Abdominal Contour Surgery for the Massive Weight Loss Patient: The Fleur-De-Lis Approach

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Background: Massive weight loss patients often have significant upper midline abdominal fullness that contributes to the overall abdominal girth. This region frequently is not adequately treated with conventional abdominoplasty techniques.

Objective: The author used a fleur-de-lis pattern when performing a full abdominoplasty or circumferential abdominoplasty. The technical refinements of this procedure for massive weight-loss patients are presented, as well as considerations of the technique's safety.

Methods: A full abdominoplasty pattern was marked, and the inferior incision was lowered along the midline to adjust for mons pubis ptosis as necessary. The vertical component of the abdominoplasty was marked as an inverted "V" or triangle to decrease the abdominal girth, and the cephalic portion was "rounded off" to create an inverted "U." It was important to lower the final incision of the superior margin of the original abdominal pannus resection approximately 2 to 3 cm to allow for minimal tension at the lower abdominal midline closure. The back and flanks were marked for those patients undergoing a circumferential procedure using a gull-wing type incision, joining it with the anterior abdominal marks. The mid-axillary line was marked bilaterally. Vertical reference lines were also drawn along the back to aid in aligning the upper and lower back incisions. The back was treated first for those patients undergoing a circumferential procedure, and then the patient was repositioned supine for treatment of the abdomen and flanks.

Results: Ten patients whose average weight loss was 137 pounds after gastric bypass surgery underwent abdominal contour surgery incorporating a fleur-de-lis pattern. Two men and 8 women with ages ranging from 17 to 53 years (average, 39 years) were treated. Seven underwent a circumferential procedure whereas 3 underwent an isolated abdominoplasty. The follow-up period ranged from 1 month to 26 months, with an average follow-up of 9.5 months. Five patients had a hernia repair performed in conjunction with the abdominal contour surgery. There was no flap loss or wound dehiscence at the inverted "T" closure for any patient.

Conclusions: Use of a fleur-de-lis pattern in abdominal body contouring is a safe and effective technique for properly selected massive weight-loss patients. It is particularly appropriate for those patients with significant upper midline abdominal fullness. (Aesthetic Surg J 2005;25:454-463.)

The number of gastric bypass surgery procedures performed in the United States jumped from 16,000 in 1992 to 145,000 in 2004.1 The ultimate postoperative result of bariatric surgery programs is often flaccid skin and variable amounts of excess subcutaneous tissue. This has led to predictions that many of these patients will undergo plastic surgery to improve the contour of multiple body regions.2

Patients wait at least 1 year after gastric bypass surgery or until their weight loss has stabilized before undergoing body contour procedures. Commonly, they lose in excess of 100 pounds. Some patients may complain about intertrigo between the redundant skin folds that does not improve with nonoperative treatment. Others are concerned that the redundant tissues limit their ability to purchase properly fitted clothing. Most patients just want improvement in the overall contour of their abdomen.

Although some patients can be categorized according to the abdominolipoplasty system of classification,3 in many cases such categorization is not possible because of the excessive amount of loose skin and subcutaneous tissue that accompany the weight loss. Conventional abdominal contour procedures, ranging from lipoplasty to a full abdominoplasty, often cannot treat these patients adequately. In fact, many patients have skin and subcutaneous tissue excess of both the vertical and horizontal abdominal components, which significantly contributes to their overall girth.

Traditional belt lipectomy procedures, such as those described by Gonzalez-Ulloa4 and Muhlbauer,5 can treat the overhanging pannus but are less effective in improving the circumferential laxity contributing to the overall abdominal girth, especially in the regions above the umbilicus. Fleur-de-lis patterns described by Castanares and Goethel,6 and more recently by Dellon,7 can improve both
horizontal and vertical laxity by removing a circumferential component in the lower abdomen combined with an inverted “V” pattern excision from the upper abdomen. Incorporating the fleur-de-lis pattern for the abdomen with techniques described for the flank and buttock regions can treat the circumferential component successfully.8-10

In this article, the author reviews his experience treating massive weight loss patients using the fleur-de-lis pattern for both circumferential and isolated abdominoplasty, presents the technical refinements of this procedure, and reports on the safety of this technique for properly selected patients.

Material and Methods

Ten patients underwent surgery using a fleur-de-lis pattern; 7 patients underwent a circumferential procedure and 3 underwent an isolated abdominoplasty. The patients included 2 men and 8 women, aged 17 to 53 years (average, 39 years). The average weight loss prior to undergoing body contour surgery was 137 pounds. Four patients had undergone a laparoscopic gastric bypass procedure, and 6 had undergone an “open” procedure using an upper midline abdominal incision. One patient had a previous right subcostal abdominal incision from an “open” cholecystectomy. The follow-up period for patients in this study ranged from 1 month to 2 years and 2 months, with an average follow-up of 9.5 months. Five patients had a hernia repair performed in conjunction with the abdominal contour surgery.

Preoperative markings

Patients were marked in a standing position. The markings were used as a reference point for the excision during the surgical procedure, and adjustments were made during surgery to provide the desired result.

Initially, a full abdominoplasty pattern was marked; this area included the tissue from the superior border of the umbilicus to the lowest abdominal crease (Figure 1). The inferior incision was lowered along the midline to adjust for mons pubis ptosis as necessary. This was marked in accordance with Baroudi’s9 description, leaving a 5- to 7-cm length from the vulvar commissure to the top of the mons pubis for women. The vertical component of the abdominoplasty was marked as an inverted “V” or triangle to decrease the abdominal girth. The widest portion at the base of the triangle was determined by using a “pinch test,” and was commonly 10 to 16 cm wide (Figure 2). Rounding off the cephalic portion of the inverted “V” to be more like an inverted “U” increased the amount of tissue resected from the cephalic portion. It was also important to lower the final incision of the superior margin of the original abdominal pannus resection approximately 2 to 3 cm to allow for minimal tension at the lower abdominal midline closure (Figure 3).

The back and flanks were then marked for those patients undergoing a circumferential procedure. A “pinch test” was performed along the hip region, often removing 12 to 16 cm of tissue at the greatest width along the flanks (Figures 4 and 5).8-10 It was important to evaluate the gluteal cleft and determine the inferior resection mark first. Often the gluteal cleft is redundant because of the lax tissues, and it is a common mistake to mark the incision too high. A gull-wing type incision was made in the gluteal crease, and the superior extent of the excision was marked as well (Figure 6). These markings were then joined with the anterior abdominal marks to complete the incision design.

The mid-axillary line was marked bilaterally (Figure 5). These markings provided a reference point for closure...
when the patient was placed in a supine position, so that when anterior abdominal surgery was performed, the remaining wound could be closed with ease. Vertical reference lines were also drawn along the back to aid in aligning the upper and lower back incisions for closure, since the buttocks tend to rotate away from the midline during the excision (the right buttock clockwise, and the left buttock counterclockwise) and need to be repositioned correctly for the final closure (Figure 6). Final markings of the anterior abdomen are shown in Figure 7. For those patients undergoing a full abdominoplasty with a fleur-de-lis pattern, the mid-axillary and posterior markings were not drawn.

Operative technique

All patients wore sequential compression devices on the lower extremities. A Foley catheter was inserted and prophylactic antibiotics were administered. Anticoagulation medications were not used. For those patients undergoing circumferential treatment, endotracheal intubation was performed on a stretcher and the patient was then transferred to an operating table in a prone position. The lower back incision was performed down to the level of the muscle fascia. The tissue was elevated to the upper skin markings or until adequate resection limits were met—that is, when the proper buttock elevation was achieved and the lower back skin and soft tissue redundancy was eliminated. The upper back flap was not undermined, nor was the operating table flexed. No tension was placed on the closure of the wounds. Cauterization was performed almost exclusively using a coagulation mode to minimize blood loss in these often anemic patients. Careful hemostasis was performed during the excision of the redundant tissue as well. Two closed suction drains were brought out through separate stab incisions along the lateral thigh to facilitate monitoring of the fluid output and also to minimize postoperative discomfort when the patient was sitting or lying down. The superficial fascia system was repaired with 2-0 polydioxanone (PDS) suture (Ethicon, Somerville, NJ). The deep dermis was repaired in interrupted fashion using 3-0 poliglecaprone 25 (monocryl) (Ethicon) followed by an intracuticular repair using 3-0 monocryl as well.

The excision and closure were performed to the mid-axillary line previously delineated. The excess tissue at the mid-axillary line could be temporarily closed using staples and treated when the abdominal portion of the procedure was performed. The incision of the lower back and buttock region was then dressed with steri-strips and dress-
ing sponges; 1010 steridrapes (3M, St. Paul, MN) were placed over the dressing to minimize soilage during the abdominal portion of the procedure. The patient was then positioned supine. This was accomplished by turning the patient over carefully on the same operating table, or by transferring the patient to a second operating table. Transferring the patient to a second operating table was often easier.

The anterior abdominal portion of the procedure was performed in a similar fashion for both the circumferential and isolated abdominoplasty. The umbilical stalk was first circumscribed from the surrounding abdominal pannus. The lower abdominal incision was made extending to the mid-axillary line or, if the back was treated, to the previous incision lines laterally. The flap was undermined at the level of the anterior rectus sheath and continued cephalically to the xyphoid centrally and the costal margins laterally. The elevated flap was divided along the midline in a vertical fashion. The operating table was either left flat or slightly flexed to approximately 5 to 10 degrees for those patients who underwent a circumferential procedure, and to 20 to 30 degrees for those who underwent an isolated abdominoplasty procedure. The redundant tissue was then excised, after checking that the fleur-de-lis markings would meet at the lower midline. The midline diastasis was routinely plicated using interrupted figure-of-eight 0-Ethibond sutures (Polyester) (Ethicon), unless a hernia repair limited the plication. The midline repair was performed only to tighten the fascia, but it may help to narrow the waistline, as in a cosmetic abdominoplasty. The umbilical stalk was not commonly secured to the fascia unless the stalk was unusually long and the abdominal flap was significantly thin. Two additional closed suction drains were brought out through stab incisions in the mons pubis region.

The closure was performed in the same manner as the back wound, without significant tension. The umbilicus was inset in the midline vertical closure after a rim of abdominal flap skin was excised to match the circumference of the umbilical stalk. The umbilicus was then secured with 3-0 Poliglecaprone 25 (monocryl) (Ethicon) in the deep dermis and a running 4-0 Poliglecaprone 25
(monocryl) (Ethicon) at the intracuticular level. A sterile dressing was applied using steri-strips and dressing sponges along the incisions. A xeroform strip (Tyco Healthcare, Mansfield, MA) was placed in the umbilical stalk, and an abdominal binder was then applied.

Postoperative care

The patient was extubated and transferred to a hospital bed in the same final position as on the operating table. Most patients remained in the hospital for 1 night. They were instructed to get out of bed to a chair, with assistance, the night after surgery, and they usually went home the following morning. The sequential compression devices were maintained until the patient was fully ambulating, and the Foley catheter was removed the night after surgery. A clear liquid diet was started the night after surgery and advanced as tolerated. The patients were instructed to wear an abdominal binder for the next 3 to 6 weeks continuously. Normal activity and exercise regimens were gradually introduced during the following 3 to 6 weeks. All patients were maintained on oral antibiotics while the drains were in place. Drains were routinely removed after there was less than 30 mL drainage in a 24-hour period. This commonly occurred after 2 to 3 weeks.

Results

All patients were satisfied with their results (Table). One patient had a wound dehiscence along the hip region 16 days after surgery that healed secondarily. One patient had a 1 x 1-cm flap loss in the gluteal crease that healed without surgical intervention. One patient developed meralgia paresthetica, most likely from poor padding when placed in a prone position. There was no flap loss or wound dehiscence at the “inverted T” closure for any patient. There were no infections, hematomas, or seromas. One patient required a transfusion of 2 units; this was a patient who had undergone previous brachio-

Figure 6. A gull-wing incision is designed in the gluteal crease. It is important to keep the incision line low. Lifting the buttocks superiorly will facilitate marking the lower gluteal incision more accurately and minimize the risk of a superiorly placed scar. A “pinch test” is also performed in this region to determine the extent of excision. Reference lines are drawn to correctly align the final closure. The gull-wing incision design is then joined with the flank and anterior abdominal markings fold posteriorly, and connected to the anterior abdominal markings.

Figure 7. Final markings of the abdomen. The inverted "U"-shaped area is carried inferiorty approximately 2 to 3 cm below the original marking of the abdominal closure to account for length discrepancies when reapproximating the midline. This facilitates the closure in the midline and minimizes the tension.
plasty and mastopexy 3 months prior to her circumferential abdominal procedure and had a low-normal hemoglobin count prior to her circumferential abdominal procedure. All patients were treated in a hospital setting. Most stayed 1 night in the hospital; 2 patients stayed 2 nights. Typical cases are shown in Figures 8 through 11.

Discussion

The fleur-de-lis approach accomplishes many of the aesthetic goals of abdominal contour surgery for the massive weight-loss patient. It includes a vertical and low horizontal excision, resulting in the improvement of the abdominal girth and upper abdominal contour, and also removing an overhanging pannus. In addition, mons pubis ptosis and flank and buttock contour deformities can be treated at the same time. Even though an abdominoplasty with/without a circumferential component may improve the vertical component moderately, the fleur-de-lis pattern improves this area further.

Gastric bypass surgery can result in vitamin and mineral malabsorption. Patients can have a low hemoglobin count from the bypass procedure even after taking supplemental vitamins and iron. This is an important consideration for all patients undergoing further surgery, especially for those patients undergoing a circumferential abdominal procedure that could result in significant blood loss. Using the coagulation mode on the cautery as opposed to the cutting mode has helped minimize the blood loss in my patients. Even with meticulous hemostasis, a significant amount of blood is probably lost, given the amount that remains in the excised specimen.

I have found that many patients who have had laparoscopic gastric bypass with 4 to 5 stab incisions preferred to have a fleur-de-lis technique because of the contour improvement it affords, even though it requires more incisions. For those patients who have undergone “open” techniques, the upper abdominal scar already exists and, in fact, may hinder the redraping of the soft tissues by tethering the superior flap as it is pulled inferiorly during final tailoring. This technique can also be applied to older patients in whom scars are less of a problem, and who may have greater abdominal tissue laxity. In turn, the greater laxity will potentially reduce lateral tissue undermining so that the flap maintains better vascular perfusion.

The goal of aesthetic surgery is to provide the best result with a low complication rate. In general, the relative contraindications are similar to those for abdominoplasty. Patients with significant cardiovascular disease, hematologic or metabolic disorders, or thromboembolic disease should not be considered for this surgery. The threshold for performance of a fleur-de-lis abdominoplasty or circumferential procedure should be higher than for those

Table. Results of fleur-de-lis abdominoplasty after gastric bypass surgery

<table>
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<tr>
<th>Patient No.</th>
<th>Sex</th>
<th>Age</th>
<th>TWL</th>
<th>Surgery</th>
<th>Hernia</th>
<th>LOS</th>
<th>Transfusion (units required)</th>
<th>Complications</th>
<th>Follow-up (mos)</th>
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<td>202</td>
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<td>1-cm skin breakdown posterior</td>
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*TWL*, Total weight loss in pounds prior to abdominal contour surgery; *LOS*, length of stay in the hospital in number of days; *CFDLA*, circumferential fleur-de-lis abdominoplasty; *FDLA*, fleur-de-lis abdominoplasty; (+), patient required hernia surgery; (−), patient did not require hernia surgery.
patients undergoing a standard abdominoplasty; the patients should be in very good health.

Smokers are not treated unless they have stopped for at least 3 to 4 weeks prior to surgery. In general, morbidly obese patients who undergo surgery have significant risk for complications. However, it has been reported that abdominoplasty patients who have had prior gastric bypass surgery and are no longer obese do not have an increased risk of complications as compared to non-obese patients. Patients who are considering a future pregnancy should probably delay having this procedure. As is the case after a standard abdominoplasty, the result would be compromised by the usual body changes that occur from pregnancy; this translates into having recurrent loose skin and muscular weakness.

Abdominal wall scarring is a risk factor that has to be reconciled for each patient. Many scars, such as those resulting from a previous McBurney’s incision for appendectomy, lower transverse abdominal incisions, Pfannensteil’s incisions, and umbilical hernia incisions, can be incorporated into the design of the resected abdominal tissue. In fact, many Kocher subcostal incisions from an open cholecystectomy and midline vertical laparotomy scars can also be incorporated into the design of the fleur-de-lis procedure without jeopardizing the viability of the flaps. A chevron scar or upper midline transverse scar is a contraindication. Previous laparoscopy resulting in 4 to 5 small stab incisions is not a contraindication.

Abdominal scars increase the risk for hernia. It has been reported that 8.6% of patients who undergo an open gastric bypass and 0.5% of those who undergo a laparoscopic approach develop an incisional hernia. Interestingly, there is a more than 30% recurrence rate following repair. Abdominal contour surgery is often performed in conjunction with the herniorrhapay. In this series, 50% of patients had a hernia repair in conjunction with the fleur-de-lis procedure; 80% (4/5) were identified prior to surgery. Some hernias may not be palpable or symptomatic and are discovered while elevating the abdominal flap. Therefore, greater attention should be given to avoidance of injury to intraperitoneal organs while the flap is elevated. In addition, the hernia repair may affect the final contour because it may limit adequate diastasis repair, jeopardize the umbilical stalk survival, or as in 1 patient treated in this series, require the umbilical stalk to be excised.

Patients are offered options for treatment based on their physical examination and general medical condition. This includes a full abdominoplasty and belt lipoplasty, with or without a fleur-de-lis pattern. Patients can be downstaged to a less invasive procedure as a result of their overall medical condition, their desire for less scarring, potentially shorter recuperation, and potentially lower morbidity.

In his discussion of the potential for necrosis of the flap using a “T” closure, Huger states, “If the technique of midline lower wedge removal is chosen, all too often the unilateral blood supply to the right angle margins closed at the midline to the pubis is inadequate to sustain tissue viability at the point of closure.” His study and others have raised concerns about using a fleur-de-lis pattern. In this series, there were no central flap losses. I believe that an important reason for this success is proper patient selection. There were no active smokers in this group, nor any patients with medical conditions that could predispose to delayed wound healing. One patient had a right subcostal scar from a cholecystectomy. Alternative excision patterns were discussed with the patient preoperatively and re-evaluated intraoperatively, but fortunately were not necessary during the procedure. The cholecystectomy scar was incorporated into the vertical excision. Another very important reason why there was no central flap loss was the minimal amount of tension put on the flap during final closure. Most of the redundant tissue was removed in a vest-over-pants approach, so that the excision was not compromised and there was no significant tension upon closure. On the other hand, the abdominal flap was undermined extensively to the costal margins bilaterally and up to the xyphoid centrally, as I customarily do when performing a full abdominoplasty. Six of the 10 patients described had an upper midline vertical scar already present from their previous bariatric procedure. In theory, the scar may have contributed to a delay phenomenon of the upper abdominal flap and perhaps contributed to its overall viability. Further investigation is probably warranted to look at the numerous variables.

I do not perform lipoplasty of the elevated flaps during a circumferential abdominoplasty because I believe the potential for seroma formation is increased, given the large undermined area. Several investigators have suggested using quilting sutures or fibrin sealant to limit the “dead space” created during abdominoplasty; this may reduce the rate of seroma formation in patients undergoing abdominoplasty combined with lipoplasty. In addition, the undermined flaps may become devascularized when combined with lipoplasty, potentially increasing...
Figure 8. A, C, E, Preoperative views of a 34-year-old woman after a 117-lb weight loss. B, D, F, Postoperative views 3 months after circumferential fleur-de-lis abdominoplasty.

Abdominal Contour Surgery for the Massive Weight Loss Patient: The Fleur-De-Lis Approach
Figure 9. A, C, E, Preoperative views of a 45-year-old woman after a 125-lb weight loss. B, D, F, Postoperative views 7 months after circumferential fleur-de-lis abdominoplasty. Patient had a previous brachioplasty and mastopexy.
Figure 10. A, C, E, Preoperative views of a 47-year-old woman after a 107-lb weight loss. B, D, F, Postoperative views 6 months after circumferential fleur-de-lis abdominoplasty.
the risk of flap loss or dehiscence. In this series, 1 patient had a wound dehiscence along the flank 16 days postoperatively, and another had a 1-cm distal flap loss in the gluteal crease that healed secondarily.

Finally, I try not to perform multiple procedures in conjunction with a fleur-de-lis circumferential abdominoplasty. This procedure usually takes 5 to 6 hours with one resident assistant. Most patients in my series required only 1 night in the hospital, and only 1 required a transfusion of 2 units of packed red blood cells. This single patient was treated early in the series, and had undergone a mastopexy and brachioplasty approximately 3 months earlier. She also had a low-normal hemoglobin count prior to the abdominal contour surgery, and, in retrospect, surgery should have been delayed until the hemoglobin level was higher. Furthermore, performing multiple procedures along with the circumferential abdominoplasty increases the operating time, which could cause further blood loss in these often borderline-anemic patients and, in turn, increase the risk for more complications.

Conclusion

The fleur-de-lis pattern for abdominal contour surgery is an option for treating properly selected post-bariatric surgery patients. It is especially appropriate for those patients who have significant upper midline abdominal excess that contributes to the overall girth. The complica-
tion rate reported in this review is consistent with those reported classically in the abdominoplasty literature.\textsuperscript{21,35,36} The technical nuances of the procedure have been presented and, along with the results, support the conclusion that a safe and consistent outcome can be achieved using this technique in the appropriate candidate.

References

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Commentary
by Gustavo A. Colon, MD
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It is an honor to be able to comment on this new concept as presented by Dr. Wallach for the treatment of weight loss patients. I agree that weight loss patients do have significant upper midline abdominal fullness, which creates a problem not only for the anterior abdominal wall, but also for the back.