Ethnic Considerations in Buttock Aesthetics

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ABSTRACT

There has been increased interest in buttock contouring and augmentation in recent years, which has translated into increased demand for these procedures. In addition, we are witnessing a growing number of patients from all ethnic groups requesting cosmetic surgery in the United States. Buttock aesthetic surgery today consists of either augmentation or recontouring of the gluteal region by one of three methods: (1) liposuction (if only reductive shaping is required); (2) liposuction and augmentation by micro fat grafting; and (3) gluteal implants. Whereas there certainly exists a “universal ideal” of beauty in buttock augmentation, there are fundamental ethnic differences that must be recognized to achieve a desirable surgical outcome. We present an article reviewing current trends in buttock aesthetic procedures and discuss issues relevant to the ethnic populations.

KEYWORDS: Buttock augmentation, ethnic aesthetic surgery, gluteal implants, gluteal autologous fat grafting, ethnic buttock augmentation

Aesthetic surgery of the buttocks is one of the fastest growing segments of plastic surgery today.¹ The buttock area has received much media attention in recent years, which has increased patient demand for buttock contouring and augmentation. In addition, the growing popularity of bariatric procedures and massive weight loss programs has increased the demand for body and buttock contouring procedures. Therefore, any discussion about cosmetic surgery in the ethnic population is not complete without an in-depth look at buttock aesthetic procedures.

Although standards of beauty change depending on the times, cultures, and locations, the iconic representation and allure of the hourglass female figure withstands the test of time and crosses cultural barriers.^{2,3} In fact, Singh proposed that there is one female body shape (full buttocks and narrow waist) that men universally find most attractive, and he theorized and gave extensive evidence to support the concept, that a waist-to-hip ratio

(WHR) of 0.7 was the universal ideal female shape.⁴ The waist-to-hip ratio is defined as the ratio of the circumference of the waist at its narrowest to the circumference of the thighs at the level of the maximum prominence of the buttocks. The evidence supporting his theory is quite strong; in fact, Roberts et al showed that successful buttock augmentation is achieved when a woman's WHR is recontoured close to the ideal 0.7 regardless of her ethnic background.⁵ What was different among different ethnic backgrounds was the size of the buttocks, whether the lateral buttocks should be full, and whether fullness of the lateral thighs (trochanteric area) was desirable (Table 1).

Therefore, any aesthetic procedure must not only adhere to the universal aesthetic ideal but also must embrace various ethnic differences to achieve a desirable outcome. Here, we will review current trends in buttock aesthetic procedures and discuss issues relevant to ethnic populations.

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Table 1 Ethnic Ideals of Beautiful Buttocks

	Buttock Size	Lateral Buttock Fullness	Lateral Thigh Fullness
Asian	Small to moderate, but shapely	No	No
Caucasian	Full, but not extremely large	Rounded (voluptuous) or hollow (athletic)	No
Hispanic	Very full	Very full	Slight fullness
African American	As full as possible	Very full	Very full

Source: Roberts TL III, Weinfeld AB, Bruner TW, Nguyen K. "Universal" and ethnic ideals of beautiful buttocks are best obtained by autologous micro fat grafting and liposuction. Clin Plast Surg 2006;33:371–394.

BUTTOCK AESTHETIC SURGERY

Buttock aesthetic surgery today consists of either augmentation or recontouring of the gluteal region by one of three methods: (1) liposuction (if only reductive shaping is required); (2) liposuction and augmentation by micro fat grafting; and (3) gluteal implants.³ These three modalities can be used in combination to achieve the desired outcome and can also include fixation, lifting, and skin resection, much the same way as for breast aesthetic surgery. The early work on gluteal augmentation was performed by plastic surgeons in Mexico, Brazil, Peru, and other South American countries, and their innovations and techniques have led to better implants and more reproducible aesthetic results. Even today, there are significant differences in how buttock augmentations are performed here in the United States and in other parts of the world. For example, in other parts of the world, implant augmentation, especially the subfascial technique, is more common and can achieve excellent aesthetic results because of the availability of softer cohesive gel implants. These subfascial results cannot be duplicated with the semisolid implants available here in the United States.

Regardless of the method, aesthetic surgery of the gluteal region begins with careful surgical evaluation. One approach is that of Cuenca-Guerra and Lugo-Beltran who studied numerous photographs of female nude

buttocks and identified four defining features that stood out as consistent features of beauty: (1) lateral depression formed by the lateral border of the gluteus maximus, the quadratus femoris, and the insertions of the gluteus medius and vastus lateralis to the greater trochanter; (2) infragluteal fold created by the ischial tuberosity, the insertions of the semitendinous muscle and long belly of the biceps femoris, and the lower border of the gluteus maximus; (3) supragluteal fossettes (one on either side), over the posterior superior iliac spine, created by the multifidus muscle, the lumbodorsal aponeurosis, and the insertion of the gluteus maximus; and (4) V-shaped crease, arising in the proximal portion of the gluteal crease.⁶ In addition, lumbar hyperlordosis, the hyperextension of the spine in the lumbosacral region, was found to be a desirable feature specific to people of African descent. They then went on to perform anthropometrical analysis of the gluteal projection and devised five categories of buttock characteristics that would determine the appropriate surgical intervention (Table 2). The foundation behind this categorization is the projection ratio, which is defined as the ratio of the distance from the greater trochanter to point of maximal projection of the mons pubis, to the greater trochanter to the point of maximal gluteal projection. Then, depending on the type of buttock, the right combination of liposuction, implant augmentation, and/or adjunctive procedures are used.

Table 2 Five Categories of Buttock Characteristics

Type	Characteristics	Surgical Intervention
I	2:1 or higher projection ratio,* adequate volume, good projection, but excess of supragluteal, paralumbar, and subgluteal fat	Lumbar, supragluteal, and subgluteal liposuction as well as liposuction in trochanteric region
II	Projection ratio lower than 2:1, enough volume and latero-lateral projection but little anteroposterior projection; appearance of wide hips with relatively flat buttocks	Round, small-based, high-profile gluteal implant, +/- liposuction
III	Lumbosacral hyperlordosis, projection ratio usually 2:1 or slightly lower	Almond-shaped gluteal implants with wide base and low profile, +/- liposuction
IV	Projection ratio below 2:1 and lack of both projection and volume; usually have athletic build, thin or at ideal weight, with lack of volume and projection	Wide-based, high-profile implant, +/- liposuction
V	Older women with "senile buttocks" characterized by hypotrophy of skin, fat, and muscle and ptosis of tissue	Combination of liposuction, gluteal implants, and skin excision

*Projection ratio = distance from greater trochanter to point of maximal projection of the mons pubis:greater trochanter to point of maximal gluteal projection.

Source: Cuenca-Guerra R, Lugo-Beltran I. Beautiful buttocks: characteristics and surgical techniques. Clin Plast Surg 2006;33:321–332.

Another way to evaluate the gluteal region is to use the classification system devised by Mendieta in which the buttocks are viewed as two separate removable structures: the frame, which consists of fat, bone and skin, and the detachable gluteus maximus muscle.⁷ The evaluation is then divided into four tasks. The first task involves evaluating the frame based on pelvic height and four different frame types: round, square, A-shape, or V-shape. The second task involves evaluating the gluteus muscle for height, width, and volume, and the third task involves evaluating the four junction points (upper inner gluteus/sacrum, infragluteal fold/thigh, lower lateral gluteus/thigh, and lateral mid-buttock/lateral thigh) between the muscle and the frame. Finally, the degree of ptosis, if present, is evaluated. The type of procedure required then can be deduced from this analysis.

Roberts et al propose yet another method of evaluating the gluteal region.⁵ As previously discussed, Roberts et al found that a WHR of ~ 0.7 creates attractive, youthful buttocks. In his practice, Roberts attempts to adjust the WHR close to the ideal 0.7. In addition, he found several buttock characteristics that appealed to all ethnic groups: smooth inward sweep of the lumbosacral area and waist, a feminine cleavage as the buttocks separate superiorly and inferiorly, maximum prominence in the mid to upper buttock (or at the junction of medial and central thirds of the buttocks in cross section), and minimal infragluteal crease without ptosis above this line. Sacral dimples may be present in an attractive youthful buttock but are not a determinant of an attractive buttock.

Evaluation and treatment of the gluteal aesthetic unit is highly dependent on the surgeon's level of comfort and expertise with various operative techniques. In addition, there is great variability in patient preference and her view of the ideal buttocks, which crosses ethnic boundaries. However, as discussed above, there are only a limited number of treatment modalities for buttock augmentation/recontouring today, which can be used alone or in combination to achieve desired results. These modalities include gluteal implants, liposuction, and autologous micro fat grafting. Contrary to popular beliefs, exercise will not increase buttock size or significantly improve shape. In fact, reduction in fat

volume seen with aggressive exercise can make buttocks become smaller. Therefore, surgical intervention becomes the only option for these patients.

GLUTEAL IMPLANTS

Use of gluteal implants is the most common method of buttock augmentation worldwide.⁸ Implants can give good immediate results and can be used in conjunction with liposuction and/or fat grafting, which is especially beneficial for those patients who desire increased volume for projection to counter the flattening effect seen in massive weight loss individuals.⁹ However, certain limitations must be respected. Implant placement must be done first, then care must be taken not to penetrate the implant pocket with either the liposuction cannula or the fat grafting, or the risk of seroma and/or infection will increase. The history of gluteal implant development is quite colorful and has been described thoroughly elsewhere in the literature.² The search for the ideal implant continues today, both in the type of implant being used as well as in the technique by which the implant is placed. The types of implants (Table 3) and various surgical techniques of implant placement (Table 4) are summarized below along with their advantages and disadvantages.

The major drawback of implant augmentation is the substantially high rate of complications associated with its techniques. Many of the early proponents of the procedure were not open to discussing complications. It was not until Mendieta, who reported the first large American series on buttock implants and its complications, that open communication between surgeons led to discussion of these complications and their possible solutions.¹⁰ The most common complication of implant augmentation is wound dehiscence, which occurs in up to 30% of intramuscular augmentation and between 15% and 30% in subfascial augmentation. After much thought and "soul searching," the consensus among several surgeons who study and perform gluteal implant surgery (Roberts, De La Pena, Mendieta, Young, and Centano) is that the predisposing element is the fact that the intergluteal cleft (where the incision is traditionally placed) is a "watershed area" in terms of blood supply.

Table 3 Types of Implant Material Used

Type	Description	Advantages	Disadvantages
Semisolid elastomer	Composed of soft silicone elastomer of various sizes and shapes.	Does not rupture. More firm buttocks.	Requires more accurate-sized implant pocket. Provides less projection. More firm buttocks.
Cohesive gel	Silicon gel-filled device with a thick and resilient smooth shell.	Provides good projection. Provides very soft, natural feel.	Not available in United States. Possibility of rupture.

Table 4 Implant Placement Technique

Technique	Advantages	Disadvantages
Subcutaneous	None: universally condemned.	Unnatural look due to dissection of aponeurotic structures that keep skin firm and fixed.
More of historical interest only.		Implant migration.
		High risk of complication.
Submuscular	Easy dissection.	Creates fullness in upper pole of buttocks due to high-riding implant.
Implant placed under the gluteal muscle.	Reduces skin mobility.	Inability to correct ptosis in lower buttocks.
Devised as a way to preserve the system that held the gluteal skin in position.	Reduced implant visibility.	Sciatic nerve injury.
	Ideal for patients who have well-developed lower buttocks but lack volume in upper third.	Implant size limitation (must fit into small pocket).
		“Double bubble” effect.
Intramuscular	Minimizes risk of injuring the sciatic nerve.	Difficult dissection due to lack of anatomic landmarks.
Created by separating muscle fibers of gluteus maximus to create an implant pocket with ~3 cm muscle thickness overlying the implant.	Allows implant to be placed in a more natural position.	Uneven dissection above and below the plane (i.e., even thickness).
	Provides implant coverage and prevents implant migration.	Disruption of muscle fibers can lead to seroma formation and chronic pain.
Subfascial	Ideal for young, thin patients with athletic build and little to no ptosis.	Implant coverage may be too thin and always palpable when using firmer elastomer implants. Implant visibility.
Implant placed under gluteal fascia, above the muscle.	Can use smaller implants given superficial location of implant pocket.	
Limited inferiorly by infragluteal fold.	Limits implant movement.	

Because the unusual anatomic situation that the underlying sacrum has no perforating vessels, all flow must come from laterally and diminishes to just capillaries as it approaches the midline. All we can do to minimize the risk of dehiscence is careful patient selection and atraumatic handling of the wound margins, avoiding desiccation and excessive traction.¹¹ This rate is increased to 80% in overweight patients and also is very high in patients in which an implant of more than 350 cc or more than 3.5 cm projection is used.¹² Other complications include seroma, infection, implant malposition/palpability, and loss of implant, bringing the major complication rate to 15 to 25% with intramuscular and to 35% with subfascial augmentation.¹¹ Although cohesive gel implants are less palpable, the dehiscent rate remains ~30%, and these silicone gel implants are not available in the US, nor will they be in the predictable future.¹³

LIPOSUCTION

Liposuction is an integral aspect of successful gluteal aesthetic surgery. It is needed to define not only the

buttocks but also the area around the buttocks, such as the flanks, the presacral area, the hips, the inner and outer thighs, to optimize results and improve patient satisfaction. However, liposuction of the infragluteal area (banana roll) must be avoided at all costs as it is the supporting pillar for the buttocks, reduction of this “banana roll” by liposuction will inevitably cause ptosis of the buttocks over the infragluteal crease. It is useful for defining and contouring the buttocks region and, in certain patients, can be used in conjunction with lifting and/or skin resection. However, most patients require and desire increased projection along with improved contour. Liposuction alone cannot provide for projection or augmentation of the region as seen with either implants or fat grafting and, therefore, must be used in conjunction with either of these modalities.

AUTOLOGOUS FAT GRAFTING

Many plastic surgeons in North America believe that autologous fat grafting is the best option for obtaining the ideal buttock shape.^{5,14,15} The tissue is readily

available by liposuction (if obtained correctly: see later). One author believes it can be stored for future use for up to 3 months.⁹ However, percentage survival must decrease with time and the risk of infection must increase. The senior author of this article presented the first large, well-documented series of micro fat grafting for moderate buttocks augmentation and the complications associated with this volume of grafting.¹⁴ There are two primary reasons why implants cannot achieve the aesthetic results seen with fat grafting. As previously discussed, creation of the inward sweep of the lower back and the cleavage where the upper buttocks separate superiorly is very important for a successful procedure. This requires aggressive liposuction of the presacral area, which can be done routinely at the time of autologous fat grafting. Simultaneous liposuction of this area is not an option at the time of implant augmentation because of the increased risk of vascular compromise of an area already at high risk for dehiscence and seroma associated with implants.^{11,14}

Autologous micro fat grafting may be the safer alternative in comparison with implant augmentation, with a major complication rate of 7% with current techniques.¹⁴ However, fat grafting requires a major investment of time and is labor intensive. In addition, implants can achieve good results for augmenting the upper and central portion of the gluteal region but they cannot augment nor is it technically feasible to place them in the lateral buttocks and the lateral thigh regions, which is routinely requested by Hispanic and African American patients. However, implants may be the only option when a patient does not have adequate fat donor sites or is unwilling to gain weight.

Autologous fat grafting is also ideal for correcting isolated defects, surface irregularities, and volume

deficiencies in the gluteal region, such as the retrotrochanteric depression that many patients find objectionable, although it is a natural anatomic entity.⁹ Some surgeons are also using a combination of implant augmentation and fat injection to improve overall results. When doing so, one must always be cognizant of the increased risk of infection and dehiscence, and therefore, a staged approach is highly recommended when using multiple modalities for gluteal recontouring and buttock augmentation.

The specific operative technique for fat grafting varies with each surgeon and is performed according to his preference. There are slight variations in how the fat is harvested, processed, and injected. There are other varying opinions such as the use of antibiotics in the aspirate, use of stored harvested fat, and concomitant use of implants with grafting technique. Our recommended technique for autologous fat grafting was published previously and is summarized in Appendix A of this article.⁵

COMPLICATIONS OF GLUTEAL AUGMENTATION

Buttock augmentation is a major surgical procedure with the potential for major complications, including serious infections, wound dehiscence, exposure of implant, hematologic and metabolic disturbances, pulmonary disturbances, and electrolyte imbalance. Some of these complications are associated with gluteal augmentation regardless of technique. However, many of the complications are technique dependent and/or the complications may present differently depending on whether implants or fat grafting technique was used. A detailed discussion concerning the complications of gluteal

Figure 1 (A, B) A typical African American patient requesting as full and rounded buttocks and “hips” (lateral thigh) as possible, which was achieved with 2000 cc liposuction and grafting 825 cc per side.

Figure 2 (A, B) This African American patient requested substantial enlargement of all areas of her buttocks, including a “shelf” (extreme prominence of the upper pole), which was achieved with 890 cc per side and liposuction of 2150 cc.

augmentation is beyond the scope of this article, but readers are encouraged to refer to an article by Bruner et al on the complications of buttocks augmentation for further details.¹¹

ETHNIC CONSIDERATIONS

Lastly, we want to address specific issues pertaining to various ethnic populations. The view expressed in this article is by no means universal or complete, as there is a tremendous variability among patient and surgeon preferences around the world. However, the issues

presented here are some of the more common findings that can be generalized to the various ethnic populations regardless of individual differences.⁵ Note that bringing the WHR close to the ideal 0.7 is important in obtaining the ideal results in *all* ethnic groups.

African American

These women have a strong and consistent ideal of very large buttocks. In addition, lumbar hyperlordosis is a desirable feature in addition to fullness of the

Figure 3 (A, B) This Asian patient requested small but shapely buttocks. Although she is thin and her buttocks fairly flat, enough fat (550 cc) could be found for a moderate augmentation, coming close to the ideal WHR of 0.70.

Figure 4 (A, B) In this Asian patient with more excess fat who wanted fuller buttocks, liposuction and 800 cc per graft per side produced this attractive shape. She did not want any fullness in the lateral buttocks or lateral thigh.

upper buttocks. A full, prominent trochanteric area of the lateral thighs is desired and is still seen as a sign of fertility or fecundity. This lateral trochanteric area is uniquely called “the hip” among African Americans but most other cultures call the iliac crest “the hip.” Figure 1 is representative of many African American patients we see: large framed, and requesting substantial enlargement of all areas of the buttocks and very full lateral thighs (“hips”), but as small a

waist as possible. Another common request that is uniquely African American is to create an extreme prominence of the upper buttocks (“shelf”), as seen in Fig. 2.

Asian

These patients prefer small to moderate-size buttocks, and fullness in the lateral buttocks or lateral thigh

Figure 5 (A, B) This Caucasian patient requested more feminine, full, rounded buttocks, which was accomplished with liposuction of the waist and low back and grafting of 780 cc to the medial and lateral buttocks bilaterally. The infragluteal crease and lower pole, of the buttocks appear “lifted” and less ptotic postoperatively.

Figure 6 (A, B) This Caucasian patient requested a more trim, athletic look. This was accomplished by grafting 400 cc bilaterally to the medial buttocks only.

is almost never desired (Fig. 3). Moreover, the shape of the buttocks and its relative proportion to the overall body frame is very important to this ethnic group. They are usually shorter and smaller than other ethnic groups so even small changes in size or shape of the buttocks can have dramatic results. Figure 4 shows an Asian patient with a little more fat available, who wanted fuller

buttocks but still no fullness in the lateral buttocks or lateral thigh.

Caucasian

These patients generally want buttocks that are full but not extremely large. Fullness of the lateral thigh is an

Figure 7 (A, B) This Hispanic patient requested more fullness all over, but specified that she wanted to fill the lateral buttocks and lateral thighs. The depression of the lateral buttocks and thigh has been filled with 700 cc per side and none of the trochanteric fullness was removed.

Figure 8 (A, B) Reduction of roll below her bra strap as well as generous liposuction of the lower chest, low back, and waist to obtain a smooth hourglass curve emphasizes the new fullness of the buttock.

undesirable characteristic, but in regard to the lateral buttocks, Caucasians fall into two categories: some prefer more feminine, full, rounded buttocks (Fig. 5), whereas others prefer flat or hollow lateral buttocks, which give a more athletic look (Fig. 6). Neither of these two types of patients desire fullness in the lateral thigh.

Hispanic

These patients, at least in the United States, prefer buttocks and lateral buttocks that are very full and prefer a slight fullness in the lateral thigh (Fig. 7). Compared with the much fuller lateral thighs requested by African Americans, Hispanic patients desire slight to moderate lateral thigh fullness. In a patient with more excess fat, the surgical plan should include generous liposuction of the lower chest, low back and waist to obtain a smooth hourglass curve and to emphasize the new fullness of the buttocks (Fig. 8).

STRENGTH AND PREVALENCE OF ETHNIC IDEALS

It is the observation of the senior author that these ethnic ideals are so strongly imprinted, in even the most sophisticated woman, that the only exception to the African's typical request (i.e., very full lateral thighs and lateral buttocks and very large overall size of buttocks) have been in women who either (1) move in a social group that is largely Caucasian or (2) are in a significant relationship with a Caucasian.

Conversely, the only times a Caucasian woman has requested very full lateral thighs were when she

moved in a predominately African-American social group or was in a significant relationship with an African American.

CONCLUSION

We have presented an overview of ethnic considerations in buttock aesthetic procedures. We are seeing an increase in the demand for buttock augmentation procedures as well as increasing popularity of aesthetic procedures among Caucasian and non-Caucasian patients in this country. A proper understanding not only about the techniques but also of the ethnic differences is integral to safe and effective practice of aesthetic buttock procedures. Readers are strongly encouraged to attend an instructions course offered by Roberts, Young, Mendieta, De La Pena, and colleagues at the American Society of Aesthetic Plastic Surgery future annual meetings for the most current techniques for buttock aesthetic procedures.

APPENDIX A

Technique of Buttocks Augmentation by Autologous Micro Fat Grafting⁵

1. Choice of Fat Donor Sites: Any donor site is acceptable as we have discerned no difference in survival of fat from various areas. For aesthetic reasons, we always include the lumbar area, sacrum, flanks, and hips (iliac crest area).
2. Presurgical Marking to Obtain Ideal Shape: There is a powerful aesthetic synergy of liposuction of the low back/waist with buttocks augmentation. We realized

that the "inward sweep" of the low back emphasizes the new fullness of the buttocks even before being aware of the importance of the ideal WHR of 0.7. Fuller buttocks look more attractive when the waist is slender rather than fuller.

- a. We always plan to use as donor sites and thoroughly sculpt the lumbosacral, flank, and hip (iliac crest) areas to create this inward sweep of the low back.
 - b. As for areas to be grafted, place the greatest prominence in the (transverse plane) at the junction of the medial and central thirds of the upper and mid buttock.
 - c. We suction a deep sacral "V," and always graft the adjacent upper medial buttocks to enhance the superior gluteal cleavage.
 - d. Because of its role in providing support for the buttock, any transverse roll of fat immediately below the infragluteal crease (the "banana roll"), if present, should never be suctioned. Resection in this area can result in a deeper, longer infragluteal crease and sagging of the buttock. The full extent of the deficiency can only be appreciated in the "diver" position and, in fact, we have often had to graft this area to correct these liposuction deformities. This is truly "structural fat grafting" as described by Coleman.¹⁶
3. Surgical Preparation:
- a. Estimate the amount of fat to be harvested. Our average augmentation now is 825 cc/buttock, or 1650 cc graftable fat. Plan on and mark sufficient donor sites to harvest roughly 25% additional fat, or ~2000 cc total in our average case, because some fat is damaged in harvesting and free oil is released.
 - b. Prepare the patient circumferentially with povidone-iodine while standing.
 - c. Use sequential compression devices for prevention of venous thrombosis.
 - d. Give intravenous antibiotic prophylaxis based on sensitivities of causative agents of previous infections: Ampicillin and sulbactam (Unasyn) 3 g every 6 hours, gentamicin (Garamycin) 5 mg/kg every 24 hours, and cefazolin (Ancef) 2 g every 4 hours.
 - e. Place patient under general endotracheal anesthesia.
 - f. Once asleep, place a sponge soaked in povidone-iodine over the anus.
 - g. Place warming blanket under patient and warm air blanket over patient wherever possible.
 - h. Warm tumescent fluids:
 - (1) To donor sites: Should be ~2 times the amount of fat to be removed. This is typically 6 to 9 L of "half-strength" tumescent fluid (250 mg lidocaine and 1 mg epinephrine per liter of fluid).
 - (2) To recipient sites: Should be kept to a minimum (50 cc) because the buttocks will only hold a certain volume. If you fill them with

fluid, there is less room for the graft and it is hard to judge the aesthetic end point.

4. Surgical Technique: Given the high incidence of serious infections and other major complications, an almost obsessive adherence to sterile technique and the recommendations above and below are mandatory. By adhering to these techniques, we have reduced our infection rate from 14 to 2.7%, with only one patient requiring aspiration of fluid from liposuction donor sites (versus 40% of infected patients requiring fluid aspiration in our first 160 cases). A full discussion of the complications and how they were reduced is detailed in the article by Bruner et al.¹¹
 - a. Harvesting cannula: We use a 3.0- or 3.5-mm "keel" tip cannula, which is very efficient and harvests the desired particle size of ~2 mm.
 - b. Vacuum level: Although most commercial liposuction pumps create a vacuum of 25 to 28 in. Hg, we maintain our vacuum at less than 22 in. Hg (~560 mm Hg) because there is some evidence to suggest that high vacuum may damage the fat cells and decrease their survival.¹⁷
 - c. Surgical assistants: Three scrub nurses are required to process the fat to keep up with the surgeon. This allows all the fat to be ready to graft by the time the surgeon has finished the harvesting.
 - d. Fat collection: Collect the fat in sterile 500-cc canisters and remove the canister as soon as it is half full. We believe that minimizing the amount of time the fat cells are exposed to the vacuum as well as lowering the vacuum pressure may be important reasons why we have such high fat survival.
 - e. Adding antibiotics: Remove the canister once it is half full, add antibiotics and invert the canister to mix the solution (10 cc of a solution containing 3 g ampicillin/sulbactam and 80 mg gentamicin plus 1 g cefazolin in 1000 cc saline). This exposes the fat to a concentration of antibiotics that is 3 times greater than can be obtained intravenously, for ~2 hours from the time it is collected until it is grafted.
 - f. Processing the fat: Draw off the watery layer after an initial settling and pour the supernatant fat into 60-cc syringes and centrifuge at 2000 rpm for 3 minutes. Pour off the water again and decant and wick off the free oil. Transfer the resultant fat to 3-cc syringes through a closed system.
 - g. Turning: Turn the patient prone once harvesting is complete on the front and completely reprepare and redrape the patient.
 - h. Grafting: The grafting cannula is 2 mm in diameter by 15 cm in length, with a blunt tip and single side hole (Byron Medical). Pass the entire length of the cannula through a gauze soaked in Betadine (povidone-iodine) as the surgical assistant hands each

syringe to the surgeon. Make three to five tiny incisions in each lateral buttock. Deposit the fat beginning medially and deep into the muscle and fat just above the bone, being aware of the position of the sciatic nerve just lateral to the ischial tuberosity. Deposit no more than 0.3 cc in each pass (almost 3000 tunnels per side are required to graft 825 cc to each buttock).

Because the soft tissue under the ischium is often flattened and fibrous from years of sitting, which may limit the degree of augmentation that can be obtained, we prefer to begin grafting inferomedially, moving to the mid-medial buttock and then to the supero-medial buttock. Maximum fullness should be near the junction of the upper and middle thirds of the buttock and between the central and middle thirds in the transverse plane of the buttocks. Much of the lateral area will already be partially filled by the time you have completed grafting the medial buttock because some fat will tend to track backward along the cannula. Finally, the lateral buttock and lateral thigh are grafted, depending on the patient's desires and ethnic identity.

For those patients requesting significant augmentation of the lateral thigh, it may be necessary to graft the anterior extent of the lateral thigh before the patient is turned prone, to ensure a smooth contour. Our average augmentation now is 825 cc per side; we try to graft less than 1000 cc per side, as we found that major complications arise dramatically to 19.2% when grafting surpasses 1000 cc per side, compared with 2.7% when less than 1000 cc is grafted to each side.¹¹

- i. Final suctioning: Refine the shape of the buttocks with a final suctioning. Sometimes the buttock may rise as a block or platform instead of the desired rounded shape. In such cases, the margins of the buttock are slowly and carefully suctioned down and edges are rounded off to create the ideal shape, curving smoothly into the new inward sweep of the low back and waist. Suction off any fluid that has built up in the flanks to avoid overwhelming the drains.
- j. Drains: Pass a curved liposuction cannula, 40 cm long and 3.5 mm in diameter, through a new incision under the right scapula and beneath the bra strap, down across the sacrum and out through an existing incision over the left hip. The external end of a 3-mm round, multiperforated drain is forced several centimeters over the tip of the cannula. Withdraw the cannula while leaving the drain in place. Pass a second drain similarly by inserting it through an existing incision in the left lower abdomen and exiting under the left scapula beneath the bra strap.

- k. Dressing: Make a gauze triangle shaped like an old wide bicycle seat with Kerlix rolls to ~3 inches in thickness. Place this gauze in the midline over the sacrum to help the skin adhere to the sacrum and maintain the important superior gluteal cleavage (otherwise, the presacral skin will tent up, fluid will accumulate, leading to development of fibrosis and loss of cleavage). Apply a compressive garment at this point.

5. Postoperative Management

Although the surgery is planned as an outpatient procedure, there must be a competent caregiver with the patient at all times for at least 3 to 4 days. The patient must also remain in town for 2 weeks, as gram-negative infection may not present until postoperative days 7 to 14.

This surgery is a physiologic challenge for the patient due to the extensive liposuction usually required. Therefore, monitor patients carefully in the recovery room (O₂ saturation, EKG, blood pressure, and urine output), and discharge patient only when certain standard criteria are met.

Instruct the patient on the use of an incentive spirometer preoperatively, which must be used every hour postoperatively. Leave the Foley catheter in overnight. Record drain output and strip drains frequently. The patient must lie prone or be up on her feet—not sitting.

- a. First Postoperative Day: When the patient returns, check vital signs along with O₂ saturation, weight, and urine output. Encourage progressive ambulation as well as hydration. The patient should be drinking a gallon of Gatorade or other sports electrolyte fluid per day. Give 2 to 3 L intravenous fluid if intake or output is poor or if there are orthostatic symptoms. Check hemoglobin and metabolic profile. We expect to see slightly low potassium (3.0 to 3.5 mmol/L) and calcium levels (9.0 to 9.5 mg/dL) but have never had to replace the electrolytes intravenously. Place the patient on ampicillin/clavulanic acid (Augmentin 500 mg twice daily) and gatifloxacin (Tequin 400 mg daily) for 5 days, as grafted fat will not be vascularized for 4 to 7 days and is in ideal culture medium, placed in a warm, moist, traumatized environment.
- b. Days 2 to 7:
 - (1) Patient may lie prone, kneel, or stand up, and ambulation should be increased daily.
 - (2) No sitting is permitted for 2 weeks, except for a bowel movement.
 - (3) The drains are stripped and drainage measured several times each day.
 - (4) Do not remove the compressive garment for 2 to 4 days because of potential for orthostatic hypotension.
 - (5) Hemoglobin and metabolic profile are checked again on day 4 to 5 and managed appropriately.

- (6) The patient is checked in the office daily, then every other day.

c. Days 6 to 14:

- (1) Patient and caregiver are instructed to firmly feel every square inch of the operative areas daily, looking for any new tenderness that might suggest an infection.
- (2) The patient is seen every other day, and the drains are removed when there is less than 30 cc/day for 2 days, usually day 7 to 10.
- (3) The thick gauze triangle is maintained in the sacral area for 3 weeks, to decrease the risk of seroma and promote the adherence of the skin to the sacrum.
- (4) No sitting or lying on the back is allowed for 2 weeks, then minimally for the next 2 weeks.

REFERENCES

1. ASAPS. 2007 Statistics. Available at: <http://www.surgery.org/press/statistics-2007.php>. Accessed May 8, 2009
2. de la Peña JA, Rubio OV, Cano JP, Cedillo MC, Garcés MT. History of gluteal augmentation. *Clin Plast Surg* 2006; 33:307–319
3. Harrison D, Selvaggi G. Gluteal augmentation surgery: indications and surgical management. *J Plast Reconstr Aesthet Surg* 2007;60:922–928
4. Singh D. Universal allure of the hourglass figure: an evolutionary theory of female physical attractiveness. *Clin Plast Surg* 2006;33:359–370
5. Roberts TL III, Weinfeld AB, Bruner TW, Nguyen K. “Universal” and ethnic ideals of beautiful buttocks are best obtained by autologous micro fat grafting and liposuction. *Clin Plast Surg* 2006;33:371–394
6. Cuenca-Guerra R, Lugo-Beltran I. Beautiful buttocks: characteristics and surgical techniques. *Clin Plast Surg* 2006; 33:321–332
7. Mendieta CG. Classification system for gluteal evaluation. *Clin Plast Surg* 2006;33:333–346
8. Restrepo JC, Ahmed JA. Large-volume lipoinjection for gluteal augmentation. *Aesthet Surg J* 2002;22:33–38
9. Aiache AE. Gluteal re-contouring with combination treatments: implants, liposuction, and fat transfer. *Clin Plast Surg* 2006;33:395–403
10. Mendieta CG. Continuing medical education article: body contouring gluteoplasty. *Aesthet Surg J* 2003;23:441–455
11. Bruner TW, Roberts TL III, Nguyen K. Complications of buttocks augmentation: diagnosis, management, and prevention. *Clin Plast Surg* 2006;33:449–466
12. Mendieta C. Intramuscular buttocks implant augmentation. Presented at: The Annual Meeting of the American Society of Plastic Surgery; September 27, 2005; Chicago, IL
13. de la Peña JA. Subfascial technique for gluteal augmentation. *Aesthet Surg J* 2004;24:265–273
14. Roberts TL III, Toledo LS, Badin AZ. Augmentation of the buttocks by micro fat grafting. *Aesthet Surg J* 2001;21:311–319
15. Mendieta CG. Gluteal reshaping. *Aesthet Surg J* 2007;27: 641–655
16. Coleman SR. Structural fat grafts: the ideal filler? *Clin Plast Surg* 2001;28:111–119
17. Har-Shai Y, Lindenbaum ES, Gamliel-Lazarovich A, Beach D, Hirshowitz B. An integrated approach for increasing the survival of autologous fat grafts in the treatment of contour defects. *Plast Reconstr Surg* 1999;104:945–954