Breast Autologous Fat Transfer Entirely Under Tumescent Anesthesia: Safety and Efficacy
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BACKGROUND/OBJECTIVES The prior use of external expansion has been described in the literature as a tool to allow reliable grafting of more than 200 mLs of autologous fat under general anesthesia. The purpose of this study was to determine whether breast autologous fat transfer entirely under tumescent anesthesia (BAFTEUTA) is a safe and effective technique.

METHODS After institutional board approval, 22 consecutive patients were enrolled in this single-cohort, prospective study. All patients underwent preparative expansion using manually evacuated domes. All procedures were performed under tumescent anesthesia with oral sedation.

RESULTS There was a median successful graft of 200 mLs. Complications were minimal and limited to occlusive folliculitis.

CONCLUSION Although the author has not reported as large graft volumes as some other authors, BAFTEUTA is a safe procedure and can have good outcomes with high levels of patient satisfaction.

Although augmentation of the breast with fat has a long history starting with Czerny’s account of the transfer of a lipoma to the breast in 1895, it became more popular with the advent of cannula surgery in the second half of the past century but was eventually condemned by the American Society of Plastic and Reconstructive Surgeons in 1987 because of concern about mammographic changes after fat augmentation of the breast, which might interfere with surveillance for breast cancer. This was because workers were squirting large volumes of fat into the breast, creating globules too large for survival, with subsequent necrosis and the formation of cysts and microcalcifications.1 With the advent of refined techniques for fat augmentation and the advent of high-quality mammography and MRI, the American Society reversed their recommendation in 2009. Subsequent articles in the literature have confirmed the safety of fat augmentation of the breast.2-10. Recent meta-analyses did not demonstrate an increased local recurrence rate of breast cancer among more than 4,000 patients receiving post-breast cancer grafting procedures across 59 studies.3,8 This confirmed the results of individual studies that AFT can be performed safely in breast reconstruction after breast cancer surgery. Further meta-analyses have confirmed no increase in the incidence of radiographic procedures or biopsies after postoncologic fat grafting.10

The prior use of external expansion to the breast has been described in the literature as a tool to allow reliable grafting of more than 200 mLs of autologous fat under general anesthesia.11-15 The purpose of this pilot study was to determine whether this technique could be adapted to be undertaken safely and effectively entirely under tumescent anesthesia.

Methods
After obtaining permission of the institutional authority, 22 patients were enrolled into the trial and signed consent. Exclusion criteria were pregnancy, treatment with systemic immune-suppressant, inadequate body fat, and unrealistic expectations.

The age range was 26 to 67 years. Just 5 patients in this study had not breastfed, and these patients were all interested to increase their breast size. A representative example is shown in Figure 1. The remaining 17 patients in this study had all breastfed at least 2 children for a minimum of 6 months each. All these patients expressed a desire to rejuvenate their breasts and restore them toward their prelactation state. A representative example is shown in Figure 2.

Volume measurements were obtained by averaging 3 displacement measurements and were obtained at entry, on the day of surgery, at 6 weeks postsurgery, and 12 months postsurgery. Patients logged their use of external expanders, and these logs were used to establish the number of hours of external expander use. All patients had imaging before surgery and at 6 months after surgery. In the youngest patients, this was by ultrasound, in most patients by using mammogram, and in a minority by MRI. Patients were encouraged to achieve at least 200 hours of external expansion over 8 weeks preceding their surgery.

At surgery, patients received 2 to 4 mg of lorazepam as an oral sedative. The donor site and the breasts were infiltrated with 0.05% lidocaine with epinephrine 1000 μg/L and
0.75% lidocaine with epinephrine 1000 µg/L, respectively. A maximum dose of 35 mg/kg of lidocaine was not exceeded. Donor fat was suctioned using a 3-mm Kouri harvester under low pressure vacuum (<30 kPa) and collected in a closed system. The tumescent infranatant was immediately discarded before placement of the fat through multiple 2-mm stab incisions using a 16-G Coleman type 2 cannula. The fat was placed by multiple passes in 3 dimensions, starting most superficially then more deeply, including to just above the pectoralis fascia. Fat was only injected on withdrawal of the cannula, evenly and throughout the entire pass of the cannula from the opposite side of the breast to the entry port and only 1.5 mL per pass. After grafting, the breasts were immobilized using a Hypafix tape, and the patients wore a sports bra for the first 6 weeks.

Expanders were not used postoperatively. Donor sites were managed with compression garments for 1 week. Patients were discharged home on the day of operation. Patients were instructed to rest at home for the first week, with minimal use of their arms followed by slow return to normal activity but only after 3 weeks. Patients were asked to rate their postoperative discomfort at the donor site and at the breast at 1 day, 6 weeks, and 6 months postoperatively on a scale of 1 to 10. All patients were followed at 1 day, 1, 6 weeks, 6, and 12 months. Volumes were measured at 6 weeks and 12 months, and patients filled in a satisfaction survey at 12 months.

Results
Twenty-two patients were enrolled and all completed this study, and 44 breasts were grafted. All patients were available for follow-up to 12 months. One patient requested further rejuvenation and received 2 procedures (Figure 3).

The median preoperative breast volume was 253 mLs. The median hours of preoperative expansion and weeks of expansion were 225 hours and 11.5 weeks, respectively. The median graft volume was 230 mLs per breast. The median size at 6 months was 478 mLs. The median breast size at 12 months was 442 mLs. The median volume increase at 12 months was 200 mLs.

There was a strong correlation between the number of weeks (Pearson correlation \( r^2 = 0.43 \), Figure 4) of expander use and the percentage of successful graft take. Analyzing the data by multiple linear regression, there was also a strong association between the percentage and ultimate volume of successfully grafted fat and the weeks of expander use but not hours of expander use. The data indicate that a total of 273 hours of expansion over a minimum of 10 weeks were necessary to achieve \( >90\% \) take of grafts of more than 200 mLs, and that for every week of expansion use, the graft take went up to 4.5% (\( y = 84.5 + 0.01 \times x \) hours + 8.81 \( \times \) weeks).

In all cases, sensation in the breast was reported as normal at 12 months. Follow-up imaging at 6 months did not reveal any significant changes in breast architecture, particularly; no cysts and no microcalcifications. There were no significant complications, particularly; there were no hematoma, no seroma, and no infections (Table 1). Occlusion folliculitis was not uncommon with expander use and resolved in all cases without need for treatment.

The procedure was well tolerated using only paracetamol with codeine as postoperative pain relief. All patients experienced normal liposuction postoperative bruising in their donor site but only 3 patients reported bruising on the breast. Pain in the breast was reported on a Likert scale and rated a median of 1 of 10 within 24 hours of surgery and a median of 0.5 at 6 weeks. Only one patient complained of discomfort, which was minor, at 6 months.

Preoperative asymmetry in breast size was largely corrected in all patients.
Patient satisfaction was rated on a Likert scale at the 12-month visit and is summarized in Table 2.

**Discussion**

After the publication of numerous studies showing no oncologic risk associated with autologous fat transfer to the breast,2–10 Kouri and others published data showing that preoperative use of external expansion could reliably increase the successfully grafted volume from approximately 50 mLs to more than 200 mLs.11–15 All previous studies have published the use of autologous fat transfer to the breast as a procedure under general anesthesia, using solutions containing epinephrine to control bleeding in the donor areas. In this small prospective pilot study, the author have demonstrated that breast autologous fat transfer entirely under tumescent anesthesia (BAFTEUTA) seems safe and effective when conducted entirely under tumescent local anesthesia. As with all his tumescent procedures, these procedures were performed as day-stay cases entirely under local anesthesia with only 2 to 4 mg of lorazepam as oral sedation.

The donor site was rated as uncomfortable in the first 4 weeks postsurgery but discomfort in the breasts in all cases was rated as minor only.

Of patients receiving silicon breast prostheses, 20% to 25% will eventually request or require reoperation,16 this compares favorably with the data of this small series where only one patient requested a further augmentation, and in this case, only because of her desire for additional augmentation.

There were no significant complications during this small pilot study. Given the excellent safety record of tumescent liposuction practised under local anesthesia17–19 and that of fat transfer using blunt Coleman-type cannulas, the author is not anticipating additional complications in larger studies. There were no significant changes in breast architecture at six-month imaging after this procedure.

The procedure was tolerated uniformly well. There was a good level of patient satisfaction both among patients who had breastfed and those who had not (Table 2). Only one patient had a disappointingly small augmentation despite 270 hours of preoperative external expansion. However, her 270 hours were accumulated over only 4 weeks, and this may have not allowed the physiologic changes in the breasts to occur necessary for larger-volume fat transfer. She also received a 290-mL graft on each side which may have resulted in excessively high interstitial pressures and consequent graft failure, Kouri’s so called “cliff” effect.20

Our results suggest that for larger-volume BAFTEUTA (>175 mLs), not only it important for a patient to accumulate over 200 hours of expander use but that these hours should be spread over at least an eight-week period and ideally a fourteen-week period. The 14 patients who accumulated over 200 hours of expander use over more than 8 weeks had an average breast increase of 207 mLs from an average graft size of 245 mLs (84% take). This contrasts with those 8 patients with less than 173 hours and less than 8 weeks of expansion who had an average breast size increase of 130 mLs, from an average graft size of 242 mLs (54% take).

| Complications          | No. (%) |
|------------------------|---------|
| Bruising               | 3 (14)  |
| Occlusion folliculitis  | 8 (36)  |
| Infection              | 0       |
| Oil cysts              | 0       |
| Microcalcification      | 0       |

**Figure 3.** Thirty-nine-year-old, lactation 133 months. Two procedures. Expansions 12 weeks and 300 hours with 220 mL x 2 grafts each breast, and then 12 weeks and 330 hours with 190 mL and 240 mL grafts, respectively. Follow-up photographs at 6 months after the second procedure. The postoperative volumes were 900 mLs each side. Note weight gain. Donor sites abdomen and upper lateral thigh. Pre-operative views (A, C and E). Post-operative views (B, D and F).

**Figure 4.** Scatter plot showing percentage of fat successfully grafted versus weeks of expander use.
Preoperative consultation should include the need for realistic expectations on the patient’s part of an increase of no more than 1 cup size per procedure. This is a disadvantage compared with the use of silicon prostheses where much larger augmentations are possible in a single procedure. In this small study, the author was able to reliably graft more than 100 mLs of fat to each breast and over 200 where the patient had accumulated over 200 hours of expander use over more than 8 weeks. Nevertheless, patients who put on extra adipose tissue in the donor area after their procedure may experience volume increase in their breasts. This is presented in Figure 3, where the subject received 500 mL or less as grafts but increased their breast volumes by more than 700 mL.

BAFTEUTA is not a suitable procedure for all patients requesting rejuvenation or enlargement of the breast. Some patients will not be comfortable with the concept of a procedure under local anesthesia. Some patients may have insufficient accumulations of fat to make the procedure practical.

By contrast, patients who gain weight in the post-operative period may experience enlargement of their breasts in concert with that of their donor site (Figure 3). The major limitation of this study is its small size. Hopefully, in time, a larger experience can be published, including works by others in this field. Volume assessment of the breast was performed by displacement of water, 3 times for each breast at each measurement to reduce error. Volume measurement immediately preoperatively could have provided further information regarding the percentage of enlargement from expansion. Future studies will focus on patient satisfaction using the Breast-Q questionnaire.

In conclusion, BAFTEUTA (breast autologous fat transfer entirely under tumescent anesthesia) is a safe procedure and can also be an effective method of rejuvenation and enlargement of the breast when suitable periods of pre-expansion are undertaken by the patient.

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