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Correction with autologous fat grafting for contour changes of the breasts after implant removal in Asian women

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KEYWORDS
Breast augmentation;
Autologous fat grafting;
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Summary *Background:* Patients who were diagnosed with symptomatic capsular contracture or with safety concerns for the implant would be often reluctant to accept the operation of implant exchange, choosing instead removal without exchange or taking other options to rebuild their breasts. These patients may benefit from augmenting the overlying soft tissue of the breasts with autologous fat grafting after removing the prosthesis.
Objectives: A retrospective analysis of the patients receiving fat grafting for breast augmentation after implant removal was performed in this study.
Methods: Between March 2011 and November 2013, 27 patients receiving autologous fat grafting after breast implant removal. Objective evaluation was made by measuring the change in breast thickness with ultrasonography taken before and after the treatment. Aesthetic evaluation was performed using a 5-point Likert scale for patient satisfaction and comparing preoperative and postoperative digital photographs for physician satisfaction.
Results: The mean breast thickness change was 13.1 mm (SD = 3.3) which was an increment by 154% in comparison to the averaged breast thickness of 8.5 mm after implant removal. The results of patient satisfaction and physician satisfaction were 16.3 (SD = 1.2) and 16.7 (SD = 1.6). Complications included recipient site infection, fat necrosis, and small areas of induration. The overall complication rate was 22.2% (6 of 27).
Conclusion: Autologous fat grafting is beneficial for the correction of deformed breasts after implant removal. With its preferential fill qualities, the wide cleavage and excessive upper pole fullness associated with existing implants can also be corrected.

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Introduction

Breast augmentation with implants was the most commonly performed cosmetic surgical procedure in 2012 and the second most common surgical procedure in 2013 according to data obtained from the American Society for Aesthetic Plastic Surgery.[1]

Despite obvious progress has been made in the past decades, implant-related complications following breast augmentation keep on challenging cosmetic surgeons.[2,3] Studies reveal that the longer the implants are in place, the greater the accumulative risk of developing implant-related problems such as capsular contracture, implant rupture, breast discomfort and/or psychological problems.[4–7]

Moreover, the pressure resulted from the implant volume can lead to soft tissue thinning of the breasts and atrophy of the pectoral muscles in the long term. Aging is another precipitating factor of soft tissue thinning in the patients with long history of breast implantation. Besides, the excessive upper pole fullness and wide breast cleavage can make their breasts looked unnatural.[8]

As a result, removal of a breast implant is indicated either due to symptomatic contracture, implant rupture, safety concern, or patient's desire to correct the unnatural appearance.[9]

Once the patients were diagnosed of the above impressions and decided to undergo implant removal, they would be often reluctant to accept the operation of implant exchange because of concerns about the implants.[10] Autologous fat grafting can benefit the scooped and flaccid breasts when the patients were dissatisfied with the appearance of their breasts after implant explantation.[9]

It appears that no study has addressed long term outcomes of the patients receiving autologous fat grafting for breast augmentation in patients after implant removal. A retrospective analysis of the patients receiving the procedure for breast augmentation after implant removal was performed in this study.

Materials and methods

We retrospectively reviewed the charts of 33 consecutive patients who underwent fat grafting for breast augmentation after removal of the breast implants between March 2011 and November 2013. All the surgical procedures were performed by the author. Indications for breast implant removal included capsular contracture, physical discomfort and safety concern over the implant. After exclusion of patients with inadequate follow-up time (<12 months), including those lost to follow-up, 27 patients were enrolled in the study. All patients provided written informed consent and had been advised of the potential complications of autologous fat grafting for breast augmentation. They all promised to conduct routine follow-up and undergo routine ultrasonography after treatment.

Physical examination and breast ultrasonography were performed routinely at 3,6 and 12 months follow-up visits to determine potential complication including infection, fat necrosis, indurations and/or calcification after treatment. Clinical data on all postoperative complications were collected throughout follow-up for all patients. If a mass was palpable during routine physical examination or observed with ultrasonography, magnetic resonance imaging (MRI) was performed for further evaluation.

Aesthetic assessment was performed using preoperative and postoperative digital photographs with frontal, lateral and bilateral oblique views for each patient. Follow-up photographs were taken at each return visit after completion of the treatment. For the evaluation of aesthetic outcomes, a questionnaire was used to assess each patient's satisfaction and graded according to a five-point scale as very satisfied (5), satisfied (4), fair (3), unsatisfied (2), and very unsatisfied (1). The results of physician satisfaction were obtained by an independent physician who did not participate in the medical care of the patients. According to the photographs taken preoperatively and postoperatively, the results were also graded as very good (5), good (4), fair (3), poor (2), and very poor (1). Categories for patient self-evaluation and physician assessment included breast size, shape, symmetry and proportion to the body. A final combined score (maximum of 20 points, minimum of 4 points) was calculated for each patient and the 12-month results were included.

Ultrasonography was performed in all patients before treatment and at postoperative follow-up visits. After complete examination of the breasts, measurements of the thickness at 3- and 9- o'clock direction on the areolar margin of both breasts were recorded. The 4 anchoring points of thickness measurement were defined as L3, L9, R3 and R9 (Figure 1). The change in breast thickness at 12-month was recorded and compared.

Implant removal

The breast implant was removed via periareolar, transaxillary or inframammary fold (IMF) approaches after the injection of local anesthetic solution (1 mL epinephrine in 100 ml 1% lidocaine). Owing to the inevitable surgical trauma and bleeding which are unfavorable to the survival of a fat graft, we implemented 2-stage operations. Almost all of the patients underwent fat grafting for breast augmentation several weeks after implant removal.

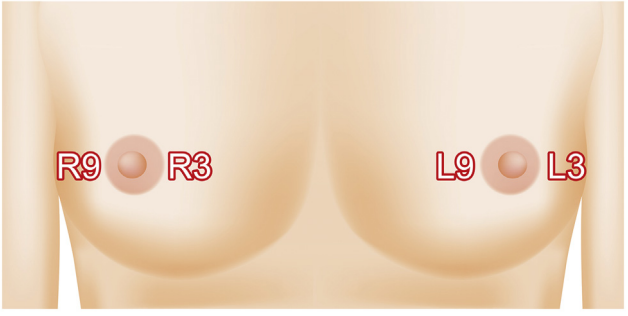

Figure 1 To increase the accuracy in comparison of preoperative and postoperative measurements of breast thickness, four anchoring points at 3- and 9- o'clock direction over areolar margins of left and right breasts are defined as L3, L9, R3 and R9.

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Harvesting of adipose tissue

Fat was harvested from potential donor sites including thighs, hips, flanks, abdomen and calves under intravenous sedation and local tumescent anesthesia. Each harvest site was infiltrated with 150–300 mL of tumescent anesthetic (1000 mL of lactated Ringer's solution, 30 mL of 2% lidocaine, and 1 mL of 1:1000 epinephrine) 10–15 min before liposuction was initiated. Adipose tissue was harvested with a 3- or 4-mm aspiration cannula attached to a low pressure suction machine set at −400 to −500 mm Hg.

Preparation of fat graft enriched with stromal vascular fraction (SVF)

A portion of harvested fat (100 mL) was mixed with 1% type I collagenase (100 mg in 100 mL of normal saline solution) and transferred to a shaking incubator (Beauty Cell multi-station [NB-803MS]; N-BIOTEK, Seoul, Korea) at 37 °C (200 rpm). The mixture was shaken for at least 30 min to dissolve the adipose tissue.

The collagenase-dissolved fat was centrifuged at 800 g for 5 min to isolate the SVF in a cone tube. The cone tube resulted in 4 distinct layers of content after centrifugation with the uppermost layer comprising lysed fat and oil, the second layer consisting of collagenase solution, and the bottom layer containing red blood cells. The third layer which appeared between the collagenase solution and RBC was the collection of SVF containing adipocyte derived stem cells.

During the process of isolation, the remaining fat was centrifuged at 800 g for 4 min preparing for grafting. After removal of the free oil and blood components, the fat was combined with the isolated SVF and transferred to 10-mL BD syringes (Becton Dickenson, Franklin Lakes, New Jersey) and connected to a 14-gauge, 15-cm, single-hole cannula ready for injection.

Delivery of the SVF-Enriched fat graft

With the patient in a supine position, injections were performed in a fanning pattern through the entries made at the IMF and medial areolar margin. The fat was injected into subcutaneous, subglandular, supramuscular and/or

Table 1 Demographic analysis and related management of the patients.

Patient no.	Age	BMI	Indication for implant removal	Capsule surgery	Time between explantation and fat grafting (days)	Complications
1	28	18.9	Physical discomfort		21	
2	44	19.1	Baker III CC		19	
3	39	21.3	Physical discomfort		58	
4	45	19.3	Baker IV CC	Capsulectomy, IMF approach	24	
5	34	17.5	Safety concern		41	
6	47	24.2	Physical discomfort		26	Induration and/or calcification
7	41	20.9	Baker III CC		40	
8	37	17.8	Baker III CC		21	Induration and/or calcification
9	41	21.1	Physical discomfort		27	
10	33	21.3	Baker III CC		48	
11	47	20.2	Baker III CC		19	Induration and/or calcification
12	33	18.8	Safety concern		16	Induration and/or calcification
13	40	19.8	Physical discomfort		15	
14	43	22.5	Baker III CC		54	
15	34	18.4	Physical discomfort		25	
16	40	22.7	Baker III CC		21	
17	37	19.6	Baker IV CC	Capsulectomy, periareolar approach	24	
18	36	18.1	Baker III CC		9	Induration and/or calcification
19	31	15.6	Physical discomfort		77	
20	44	19.7	Physical discomfort		29	
21	41	18.3	Baker III CC		23	
22	46	22.1	Physical discomfort		0	Fat necrosis
23	41	20.5	Physical discomfort		23	
24	27	22.5	Safety concern		14	
25	50	20.4	Baker III CC		28	
26	49	18.8	Baker III CC		30	
27	28	18	Baker III CC		42	

CC, capsular contracture; IMF, inframammary fold.

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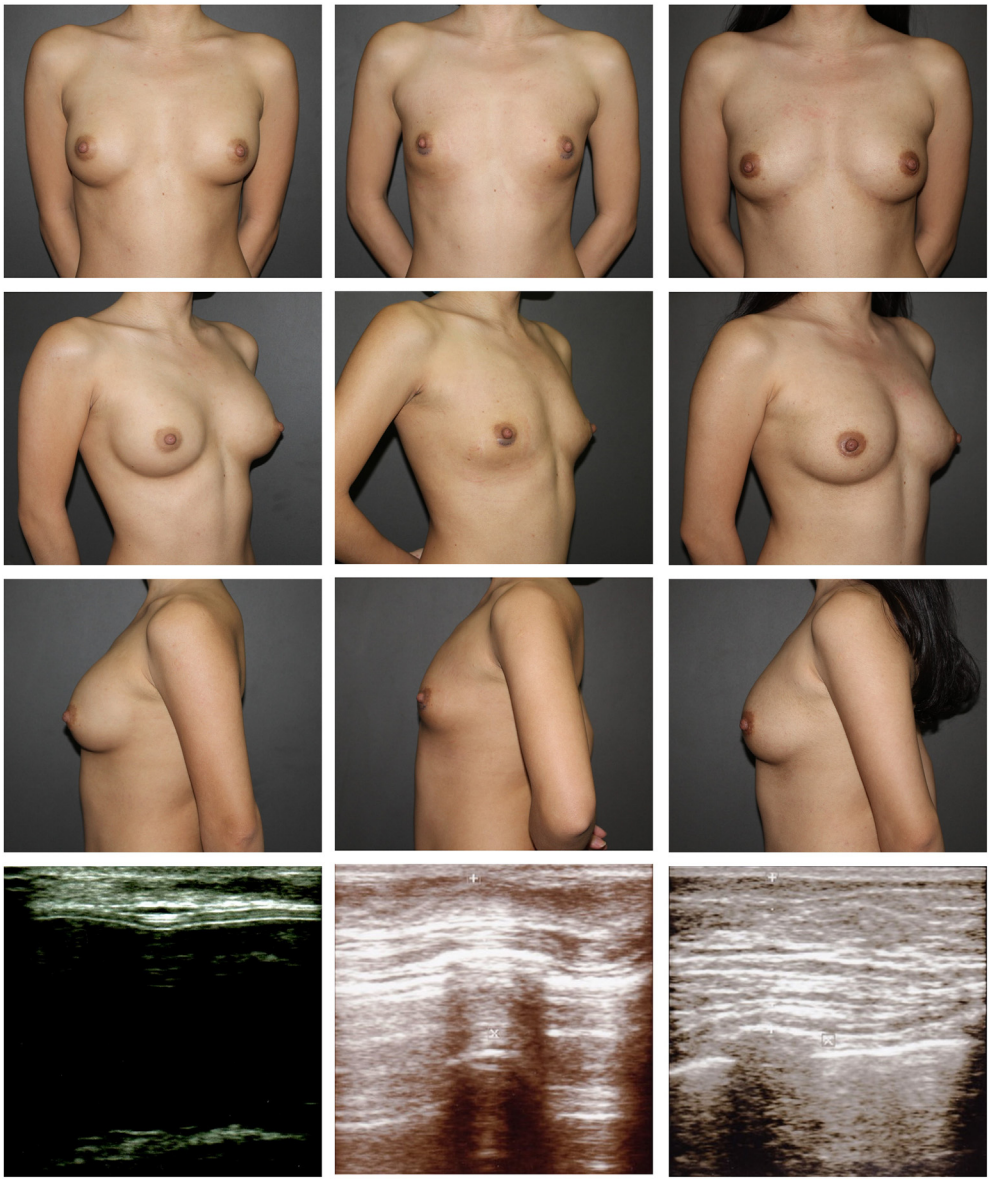

Figure 2 Case 1 patient, a 28 year-old woman presented to our clinic with the chief complaints of excessive upper pole fullness and wide cleavage gap 2 years after saline bag implant of 230 ml per side. (Left) Pretreatment views with the existing implants. Ultrasonography demonstrated a thin layer of hyperchoic band of tissue surrounding the anechoic interior representing capsular formation. (Middle) Photographs taken 21 days after explantation, Note the unpleasing contour of the breasts. (Right) Photographs taken 12 months after autologous fat grafting of 210 ml in each breast performed in one session. Note the improvement of breast cleavage and upper pole fullness.

intramuscular layers. Care was taken not to inject fat into the implant pocket which can be done by using the "solid injection" technique, as described by the author in a previous article.[11]

Results

The mean age was 39.1 years (range, 27—50 years) and the BMI was 19.9 (SD = 1.9). Patients underwent breast implant removal due to capsular contracture (Baker III-IV, n = 14,51.9%), physical discomfort (n = 10, 37.0%), and personal safety concern (n = 3,11.1%) (Table 1). The mean follow-up time was 27.1 months (SD = 10.8). The mean volume of fat grafted to each breast was 247.0 mL (SD = 32.2).

Breast thickness was measured with ultrasonography at four anchoring points before and after treatment. The mean breast thickness change was 13.1 mm (SD = 3.3) which was an increment by 154% in comparison to the averaged breast thickness of 8.5 mm after implant removal (Figures 2—5). The results of patient satisfaction and physician satisfaction were 16.3 (SD = 1.2) and 16.7 (SD = 1.6). Complications included recipient site infection, fat necrosis, and small areas of induration (with or without calcification). The overall complication rate was 22.2% (6 of 27).

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Figure 3 Case 8 patient, a 37 year-old woman presented to our clinic with the chief complaints of unnatural appearance and position of her breasts 15 years after saline breast implantation. (Left) Pretreatment photographs with the existing implants. Notice the breasts are firmer and more balloon-like in fullness. Ultrasonography showed thickening of the intercapsular space with minor circumferential irregularity of the inner capsule suggesting Baker III capsular contractures. (Middle) Photographs taken 21 days after explantation. The scooped out appearance of her breasts made the patient rather depressed. (Right) Photographs taken 23 months after autologous fat grafting of 250 ml in each breast performed in one session. Note the more natural and softer appearance of her breasts.

Discussion

Breast augmentation with implants was a commonly performed cosmetic surgical procedure. Nonetheless, studies reveal that the longer the implants are in place, the greater the accumulative risk of developing implant-associated problems.[4–7] Once the complications developed, removal of the breast implant might be required to exclude the risk of recurrent problems apart from various treatment options.[2,12] Patients who were diagnosed of capsular contracture, implant rupture, or psychological discomfort about the implants would often prefer implant removal without exchange or taking other options to rebuild their breasts.[10] Autologous fat grafting can benefit the scooped

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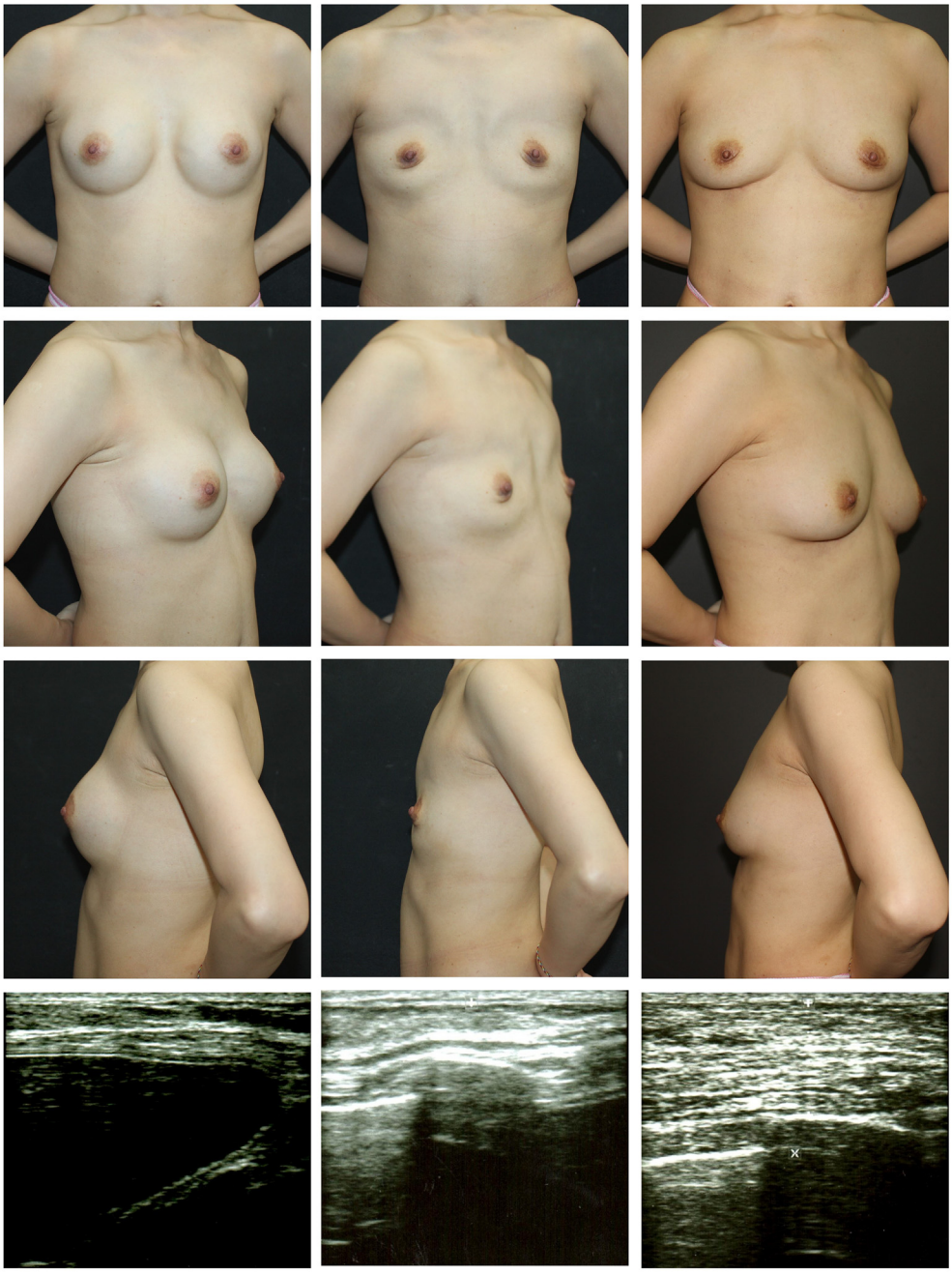

Figure 4 Case 11 patient, a 46 year-old woman presented to our clinic with the chief complaints of excessive upper pole fullness and balloon-like appearance of the breasts 13 years after saline implant. (Left) Pretreatment views with the existing implants. Ultrasonography combined with clinical pictures demonstrated Baker III capsular contractures in her breasts. (Middle) Photographs taken 19 days after explantation. Note the concavity of her chest wall resulted from atrophy of pectoralis muscle and thinning of her breast skin. (Right) Photographs taken 30 months after autologous fat grafting of 210 ml in each breast performed in one session. Note the improvement of the deformed contours of the breasts after implant removal and the more natural appearance in comparison to the pre-explantation condition.

and flaccid breasts when the patients were dissatisfied with the appearance of their breasts after implant explantation.[9]

In 2012, Del Vecchio et al. described his technique of simultaneous implant exchange with fat grafting after breast implant removal in a case report. Preoperative preexpansion of patient's breasts with Brava (Brava, Inc., Miami, Florida) was applied by using negative pressure generated by the device for 2 weeks. The fat graft was then injected into the breasts with the amount of injected fat being 2-fold the volume of the breast implant. He advocated that the reconstructed breasts could be as large as the pretreatment ones.[9] However, the positive effect of preexpansion remains unclear, and the process of

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Figure 5 Case 17 patient, a 37 year-old woman presented to our clinic with the chief complaints of tender rigidity and balloon-like appearance of the breasts developed 12 years after silicon gel implantation. (Left) Pretreatment views with the existing implants. Ultrasonography revealed intracapsular ladder sign where several horizontal and parallel echogenic lines are observed inside the lumen of the implant. Together with the asymmetric breasts, Baker IV capsular contracture with intracapsular rupture was impressed. (Middle) Photographs taken 24 days after explantation and capsulectomy via periareolar approach. (Right) Photographs taken 24 months after autologous fat grafting of 260 ml in each breast performed in one session. Note the natural appearance of the breasts.

preexpansion is time consuming and requires significant effort on the part of the patient.[13] Moreover, there was no report in the case study of long term outcomes to identify potential complications or the effectiveness of this procedure.

Removal of a breast implant can be performed via periareolar, transaxillary or inframammary fold approaches. Surgical intervention over these areas inevitably results in tissue trauma and bleeding which can compromise the survival of the grafted fat.[14] Furthermore, incision wounds here limit fat transplantation in the immediate area because of the inevitable egress of fat with elevated intramammary pressure. Transplanting fat successfully beneath the areolar incision and inside the tract at the tail

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of Spence is unlikely to be very successful.[9] To reduce the potential complications in fat grafting and to overcome the issues involved in the use of the Brava system, we implemented 2-stage operations with fat grafting for those patients who did not desire implant exchange after implant removal. Most of the patients received fat grafting 2 weeks to one month after implant removal when the operated tissue had healed.

Avoidance of injecting fat into the implant pocket was important during operative augmentation by autologous fat grafting. Digital insertion into the implant pocket as guidance to avoid careless injection has been described elsewhere.[15] However, this method involves enlargement of the entry point to allow finger insertion and results in broader tissue trauma. We can easily prevent unintentional injection into the implant pocket by using the "solid injection technique" described earlier in the author's published article.[11] In this technique, the operator use his non-dominant hand to feel the tip of the injecting cannula and help guiding the injection. The fat was only injected on withdrawal when the operator felt a solid feedback while advancing the cannula. No injection was performed when the operator feel an empty feedback from the cannula which meant the tip was inside the pocket. According to the study published in 2013, the postoperative complication rate was 2.2% which was relatively low as compared with that in the published literature.[11,16] In this study, with all the patients underwent the surgeries by the same operator the complication rate was 22.2%, suggesting that tissue trauma and implant related problems are unfavorable to the survival of grafted fat. Besides, the compressed pectoralis muscle and thin overlying skin of the breast limited the volume of fat to be injected without resulting in high interstitial pressure. This in turn led to potential fat necrosis, induration and calcification. In this study, most patients received autologous fat grafting for breast augmentation 2 weeks after their implant removal when the operated tissue had healed. It appeared that longer duration of healing process after implant removal was beneficial to the reduction of postoperative complications. To elucidate the optimal timing in autologous fat grafting for the patients after implant removal, further study with more patients is mandated.

Ultrasonography was performed by a radiologist to measure breast thickness and to detect potential lesions inside the breasts for all the patients. Ultrasonography is an accurate yet operator dependent technique. In 2014, Oulharj et al. advocated that breast ultrasound remains the first-line examination, as it is cheaper, faster and accessible. An MRI is used in case of remaining doubt at ultrasound.[17] However, some thickening could be considered scar tissue by one, induration by another and fat necrosis by a third observer and it may well be settled or resolved as time passed. In this study, all the ultrasonography examinations were independently performed by a well-trained radiologist to bypass the bias.

The average change in breast thickness was 13.1 mm which was an increment by 154% in comparison to the original breast thickness of 8.5 mm after implant removal. Autologous fat grafting was demonstrated to successfully correct the deformed contour of the breasts in patients after implant removal. Owing to the preferential fill qualities of fat, the wide breast cleavage and the excessive upper pole fullness were also improved after fat grafting.

Conclusion

Autologous fat grafting is beneficial to the correction of deformed breasts after implant removal. With its preferential fill qualities, we can also correct the wide cleavage and excessive upper pole fullness associated with breast implants. Postoperative complication in autologous fat grafting for breast augmentation was found to be higher in patients after implant removal suggesting that implant related issues were unfavorable to a successful fat grafting for breast augmentation.

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