

Invisible Tattoo Granuloma

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Polymethylmethacrylate (PMMA) is a synthetic polymer with multiple uses in industry and medicine. In dermatology, it is primarily used as an injectable implant for the correction of rhytides. We report the first case of an adverse event caused by the recreational use of PMMA in the form of an invisible tattoo granuloma.

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Tattoos date back thousands of years. The word *tattoo* is derived from the Tahitian word *tatau*, which means to tap.

Traditionally, tattoo ink is composed of metal salts or plant derivatives. Recent advancement in tattoo technology has led to the development of a tattoo medium that closely parallels a substance used in the medical industry. We report the first case of an adverse reaction to this unique tattoo medium.

Case Report

A 19-year-old woman presented to our clinic with a 3-month history of an erythematous pruritic plaque located in the area of an unconventional invisible tattoo placed on the upper arm approximately 9 months prior to presentation.

Results of a physical examination revealed a 6.5-cm erythematous plaque of coalescing firm papules in the shape of a stylized sun located on her left lateral upper arm (Figure 1). Conventional tattoo pigment was not appreciated on the skin's surface. Further evaluation with a Wood lamp demonstrated a brilliant illumination in the area of involvement (Figure 2). There was no palpable lymphadenopathy. The patient's prior medical history was negative

for exuberant scar formation. A complete blood count with differential was within reference range, and results of a chest x-ray were normal.

Histologic examination disclosed rare findings. The epidermis appeared unchanged. The dermis contained multiple epithelioid granulomas surrounded by a sparse lymphocytic infiltrate. Small, clear, spherical, refractile particles with some variation in size and shape were present within these granulomas (Figure 3). Some of the particles appeared to have a central bubble. The particles did not mark with Fontana-Masson silver, periodic acid-Schiff, iron, or Alcian blue stains. However, the paraffin-embedded section fluoresced under Wood lamp examination (Figure 4).

Comment

Our patient's tattoo is a new generation of UV light tattoos. Instead of traditional pigment, this tattoo is composed of polymethylmethacrylate (PMMA) microspheres filled with fluorescent dye, which is

**Figure not
available online**

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Figure 1. Erythematous plaque in the shape of a stylized sun.

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Figure 2. Wood lamp examination (360 nm).

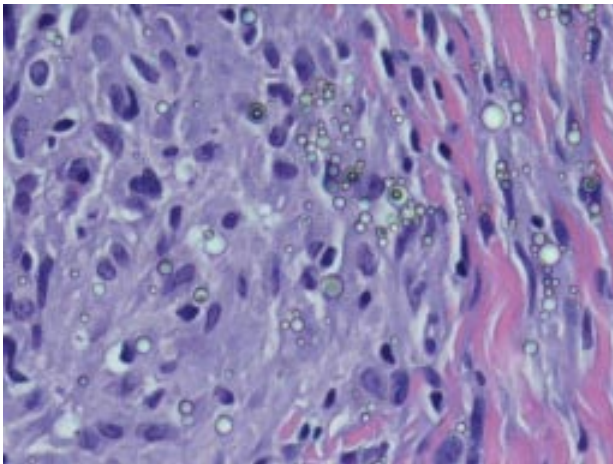


Figure 3. Polymethylmethacrylate microspheres of differing sizes and shapes present within granulomas (H&E, original magnification $\times 400$).

injected into the skin in a similar fashion to traditional tattoos. The microspheres are suspended in a vehicle of distilled water to produce a tattoo that is invisible to the eye except when fluoresced under light at 350 to 370 nm.

This fluorescent microsphere technology was developed in 1995 for use in animals, plants, and fish for the purpose of tracking migration, growth patterns, and breeding habits. The following ingredients are reported in the tattoo ink: PMMA 97.5% and microspheres of fluorescent dye 2.5% suspended in UV sterilized, distilled water with no preservatives or other additives.¹ This ink is approved by the US Food and Drug Administration (FDA) for tracking wildlife. UV light tattoo inks, along with all other tattoo inks, are not approved by the FDA for use in humans.

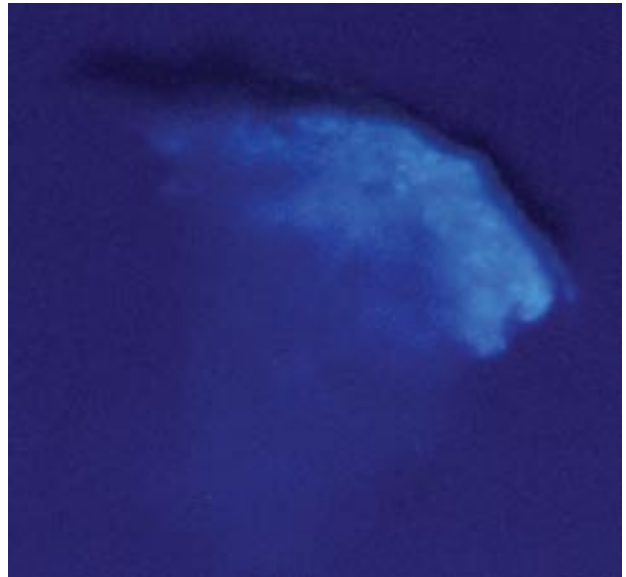


Figure 4. Paraffin-embedded, hematoxylin and eosin-stained section examined under $\times 20$ original magnification with concurrent 365-nm light luminescence.

In medicine, some bone cements, artificial joint prosthesis, and ocular implants are composed of PMMA and have been successfully used for many years. The main application of PMMA in dermatology is a subdermal injectable implant composed of PMMA microspheres suspended in a water-based carrier gel containing 3.5% bovine collagen used for permanent correction of rhytides. This injectable implant is used in Canada and Europe and recently obtained FDA approval for correction of nasolabial folds.

Several reports of hypersensitivity, both acute and delayed, and granuloma formation caused by PMMA have been published in the literature.²⁻⁵ While multiple cases of erythema and granuloma formation from cosmetic fillers containing PMMA microspheres are documented, there are no published reports of adverse events as severe as those observed in our patient. Because the PMMA microspheres used in the UV light tattoo ink are much smaller, irregular in shape, and placed in the upper dermis, they are more likely to induce an immunologic response than the subdermally placed, 30- to 40- μm , smooth microspheres of the cosmetic filler.

Treatment in this case was limited given the resilient nature and nonpigmented characteristics of the PMMA microsphere implant. Our case of PMMA granuloma formation responded well to serial intralesional corticosteroid injections (10–40 mg) at 1-month intervals. Traditional tattoo removal treatments, such as laser ablation using multiple wavelengths, provide no benefit with UV light tattoos because of the lack of a chromophoric target.

Other anecdotal reports have shown that allopurinol 600 mg daily for 24 weeks treats granuloma formation caused by PMMA.^{6,7}

Conclusion

PMMA is an elegant compound with various forms and functions. In contrast to its other medical uses, PMMA use in dermatology has been met with resistance due to increased reported incidence of adverse events. This is the first reported case of a granuloma formation caused by recreational use of a PMMA implant in the form of an invisible tattoo.

REFERENCES

1. Material Safety Data Sheet for BM1000: Chameleon Tattoo Ink. Chameleon Body Art Supply Web site. <http://www.crazychameleonbodyartsupply.com/msds-material-safety-data-sheets.htm>. Accessed August 2007.
2. Hoffmann C, Schuller-Petrovic S, Soyer HP, et al. Adverse reactions after cosmetic lip augmentation with permanent biologically inert implant materials. *J Am Acad Dermatol*. 1999;40:100-102.
3. Alcalay J, Alkalay R, Gat A, et al. Late-onset granulomatous reaction to Artecoll. *Dermatol Surg*. 2003;29:859-862.
4. Thaler MP. Foreign body granulomas caused by polymethylmethacrylate microspheres: an added perspective. *Arch Dermatol*. 2003;139:1505-1506.
5. Kirby BS, Doyle A, Gilula LA. Acute bronchospasm due to exposure to polymethylmethacrylate vapors during percutaneous vertebroplasty. *AJR Am J Roentgenol*. 2003;180:543-544.
6. Kemp SF, Lockey RF. Anaphylaxis: a review of causes and mechanisms. *J Allergy Clin Immunol*. 2002;110:341-348.
7. Reisberger EM, Landthaler M, Wiest L, et al. Foreign body granulomas caused by polymethylmethacrylate microspheres: successful treatment with allopurinol. *Arch Dermatol*. 2003;139:17-20.