

Argyria Associated With Use of Systemic Colloidal Silver

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This patient presented to the clinic seeking treatment for the silver-blue tinge to his skin.

Homeopathy and home remedies have been utilized for ages. One such modality is silver, which, in the past, has been purported as a cure for multiple illnesses. More recently, treatment with colloidal silver has been brought to national attention because of a patient named Paul Karason, who has made appearances on several television programs because of his unusual skin discoloration.¹⁻³ Karason has a condition known as argyria—a blue-gray coloring of the skin caused by accumulation of metallic silver and silver sulfide in the sub-epithelial portions of the skin.⁴ The silver deposits stimulate the production of melanin, causing those areas of skin that are sun-exposed to turn especially dark.⁵ Although this toxicity is relatively harmless, aside from the aesthetic adverse effect, it is, for the most part, permanent. Here, we present a case involving a 61-year-old white man who presented to the clinic with symptoms of argyria.

Dr. Baker is a clinical pharmacy specialist in the anticoagulation and traveling veteran clinics, **Ms. Leidy** is a primary care provider, and **Dr. Okeke** is a primary care provider, all at the VA Tennessee Valley Healthcare System (VATVHS) in Murfreesboro, Tennessee. At the time of this study, **Mr. Smith** was a PharmD candidate at the University of Tennessee in Memphis, and was on rotation at the VATVHS.

CASE REPORT

The patient presented to the VA Tennessee Valley Healthcare System (VATVHS) in Murfreesboro, Tennessee, to establish primary care. His skin had a distinct silver-blue tinge, which was more pronounced in areas prone to sun-exposure, such as his face, upper body, and hands (Figures 1 and 2). His chief complaint was emotional distress related to his skin's discoloration. The patient was seeking treatment options to correct his skin tone. He stated that he had been ingesting a homemade colloidal silver solution as a form of self-treatment for a presumed melanoma on his right ankle, which he excised without confirmed diagnosis. He brewed the silver solution by means of electrolysis using 710 mL of distilled water, 2 silver (99%) 12-gauge wires, and a 50-volt battery. He initially drank approximately 44 mL of the cloudy brown solution daily, but, eventually, increased his daily consumption to 710 mL per day. He drank the solution from spring of 2001 through 2003.

According to the patient, in an attempt to cure the silver-blue tinge of his skin, upon coming to the VATVHS, he already had tried chemical peels with salicylic acid, oxalic acid, and glycolic acid. He also had applied 3% hydroquinone skin cream and

had taken ethylenediaminetetraacetic acid chelating pills for 6 months. None of these options were effective. Medical history was insignificant except for smoking, which he stopped 1 year prior to this visit. The presumed melanoma lesion that he excised never recurred. He developed a right breast mass 2 months prior to the initial visit and had a subsequent mammogram, ultrasound, and biopsy, with the final diagnosis of gynecomastia. Medications upon initial visit included aspirin, niacin, and a multivitamin.

Vital signs, pulse oximetry, and physical examination were normal. Electrocardiogram showed sinus bradycardia at a rate of 56 beats per minute. The following laboratory tests were collected: complete metabolic panel, complete blood count, lipid panel, thyroid panel, urinalysis, prostate specific antigen, and liver function. Mercury, lead, and arsenic blood levels also were obtained. Laboratory findings were unremarkable, except for the complete blood count, which showed normocytic anemia. The initial mental health evaluation revealed intermittent anxiety, which the patient attributed to the impact his skin discoloration had on his life. He stated that he had difficulty finding employment and often was the focus of public staring. He denied any prior

mental health diagnosis or treatment. Because of the unremarkable findings of his initial visit, further medical treatment was deemed unwarranted. However, the patient was referred to the dermatology department of the VATVHS to explore treatment options for his skin discoloration.

At the first dermatology visit, punch biopsies were obtained from the right arm and neck. Results showed a fine black granular pigment present in the sweat duct epithelium, fibrocytes, and collagen fibers, which was probable for silver deposition (Figures 3 and 4). He was given 4% hydroquinone and his skin showed a mild improvement. However, there was a concern that the patient would develop ochronosis with prolonged use of hydroquinone and, therefore, other treatment options were explored. The patient was referred to an outside dermatology facility where he was given 3 test pulses of 20 J, 40 J, and 60 J with an intense pulsed light laser therapy—which also proved ineffective. The patient then was educated on potential use of Q-Switched Nd:YAG laser (at 1,064-nm). At the time of the patient's visit, this laser was unavailable and the patient was informed that he would be rescheduled when this laser became available. However, since this visit, the patient has now decided not to pursue any more laser treatments. He has refused to go back to any more dermatology visits and states he is pursuing alternative treatment options for argyria.

DISCUSSION

Silver has been used for centuries as a cure-all. In the past, silver-containing product labels have claimed to treat numerous conditions, such as: “human immunodeficiency virus (HIV), acquired immune deficiency syndrome (AIDS), cancer, tubercu-

losis, malaria, lupus, syphilis, scarlet fever, shingles, herpes, pneumonia, typhoid, exanthematic typhus, tetanus, variola, scarlatina, erysipelas, rheumatism, candida/staphylococcus/streptococcus infections, tonsillitis, parasites, fungus, bubonic plague, cholera, chronic fatigue, acne, warts, Meniere's disease (syndrome), whooping cough, enlarged prostate, perineal eczema, hemorrhoids, impetigo, ringworm, recurrent boils, burns, and appendicitis.”⁶ At one point, silver-containing products were in both the United States Pharmacopeia and the National Formulary. Over time, however, all were removed (except a few silver topical and ophthalmic products that remain as prescription anti-septics and anti-infectives). Because of colloidal silver's lack of efficacy support and the possible toxicities associated with it, the FDA declared that all over-the-counter drug products containing colloidal silver ingredients or silver salts are misbranded and, generally, are not recognized as being safe and effective.⁶

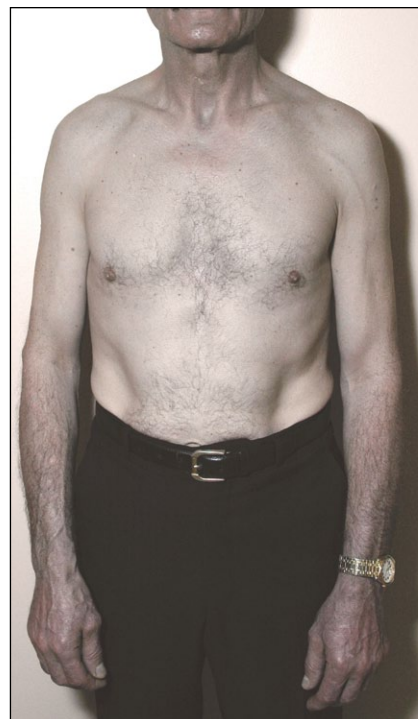


Figure 1. Argyria presented as a distinct silver-blue tinge of the skin, which was more pronounced in areas prone to sun-exposure, such as the face, upper body, and hands.



Figure 2. Argyria presenting in the hands.

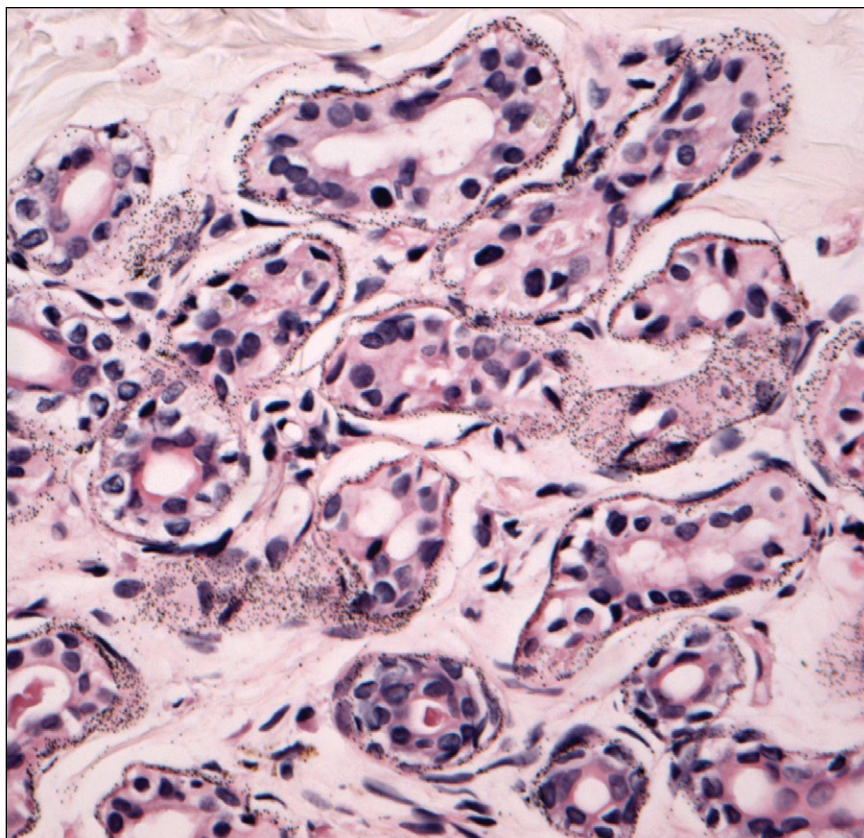


Figure 3. Silver granules in sweat glands.

While it is true that there is a lack of scientific support for the efficacy of silver, there also is a lack of scientific evidence proving its toxicities. Although most toxicity studies to date have been performed in animal models, there have been some case reports of toxicities in humans. The most common and benign toxicity is argyria, which results in the blue-gray discoloring of the skin and mucosa. However, beyond this, there are a few case reports of neurologic toxicities, such as vertigo, gait disturbances, weakness, hyposmia, hypogeusia, and seizures, as well as possible kidney and gastric toxicities.^{4,7-10} In animal models, research shows that silver deposits widely throughout the body in organs, including the skin. Additionally, silver can cross the

blood-brain barrier. The highest concentrations of silver are found in the skin, liver, spleen, and adrenal glands, with lesser depositions being in the muscles and brain.⁴

The differential diagnosis for blue-gray discoloration of the skin includes exposure to other heavy metals besides silver, such as gold, mercury, bismuth, arsenic, and lead.¹¹⁻¹³ Other causes to be considered include central cyanosis, methemoglobinemia, melanosis secondary to widespread melanoma, hemochromatosis, Addison's disease, chlorpromazine, amiodarone, and antimalarial therapy.¹²⁻¹⁶ Discolored nails, often present in generalized argyria, also may be the result of pseudomonas infections.^{17,18}

In the past, argyria has proven to

be a permanent condition once developed. Chelation therapy has shown to be ineffective in treating argyria and treatment with intradermal injection sodium thiosulfate (6%) or potassium ferrocyanide (1%) has yielded only partial success.⁴ However, new emerging reports of success with laser treatment using a Q-Switched Nd:YAG Laser (1,064-nm) offer hope for more effective treatment in the future.¹⁹

CONCLUSION

Long-term exposure to colloidal silver, as in this case, may cause irreversible pigmentation of the skin known as argyria. Although the deposition of silver in the skin is uniform, the discoloration becomes more prominent in areas of the skin that are exposed to sunlight.^{11,14,20} This condition is almost always irreversible and may cause aesthetic effects so severe that patients experience extreme embarrassment and social withdrawal. Studies have shown that the skin discoloration is benign; however, there are a few isolated reports of neurologic deficits, renal problems, and hepatic complication associated with argyria and silver poisoning.²¹ In addition, because of the blue-gray skin discoloration, symptoms of other disease states can be masked or misdiagnosed.

While there are no effective treatment options to date for systemic argyria, decreasing sun exposure and implementing sun protection can help reduce the severity of blue-gray discoloration on exposed areas.¹¹ Treatment of localized argyria using a Q-switched Nd:YAG laser has been reported to be successful,²² as the mechanism may be similar to those involved in the treatment of conventional or amalgam tattoos.^{23,24} However, laser treatment for generalized argyria has not been described. ●

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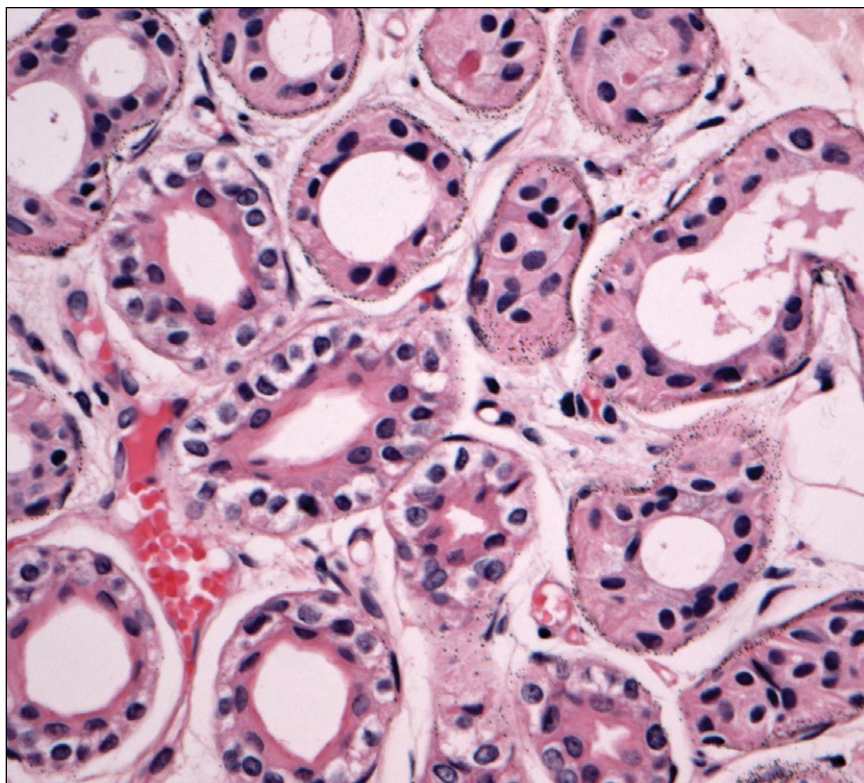


Figure 4. Fine black granular pigment present in the sweat duct epithelium, fibrocytes, and collagen fibers.

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