Filling the Spectrum Expander with Air—A New Alternative

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Summary: The Spectrum adjustable saline implant is optimal for prepectoral breast reconstruction as it can be placed virtually empty and thus flat, applying no pressure on the overlying skin flap. However, when saline is added, it tends to pool at the bottom of the implant resulting in its uneven surface and rippling. Air filling results in the uniform distribution within the implant shell and smooth even implant surface, which facilitates acellular dermal matrix adhesion. Pressure to the skin flap is averted, patients are more comfortable, and rippling is not seen. (Plast Reconstr Surg Glob Open 2017;6:e1541; doi: 10.1097/GOX.0000000000001541; Published online 25 October 2017.)

With the advancement of breast cancer operative techniques to skin and nipple sparing mastectomies, prepectoral breast reconstruction now is being performed more commonly.1,2 A smooth contour of the implant is important in supporting the acellular dermal matrix (ADM) by applying uniform pressure along the outer surface, particularly when the implant is underfilled. This encourages adhesion and tissue ingrowth from the overlying skin flap. The silicone shell of the Spectrum adjustable implant collapses when underfilled with saline. Therefore, it does not have stability when initially placed (Figs. 1, 2).

In our study by filling the Spectrum adjustable implant with air instead of saline, we were able to provide stability to the underfilled implant and prevent its uneven filling with pooling of the saline at the bottom.

METHODS
Prospective review of the treatment results for 34 patients after breast reconstructions (58 breasts) with the Spectrum adjustable saline implant from January 2015 till October 2016 was performed. The patients between the ages from 29 to 74 years (mean, 55.8) who opted to undergo immediate breast reconstruction after mastectomy were included in the study. The collected and analyzed data contained the patient’s age, diagnosis, postoperative complications, postoperative interventions, conversion to silicone gel implant, and the time of follow-up. The Declaration of Helsinki ethical principles were strictly followed.

The patients underwent prepectoral breast reconstruction with the Spectrum adjustable implant placement. FlexHD Pliable mesh (ADM) was used to cover the anterior surface of the expander. Two separate air syringe filters (Gole-Parmer, Vernon Hills, Ill.) were used for the aspiration of the air in the syringe and the filling of the implant to exclude the contamination of the implant. The expanders were filled with 50–400 cc of air. The amount of air placed initially was determined by assessing the circulation of the flaps and amount of loose skin that needed support. It ranged from 0 to 50% of the expander volume (Table 1). The implant was placed completely deflated if there was tension on the closure or concern regarding flap vascular supply. During the further office visits, additional air was added when circulation was satisfactory: a 23 g butterfly needle (Kawasumi, Tokyo, Japan) was inserted into the injection port and 50–100 cc of air was added at a time. Once fully filled, the air in the implant was replaced with normal saline. A 23 g butterfly needle was used to access the injection port, the air was aspirated with a 60 cc syringe. Then intravenous solution bag containing normal saline was connected to the injection port via the needle and desired amount of the saline was injected.

Once patients were satisfied with their results, the injection port was removed under local anesthesia. In patients who wished to exchange their implants for silicone gel implants, a second procedure was performed.

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RESULTS

The results of the modification of breast reconstruction with the Spectrum adjustable implants filled initially with air in 34 patients (58 breasts) are presented.

Two patients (5.8%) developed wound infection, which was successfully treated with surgical debridement and intravenous antibiotic therapy. Seroma formation was seen in 3 (8.8%) cases and was resolved with seroma catheter aspiration. One (2.9%) patient had subsequent necrosis of the skin edges and surgical site infection, which lead to the implant loss.

Four patients (11.7%) developed skin flaps necrosis in the early postoperative period. Skin flap debridement, expander deflation, and secondary wound closure were performed in 3 cases for minor skin necrosis. In 2 cases (5.8%), expander removal was required. Another patient (2.9%) had a postoperative hematoma complicated by skin flap necrosis. She underwent hematoma evacuation and debridement of the skin flap, which resulted in complete healing.

When the desirable implant size was achieved, 20 patients (58.8%) were satisfied with the breast reconstruction results and decided to leave the Spectrum adjustable implant filled with saline in place. They had the injection port removed under local anesthesia in the office.

Fourteen (41.1%) patients who requested conversion to gel implants were operated in 6 months after the original surgery. The saline-filled expanders were removed and examined visually. The saline in all the expanders was clear and showed no signs of contamination. Autologous fat was injected to enhance the skin flaps when necessary, mainly in the upper pole.

DISCUSSION

Two options for immediate prepectoral breast reconstruction are currently utilized: direct-to-implant and tissue expander placement with subsequent replacement with a gel implant. Direct-to-implant technique can be applied only with ideal blood supply of the flap, which is frequently problematic immediately after the mastectomy. Tissue expander placement requires the second stage surgery. Most conventional expanders are bulky, have grossly irregular surfaces, and not optimal for prepectoral placement. Direct-to-adjustable implants offer a solution to the above issues. The adjustable gel-saline implant (50-50 Becker) gives the opportunity for 1-stage prepectoral reconstruction, but unfortunately, is not available in the United States. The Spectrum adjustable saline implant, widely used in the United States, has a smooth collapsible surface and can be placed deflated when adequacy of the flap circulation is questionable. It can be adjusted postoperatively, the injection port is subsequently removed leaving the filled implant in position. The significant disadvantage of Spectrum adjustable saline implant is the tendency to collapse and ripple when underfilled with saline.

Ascherman et al. used carbon dioxide in the patient-controlled breast tissue expander (AirXpanders, Inc., Palo Alto, Calif.). They proved that the use of the carbon dioxide implants is as safe as the saline-filled ones. The rate of all adverse events (breast related, postoperative wound complications, wound infection, seroma, and hematoma) was similar between the investigational and control groups.

In the current study, we report the results of air injection to the Spectrum adjustable implants. We have found that initial filling with air keeps the implant expanded evenly as the air spreads in the entire inner volume (Fig. 3), in contrast with saline, which falls to the lower pole and allows the implant to collapse. The smooth stable implant surface during serial expansions promotes uniform and smooth attachment of the ADM to the air-filled implant surface and results in its complete even integration. Air loss was not noted even several weeks after surgery, which was evidenced by stable air volume in the implant during the exchange of the air with saline. In our study, the incidence of the postoperative complications were not higher than that of saline-filled implants reported in the literature. No adverse events related to filling of the Spectrum implant with air were noted. Patients are very comfortable with the feel of the air (Fig. 4). Thus, there is no need to immediately replace the air with saline.

The presented results are limited with small study group size and short follow-up term, which will be addressed in a future publication.
CONCLUSIONS
Initial filling of adjustable implants with air has distinct advantages over filling with saline. An implant that does not collapse and maintains uniform surface encourages ADM adhesion and incorporation as well as improved patient acceptance. Pressure on overlying skin flaps is eliminated. This modification is safe as no specific complications related to air filling were found. Overall complications are low as noted in this group of the patients.

Table 1. Patient Data

| Patients’ Age | Initial Surgery | Initial Air Volume (cc) | Complication | Management, Outcome | Second-Stage Surgery |
|---------------|-----------------|-------------------------|--------------|---------------------|----------------------|
| 66            | BL, BR          | 300                     |              |                     |                      |
| 58            | R, BR, L mastopexy | 150                    |              |                     |                      |
| 56            | L, BR, R reduction, mastopexy | 100 |              |                     |                      |
| 73            | BL, BR          | 200                     |              |                     |                      |
| 52            | R, BR           | 200                     |              |                     |                      |
| 30            | BL, BR          | 400                     | Skin flap necrosis | Debridement, secondary closure, healing |                      |
| 60            | BL, BR          | 350                     |              |                     |                      |
| 67            | R, BR, L breast reduction | 325 | Seroma       | Resolution after seroma catheter aspiration |                      |
| 56            | BL, BR          | 50                      | Necrotic edges of L mastectomy incision, seroma, L breast infection, Necrosis of R nipple. | Removal of L breast expander |                      |
| 68            | BL, BR          | 200                     | R breast hematoma | R breast hematoma evacuation, healing |                      |
| 57            | BL, BR          | 150                     |              |                     |                      |
| 43            | BL, BR          | 300                     |              |                     |                      |
| 73            | R, BR           | 200                     |              |                     |                      |
| 62            | R, BR           | 300                     |              |                     |                      |
| 48            | BL, BR          | 100                     | L breast SSI  |                     |                      |
| 43            | BL, BR          | 100                     |              |                     |                      |
| 67            | L, BR, R mastopexy reduction | 50 |              |                      |                      |
| 60            | R, BR, L reduction | 200 |              |                      |                      |
| 56            | BL, BR          | 50                      |              |                     |                      |
| 42            | BL, BR          | 200                     | L breast SSI   | L breast exploration, expander exchange. Healing |                      |
| 51            | BL, BR          | 250                     | Necrosis of R breast incision | Debridement, secondary closure. Healing |                      |
| 29            | BL, BR          | 200                     |              |                     |                      |
| 57            | BL, BR          | 100                     |              |                     |                      |
| 58            | BL, BR          | 300                     | Necrosis of R breast skin flap | Debridement, secondary closure. Healing |                      |
| 40            | BL, BR          | 300                     |              |                     |                      |
| 49            | BL, BR          | 200                     | L breast skin flap necrosis | Debridement, removal of L breast expander, subsequent expander replacement |                      |
| 60            | L, BR, R mastopexy | 150 | L breast hematoma, skin flap necrosis | Hematoma evacuation, skin flap debridement. Healing |                      |
| 54            | BL, BR          | 100                     | L breast SSI   | Removal of implant, subsequent expander placement. Healing |                      |
| 42            | BL, BR          | 100                     | L breast SSI   |                      |                      |
| 73            | BL, BR          | 150                     |              |                     |                      |
| 50            | BL, BR          | 200                     |              |                     |                      |
| 62            | BL, BR          | 200                     |              |                     |                      |
| 64            | BL, BR          | 200                     |              |                     |                      |
| 74            | L, BR, R reduction | 450 |              |                      |                      |

BL, bilateral; L, left; R, right; BR, breast reconstruction; SSI, surgical site infection.
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Fig. 3. The Spectrum implant underfilled with air maintains vertical position.

Fig. 4. Patient following breast reconstruction with the Spectrum implant partially filled with air: implant does not collapse.