



Breast augmentation with Aquafilling: complications and radiologic features of two cases

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Abstract

Breast augmentation with various injectable materials has been performed for decades. Aquafilling was developed in 2005 as soft tissue filler for facial contouring and recently its use for breast augmentation has gained speed in several countries. Its declared composition is 98% water and 2% copolyamide. Although not approved by the U.S. Food and Drug Administration, the procedure is increasingly applied in Turkey. Thus, familiarity with specific imaging findings and complications of this entity is important for the correct diagnosis. Possible migrated material should especially be sought for when reporting these cases. Hereby, we present two cases with a history of breast augmentation with Aquafilling, with special emphasis on MRI findings. Two female patients (ages 28 and 32) were referred for breast ultrasonography (US) with progressive swelling of the right breast (4 years after Aquafilling) and mastalgia (1 year after Aquafilling). Breast MRI at 1.5T (Siemens Espree) with 4-channel breast coil was performed. High-resolution non-fat sat T1- and T2-weighted (W) images, time of repetition-independent multislice (TRIM), and diffusion-weighted imaging (DWI), and for the silicone assessment, water-suppressed and fat-suppressed (WS-FS) sequences, were used. No contrast was administrated. Knowledge of the radiologic characteristics and migration patterns of Aquafilling material as well as related complications is very useful to make an accurate diagnosis.

Level of Evidence: Level V, diagnostic study.

Keywords Breast augmentation · AQUAfilling · Magnetic resonance imaging · Sonography

Introduction

Aquafilling was developed in 2005 as soft tissue filler for facial contouring and recently its use for breast augmentation has gained speed in several countries. Its declared composition is 98% water and 2% copolyamide [1, 2]. Familiarity with specific imaging findings and complications of this entity is important for the correct diagnosis. To our knowledge, six cases of breast augmentation with Aquafilling have been reported in PubMed [2–5], and breast MRI findings have been reported only in one case [2, 4]. Hereby, we present two cases with a history of breast augmentation with Aquafilling, with special emphasis on MRI findings.

Case reports

Ultrasonography (US) was performed with 6–15-Mhz high-resolution linear transducer with GE Logic 8 (General Electric Healthcare, United States). Breast MRI was performed at 1.5T (Siemens Espree; Siemens Medical Solutions, Erlangen, Germany) with 4-channel breast coil. High-resolution non-fat sat T1- and T2-weighted (W) images, time of repetition-independent multislice (TRIM), and diffusion-weighted imaging (DWI), and for the silicone assessment, water- and fat-suppressed (WS-FS) sequences, were used. No contrast was administrated.

Case 1

A 28-year-old female presented with progressive swelling of the right breast, which was twice the size of the left breast in physical examination (Fig. 1). A complex cystic structure 11 × 2 cm in size with multiple mobile hypoechoic inner foci in the right breast was noted (Fig. 2a) on US. In addition, a smaller complex cystic structure was noted in the left breast. On MRI, a hyperintense and heterogenous loculated round cystic

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Fig. 1 Clinical appearance of case 1. A 28-year-old female with swelling of the right breast in physical examination

structure was noted in non-fat sat T2-W axial sequences (Fig. 2b). The material showed restricted diffusion on DWI and there was no silicone signal on WS-FS TRIM silicone sequence. Later on, the patient revealed her cosmetic intervention history, which she withheld at the admission, of bilateral

Aquafilling injection procedure 4 years ago. The material had migrated among the pectoral muscle fibers at the superior parts of both breasts and into the subcutaneous fat tissue in the bilateral middle-inner quadrants, which appeared as hyperintense on T2-W and as hypointense on T1-W sequences (Fig. 2c). The surgeon who performed the Aquafilling procedure told her that the material would eventually be resorbed in years. However, her right breast kept swelling since the material continued to absorb fluid. The patient was referred to the reconstructive surgery. She was offered excision of the material, which she refused.

Case 2

A 32-year-old female with a history of breast augmentation with Aquafilling 1 year ago with recent mastodynia was referred for US. The patient did not give consent to photography. A complex cystic structure 3×1.5 cm in size with multiple mobile hypoechoic foci at the right retroglandular area was noted (Fig. 3a). Breast MRI revealed hyperintense and heterogenous loculated areas representing migrated

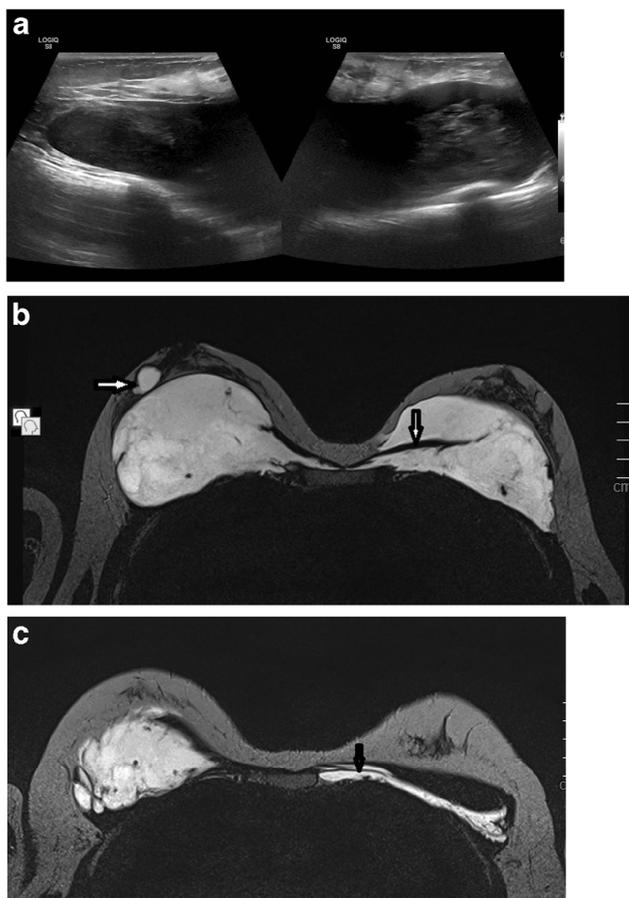


Fig. 2 28-year-old female. **a** Complex cystic structure with multiple mobile hypoechoic inner foci is noted on US in the retroglandular area of the right breast. Non-fat sat high-resolution T2-W axial MRI (**b**, **c**)

reveals hyperintense and heterogenous material with loculated areas and hyperintense Aquafilling material migration among pectoral muscle fibers (arrows) and to the upper quadrants of pectoralis muscle

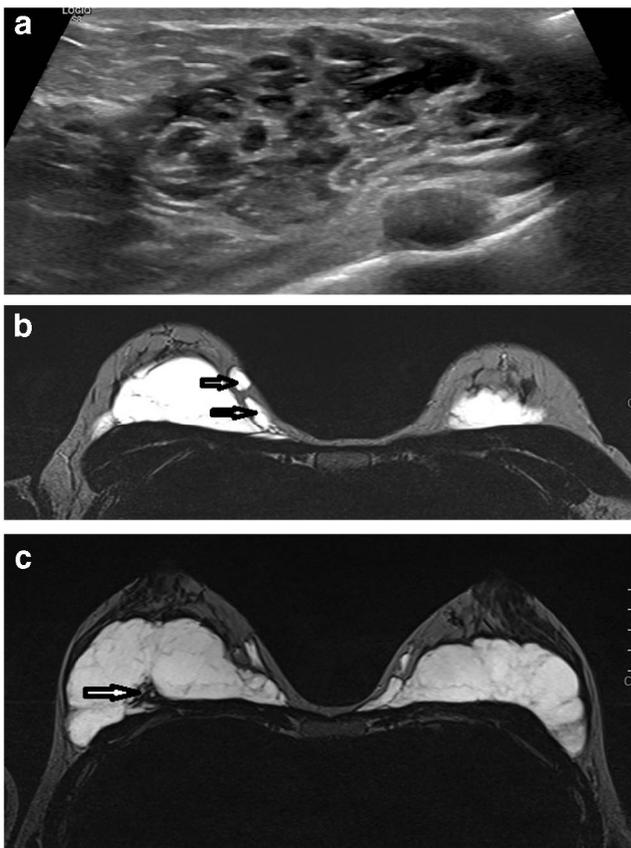


Fig. 3 32-year-old female. **a** An ill-defined complex cystic structure is seen on US in the retroglandular area of the right breast. **b** Axial fat sat T2-W TRIM MRI reveals hyperintense and heterogenous loculated areas (arrows) with migration of the Aquafilling material into the subcutaneous fat tissue in the middle-inner quadrant of the right breast and **c** among pectoral muscle fibers (arrow)

Aquafilling material into the subcutaneous fat tissue in the middle-inner quadrant of the right breast in T2-W sequences (Fig. 3b). Also, migration of the Aquafilling material into the subcutaneous fat tissue in the bilateral middle-inner quadrants was noted. The patient was referred to the reconstructive surgery where she was informed about possible future complications and put on clinical follow-up.

Discussion

Breast augmentation with various injectable materials has been performed for decades, but none of them have provided ideal results [6]. Initially developed in Czech Republic as soft tissue filler for facial contouring, Aquafilling^R has been widely used for breast augmentation since 2005. According to the manufacturer, it is composed of 98% water and 2% copolyamide. However, based on the document submitted to the Korean Food and Drug Administration (KFDA), it may be classified as a polyacrylamide since the exact ingredient of Aquafilling^R is reported as 2% of poly (acrylamide-co-N,N'-

methylene-bisacrylamide) and 98% of sodium chloride solution 0.9% [7]. Polyacrylamide hydrogel (PAAG) was initially considered as biocompatible and atoxic [8, 9]; however, long-term complications of the use of PAAGs in breast augmentation have been reported [10–12], and in most countries, its clinical use is not permitted [3].

Although breast augmentation with Aquafilling is not approved by FDA [13], the procedure is increasingly applied in Turkey. The gel can leak into the neighboring soft tissues; as in our case, MRI has clearly demonstrated the material in the subpectoralis compartment, between the pectoralis muscle fibers, and subcutaneous migration and in rare cases it may migrate into the vascular compartment [2]. Distant migration has also been reported [3, 4]. Knowledge of the radiologic characteristics and migration patterns of Aquafilling material as well as related complications has utmost importance. Familiarity with the images allows the radiologist to expand his differential diagnosis especially in cases where the patient tends to withhold the medical history of her cosmetic intervention. Also, the knowledge of MRI characteristics helps to differentiate the material from other injectable filling materials when the patient history is obscure. Aquafilling follows water signal on MRI sequences similar to PAAGs; hypointense on T1-weighted sequence and hyperintense on T2-weighted sequence and hyperintense with diffusion restriction on DWI [14]. MRI is the most sensitive technique for assessing the exact location of the injection material as well as the demonstrating the local and distant migration patterns [15].

The gel is injected under the fibroglandular tissue through the skin by a needle. This procedure is brief and is performed under local anesthesia. Training and experience is required for application. The material may be injected into incorrect locations leading to some local and/or systemic complications including fever, swelling, redness, tenderness/pain, asymmetry, and deformity [2, 5]. Most of the cases of deformity are irreversible. In addition, this gel may also produce hypoechoic nodules gradually and may be misdiagnosed as tumors. Even if the application technique and location is correct, complications such as the migration of the gel towards the subcutaneous fat tissue and pectoralis muscle can occur as seen in our cases. Excision is the only solution in migration complications; however, once transpassed through the pectoralis muscle and/or skin, it is not possible to remove the material. Moreover, enlargement of this material demonstrated by MRI as in case 1 revealed that it is a chronic progressive process. Similar complications have been noted for PAAGs. Although some were considered minor, many cases necessitated a spectrum of interventions ranging from incision and drainage to complete removal of mammary tissue and reconstruction of the breast [15]. Complications after injection of fillers are very common in Europe and the Middle East. The side effects of the most common filler injected into the breast, hyaluronic acid (Macrolane), have led to its subsequent

withdrawal from the worldwide breast augmentation market. On MRI, this type of filler is reported to undergo only minor degradation up to 1 year, which suggests that large volumes remain in the breast for a much longer time. Intraglandular and intramuscular cysts, visible subcutaneous nodules, breasts nodules, and infection were the reported side effects [16–18]. Therefore, the patients should be aware of the potential side effects of injectable breast fillers, and the effect on breast imaging.

In conclusion, there can be severe complications of breast augmentation with Aquafilling injections. Aquafilling follows water signal on MRI sequences like polyacrylamide hydrogel and saline, distinguishing it from silicone. Knowledge of the radiologic characteristics and migration patterns of Aquafilling material as well as related complications is very useful to make an accurate diagnosis.

Compliance with ethical standards

Conflict of interest Author A and Author B declare that they have no conflict of interest.

Ethical approval Ethical approval was not needed for this research.

Informed consent Informed consent was obtained from the patients.

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