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CASE REPORT BREAST

Tissue Degeneration 7 Years After Breast Augmentation With Injected Polyacrylamide Hydrogel (PAAG)

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Abstract Injectable polyacrylamide hydrogel (PAAG) is a jelly-like transparent implant used in breast augmentations. This type of implant had been used since 1998, but its use was prohibited in China in 2006 due to numerous complications that had arisen from its use. In one case, a rare appearance of PAAG tissue degeneration was observed 7 years after an injectable breast augmentation using PAAG.

Keywords Injectable breast augmentation · PAAG · PAAG tissue degeneration · Polyacrylamide hydrogel

The PAAG implant used in breast augmentations was prohibited in 2006 in China due to its numerous complications including asymmetric breasts, lumpy subcutaneous nodules, mastodynia, hematoma, infection, mastalgia, and lactation [1]. In a rare case, we discovered that a patient who had undergone an injectable PAAG breast augmentation 7 years previously was experiencing continuous mastodynia and had lumpy subcutaneous nodules and asymmetric breasts. During removal of the PAAG, we observed that the injected material had degenerated the surrounding tissue. In addition, the pathology of a section of the breasts stained with hematoxylin and eosin (H&E) showed evidence of nodules.

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Materials and Methods

A 31-year-old woman had undergone an injectable breast augmentation in 2001 with implantation of two 180-ml PAAG implants in each breast. After the surgery, she experienced complications including asymmetry of the breasts (Fig. 1) and lumpy subcutaneous nodules. She also experienced continuous mastodynia, which developed gradually postoperatively.

Surgical removal of the PAAG prosthesis, as requested by the patient in July 2008, was achieved via an inferior periareolar arc incision. The woman received a local anesthetic. Both abnormal tissue and nodules were removed. The histologic section of the nodules was stained with H&E and observed under a light microscope for performance of a pathologic examination.

Results

The PAAG was yellow and had the consistency of rubber cement. Numerous nodules containing subcutaneous adipose tissue and portion of the mammary gland were found. Honeycomb-like structures were present, and the cysts showed evidence of edema. The cysts were gray, semi-transparent, and hard to the touch.

The pathology of the cysts showed the presence of fibrous connective tissue hyperplasia with an irregular structure. A pressurized drainage system was placed in the cyst. The blue H&E stain showed fremde stoffe ("strange material") between the collagen fiber and the adipose tissue. Multiple tender indurations distributed within the breast tissue were evident. The largest mass was approximately $4.5 \times 5 \times 5$ cm in volume but had no clear boundaries. No superficial lymph nodes were found. The

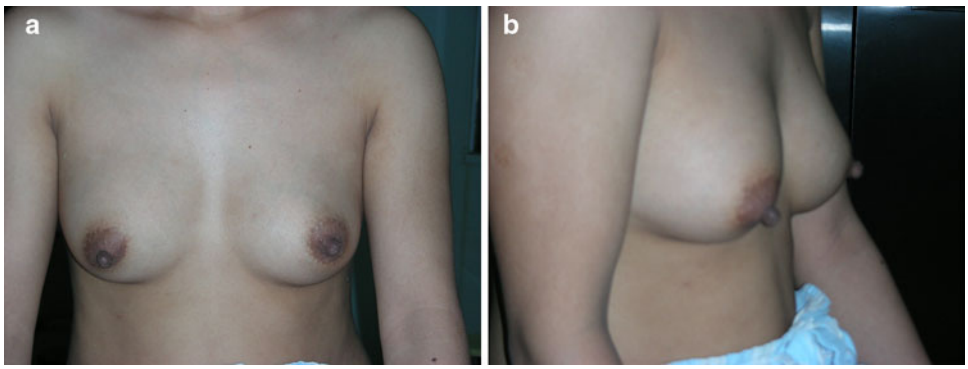

Fig. 1 The breasts were asymmetric 7 years after breast augmentation using polyacrylamide hydrogel (PAAG). The right nipple was moved down to correct the asymmetry. **a** Normotopia position. **b** Side position

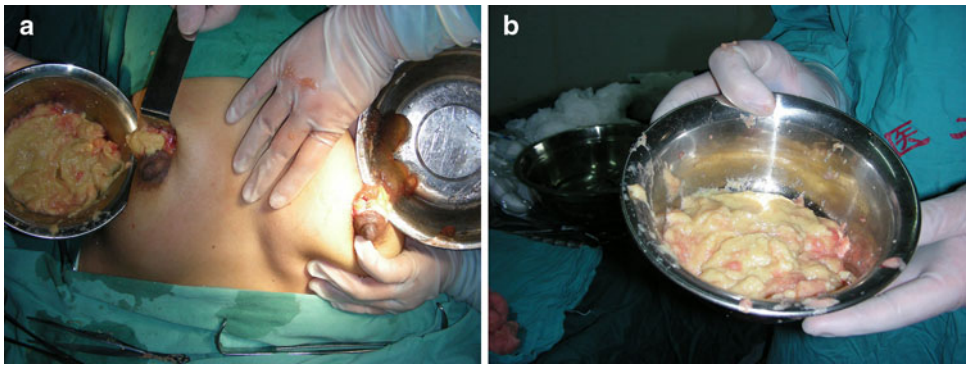

Fig. 2 **a** A small amount of jelly-like semitransparent substance and approximately 300 ml of the PAAG was removed from the right breast. By contrast, surgeons removed about 160 ml of PAAG from the left breast, which had a gel-like transparent appearance. **b** A close look at the PAAG removed from the right breast, which was yellow in color and had the consistency like rubber cement

honeycomb-like structures left over from the surgical removal were irrigated using normal saline.

A small amount of a semitransparent jelly-like substance and approximately 300 ml of the PAAG were removed from the right breast and approximately 160 ml of the PAAG was removed from the left breast (Fig. 2a). The PAAG removed from the right breast was yellow in color and had the consistency of rubber cement (Fig. 2b). The PAAG prosthesis, the abnormal tissue, and the majority of the nodules were removed. After the removal was completed, the incision was sutured to retain the anatomy of the patient. The patient then received antibiotics, and the drainage system was removed 48 h later. The histologic section of the nodules stained with HE showed fibrous connective tissue hyperplasia, irregular structures, and fremde stoffe between the collagen fiber and the adipose tissue. Foreign giant cells were not found (Fig. 3).

Discussion

Since 2006, the use of PAAG in breast augmentations has been prohibited in China due to the numerous complications after its use [2]. The complications included asymmetric breasts (Fig. 1), lumpy subcutaneous nodules, and mastodynia. Studies have shown that polyacrylamide is harmless to the body, but the acrylamide monomer released from polyacrylamide contains toxins. Animal studies have shown that acrylamide reproductive toxicity and nervous toxicity can lead to gene mutation [3–6].

The patient experienced PAAG tissue degeneration and other rare complications 7 years after her injectable breast augmentation. The removed PAAG had the appearance of yellow rubber cement, confirming that the PAAG had interacted negatively with the surrounding tissue. Observations during the operation confirmed that the PAAG physicochemical properties changed after implementation, resulting in degeneration of the breast tissue. In addition, chronic stimulation of PAAG caused the formation of fibrous tissue as well as fiber contraction, which led to displaced papillae and mastodynia. The PAAG was dispersed into the tissue during the injection, which caused the formation of numerous nodules. The PAAG also was phagocytized by the surrounding cells. After injection into the body, PAAG can cause many complications, but the chemical changes in PAAG and the tissue degeneration

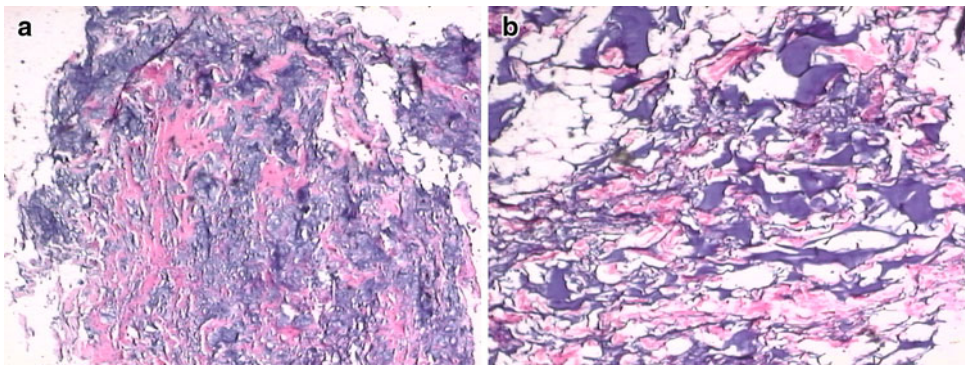

Fig. 3 **a** Microphotographs of the cysts showing hyperplasia of the fibrous connective tissue and an irregular structure (original magnification, x40; HE stain). **b** Fremde stoffe was observed between the collagen fiber and the adipose tissue (x200; HE stain)

that occurred postoperatively in the reported patient were rare complications.

Conclusion

The reported case suggests that the degeneration of the PAAG in the patient was caused by an interaction between the patient's internal environment and the PAAG. Over a 7-year period, the PAAG's physicochemical properties changed due to a complex internal environment, and the PAAG and acrylamide monomer stimulated tissue degeneration. Whether PAAG can cause damage to distant organs or not still needs to be observed.

Conflict of interest None.

References

1. Cheng N-X, Wang Y-L, Wang J-H et al (2002) Complications of breast augmentation with injected hydrophilic polyacrylamide gel. Aesthetic Plast Surg 26:375–382
2. Besaratinia A, Pfeifer GP (2003) Weak yet distinct mutagenicity of acrylamide in cells. J Natl Cancer Inst 95:889–896
3. Janneke GH, Leo JS, Erik JK, Goldbohm RA, Brandt PA (2008) Dietary acrylamide intake and the risk of renal cell, bladder, and prostate cancer. Am J Clin Nutr 87:1428–1438
4. Takafumi Y, Masao H, Shinsuke Y, Yoshimasa O et al (2001) Evaluation of acrylamide and 3,3'-iminodipropionitrile-induced neurotoxicity in a rat 28-day oral toxicity study: collaborative project for standardization of test procedures and evaluation of neurotoxicity. J Toxicol Pathol 14:279–287
5. Wang H, Huang P, Lie T, Li J, Hutz RJ, Li K, Shi F (2010) Reproductive toxicity of acrylamide-treated male rats. Reprod Toxicol 29:225–230
6. Xiao ZB (2008) The relationship between breast cancer and breast augmentation with injected polyacrylamide gel: two case reports. J Plast Reconstr Aesthet Surg 61:981–982