

SPECIAL 25<sup>TH</sup> ANNIVERSARY ISSUE

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# Fat Transplantation to the Buttocks and Legs for Aesthetic Enhancement or Correction of Deformities: Long-Term Results of Large Volumes of Fat Transplant

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**BACKGROUND** A comprehensive review of the history of free fat transplantation reveals that since 1893 when Neuber used small pearls of fat taken from the arm to fill out depressed facial scars after trauma and underlying bone loss, free fat graft has been used with success in facial surgery, brain and nervous system surgery, various orthopedic uses, general Surgery, craniofacial surgery, and cosmetic surgery.

**OBJECTIVE** To present the author's hypothesis that a fat graft in cosmetic surgery responds like other kinds of tissue grafts. This article was written as a result of the author's search for a way to avoid the most common complications of doing a buttock or leg augmentation with silicone prostheses and to find a better surgical procedure that is simpler, complementary with liposuction, and better able to deal with subtle body irregularities that do not justify a large and complicated procedure.

**METHODS** Over a period of 6.5 years, a total of 1350 liposculptures were performed. Eight hundred and seventy-nine patients had buttock augmentation. One patient had facial hemiatrophy and her face was treated twice with fat grafts. Four hundred and seventy patients had fat grafted onto their ankles and their legs for cosmetic reasons. One patient with polio sequelae and one male patient with agenesis of the gemellus muscles over his left leg were treated. The patients selected were not obese, but had moderate to severe lipodystrophy. The patients ranged in age from 18 to 65 years.

A COMPREHENSIVE REVIEW of the history of free fat transplantation reveals that since 1893, when Neuber used small pearls of fat taken from the arm to fill out depressed facial scars after trauma and underlying bone loss, free fat grafts have been used with success in the treatment of facial scars, facial hemiatrophy, saddle nose, first branchial cleft syndrome, jaw defects, as well as in reconstruction after Frontal sinus empyema, zygomatic arch replacement, postparotidectomy reconstruction, mastoidectomy reconstruction, filling periodontal cysts, and chin augmentation.<sup>1</sup>

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**RESULTS** The results of the buttock augmentations showed that there was a 0.5–1.0 cm reduction at 2 months. This persisted until the sixth month and until years later. These findings were seen in patients that had 3–5 kg less body weight after surgery than before or had 3–5 L of fat removed from their bodies. Patients who underwent ankle or leg augmentation experienced a 0.5 cm loss in diameter over the treated areas after the 1.5 month postoperative period. No more volume was lost after that. The areas kept the same parameters until the sixth month and also into later follow-ups. The few complications that our patients experienced appeared between days 2 and 15. The complications of 6.5 years occurred in 14 patients (1.037%). One case of erysipelas appeared on the 10th postoperative day. This patient reported that she was riding a bicycle and had a scratch over the left ankle, producing an infection with edema, erythema, and pain. Twelve patients got skin vesicles because of contact with micropore over the skin of the ankles. We treated those patients with local antibiotics, obtaining healing of the skin in about 5 days, with dryness and absence of the vesicles. No damage to the graft was observed.

**CONCLUSION** The hypothesis that applied fat grafts are real grafts was demonstrated. Not only are the grafts real, they are able to live and persist with the patients, growing if the patient gained weight over the gluteus area and not losing circumference when reducing weight.

Other successful uses for free fat grafting were reported in relation to the brain and nervous system including to prevent brain adhesions, cover nerves to prevent neuromas, treat dural defects, treat epilepsy secondary to dural scars, and treat dural adhesions after meniscectomy.<sup>2</sup> The various orthopedic uses of fat grafts include the treatment of stiff humeral-ulnar joints, stiff finger joints, filling osteomyelitis cavities, replacing the carpal lunate, and preventing tendon adhesions.<sup>3</sup> In general surgery, its use includes closing ventral hernias and stopping unsuturable bleeding in the kidney and liver.<sup>4</sup> It was also grafted in the posterior pharynx to correct velopharyngeal incompetence.<sup>5</sup>

In the early 1990s Dr. Vida T. Vida used fat tissue to graft the hand dorsum for rejuvenating of the hands, and Dr. Julius Newman, who processed fat to obtain collagen, demonstrated how the filling of a face

was accomplished with fat tissue to avoid an early facelift and produce a face rejuvenation.

Several things fueled our growing interest in grafting fat tissue for body contouring and augmentation:

Trying to avoid the most common complications of having a buttock or leg augmentation done, with the introduction of silicone prostheses.

Finding a surgical procedure that was complementary to liposuction, which could give not only the surgeon, but also the patient, fewer medical and surgical complications, better cosmetic results, more natural cosmetic results, longer lasting results, and an easier surgical technique.

Finding a surgical procedure to deal with subtle body irregularities that do not justify a large surgical procedure.

We also needed a surgical procedure that could be attached to the term liposculpture because we observed that a better body shape was not only given by suctioning the excess adipose tissue from a lipodystrophy, but also from transplanting some of the adipose tissue into areas that needed to be filled.

The experience of other surgeons and our own observations during follow-up of our patients have encouraged us to hypothesize that the fat graft in cosmetic surgery will respond as other tissue grafts do, integrating with the tissue surrounding it, grossing, and presenting natural-looking cosmetic results.

## Materials and Methods

Over a period of 6.5 years, 1349 women and 1 man who underwent liposculpture were selected. The patients selected were not obese, but had moderate to severe lipodystrophy. Removing fat tissue with lipodystrophy causes bulging irregularities. Grafting fat over the buttocks, legs, or ankles to increase volume over the treated areas creates a better and more harmonious body contour.

The age of the patients treated ranged from 18 to 65 years. Table 1 shows the number of patients in each age range that were treated.

Table 1. Number and Percentage of Patients Treated in Each Age Range

Average age (years)	Number of patients	Percentage
18-35	540	40
36-45	472.5	35
46-65	337	25

## Fat Harvest

Tumescent liposuction technique with saline and epinephrine was used during liposuction. The materials used for fat harvest were liposuction cannulas, 5 mm and 6 mm in diameter; suction machine under 500 mmHg; pyrex vapor-sterilized flasks, capacity 1000 cc; 12-gauge sharp needle; 60 cc syringes; 10 cc syringes; blunt-tipped lipofilling cannulas, 2 mm in diameter; and an image computer to show the surgeon the patient's desires.

In the patients that were having general body decompression (reshaping their body contour and filling their buttocks and legs), the fat grafts were obtained by suctioning different areas all over the body, such as the abdomen, waist hips, back, the arms trochanteric region, and the inner superior third of the legs and knees. The fat graft is deposited in sterile glass flasks that have been vapor sterilized. The sterile flask is located immediately after the suction cannulas. After filling one, two or three of the flasks, the normal liposuctioning continues without keeping additional sterile fat for grafting. We attempt to obtain at least 1-2 L of fat tissue.

In thin patients, any possible body area was suctioned with the purpose of having enough fat to graft. Some of these patients were asked to put on an additional 3-4 kg of weight before surgery in order to obtain enough fat for grafting. It was explained to the patient that the decompression of their body volume during liposculpture will return them to their previous thin appearance. The patient is, in essence, a graft-growing laboratory.

## Fat Grafting

The fat graft is injected subcutaneously over any areas that need filling. Minimum tunneling is performed, and while injecting we mold the fat to obtain a regular accommodation with finger and hand pressure. We prefer or use a 12-gauge needle to transplant the fat over the buttocks and 2 mm blunt cannulas to fill ankles and legs. The cannulas prevent unfavorable complications for the patient and the surgeon such as the unwanted puncture of a vein, nerve, or artery; bleeding; or a fat embolus.

After the fat is injected for a buttock augmentation, careful measurements are taken along the intergluteal line, in a face-down position, to make sure the projection of the new volume reaches 3-3.5 cm. When grafting buttocks, we strive for the 3-3.5 cm posterior projection that can be achieved with the Brazilian silicone prostheses for the gluteus. It was our goal to reach this same posterior projection with a fat transplant. In some cases, because patient's desired more volume, we tried to graft more fat. Surprisingly we observed that the graft was running over the lateral areas, but not giving more projection. This happened in the ankles too. When fat begins to run over the lateral areas, the surgeon knows immediately that the graft in place is large enough. Filling is suspended because overfilling any areas may cause skin necrosis due to failure of irrigation (could be circulation) secondary to excessive pressure. The fat graft does not have any special treatment other than keeping it in sterile glass



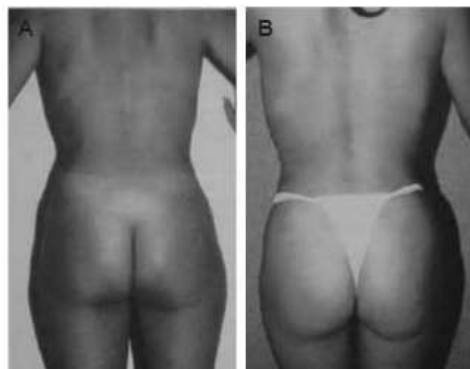


Figure 1. A) A 19-year-old woman preoperatively who asked for buttock augmentation. B) The same patient 2 years postoperatively. A large volume of fat tissue was grafted-270 cc each side. The patient was the same weight after 2 years postoperatively.

containers and immediately placing it in a sterile 60 cc syringe or a 10 cc syringe (Figure 1).

Measurements are taken before surgery of the chest, waist, hips, ankles, and any other area to receive a fat graft treatment. Body weight is measured pre- and postoperatively.

Large volumes of fat (200-350 cc) were used to perform a buttock augmentation. In ankles about 80-110 cc are used.

## Results

A total of 1350 liposculptures were performed. Eight hundred seventy-nine patients had buttock augmentation. One patient had facial hermitrophia and her face was treated twice with fat grafts. Four hundred seventy patients had fat grafted onto their ankles and their legs for cosmetic reasons. One patient with polio sequelae and one male patient with agenesis of the gemellus muscles over his left leg were treated.

Observations during the postoperative period can be divided into early and late observation periods. During the first month we were able to follow 100% of the patients. However, during the second month we could follow only 92% of the patients; during the third month, 87%; and during the sixth month, 68% (see Table 2).

At each postoperative observation we measured and compared the body and treated areas or circumferences. The results of the buttock augmentation showed that there was 0.5-1.0 cm less projection at 2 months. This persisted until the sixth month and until years later (Figures 2-5). These findings were seen in patients that had 3-5 kg less body weight after surgery than before or had 3-5 L of fat removed from their bodies.

Postoperative follow-up	Percentage of cases
Day 3	100
Day 6	100
Day 10	100
Day 20	100
Day 30	100
Day 45	92
2 months	92
3 months	87
6 months	68
1 year	55
2 year	36
3 year	28
6 year	13

For those patients who underwent ankle or leg alignment (Figure 5), a 0.5 cm loss in diameter over the treated areas was observed after a 1.5-month post operative period. No more volume was lost after that. The areas kept the same parameters until the sixth month and into later follow-ups.

These observations made us think that at the end of 1.5 months, the graft was already integrated. The graft was able to persist alive within the patient.

### Complications

The few complications that were experienced appeared between days 2 and 15. One case of erysipela appeared on postoperative day 15. This patient reported that she was riding a bicycle and scratched her left ankle, producing an infection with edema, erythema and pain. We treated the patient with benzathine penicillin 1,200,000 IU, m cry third day for 12 days,



Figure 2. A) A 24-year-old woman preoperatively who asked for buttock augmentation. B) The same patient 18 months postoperatively after 300 cc of fat graft was placed over each gluteus.



Figure 3. A) A 41-year-old patient with facial hemiatrophy. B) The same patient 15 years postoperatively after 170 cc fat graft.

obtaining resolution of the skin pathology and no loss of fat in the graft.

Twelve patients got skin vesicles because of contact with Micropore over the skin of the ankles. We treated those patients with local antibiotics, obtaining healing of the skin in about 5 days, with dryness and absence of the vesicles. No damage to the graft was observed.

One patient had cellulite with inflammation of the area, redness, and pain over the right gluteal area. We treated that patient with oral antibiotics (veracef 500 mg, 2 g/day for 10 days). After healing he did not lose the graft and no irregularities were observed.

All of the patients were concerned about foot edema from the third postoperative day through the first month. The patients ranged in age from 18 to 65 years. The foot edema was managed with daily use of compression



Figure 4. A) A 19-year-old patient preoperatively who asked for leg and ankle enlargement. B) The same patient 6 years after fat transplantation to leg from the knee to the ankle. The patient had 3 kg of weight gain. The fat graft grew with the weight gain.

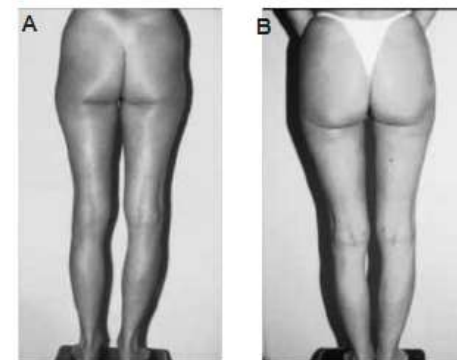


Figure 5. A) A 38-year-old woman who asked for buttock and ankle enlargement. B) One year postoperatively after 250 cc of fat transfer to each buttock and 100 cc to each ankle. The patient is the same weight.

socks (panty hose) for 30 days, and at night we suggested they elevate their legs while resting.

The appearance of foot edema was not unexpected and can be explained by physiologic principles: a thin structure like the ankle, full of vascular structures, suddenly filled with fat grafts causing pressure over the area, loses venous flow and a normal edema is produced.

In those patients who lost at least 8-10 kg of weight by 1.5 months-2 years after surgery, we observed that the circumferences of the augmented buttocks were not reduced. This was evidence that the fat graft was not only alive, but integrated extremely satisfactorily.

Fifteen percent of the patients we followed up at 6 years showed a weight gain of 4-6 kg. Surprisingly the buttocks were more voluptuous and the circumferences had increased 2 cm for each kilogram of weight gained.

Only five patients, ranging in age from 58 to 65 years, were concerned about foot edema after the third postoperative month and until the fifth postoperative month. The patients were advised to continue using compression socks, and only two of them, aged 61 and 64 years, were asked to have a phlebography test and a consultation with a peripheral vascular physician. None of them had any pathology and finally after the sixth month they reported no more problems.

### Ankles

The thinner patients had a preoperative ankle circumference of about 17 cm and after the graft was transplanted the circumference was augmented 3-3.8 cm.

## Discussion

Currently in plastic surgery there is a certain incredulity when we talk about soft tissue substitutes. However, free fat grafts had been used for 60 years before the arrival of silicone and with very good results. Our own good results have encouraged us to augment gluteus, legs, and ankles for cosmetic purposes, not only because our patients continue to demand the treatment, but also because the concept of using the graft was so well known in plastic surgery.

Knowing the principles of grafting fat over small areas and knowing that silicone prostheses used for buttock and leg augmentation were having the same complications as silicone implants in the breast, we began to try our technique with large volumes of fat instead of the small amounts of fat used for correcting small defects. Artificial buttock prostheses cause patients to be incapacitated for 15-30 days after surgery. Mostly this is caused by extreme pain and the fact that the patient cannot lie down on the gluteus area. In addition, patients receiving an artificial buttock implant are forbidden to receive intramuscular injections. This raised the potential problem of having an accident that might leave the patient unconscious while someone else applied an intramuscular injection. This might rupture the prostheses, requiring a repeat of the cosmetic surgery. In addition, gluteal prostheses cause small irregularities that are easy to view through the skin and many patients are unable to wear a swimsuit in a natural way. We began using fat grafts in an attempt to find a procedure that was easier on the patient. When compared, the fat grafts look more natural than artificial prostheses. Also, the patient can lie in a supine position with no restriction and can ambulate early the same day of surgery.

Similar results were observed with leg augmentations, and no ankle augmentations are performed with any kind of prostheses. This produces an extremely voluminous leg with an extremely thin ankle, as seen in ballerinas and football players. After performing this procedure many times for cosmetic results, we used it for reconstructive purposes



Figure 6. A) A 27-year old man with agenesis of the right gemellus muscles preoperatively. B) The patient 1 year postoperatively after 300 cc fat transfer to the leg from the knee to the ankle.

in one patient with agenesis of the gemellus muscles of his left leg (Figure 6). We also treated one patient with facial hemiatrophy using fat grafts (Figure 3).

Observing that the complications of 6.5 years occurred in only 14 patients (1.037%), we demonstrate the hypothesis that applied fat grafts were not only real grafts, but that they were able to live and persist with the patients, growing if the patient gained weight over the gluteus area, and not losing circumference when reducing weight. In summary, we found a natural-looking procedure, a physiologically safe one, and one with long-lasting cosmetic results.

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