

Complications and Surgical Treatment of Breast Augmentation Using Autologous Fat Transfer and Fillers

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Background: Breast augmentation with autologous fat grafting or hyaluronic acid injection requires minimal loss of healthy tissue. With an increasing trend of breast augmentation with these fillers, accompanying complications have also increased. Patients with complications often complain of induration, cyst formation, calcification, and infection, which require surgical treatment. We will discuss these complications and their surgical treatment through our experience of cases.

Methods: This retrospective study included 20 patients who all required surgical treatment due to breast augmentation complications such as induration, cyst formation, calcification, and infection, and who visited us between May 2007 and June 2018. The patients' ages ranged from 25 to 63, and the mean age was 39.9. The material used for breast augmentation was fat for 17 cases, and hyaluronic acid, paraffin, and silicon for one case each. The results were analyzed through plastic surgeons at our hospital.

Results: We performed a zigzag incision in the peri-areola margin to 17 of 18 patients for complications of autologous fat grafting and hyaluronic acid injection. The one excluded patient required an adipo-fascial flap from an inframammary fold incision. For one patient with silicon injection complication and one patient with paraffin injection complication, each required mammary gland resection.

Conclusions: A zigzag incision in the peri-areolar margin was useful for treating complications of breast augmentation with autologous fat grafting and hyaluronic acid injection. All cases resulted in inconspicuous fine scars, with high patient satisfaction. However, this incision was insufficient to remove injected silicon and paraffin. (*Plast Reconstr Surg Glob Open* 2021;9:e3734; doi: 10.1097/GOX.0000000000003734; Published online 16 August 2021.)

INTRODUCTION

Breast augmentation with fillers such as autologous fat grafting or hyaluronic acid injection requires minimal loss of healthy tissue, which makes it appealing to patients who opt for less invasive procedures. Filler injection for breast augmentation, as well as complications accompanying this procedure, show an increasing trend.¹⁻⁴ Many patients with

breast augmentation complications, such as induration, cyst formation, calcification, and infection, attend our hospital for consultation and treatment, including surgery.

New techniques of fat injection have been reported, and results have improved over the years.⁴⁻⁶ However, unsightly complications such as lumps and dimples are still common, and for example, a bolus injection of too much adipose tissue is said to raise the odds of complications. In hyaluronic acid injection, lumps due to pseudocystic encapsulation are a frequent complication. In this case, injecting hyaluronidase into each lump is often difficult, and even if they could be injected by hyaluronidase, the encapsulations often remain.

Currently, silicon and paraffin injections are prohibited in Japan. However, some patients who have undergone

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surgery overseas have these injections and are unaware of what was injected, especially those who have had multiple filler breast augmentations. To correctly cure their complications, it is better for us plastic surgeons to know the exact material that was injected, especially if it was something other than fat or hyaluronic acid. When a large mass is found through imaging, sometimes extended resection such as total breast removal become an option, as adhesion to normal tissue could be too strong.

METHODS

Informed consent and consent for publication were obtained from every individual whose data were included in the study. This retrospective study included 20 patients who all required surgical treatment due to breast augmentation complications such as induration, cyst formation, calcification, and infection that visited us between May 2007 and June 2018. The patients ranged in age from 25 to 63 years, and the mean age was 39.9 years (Table 1). There were 17 cases of injection with autologous fat grafting, and one case each of hyaluronic acid, paraffin, and silicon injection. None of the patients had undergone breast augmentation at our hospital and were referred without consultation or contact from other hospitals. Therefore,

the details of injected materials and their volumes were unknown. The postoperative follow-up period was 1 week to 42 months. Zigzag incision in the peri-areola margin was performed for 16 cases of fat injection and one case of hyaluronic acid injection. Fifteen patients, who we were able to observe for more than 1 postoperative month, were randomly evaluated by five plastic surgeons for breast morphology and areola scars.

We planned our zigzag incision on the side of the areolar border that is the closest to the mass within the breast. We made sure the Montgomery glands were included with the nipple areolar complex. We used Picoctanin temporal tattoos beforehand to be able to suture the correct edges together afterward. We used a buried suture technique for the corners of the zigzags with absorbable monofilaments.

Case 1 (Patient 2)

A 38-year-old woman underwent autologous fat grafting from both buttocks and thigh to both breasts at a certain cosmetic surgery clinic, 2.5 years before visiting our hospital. Immediately after the breast augmentation, she noticed unnatural lumps in both breasts. Although her doctor assured her that these lumps would naturally disappear, they did not disappear for 2 years, and she decided

Table 1. Patient Profile Characteristics and their Disposition

No.	Age (y)	Injection (years ago)	Preoperation	Incision	Follow-up (mo)	Remarks
1	49	Fat (1 years) 260 ml	Multiple lumps. Reddish skin on the lumps	Zigzag*	18	Calcification. Left side: scar redness 3 months postoperatively
2	38	Fat (2.5 years)k	Multiple lumps. Reddish skin on the lumps	Zigzag	42	Case 1. Calcifications
3	28	Fat (4 years)	Multiple lumping 10 days after injecting fat	Zigzag	1	Right side calcifications
4	50	Silicon (approximately 20 years)	Induration	IMF†	12	Total mastectomy. DIEP flap both sides
5	34	Fat (10 years)	Multiple lumps. Hyaluronic acid injection several times	Zigzag	0	Multiple hyaluronic acid cysts. Multiple calcifications
6	30	Fat (3 years)	One large lump on both sides	Zigzag	7	No calcification tumor.
7	27	Fat (8 years)	Multiple lumps	Zigzag	18	Calcifications on both sides.
8	63	SBI‡ (20 years) Fat (6 years)	SBI removal and fat injection 6 years ago. Multiple lumps	IMF§	18	Right side: slightly wide white scar Right side: loss of volume. Reconstruction by adipo-fascial flap from IMF incision
9	46	SBI (3 times) Fat (3 years)	Multiple lumps	Zigzag	4	Keep SBI
10	64	Paraffin (38 years)	Induration	Spindle with nipple	18	Case 5. Auto-graft areola and nipple
11	31	Fat (0.5 years)	Multiple lumps	Zigzag	18	Oil cyst. Right side: hypertrophic scar 2 mm wide
12	35	Fat (13 years)	One large lump on both sides. Left side: reddish skin on the lumps	Zigzag	12	Case 4. Oil cyst and calcification. Left side: slight postoperative deformity
13	27	Fat (7 years)	Multiple lumps	Zigzag	3	Case 2. Calcification on both sides.
14	25	Hyaluronic acid (4 years)	Right side: huge lump. Small multiple lumps on both sides	Zigzag	3	Case 3. Encapsulation
15	27	Fat (5 years)	Right side lump	Zigzag	18	Right side only
16	42	Fat (1 year)	One large lump on both sides	Zigzag	0	Oil cyst both sides
17	42	Fat (3 years)	One huge lump on both sides	Zigzag	8	Oil cyst both sides
18	51	Fat (6 years)	Right side: 1 huge lump Left side: 2 lumps	Zigzag	6	Calcification on both sides The skin was thin, and lumps were visible, although they improved.
19	45	Fat (1 year)	One huge lump on both sides	Zigzag	3	Calcification on both sides
20	45	Fat (12 years)	One huge lump on both sides	Zigzag	1	Calcification on both sides

*Zigzag incision on the peri-areolar margin.

†IMF (inferior mammary fold) incision.

‡SBI (silicon bag implant).

to seek treatment from the same doctor of the same clinic. Her doctor diagnosed her with fat necrosis, and aspiration was immediately performed. However, this did not improve her condition; the precordial area began to swell, and indurations cephalic to the nipple areolar complex were detected on the right breast, while indurations caudal to the nipple areolar complex were detected on the left breast (Fig. 1A). Mammography revealed mass and calcification in both breasts. (See figures, Supplemental Digital Content 1, which displays (a) mammography: calcification and mass in both breasts; (b) mammography: calcification and mass in both breasts; (c) mammography: multiple lumps in both breasts; (d) pathology: an involucre is formed surrounding the hyaluronic acid particles; (e) pathology: voids due to necrotic tissue and liquefaction of fat are observed; (f) peri-surgical findings: tumors were adhered to the skin, so composite resection of the skin and mammary gland was performed. <http://links.lww.com/PRSGO/B737>.)

To remove this mass, a zigzag incision was designed on the cephalic peri-areolar margin of the right breast

(Fig. 1B) and on the caudal peri-areolar margin of the left breast (Fig. 1C). The patient was satisfied with the even postsurgical shape of the breasts, minimal areolar deformation, and inconspicuous fine scars from the zigzag incision (Fig. 1D).

Case 2 (Patient 13)

Similar to case 1, a 27-year-old woman underwent autologous fat grafting at a certain cosmetic surgery clinic 2.5 years before visiting our hospital. She also noticed post-surgical lumps in both breasts. She waited for 7 years but they did not disappear, so she revisited and consulted a different doctor at the same clinic. Her doctor diagnosed her with seroma, and aspiration was performed. This did not improve the lumps, and only caused inflammation of the precordial area. Her doctor referred her to a dermatologist who prescribed topical corticosteroids, which slightly improved the precordial inflammation. However, the lumps persisted in both breasts, so the dermatologist referred her to our hospital. Upon palpation, indurations cephalic to both nipple areolar complexes were detected

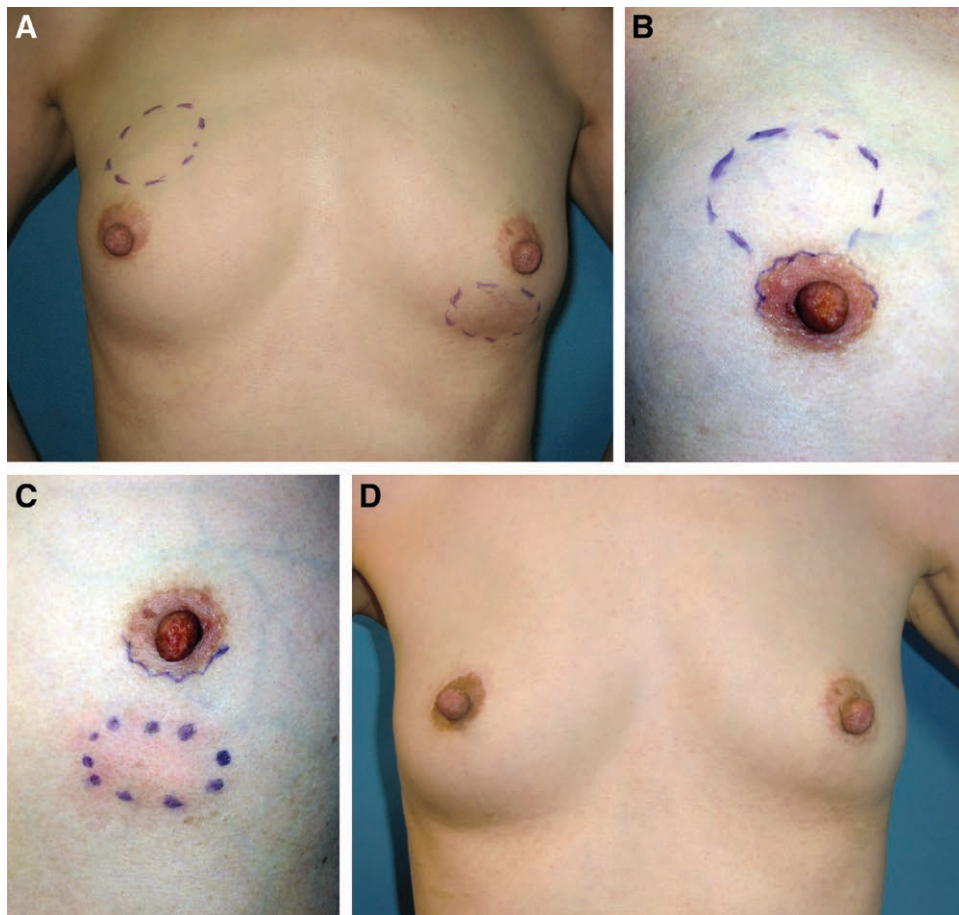


Fig. 1. Case 1 presentation and results. A, Presurgical findings: indurations located in the cephalic side of the right areola and the caudal side of the left areola. B, Peri-surgical findings (right breast): the zigzag incision line was designed in the cephalic side of the peri-areolar margin. C, Peri-surgical findings (left breast): the zigzag incision line was designed in the caudal side of the peri-areolar margin. D, 3 years after surgery: the shape of the breasts is basically equivalent before and after surgery, with minimal nipple-areolar deformations and inconspicuous scars.

(Fig. 2A). Mammography revealed mass and calcification in the same area (see SDC1b, <http://links.lww.com/PRSGO/B737>). For tumor excision, a zigzag incision was made in the cephalic peri-areolar margin in both breasts (Fig. 2B). The patient was satisfied with the postsurgical breast shapes, minimal areolar deformation, and inconspicuous fine scars resulting from the zigzag incision (Fig. 2C).

Case 3 (Patient 14)

A 25-year-old woman underwent bilateral breast augmentation using hyaluronic acid at another hospital and was aware of many lumps in both breasts soon after. Sharp pain developed in both breasts 3 years later, and cyst formation due to hyaluronic acid was diagnosed from the same doctor at the same hospital. Although hyaluronidase injection was administered from a different doctor at the same hospital, the numerous lumps and stiffness failed to disappear. The doctor assured her that the stiffness would improve in time, but it did not, so she consulted our hospital (Fig. 3A). Large, palpable lumps were detected in the caudal area of her breasts, and especially large ones were found caudally to the nipple areolar complex. Thus, a zigzag incision was designed in the caudal peri-areolar margin to excise the lumps (Fig. 3B). The postsurgical breast shapes were satisfactory, areolar deformation minimal, and fine scars from the incision were barely visible (Fig. 3C).

RESULTS

We used a zigzag incision in the peri-areolar margin to treat 17 cases with complications following breast filler injections, including one hyaluronic acid injection case and 16 autologous fat grafting cases. For one case with dimpling in the breast after silicon bag implant removal, breast reconstruction was performed through inframammary fold (IMF) incision, using an adipo-fascial flap. For one case of silicon injection and one case of paraffin injection, both required mammary gland excision (Table 1). If any case presented with calcification, enucleation was performed. In one of our autologous fat graft cases, the

injected fat became liquefied to an oily cyst and slurry substance due to necrosis, which required excision and lavage (Fig. 4). (see SDC1e, <http://links.lww.com/PRSGO/B737>.)

For the hyaluronic acid injection case, multiple lumps from encapsulation of hyaluronic acid were detected upon palpation. Injecting hyaluronidase does not dissolve the hyaluronic acid that has already spread and formed several lumps. Injected hyaluronic acid cross-links and forms capsules over time, and does not absorb after forming these capsules, so surgical excision is necessary. On mammography, these capsules present as numerous masses without calcification (See SDC1c, <http://links.lww.com/PRSGO/B737>). The contents of these capsules were fine white granules, which pathologically revealed a round capsule surrounding the hyaluronic acid (See SDC1d, <http://links.lww.com/PRSGO/B737>). Although we excised these multiple capsules, complete removal was difficult, especially the extremely small ones.

For follow-up, among the 17 patients who underwent zigzag incision in the peri-areola margin, two did not return after suture removal, and two did not return after the 1-month follow-up. Four patients stayed for only 3–5 months, and the remaining nine patients for more than 6 months (Table 1). The 15 patients who were observed for at least 1 month were evaluated for breast morphology by five plastic surgeons with over 6 years of experience.

DISCUSSION

Patients who undergo breast augmentation, especially by autologous fat grafting, have high cosmetic demands. We have had many patients who want to correct irregularities and indurations to the finest detail. Because such patients chose noninvasive breast augmentation in the first place, if they are proposed with an incision in the IMF for correction, they usually hesitate. When treating the 20 patients in this article, we prioritized treating the large lumps and abandoned the very small ones when surgical excision was too difficult, for we believed that digging in



Fig. 2. Case 2 presentation and results. A, Presurgical findings: indurations located on the cephalic side of both areolae. B, Peri-surgical findings (left breast): the zigzag incision line was designed in the cephalic side of the peri-areolar margin. C, 3 months after surgery: the shape of the breasts is basically equivalent before and after surgery, with minimal nipple-areolar deformations and inconspicuous scars.

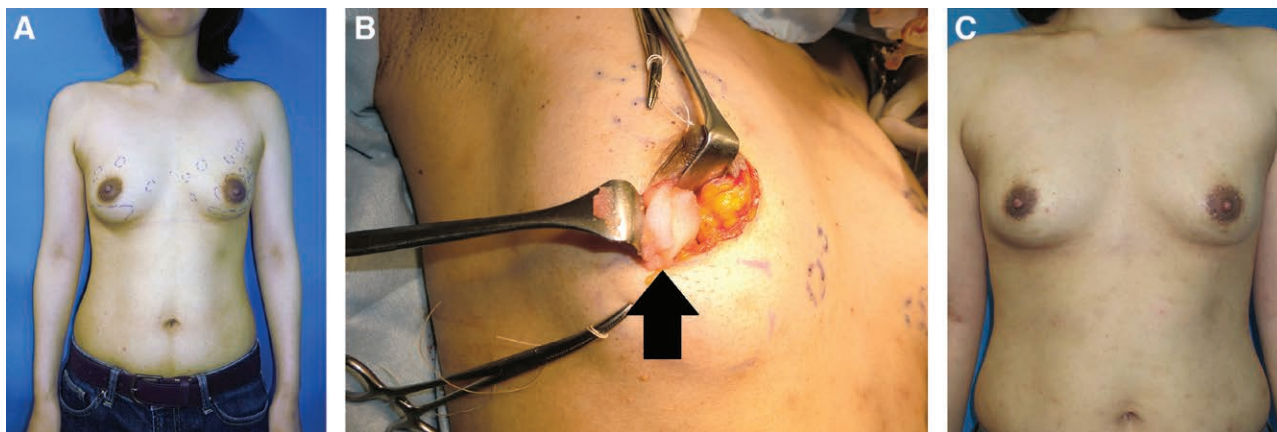


Fig. 3. Case 3 presentation and results. A, Pre-surgical findings: multiple lumps, palpable in both breasts. B, Peri-surgical findings (right breast): a zigzag incision was designed on the caudal side of the peri-areolar margin where the largest lump was found. When the capsule-forming involucre was excised, fine white granules of hyaluronic acid were found. C, 3 months after surgery: the shape of the breasts is basically equivalent before and after surgery, with minimal nipple-areolar deformations and inconspicuous scars.

deeper tissue and excising excessive tissue would result in additional breast deformation and scars.

Also, as you can see from our case series (Table 1), we have a high drop-out rate of patients who undergo surgery to correct indurations, which is much higher than our other plastic surgery out-patients. This may be one reason why there are only a few articles on the zigzag incision like ours. There are abundant reports on methods and complications for autologous fat grafts.¹⁻⁴ Recent fat graft methods for breast augmentation tend to have less complications, such as Coleman's method,⁴⁻⁶ composite breast augmentation,⁷ and correction of stenotic breast malformations using fat grafts.⁸ However, only a few summaries or compilations on how to treat them currently exist. We were also unable to find much detailed information on the zigzag incision, which we used. This zigzag incision in the peri-areolar margin has the effect of extending the wound length, enabling easier access to inside the breast compared with the conventional arcuate incision in the peri-areola margin. Also, for the cephalically located tumors, we also think a zigzag incision on the cephalic side



Fig. 4. Outflow of liquefied fat (oil cyst). Cephalic side: yellow liquid and lipid droplets flowed out after skin incision. Caudal side: necrotic tissue and fibrous capsule are found.

of the peri-areolar margin is better than a traditional skin incision in the IMF because it provides closer access and thus less exfoliation.

For patients who experienced noninvasive breast augmentation with fillers, their breast skin is normally soft with no scars. Therefore, the tumor can be approached from a small skin incision, which can be further facilitated by applying reverse traction with the retractor.

We designed a zigzag incision on the cephalic peri-areolar margin when the tumor is located in the cephalic side of the breast, and on the caudal margin when the tumor is located in the caudal side of the breast. Small tumors scattered throughout the breast can be easily removed by a zigzag incision in any side of the peri-areolar margin, depending on the distribution (Fig. 5).

This zigzag incision in the peri-areola margin is a cosmetically useful method because the wound most likely results in fine scars and is highly unnoticeable. Retrospectively, our 15 cases that were followed up for more than 1 month were evaluated by five plastic surgeons, and all were considered good or excellent. Also, patient satisfaction was also high, except for two cases without follow-up and three cases without zigzag margin around the areola.

It is important to explain to patients in advance that we may perform other methods of incision when the zigzag incision is insufficient to remove the mass. Other methods of incision include incision in the IMF, a direct incision above the tumor, resection of the skin when tumor is too tightly adhered to separate, and a combination of these.

We experienced breast augmentation by paraffin injection. Injection of silicon or paraffin is rarely seen today because it is prohibited in many countries, and our patient was unaware of what was injected. In our case, adhesion of paraffin to the skin was so severe that resection of the skin and mammary gland was inevitable (See SDC1f, Pt. No. 10, <http://links.lww.com/PRSGO/B737>).

Injection of foreign materials would sometimes result in infection. There are several reports on infection cases from breast augmentation that systemically spread and

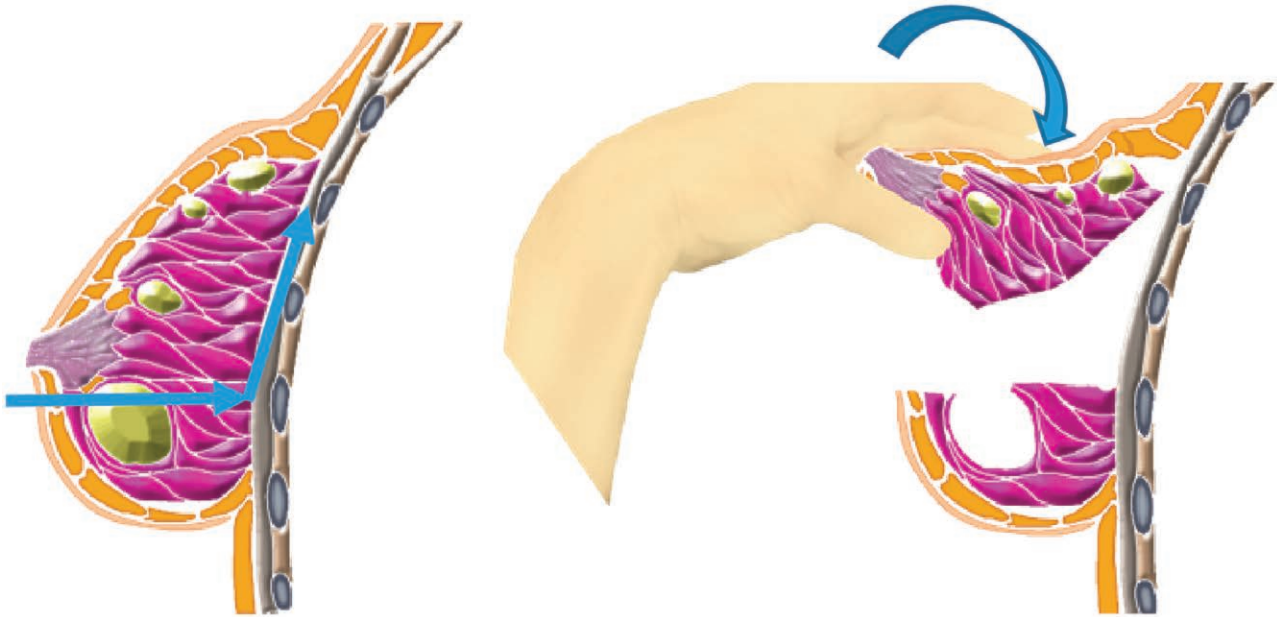


Fig. 5. Sagittal section of the zigzag incision is designed on the caudal side of the peri-areolar margin. The schema shows our excision method for small-sized tumors.

resulted in a septic shock.⁹ Such cases should be treated according to the guidelines on infections of their countries.^{10,11} Some reports claim that fat injection does not increase the risk of developing breast cancer,^{12,13} but long-term inflammation may increase the risk, and pathological analysis has been explored. Therefore, when resecting augmentation complications, it is preferable to consider having pathological tests performed.

We recommend an algorithm from our experience of treating these cases of breast augmentation complications. First, you must diagnose whether the patient has developed an acute infection or a chronic foreign body response. For acute infection, you should first administer antibiotics. Next, you should investigate the material of the filler used through history taking and imaging tests. If the material used is hyaluronic acid, try aspiration and injecting hyaluronidase. If this does not relieve the lumps, try surgical removal through the zigzag incision in the areolar margin. The zigzag incision should be enough to remove all units of hyaluronic acid. For autologous fat grafts, if the fat is an oil cyst, try aspiration, but if the graft is more solid with calcification, try the zigzag incision in the areolar margin. For silicon or paraffin injection, there is a higher chance of adherence to the skin or mammary glands. If there is a strong adherence to the skin, then skin resection is necessary, and the mass is approached from this resection. If there is no skin adherence, the mass is approached from the zigzag incision. However, if this incision provides insufficient access to the mass, then you should extend the zigzag incision laterally, or even add an IMF incision when necessary.

The overall timing of resection for chronic foreign body response should be at least half a year since the last surgery. In cases of acute infection, surgery should be planned quickly.

A major concern in patients who have received injection augmentation mammoplasty is delayed or compromised diagnosis of cancer. Injected foreign materials cause fibrosis and granulomatous reactions, which create tumors and architectural distortion that mimic neoplasm.¹⁴ Therefore, physical, mammographic, and sonographic examination for breast cancer is compromised,¹⁴ causing a delay in the diagnosis. In addition, foreign body reactions or recurrent infections, such as in our case, may lead to the formation of dystrophic calcification, which further complicates the detection of breast cancer.¹⁵ Also, there have been reports where injection augmentation such as polyacrylamide hydrogel may increase the risk of breast cancer.¹⁶ Therefore, we recommend submitting all masses removed from the breast to pathology.

Finally, all 15 of our zigzag incision cases that were followed up for more than 1 month were Japanese, who generally are more likely to produce more conspicuous scars compared with Whites. To further research the extent of this zigzag excision, evaluation for other races is necessary but can be estimated to have similarly good results.

CONCLUSIONS

Cases of breast augmentation by injecting autologous fat grafts and hyaluronic acid are increasing and so are reported complications from them. A zigzag incision in the peri-areolar margin is useful for treating these complications because it provides good view of the mass and leaves less-conspicuous scars.

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