



Review Articles

Polyacrylamide gel breast augmentation: report of two cases and review of the literature



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ABSTRACT

Polyacrylamide gel (PAAG) injection remains an uncommon method of breast augmentation. Providers must recognize the clinical and radiological manifestations to optimize management. The clinical and radiological findings of PAAG injection may mimic malignancy and silicone breast augmentation. We described two patients with prior PAAG breast augmentation with physical exam and imaging findings concerning for malignancy. We reviewed the literature on PAAG breast augmentation and compare PAAG to silicone breast augmentation. The management of such patients is discussed.

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1. Introduction

Polyacrylamide gel (PAAG) is a stable, nontoxic highly hydrophilic substance with 2.5% cross-linked polyacrylamide and 97.5% water [1]. Its high water content allows PAAG to be readily integrated within surrounding connective tissue and fat. When hydrated, PAAG forms a gel, which is commonly exploited in everyday items such as contact lenses, food packaging, and water purification [2].

Though PAAG was first introduced in the 1970s, it was not popularized for breast augmentation until 1997 by China and the Soviet Union [2]. Soon after, the Russian ministry prohibited PAAG injection for fear that it may lead to glandular atrophy [3]. The Chinese State Food and Drug Administration followed suit in 2006 and also banned PAAG sale, production, and use. There are still countries, such as Iran, that have yet to prohibit PAAG use. Thousands of women in foreign countries to date have used PAAG injection for breast augmentation, though exact numbers are not published [4].

Although PAAG is banned in most countries, patients may present with symptoms related to PAAG augmentation, which may mimic malignancy clinically and radiographically [2]. Because of this, it is essential

for health care providers to be cognizant of the signs and symptoms PAAG breast augmentation. Radiologists in particular should be aware of the imaging findings of PAAG in order to correctly diagnose patients who present for workup of palpable abnormalities or for cancer screening.

In the absence of an accurate surgical history, the clinical and radiological features of PAAG augmentation may overlap with silicone breast augmentation. However, the pathologic features and management techniques of PAAG augmentation differ from those of silicone augmentation. If removal of PAAG is desired, several management strategies are available: watchful waiting, aspiration, and surgical removal. In this article, we report two cases of PAAG breast augmentation and present an associated review of the literature.

2. Case #1

A 42-year-old Chinese female with history of breast augmentation with injection of PAAG in China 4 years prior (in 2008) presented with a palpable lump in the left breast. A well-circumscribed mass was seen in the upper outer left breast on mammogram and ultrasound (Figs. 1 and 2), which was biopsy proven to be foreign body reaction (Fig. 3). A right mammogram performed as part of the workup showed pleomorphic microcalcifications in the upper outer quadrant of the right breast middle to posterior depth (Fig. 4). Patient underwent stereotactic core biopsy of the microcalcifications. The samples obtained consisted of thick gelatinous material that extruded from the biopsy site. A clip was inserted into the biopsy cavity but was displaced out of the

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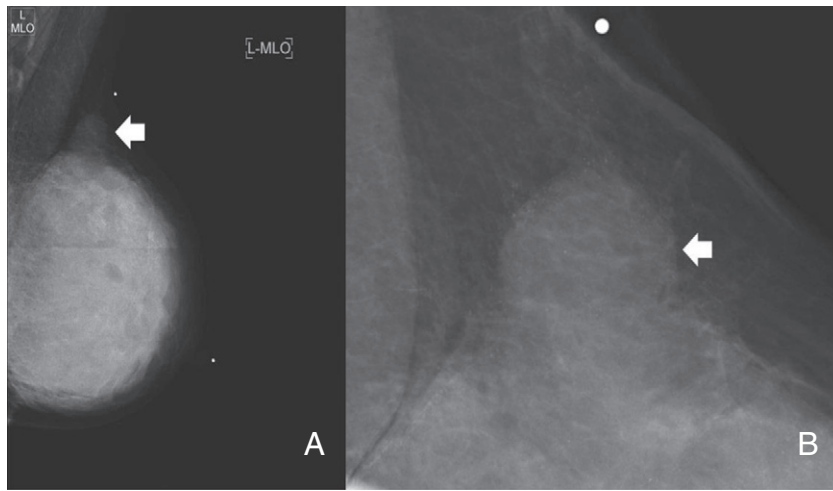


Fig. 1. Case #1: Left breast mammograms. (A) Left mediolateral oblique (MLO) mammogram demonstrating a mass in left upper outer breast corresponding with the patient's palpable abnormality (arrow). The breast parenchyma appears extremely dense, which may be related to the injected PAAG. (B) Left MLO spot magnification view of the palpable mass demonstrating indistinct margins and associated pleomorphic microcalcifications (arrow).

breast by the extruding gel like material. Once the needle was removed, no additional gel-material extruded from the access site. The right breast biopsy yielded foreign body reaction (Fig. 5).

3. Case #2

A 29-year-old Chinese female with a history of breast augmentation with injection of PAAG in China 8 years prior (in 2003) presented with a palpable left breast mass. Ultrasound of the palpable abnormality in the left breast at the 5:00 axis, 2 cm from the nipple revealed a small hypoechoic mass outside the injected PAAG material (Fig. 6). Ultrasound-guided fine needle aspiration yielded benign ductal proliferation with hyperplastic/papillary features. Subsequently, the patient underwent needle localization (Fig. 7) and excision, with final surgical pathology consistent with sclerosing intraductal papilloma. As this was a high-risk lesion, the patient also underwent follow-up magnetic resonance imaging (MRI), which demonstrated extensive PAAG injection within the retroglandular tissues and pectoralis muscle (Fig. 8). There was extension of the PAAG into the extrapleural space.

4. Discussion

The purpose of our manuscript is to report two cases of women who have undergone breast augmentation with PAAG injections and to perform an associated review of the literature in this section. Marketed as a “minimally invasive” procedure, patients became enthralled with PAAG as a quick, nonsurgical, and seemingly safe way to undergo breast

augmentation. While PAAG was once believed to be safe for injection for breast augmentation, recent literature exhibits a constellation of complications associated with its use. We have reported two cases of patients presenting with palpable breast masses and suspicious imaging findings following PAAG breast augmentation.

Since PAAG is injected blindly, the outcome is often unpredictable. Though typically retroglandular, an intraglandular approach has been seen, producing multiple PAAG masses in the breast. Inadvertently, the gel can be injected into the pectoralis muscle. The gel can then extravasate into the extrapleural space, as seen in case #2 [6]. PAAG can spread via direct extension to create subcutaneous nodules in the inframammary fold, axilla, sternum, and infraclavicular region if the gel is injected in the subcutaneous plane [7].

Gel migration is more likely to occur if the fibrous capsule surrounding the gel is thin. Certain factors like gravity or constant pectoralis major muscle contraction can accelerate gel migration by disrupting the fibrous capsule. In contrast, the fibrous capsule surrounding ruptured silicone breast implants is generally thicker than those after PAAG injection, thereby making silicone gel migration relatively less common [1].

Signs and symptoms of PAAG breast augmentation include breast lumps, contour abnormalities, abnormal skin sensation, mastalgia, mastodynia, infection, induration, and inflammation [8]. The most common sign or symptom of PAAG injection is the development of breast lumps, which are concerning to the patient and provider as they may simulate malignancy [9]. There is a tendency for PAAG to form globules, which may present as a palpable mass on physical examination and be

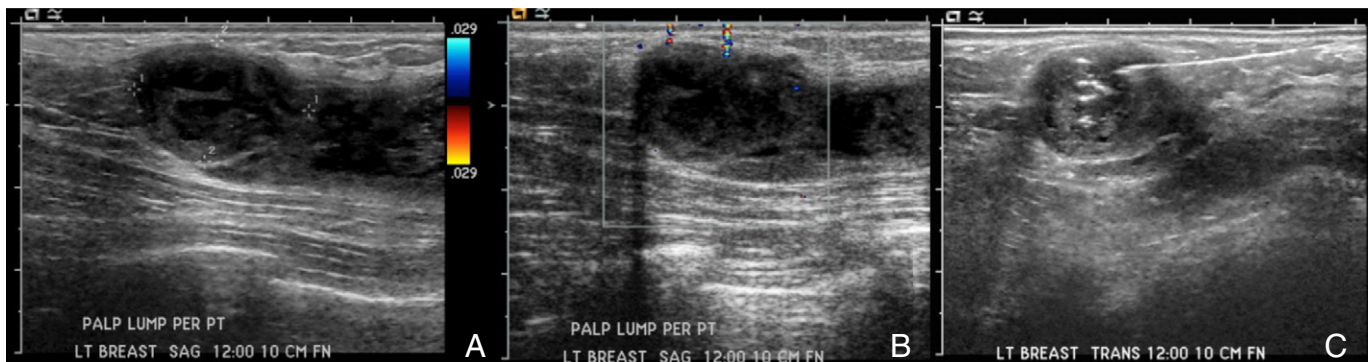


Fig. 2. Case #1: Left breast ultrasound images. (A) Left breast sagittal grayscale ultrasound demonstrating a complex cystic mass measuring 2.1×1.5×2.0 cm. (B) Left breast sagittal color Doppler ultrasound shows that the mass is avascular. (C) Left breast transverse gray-scale ultrasound during fine needle aspiration.

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