Del Vecchio\textsuperscript{1} introduced us to the term simultaneous implant exchange with fat (“SIEF”), and patients in this study have undergone SIEF operations without the use of Brava (Brava, Inc., Miami, Fla.) preexpansion device.

Our experience with the “Coleman technique,”\textsuperscript{2,3} in using small droplets of refined fat with minimal manipulation trauma, has resulted in higher yielding survival rates. The combined clinical implications of using adipose-derived stem cells in fat grafting have complemented our lipoinjection procedures. Adipose tissue for lipoinjection is now becoming a very attractive material for tissue augmentation in Japanese patients who have sufficient redundant fat.
In Japan, SIEF has not been the common practice. One reason for this limited approach might be a Japanese “urban legend” that the expanded intracapsular spaces where the breast implant existed would require several months postsurgery to collapse and close forever. There are concerns that fat may reinfiltreate into the intracapsular space creating opportunities for fat necrosis. Our recent experience with the Brava (Brava, Inc.) in postexpansion patients with implants previously removed, sometimes up to 10 years, shows clear intracapsular spaces in ultrasound examinations (Fig. 1). Most capsules are unnoticeable in our preexaminations before Brava use.

We have chosen to use SIEF in our clinic for the following reasons: (1) careful lipofilling around the intracapsular space can be performed at the time of implant removal; (2) preexisting skin elasticity from implant removal is beneficial in restoring lost volume immediately; (3) only during the simultaneous surgery could we wash out the intracapsular space, thus lowering fat necrosis risk; (4) the current belief in Japan is that autologous fat creates a more natural feeling breast as compared to implants; and (5) patients who have had their implants removed can recover from this surgery with breast volume and shape. Here, we have ascertained the usefulness of SIEF by examining changes in breast size and short-term complications of the procedure.

PATIENTS AND METHODS

Patient Inclusion and Exclusion Criteria

We absolutely exclude patients younger than 19 years and with a body mass index greater than 35 kg/m². Furthermore, patients with diabetes are also excluded from our SIEF surgeries.

![Fig. 1. Residual capsule remaining after 10 years. Ultrasound examination of a patient who had already had her breast implants removed 10 years earlier. Note the edematous subcutaneous tissue around the capsule and widespread residual space by the Brava (Brava, Inc., Miami, Fla.).](image)

Patients

Of 131 patients enrolled in this study, from January 2010 and January 2015, surgery was performed at 3 of our clinic institutions by a total of 4 surgeons. Table 1 lists the 131 patient details including age, height, weight, and body mass index. Table 2 shows the breast implant volumes removed and amounts of centrifuged fat injected.

Operative Methods

Anesthesia

Most patients were sedated by intravenous anesthesia and analgesics with local anesthesia by tumescent technique, but without intubation. Only a few patients were under general anesthesia with intubation during surgery.

Harvesting

Fat was aspirated using a tumescent technique (1 ml of epinephrine, 20 ml of 8.4% sodium hydrogen carbonate, and 50 ml of 1.0% lidocaine per 1000 ml of saline solution). Liposuction was performed with a third-generation ultrasound device, VASER Lipo System (Sound Surgical Technologies, Louisville, Colo.) used at a low power (50 kPa). Cannulas used for harvesting were of diameter 3.0 to 4.6 mm, with an average length of 20 cm.

Fat Preparation

Centrifugation with a Lipokit (Medikan Corp., Seoul, Korea) was performed at 1200g to 2000g for 3 minutes.¹ The filter piston in the Lipokit is designed to separate fat into 3 portions: (1) oil, (2) adipose, and (3) fluid portion. Only the adipose portion is used for fat injection (Fig. 2).

Implant Removal

Ultrasound preexaminations are performed to indicate in vivo implant positioning (subpec-

| Table 1. Patient Characteristics (n = 131) |
|------------------------------------------|
| Duration: January 2010 to January 2015 (5 y) |
| Sex: All women |
| Age: 22–62 y (39.5±9.1) |
| Height: 142–172 cm (158.8±5.2) |
| Weight: 38.0–73.8 kg (50.3±6.0) |
| Body mass index: 15.8–28.9 kg/m² (19.9±2.1) |

| Table 2. Size of Extracted Breast Implants and Amount of Injected Fat (n = 131) |
|------------------------------------------|
| Extracted breast implants (mean ± SD): Right, 203.8±43.5 cc; left, 201.7±43.4 cc |
| Amount of fat injected (mean ± SD): Right, 241.3±32 cc; left, 237.9±34.0 cc |
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Complications are listed in Table 3.

Fat Necrosis
Three patients (2.3%, n = 3/131) with partial fat necrosis were detected during our postsurgery assessments. Patients were assessed the following day after surgery, at 1 week, at 2 weeks, at 3 months, and at 6 months. We performed an ultrasound examination and continued to monitor for signs of inflammation, redness, discomfort, and pain. Blood examination was checked frequently if necessary, and we were always concerned about fat necrosis.

Estimation of Change in Breast Size
To estimate the changes in breast size, we took preoperative and postoperative (6 months postoperative) top bust and underbust measurements and compared each patient individually.

Top bust is the circumference measurement of the chest at the highest projection point; usually the nipple areolar complex (NAC) and underbust is the circumference measurement at the IMF.

Changes in Breast Size
There were no significant differences in underbust sizes before and after surgery. The difference between the top bust and underbust sizes changed...
Fig. 3. Subpectoral SIEF injection approaches. Above, Pre-OP SIEF: Implant in subpectoral plane, before removal. Areas where we will inject fat into, post implant removal. Fat should be injected only above the breast implant capsule into subcutaneous, submammary, and cautiously into intramuscular spaces with a blunt cannula. Below, Post-OP SIEF: Implant removed from subpectoral plane. Fat has been injected, and thus, the subcutaneous, submammary, and intramuscular pectoral layers have become thick. To avoid migration of the fat into the intracapsular space while injecting into the pectoral muscle, careful injection with finger guidance through the incision is recommended. Furthermore, a blunt tipped cannula is always recommended.

Fig. 4. Submammary SIEF injection approaches. Above, Preoperative SIEF: Implant in submammary plane, before removal. Areas where we will inject fat into, post implant removal. Fat can be injected above the breast implant capsule into subcutaneous and submammary spaces with a blunt cannula cautiously to avoid fat migrating into the breast implant capsule. Below, Postoperative SIEF: Implant removed from subpectoral plane. Fat has been injected, and thus, the subcutaneous, submammary, and intramuscular pectoral layers have become thick. To avoid migration of the fat into the intracapsular space while injecting into the pectoral muscle, careful injection with finger guidance through the incision is recommended. Furthermore, a blunt tipped cannula is recommended.
from 12.1 ± 2.7 cm (presurgery) to 10.1 ± 2.8 cm (6 months postsurgery; Fig. 5). So, overall bust size decreased slightly 2.0 ± 3.0 cm. There was a statistical difference; however, it decreased less than one breast bra cup size by the Japanese Industrial Standards (Table 4).

Customer Survey

A customer satisfaction survey (Fig. 6) was performed with patients 6 months after the surgery (n = 131). We asked patients to score “how they felt about their overall surgical experience and cup size changes 6 months postsurgery?” Forty-nine (37%; n = 49/131) patients answered “excellent” toward their results. Thirty-nine patients (30%; n = 39/131) answered “very satisfied”; 38 patients (29%; n = 38/131) answered “satisfied”; and 5 patients (4%; n = 5/131) were “not satisfied.”

**Table 3. Complications (n = 131)**

| Complication                                                                 | Patients |
|------------------------------------------------------------------------------|----------|
| No severe complications                                                      | 12/131 = 9.2% |
| Mild complications                                                           |          |
| Partial fat necrosis with inflammation: 3 patients (2.3%)                    |          |
| Seroma in the capsule: 4 patients (3.1%)                                     |          |
| Complaint of nodules (cysts, lumps): 4 patients (3.1%)                       |          |
| Hematoma: 1 patient (0.8%)                                                   |          |

**Table 4. Breast Bra Cup (Japanese Industrial Standards: L4006)**

| Cup Size | Difference between top bust and underbust: |
|----------|---------------------------------------------|
| AA cup   | about 7.5 cm                                |
| A cup    | about 10.0 cm                               |
| B cup    | about 12.5 cm                               |
| C cup    | about 12.5 cm                               |
| D cup    | about 17.5 cm                               |
| E cup    | about 20.0 cm                               |
| F cup    | about 22.5 cm                               |
| G cup    | about 25.0 cm                               |
| H cup    | about 27.5 cm                               |
| I cup    | about 30.0 cm                               |

Each cup size increases or decreases by 2.5 cm.

Case Reports

In this study, we present a 37-year-old female patient (Fig. 7) and a 49-year-old female patient (Fig. 8), with implant removals and fat injection details including before and after pictures.

**DISCUSSION**

Breast augmentation by fat grafting embracing the “Coleman technique” has been popular not only in SIEF revision, but also in primary breast augmentation, as seen in previous studies. However, there have been only a few published studies of the timing of fat injection after implant removal. Asano and Yoshimura found that fat grafting using the cell-assisted lipotransfer method was useful not only for routine breast augmentation but also for simultaneous injection with implant removal. Del Vecchio described 8 patients who received SIEF (simultaneous breast implant exchange with fat) with the use of Brava (Brava, Inc.) external preexpansion breast device.
In Japan, the “urban legend” of complete capsule closure has many surgeons staging the fat injection surgery. However, it was never possible to know definitively whether the residual capsule space was open or closed after the implant was removed.

Our series had no severe complications. We attempted to maintain the breast volume lost by the implant, without adding extra volume.

Gradual decrease in the incidence of fat necrosis with inflammation in our series over time was an improvement in our surgical approaches. Our learning curve taught us to inject small fat droplets and pay careful attention to minimally detaching the capsule from the surrounding tissue when removing breast implants.

Our key points for SIEF are as follows: (1) careful attention to removing the breast implant, such as gentle detachment from implant to capsule, and limited trauma of the intact capsule; (2) fat processing method for injection; and (3) precise injection as small fat droplet volumes and injection to the correct layers.

**Implant Removal and Capsule Detachment**

Before implant removal, we consider preoperative ultrasound examinations to be essential. They can con-
firm the position (layer) of the implants (subpectoral or submammary), determine whether they are ruptured or intact, and reveal the distance from skin to implant and the degree of calcification, thus enabling us to prepare our approach to the implant removal.

In general, the periareolar or IMF approach is popular in other countries, but almost all Japanese patients have received primary breast augmentations with implants via the axilla. For this reason, most of our patients wanted their prostheses removed via the axilla, along old incision lines. Japanese patients fear scarring issues and desire surgical anonymity.

However, if the capsule needs to be removed because of strong capsule contracture or calcification, we consider it better to use periareolar or IMF approaches. When removing the implants, too much detachment from the intact capsule to the surrounding tissues should be avoided. This helps us avoid the creation of a new space where injected fat can migrate. Before the implants are removed, they should be detached well from the capsule and avoid tearing the capsule away, because an intact capsule helps to prevent fat from flowing inside the intracapsule space. If there is a lack of partitioning, injected fat may migrate into the capsule easily, and serious fat necrosis may occur. Moreover, if the distance from skin to implant is less than 4 mm, we need to be careful not to inject too much fat, because it may not have sufficient vascular nourishment. The “4-mm skin to implant distance” practice is our own clinic protocol, and we look forward to participating in future studies that evaluate this surgical decision.

**Careful Processing of Fat for Injection**

The most challenging part to this statement is whether or not to centrifuge. Opinions differ on fat centrifugation. For example, Khouri et al.\(^1\) recommend centrifugation at 15 min × 1 g with Brava, because the fat can diffuse easily. On the other hand, Kurita et al.\(^4\) recommended 1200g for 3 minutes because appropriate centrifugation concentrates adipocytes/ADSCs and can reduce oil content. Additional investigation is needed to determine the optimal centrifugation protocol.

The harvesting method remains controversial. Ultrasound procedures will damage adipocytes and ADSCs, however; we often (at the patient’s request) use VASER (Sound Surgical Technologies, Louisville, Colo.; third-generation ultrasound) for harvesting and body contouring. We use a lowered power setting and shorter interval time, because some papers have shown that VASER does not adversely affect fat quality.\(^{14-17}\) When we use VASER for harvesting, at a lower negative pressure (50 KPa), we have been able to collect viable amounts of fat for grafting. This device is very effective for fat collection in our practice and is very useful in Japanese patients because they are very thin.

**Injecting Small Fat Droplet Volumes**

With Coleman’s\(^7,3\) introductions to fat injections with small aliquot droplets and Khouri and Biggs\(^13\) recommending us to not use fat droplets larger than 2 mm, as survival may be compromised, we prefer to use the 1.69-mm Coleman cannula and inject thin noodle-like droplet strands. To inject less than 2.0-mm diameter, 1.0 cc of fat should be elongated over 10 cm of noodle-like strands.

Usually, we inject from just below the nipple (incision length about 2 mm) and at the axilla (frequently at the same point as used to remove the prosthesis). If implants are removed from IMF, we use just below the nipple, the axilla (incision length about 2 mm), and IMF incision line. If implants are removed from periareolar, we use the incision line of periareolar, and the axilla (incision length about 2 mm). Those points allow us to inject in desired locations with a crisscross technique. Many factors influence results. Prudent injection techniques are indispensable.

In closing, we recommend the SIEF approach because (1) the skin is most stretched at the time of implant removal; (2) only during surgery can we avoid injecting into the capsule because even if the fat flows into the capsule we can wash it out; and (3) our patients like to recover their breast shape and natural feeling as soon as possible. Simultaneous performance of these procedures prolongs the operation time, but we can find no other disadvantages.

**CONCLUSIONS**

We suggest that SIEF is very safe and effective breast augmentation modality. Nevertheless, the methods of extracting breast implants and careful injection technique are very important. Additional research is needed to find whether SIEF is optimal and which is the most appropriate standard in preparing and processing fat for injection moving forward.

**REFERENCES**

1. Del Vecchio DA. “SIEF”—simultaneous implant exchange with fat: a new option in revision breast implant surgery. *Plast Reconstr Surg*. 2012;130:1187–1196.
2. Coleman SR. Structural fat grafting: more than a permanent filler. *Plast Reconstr Surg*. 2006;118(3 suppl): 108S–120S.
3. Coleman SR, Saboeiro AP. Fat grafting to the breast revisited: safety and efficacy. *Plast Reconstr Surg* 2007;119: 775–785; discussion 786–787.

4. Kurita M, Matsumoto D, Shigeura T, et al. Influences of centrifugation on cells and tissues in liposuction aspirates: optimized centrifugation for lipotransfer and cell isolation. *Plast Reconstr Surg*. 2008;121:1033–1041; discussion 1042.

5. Yoshimura K, Suga H, Eto H. Adipose-derived stem/progenitor cells: roles in adipose tissue remodeling and potential use for soft tissue augmentation. *Regen Med*. 2009;4:265–273.

6. Yoshimura K, Sato K, Aoi N, et al. Cell-assisted lipotransfer for cosmetic breast augmentation: supportive use of adipose-derived stem/stromal cells. *Aesthetic Plast Surg*. 2008;32:48–55; discussion 56–57.

7. Yoshimura K, Hirano K, ed. *Breast Augmentation with Fat Grafting (Japanese Papers)*. Tokyo: All Japan Hospital Press; 2009;31:41–50.

8. Asano Y, Yoshimura K. Clinical experience of cell-assisted lipotransfer (CAL) for breast implant replacement. *J Jpn Soc Aesthetic Surg*. 2010;47:78–85.

9. Yang H, Lee H. Successful use of squeezed fat grafts to correct a breast affected by Poland syndrome. *Aesthet Plast Surg*. 2011;35:418–425.

10. Ohashi M, Yamakawa M. Short-term results of consecutive 642 patients of breast augmentation by centrifuged and pressurized autologous-fat (condensed rich fat: CRF): specially the change of the breast-size. *J Jpn Soc Aesthetic Surg*. 2013;49:148–156.

11. Khouri RK, Rigotti G, Cardoso E, et al. Megavolume autologous fat transfer: part I. Theory and principles. *Plast Reconstr Surg*. 2014;133:550–557.

12. Khouri RK, Rigotti G, Biggs TM, et al. Megavolume autologous fat transfer: part II. Practice and techniques. *Plast Reconstr Surg*. 2014;133:1369–1377.

13. Khouri RK, Biggs TM. *Your Natural Breasts. A Better Way to Augment, Reconstruct, and Correct Using Your Own Fat*. Chapter 1. Miami, FL: San Pedro Publishing; 2012:2.

14. Hoyos AE, Millard JA. VASER-assisted high-definition liposculpture. *Aesthet Surg J*. 2007;27:594–604.

15. Fisher C, McAtee J, Marra KG, Rubin JP. Human fat graft harvested by suction assisted liposuction is comparable to filtered human fat harvested by ultrasound assisted liposuction. Abstract presented at the American Society of Plastic Surgeons Annual Meeting, October 2010, Toronto, Ontario, Canada.

16. Mendieta CG. Gluteal reshaping. *Aesthet Surg J*. 2007;27:641–655.

17. Panetta NJ, Gupta DM, Kwan MD, et al. Tissue harvest by means of suction-assisted or third-generation ultrasound-assisted liposuction has no effect on osteogenic potential of human adipose-derived stromal cells. *Plast Reconstr Surg*. 2009;124:65–73.