

LIPOSUCTION OF THE THIGH

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Women are frequently dissatisfied with the contour of their thighs; therefore, thighs are among the most commonly requested areas for liposuction surgery. By contrast, men rarely request liposuction of the thighs. Hetter noted that prior to liposuction surgery, there were relatively few procedures performed to remove prominent fatty deposits in the trochanteric area because they were difficult to improve surgically and left undesirable scars.¹³ Pitman also discussed the various surgical approaches designed to improve the saddlebag area. He also felt that there were relatively few individuals who were willing to accept the unsightly residual scars.¹⁹ As is true with most localized fatty deposits, those on the thighs are usually inherited and rarely respond to diet or exercise.

In addition to the dysmorphic changes resulting from localized or diffuse fatty deposits of the thigh, the skin of the female thigh is prone to irregularities resulting from cellulite, waviness, and poor skin tone—all of which impact the patient's perception of the overall problem. These factors also limit the degree of improvement that can be obtained by liposuction surgery.

Pitman defines three general types of thigh configurations. Type I individuals have localized fat and good skin tone and can benefit from liposuction alone. Type III individuals have virtually no fat and very poor skin tone. These women will not benefit from liposuction surgery, but would have to undergo a

thigh lift to achieve the desired result. Type II patients have variable fat and skin laxity. Many of these individuals will benefit from liposuction surgery. Pitman further points out that liposuction surgery is the preferred treatment, but some Type II patients may also require surgical lifting.¹⁹

Cellulite is another common complaint of women who request treatment of their thighs. Cellulite is a term used to describe the irregularities of the skin, mainly of the thighs and buttocks of women (Fig. 1). It is rarely seen in men. Although the origins of cellulite are not clearly understood, some investigators feel that it is a result of the attachment of fibrous bands from the dermis to the deep fascia, creating a quilting effect.¹⁹ Other investigators relate this to subdermal edema and liposclerosis.¹⁵ Draelos et al recently studied cellulite using ultrasound. She demonstrated projections of fat into the dermis and postulated that, at least in part, cellulite is a result of an inflammatory process involving the dermis and superficial fascia.⁶

Therapeutic recommendations abound for the correction of cellulite. These include weight loss,⁶ subscision of the fibrous bands, lipoinjection, mineral and dietary supplements, and massage.^{6, 15, 19} Contrary to early expectations, liposuction has not been successful in reducing cellulite.^{6, 15, 19} Indeed, Narins noted that occasionally liposuction can even appear to worsen the problem.¹⁷ It is important that patients who request liposuc-

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Figure 1. Prominently disproportionate outer thighs in woman with otherwise proportionate body at ideal weight. She has substantial cellulite of buttocks and outer thighs. She is an ideal candidate for liposuction.

tion understand that localized fatty deposits and cellulite are unrelated and that they can expect no substantial improvement of cellulite from liposuction. In addition, as previously noted, poor skin tone, either as part of the aging process, an inherited condition, or as a result of prior weight loss, can also result in suboptimal improvement following liposuction.

Large lateral thighs are part of the typical gynoid shape. Also, large disproportionate [lateral] thighs are not uncommonly present in women who have smaller upper bodies and legs (see Fig. 1). Therefore, large thighs create a problem especially with tightly fitting dresses, pants, and jeans. This is demonstrated as a significant problem by the frequency with which liposuction is requested for the thighs, especially the lateral trochanteric areas. Pitman describes the ideal female form for the upper thigh and lateral and lower torso as a single smooth curve beginning at the waist, extending downward over the iliac crest and greater trochanter and then

continuing down to the knee.¹⁹ The photographs published in fashion magazines and catalogues routinely demonstrate this ideal contour. Although not ordinarily understood by men, this deformity is an enormous problem for modern women who perceive themselves as living in a very competitive society.

The primary area treated for localized fatty deposits (lipodysmorphia) on the thighs is the trochanteric area of the lateral thigh or saddlebag area (Fig. 2).¹⁹ The second most commonly requested area for liposuction treatment includes the upper portion of medial thighs with variable contributions from the adjacent anterior-medial or posterior-medial thighs (Fig. 3). Occasionally the fatty deposition can extend along the entire internal medial thigh to the knee. These localized fatty deposits project medially from the upward sweep of the medial thigh and produce a proximal bulge, 1.0 cm to several centimeters below the crural fold.¹⁹ Functional problems also result from rubbing of enlarged medial thighs during ambulation. In addition, the thickened inner thighs generate tightness when women are wearing pants or shorts. The latter tend to ride up while walking, further aggravating the situation. Women who request liposuction feel that this condition is unsightly and uncomfortable. They desire legs with uniform linear contour of the medial thighs from the groin to the knee.

Anterior thighs often represent a problem of increased bulk that projects the anterior thigh forward. The fat of the anterior thigh is more diffusely situated rather than localized as in other areas.¹⁹ There is also the additional problem of fat in the suprapatellar area, which many women request treatment of separately from the rest of the anterior thigh. The skin tone of the anterior thighs, especially the suprapatellar portion, is often poor and associated with fine waviness. These changes aggravate the problem, especially when hem lines go up or when wearing shorts. They also affect the final result of liposuction surgery.

The posterior thigh is the area least requested for liposuction with the exception of the proximal infragluteal fold or so-called "banana fold." In contrast to the rest of the posterior thigh, this fatty roll is a rather common problem (see Fig. 3).

Overall, the contour of the thighs is a function of both the fat and the underlying musculature (Fig. 4).^{14, 19} Women who exercise vigorously will often have prominent projections, especially of the medial and anterior

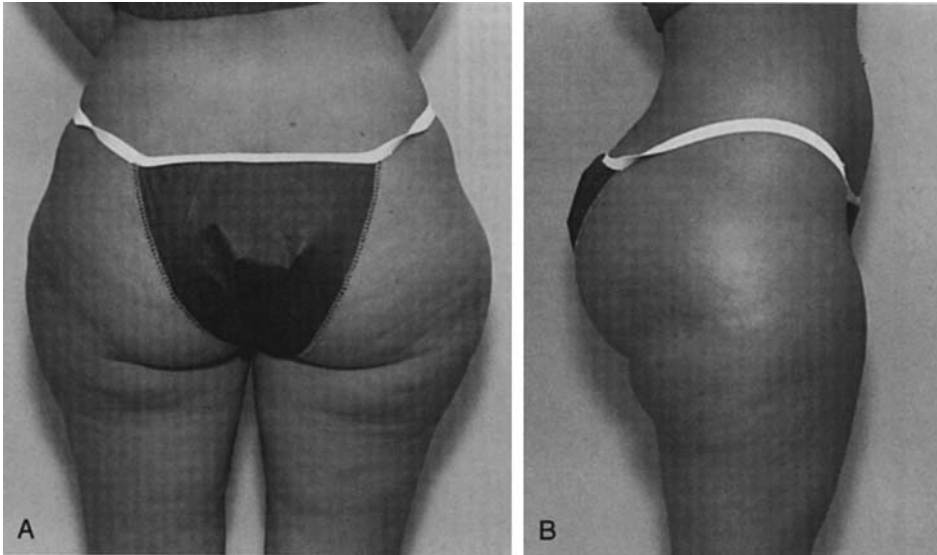


Figure 2. A, Very large, disproportionate lateral thighs in woman in her late 20s. She also demonstrates rather extensive cellulite and a rather prominent infragluteal "banana" roll. B, Side view, demonstrating cellulite and infragluteal roll. She also has a prominent buttocks.

thighs, which are a result of muscular hypertrophy rather than fatty deposits. These women will not benefit from liposuction surgery. In addition, bony irregularities resulting from scoliosis or inequalities in the length of the lower extremities will produce further asymmetry.¹⁴ It is difficult or impossible to compensate for asymmetries and bony irregu-

larities with liposuction surgery. It is important that they be pointed out preoperatively and the limitation of liposuction in correcting these irregularities be explained to the patient.

EVALUATION OF THE THIGH

The liposuction surgeon must spend ample time with the patient to evaluate her complaints and to determine which goals can be realistically achieved. There must be clear two-way communication between the patient and the physician. The most important element of the evaluation is that the physician must know the patient's expectations to the greatest degree possible. By the same token, the patient should understand what the physician can and cannot achieve with liposuction surgery. The patient must be examined in appropriate garments so that the entire area can be viewed from all directions. Particular attention should be paid to skin tone and cellulite. Irregularities and asymmetries should be identified and pointed out to the patient. It is rare that patients are aware of asymmetries, especially those that can only be seen from behind. The patient should be advised that it may take up to 6 months before all edema has dissipated and the final result becomes evident. In addition, patients should always be advised that secondary pro-

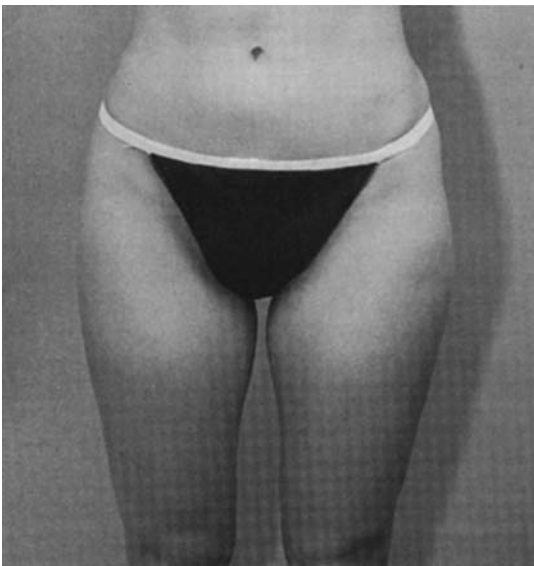


Figure 3. Medial thighs with localized fatty deposits. Remainder of thighs and body are otherwise well proportioned and slim. This is unresponsive to diet and exercise.

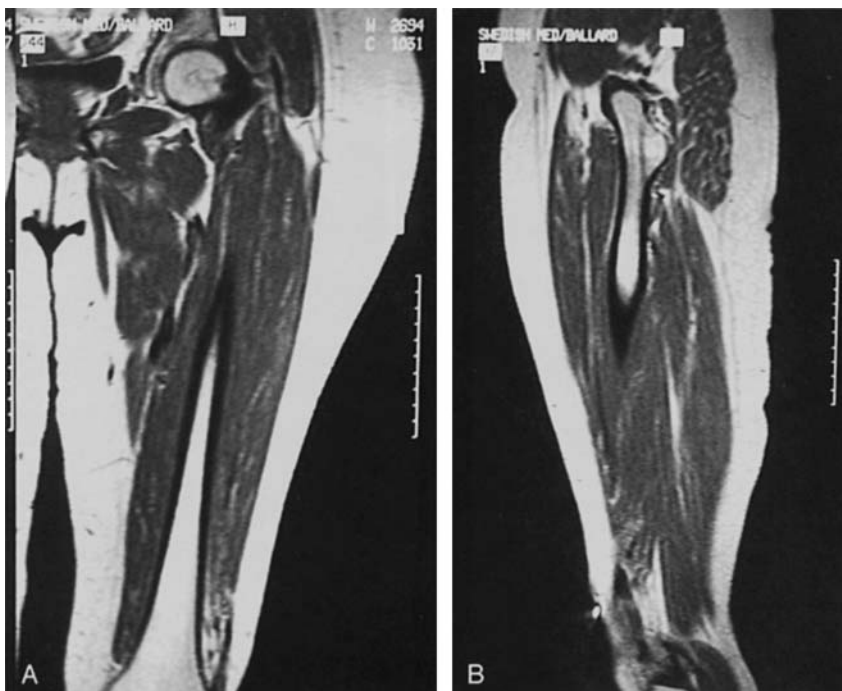


Figure 4. A–B, Magnetic resonant imaging views of sagittal and coronal sections of the thighs. Localization of fatty deposits are noted as well as relationship to underlying muscle and bone.

cedures (or touch ups), involving either further lipoaspiration or occasionally even autologous fat injection, might be required to achieve a more even result. The fees for the procedures and any future secondary procedures should also be discussed at that time.

The patient should be asked to specifically identify those areas that are troublesome. It may be useful to have her put her hands on those parts that bother her. All areas to be treated should be gently pinched to obtain a sense of the amount of fat to be removed, the consistency or density of the fat, and the position of the underlying structures.^{5, 17, 19} The patient is ideally examined in a standing position from all sides. A full-length mirror helps the doctor and patient identify all undesired fatty deposits and troublesome areas. Used in conjunction with a small hand mirror, the full-length mirror will further assist in demonstrating the full posterior view to the patient—a view she may never have seen. The physician should be seated so that he or her is eye level with the areas being examined.

The lateral thigh or saddlebag areas are usually evaluated first. Gasparotti et al have identified four variations in localization of

saddlebag deformities in women (Fig. 5): Type A, which is mainly trochanteric distribution, Type B, which is posterior femoral, Type C, which is posterior-inferior, and Type D, which is saddlebag with prominent gluteal distribution.^{9, 10} Narins also discusses the contribution of the lower outer part of the buttocks to the saddlebags in individual cases. This can be demonstrated by having the patient contract the buttocks muscles forcefully. The latter maneuver will tend to flatten the outer thighs and force the fat medially and superiorly into the buttocks. Here liposuction will necessarily include the lower outer buttocks.^{17, 19}

Contracting the buttocks muscle will also demonstrate a rather deep depression that is posterior and somewhat inferior to the trochanter. This depression is located between the vastus lateralis and gluteus maximus muscles. Excessive resection in this area can produce a deep depression (see Fig. 11),^{5, 16, 17} which will rarely respond to lipoinjection or other attempts at correction.

The medial thigh is also viewed from the front and back. Skin tone and irregularities are noted and pointed out to the patient. Again, asymmetry and irregular contours are

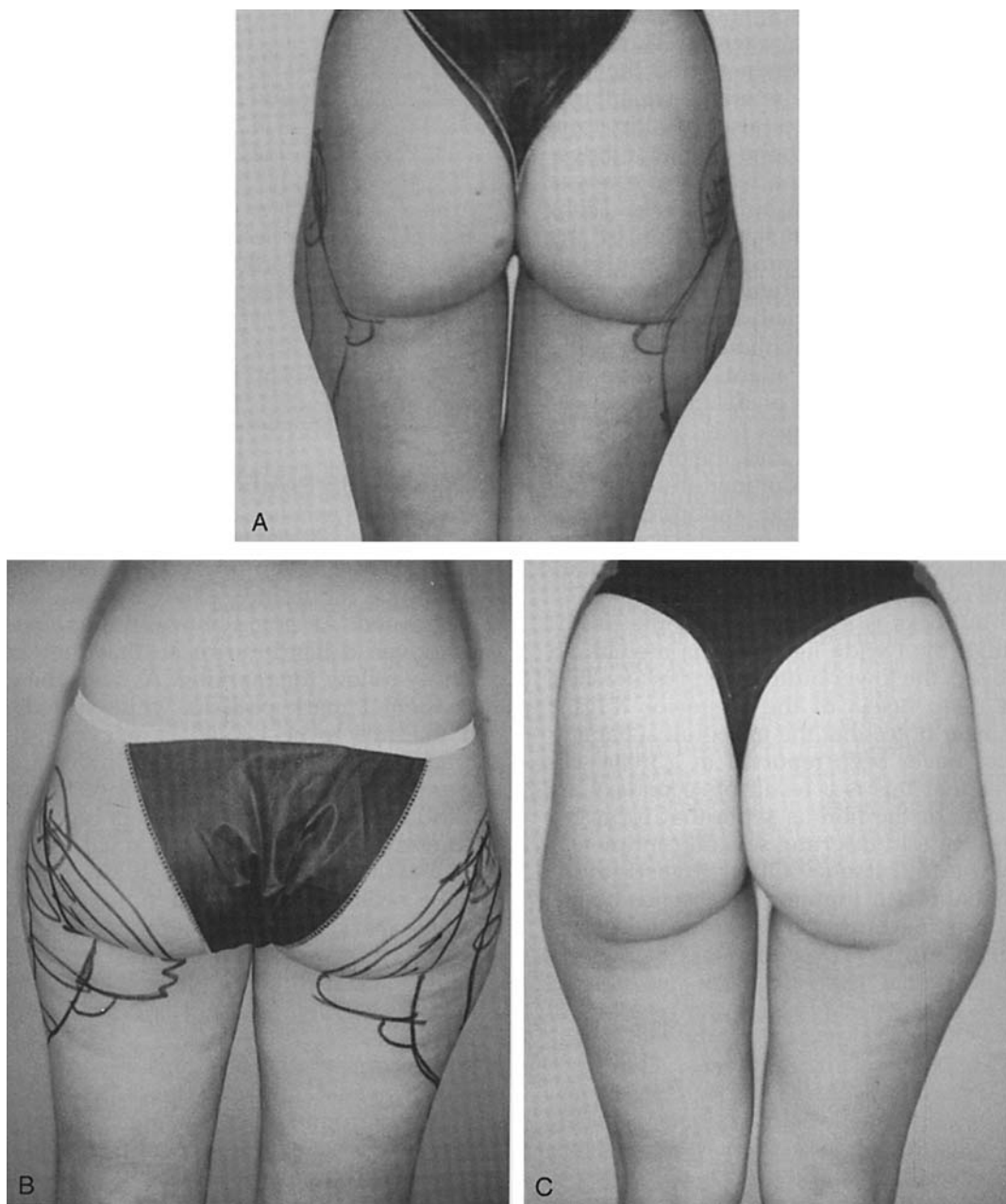


Figure 5. Variation in localization of fatty deposits in lateral thighs as described by Gasparotti et al. *A*, Femoral distribution only without involvement of buttocks or infragluteal area (Gasparotti's Type A saddlebag). *B*, Localized fatty deposition of the lateral thigh including the lower outer buttocks and the infragluteal area (combination of Gasparotti Type C and Type D fatty deposition). *C*, Saddlebag with femoral posterior distribution (Gasparotti Type B).

common and should be pointed out to the patient.

The anterior thighs are examined from the front and both sides. The amount of fat is noted, as are irregularities, and the skin tone is also described. Special attention should be paid to the degree of waviness and the skin tone of the distal leg. As before, all irregularities and especially the status of skin tone should be discussed with the patient and documented. The likely impact of these changes on the final result must be explained. Liposuction of the suprapatellar portion of the anterior thigh not uncommonly results in waviness because of relatively poor retraction of the skin. This is especially true if the suprapatellar area is treated without including the entire anterior thigh. Patients must be advised of the possibility of disappointing results in treating this area.^{16, 19}

The posterior thighs and the infragluteal [banana] fold are also examined in the standing position from both sides and from behind. The degree of fat should be estimated at the time of the evaluation. Cellulite and irregularities are common in this area.

The buttocks is separated from the posterior thigh by a wide ligamentous membrane that covers the lower buttocks and is attached to the deep fascia of the posterior thigh.² Schlesinger notes that the infragluteal banana fold has never been reported in a male. He believes that this is a result of secondary attachments of the fibrous septa that form the infragluteal fold inserting several centimeters below the fold itself.²⁰ Other investigators have identified a thinning or absence of the deep investing muscular fascia of the posterior thigh, up to 4.0 centimeters below the infragluteal fold (Edward Lack and Robert Jackson, personal communication); however, the exact etiology of the banana roll is still not clear. Of significance, however, is the fact that the support to the lower buttocks is supplemented from below by the dense superficial fascia of the upper posterior thigh. Vigorous liposuction in this area can result in ptosis of the buttocks as a result of disruption of supportive fibers (Edward Lack, MD, and Robert Jackson, MD, personal communication, 1997).^{2, 5, 20} This is a serious complication that may not be correctable.

PREOPERATIVE CARE

Preoperative care varies substantially from one liposuction surgeon to another. Many

surgeons will have patients obtain laboratory tests, which include complete blood cell count and clotting factors. Other physicians have their patients tested for hepatitis B and C and HIV. Because of the role of the liver enzymes in deactivating lidocaine, liver function tests would seem indicated, especially in patients with a history of liver disease. In addition, normal kidney function is important when large volumes of tumescent solution are being infiltrated into the body.

I have patients scrub with an antiseptic soap such as Hibiclens for at least 5 days preoperatively. In addition, they take antibiotics starting 1 day preoperatively and continue this for a total of 5 days. Finally, all salicylates and NSAIDs are discontinued 1 to 2 weeks preoperatively. We attempt to have patients discontinue vitamin E as well.

MARKING THE PATIENT

I always mark the areas to be treated in front of a full-length mirror so that the patient can provide input and concur with all areas to be treated. As noted above, the patient is again given a hand-mirror so that they can carefully follow the marking. As with the examination, I mark patients while seated so that the area to be treated is at eye-level. I emphasize that I will treat only those areas that are marked. If there are any uncertainties, questions, or misunderstandings regarding the areas to be treated, they must be discussed at that time. As I do not allow patients to take sedative medication until after the areas are marked and photographed (and the surgery consent form is signed and witnessed), there will be no misunderstandings of exactly which areas will and will not be treated.

Medium tip indelible marking pens are commonly used to mark the patient. Cook and Cook recommend using a gentian violet pen to avoid leaving permanent tattoo marks in the skin.⁵ I usually mark significant depressions, dimples, and irregularities with a different-colored pen. These are pointed out to the patient as well. When marking the lateral thighs, I have the patients contract their buttocks to demonstrate the posttrochanteric depression, which is marked with a red pen. This serves as a reminder to avoid liposuction in this area, or else to exert special care in limiting or carefully monitoring the amount of fat to be resected. I also mark sites for the

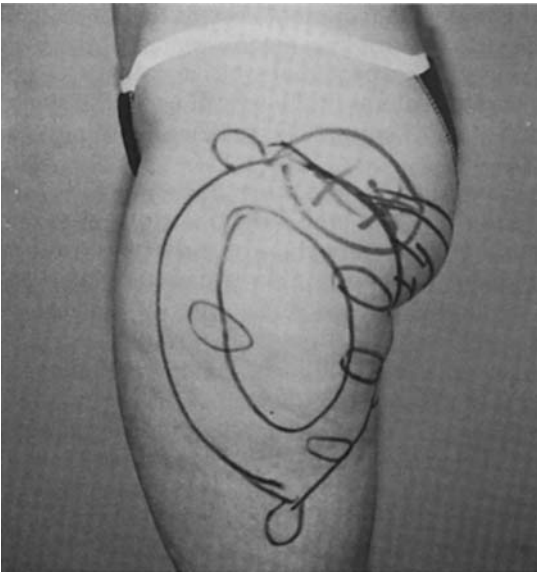


Figure 6. Lateral thigh marked prior to liposuction. Large topographic oval indicates areas of primary fat localization. Circle on upper portion containing x's indicates post-trochanteric space to be carefully monitored during liposuction to avoid deep depression. Small ovals in the large topographic area indicate areas of preexisting cellulite. Small circles above the area to be treated are indicated for sites of incisions.

placement of the incisions at this time, both for the infusion of the tumescent solution as well as for the aspiration of the fat.

I mark the lateral thighs first (Fig. 6), marking one port each at the superior and inferior pole of the treated area and a third at the

lateral aspect of the infragluteal fold. By placing incisions at asymmetric locations, the scars are less obvious and therefore the cosmetic result is enhanced.⁴ In addition, I avoid placing an incision at the anterior pole (3 o'clock position) because of the possibility of creating a depression in the anterior curve of the thigh from the action of the cannula itself. There is wide variation in the placement of incisions; many liposuction surgeons strictly limit the number of incisions by placing one at the 12 o'clock position and the other at the 3 o'clock position.^{5, 17, 19} As the scars tend to heal with minimal residual, it is often necessary to make additional incisions in order to access all fat.^{14, 19} Again, attempts should be made to place the incisions in an asymmetric fashion to avoid an obvious pattern.

The medial thigh is marked in two segments. First the thigh is viewed from the front and back with the patient standing and the doctor sitting at eye level. The skin tone and irregularities are noted and pointed out to the patient. The overall contours are noted and marked with a marking pen both from the anterior and posterior view. Although this will adequately mark the inner thighs, some surgeons will then mark this area with the patient in the lateral decubitus position. In this position the upper leg is drawn up to the chest and the lower leg slightly flexed until there is no tension on the upper medial thigh.^{5, 14} This position places the medial thigh in a flat, two-dimensional plane (Fig. 7). The fatty deposits in the upper medial thighs can

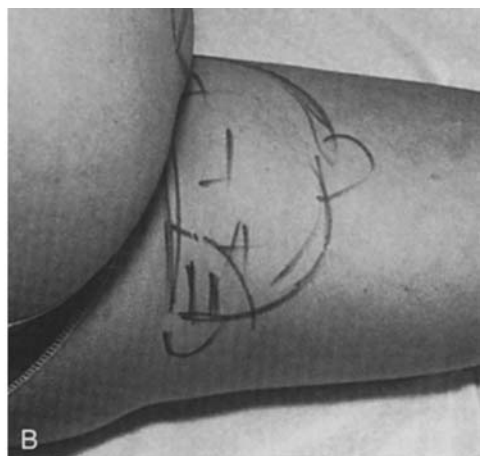


Figure 7. A and B, Evaluation and marking of the medial thighs with the patient in the lateral decubitus position. Upper leg is drawn up to the chest and the lower leg slightly flexed to eliminate tension. This places the medial thigh in a flat, two-dimensional plane. B, Close-up view of markings.

now be examined by both vertical and horizontal perspectives. This position also provides a more detailed sense of the topography of the area to be treated.

After the skin is pinched and the exact location of the fat determined, the marks can be refined. Circles are again placed to mark the sites of incisions. These are usually at the distal pole and the posterior pole by the gluteal crease. Other incisions may be made as the procedure progresses. The patient then turns to the other side and this marking procedure is repeated. The fat will be removed with the patient in the same lateral decubitus position.

The anterior thighs are examined and marked with the patient standing, again viewed from all sides. The doctor again should be sitting with the thighs at eye level. The area to be treated is again marked and irregularities noted (Fig. 8). The skin tone is also examined and discussed with the patient. The thickness of the fatty layer should be carefully assessed prior to instilling the tumescent solution. Sites for the placement of incisions on the anterior thighs are marked at this time as well. Cook and Cook place incisions in the lateral and medial knee, superior lateral thigh, and by the superior medial groin.⁵ Pitman places two incisions, at asymmetric sites on each side of the lateral thigh.¹⁹

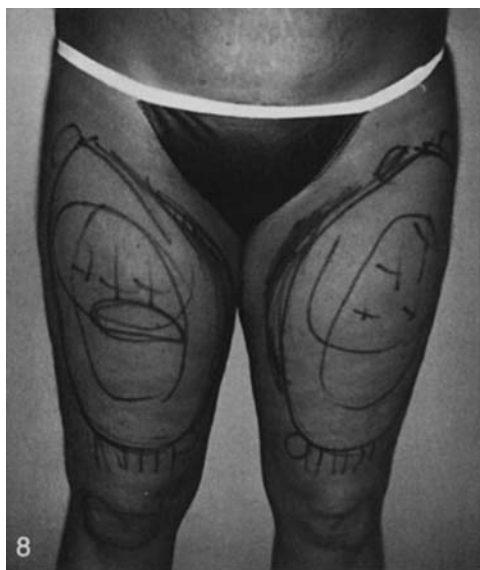


Figure 8. Anterior thighs are marked prior to liposuction surgery.

This allows adequate access to the fat as well as for criss-crossing. Fenno placed three incisions, at the proximal and distal aspects of the anterolateral thigh as well as by the crural fold (Gary Fenno, MD, personal communication, 1991).

Posterior thighs and banana folds are marked in the standing position from the sides and posteriorly. The inferior posterior thigh or hamstring area is carefully marked. The popliteal fossa, at the inferior junction of the hamstrings, should also be marked (Fig. 9).

PROCEDURE

Infusion of Tumescent Solution

After the patient has signed all necessary surgical request/consent forms, she is appropriately sedated and all areas to be treated are prepped with Betadine or equivalent antiseptic. The patient is then placed on the table and the tumescent solution is infused. The Klein tumescent solution has been discussed elsewhere in this volume and will only be briefly mentioned here. In my clinic, 0.05% lidocaine is adequate for liposuction of virtually all areas of the thigh. If anesthesia is not achieved, 0.075% lidocaine has always been



Figure 9. Posterior thighs are marked. Note banana roll is marked separately from posterior thigh. X's inferiorly indicate popliteal space—to be avoided. Ovals within the mid-portion of the posterior thigh indicate areas of deep preexisting cellulite.

adequate to allow the liposuction to proceed comfortably. Many liposuction surgeons prefer to use 0.1% lidocaine per liter. In addition, we are now using 0.75 mL adrenaline per liter, as this appears to produce adequate hemostasis. Since switching to this concentration of adrenaline, we have had no increase in bruising and the hematocrit of the infranatant remains at approximately 1% or less.

We infuse patients through all major ports that will be used for aspiration. This ensures that the solution is evenly placed throughout the subcutaneous layer. The solution is infiltrated with a mechanical peristaltic pump. Other techniques such as the syringe or IV power infusion pump can be used as well. We use a multiport Garden Spray-type needle (Tiemann/Bernsco Co., Hauppauge, NY). Some surgeons use ordinary 18- to 25-gauge needles. First, the solution is instilled slowly to avoid excessive distention of the tissue and consequent pain. As soon as an adequate level of anesthesia has been achieved, the rate of infusion can be increased. The solution is first instilled into the deep layer, then infiltrated in a mid-level, and finally in the subdermal plane. In my hands, the latter is essential to achieve profound anesthesia. Ample time is provided to allow the solution to become effective, usually 20 to 30 minutes. During the course of the procedure, the patient will occasionally experience pain in small localized areas owing to inadequate diffusion of the tumescent solution. Reinfusion in that area usually produces immediate relief of pain and the procedure can therefore continue. The safe dose of tumescent solution that can be injected has been discussed elsewhere.¹⁸

When physicians use preoperative external ultrasound, it is performed after the infusion process is concluded. Use of a sterile rubber glove over the hand piece will maintain an aseptic environment. It is important to put the conducting gel both inside and outside the rubber glove to obtain maximum transmission of the ultrasound. The entire area should then be repreppeped with antiseptic.³ Use of 1 MHz ultrasound generators at 2 or even 3 W/cm² has been used in this procedure.^{5, 12} It is claimed that the use of ultrasound preoperatively will enhance the anesthesia, reduce bruising, and reduce the internal resistance, therefore simplifying the task for the operating surgeon. Cook and Moy have thoroughly reviewed the subject of external preoperative ultrasonic liposuction.^{4, 12}

The use of internal ultrasonic liposuction has been reviewed elsewhere, and it will not be discussed in this article.^{21, 22}

Aspiration

The actual aspiration of fat can be performed either with a mechanical pump or by using the vacuum generated by withdrawing the plunger on a 60-mL syringe. Many surgeons feel that a safer, more cosmetically desirable result can be achieved by using the syringe method.^{2, 10} This technique also appears to be popular in South America. Many other surgeons use the mechanical vacuum pumps that are described elsewhere in this issue. There is, however, no objective evidence that there is any benefit to be achieved by using the syringe method over the mechanical pump method.

The lateral thighs (trochanteric fat—saddlebags) are usually treated first. The patient is placed on her side in the lateral decubitus position. To avoid creating the previously mentioned depression in the posttrochanteric area, some surgeons use a wedge-shaped leg elevator (Fig. 10). This elevates the leg approximately 30°. The foot extends beyond the support and is rotated downward to the greatest degree consistent with comfort. This moves the trochanter forward and helps avoid over resecting this hollow between the thigh and buttock. By contrast, if the patient is lying on her side and the thigh and knee are flexed (the "fetal position"), the head of the trochanter fills this space. Resection of the fat to an apparent smooth level in this latter position may create a deep hollow when the patient stands (Fig. 11). This depression is probably not correctable. By using the wedge it is relatively easy to avoid this complication.

Fischer recommends performing liposuction of the thighs with the patient in the upright or standing position. He has devised an ingenious operating table that can be tilted in all directions and the patient safely and comfortably supported during the procedure. By performing the procedure in the vertical position, the amount of fat removed from the thighs can be gauged as the operation progresses.⁸ Other surgeons modify this procedure by having the patient standing, supported by a nurse or assistant as the procedure progresses (Patricia Wexler, MD, personal communication, 1998).

The selection of appropriate cannulas de-

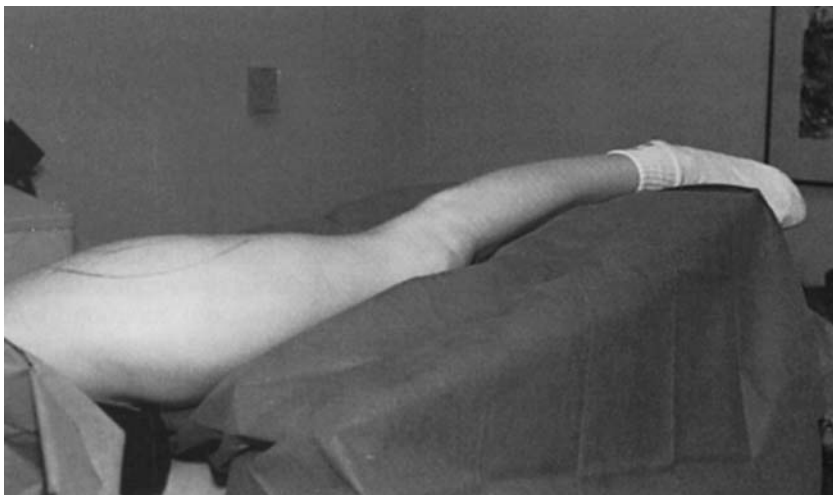


Figure 10. View of patient's leg on wedge demonstrating position during liposuction. Using this device, one can reduce the likelihood of forming a depression in the posttrochanteric space.

depends upon the amount of fat to be resected and the density of the fat. I usually initiate the procedure with a 3.0-mm dual-port spatula or 3.0-mm Eliminator tri-port bullet-tipped cannula. Swan-necked or curved cannulas



Figure 11. Deep depression between upper posterior thigh and anterior buttocks. Result of over-resection in posttrochanteric space. This can be avoided by carefully marking the area preoperatively and using a leg wedge.

can be useful in accessing the lateral thigh by raising the hand off of the thigh. The fat should be uniformly removed with long strokes including the area to be resected when possible. This will help avoid creating localized depressions or irregularities. Next, a somewhat larger, dual-port spatula or Eliminator tri-port spatula can be used if necessary to debulk the fat. Some investigators recommend performing the entire procedure using the cannula only in a vertical direction.⁸ Others recommend aspirations be performed in at least two directions.^{5, 9, 10, 16, 17, 19} This allows for criss-crossing and is felt to help avoid ripples or grooves and to help produce a smoother result.

Some surgeons recommend the use of small 2-mm cannulas (or even smaller) for the entire procedure. Others start with a small 14-gauge cannula and increase the diameter during the procedure.⁵ Another approach is to start with larger 3- or 4-mm cannulas and progress to smaller cannulas throughout the operation in an attempt to refine the results. There is no evidence that any of these approaches produces consistently better results than any of the others. One should, however, attempt to tailor the cannula to the amount of fat to be removed. For example, a surgeon should probably not use large cannulas when there is only a small amount of fat to be removed.

There is also considerable variation in opinion as to the level in which the liposuction should be performed on the lateral thigh.

Some recommend that the procedure be performed in the deep fatty layer¹⁰ whereas others recommend that it be performed in the deep layer for debulking and the superficial layer for sculpting.^{10, 14} Lillis recommends suctioning in a medium plane.¹⁶ When it contributes to the localized fatty deposit, the lower outer buttock should be conservatively debulked. In any event it is important to stay at least 1 cm below the dermis to avoid superficial ridging and grooving. Small residual areas of fat can be removed with a 2- to 3-mm cannula. In general, the larger cannulas are used in the deeper layers of the fat and the thinner cannulas are used more superficially. Peripheral mesh undermining, using the cannula without suction at the edges of the treated area, will smooth out edges and avoid step deformities. Additional incisions are made, if necessary, to access the residual fatty deposits. The small incisions used for modern small cannulas tend to heal without noticeable scars.

The end point for the trochanteric area is first determined by visual examination from all sides (including from the feet). The skin should be pinched to ensure that the thickness of remaining fat is uniform. Raising up the cannula to ensure the uniformity of fat removal is another technique to determine uniform removal of fat. Finally, wetting the gloved hand with saline and rubbing it over the surface will help identify irregularities, high and low spots, and steps between the treated and untreated areas.

The medial thigh is treated with the patient on her side in a lateral decubitus position with the upper thigh fully flexed and resting on a support pillow, the same position that is used when marking and tumescing (see Fig. 7). Incisions are usually made inferiorly and posteriorly. I place two incisions within the treated areas. An additional incision may be placed anteriorly if needed (see Fig. 7). The main fatty deposit is usually in the posterior position. I use small, relatively nonaggressive, 2- to 3-mm dual-port spatulas in a middle to middle-high level in the fat maintaining at least 1 cm depth from the dermis. Other liposuction surgeons will work in the mid and deep layers.^{16, 20} Incision ports are constantly changed to avoid creating a depression resulting from the action of the cannula itself. The treated areas and amounts of fat are carefully noted and recorded and there is extensive criss-crossing to avoid ridging and obtain a smooth result. Fat from the medial thigh

tends to be aspirated rapidly and it is relatively easy to over-resect the fat, leaving unsightly depressions. The end point is reached through palpation, pinch, and careful visualization of the treated area. A wet-gloved hand will uncover irregularities as noted with the lateral thigh. The thickness of the treated area should be uniform. This can be further determined by inserting a cannula at various directions and lifting up the skin. Irregularities will be evident.

The anterior thigh is treated with the patient in the supine position using the three ports that were created for infusing the tumescent solution. Other incisions may be made as necessary to achieve a smooth even result; however, these should be minimized. The anterior thigh can be treated with conservative to moderately aggressive 2-port spatula and 3-port Eliminator cannulas, generally 3 to 4 mm. This region will easily show ridging and should be treated with long strokes, primarily in a vertical direction, and encompassing the entire area. The fat in the anterior thigh should be resected in the mid to deep plane.^{14, 19} Some cross-hatching is necessary to obtain a smooth, even result and avoid ridging. Removing relatively small amounts of fat will often produce noticeable improvement.¹⁹ It is worth noting that relatively small over-resections can result in significant depressions that can be difficult to correct.

Again the end point will be demonstrated by palpation and visualization of the treated area. A wet-gloved hand rubbed across the skin will often reveal irregularities. Fenno advised resecting more fat in the suprapatellar area to create a concavity. He felt that this produced a more cosmetically appealing result (Gary Fenno, MD, personal communication, 1991). Others disagree with this approach (Edward Lack, MD and Robert Jackson, MD, personal communication, 1998).

The posterior thigh is treated with the patient in the prone position. The posterior thigh is again sculpted using the 3- to 4-mm single- or dual-port spatula cannulas in the deep plane overlying the hamstring muscles. With this process two or three ports are created. Again, the direction is primarily vertical; however, cross-hatching should be performed to ensure a smooth result and avoid ridges or grooving. It is important to avoid the popliteal fossa¹⁴ (Gary Fenno, MD, personal communication, 1991).

The banana fold is a potential mine field.

Over-resection can result in ptosis of the buttocks, which may be difficult or impossible to correct. Schlesinger recommends the 2.4- to 3-mm cannulas in a horizontal fashion, parallel to the long axis of the fold. Others, however, feel that only small 2-mm cannulas should be used and in a vertical direction; treatment should be limited to the superficial fat. It is far better to remove too little fat and perform a touch-up at a later time than to over-resect.² If ptosis of the buttocks occurs, Schlesinger recommends a linear scarifying of the dermis to recreate the dermal fold with a 6-cm cannula opening turned to the dermis followed by supportive taping with a thick foam tape. Alternatively, he suggests a formal surgical buttocks lift.²⁰

There is a difference of opinion as to whether the entire circumferential thigh should be treated at one time. Some authorities are opposed to circumferential liposuction because of problems associated with lymphatic drainage, the rate of recovery, morbidity, cosmetic result, and the possibility of surgical complications. Other liposuction surgeons, with extensive experience in circumferential liposuction, have a satisfactory record of good cosmetic results and lack of significant surgical complications or even prolonged recovery.¹⁴ Evidence of proven complications related to circumferential liposuction of the thighs is lacking.

SEQUELAE AND COMPLICATIONS

Postoperative sequelae are common. They include edema, tenderness, pain, and hypesthesia. The edema will resolve but often slowly and I always advise patients to allow 6 months for the edema to fade. Induration is also common, but will resolve over time. The patient should be warned preoperatively of the likelihood of postoperative sequelae and their temporary nature.

Complications of liposuction of the thigh are similar to complications described for liposuction of other areas of the body. They can be either medical/surgical or cosmetic. The medical/surgical complications are extremely rare with tumescent liposuction.¹¹ They include infection, including the possibility of widespread necrotizing fasciitis, and uncontrollable bleeding. Deep vein thrombosis with pulmonary emboli have occurred as well. One fatality was reported in a young woman who was on birth control pills. As a

result of this, some physicians have patients discontinue birth control pills at least 1 month prior to liposuction of the thighs (Ronald Moy, MD, personal communication, 1998). The causative role of birth control pills, however, has not been confirmed.

Inadequately resected fat must be considered a complication as well. Many of the cosmetic complications can be remedied, at least to some degree, by secondary or touch-up procedures or lipoinjection.

EXCELLENCE IN LIPOSUCTION OF THE THIGH

It is clear that there are a variety of appropriate techniques available. No one technique is exclusively correct. Many variations of the technique have been highly successful in the hands of experienced liposuction surgeons. The key to a successful result is thorough training, including hands-on training and experience. It is far better to err on the side of conservatism and retreat than to over-resect as the latter can produce irregularities and unsatisfactory cosmetic results that may not be repairable (Figs. 12 and 13).

POSTOPERATIVE CARE

After the conclusion of the procedure, the patient is cleansed by the nursing staff. Some surgeons will use sutures or staples to close the incision sites.¹⁹ Most dermatologic surgeons will leave the wounds open to encourage drainage of fluid and blood.^{5, 16} The patients are advised that drainage will continue for 1 to 2 days, but minor drainage can be seen for as long as a week. Some surgeons use adhesive foam on the lateral thigh¹⁶ whereas others use tape.^{9, 10} The garments may also be supplemented with absorbent pads, which are placed between the skin and the compressive garment, and which can be changed by the patient. Some liposuction surgeons allow patients to shower within 24 hours of surgery, whereas others wait 3 to 4 days or even as long as 1 week. Lillis, for example, has patients who are wearing adhesive foam keep the dressings on without changing for 3 to 5 days (Patrick J. Lillis, MD, personal communication, 1997). One possible complication of the foam is blistering at the edges of the foam. It is therefore important that the Reston foam be kept dry; blistering appears to be a result

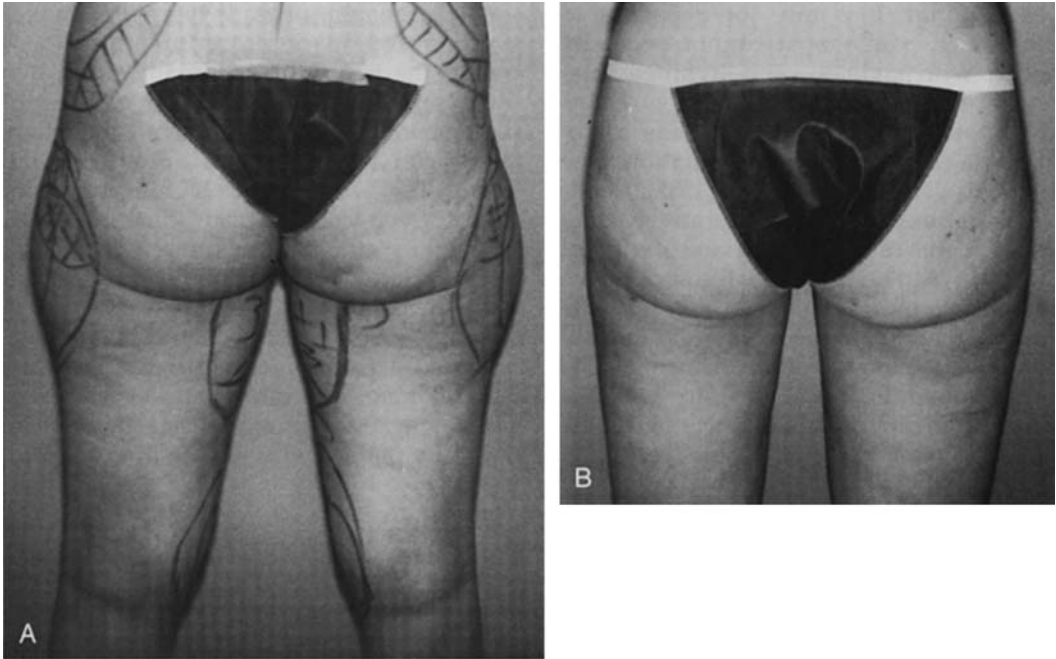


Figure 12. *A and B*, Preoperative and postoperative liposuction of the medial and lateral thighs with a satisfactory cosmetic result.

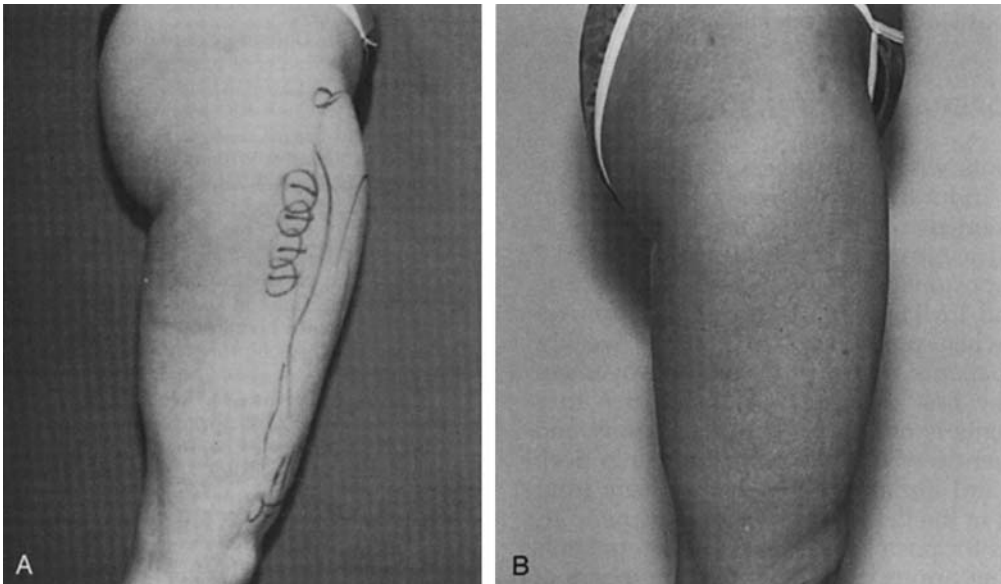


Figure 13. *A and B*, Preoperative and postoperative liposuction surgery of anterior thighs. Subtle but significant improvement noted.

of the shearing action on the skin, especially if there is moisture.

Postoperative care includes pain medication as required. It is rare for a patient to have so much pain that it cannot be easily controlled with codeine or a hydrocodone-acetaminophen combination. Some surgeons will use postoperative corticosteroids to reduce swelling, edema, and inflammation. One mL of IM Celestone (Schering Corp., Kenilworth, NJ) immediately postoperatively may be used. Patients return at a variable period of 1 or 2 to 7 days to help remove the supportive garments and any dressings. At this time the treated areas are examined. There is usually substantial edema and some bruising. The bruising is usually gone in 2 to 3 weeks whereas the edema may take up to 6 months to resolve completely. Usually, however, a significant cosmetic result is obtained in 1 to 2 months or sooner.

Patients are encouraged to remain active. Patients are often encouraged to walk 1 to 2 miles on the first postoperative day. Staying in one position for prolonged periods often results in greater discomfort. Most patients indicate that they are more comfortable if they move about regularly. Patients who must fly within 1 to 2 weeks of surgery are encouraged to get up regularly and walk around the airplane to avoid formation of deep vein thrombosis or further edema.

POSTOPERATIVE ULTRASOUND

Patients who have substantial pain, swelling, or induration will often note significant improvement with regular use of postoperative ultrasound.^{1, 7, 13} Usually introduced 2 weeks postoperatively, ultrasound at 0.75 to 1 W and 1 MHz will produce rapid improvement when provided 1 to 2 times weekly. Most patients note significant improvement after the first treatment. A series of 6 to 8 treatments is often adequate. The safety and effectiveness of ultrasound for bruising, deep pain, and inflammation have been long known in the field of physical medicine.^{1, 7} Its benefits for postoperative liposuction patients are being appreciated by greater numbers of surgeons.

Patients are examined at variable periods, but the final examination is usually performed at about 6 months. At this time, the treated areas can be carefully inspected for irregularities, high, and low points. Secondary "touch-up" procedures can then be sug-

gested as indicated. This may consist of small procedures to smooth out irregularities or larger resections to further reduce inadequately treated areas. It is far better to perform a secondary procedure than to over-resect the treated area initially. Also, it may be wise to harvest fat at the time of the initial liposuction procedure so that small depressions can be filled with autologous fat.^{9, 10} Often, this will produce significant improvement. Even cellulite can sometimes be improved by autologous fat injections.

Liposuction of the thighs can produce a "dream come true" for many women. This can improve or correct a problem that has plagued a woman for her entire life, despite serious long-term efforts at diet and exercise. Achieving even proportionate thighs can result in a patient who will be grateful forever.

References

- Bernstein G: Advanced seminar of ultrasonic liposuction. American Academy of Cosmetic Surgery, Annual Scientific Meeting, New Orleans, Louisiana, February 1, 1998
- Bernstein G, Lack E, Breisch E: Infragluteal ligament: A suspensory ligament of the buttocks (Lecture). World Congress on Liposuction Surgery, San Francisco, California, May 3, 1996
- Brandy N: The use of asymmetrical incisions in liposuction. *American Journal of Cosmetic Surgery* 14:459-462, 1997
- Cook WR Jr: Utilizing external ultrasonic energy to improve the results of tumescent liposculpture. *Dermatol Surg* 23:1207-1211, 1997
- Cook WR Jr, Cook KK: *Manual of Tumescent Liposuction and Laser Cosmetic Surgery*. New York, Lippincott Williams & Wilkins, 1999
- Draelos ZD, Draelos ZZ, Marenus KD, et al: Cellulite: Etiology and purported treatment. *Dermatol Surg* 23:1177-1181, 1997
- Dyson M: Therapeutic applications of ultrasound. In Nyborg WL, Siskin MC (eds): *Biological Effects of Ultrasound (Clinics in Diagnostic Ultrasound)*. Edinburgh, Churchill Livingstone, 1985, pp 121-133
- Fischer G: Liposculpture: My technique. *Dermatol Surg* 23:1177-1181, 1997
- Gasparotti M, Lewis CM, Toledo LS: *Superficial Liposculpture*. New York, Springer-Verlag, 1992, 7-28
- Gasparotti M, Lewis CM, Toledo LS: *Syringe Method*. New York, Springer, 1992, pp 29-59
- Hanke CW, Bernstein G, Bullock S: Safety of tumescent liposuction 15,336 patients. *Dermatol Surg* 21:459-462, 1995
- Havoonjian HH, Luftman DB, Menaker GM, et al: External ultrasonic tumescent liposuction. *Dermatol Surg* 23:1201-1206, 1997
- Hetter P: *Lipoplasty*. Boston-Toronto; Little Brown & Company, 1984, pp 257-269
- Lack Edward: Liposculpture of circumferential thigh: Lecture, World Congress on Liposuction Surgery, San Francisco, California, May 1996
- Leibaschoff GH: Cellulite (liposclerosis): Etiology and treatment. *Am J Cosmetic Surg* 14(4):395-401, 1997

16. Lillis PJ: Liposuction update: Laboratory manual for liposuction course.
17. Narins RS: Liposuction surgery of the lateral thigh. *Dermatol Surg Oncol* 10(Oct):1155-1161, 1988
18. Ostad A, Kageyama N, Moy RL, et al: Tumescent anesthesia with a lidocaine dose of 55 mg/kg is safe for liposuction. *Dermatol Surg* 22:921-927, 1996
19. Pitman GH: *Liposuction and Aesthetic Surgery*. St. Louis, Missouri, Quality Medical Publishing, Inc., 1993; pp 337-411
20. Schlesinger SL: Two arcane areas in liposuction: The banana and the centuous triangle. *Aesth Plast Surg* 15:175-180, 1991
21. Zocchi M: Clinical aspects of ultrasonic liposculpture. *Perspect Plast Surg* 7:153-174, 1993
22. Zocchi M: Ultrasonic assisted lipectomy. *Adv Plast Reconstr Surg* 11:197-221, 1995

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