

Bullous *Pseudomonas* skin infection and bacteremia caused by tattoo ink used in radiation therapy

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INTRODUCTION

The dangers of injection-related procedures came to light nationally with the 2012 outbreak of more than 750 fungal infections linked to the use of 3 recalled lots of preservative-free methylprednisolone acetate distributed by the New England Compounding Center.¹ We describe a case of a life-threatening pseudomonas infection, which was traced to the ink used in placement of radiation tattoos. There are numerous reported infections related to recreational tattoo placement, but to our knowledge, this is the first report in the literature of a medical radiation tattoo—related infection.

CASE REPORT

A 31-year-old woman who had Burkitt lymphoma with central nervous system, bone marrow, and breast involvement was admitted for neutropenic fever. The patient was receiving ongoing systemic and intrathecal chemotherapy. She relayed a 2-day history of fever, was found to be neutropenic, and was subsequently admitted for empiric antibiotic therapy. Two days before admission, the patient had 4 medical tattoos placed in anticipation of local radiation for cutaneous involvement of her Burkitt lymphoma to the skin overlying the breast. Within 48 hours of placement, the patient noted blisters and spreading redness at 3 of the 4 injection sites on her trunk. Cutaneous examination found 5- to 6-mm bullae with surrounding erythema and tenderness to palpation at 3 of the 4 tattoo sites (Fig 1).

Laboratory values showed the patient to be neutropenic with an initial white blood cell count of less than 0.1 K/ μ L with 17% segmented

Abbreviation used:

FDA: US Food and Drug Administration

neutrophils and 11% bands giving an absolute neutrophil count of 28. Blood cultures that were taken from the left antecubital fossa upon admission subsequently grew *Pseudomonas aeruginosa*. There were no other skin lesions, such as ecthyma gangrenosum, or signs of embolic dissemination. A peripherally inserted central catheter line did not show sign of infection, and culture results of its tip were negative as were blood cultures taken from that line. Urine culture grew no predominant organism. A chest radiograph was clear.

The dermatology department was consulted a few days after admission for the focal tattoo—associated bullae and suspected possible tattoo reaction. Gram stain of the fluid from one bulla found few leukocytes but no bacteria, and its subsequent culture was negative (although the patient had already received several days of antibiotics by the time the culture was drawn). Skin biopsies were suggested to evaluate for infectious as well as other causes, although the patient declined a skin biopsy, as she was improving with systemic antibiotics. The dermatology department suspected an infectious etiology as the working diagnosis. The radiation oncology department was immediately notified to withdraw the ink, and hospital infection control was requested to assist. Subsequent culture of the ink grew out *Pseudomonas* and *Enterococcus*. The pseudomonas grown from the ink had the same sensitivities as the bacteria from the patient's blood.

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Fig 1. **A**, Infected radiation tattoos on chest/abdomen (distant). **B**, radiation tattoo infection, abdomen (close up). **C**, radiation tattoo infection, lateral abdomen.

The infectious disease department also studied the cultured bacteria and confirmed this was the same strain in both the ink and the patient's blood. Analysis by pulse field electrophoresis found both isolates to be identical. The patient was discharged 7 days later on oral Ciprofloxacin after responding well to intravenous therapy.

DISCUSSION

Upon consideration of the possibility of infection related to its placement, the medical tattoo ink was promptly removed, thus limiting the potential for similar infections in other patients receiving medical tattoo ink. No other patients evaluated in follow-up for their radiation therapy were noted to have a local infection. Although inks used in tattoos are subject to US Food and Drug Administration regulation (FDA), the FDA does not control the actual practice of tattooing, and there is no specific FDA regulatory requirement that tattoo inks be sterile.² Nontuberculous mycobacteria have been reported after tattoos for which the ink was diluted with nonsterile water.³ Tap water is considered a major reservoir for nontuberculous mycobacteria and should not be used in mixing tattoo inks.⁴ A study done in Europe raised some concern on the sterility and safety of tattoo inks. In this study, they purchased 58 commonly used tattoo inks over the internet from 13 different manufacturers, 6 of which were based in the United States. They found

that 6 of 58 unopened stock bottles (10%) were contaminated with bacteria.⁵ Furthermore, packaging and preservation of inks seemed to be inadequate, and they even found claims of sterility to be "erroneous".⁵

This case report reminds us of the need for careful infection control and monitoring for any procedurally related infections. Our patient was in an immunocompromised state because of neutropenia and metastatic lymphoma. In the setting of a radiation oncology clinic, such patients undergoing radiation for malignancies are often immunocompromised, perhaps even more so when treated concurrently with systemic chemotherapy. Patients without malignancy can also be susceptible, as with the outbreak of the 750 injectable steroid-related fungal infections, and serve as a continuing reminder of the importance of reporting and surveillance.

This infectious complication was promptly addressed with a goal of future prevention. There was no deviation from the usual protocol in placement of these types of radiation tattoos, and this was an unexpected event. Once the possibility of infection related to the medical tattoo placement was considered, the tattoo ink bottle that had been used for our patient was identified, cultured, and removed. Measures were taken to ensure no other lots of that ink were similarly affected. The ink well had not been used on any other patients. An

unused ink bottle from the same lot from the manufacturer was culture tested with negative results. Additionally, the manufacturer was notified and after further evaluation reported no other contaminated bottles.

It is also theoretically possible that this particular ink well may have become colonized perhaps from a previous tattooing procedure on our patient's skin, as the ink bottle identified was used previously in the same patient for prior radiation tattoos. Individual or single-use sterile pigment inks perhaps could minimize and preclude future risks. This report alerts physicians of the possibility of cutaneous infection from percutaneous medical techniques to include placement of medical radiation tattoos. This infectious possibility should be considered in

anyone presenting with bullous lesions after such placement, especially in neutropenic patients.

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