the possibility of performing a vertical midline incision is discussed. The threshold for using this additional incision is lowered if the patient has a preexisting paramedian or midline vertical scar.

The patient is then examined for mons pubis ptosis. This is marked in accordance with Baroudi’s description, leaving a 5- to 7-cm length from the vulvar commissure to the top of the mons pubis. The patient is evaluated in a right lateral, left lateral, and posterior standing position using the horizontal pinch test to evaluate the impact the pinch has on lateral and anterior thigh laxity and buttock ptosis (Table 1).

The preoperative examination is essential because there is tremendous variability of skin quality, amount of the subcutaneous fat, and distribu-
tion of tissue laxity in these patients. Furthermore, it is during this period when the risks, benefits, and alternatives of all procedure options can be discussed thoroughly with the patient.

CLASSIFICATION SYSTEM

Type I: Full Abdominoplasty

This patient has moderate abdominal skin laxity with variable amounts of subcutaneous fat. The vertical skin and subcutaneous component contributing to the abdominal girth is minimal. The laxity in the upper abdomen can be treated by superior elevation and excision in a transverse fashion along the lower abdomen as performed for non–massive weight loss patients. The flanks and buttocks are not significantly lax and are not treated. Repair of the rectus diastasis is performed. This patient has fairly good skin elasticity that contributes to the resiliency of the tissues, precluding the need for a more involved procedure. I have found this more commonly in the younger massive weight loss patient or in those patients who have had less than a 100-pound weight loss. However, in general, this massive weight loss patient is not common. Traditional abdominoplasty procedures have been described elsewhere. Two closed suction drains are placed in the mons pubis region through separate stab incisions. They are removed once the total fluid is less than 30 cc/24-hour period, usually within 1 week. The patient is encouraged to ambulate the first night of surgery and is to wear an abdominal binder for 3 to 6 weeks (Fig. 2).

Type II: Fleur-de-Lis Abdominoplasty

A massive weight loss patient ideally fitting this profile is more theoretical than an actual patient. If individuals have enough vertical laxity to warrant a fleur-de-lis, they will likely have similar laxity of the flanks and buttocks, requiring a circumferential procedure. Unlike the type I patient, there is significant vertical laxity contributing to the overall girth that cannot be treated alone by undermining and excision along the lower abdomen. Furthermore, diastasis repair alone will not significantly narrow this patient. The superior flap is undermined and the redundant tissue is resected in the vertical midline to decrease the overall girth. The redundant transverse component is then resected once the vertical component is reconciled. The key to the closure is minimal tension. This patient is not flexed more than 20 to 30 degrees to remove the excess tissue. The postsurgical care is similar to that used for the type I patient; however, I find that the drains stay in for several days longer (Fig. 3).

Type III: Circumferential Abdominoplasty

This procedure is indicated for a patient with moderate to severe skin laxity of the abdominal skin with a significant flank/buttock component. The patient may have minimal to moderate excess in the supraumbilical component that can be treated by undermining alone and excising along the lower transverse abdomen. In addition, the patient requires resection of the flank/buttock component to treat the laxity. After anesthetic induction, the patient is placed prone and the buttocks and flanks are treated first. The excess tissue is resected and closed without tension or significant undermining. The patient is then placed supine and the abdominal component is treated. The patient is flexed 5 to 10 degrees for final excision and closure of the lower transverse abdomen. The postsurgical care is similar to that described earlier, with the exception that four closed suction drains are placed. Two drain the buttock and flank region and two drain the abdominal region. These drains will often be kept in for 2 to 3 weeks (Fig. 4).

Type IV: Fleur-de-Lis Circumferential Abdominoplasty

This patient has significant upper abdominal laxity, and redundancy in the lower abdomen requiring both vertical and transverse excision. The flank and buttock regions contribute to the overall laxity and require treatment. There is noticeable laxity in the upper midline that contributes to the overall girth of the patient that cannot be treated by

<table>
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<tr>
<th>Type</th>
<th>Fat</th>
<th>Vertical Abdomen Laxity (girth)</th>
<th>Flank/Buttock Component</th>
<th>Treatment</th>
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<td>I</td>
<td>Variable</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Full abdominoplasty</td>
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<td>II</td>
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<td>Fleur-de-lis abdominoplasty</td>
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<td>III</td>
<td>Variable</td>
<td>Minimal to moderate</td>
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<td>Circumferential abdominoplasty</td>
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<td>IV</td>
<td>Variable</td>
<td>Severe</td>
<td>Moderate to severe</td>
<td>Fleur-de-lis circumferential abdominoplasty</td>
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<td>V</td>
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<td>Panniculectomy</td>
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just undermining of the superior flap and resection along the inferior abdominal incision. Technical variations for treatment have been described elsewhere. As with the type III patient, the patient is placed prone and the buttock and flank tissue is excised without undermining and with minimal tension. The patient is then placed supine and the abdominal component is treated. Once the superior flap is elevated, the excess in the vertical midline is treated. The patient is flexed 5 to 10 degrees and the redundant lower abdominal transverse component is excised. There is no tension on the closure. The keys to this procedure are in the initial marking of the patient, which is used as a guideline during the surgical procedure, and minimizing the abdominal closure tension (Figs. 5 and 6).

**Type V: Panniculectomy**

This is reserved for a patient who has significant amounts of subcutaneous fat with moder-
ate to severe skin laxity. This patient is best treated after his or her goal weight is achieved, when the patient can be assigned to a type I to IV abdominotorso group. Unfortunately, because of hygiene issues or the need to perform other surgical procedures (i.e., general surgical, gynecologic, or urologic procedures), the pannus is obstructing access and requires excision. This patient is still overweight and has significant surgical risks including delayed wound healing. Delaying surgery until weight loss is complete is preferable, because the risks of surgery are significantly diminished. Excision of the pannus is performed without undermining to avoid creating poorly perfused tissue and to decrease the risk of seroma formation. In some instances, the umbilicus may have to be sacrificed (Fig. 7).

Fig. 3. A 48-year-old woman, 5 feet 2 inches tall, after a 101-pound weight loss. She had had a recurrent umbilical hernia and multiple scars on her abdomen. The patient had significant laxity of her lower abdomen, her vertical midline abdomen, and her flanks and buttocks. The patient chose not to have the flanks and buttocks treated at the time of surgery. Appearance preoperatively (left) and 7 months after fleur-de-lis abdominoplasty and 1 month after umbilicoplasty (right).
CASE REPORTS

**Case 1**

A 36-year-old woman, 5 feet 2 inches tall and initially weighing 228 pounds, lost 78 pounds after undergoing a laparoscopic gastric bypass and weighed 150 pounds. On physical examination, she had moderate skin laxity confined to her lower abdomen, with minimal upper midline vertical skin laxity. She was classified as a type I patient that underwent a full abdominoplasty. Her 3-week postoperative photographs are shown (Fig. 2).

**Case 2**

A 48-year-old woman, 5 feet 2 inches tall and initially weighing 275 pounds, lost 101 pounds after her gastric bypass and weighed 174 pounds. The patient had significant skin laxity of her abdomen, flanks, and buttocks, including severe supraumbilical laxity. She had a reducible umbilical hernia. She also had an upper vertical midline scar, a prior appendectomy scar, and previous laparoscopic bypass incisions. Although she was a good candidate for a type IV procedure, she opted to be down-staged to a type II, fleur-de-lis abdominoplasty for financial reasons. At the time of her combined type II procedure and umbilical

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**Fig. 4.** A 34-year-old man, 6 feet 1 inch tall, after a 145-pound weight loss, with moderate skin laxity and significant lower abdominal transverse laxity and significant buttock and flank laxity. He had an upper midline vertical scar. He did not have significant vertical abdominal skin laxity. He was classified as a type I patient that underwent a full abdominoplasty. Preoperative (left) and 3-month postoperative (right) appearance following a full abdominoplasty.
hernia repair, the general surgeon elected to amputate her umbilical stalk. The patient underwent an umbilicoplasty 6½ months after the type II operation. Photographs of the 7½-month result from the type II procedure and 1 month after her umbilicoplasty are shown (Fig. 3).

Case 3

A 34-year-old man, 6 feet 1 inch tall and initially weighing 360 pounds, lost 145 pounds after an open gastric bypass procedure and subsequently weighed 215 pounds. On physical examination, he had moderate skin laxity confined to the lower abdomen and a moderate amount of subcutaneous fat. He also had significant buttock and flank laxity. The patient had an upper midline vertical scar that he did not want revised. He was classified as a type III patient. His 3-month postoperative result is shown (Fig. 4).

Case 4

A 47-year-old woman, 5 feet 6 inches tall and initially weighing 285 pounds, subsequently weighed 178 pounds after a laparoscopic gastric bypass. On physical examination, she had sig-
significant transverse and vertical laxity of the abdomen and significant flank and buttock laxity. She had undergone three prior cesarean sections: one by means of a lower midline vertical abdominal incision and the others through a Pfannenstiel incision. She was an excellent candidate for a type IV procedure. Her 6½-month postoperative photographs are shown (Figs. 5 and 6). She was pleased with her postoperative result but developed meralgia paresthetica in her left upper thigh.

A 43-year-old woman, 5 feet 6 inches tall, after a 78-pound weight loss, with a large painful umbilical hernia. The patient had significant skin laxity and rashes below her large abdominal pannus. She had a significant amount of fat in her subcutaneous component circumferentially and had a previous upper vertical midline incision. She was still actively losing weight. Because she needed to have her umbilical hernia treated but was still severely overweight, she was a good candidate for a panniculectomy. Preoperative view (left) and 16 months after panniculectomy with umbilical sacrifice (right).

Fig. 6. Additional views of the patient shown in Figure 5.

Fig. 7. A 43-year-old woman, 5 feet 6 inches tall, after a 78-pound weight loss, with a large painful umbilical hernia. The patient had significant skin laxity and rashes below her large abdominal pannus. She had a significant amount of fat in her subcutaneous component circumferentially and had a previous upper vertical midline incision. She was still actively losing weight. Because she needed to have her umbilical hernia treated but was still severely overweight, she was a good candidate for a panniculectomy. Preoperative view (left) and 16 months after panniculectomy with umbilical sacrifice (right).
Case 5
A 43 year-old woman, 5 feet 6 inches tall and initially weighing 303 pounds, weighed 225 pounds after an open gastric bypass and was not at her ideal weight. She was referred by her bariatric surgeon to remove the pannus in conjunction with treatment of her painful umbilical hernia. On physical examination, the patient had a large reducible umbilical hernia and an upper midline vertical scar. She had significant skin laxity and rashes below her abdominal pannus. She was a candidate for type V procedure at this time and desired further treatment of other anatomical regions once her weight loss was complete. The patient underwent a type V procedure (panniculectomy) combined with an umbilical hernia repair and sacrifice of her umbilicus. Sixteen-month postoperative results are shown (Fig. 7).

DISCUSSION
The algorithm described is based on ideal patient conditions so that general guidelines can be used as a starting point for patient classification and treatment. Most massive weight loss patients who desire abdominal contour surgery fall into the five general treatment categories that I have described previously. Types I through IV are those patients who have reached their goal weight. The type V patient (i.e., one that requires a panniculectomy) is the one that has not reached her ideal body weight but requires excision of the abdominal pannus to facilitate other surgical procedures (i.e., gynecologic, urologic, or general surgical procedures).

The classification system described is simple and straightforward (Fig. 1). Although many of the patient categories appear to have very similar characteristics, there are unique differences. A type I patient has minimal supraumbilical vertical pinch laxity and does not have flank or buttock laxity. Both the type II patient and the type IV patient have severe vertical abdominal laxity demonstrated by a significant vertical pinch; this differentiates them from the other types. What should differentiate the type II from the type IV patient is that the type IV patient also has significant flank and buttock laxity, warranting a circumferential procedure. In my experience, a type II patient is a theoretical entity. I do not think the patient really exists in the sense that she could only have significant vertical upper midline laxity without also having flank and buttock laxity. The type II patient that I encounter is originally classified as a type IV patient but, because the patient may not be able to afford the circumferential procedure or may not want the increased surgical risk of a lengthier and more complex surgical procedure and/or the potential increased downtime from the procedure, opts to be down-staged to have a type II procedure. The type III patient does not have significant supraumbilical fullness or laxity that, on performing a vertical pinch, warrants a fleur-de-lis procedure yet still has the laxity in the flanks and buttocks that warrants a circumferential procedure.

Abdominotorso contour surgery in the massive weight loss patient involves a complex decision-making process to ensure the best result with the least amount of complications.20,21,26,30,31 With this, there are certain tradeoffs that a massive weight loss patient must consider when choosing an abdominotorso contouring procedure. These include the following: reconciliation of scarring versus additional contour improvement, the amount of time that the patient can take off from work or daily activities, and the potential financial obligations that may impact the choice of surgical procedure. More extensive procedures will probably require a longer convalescence period, additional incisions, and often a greater financial burden, all of which impact the patient’s decision. Certainly, many variables including those described above can impact the procedure choice, and in some cases downstaging to a lesser procedure may be appropriate.

Prior surgical procedures can impact the choice of treatment. There has been some debate regarding abdominoplasty after open cholecystectomy because of the potential of having a limited blood supply to tissue that would end up between the new lower abdominal scar and the cholecystectomy scar.32,33 Chevron incisions in the upper midline may lead to consideration of using a reverse abdominoplasty.34–36 Commonly, a McBurney incision, a lower midline or paramedian vertical incision, and a Pfannenstiel incision can usually be removed when performing one of the five procedures described. Having a vertical upper midline abdominal scar may tether and restrict movement of the upper abdominal flap. A simple scar revision for a patient without significant midline vertical laxity or using a fleur-de-lis approach for the patient that does have significant vertical laxity can alleviate this problem.

Often, the massive weight loss patient requests treatment of several different anatomical regions. Combining surgical procedures in addition to the abdominotorso contour procedure can impact the treatment choice as well. Sometimes, these may be performed together during the same operative session. However, performing combined procedures will increase the length of surgery and complexity, and may increase the risk of complications, requirement for blood transfusions, and need for extended hospital stays,37,38 although
some studies do not support the potential increased complication risk. The patient may be down-staged to a less invasive abdominotorso procedure while also treating the additional anatomical region, so that these risks can be minimized. For instance, a mastopexy or breast reduction procedure using a Wise pattern performed in combination with an abdominal contour procedure may impact the blood supply to the abdominal flap, especially with a fleur-de-lis approach, and so down-staging may be appropriate.

Sometimes, the massive weight loss patient requires hernia repair, and this can be performed in conjunction with their abdominotorso contour procedure. An umbilical or incisional hernia usually does not affect the choice of surgical procedure but may impact the complexity and length of the procedure, potentially increasing the risks as well. Hernia repair in conjunction with an abdominotorso contour procedure may impact the viability of the umbilicus (see case 2), and when a ventral hernia is repaired, it may impede the quality of the diastasis repair.

The algorithmic approach is set up for the ideal situation, barring contributory medical conditions, scarring, hernia repair, or combined procedures. The algorithm is presented to provide an easy, reliable method with which to classify patients so that an adequate treatment plan can be offered.

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**REFERENCES**