

Localized cutaneous argyria in the ear after short-contact acupuncture

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S U M M A R Y

We report a unique case of localized cutaneous argyria in the ear of a 39-year-old woman, which developed after short-contact acupuncture.

The woman presented with a blue-black macule in the skin of her left ear. The macule was 2 mm in diameter and had a smooth unaltered surface. A dermatologist suggested the diagnosis of a blue nevus and excised the lesion by punch biopsy to rule out melanoma.

Histopathologic examination of the biopsy specimen revealed, in the connective tissue, a brown-black fusiform particle encapsulated by dense collagen fibres. In the surrounding dermis, numerous brown-black granules were found.

The analysis of the chemical nature of the granules in an unstained paraffin section was performed by a laser microprobe mass analyzer and determined the presence of silver in the tissue section.

20 years ago, our patient had undergone five sessions of short contact acupuncture in her ears because of lumbalgia. 10 years later, she noticed the blue-black macule in her left ear.

We believe that during one of the short sessions of ear acupuncture, a small particle of a silver needle might accidentally have been deposited. This small silver particle then, over the years, could have led to the development of localized cutaneous argyria presenting as a blue-black macule in the skin of the left ear of the patient.

K E Y W O R D S

localized cutaneous argyria, ear acupuncture, laser microprobe mass analyzer, silver analysis

Introduction

Argyria, systemic or localized, develops after silver deposition in the tissues. While systemic argyria is caused by iatrogenic or occupational intake of silver via the gastrointestinal or the respiratory tract, localized cutaneous argyria results from localized exposure of the skin to silver. Previous reports describe localized argyria,

which developed after the skin had been in long contact with silver. Thus, localized argyria has been attributed to deliberate or accidental implantation of acupuncture needles (1,2), silver jewellery (3,4) or silver suture material (5), or to the topical application of silver sulphadiazine cream to burned skin (6).

We describe here the case of a 39-year-old woman who noticed localized cutaneous argyria on her left ear

ten years after she had undergone five sessions of acupuncture in her ears because of lumbalgia. Each of the five acupuncture sessions had lasted not longer than 30 minutes and no acupuncture needle had ever been left in the skin for a longer period of time.

Part of this work has been presented in the correspondence section of *Lancet* (7).

Case report

A 39-year-old woman presented with a well circumscribed, blue-black macule in the skin of her left ear. The macule was 2 mm in diameter, had a smooth unaltered surface, and was situated at the site where the crura anthelices unite to form the anthelix (Figure 1). The blue-black colour of the macule was slightly less intense in the periphery of the macule. A dermatologist suggested the diagnosis of blue nevus and excised the lesion by punch biopsy to rule out melanoma.

Conventional histopathologic examination of the HE-stained biopsy specimen revealed a dense, brown-black fusiform particle, about 75 μm in length, in the connective tissue near the outer surface of the auricular cartilage (Figure 2). This particle was encapsulated by dense collagen fibres. In the surrounding dermis, numerous brown-black granules, mainly located around blood vessels, nerve fibres, and sebaceous glands, were found. At higher magnification numerous brown-black granules were detected within the wall of blood vessels (Figure 3a). In polarized light the granules had refractile properties (Figure 3b).

The chemical nature of the granules was analyzed by a laser microprobe mass analyzer (LAMMA 500®, Leybold Heraeus GmbH, Cologne, Germany) which excites microvolumes of a sample to an ionized state by a focused laser beam (Nd:YAG-laser with a wavelength of 266 nm); the ions produced are detected by a time-to-flight mass spectrometer (8).

In an unstained paraffin section a representative area, showing brown-black granules in the HE-stained specimen, was brought into focus of the laser beam and irradiated. The resulting mass spectrum showed clear signals for the two naturally occurring silver isotopes at m/e (mass over electron charge) 107 and m/e 109 thus proving that silver was present in the tissue section (Figure 4).

Discussion

Localized cutaneous argyria presenting clinically as a pigmented lesion resembling a blue nevus or a malignant melanoma has already been published in the literature for several times. The embedding of the backing of silver ear-rings (4), the usage of silver suture

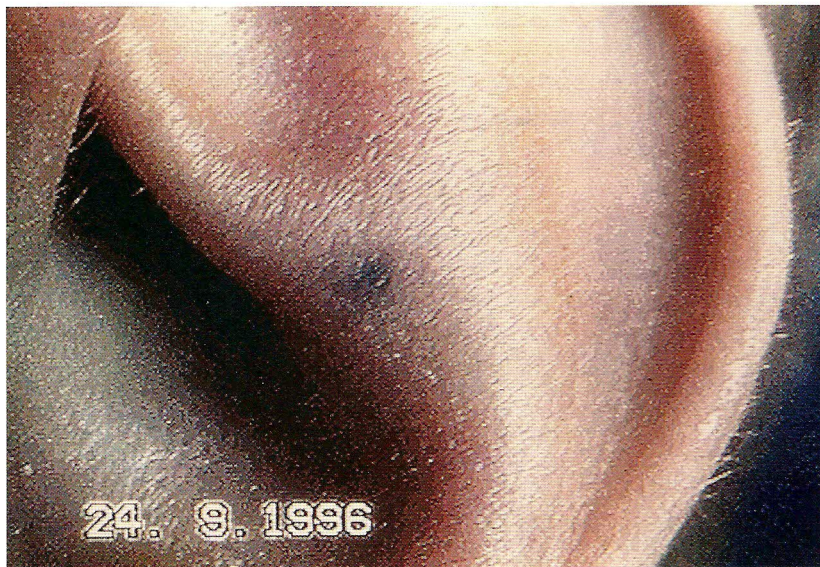
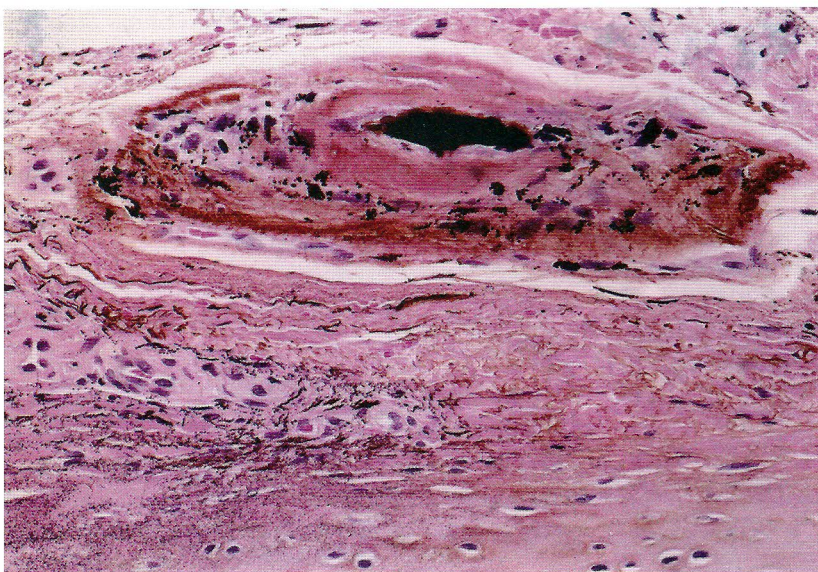


Figure 1. Blue-black macule in the left ear of a 39-year-old woman. The macule was noticed 10 years after short-contact ear acupuncture with silver needles at this site.

Figure 2. Histopathology, HE-staining, 100x: A brown-black, fusiform particle in the dermis adjacent to the auricular cartilage. The particle is encapsulated by dense collagen fibres. In the surrounding connective tissue numerous brown-black granules are visible.



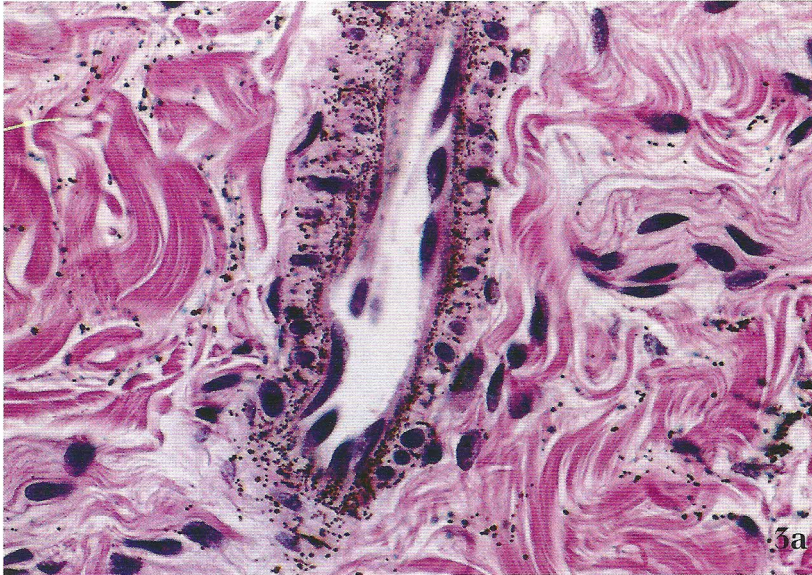


Figure 3. Histopathology, HE-staining, 250x: a) Numerous brown-black granules within the wall of a blood vessel. b) Refractile nature of the granules in polarized light.

material (5) and the prolonged implantation of silver acupuncture needles into the skin for several reasons (1,2) have been reported to cause localized cutaneous argyria. In these cases localized argyria developed one to 30 years after the onset of the exposure to silver. Remarkably, in all these instances the skin had been in continuous contact with material containing silver for long periods of time.

Our patient noticed the blue-black macule in her left ear, 10 years after she had undergone only five sessions of short-contact acupuncture in her ears because of lumbalgia. Her acupuncture sessions had lasted

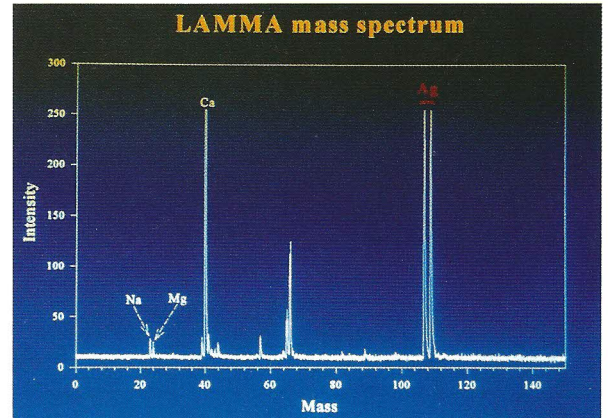
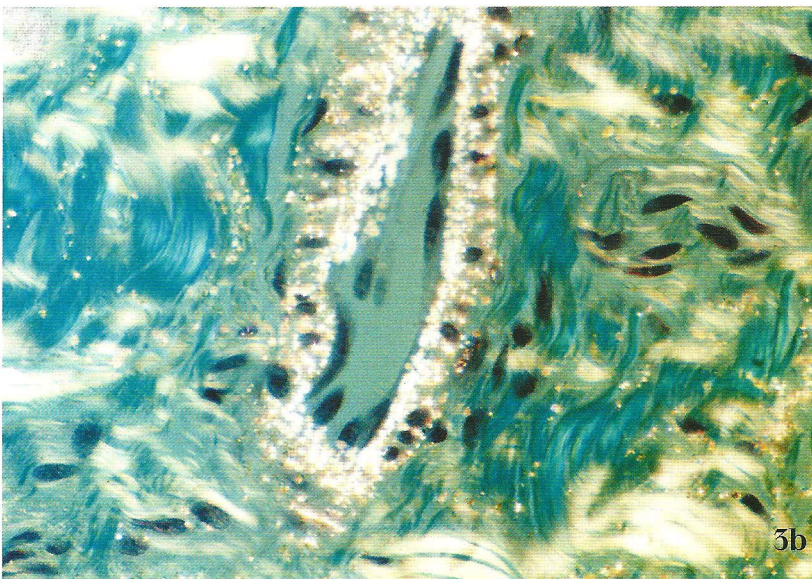


Figure 4. LAMMA 5000 mass spectrum: The two naturally occurring silver isotopes at m/e (mass over electron charge) 107 and m/e 109 proved the irradiated specimen to contain silver.

not longer than 30 minutes each. Thus, the needles had been in contact with the tissue for not longer than 3 hours, which would certainly be too short a time to induce localized argyria by the acupuncture needles themselves. However, the blue-black macule was located at exactly the site of acupuncture, and she did not wear silver jewellery at that site.

We believe that during the short sessions of acupuncture, a small particle of a silver needle might accidentally have been deposited. This small silver particle then, over the years, could have led to the development of localized cutaneous argyria presenting as a blue-black macule in the skin of the left ear of the woman. The brown-black fusiform particle, 75 μm in length, in the connective tissue near the outer surface of the auricular cartilage found by conventional histopathologic examination strongly underlines this hypothesis.

Extensive exposure of the ears to natural sunlight could have supported the development of localized argyria after deposition of the small silver particle in the ear following acupuncture. It has been reported previously that sunlight is a trigger for the induction of the pigment in argyria, with photo-reduction of silver compounds to elemental silver as the pathway (9).

In localized or generalized cutaneous argyria the refractile brown-black granules in the dermis of a biopsy specimen can be found easily by conventional microscopy. As a rule, the granules are situated mainly around blood vessels, nerve fibres, hair follicles and sebaceous glands. The chemical nature of these granules, however, is more difficult to analyze and requires particular methods. In argyria, X-ray microanalysis (10), X-ray fluorescence spectroscopy (11) and neutron activation analysis (12) of specific granules in the dermis have previously been used to prove the granules to contain silver.

So far, a laser microprobe mass analyzer has not been used to determine the chemical nature of silver granules in paraffin-embedded sections of localized cutaneous argyria. The laser microprobe mass analyzer LAMMA 500® is a powerful tool for the qualitative analysis of exogenous inorganic deposits in thin biopsy sections. It is especially useful when these deposits are available only in very small amounts, since the absolute detection limits of the LAMMA 500® are in the range of 10^{-16} to 10^{-19} g. The analysis can be performed, without time consuming pre-processing, in stained or unstained tissue sections mounted on foiled electron microscopy grids made from copper. Through the microscope of the LAMMA 500® the area of interest can be focused accurately by a red He-Ne-laser before the sample is

evaporated and excited by a Nd:YAG-laser beam. The smallest area, which can be analyzed, is approximately 5 µm in diameter. The disadvantage of the LAMMA 500® is that only semi-quantitative results can be obtained. However, the primary interest in the analysis of inorganic deposits in tissue samples mostly lies in a qualitative rather than quantitative analysis of the samples.

In conclusion, we report a unique case of localized cutaneous argyria presenting as a small blue-black macule on the left ear of a 39-year-old woman 10 years after short-contact ear acupuncture. The diagnosis was suggested by conventional microscopy and was confirmed with a laser microprobe mass analyzer by the proof of silver in this lesion.

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