Numerous surgical techniques have been described to improve the gluteal contour, either with the placement of implants or lipoinjection of the buttocks. Coleman and others described fat liposculpture with good results in terms of injected fat survival and aesthetic outcomes, even at long-term follow-up. The main disadvantage of this technique is the high absorption rate of the injected fat, which can reach up to 70% of its volume—hence the need for overcorrection and repeated operations. In this case, abdominal adipose tissue obtained by liposuction was preserved with specific freezing and thawing procedures for delayed gluteal augmentation and possible future repeat injections.

**CASE REPORT**

A 42-year-old man presented to our clinic for abdominal liposuction. During the first consultation, he also expressed interest in receiving gluteal augmentation in the near future, but he would not consent to undergo general anesthesia and did not want a prosthesis. He also refused to undergo simultaneous abdominal liposuction and gluteal lipofilling. The possibility of storing his abdominal fat for future use by a controlled freezing procedure was explained and accepted by the patient. A consent form detailing the procedure was obtained.

Through suprapubic and umbilical incisions, 1000 mL of Klein solution was infiltrated in the abdominal wall. Fat was harvested with a standard 2-mm Coleman aspirator cannula with a curettage tip, connected to a 10-mL syringe. Centrifugation of the fat (500 g at 25°C for three minutes) was carried out.

In other cases, the fat obtained could be used as a graft and injected in the same surgical procedure. In this case, as mentioned, the leftover fat was not used in the same operation but frozen according to the following procedure. Fat in the centrifuged syringes (approximately 600 mL) was resuspended in equal volumes of a sterile 0.9% NaCl solution with 20% dimethylsulfoxide (DMSO) to yield final cryoprotectant concentrations of 10% (Figure 1). DMSO is a molecule widely and safely used in several pharmaceutical industries.

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drugs and in cryopreservation of human tissues. Although glycerol was a possible alternative to DMSO, we preferred DMSO because of its superior viability rate in the cryopreservation process, as reported by Moscatello et al.\(^4\) The 20% DMSO saline mixture was prepared in our laboratory and brought into the surgical room before the operation.

Before freezing, fat was stored in 60-mL Luer-Lok syringes (Figure 2) and each syringe (20 samples, for a total of total 1200 mL) was placed in a double sterile plastic bag to maintain sterility for further use (Figure 3). Freezing to −80°C was achieved slowly, at approximately one minute per −1°C. The day after surgery, syringes were transferred to liquid nitrogen vapor phase (−196°C). It was crucial to maintain sterility throughout the procedure and to limit the number of times fat passed through the syringe connector.

Three months after the abdominal liposuction, the gluteal augmentation was planned. The day of the operation, 14 bags containing sterile syringes with cryopreserved fat were quickly thawed by swirling them in a 37°C water bath. To eliminate DMSO from the samples, a cleaning centrifugation of the fat was performed (500 g for three minutes). The liquid portion containing DMSO was eliminated and further washing of the fat was carried out, adding equal volumes of sterile 0.9% NaCl solution. In the same syringe, fat was resuspended by simple agitation and then centrifuged once again (500 g for three minutes). This procedure was performed three times. After the last centrifugation, the liquid was eliminated and the fat was ready to be injected.

The areas to be lipoinjected were marked preoperatively with the patient standing. Sedation was accomplished with midazolam, propofol, and remiphentanyl. Two skin incisions (superior and inferior) for each side were made. Lipoinjection of the marked areas was performed using 60-mL Luer-Lok syringes and a 3-mm round-tip cannula with one hole. Both the muscular plane and a deep subcutaneous plane were infiltrated. Intramuscular positioning of the cannula was confirmed by small contractions of the gluteal muscle when penetrated by the cannula. The skin was closed with 4-0 nylon sutures.

The patient was able to return home in two hours and was instructed to wear an elastic garment for three weeks postoperatively. No specific postoperative positioning of the patient was necessary. Beginning with the first postoperative week, therapeutic massages were given for 21 days, twice a week, in the treated areas. The postoperative period was not marked by any complications. No irregularities or induration of the infiltrated area were observed.
Figure 4. (A, C) A 42-year-old man who presented initially for abdominal liposuction and expressed interest in receiving gluteal augmentation in the near future but not during the same procedure. (B, D) One year after gluteal augmentation with cryopreserved fat harvested during the initial liposuction procedure.
Figure 4 (continued). (E, G) A 42-year-old man who presented initially for abdominal liposuction and expressed interest in receiving gluteal augmentation in the near future but not during the same procedure. (F, H) One year after gluteal augmentation with cryopreserved fat harvested during the initial liposuction procedure.
Postoperative photos were taken one year after gluteal augmentation (Figure 4).

DISCUSSION

Soft tissue augmentation by fat injection is not new and is not a complex procedure. It is performed with the aid of local anesthesia in an outpatient setting and is associated with low morbidity. The technique, first described by Neuber in 1893, indications for several congenital or acquired anomalies such as hemifacial atrophy, Romberg’s disease, depressed scars, wrinkles, subcutaneous adipose atrophy of senility, and breast and gluteal augmentation.

The main drawback of fat injection is its high absorption rate, which may reach up to 70% of the originally injected volume, hence the need for overcorrection during the first session (limited by the difficulty of predicting the right amount of excess fat) or for repeated injections, which necessitates additional surgical procedures for fat harvesting, thus increasing morbidity and costs.

There are many theories regarding the reason for the partial loss of the graft, such as mechanical destruction of the lipocytes during the harvesting and reinjection procedures, insufficient nutrition of the fat cells in the core of each aggregate, inadequate storage, and poor blood supply to the recipient area, all of which can result in cell destruction shortly after injection.

The logistics of the repeated procedures can be simplified, in part, by suitable storage of the fat harvested during the primary surgery for future injection. We believe that the most critical factors for tissue survival are as follows:

- Taking the graft with adequate cannulae and pressure
- Controlled slow freezing with the aid of cryoprotectant
- Controlled rapid thawing procedure
- Injection of the graft intramuscularly and in the deep subcutaneous plane

The importance of adequate procedures in taking the fat graft has been well demonstrated by Coleman. When fat is frozen immediately at −20°C, very few viable adipocytes and stromal cells can be recovered. Better survival rates (similar to fresh specimens) were found with tissue samples frozen at a controlled rate in the presence of cryoprotectants. We do not believe the length of time the tissue is kept in the frozen state to be a critical factor in survival rates. A few studies have emphasized the importance of the size of the fat particles; these have shown that the largest fat particle that can possibly survive to gain a local blood supply is probably in the range of 1.5 to 2 mm in diameter. Larger fat particles may undergo central necrosis due to lack of revascularization to the core.

Fat infiltration in different planes and in multiple directions, with continuous movement of the syringe, avoids accumulation of large quantities of fat in any one area that might result in fat necrosis, guaranteeing more symmetrical results.

The described technique is a simple, low-cost procedure with minimal morbidity and very good results. Although we could not objectively and precisely measure the survival of the injected fat in this patient, the gluteal shape maintained after prolonged follow-up was satisfactory and demonstrated considerable fat survival after one year (Figure 4). We usually infiltrate anesthetic solutions with epinephrine in fat graft donor sites with no issues of viability in the grafted fat cells.

Infiltration in the upper portion of the gluteus favored buttock elevation and some minor correction of ptosis. The problem of excess skin in the subgluteal fold could have been addressed by a direct excision or by an upper buttock lift, but the patient did not want any scar and was satisfied with the improvement achieved by fat injection alone.

Although in this case, part of the stored fat was used to perform a delayed gluteal augmentation as a first procedure without any repeat injections, the same procedure can be easily extended to repeat treatments. Part of this patient’s frozen fat (approximately 180 mL) is still preserved for possible future soft tissue injections in the same patient.

CONCLUSIONS

Although a larger series of cases is needed to confirm the efficacy and safety of this procedure, the authors believe that fat preservation for delayed gluteal augmentation can reduce costs and morbidity for patients. Furthermore, the procedure would be an option for other soft tissue augmentations with fat. The future will likely see the creation of soft tissue banks for storage of patient specimens, samples, and tissue for further medical, aesthetic, or antiaging procedures.

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