

Autologous Fat Transplantation

edited by
Melvin A. Shiffman

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Preface

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The transplantation of fat from one area of the body to another is a safe and effective procedure. Autologous fat will vascularize without rejection or allergic reaction if injected in small aliquots. There is no cost for the fat and it is available in sufficient quantities from almost any patient. The convenience is thus inestimable.

Autologous fat transplantation is operator-dependent and requires gentle handling, proper instruments, and careful selection of recipient sites. Despite all precautions, the transplant will often resorb either partially or completely. In most cases, at least a portion of the fat will remain viable. Repeat transplants may be necessary to obtain the desired results.

Fat can also be frozen and used at a later date for refinement of a particular problem or for cosmetic use in other areas. The proper method of freezing and thawing has not been adequately researched and it is not known if the fat survives or the residual collagen results in filling of defects.

There is little doubt that autologous fat transplantation has become a recognized and established tissue filler. This book attempts to give the cosmetic surgeon an understanding of the techniques that are being utilized by surgeons around the world. It is hoped that there will be continued research concerning fat transplants so that even better results can be obtained in the future.

Melvin A Shiffman.

Introduction

I began the modern technique of fat transfer after my first ten years of liposculpture when confronted with the problem of creating better anatomical form in areas of the body that had depressions from the suction of excessive fat. The early techniques not only entailed feathering the margins close to the entrance incisions but also consisted of replacing the fat with autologous fat transfer. This evolved into transferring fat to other body parts. In 1988, fat transfer to the breast was initiated with the intention to improve consistency and contour with augmentation rather than the insertion of breast prostheses. This method included placement of modest amounts of adipose above the pectoral muscle and around the mammary gland but not in the gland proper.

Confirmation of this technique came about ten years ago when Pierre Fournier and I came across *The Face and Its Improvement by Aesthetic Plastic Surgery*, written in 1926 by Charles H. Willi. In the book, Willi describes the technique and advantages of syringe fat transfer. In 1986, I had begun to augment the zygomatic and malar region with autologous fat and to fill deep nasolabial folds. At that time, fairly large quantities of fat were deposited in these anatomical subunits, which caused overfilling to compensate for anticipated graft loss. As a result, 50% of the transferred fat was lost. This was consistent with the literature but was not acceptable. By 1992, there was a better understanding of grafting techniques, biology, and physiology of adipose tissue and closer attention was being paid to harvest techniques and processing. I began to harvest the adipose tissue with small syringes and a sharp needle. Processing of

fat was abandoned and the adipose tissue was allowed to settle into layers. In 1992 and 1993, the technique focused on graft survival rather than anticipated graft loss. Because less fat was transferred, there was a great increase in long-term survival and a decrease in early graft loss.

In 1997, I developed a technique that consisted of the transfer of rice grain-sized fat parcels for total facial rejuvenation. This technique focuses on multiple transfers to the subdermal, interdermal, muscular, and fat layers using a microcannula to deposit tiny parcels of adipose tissue. The intention was early and reliable neovascularization. The microcannula has also allowed correction of problems that were once difficult or impossible to manage. Signs of aging in the infraorbital region caused by the orbicularis oculi muscles shining through the delicate translucent infraorbital skin could be restored by depositing approximately 4 cc of adipose tissue on one side of the face from forehead to chin. The age of the patient will often determine the number of transfers performed this technique is ideal for patients 25-30 years old. The rice grain-sized implants stimulate new vessel formation and gives the skin improved color, consistency, and texture.

These early successes led me to correct other deformities such as acne scarring using fat transfer. The pathophysiology of acne scarring is complicated and acne-related deformities are difficult to manage as acne lesions affect the epidermis, dermis, and subdermal fat. The current method is used to restore the atrophied subcutaneous tissues with subsequent dermabrasion of the acne scars.

The next step in the evolution of fat transfer focused on lines of force and strength in the face. These are the lines that act against gravity and are responsible for the typical aged appearance of the aging face. These factors were used to determine the vector of placement of the fat. Fat is transferred in an oblique manner to support the skin and is deposited from the chin to forehead in the shape of a herringbone, the head of the herringbone at the chin and the tail toward the forehead.

The clinical scientific aspects of fat transfer are exciting and challenging areas of cosmetic surgery. All factors must be taken into consideration and addressed to maintain and improve outcomes. As the technology of medicine and surgery continues to evolve so do the techniques and our understanding. The future of fat transfer is in our hands as scientists and surgeons.

Giorgio Fischer, M.D.

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Fat Transplant to the Buttocks and Legs for Enhancement and Deformities-Large Volumes of Fat Transplant

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I. HISTORY

Neuber, in 1893,¹ used small pearls of fat taken from the arm to fill depressed facial scars for bone loss following facial trauma. Since then free fat graft has been used successfully for various problems such as facial scars, facial hematrophy, saddle nose, first branchial cleft disorder, jaw defects, zygomatic arch loss, postparotidectomy defects, periodontal cysts, and chin augmentation. Grafts have been effective in preventing cerebral adhesions, covering nerves to prevent neuromas, and treating dural defects and adhesions. Orthopedic use includes treatment of stiff humeral-ulnar joints and finger joints, filling osteomyelitis cavities, replacing the lunate carpal bone, and preventing tendon adhesions. In general surgery, fat, is used for closing ventral hernias and stopping persistent bleeding in the kidney and liver.

With the introduction of liposuction in the 1970s, there followed autologous fat transplantation utilizing aspirated fat.

Augmentation of tissue to improve the esthetic appearance or to refill atrophic regions is now common practice. Very satisfying results can be obtained from fat transplants to the buttocks and legs.

II. PREOPERATIVE PREPARATION

The patient is carefully evaluated and the results are explained using computer imaging. All details of surgery and possible complications are discussed with the patients. Patients who are smokers are asked to quit smoking at least 20 days before surgery, and they are also forbidden to take aspirin in any form.

Measurements are made over the chest, waist, hips, ankles, or any other area that is going to have a fat graft. Body weight is measured preoperatively and postoperatively.

Patients are given a prophylactic antibiotic, cephalexin (Keflex) 500 mg, orally every 12 hs starting 2 days preoperatively. The skin of the patient is sterilized for 3 days before surgery with surgical soap while taking showers twice a day. Before entering the operating room on the day of surgery, one more shower is taken.

Instruments to be used during surgery such as cannulae and Pyrex and glass flasks are vapor sterilized.

III. TECHNIQUE

The areas for fat retrieval are tumesced with Klein's solution. The fat graft is obtained by suctioning areas all over the body such as the abdomen, waist, hips, back, arms, trochanteric region, inner superior third of legs, and knees. These patients usually need general body contouring as well as filling of buttocks and legs.

The fat graft is placed in sterile glass flasks which have been vapor sterilized (Fig. 1). The flasks are located between the suction cannula and the suction machine. The fat is retained in at least two or three flasks while normal liposuction contouring is continued.

The fat graft does not need any special treatment other than keeping it in sterile glass receptacles and immediately placing it in a sterile 10- or 60-mL syringe (Fig. 2).

In thin patients, any possible body area which has enough fat is suctioned for the grafts. Some patients may need 3-4 kg of fat weight in order to obtain enough graft. The patient is his or her own laboratory for growing a fat graft.

Since the Brazilian silicone prostheses for the gluteus is able to project approximately 3.0-3.5 cm posteriorly, this is the goal for the fat transplant.

In thin ankles with a circumference of 17 cm, the transplanted graft circumference should augment the circumference from 3.0 to 3.8 cm.

The fat graft is injected subcutaneously over any area needed to be filled. Minimum tunneling is performed and the fat is molded with finger and hand pressure while injecting to give a smooth appearance.



Figure 1 Fat for graft in sterile Pyrex flask following liposuction.



Figure 2 Storage of autologous fat in syringes.

A 12-gauge needle is used to transplant the fat into the buttocks and a 2-mm blunt cannula is used to fill ankles and legs. This will avoid artery or vein puncture with bleeding or injury to nerves and has not been associated with fat embolus.

In the buttock, measurements are taken from the intergluteal line to show the projection from 3.0 to 3.5 cm with the injected fat volume. Adding more volume results in the fat running over into lateral areas but not giving more projection. A similar occurrence is observed in the ankles. When the graft volume is enough, the procedure is stopped. Overfilling may cause skin necrosis due to excessive pressure.

From 200 to 350 mL is used to perform buttock augmentation and 80 to 100 mL is used for ankles.

IV. POSTOPERATIVE CARE

All patients remain 1 night in the hospital. Compression garments are applied immediately after surgery, and the patient should wear them for a period of 30 days postoperatively.

The areas of the body suctioned are massaged starting 15 days after surgery. Three massages of 1-h duration are performed every week for 2 months.

The grafted areas do not receive any treatment other than the normal care of a surgical scar where the skin puncture is present. Peroxide is applied to the wounds starting 3 days after surgery.

V. COMPLICATIONS

The authors have treated 1350 patients with ages ranging from 18 to 65 years. The patients were followed for up to 6 years (Table 1).

Table 1 Follow-up Time Period and Percentage of Patients Followed

Time	Patients followed (%)
2 months	92
3 months	87
6 months	68
1 year	55
2 years	36
3 years	28
6 years	13

Fat Transplant to the Buttocks and Legs

The treated areas circumferences were measured. Buttock augmentation had 0.5-1.0 cm loss at 2 months, which persisted at that measurement for years. This minimal decrease occurred if the patient had 3-5 kg of weight loss from the preoperative weight or if 3-5 L of fat was liposuctioned from the body. Patients losing 8-10 kg have no loss of buttock circumference. Patients who had gained 4-6 kg at the 6-year follow-up showed an increased circumference of 2 cm for each kilogram of weight gained. For those who underwent ankle or leg augmentation, there was a 0.5-cm loss in diameter at 1.5 months, which remained the same thereafter. The graft is, therefore, well preserved after 1.5-2.0 months.

One case of erysipelas appeared on the tenth postoperative day. The patient reported she was riding a bicycle and had a scratch over the left ankle producing a skin infection with edema, redness, and pain. The patient was treated with penicillin, 1,200,000 units, every third day for 12 days. The problem resolved quickly without loss of the fat graft.

Twelve cases of skin vesicles occurred because of the contact with Micropore over the skin of the ankles. These patients were treated with local antibiotics and the skin healed in about 5 days. The vesicles dried and resolved without damage to the graft.

Cellulitis with inflammation of the skin, which included redness and pain, occurred in one patient over the right gluteal area. The patient was treated with an oral antibiotic, Veracef (Cefradine) (2 g daily for 10 days). After healing there was no loss of the graft and no irregularities were observed.

All of the patients developed edema of the feet from the third postoperative day until the end of the first month. This was managed with the daily use of compression stockings (pantyhose) for 30 days, and at night the legs were elevated while resting. Five patients had foot edema for 3-5 months postoperatively. Two of these patients had peripheral vascular consultation and no pathology was found. Edema of the foot appears because when a thin structure like the ankle which is full of vascular structures is suddenly filled with a fat graft, pressure over the area occurs. Reduced venous flow results and produces the edema.

VI. DISCUSSION

Buttock prostheses cause prolonged incapacity ranging from 15 to 30 days. Mostly this is caused by extreme pain and the impossibility of lying on the gluteal area. In addition, patients are forbidden to have intramuscular injections

into the buttocks. These gluteal prostheses cause small irregularities easily viewed through the skin, and many such patients were not able to wear a swimsuit. The buttock fat graft looks natural (Figs. 3 and 4), is well located, and the patient can lie in the supine position without restriction and can ambulate early on the day of surgery. Similar results are observed with leg fat augmentation (Fig. 5). Fat augmentation can be performed for reconstructive purposes such as polio sequelae (Fig. 6), agenesis of the gemellus muscles of the leg (Fig. 7), and facial hemiatrophy.



Figure 3 (A) Preoperative 19-year-old patient with small buttocks. (B) Postoperative 1.5 years. No weight gain.

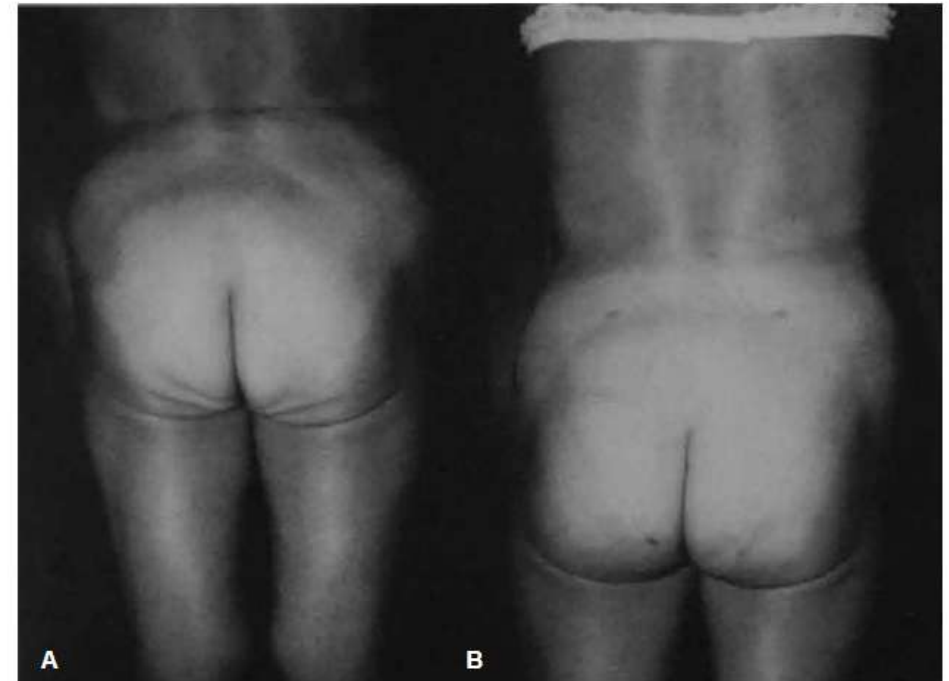


Figure 4 (A) Preoperative 58-year-old female with small buttocks and loose skin. (B) Postoperative at 8 months after 600-mL fat graft to buttocks.

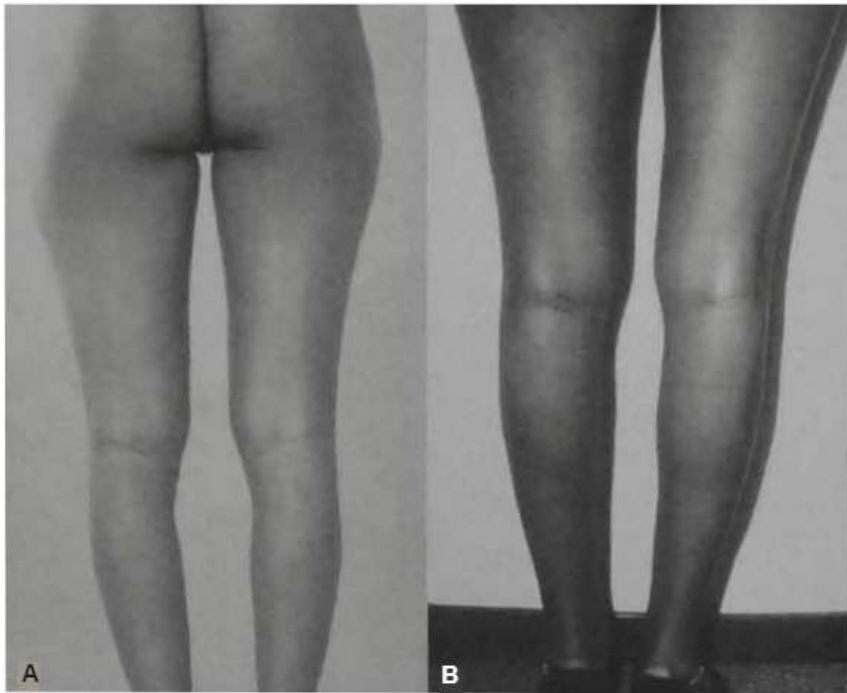


Figure 5 (A) Preoperative 21-year-old female with thin legs. (B) Two years postoperative 2 years. No weight gain.



Figure 6 (A) Preoperative 44-year old female with polio sequelae of right leg. (B) Postoperative 9 months after 800-mL fat transplant.

Fat graft to the buttocks and legs has been shown to last at least 6 years in the follow-ups and is most likely permanent. The transplant is physiological and safe.

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Figure 7 (A) Preoperative 27-year old male with agnesis of right gemellus muscles. (B) Postoperative 1 year after 300-mL fat transfer to leg from knee to ankle.

about the book...

This book considers various techniques used by the world's top cosmetic and plastic surgeons to perform autologous fat transfer to all areas of the body, highlighting the entire procedure, and covering donor site selection, infiltration with tumescent solution, aspiration by cannula with suction or syringe, washing, injection, dressings, and freezing—focusing on overall attractiveness rather than simple rejuvenation.

Containing over **550** photographs, micrographs, and references, **Autologous Fat Transplantation** explores the advantage of using small fat particles to improve neovascularization...addresses the danger of tissue trauma caused by liposuction ...argues against using fat for augmentation when it impairs fluent muscle interaction...considers substituting fat transfer for implants during malar and chin augmentation...describes fat transfer with Botox to prevent muscle contraction and consequent drooping of the eyebrow and forehead.. details dermabrasion, skin peeling, vein stripping, lifting, and filling of the hands...reveals how to correct deep facial furrows, sunken areas, and atrophic scars.. explores the combination of autologous fat and microparticulate alloplastic to correct contour defects ...and more.

about the editor...

MELVIN A. SHIFFMAN is a physician and surgeon in private practice of reconstructive and cosmetic surgery and a medical legal consultant in Tustin, California. The author or coauthor of over 200 books, articles, and professional papers, Dr. Shiffman is a Fellow of the International College of Surgeons, the American Society of Cosmetic Breast Surgery, the Royal Society of Health, the American College of Forensic Examiners, and the American College of Forensic Medicine. He received the M.D. degree (1957) from Northwestern University Medical School, Evanston, Illinois, and the J.D. degree (1976) from Western State University College of Law, Fullerton, California.

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