

## Case Report

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# Irreversible Sequels of Poly Acrylamide Gel (Paag) in Breast Augmentation

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## Abstract

**Background:** Breast augmentation is increasingly popular and office based procedures are interesting for clients who do not like general anesthesia for surgeries. PAAG as old labeled filler was used among nations mostly in eastern countries. Gradual complicated presentations of injected breasts caused some limitations in its use.

**Case presentation:** A 41 years old woman who had PAAG injection 15 years before, admitted for breasts` lumps and irregularities. Upon surgery, about 250cc of dens collected fluid drained of each breast and hard stony tissues excised as much as possible. 6 months later we did fat injection to compensate volumetric deficiency. Ultimately, final surgery was not proceeding, as the tissues were embedded with dens fibrotic tissues. It was not possible to manipulate pocket for implantation.

**Conclusion:** PAAG injection to augment breast is no more acceptable due to its long term destructive effects, which limits reconstructive approaches.

**Keywords:** Polyacrylamide Gel (PAAG); Breast augmentation; Prosthesis implantation; Fat grafting.

## Introduction

Breast augmentation is a long lasting desire and its popularity is increasing worldwide. Besides auto augmentation procedures, there were numerous attempts to find proper material which had safety and availability. Historically, Paraffin, petrolatum, vegetable oil, lanolin, beeswax, and liquid silicone are among materials

which were used. In the late 1980s, Polyacrylamide gel (PAAG) introduced for breast augmentation [1]. Manufacturers announced it safe and easy to use, and only reported some breast lumps due to gel migration.

The injected compound consisted mostly water (near 95%) without significant micro-particle. The toxicity dose was 0.2 g/kg/

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bw/day (14 g/kg), and it was recommended for volume augmentation not for superficial wrinkles [2]. During breast augmentation, a retro-mammary pocket was selected the gel was injected, though the formed capsule was thin enough to be torn easily. This caused gel migration to surrounding tissues, presented by pain, fever, and breast deformity [3]. Aseptic inflammation, is dominant event, which happens in complicated cases, but progression to infection is slow and PAAG can spread through mammary ducts leading to opportunistic infection, as the material is hydrophilic and can be a good medium. Destructive characteristics of PAAG erodes peripheral tissues and makes cavities, even after surgical debridement, which interferes with wound healing [4].

The other presentations of PAAG breast augmentation include breast lumps, contour abnormalities, abnormal skin sensation, mastalgia, mastodynia, infection, in duration, and inflammatory events. Micro-calcification on mammography is rarely seen. However, this view is of 28.8% positive predictive value for malignancy [5,12].

As PAAG can migrate easily with muscle activity and gravity, its effects may reach to upper abdomen and evokes abdominal pain. The weak capsule is amenable to rupture, even with violent sneezing, and prone to displacement. If injection was outside the retro glandular space, this migration was significantly widespread [6].

There are various studies on PAAG complications in breast augmentation, and here we wanted to present our case with unusual nature during reconstructive process following breast augmentation and discuss about previous studies and their approaches.

### Case presentation

A 41 years old woman counseled for breast problem. 15 years past, PAAG was injected for her breasts as a cosmetic procedure. Her presentation was as lumps in both breasts and fullness especially in right side which extended to axilla (Figure 1). Her concerns were about malignancy and infection. According to first ultrasonography, there were collections detected in multiple pockets.

The plan was drainage of collected fluid and removal of foreign bodies. During surgery, via IMF incision, about 250 cc of dense yellowish fluid drained from each breast. After irrigation, the pockets evaluated and tried to excise abnormal tissues which looked like appendicular tissues hanging from peripheral walls. Exactly the same as stalactite and stalagmites in caves, and as adhesive and hard to broken as those allegories (Figure 2).

So, harvested fats from abdomen and flanks were transferred to both breasts to re-shape. She was satisfied about few months, until she decided to do comprehensive reconstruction. Finally, she admitted for prosthesis implantation in proper pocket and achieve optimal condition. Pre-operative ultra-sonographic examination revealed normal tissues without complications.

During surgery, we saw particles of PAAG- despite previous removal and fat injection- which caused improper field to implant prosthesis. Lots of dens fibrotic tissues were all around, and any attempts to create pocket for insertion seemed to be ineffective. Thus, only we irrigated the field and cleaned foreign bodies as possible. This denotes the long-term sequels following PAAG in-



Figure 1: Breast lumps and fullness, 15 years after PAAG injection.

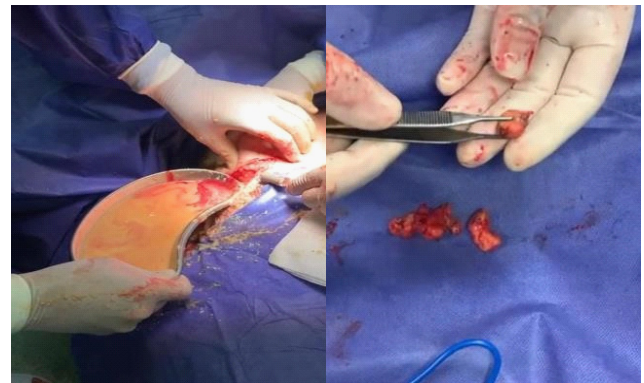


Figure 2: Drainage of more than 250 cc collection of PAAG and reactive fluid of hard foreign bodies.

Microscopic tissue examination demonstrated large macrophages with strict structures full of gel particles.

6 months later, second sonography demonstrated normal tissues without collection. Patient had deflated breasts following previous drainage and wanted better contour (Figure 3).



Figure 3: 6 months later, PAAG had been evacuated and breast tissues need new reconstruction.

jection, which cannot heal even with enough drainage and fat injection.

## Discussion

Breast augmentation, as one of common procedures in the world is increasing and some clients seek procedures without general anesthesia. Filler injection is a simple way to compensate volumetric defects in breast area. PAAG as a common filler in a few years before, was used to augment breast. Its complications, gradually made prohibitions against universal usage.

The exact rate of complications is not clear. Though, one of manufacturers announced one in every 1500 patients experienced transient swelling and tenderness [13].

Detection of Polyacrylamide gel is depicted by a T2-weighted MRI technique as well adjacent tissue reaction. Uncomplicated lumps are retro glandular homogenous masses similar to a saline bag or a silicon bag prosthesis. Due to different layers of breast involved by gel injection, multiple small pockets may appear and make significant challenge to the surgeons to remove the material [7].

Kim et al (2020) reported destructive effects of massive filler injection in breast tissue which complicated blood flow to NAC and nipple, and eventually caused catastrophic events in NAC area. They had to remove surgically the materials to repair retracted nipples. They used fat injection, autologous tissue transfer and even silicone implants to reconstruct deformed breasts. However, they recommended to postpone fat injection 3 to 6 months later to diminish risk of infection rate of fat transfer [8].

Jin et al (2018) reported their 10 years' experience on management of PAAG complications following breast augmentation. They demonstrated under the pectoralis major is preferred plan for prosthesis implantation to avoid the prosthesis's contact with the residual foreign material. Upon foreign body removal in a surgery, deflated breast lacks proper contour, should be compensated with volumization. In their experience decellularized allogeneic dermis could be used to repair the local tissue, remodel the location of the sub mammary fold, and provide a more stable support for the prosthesis [9]. But our case had such a hard and stiff tissues around injected PAAG, which prohibited any attempts to replace volume deficiency during primary operation.

PAAG is not infectious by itself, but poor intraoperative-gel removal- disinfection and bacterial contamination, may lead to acute infection. On the other hand, thin capsule around injected PAAG, predisposes materials to rupture and distribute surrounding tissues and evoke pain and unpleasant feelings [10]. Our patient had fullness in axilla, and enlarged breast, which displaced breast defining borders.

Upon surgery and gel evacuation, grossly there were very hard to remove stone- like fibrotic tissues as sticky or grainy, mixed with some firm or fragile nodules. Yang et al (2020) illustrated cut surfaces of the nodules showed a translucent yellow or milky-white gelatinous appearance with varying amounts of gray area. Microscopically, the PAAG presented in HE sections as pale-to dark purple homogenous gel pools of various sizes and shapes. They were seen mostly in the stroma, while others were closely adjacent to breast glands, muscles, and fat tissues, they also clarified to pat-

terns: Giant cells in periphery of gel pool, and macrophages entered the gel pool. They presented the theory of real capsule and pseudo-capsule around the gel, which strongly recommended its removal during surgery [11].

## Conclusion

Surgeons prefer to remove as much as possible filler collections to reach better environment to proceed reconstructive options like implant based augmentation. PAAG has sufficient destructive effects which limits available solutions to reshape deformed breasts. This filler is still red flag in breast augmentation.

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