Adverse Effects After Use of Polyacrylamide Gel as a Facial Soft Tissue Filler

Abdolijalil Kalantar-Hormozi, MD; Naser Mozafari, MD; and Mehdi Rasti, MD

BACKGROUND: Although the "perfect" filler material to correct soft tissue facial defects, wrinkles, and scars has not yet been found, ideal characteristics for such a substance may be considered as the following: permanent, inert, malleable, easily injectable, quick to metabolize, not prone to infection, affordable, removable, nonmigratory, and not associated with any disorder or disease state as shown by clinical and paraclinical studies.

OBJECTIVE: The authors present an evaluation of patients undergoing treatment for facial wrinkles or soft tissue defects by injection of polyacrylamide hydrogel (PAAG) and analyze outcomes on the basis of the incidence of moderate to severe complications.

METHODS: A retrospective study was performed, including history taking, physical examination, and follow-up of 542 patients who received facial injections of PAAG.

RESULTS: Of 542 patients, 42 (7.7%) experienced complications such as swelling, abscess formation, lumpiness, change in facial appearance, change in gel location after injection, and sensitivity.

CONCLUSION: The authors recommend that complications from treatment with PAAG be studied further before widespread use of this soft tissue filler. (*Aesthetic Surg J 2008;28:139–142.*)

Facial filler materials among those first presented and classified as permanent or nonbiodegradable include paraffin oil and liquid silicone.[1] Because of ease of use and reportedly good results, liquid silicone soon became a popular facial filler. Silicone was also available as solid blocks and gel and was used for breast, cheek, and chin prostheses. However, injectable silicone was removed from the market because of resulting complications such as tissue cellulitis, deformation at the injection site, soft tissue sagging, formation of granuloma, and difficulty of extraction. Use of bovine collagen for correction of wrinkles and scars began in 1977. Bovine collagen is an absorbable material that typically persists for 3 to 6 months. Because it has a complication rate of 1% to 5%, it is recommended that it be tested before application.[2]

More recently, several other absorbable facial filler materials have been presented, including human collagen and hyaluronic acid, neither of which requires pretesting. However, these materials cannot produce the permanent results available with liquid silicone.

Recently, polyacrylamide gel (PAAG; Sinocos Eastcos Medical Technology Development, Ltd., Causeway Bay, Hong Kong), which is a type of polyacrylate amide, has come on the market.* This nonabsorbable injectable material is available in 20- and 40 mL vials. Manufacturers describe it as a colorless, translucent, biocompatible material made from polyacrylamide, with components of 2.5% cross-linked polyacrylamide and 97.5% sterile water that can be preserved at room temperature.

Additionally, it is stable, not degraded with proteolytic lipolytic enzymes, and can be sterilized once at 120° C. The manufacturer states that it creates no allergic reaction, does not interfere with the hemodynamic system, is noncarcinogenic, does not create capsules or fibrosis, is neither toxic nor absorbable, is not easily expelled or displaced, and does not interfere with diagnostic modalities.[3]

Manufacturers recommend injection of PAAG in the breasts to treat asymmetry, hypoplasia, and after mastectomy; in the face to treat wrinkles and scars and for soft tissue augmentation of the malar area, lips, and chin; for augmentation or contouring of male and female external genitalia, and in vocal cords.

COMPLICATIONS

According to a product insert, included in packaging between 2000 and 2001, PAAG had been injected in more than 25,000 patients; 80% was injected in the

Dr. Kalantar-Hormozi is Associate Professor of Plastic Surgery, Dr. Mozafari is Assistant Professor of Plastic Surgery, and Dr. Rasti is a Fellow in the Department of Plastic Surgery at Shahid Beheshti Medical University, Tehran, Iran.

**Editor's Note:* PAAG is not currently approved for soft tissue augmentation in the United States.

breasts, 10% in the skin for wrinkle/scar reduction, and the remaining 10% was injected in the face, lips, thighs, and back for volume augmentation. The manufacturer stated that complications included infiltration, edema, hematoma, and lumpiness.

In a small study conducted by a Danish pathologist, 27 women were injected with PAAG over a period of 10 months to 8 years. The study concluded that this agent is not degradable, is permanent, and, in moderate to large injections, may cause foreign body reactions.[3] In 3 separate articles discussing PAAG injections into the breast, complications such as deformity, spontaneous extrusion, lumpiness, capsular contracture, and gel migration have been reported.[2,4,5]

Thus far, no complications have been reported with PAAG facial injections. In this article, we discuss complications of PAAG facial injections that emerged in our retrospective study.

PATIENTS AND MATERIALS

We performed a retrospective study of patients with a history of PAAG injections. Our study was performed over 2 years, from January 1, 2004, until January 1, 2006. We studied a group of patients 1 day to 5 years after PAAG injection. At the end of the study a minimum of 2 years had passed from the time of injection for all patients.

Using systematic sampling, 600 participants (prevalence 50%, deviation 0.04, and confidence interval 95%) were chosen from medical records and other documents from private clinics in large Iranian cities. The inclusion criterion was a history of PAAG injection from January 1, 2001 to December 31, 2003. We informed participants about our research in PAAG injection complications and invited any participant with a complaint about their injection site to contact us for a consultation. From patients who came in for a consultation, we collected data on medical history, physical examination, date and number of injections, reason for injection, injection site, complications, previous treatment, and photographed abscesses and changes in injection sites. Of 600 patients with a history of PAAG injection, 542 had been injected in the face, and 58 were injected in other sites (16 in the extremities and 42 in the breast). Those 58 patients with no history of facial injection were excluded from the study.

RESULTS

Of the 542 patients injected in the face, 42 (including 37 women and 5 men, ranging in age from 26 to 58 years) had complaints at injection sites, including glabellar area, cheeks, eyelids, nasolabial folds, and upper lips. Many of these 42 patients had multiple complications occurring simultaneously. The overall rate of complication was 7.7%.

Most patients with complications presented with a history of swelling, redness, and long-term use of corticosteroids and antibiotics. They also mentioned a history of outpatient surgical procedures.

Two of those injected in the face had been hospitalized for respiratory distress. Four patients were hospitalized for severe swelling and uncontrolled infection lasting for 3 weeks. Complications developed as soon as 10 days and as late as 58 months after injection.

The most common complications were abscess formation in 32 (5.9%) and displacement of gel in 29 (5.3%) of patients. In 16 patients the gel had moved and extruded from another site in the form of an abscess. In one third of the patients with abscess formation, the abscess had occurred after a dental procedure. In 2 patients, an abscess appeared in the injection site after more than 3 years, but 85% of complications occurred less than 1 year after injection. Patients were treated with minor or major procedures. Abscess drainage was performed with large needles. In 30 patients abscesses were drained in the operating room. Five patients needing correction of lumpy gel appearance underwent drainage in the operating room. In the remaining 7, treatment was performed in the office setting.

In a patient who had gel injected into the whole face, despite several attempts at removal, there developed persistent fibrotic nodules with small overlying blood vessels in the skin. In 2 patients, abdominal cramps developed after injection of gel after a period of 3 days to 3 years.

CASE PRESENTATIONS

Case 1

A 36-year-old woman was injected with PAAG for correction of nasolabial folds and with botulinum toxin for reduction of periorbital and frown wrinkles. Ten days after PAAG injection, her face became swollen. After injections of intramuscular betamethasone, the reaction subsided. Then, after a 2-week period, her entire face and neck became swollen. The patient also experienced respiratory distress, abscesses, and pus discharge in several areas of the face and neck. She was hospitalized, the pus was drained, and gentamicin, clemastine, ciprofloxacin, and cloxacillin were prescribed.

The pus discharge culture showed no specific microbe. Laboratory study results of creatine phosphokinase, erythrocyte sedimentation rate, complete blood cell count, alkaline phosphate, serum glutamate pyruvate transaminase, serum glutamate oxaloacetate transaminase, creatinine, blood urea nitrogen, and blood sugar were in the normal range. The patient was discharged after 1 week.

After several days, she was hospitalized again because of infection. A course of vancomycin, ciprofloxacin (500 mg daily), and rifampin was initiated and then after 3 weeks of prednisolone (5 mg 4 times daily), and then a course of 10 mg daily, the patient was discharged. After several months of treatment, including facial incisions for drainage, her condition stabilized (Figure 1).

Case 2

A 34-year-old woman had PAAG injected into her glabellar and nasolabial lines. After 5 years, following persistent complications, she had the gel removed. This left her with several lumps in her nasal and upper lip areas with associated telangiectasis, an upper lip without normal

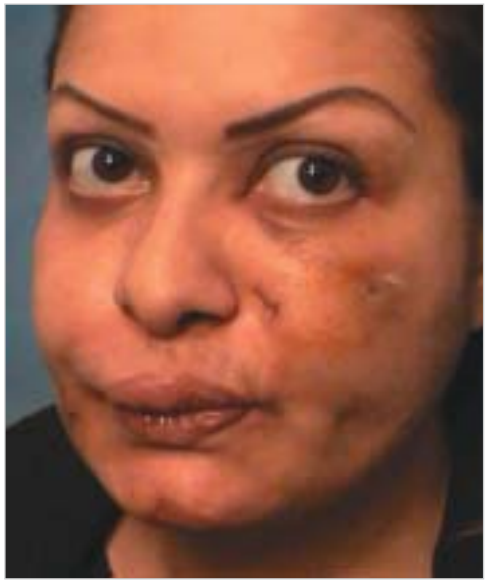

Figure 1. A 36-year-old woman is seen after several months of treatment for infection that developed after PAAG injection.

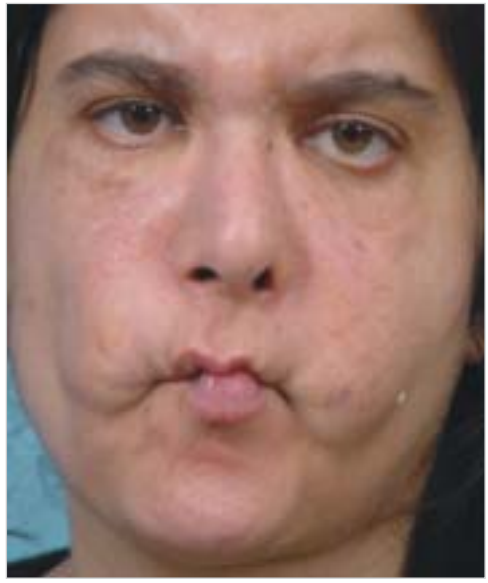

Figure 2. A 34-year-old woman had PAAG injected into her glabellar and nasolabial lines. She is photographed after gel removal and a subsequent face lift.

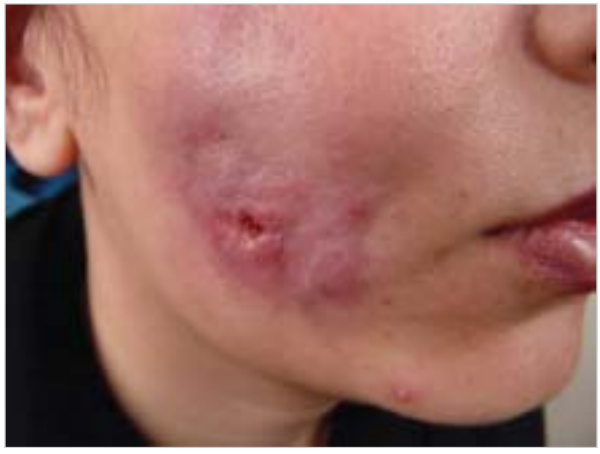

Figure 3. A 33-year-old woman had PAAG injected into her nasolabial folds, resulting in bilateral bumps and intermittent pus discharge.

Figure 4. A 35-year-old woman with a history of PAAG injection into her nasolabial folds and upper vermilion border was hospitalized 3 times and treated frequently on an outpatient basis for facial swelling, abscesses, pus drainage, and respiratory distress.

movement, and no dental show. Because of the heaviness of her facial lumps, skin sagging gave her a "lion-like" appearance. She underwent a classic face lift but, because of severe adhesions and fibrosis, the results were poor (Figure 2).

Case 3

A 33-year-old woman underwent PAAG injection into her nasolabial folds on 6 separate occasions. Two weeks after injection, she had swelling, infection, and pus drainage. The pus was drained, antibiotics and prednisolone were prescribed, and a course of intralesional injection of triamcinolone was tried several times. When we saw the patient, she had bilateral lumps in her nasolabial folds and intermittent pus discharge from the right side (Figure 3).

Case 4

A 35-year-old woman with a history of PAAG injection into her nasolabial folds and upper vermilion border had development of facial swelling and respiratory distress 1 week after injection of PAAG. Her symptoms were relieved with antihistamines, warm compresses, and antibiotics. The pus culture result was negative. A month later the patient had severe facial swelling that drained pus. She was admitted into the hospital and underwent a complete workup. Laboratory examination results were negative. Abscesses in her medial canthus, nasolabial fold, chin, and inferior eyelid were drained. Pus, 150 mL, was evacuated from her bilateral nasolabial folds, and drains were inserted into the cavities. After hospital discharge, several facial abscesses developed, which were all drained. The patient was hospitalized a

total of 3 times and underwent outpatient procedures a total of 11 times (Figure 4).

DISCUSSION

Thus far, none of the filler materials that have been presented to correct facial soft tissue defects, wrinkles, and scars has completely met the ideal criteria (permanent, inert, malleable, easily injectable, quick to metabolize, not prone to infection, affordable, removable, nonmigratory, and not associated with any disorder or disease state as shown by clinical and paraclinical studies).[6] In some cases, while the initial results of certain fillers have seemed satisfactory, after a period of time the emergence of severe complications has jeopardized patient health. Complications have sometimes been so significant that, after undergoing several operations without complete improvement, patients and their families are faced with significant psychological stress.

In some instances, untoward reactions resulting from injections may be caused by factors other than the inherent properties of the injected substance. Inappropriate patient selection, variability of manufacturers, different generic names that can affect dosage requirements or product quality, injection by unqualified practitioners, inappropriate preservation of the agent, and combined use with other materials such as botulinum toxin are among the factors that can impact results.

We believe that the number of patients with PAAG complications may be particularly high in Iran, simply because PAAG injection was so common here. The PAAG material used in Iran is delivered in its original packaging and is the same as that used in other countries; therefore we do not believe that the high rate of complication is because patients were injected with an impure product. Although we do not know the total number of patients who have undergone PAAG gel injection, because we are aware of severe complications and the difficulty of treatment, we urge that more research be done before further widespread use of this product. Our specific recommendations are as follows: (1) do not use nonabsorbable filler materials in exposed parts of the body such as the face, ie, use absorbable materials for soft tissue facial augmentation, and (2) do not use a combination of agents.

This is an ongoing study. As time passes, we expect that the number of patients who contact us with complications will increase, and the actual incidence of complications may be higher than the currently reported 7.7%.

CONCLUSION

Considering that the use of PAAG is somewhat new, evaluation of its complications is still incomplete, and resolution of complications through a variety of surgical procedures has not been satisfactory, we recommend additional research into the incidence and treatment of complications associated with PAAG before it is more widely used. ◗

DISCLOSURES

The authors have no disclosures with respect to the contents of this article.

REFERENCES

1. Evstatiev D. Late complication after injections of hydrogel in the breast. *Plast Reconstr Surg* 2004;113:1878.
2. Ashinoff R. Soft tissue augmentation. *Clin Plast Surg* 2000;27:479–487.
3. Christensen LH, Breiting VB, Aasted A, Jørgensen A, Kebuladze I. Long-term effects of polyacrylamide hydrogel on human breast tissue. *Plast Reconstr Surg* 2003;111:1883–1890.
4. Cheng NX, Wang YL, Wang JH, Zhang XM, Zhong H. Complications of breast augmentation with injected hydrophilic polyacrylamide gel. *Aesthetic Plast Surg* 2002;26:375–382.
5. Lee CJ, Kim SG, Kim L, Choi MS, Lee SI. Unfavorable finding following breast augmentation using injected polyacrylamide hydrogel. *Plast Reconstr Surg* 2004;114:1967–1968.
6. Fezza JP. Soft tissue augmentation with facial fillers. *J Facial Plastic Surg* 2004;20:109.

Accepted for publication December 6, 2007.

Reprint requests: Abdoljalil Kalantar-Hormozi, MD, 15 Khordad Medical Center, Aban Street, Karim Khan Blvd, Tehran, Iran.

1090-820X/$34.00

doi:10.1016.j.asj.2007.12.005