Localized Argyria After Exposure to Aerosolized Solder

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GOAL
To understand localized argyria to better manage patients with the condition

OBJECTIVES
Upon completion of this activity, dermatologists and general practitioners should be able to:
1. Discuss how localized and generalized argyria differ.
2. Describe how to diagnose argyria.
3. Identify treatment options for argyria.

CME Test on page 320.

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We describe a patient with a rare case of localized argyria following exposure to aerosolized solder that clinically resembles generalized argyria. Classically, localized argyria presents with sharply demarcated blue-gray macules, while generalized argyria presents with diffuse blue-gray pigmentation. Our case is unusual because the patient presented with diffuse pigmentation seen with generalized argyria but restricted to the face and neck.

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Localized argyria is a rare disorder that occurs less frequently than generalized argyria. The pathogenesis involves direct implantation of silver in the skin or, more rarely, percutaneous absorption of silver salts via the eccrine glands. The silver salts are released into the surrounding tissues. Occupational exposure is the most common cause of localized argyria and occurs most frequently in miners, photographic laboratory workers, and jewelers. Round or oval well-demarcated blue-gray macules typically are seen.

Generalized argyria most often results from systemic treatment with drugs that contain silver salts or from inhalation of silver particulates in the workplace.1 Generalized argyria usually presents with blue-gray discoloration of the skin, including
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non–sun-exposed skin, the lips, tongue, mucous membranes, lunulae, and sclera. Permanent diffuse blue-gray pigmen-
tary change of the skin is observed with generalized argyria.

Case Report
A 58-year-old man presented with an ashen color to
his face that had progressed over several years. The
patient denied taking any medications and had no
significant past medical history. The results of a com-
plete blood count, chemistry panel, liver function
test, and hepatitis panel were within reference range.
His serum silver level also was within reference range
at 11 ng/mL (reference range, 0–14 ng/mL).

The results of a physical examination revealed
diffuse blue-gray pigmentation distributed over the
face and neck with a sharp line of demarcation at
the collar (Figure 1). There was no photoaccentua-
tion and no involvement of the nails, mucous mem-
brane, or sclera. For the past 20 years, the patient
worked as an electronics technician soldering silver-
containing wire in the construction of electronic
devices. He wore gloves, long-sleeved shirts, and
pants but no protective mask.

The biopsy specimen revealed small, black,
refractile granules within the membrane propria
of the eccrine glands (Figure 2). Additional
biopsy specimens were taken from the healthy
skin of the right upper back and revealed no silver
granules. These histologic features were consistent
with argyria.

Comment
Localized argyria is a rare disorder that presents with
asymptomatic blue-gray macules.2 The lesions may be
large and ill defined or sharply demarcated, resem-
bling blue nevi.1 The most common cause of localized
argyria is occupational exposure; small silver particles
enter the skin by mechanical impregnation of workers
involved in silver mining, silver refining, silverware
and metal alloy manufacturing, and photographic
processing.1 Localized argyria also has been attributed
to surgical and dental procedures, silver earrings,
and acupuncture needles.4-6 Additionally, localized
argyria may be caused by percutaneous absorption of
silver salts via the eccrine glands, which most likely
occurred in this case.

Generalized argyria most commonly results from
long-term systemic use of silver-containing nose
drops or colloidal silver–containing dietary supple-
ments,7 homemade silver solution,8 and ingested or
topical silver nitrate.9 Inhalation of silver-bearing
dust in industries such as silver refining or metal
grounding also may cause generalized argyria. Corneal
argyrosis associated with silver soldering has been
previously reported10,11; full cutaneous examination
was not described in these patients.

The presentation of generalized argyria typi-
cally begins with gray-brown staining of the
gums that progresses to involve the skin diffusely.
The mucocutaneous findings in argyria are the
results of elevated serum silver levels, which lead
to dermal and mucosal deposition of the metal.
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Histopathology evaluations reveal black-silver granules around the eccrine glands, in the walls of blood vessels, and along elastic fibers. The granules occasionally are found in the arrector pili muscles, perineural tissue, and around collagen fibrils. The slate gray, metallic, or blue-gray pigmentation seen in argyria may be clinically apparent after a few months but usually takes years to develop and depends on the degree of exposure. In some patients, the entire skin may acquire a slate blue-gray color. Hyperpigmentation is most apparent in sun-exposed areas of the skin, especially the forehead, nose, and hands. Although pigmentary changes occur primarily in sun-exposed sites, the granules are deposited evenly throughout the skin. Light causes silver-containing compounds complexed with proteins in the skin to be reduced to elemental silver, similar to the process of developing photographs. In addition, the silver stimulates melanocyte tyrosinase activity, which results in an increase in melanin production.

The average human body contains approximately 1 mg of silver. Serum silver has a reference range of 0 to 14 ng/mL. The smallest amount of silver reported to produce generalized argyria in humans ranges from 5 to 40 g. Although the amount of silver in argyria usually results in no serious effects on human health, a few cases of notable clinical symptoms and signs have been documented. Some of the complications of systemic toxic effects of silver include gastrointestinal tract catarrh, tissue wasting, uremia, albuminuria, fatty degeneration of the liver, hemorrhage, and idiopathic thrombocytopenia.

The treatment of both localized and generalized argyria is difficult. Hydroquinone, depigmenting creams, and dermabrasion are not successful. Selenium and sulfur have been shown to have favorable modifying effects on the metabolism and toxicity of silver by forming complexes with the silver. The Q-switched double-frequency Nd:YAG laser, which has been used in the treatment of tattoos, also may be effective in the treatment of localized argyria. Unfortunately, no completely satisfactory treatment modality exists and some pigmentation remains permanent. However, sunscreens and opaque cosmetics may be helpful in masking discoloration and preventing further pigmentary darkening.

To our knowledge, this is the first presented case of localized argyria secondary to aerosolized silver. This case emphasizes the need for skin protection in individuals with occupational exposure to aerosolized solder.

Figure 2. Small, black, refractile granules in the eccrine glands (H&E, original magnification ×40).

of only exposed skin favors a diagnosis of localized argyria because of percutaneous silver absorption via the eccrine glands.

A careful history is necessary in the diagnosis of argyria, with inquiries about possible occupational and environmental exposure and the use of dietary supplements containing colloidal silver protein. Habitual use of silver-based nose drops may produce pigmentation that is most apparent on the nose and nail lunulae. Scar-localized argyria may occur secondary to the use of silver sulfadiazine cream. Other causes of diffuse blue-gray pigmentation include medications (eg, phenothiazines, antimalarials, amiodarone, minocycline), heavy metal exposure (eg, mercury, bismuth, arsenic, gold, lead), hemochromatosis, ochronosis, cyanosis, polycythemia vera, and diffuse melanosis in metastatic melanoma.

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REFERENCES

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