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Management of a Common Breast Augmentation Complication

Treatment of the Double-Bubble Deformity With Fat Grafting

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Abstract: The double-bubble deformity is one of the most common problems in breast augmentation, with or without mastopexy. Classically, open techniques have been used to treat this deformity, including elevation and reconstruction of the inframammary crease or parenchymal scoring. In this study, the author reports experience with a simple, closed technique of serial fat grafting procedures to treat the double-bubble deformity. Twenty-eight patients with double-bubble deformities were retrospectively evaluated. Fifteen patients had undergone primary augmentation, whereas 13 patients had undergone augmentation mastopexy. Eight patients presented with bilateral double-bubble deformity. Up to 3 sessions of fat grafting were performed on each patient, with a mean of 2.1 sessions required for patients in the series. An average of 27 cm³ of fat was injected with each treatment per breast. Fat was injected with a 1.5-mm blunt cannula into the subdermal and superficial breast tissue layers beneath the old inframammary fold. There were no oil cysts, infections, or donor site problems noted in the series. Twelve patients with limited breast tissue underwent magnetic resonance imaging examination at the conclusion of the fat grafting sessions, and no implant injury or disruption was noted. All patients were pleased with the results of treatment, and no revisional surgery was required. This study suggests that fat grafting is an effective treatment of the breast double-bubble deformity. The procedure allows the correction of a challenging deformity with a simple, closed technique which is safe and cost-effective.

Key Words: double-bubble deformity, breast augmentation, breast augmentation complications, fat grafting, breast fat grafting, breast implant complications, treatment double-bubble deformity, treatment double-bubble

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The double-bubble deformity occurs when a breast implant sits lower than the old inframammary crease. It can occur when a breast implant is positioned below the old crease at surgery or when an implant falls below the crease with the passage of time creating a contour deformity. Because of short nipple/fold distances often seen in patients desiring breast augmentation or asymmetric inframammary folds, the double-bubble may occur when positioning an implant in the appropriate position. The appearance of this deformity is due to the presence of breast parenchyma above the original crease, and thinner subcutaneous tissue without breast tissue below the crease.

Strategies for repair of the double-bubble deformity include reconstruction of the inframammary crease by capsulorrhaphy, scoring of the breast parenchyma to reduce the difference in tissue thickness above and below the crease,^{1,2} and other treatments. Although plastic surgeons routinely fat graft breasts for a variety of reasons, little is

known about the efficacy of fat grafting to reconstruct the double-bubble deformity. Recently, Serra-Renom et al³ reported the use of fat grafting the inframammary crease at the time of subfascial breast augmentation for patients with tuberous breast deformity. They reported good results and a high degree of patient satisfaction for primary fat grafting at the time of breast augmentation. However, in this study, they did not evaluate the preexisting double-bubble deformity and its treatment.

Fat transfer to the breast is used for a range of reconstructive and aesthetic procedures, including fat grafting for local contour irregularities⁴ and volume enhancement.⁵ Recent reports have suggested that over 60% of plastic surgeons use fat grafting for reconstructive procedures, with over 20% using fat grafting as an adjunct to aesthetic breast surgery.⁶ The advantage of fat grafting is the closed-nature of the grafting procedure as well as the quick recovery time and results which are difficult to duplicate with other techniques. In this study, the author reports experience using fat grafting for treatment of the double-bubble deformity.

METHODS

Patients undergoing treatment demonstrated double-bubble deformities with symmetrically positioned breast implants. All patients were felt to be candidates for fat grafting treatment and desired correction of the deformity. Patients were provided informed consent for both liposuction and fat grafting to the breast in the presence of a breast implant. Patients with limited breast tissue in the lower pole were encouraged to obtain a magnetic resonance imaging (MRI) after the conclusion of treatment to evaluate for the presence of implant injury or perforation. Twenty-seven of 28 total patients had procedures performed under local anesthesia, with 1 patient choosing general anesthesia.

Before the procedure, the double-bubble deficiencies and liposuction donor sites were assessed, measured, and marked with the patient standing. The volume of fat to be injected with each treatment was estimated by predicting the volume of soft tissue deficiency for each breast in the clinical double-bubble deficiency and adjusting for the low density of the fat graft material injected and a factor for predicted resorption. This was accomplished by a volume estimation, with multiplying the base width of the deficiency (cm) by the height of the deficiency (cm) by the depth of the deficiency (cm) and multiplying this volume by four. Skin turgor, resistance to injection, and the thickness of tissue overlying the breast implant were also considered at the time of injection, with smaller than calculated volumes injected when clinically indicated.

Fat graft was obtained by hand aspiration from abdominal and outer thigh donor sites. Fat graft was drained, washed with saline, and loaded into small syringes for lipoinjection. For injections, a 1.5-mm blunt injection cannula was introduced with a 20-gauge needle, and fat graft was injected in multiple thin tunnels parallel and longitudinal to the skin. With patients in the supine position, injections were performed in the subdermal and superficial breast tissue with the implant displaced superiorly to minimize the risk for implant injury. Postoperatively, patients were treated with a sterile noncompression dressing on the breast for 2 days, followed by loose fitting clothing without a bra for 3 weeks. The liposuction donor site was treated with compression for 10 days. The contour of each breast was evaluated by the treating

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surgeon 3 months after each fat transfer treatment. Breast contour and the visualization of a step-off between the breast tissue and implant were assessed for each patient. The endpoint for fat transfer procedures for each patient was made with the patient in consultation with the surgeon. For patients desiring more than 1 fat transfer procedure, patients underwent a repeat procedure as soon as 3 months after each procedure. Up to 3 sessions of treatment were offered to patients. Patients were evaluated, and a validated questionnaire was provided to each patient 6 months after the conclusion of fat grafting.

RESULTS

Twenty-eight patients were retrospectively evaluated who presented with double-bubble deformities in 1 or both breasts. Fifteen patients had undergone primary silicone gel breast augmentation, whereas 13 patients underwent silicone gel breast augmentation with mastopexy. Eight patients presented with bilateral deformities. Of the 20 patients with unilateral deformities, 15 patients had asymmetric inframammary folds before breast augmentation with higher and tighter folds.

All patients demonstrated improvement in the double-bubble deformity with each treatment. Overall improvement correlated with the number of fat grafting sessions performed. No oil cysts, infections, donor site problems, or other complications were noted. Twenty-eight patients were retrospectively evaluated who presented with double-bubble deformities in 1 or both breasts. Fifteen patients had undergone primary silicone gel breast augmentation, whereas 13 patients underwent silicone gel breast augmentation with mastopexy. Eight patients presented with bilateral deformities.

All patients were satisfied with the results of fat grafting with the number of treatments required ranging between 1 and 3. The mean number of treatments required for desired correction was 2.1 treatments per patient. An average of 27 cm³ of fat was injected with each fat transfer treatment. The distribution of patients having undergone fat transfer with the total volume of fat injected is shown in Table 1. The table demonstrates that 24 of 28 patients were treated with 1 or 2 treatments, with the largest number of patients undergoing 2 fat grafting sessions. Table 2 shows the mean volume of fat per treatment used for treating patients with different numbers of fat grafting sessions. Less mean fat per treatment was required as the number of fat grafting sessions increased. Twelve patients underwent MRI examination at the conclusion of fat grafting sessions with no implant injury, implant rupture, or fat cysts demonstrated.

The typical appearance of a single fat grafting treatment is demonstrated in Figure 1. The patient presented for a primary silicone gel breast augmentation procedure with a 450 cm³ smooth silicone gel implant. Preoperatively, her left inframammary crease was noted to be 1.5 cm higher than her right. Postoperatively, the double-bubble can be visualized on the left side as shown in Figure 1B and C. After a single fat graft procedure of 28 cm³ volume at 3 months postoperatively, partial improvement is noted, as shown in Figure 1D and E. The patient desired a larger implant with a textured surface, and an implant exchange for a textured 550 cm³ silicone gel implant and second fat grafting session was performed, placing 18 cm³ of fat. The double-bubble was managed by fat transfer only,

TABLE 1. Total Volume of Fat Grafted for Patients Treated With 1, 2, or 3 Fat Grafting Sessions

No. Fat Grafting Sessions	No. Patients	No. Breasts	Total Volume of Fat Grafted
1	6	6	31.5 cm ³
2	18	21	56.4 cm ³
3	4	9	76.8 cm ³

TABLE 2. Mean Volume of Fat Per Treatment for Patients Undergoing 1, 2, or 3 Fat Grafting Sessions

Fat Grafting Session	Mean Volume of Fat Grafted Per Treatment
1	31.5 cm ³
2	24.9 cm ³
3	20.4 cm ³

with complete resolution of the deformity at 6 months after fat transfer, as shown in Figure 1F and G.

A more complex case is presented in Figure 2. A patient presented with a history of hypomastia and ptosis, treated with a subglandular breast augmentation performed elsewhere. She developed grade IV capsular contracture which was treated with movement to a subpectoral pocket without mastopexy. The patient presented to the practice with a grade II encapsulation and bilateral double-bubble deformity as shown in Figure 2A and B. The patient liked the position of her implants and nipple/areolar complexes and requested correction of the double-bubble. She was treated with 3 sessions of fat grafting bilaterally at 3-month intervals. The first grafting session placed 35 cm³ of fat bilaterally, followed by 28 cm³ in a second session, and 17 cm³ in a third and final session. Good results at 1 year after the 3 stages of fat grafting are demonstrated in Figure 2C and D.

A dramatic case is presented in Figure 3. A patient with hypomastia and breast ptosis who declined mastopexy, presented after breast augmentation alone. She demonstrated severe double-bubble deformities as shown in Figures 3A and 3B. Following three fat grafting procedures, and with five years follow-up, resolution of the double-bubble deformities and long-lasting correction is achieved as shown in Figures 3C, 3D, and 3E.

DISCUSSION

Patients presenting with postoperative double-bubble deformities after breast augmentation have had few options for correction without major revisional surgery and open procedures under general anesthesia. In this paper, a series of patients are presented who underwent correction of the double-bubble deformity successfully, with simple, closed, fat grafting procedures done almost exclusively under local anesthesia. Although the techniques presented are basic technically, this is the first series demonstrating the effectiveness of fat grafting the double-bubble area with MRI documentation of procedural safety for patients at the greatest risk of implant injury or perforation. The fat grafting technique is technically straightforward and well accepted by patients. Patients can see the results of the procedure immediately, and view the early results on the first postoperative day. With a quick recovery and limited discomfort during the postoperative period, patients are likely to request a second procedure to further improve their results. Our experience is that patients are very grateful for the correction, and most patients can be satisfied with 1 or 2 treatments.

We advocate the addition of small volumes of fat graft directly beneath the old inframammary crease to improve the long-term viability of graft material and reduce the risk of oil cysts or fat necrosis. The lack of oil cysts or palpable fat necrosis in this study may be due to the small fat volumes and the injection techniques used. The potential space for injection in many patients is quite limited, usually 3 to 4 mm of depth. Longitudinal injection technique is important to reduce deep injection. Deeper injections increase the risk of implant injury. It is also important to displace the implant superiorly away from the injection site and to lift the skin upward and away from the implant. These simple maneuvers may reduce the risk of implant perforation or injury. In our study, 12 patients with

FIGURE 1. Patient prior to breast augmentation with higher left inframammary crease (A). Patient three months following breast augmentation with left double-bubble (B and C). Results three months following fat transfer to left breast (D and E). Final results six months following fat transfer and implant exchange without pocket modification (F and G).

thin breast skin flaps at the double-bubble site underwent postprocedure MRI scans, and no evidence of implant disruption or perforation was noted. These were the patients most at risk for implant injury due to the thin nature of the soft tissue.

Capsular contracture of the breast makes fat grafting the old inframammary crease area at more risk for implant injury or disruption. We believe that it is important to displace the implant as well as elevating the skin away from the implant when injecting fat. With tighter breast pockets, it is more difficult to keep a safe distance between the injection cannula and implant. Currently, we do not perform the fat grafting procedure for patients demonstrating either Baker III or Baker IV contractures. In addition, patients who demonstrate textured implants with tissue adherence and thin overlying soft tissue flaps may be poor candidates for fat grafting the double-bubble due to increased risk of implant injury. For patients with textured implants with tissue adherence and thin overlying flaps, an open procedure, with or without fat grafting, may be the safest option.

From a medical-legal point of view, it is reasonable to suggest that a preprocedure MRI may be useful to document the condition of the breast implant before fat injection procedures. Plastic surgeons should weigh the advantages and disadvantages of this treatment option. Cost and other factors may limit pre-fat grafting MRI. In our practice, we have not found pre-fat graft MRI necessary. We explain to patients that there is always a small risk after primary breast augmentation that their implant may have a disruption. Manufacturing defects, trauma to the implant on insertion, injury to the implant on wound closure, and other causes can lead to implant disruption in a primary augmentation. The addition of injectable fat grafts certainly increases the risk of implant injury and perforation. Although the 12 patients undergoing MRI evaluation at the conclusion of fat grafting did not demonstrate implant injury or disruption, it is possible that the patients who did not elect to undergo MRI could have had a subclinical implant disruption. Therefore, the results of the MRI portion of this study suggest that the procedure may be safe in regard to implant integrity but does not quantitate or predict the risk to the implant. If desired, post-fat grafting imaging is more useful in evaluating the implant condition, but does not document that the implant was injured from the fat grafting procedure. We use a detailed informed consent in which a patient agrees to accept the risk of implant injury and disruption with fat grafting to the breast, as well as the costs involved in corrective surgery. The consent also reviews that the results of an MRI done after

fat grafting may not provide a causal relationship to the procedure itself and can give a false positive.

The formula used in this study to estimate the volume of fat graft to be transferred with each treatment was developed after several years of experience with fat grafting the double-bubble deformity in augmented patients. It uses an estimation which provided favorable injectional volumes, good clinical outcomes, and minimized complications. Although most surgeons would describe the double-bubble as a

FIGURE 2. Patient with severe bilateral double-bubble deformity (A and B), and one year following three fat transfer procedures (C and D).

FIGURE 3. Patient presenting with severe double-bubble deformity of the breasts (A and B). Patient five years following three fat grafting sessions for treatment of bilateral double-bubble deformities (C–E).

rounded trough-like deficiency, volume estimation, using a simple elongated rectangular deficiency, (length $\times$ width $\times$ height), was chosen to simplify estimated calculation volumes. A factor accounting for the lack of graft density (times 2) and resorption estimation (times 2) were added to improve clinical outcome. Although this formula provided a “soft” numerical estimation of fat volume to be injected with each treatment, it was useful in individualizing volume needs for each deformity and provided good clinical results. Future study of double-bubble volume deficiencies with mathematical modeling may provide for more accurate estimation of fat volumes for transfer.

The data presented in Table 1 shows that the majority of treated patients required 2 treatments to achieve good results and patient satisfaction. A smaller group was treated with a single fat grafting session, with the minority treated with 3 sessions. The patients benefiting from 3 sessions tended to be patients with more severe bilateral deformities as demonstrated in Figure 2. Table 2 shows that patients requiring multiple fat graft sessions required less mean fat per treatment, when all sessions are averaged, than patients undergoing a single treatment. This makes sense as the fat grafts from each treatment will decrease the double-bubble deformity to some extent the residual volume deficiency with subsequent treatments.

The fat grafting procedure for treatment of the double-bubble deformity allows surgeons to make changes not easily achieved with other techniques. Invasive techniques, such as elevation and reconstruction of the inframammary crease for treatment of the double-bubble, are more likely to be associated with longer recovery times, more postoperative pain, increased risk of capsular contracture, and relapse or failure. Scoring of the breast parenchyma or old breast crease can thin the soft tissue in the lower pole, increase implant wrinkling, visibility, and still not fully correct the double-bubble. On the other hand, fat grafting is less likely to worsen the deformity and offers a faster and more pleasant recovery. The downside of fat grafting includes resorption of the graft, risk of implant injury, fat necrosis or calcification of fat graft material, and donor site problems. Even with these potential issues, the risks of fat grafting are likely more minimal than those of major implant revisional surgery. This is supported by the lack of complications in our study. We suggest that the more invasive procedures may play a role in more complex deformities, such as double-bubble deformity associated with implant malposition or animation deformity, not correctable with fat grafting alone.

Fat grafting for treatment of the double-bubble deformity is a simple technique which is highly effective in reducing the severity of the deformity. With staged procedures, the double-bubble can be

effectively treated to the degree desired, and often eliminated. We believe that aesthetic breast surgeons should consider this technique for treatment of the double-bubble deformity.

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