Maximizing aesthetics in lateral-tension abdominoplasty and body lifts

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The aesthetic aspects of trunk and thigh contours are a frequent concern of both women and men. In the past two decades, liposuction has revolutionized the treatment of the aesthetic deformity of the body to the extent that it is now synonymous with body contour surgery. However, liposuction only deals with one element of body aesthetics. While excess fat deposits are the major component of body contour problems, skin laxity and skin contour irregularities (cellulite) are also a significant problem for many patients. In addition, rectus muscle diastasis in both women and men may play a role in the aesthetic deformity.

Patient evaluation

The ultimate success of body contour surgery is dependent as much on the accuracy of the initial patient assessment as it is on the technical expertise of the surgeon. Too often surgeons immediately categorize a prospective body contour patient by the surgical procedures that might be possible or that are requested by the patient, rather than based on careful study of the proportions and aesthetics of the patient’s body.

Aesthetic body contour deformities frequently involve multiple areas of the trunk and thighs. The circumferential aesthetic unit of the trunk and thighs extends from the breasts to the knees. Surgery on one part of the aesthetic unit without consideration of its effect on the overall aesthetic balance of the body can lead to mediocre results and an imbalance in body contours. For example, lateral and posterior truncal deformities are commonly associated with abdominal deformities. Abdominoplasty without treatment of other truncal contour deformities will lead to aesthetic disharmony of the circumferential trunk. In addition, in patients who have aesthetic deformities of both the trunk and thighs, dramatic sculpturing of the trunk may create the visual illusion of much larger thighs, leading to an imbalance of the body aesthetic unit.

Abdominoplasty

Modern abdominoplasty techniques were developed in the 1960s [1,2]. Although many modifications have been presented over the past 40 years [3–7], the surgical principles for standard abdominoplasty remain largely the same. These principles include a transverse lower abdominal incision, wide undermining to the costal margins, tightening of the abdominal musculature, resection of the redundant abdominal flap with the maximum resection centrally, umbilical transposition, and skin closure with hips flexed.

While the operation has been standardized, the long-term aesthetic results of standard abdominoplasty have been inconsistent and often disappointing [8,9]. Common unfavorable results of standard abdominoplasty include initial over-tightening of the central abdomen, residual laxity of the inguinal and lateral abdominal regions, late suprapubic scar depression with soft tissue bulges above and below the incisional scar, superior displacement of the pubic hair, poor waist definition, and asymmetric, irregular, and hypertrophic scars [10].
Abdominoplasty design

All standard abdominoplasty techniques are based on faulty principles. The greatest truncal laxity occurs laterally in most patients, not centrally as assumed by standard abdominoplasty designs. The strong midline adherence of the epigastrium to the linea alba limits true vertical descent above the umbilicus. A more effective abdominoplasty design would (1) tighten the lateral abdomen, waist, groin, and upper thighs as much as the central abdomen and (2) allow circumferential liposculpturing of the trunk and thighs.

The high–lateral-tension abdominoplasty (1995) addresses the practical and theoretic faults of standard abdominoplasty design [10]. Key features include limited direct undermining, increased lateral skin resection with highest-tension wound closure along lateral limbs, two-layer superficial fascial system (SFS) repair, and significant truncal liposuction when needed (Fig. 1). The high–lateral-tension design limits the unfavorable features of standard abdominoplasty and produces balanced natural aesthetic contours (Fig. 2).

Placing the greatest resection along the lateral limbs of the abdominoplasty more accurately reverses truncal aging, provides lifting of the waist, inguinal area, and upper thighs, and decreases the tension on the suprapubic wound repair. Less tension in the central area reduces the risk of skin necrosis and superior migration of the pubic hair. SFS repair reduces tensions on the skin repair, resulting in improved scars with less late scar depression. Limiting direct undermining to the diastasis centrally and to the tissues to be resected inferiorly maintains maximal vascularity, making it possible to perform circumferential truncal liposuction except in the undermined hypogastric triangle. Minimal undermining will also reduce the risk of seromas and hematomas. But the key question is: Why is wide undermining necessary if one is restoring tissues to their youthful location?

Treatment strategies

Aesthetic body contour deformities frequently involve multiple areas of the trunk and thighs. In body contour patients, the ideal surgical plan targets the entire circumferential trunk and thigh aesthetic unit in one or several stages [8,11]. With the development of the lateral tension abdominoplasty [10], it has become increasingly clear that the abdomen is the cornerstone of the trunk/thigh aesthetic unit.

Relaxation of the abdomen is usually associated with relaxation of the waist, groin, pubis, and upper thighs. A side effect of this relaxation is the mature relaxed posturing caused by the aged pelvic tilt (Fig 3).

The aged pelvic tilt is a term the author uses to describe the anterior rotation of the pelvis that occurs with age in all of us. This rotation leads to more projection of the lower abdomen with a loss of the youthful lordosis of the lower back. There is a flattening of the posterior body contour with loss of the youthful projection of the buttocks, which flatten and fall.
Postural changes with aging have been linked solely to relaxation of the musculoskeletal framework [12]. It is the author’s belief that a second and, perhaps, more important cause of aged pelvic tilt is the relaxation of the SFS “body suit” of the trunk and thighs [13]. (The SFS is a three-dimensional fibrous meshwork of the subcutaneous tissue that shapes and supports the fat over many decades of life and holds the skin on the body. It is the main support structure of the skin/fat unit.) Evidence supporting such an observation is the “buttock lift” effect of lateral-tension abdominoplasty, which is not seen with classic abdominoplasty (Figs. 4 and 5). Both procedures include rectus muscle plication, but only the lateral-tension abdominoplasty significantly tightens the SFS across the entire anterior trunk. In addition to a buttock lift effect, a mild to moderate lifting of the anterior, medial, and lateral thigh occurs with the lateral-tension abdominoplasty.

**High–lateral-tension abdominoplasty**

*Patient selection*

The high–lateral-tension abdominoplasty is indicated for moderate to severe actual or potential laxity of the skin, fat, and muscles of the abdomen (Fig. 6). For isolated problems of the hypogastrium, a limited abdominoplasty may be indicated.

However, the patient selection process is more complex than these two extremes might suggest. In selecting patients for lateral-tension abdominoplasty, we must think “outside the box.” The benefits of lateral tension abdominoplasty extend far beyond the abdomen (ie, the central anterior trunk).

![Fig. 3](image1.png)

Fig. 3. Anterior rotation of the pelvis results in *aged pelvic tilt*. Features include flattening of the posterior body contour (loss of youthful lordosis and buttock projection), prominence of the lower abdomen, and an aged spinal posture.

![Fig. 4](image2.png)

Fig. 4. The “buttock lift” effect of the lateral-tension abdominoplasty. (A) Preoperative view, 48-year-old patient. (B) One year after lateral-tension abdominoplasty with a standard incision length (to the anterior axillary line).
Rejuvenation of the circumferential trunk, groin, upper thighs, and buttocks occurs with this procedure to a variable extent. Therefore, the value of the lateral-tension abdominoplasty should not be judged solely on its abdominal effect, but rather on its effect on the total trunk/thigh aesthetic unit. Even with a moderate abdominal relaxation problem, the lateral-tension abdominoplasty may be the procedure of choice to address the overall problems in the trunk/thigh aesthetic unit. This surgical strategy also results in a longer-lasting aesthetic effect, limiting the need for future body contour procedures.

The following patient example demonstrates this principle. A 35-year-old woman presents for abdominal contouring after one pregnancy. No further pregnancies are planned. The abdominal problem is not severe and could be treated with either liposuction alone or a limited abdominoplasty with liposuction with reasonable results (Fig. 7A, B).

But if we step back and look at the entire trunk/thigh aesthetic unit, an alternative becomes apparent (Fig. 7C, D). The lateral-tension abdominoplasty produces superior tightening of the entire abdomen, along with strong lifting of the waist, groin, pubis, and upper thighs, and a modest lifting of the buttocks (Fig. 8). The thighs are lifted and “lengthened.” Youthful posturing is restored (Fig. 9).

The entire trunk/thigh aesthetic unit is rejuvenated, all with an incision no longer than a standard abdominoplasty incision. In addition, the lateral-tension abdominoplasty will produce longer-lasting results than liposuction or limited resection techniques.

In conclusion, treating only one part of the circumferential trunk/thigh aesthetic unit is a very limited aesthetic goal. Be artistic. Think “outside the box.” And always photograph the entire circumferential trunk/thigh aesthetic unit, bra to knees. Proportions are critical. How can we judge our success in body contouring if we don’t look at the entire aesthetic unit?

**Operative technique**

Pulsatile foot compression boots are applied before induction of anesthesia. After general anesthesia, a Foley catheter is inserted and the patient is draped to allow movement from supine to lateral decubitus position during surgery. The circum-umbilical incision is made. The inferior resection line is incised and deepened to the underlying muscle fascia. Conservative undermining of the inferior abdominal tissue is performed. Only the tissue to be resected is undermined (Fig. 10). Final undermining of the lower abdominal flaps is performed at the time of tissue resection.

Direct undermining superior to the umbilicus is limited to the medial rectus border (Fig. 11). The table is flexed 30° to 40° at the hips. Rectus muscle diastasis from the xiphoid to the pubis is repaired in two layers: interrupted 0 braided nylon is followed by a running, interlocking 0 Prolene suture.

After vertical midline plication has treated horizontal fascial laxity, there may still be residual vertical...
laxity of the muscle fascia in the inferior quadrants. Often the author adds a horizontal plication from iliac crest to iliac crest for optimal fascial toning.

Midline bunching of the abdominal skin and fat occurs after muscle plication. This bunching may be partially released by discontinuous undermining of the abdominal flap with vertical spreading scissor dissection (usually not required). Liposuction of epigastric fat after the redundant abdominal flap is resected will resolve residual contour irregularities (Fig. 12). In thin patients not requiring abdominal liposuction, wider direct undermining before flap resection may be necessary.

The redundant abdominal flap is resected using a Lockwood marking clamp (Padgett Instruments, Kansas City, Missouri), placing maximum tension along the lateral thirds of the incision (Fig. 13). The SFS is repaired initially with interrupted 0 braided nylon on a large taper needle along the entire wound except in the final 4 cm to 5 cm of the incision lat-
eraly (Fig. 14). A second suture of interrupted 2-0 braided nylon on a smaller taper needle is placed into the SFS at the subdermal level. Braided permanent sutures are always soaked in a bacitracin-poly-mixin solution before usage. In an unpublished study from the author’s practice, this measure reduced suture complications by 50%.

The need for permanent non-absorbable sutures for SFS plication was established more than a decade ago. A series of transverse flank/thigh/buttock lift patients were treated with 0-polydioxanone (PDS) sutures for the SFS repair on one side and 0 nylon sutures on the other. At 9 to 12 months, the SFS repair had collapsed on the PDS side, with indenting of the scar to the underlying muscle and significant loss of the lift. This collapse did not occur on the nylon side (Fig. 15). Monofilament nylon knots were quite palpable after 1 year; therefore, braided nylon soaked in antibiotic solution became the suture of choice. Other nonabsorbable sutures can also be used. A relaxed skin ridge is created by the SFS repair technique (Fig. 16). This ridge requires about 6 months to flatten but reduces the risk of scar hypertrophy significantly.

Deep dermis is repaired with a running 3-0 PDS (or other absorbable suture), primarily to close the deep dermis over the superficial nylon knots. The skin is repaired with a running 3-0 polypropylene suture. Three #15 or #19 French fluted (Blake) silicone drains are placed, one into the epigastrium and the others beneath the incision laterally. These exit the skin in the mons pubis, where they are sutured. Drains are removed as drainage decreases, but the final drain is left for 12 to 14 days on average, even with minimal drainage.

Umbilicoplasty

High–lateral-tension abdominoplasty produces marked horizontal tensions in the postoperative abdominal and waist tissues. This tension will produce hypertrophy of the umbilical defect repair unless it is sutured carefully using the braided nylon SFS technique. In addition, the horizontal tension will widen a vertical umbilicoplasty incision to an aesthetic width for the new umbilicus (see Fig. 8A, B). A V-type umbilicoplasty incision will result in a wide, unaesthetic umbilicus. A 3.0-cm vertical incision is now made over the umbilicus for the umbilicoplasty. The base of the umbilicus has been previously sutured to rectus muscle fascia so that the umbilicoplasty incisional scar will be drawn into the depths of the umbilical dimple. This procedure avoids a visible umbilical scar.

Dressings and postoperative care

After adjunctive truncal liposuction, light gauze dressings are applied without pressure. No compression garment is used initially. Abdominoplasty patients are monitored as inpatients for 2 to 3 days depending on the degree of liposuction and lifting.
Prophylactic antibiotics are begun preoperatively and continued until after the last drain is removed (10–12 days). On the first postoperative day,

- dressings are removed; then silver sulfodiazene cream is applied to the incision twice daily.
- patients stand at the bedside, then progress to ambulation with a walker.
- stool softeners, enteric-coated ASA 325 mg, and protein drinks are started; diet then progresses to a high-protein diet.

An exercise body suit or leotard may be started in 2 to 3 weeks and worn for several weeks for comfort and support.

**Combining with thigh/buttock lifts**

As noted earlier in this article, relaxation of body tissues often involves multiple areas throughout the trunk/thigh aesthetic unit. Sculpturing only one portion of the aesthetic unit will lead to disharmony.

Fig. 9. Patient 1. (A) Preoperative lateral view. (B) Nine months postsurgery. (C) Preoperative posterior view. (D) Nine months postsurgery.
and unnatural contours. A proper treatment plan will include rejuvenation of all elements of the aesthetic unit, in one or several stages.

**Patient selection**

The high–lateral-tension abdominoplasty is the foundation for treatment of more generalized relaxation problems in the circumferential trunk and thighs. An extended abdominoplasty incision to the posterior axillary line produces even more thigh/buttock lifting effect than a standard lateral tension abdominoplasty (Fig. 17). However, for more significant buttock ptosis and thigh laxity problems, the lateral-tension abdominoplasty is combined with a transverse thigh/buttock lift, the lower body lift (version 2) (Fig. 18) [14–16].

The most challenging body contour patients are those presenting after massive weight loss. With the increasing obesity problem and the explosion of bariatric surgeries performed each year (over 100,000 annually in the United States), massive weight-loss patients are presenting in increasing numbers for total body restoration procedures.

While the aesthetic deformity is more severe in these patients and may require more stages, the surgical principles are still the same. Contour all areas of the circumferential trunk/thigh aesthetic unit in two to three stages. Contouring only the trunk with panniculectomies [17] and belt lipectomies [18] is a good first-stage procedure but is not adequate treatment for relaxation problems of the buttocks and thighs commonly seen in massive weight-loss patients. Contouring the trunk alone is not the future in restoration surgery of the massive weight-loss patient (Figs. 19 and 20).

The transverse flank/thigh/buttock lift is indicated for moderate to severe laxity and cellulite of the trunk and thighs, or buttock ptosis [14]. Patients presenting with laxity and cellulite of the flank/lateral thigh/buttock region usually have associated relaxation of the abdomen and medial thighs. Strong lifting of the posterolateral trunk and thighs without concomitant abdominoplasty increases the degree of abdominal relaxation, resulting in marked disharmony of the body aesthetic unit. The transverse thigh/buttock lift is seldom used alone except as a staged procedure after previous abdominoplasty.

Even in this case, a modified secondary abdominoplasty is often required. Combining the lateral-tension abdominoplasty with the thigh/buttock lift produces a degree of medial thigh lifting [15,16]. A more significant medial thigh problem will require a staged medial thigh lift [19].

**Operative technique, thigh/buttock lift**

Preoperative markings are made in the standing position with the knees 8 in to 12 in apart. After high-cut bikini margins are outlined, the desired position for the final incisional scar is drawn symmetrically within these outlines. The amount of soft tissue laxity superior to the planned line of closure is estimated. This is usually 4 cm to 7 cm (stretched skin). Next, the lax tissue inferior to the line of closure is estimated, generally ranging from 10 cm to 25 cm vertically along the lateral contour.

Following general anesthesia, the patient is placed in the lateral decubitus position on a vacuum bean-bag positioner. The hips are flexed 45° and the thighs are...
abducted with foam blocks to keep the knees wide apart. Liposuction of the posterolateral trunk and thigh is performed if needed. An incision is made through the superior resection line. Undermining superficial to muscle fascia is begun along the lateral contour anterior to the iliac crest, staying lateral to the femoral triangle lymphatics. The dissection then sweeps posteriorly in the same plane, leaving deep fat posterior to the iliac crest.

Direct undermining should extend beneath the flap to be resected. Beyond this, no direct undermining is performed over the buttocks or into the thigh, except in the trochanteric region as needed to release the SFS zone of adherence (medial to the lateral gluteal recess) or to release adhesions from previous trochanteric liposuction.

Next, discontinuous undermining using Lockwood undermining cannulas (Byron Medical, Tucson, Arizona) is performed more distally if the aesthetic deformity extends into the lower half of the thigh. The redundant soft tissue is resected using flap-splitting techniques and a Lockwood marking clamp (Padgett Instruments, Kansas City, Missouri), with the surgeon being careful to leave more skin than underlying SFS. This precaution allows minimal tension skin repair after SFS anchoring sutures.
are placed (two-layer, #1 and 2-0 braided nylon, dipped in polymyxin-bacitracin antibiotic solution, taper needles).

Two #19 French fluted (Blake) silicone drains are inserted into each thigh as far distally as possible, exiting the mons pubis anteriorly and above the incision posteriorly. Stacked towels are temporarily sutured superior to the incision to limit pressure during the opposite side surgery.

The third and final stage of the procedure is performed in the supine position. This stage may be a limited or a standard high–lateral-tension abdominoplasty (see earlier discussion). Light dressings are applied, and no compression garment is used. Postoperatively, the hips are flexed 45° and the thighs widely abducted to reduce tension on the lateral wound. At least one thigh drain is left for 18 to 21 days, regardless of drainage amounts. Removing drains sooner results in more thigh seromas. Antibiotics are continued until all drains are removed.

Complications

In addition to appropriate patient selection, procedure design, and surgical technique, thoughtful postoperative care is required to limit unfavorable results after major body lifting. The initial 24-hour period is critical to skin flap viability. To ensure adequate cardiac output and tissue perfusion, vigorous intravenous Lactated Ringer’s (nondextrose) fluid resuscitation and frequent urinary output monitoring are performed in the early postoperative period (maintain 70 mL every 2 hours for the first 12 to 18 hours). In addition, 500 mL of hetastarch (Hespan) is started at the end of the procedure, IV piggyback at 100 mL/hour to help stabilize the intravascular blood volume. In addition to adequate fluid resuscitation, proper patient positioning reduces postoperative wound tension, enhancing tissue perfusion of the wound edges.

Prophylaxis for deep vein thrombosis in patients without prior pathology includes leg elevation, support hose, pulsatile stockings or AV impulse boots started before anesthesia, anemia (hemodilution), bed exercises and ambulation, and, in the absence of a significant blood loss problem, enteric-coated aspi-
rin, 325 mg, started on the first postoperative day. Performing major body lifts in a hospital setting ensures appropriate nursing care and monitoring. Pulmonary radiographs or scans, pulse oximetry, the ICU, and specialty medical consultants are available in a timely manner should the need arise.

The risk of life-threatening complications such as pulmonary embolus or massive infection is low (less than 0.25%). Medical consultation, diagnostic scans, anticoagulation, and intensive care monitoring can successfully treat many pulmonary emboli. Massive infection requires infectious disease consultation, diagnostic wound cultures, antibiotics, surgical drainage as needed, and in-hospital monitoring.

The risk of major skin necrosis is low (less than 3%) with new body lift designs and appropriate postoperative care. The risk of lesser complications is more significant: these occur in 10% to 20% of body lift patients. They include wound infection, delayed healing—including wound dehiscence—mi-

Fig. 17. Example of umbilicoplasty after lateral-tension abdominoplasty. (A,C) Preoperative view. (B,D) Nine months postoperative view.
Fig. 18. Patient 2. When laxity problems after weight loss are primarily confined to anterior and lateral trunk and upper thighs, an extended high–lateral-tension abdominoplasty often provides reasonable rejuvenation of the trunk/thigh aesthetic unit. (A) Preoperative anterior oblique view. (B) One year after extended lateral-tension abdominoplasty with liposuction. (C) Preoperative posterior oblique view. (D) One year after surgery. Note the buttock lift effect without a circumferential incision.
Fig. 19. Patient 3. Generalized relaxation of the circumferential trunk/thigh aesthetic unit (bra line to knees) in 54-year-old patient. (A) Preoperative anterior oblique view. (B) One year after lateral-tension abdominoplasty and bilateral thigh/buttock lift (lower body lift #2) with liposuction. A future extended medial thigh lift will complete the thigh rejuvenation. (C) Preoperative posterior oblique view. (D) One year after surgery with dramatic buttock and thigh lifting and restoration of youthful posture.
Fig. 20. Patient 4. Generalized relaxation of circumferential trunk and thighs after 145-lb weight loss following endoscopic gastric bypass surgery in 45-year-old woman. (A) Preoperative anterior oblique view. (B) Seven months after lower body lift #2 and liposuction. (C) Preoperative posterior oblique view. (D) One year after surgery.
nor degrees of necrosis, poor scarring, suture reactions and infection, seromas or hematomas, anemia, non-autologous blood transfusion, dogears, significant areas of anesthesia or paresthesia, inadequate lifting of tissues, and prolonged hospitalization or recovery.

Summary

Modern body lifting is an exciting frontier for plastic surgeons. The results can be dramatic and fulfilling, although the surgeries are labor-intensive and challenging. Although life-threatening complications are rare, there is a significant risk of unfavorable results that can be minimized with proper patient selection, careful surgical design, planning, and execution, and appropriate postoperative care.

References