

# Morcellized Omental Transfer for Severe HIV Facial Wasting

David Teplica, MD, MFA\*†‡  
 Marlon Bohorquez, BA§  
 Francis J. Podbielski, MS, MD¶

**Background:** A novel surgical technique to reconstruct facial wasting was developed for patients with severe human immunodeficiency virus lipoatrophy and no source of subcutaneous fat for donor material. Fourteen patients underwent endoscopic harvest of omentum, extracorporeal morcellation, and autologous transfer to the face.

**Methods:** Omental fat was harvested using a standard 3-port laparoscopic technique. A mechanical tissue processor created morsels suitable for transfer. Gold-plated, multi-holed catheters delivered living particulate fat to the subcutaneous planes of the buccal, malar, lateral cheek, and temporal regions. Results were evaluated using standardized pre- and postoperative photographs for specific anatomic criteria found along the typical progression of the disease process.

**Results:** Electron microscopy confirmed that morcellized fat retained intact cell walls and was appropriate for autologous transfer. Complications were minor and transient. Patients were discharged home within 24 hours. No patient required open laparotomy. Survival of the adipose grafts was deemed good to excellent in 13 of the 14 cases.

**Conclusions:** Mechanically morcellized omental fat transfer provides a safe option to restore facial volume in those unusual patients with severe wasting and no available subcutaneous tissue for transfer. Consistent anatomic progression of facial wasting permits preoperative classification, counseling of patients, and postoperative evaluation of surgical improvement. (*Plast Reconstr Surg Glob Open* 2013;1:e73; doi: 10.1097/GOX.0000000000000006; Published online 21 November 2013.)

Long-term survivors of human immunodeficiency virus (HIV) infection are often affected by lipodystrophy (LD), a syndrome characterized by major morphologic changes and metabolic consequences.<sup>1,2</sup> Although the clinical progression of anatomic changes varies, many individuals who develop the wasting component at some point also

experience location-specific hypertrophy. Lipoatrophy occurs in the face, limbs, and buttocks, whereas lipohypertrophy occurs in the breasts, submentum, posterior thoracocervical region, and on the abdomen.<sup>3,4</sup> Even mild deformities may be associated with psychological consequences, including significantly lower levels of self-esteem, decreased quality of life,<sup>5-9</sup> and a higher likelihood of social isolation.<sup>2,10-12</sup> Sadly, such disruptions may negatively affect adherence to prescribed drug therapies<sup>2,6-8,13,14</sup> or may result in suicide.<sup>13,15</sup>

From the \*Department of Surgery, Section of Plastic and Reconstructive Surgery, Pritzker School of Medicine, The University of Chicago, Chicago, Ill.; †The Kinsey Institute, Bloomington, Ind.; ‡Saint Joseph Hospital, Chicago, Ill.; §University of Michigan Medical School, Ann Arbor, Mich.; ¶University of Illinois at Chicago, Chicago, Ill.; and \*\*Lung Cancer Program, Jordan Hospital, Plymouth, Mass.

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At present, autologous fat transfer (AFT) using subcutaneous fat stores is considered the “gold standard” for long-term restoration of facial features. Traditional AFT is accomplished using modified and relatively noninvasive techniques of subcutaneous liposuction.<sup>16</sup> In the HIV population, however, donor adipose ideally should be selectively harvested from regions that do not waste. Fat transfer replaces “like with like,” feels natural, and functions appropriately.<sup>17</sup> Numerous studies report the success of AFT<sup>4,18–23</sup> and high satisfaction rates after its use,<sup>2,24</sup> thus eliminating the need for costly serial injections of artificial fillers. Recent publications reinforce that fat transfer is preferable to fillers and provide strategies not only to better understand the underlying disease process but also to enhance long-term outcomes.<sup>25,26</sup>

A small subset of individuals with long-standing HIV are not candidates for traditional AFT because they have little to no subcutaneous fat for graft harvest.<sup>2,4,12,24,27–31</sup> Despite this, their omentum offers a rich source of adipose tissue for transfer. Although widely believed that omental fat is inaccessible and a poor option for grafting, only one article in the literature comments on this issue.<sup>30</sup> No other medical or surgical data suggest that the omentum would be inappropriate for use in grafting, and vascularized omental flaps have been an integral part of the surgical armamentarium for decades.

This article describes a novel surgical technique using mechanically morcellized omental grafts to reconstruct the faces of HIV patients with severe facial wasting and inadequate subcutaneous fat for traditional AFT.

## METHODS

Fourteen consecutive HIV-positive patients received morcellized omental fat transfer between May 2001 and April 2008. Each was physician-referred to the primary author (D.T.) with concerns of severe facial deformity. All were receiving specialized care and were stable with low viral loads and high CD4 counts. On examination, it was estimated that most had lost over 85% of their original facial volume when compared to prewasting photographs. More importantly, no pinchable subcutaneous fullness was present any-

where on the body. Patients had followed high healthy fat diets for several months, but subcutaneous adipose failed to enlarge sufficiently for traditional AFT. By contrast, the quantity of visceral adipose was judged to be sufficient for procurement and transfer. A detailed explanation of endoscopic partial omentectomy and AFT were provided to potential candidates, along with information regarding the new concept of mechanical morcellation of the omentum. Procedural questions were answered, and patients gave informed consent. At the project’s inception, the respective chairpersons of the Department of Surgery and the St. Joseph Hospital Institutional Review Board deemed this study “exempt from review” as each component was an established clinical entity.

Three patients had previously undergone traditional AFT using subcutaneous fat in attempts to restore facial volumes. One of these three also received injectable hyaluronic acid. In all instances, transferred volumes were inadequate, and residual donor fat was insufficient to allow for secondary restoration. In one additional patient, bovine collagen was administered to decrease deformity, but this had fully resorbed.

## Perioperative Management

Patients are instructed to completely avoid aspirin, nonsteroidal anti-inflammatory agents, vitamin E, herbal products, and dietary supplements for at least 2 weeks before and after surgery as all can affect either the clotting cascade or the patient’s response to anesthesia. Complete avoidance to primary or secondary tobacco smoke is mandated.

The patient is seen in the preoperative holding area by both the plastic and general Surgeons, where last-minute questions are answered and informed consent is obtained. With the patient in an upright position, and using a handheld mirror to maintain patient involvement, marks are made on the surface of the facial skin to define the regions to be grafted. A system of concentric contour rings to outline deficiencies in 0.5 cm increments in all wasted anatomic areas of the face is used (Fig. 1). Brown-colored Sharpie (Newell Rubbermaid, Atlanta, Ga.) marking pens provide stable reference lines during povidone iodine prep, consistently lasting throughout the procedure, and unlike methylene blue or black indelible lines, these brown marks are easily removed at case completion with alcohol swabs. The marked face is then photographed at 45-degree increments to document the plan and provide reference intraoperatively, should the marks fade.

The patient is then taken to the operating room and placed on the table in the supine position. A warming blanket, Baer Huggers (Azirant Healthcare, Eden Prairie, Minn.), and sequential compression stockings on the calves all help maintain safety.

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**Fig. 1.** Photograph of typical contour marks made on the face before surgery. In sequence, each concentric ring represents an additional 0.5 cm of thickness of omental fat needed to restore contours, as estimated from prewasting photographs. Rings are placed using indelible colored ink pens with the patient in a seated position, immediately before surgery. Photographs are taken to document the surgical plan and, if needed, can be used as reference during the operation.

The patient is induced into general endotracheal anesthesia, fully lined and monitored, and a Foley catheter is placed using sterile technique. The abdomen is prepared with povidone iodine scrub and paint solutions, and 4 towels are used to define the umbilical access region. Simultaneously, the face is prepped as part of a separate field using povidone iodine paint. Detergent “scrub” solutions and alcohol prep agents are avoided as they dissolve the preoperative marks. A head drape is fashioned, and Lacri-Lube (Allergan, Irvine, Calif.) and plastic ocular occluders are placed. A 1,000-Drape (3M, St. Paul, Minn.) is used to exclude the endotracheal tube from the field. Throughout the case, 2 separate teams work using 2 sets of instruments.

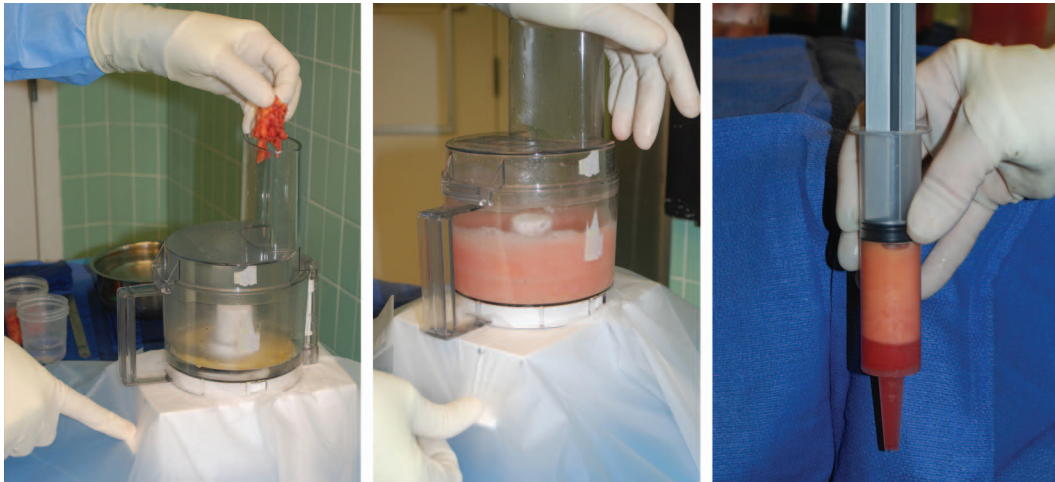
#### Operative Technique

The laparoscopic team begins harvest by cutting a window in the drape exposing the umbilical

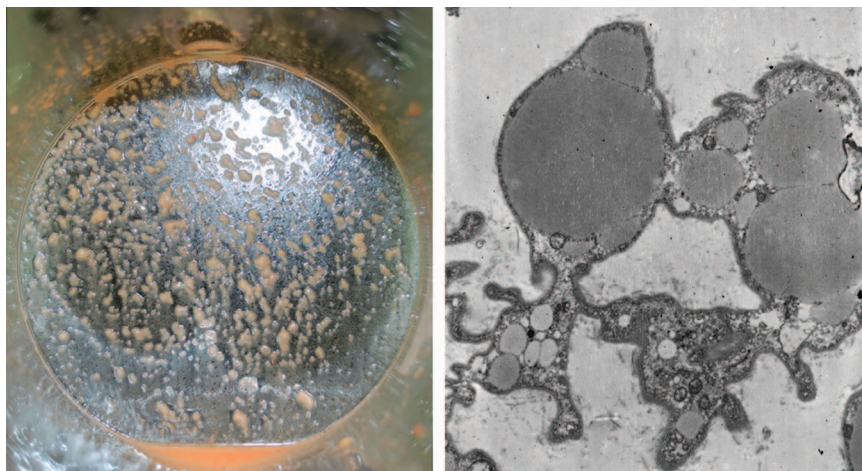
field. The peritoneal cavity is accessed laparoscopically using 1 infraumbilical port (12 mm), at least 1 right lower quadrant site (5 mm), and depending on abdominal height and breadth, a third right or left mid-abdominal entry (5 mm) with the abdomen insufflated using carbon dioxide. A “no-touch technique” was used to avoid needle puncture injuries among operating room staff.<sup>32</sup> Donor fat is harvested from the rim of the greater omentum using a low cautery setting or harmonic scalpel, and small portions weighing between 30 and 120 g are easily delivered through the umbilicus under direct vision to maximize cell survival. By contrast, traumatic delivery of larger portions of omentum, even with the use of specimen bags, results in an oily, nonparticulate sample that is presumably less viable.

Concurrently, at the head of the table, a 20-gauge spinal needle is used to infiltrate small volumes of a 1:500,000 dilution of epinephrine in injectable saline into the subcutaneous spaces of the face where both access and transfer are to occur. It is critical that non-distorting volumes of the vasoconstrictive solution be infiltrated and that gentle pressure is immediately applied over the entire face for 15 minutes to distribute the epinephrine solution throughout the planes of the face to restore original wasted contours. Pressure massage is then used to eliminate any residual distortion from the injections. Twenty minutes of wait time ensures complete surface vasoconstriction (with surface blanching in whites or negative “prick tests” in those of color) before grafting and almost always eliminates postoperative bruising.

The omental tissue is morcellized on the back table using a Cuisinart food processor (Cuisinart, East Windsor, N.J.) (sterilized by ethylene oxide, a liquid chemical sterilant processing system, or x-ray sterilization) as portions of omentum are delivered from the umbilicus by the general surgery team. Approximately 30 cm<sup>3</sup> of omental fat is placed into the morselizer along with 50 mL of Ringer’s lactate solution at room temperature (Fig. 2). Five drops of heparin solution is also added to prevent fibrin formation and stabilize the cell walls. Morcellization is accomplished using a pulse technique (8–11 brief pulses) to disrupt the tissue into small particles of fat capable of being transferred through 1.5-mm cannulae. In early cases, an oil layer was seen when a nonpulsed technique was used to fragment the harvested tissue, but once a pulsed fragmentation protocol was initiated, no significant oil layer was observed in the decantation syringes. Figure 3 shows the healthy appearance of the 0.5- to 1.5-mm particles following mechanical separation; an electron micrograph (Fig. 3B) illustrates morcellized omental particles with intact cell walls.



**Fig. 2.** Morcellation using a sterilized Cuisinart food processor, intermittent pulse technique, and subsequent gravitational decanting.



**Fig. 3.** A, Morcellized omental fat is shown on the base of a sterile container. Particles measuring 0.5–1.5 mm appear healthy following mechanical tissue separation using a Cuisinart food processor. B, An electron micrograph of morcellized omental fat documents the integrity of cell walls seen within the particulate adipose following mechanical separation, indicating that the graft remains alive at the time of transfer.

The morcellized omentum is drawn up into heparinized 10-mL syringes for vertical gravitational decanting on the back table. After the material has separated into its aqueous and adipose components, the water layer is evacuated from the syringes. If present, an oil layer should also be eliminated before transfer. Once adequate graft volumes are obtained, all viable particulate fat is commingled in a single sterile cup (with several additional drops of heparin) to produce a tissue mass of confluent character and viability. The grafts are then drawn up into heparinized 3-mL syringes for transfer to the face.

A 1.5-mm single-eyed, gold-plated Tulip catheter (Tulip Medical Products, San Diego, Calif.) is attached to 3-mL syringes to deliver volume to the regions of

the face that need to be addressed. A #11 blade is used to make nick incisions (1–1.5 mm in size) within the hair-bearing sideburns on each side of the face, in the oral commissures bilaterally, and within the brow, if needed. Hundreds of passes of the catheter are made to instill tiny trails of living fat graft as the cannula is withdrawn, without the application of significant pressure. A multiplanar cross-tunneling technique is employed to produce contours that are symmetrical, smooth, and natural in appearance. Photographs of the patient's prewaxed anatomic state are used for reference intraoperatively. Each wound is closed with a single interrupted 5-0 Blue Prolene suture, and bacitracin ointment is applied. Volumes instilled are carefully recorded by site to ensure symmetry.

**Table 1.****Progressive Scale of HIV Facial Atrophy Based on Anatomic Findings****Clinical progression of HIV facial lipoatrophy observed in more than 600 consecutive patients (least to most severe)**

Facial shape with no apparent changes, except for normal aging when compared to old photographs (considered 0% wasted)  
 Previously convex cheeks, now with general flattening, but without visible depressions (and all findings listed above)  
 Cheeks with subtle concavity (<0.5 cm depression) (and all findings listed above)  
 Cheeks with significant concavity (>0.5 cm depression) (and all findings listed above)  
 Zygomatic arches with inferior borders visible (and all findings listed above)  
 Zygomatic arches with both inferior and superior borders visible (and all findings listed above)  
 Depressed temples with subcutaneous veins visible (and all findings listed above)  
 Cheeks with hollow troughs extending inferiorly from the wasted buccal spaces, down and over the jawline into the submandibular spaces (and all findings listed above)  
 Partially visible zygomaticus major muscles that cross the buccal hollows (and all findings listed above)  
 Submandibular glands with visible borders (and all findings listed above)  
 Well-defined zygomaticus major muscles that divide the buccal hollows into 2 distinct concavities on each side of the face (and all findings listed above, considered 99% wasted)

Consistent progression of facial wasting can be recognized by tracking the sequential standardized photographs of the faces of HIV-positive individuals. This table proves useful when evaluating pre- and postoperative images of patients or their actual anatomy during physical examination. In this study, 2 reviewers used standardized pre- and postoperative frontal photographs of patients and this anatomic guide to estimate the degree of facial wasting.

**Postoperative Management**

For 2 weeks, patients are instructed to never apply ice to the face (preventing vasospasm that would block neovascularization of the graft particles), to avoid pressure or manipulation of any grafted region (preventing shape distortion), to maintain strict head elevation at 30-degrees or more (preventing excessive bruising and edema which compromise graft survival), and to refrain from lifting any object greater than 10 pounds (preventing micro- or macro-hematoma formation).

**Outlining the Progression of Facial Wasting**

The primary author documented anatomic findings that could easily be assessed both on physical examination and in standardized photographs to outline the consistent progression of wasting in patients with HIV facial atrophy. The schema was based on his 20-year observational experience with facial wasting in more than 600 consecutive patients. Wasting consistently occurred in an anatomically predictable manner.

Table 1 presents the progression of fat wasting from the face and the anatomic findings present on examination. Two independent observers analyzed the pre- and postoperative standardized frontal photographs of the subjects in this study for the presence of each anatomic feature and findings were tabulated.

**RESULTS**

Fourteen men with inadequate subcutaneous fat met criteria for reconstruction of facial lipoatrophy using morcellized omental fat. On examination, each patient had a protruding abdomen, suggesting that the omentum would be adequate for procurement and transfer. Table 2 outlines the clinical and surgical parameters and includes the mean values with

standard deviations for age, estimated length of time from seroconversion, diameter of the umbilical incision, estimated intra-abdominal blood loss, amount of omentum harvested, and transferred volume. In all cases, the quantity of omentum was judged intraoperatively to be “adequate to abundant.” The average time required to harvest graft solely for facial transfer was estimated at less than 110 minutes, whereas mean procurement time for omental graft was 153 minutes because of additional fat harvested for secondary grafting procedures.

All patients were held for 23-hour observation except one who requested postrecovery room discharge. No patients required conversion to an open laparotomy, and no surgical sequelae required admission to the hospital. Complications included one occurrence of each of the following: transient ileus, bilateral arm pain due to positioning on the operating table, mild pressure injuries of the lower lip and buttocks (all healing within several days), and an allergic reaction to the nonabsorbable suture used for fascial closure in another case.

Patients had an average follow-up of 25 months. Before surgery, 13 of 14 patients exhibited the classic facies of HIV disease. The remaining patient (with an estimated 50% loss of facial volume based on evaluation of prewasting photographs) asked for proactive care before volume loss in the face became significant enough to disclose his status. Postoperatively, 10 of the 14 patients showed a major reduction in residual anatomic signs of the disease. Three of the remaining 4 showed noticeable improvement but continued to show anatomic signs of HIV wasting. One individual had no significant improvement as the onset of diabetes in the early postoperative period caused massive weight loss that likely compromised the omental fat grafts.

**Table 2. Clinical and Surgical Parameters for the 14 Cases in This Study**

Case	Age	Estimated Years of HIV+	Estimated % Wasted Pre-op	Estimated % Wasted Post-op	Fat Volume Transferred to Face (cm <sup>3</sup> )	Omental Quantity Harvested (cm <sup>3</sup> )	Omental Quality	Estimated Blood Loss (cm <sup>3</sup> )	Diameter of Umbilical Incision (cm)	Follow-up (mo)
1	46	11	94	35	42	60	Excellent	20	3.0	54.5
2	40	10	85	40	84	240	Excellent	20	2.7	2.5
3	38	10	94	55	68	175	Excellent	25	2.3	3.0
4	59	10	99	96*	64	125	Excellent	10	2.5	22.5
5	35	10	60	40	84	150	Good friable	50	3.0	12.0
6	59	14	94	80	76	254	Excellent	25	2.6	12.3
7	54	15	94	30	94	425	Excellent	25	1.8	13.0
8	45	10	99	45	82	525	Excellent	15	3.5	40.0
9	64	10	94	45	83	405	Fair fibrotic	40	2.6	3.5
10	43	8	99	70	123	210	Excellent	10	2.2	13.5
11	49	10	70	40	88	220	Good stringy	10	2.0	82.3
12	38	12	95	45	110	290	Excellent	40	2.3	2.0
13	33	6	50	-20†	39	390	Excellent	150	1.8	77.3
14	59	19	90	40	97	470	Excellent	10	1.8	12.5
Total	662	155	1217	641	1134	3939		450	34.1	350.9
Mean	47	11	87	46	81	281		32	2.4	25.1
SD	10.17	3.17	15.54	14.53	22.99	140.35		36.20	0.51	27.55

\*The estimated percent of postoperative facial wasting for case 4 was not included in the analysis of outcomes because following the operation the patient was diagnosed with adult onset diabetes. This subsequently led massive weight loss and accounts for the very small change in percent of facial wasting after receiving omental fat grafts.

†Case 13 experienced hypertrophy of his omental fat grafts, which resulted in a negative percentage of wasting when analyzed. These grafts were later adjusted to bring the facial wasting of this patient back to baseline with 0% facial wasting.



**Fig. 4.** Standardized preoperative (A) and 12-mo postoperative (B) views of a 35-year-old man who was HIV positive for more than 10 y at the time of surgery. He received 84 cm<sup>3</sup> of omental fat grafts and experienced an improvement in anatomic form (decreased hollowness of the buccal spaces with camouflage of the zygomaticus major muscle, loss of visibility of the superior border of the zygomatic arch, improvement in the configuration of the temples, and decreased visibility of the buccal groove as it wraps over the jawline) as outlined in Table 1, case 5. On examination, he was also noted to have an improvement in pinch thickness of the buccal fat pad from 2 to 10 mm.

Figure 4 (case 5 in Table 2) is an example of the relative improvement seen after morcellized omental fat transfer. On preoperative examination, the

maximal pinch thickness of the buccal fat was 2 mm, whereas postoperative pinch testing showed 1 cm of subcutaneous fullness.



**Fig. 5.** Despite no significant change in the patient's body mass index, overgrowth occurred in the medial and inferior buccal regions of omental fat transferred 4 y earlier. A, Face 2 y after omental transfer. B, Hypertrophy of the omental grafts 4 y postoperatively. Redundancy was subsequently diminished using microliposuction under local anesthesia.

Figure 5 documents the single patient who experienced overgrowth of the transferred graft 4 years post-op. Figure 5A shows a 2-year post-op view of the grafted face. Figure 5B shows volumetric hypertrophy in the medial and inferior buccal spaces 4 years postoperatively despite no significant change in body mass index. The patient requested and underwent microliposuction under local anesthesia to partially reduce the overgrown transferred omental adipocytes.

## DISCUSSION

Patients with severe lipoatrophy display a unique disease-related facial deformity, which may be severe enough to disclose the patient's serostatus. This archetypal facial appearance has been referred to as the "Face of HIV" or the "modern scarlet letter,"<sup>33</sup> with all the stigma that each term carries.<sup>2,3,10,11</sup>

Because treated HIV-infected patients now have near-normal life expectancies, the need to provide facial reconstruction is real and rational. It restores self-confidence, improves quality of life,<sup>9,29</sup> and is now considered "medically necessary" by many insurance providers, including Medicare, on a case-by-case basis. Because of the progressive nature and severity of the disfigurement, the reconstructive process is by no means "cosmetic" and should never be referred to as such. The anatomic defects are real, reconstructive options are effective, and Federal codes exist to classify both the deformity (ICD-9 codes: 738.19 acquired deformity of the face, 272.6 disease-related LD, and 042 symptomatic HIV) and the procedures performed to restore normal anatomy (bilateral autologous fat grafting of the face 20926-22 and 20926-22,50,59).

Numerous publications discuss the use of injectable fillers to minimize the deformity associated with facial lipoatrophy.<sup>2,27-29,34,35</sup> However, these are costly, require ongoing procedures, have inconsistent long-term results,<sup>6,27,36</sup> and only partially restore volume. Furthermore, repeated injection of fillers may cause subcutaneous scar formation (characterized as "collagen in-growth" in promotional literature from the pharmaceutical companies and in the lay-press), which hardens the cheeks and prevents more natural autologous restoration.<sup>26</sup> Numerous studies report that AFT is a more favorable, long-term solution for restoring significant volume to the face,<sup>2,4,18,21,22,24,25</sup> but none mentions that traditional AFT is of no value in the small subset of HIV patients who lack subcutaneous fat stores.

As an alternative for these latter individuals, the laparoscopic approach to omental procurement and extracorporeal morcellation is safe, provides adequate tissue, adds minimal morbidity to the traditional AFT procedure, and permits significant diminution of deformity. Post transfer, tissues are stable and cells remain intact. The data described above support the contention that morcellized omentum is an excellent source of fat that can be safely utilized for facial augmentation. To our knowledge, this is the first article reporting the use of morcellized omental fat transfer for restoration of volume. This technique improves facial contours in the majority of patients to minimize the "Face of HIV" and its societal implications.

Three important practical issues must be considered and discussed with patients preoperatively. First, before grafting, patients must be informed that the total volume lost from the face is greater than

the volume that can safely be transferred so that appropriate expectations may be set. Approximately 45 cm<sup>3</sup> of particulate fat can be transferred per side before overwhelming the process of neovascularization. This makes complete correction in one stage nearly impossible because most individuals with severe wasting have lost more than 60 cm<sup>3</sup> of adipose per side. If patients desire secondary harvest, such procedures are possible. This was accomplished in 1 individual from this patient set who underwent secondary harvest and morcellization of the omentum for autologous transfer to the face 6 years after the initial omental transfer without difficulty or complications. Second, it is important that patients maintain body fat content at or above preoperative levels to experience the volumetric benefits of transplanted cells because transferred fat behaves as it would in its native location. Lastly, patients must be cognizant that, although rare, continued growth of the omentum in the postoperative period can result in excess facial fullness requiring surgical reduction.

Although biopsies of the transferred omentum have not been performed, several clinical observations provide support for long-term graft survival and the maintenance of physiologic integrity. One patient exhibited graft hypertrophy that was significant enough to require subsequent microliposuction. Against advice, 2 additional patients chose to lose weight postoperatively through diet and exercise, dropping both fat content and thickness of the grafts. One of the two regained 8 pounds, remained wasted in other areas of lipoatrophy, but experienced hypertrophy of grafted omental fat as his abdominal girth increased, showing that the transferred adipocytes maintain the physiologic properties inherent to the donor tissue.

A novel description for facial wasting using anatomic criteria allows for mapping of disease progression of facial fat that has wasted away in HIV lipoatrophy patients. This clinical tool could track disease progression and also allow for comparison of the outcomes of the various options available for facial restoration.

As patients with HIV approach normal life expectancies, the extended disease course ultimately means a growing number of individuals will experience LD and the associated deformities. Traditional AFT is the gold standard for restoration of facial form, but the use of morcellized omental fat provides an important reconstructive option for patients with no subcutaneous donor tissue. In an ideal world, studies comparing the benefits of morcellized omental fat with those of traditional fat transfer should be considered, but this is impossible in this patient population, given the absence of subcutaneous adipose tissue.

## CONCLUSION

HIV routinely wastes traditional subcutaneous adipocytes and, in many cases, compensatory enlargement of a mammary ridge subpopulation of fat almost always occurs to some degree, providing a rich source for harvesting autologous fat for reconstruction. However, in rare individuals, this lipohypertrophy does not occur, and inadequate subcutaneous fat is available for reconstruction of the well-described severely wasted “face of HIV.” Mechanically morcellized omental fat transfer provides a safe and effective tool to restore facial volume in HIV lipoatrophy. This unique subpopulation of transferred omental adipocytes remains viable over time, appears to maintain volume, and has been seen to undergo post-transfer hypertrophy in at least one patient.

*David Teplica, MD, MFA*

803 West Hutchinson Street

Chicago, IL 60613

E-mail: doctor@davidteplica.com

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## PATIENT CONSENT

*All patients provided written consent for the use of their images.*

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