

# Successful treatment of acupuncture-induced argyria using Q-switched 1064-nm Nd:YAG laser



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**Key words:** acupuncture; localized argyria; Q-switched 1064-nm Nd:YAG laser.

## INTRODUCTION

Localized argyria is a benign rare condition resulting from impregnation of silver particles in the skin by various exposure sources such as silver jewelry,<sup>1</sup> occupational exposures,<sup>2</sup> topical medications,<sup>3</sup> and medical procedures (ie, acupuncture).<sup>4</sup> We report a case of acupuncture-induced argyria on the face, both dorsa of the hands, wrists, legs, and dorsa of the feet, successfully treated with 1 to 2 sessions of Q-switched 1064-nm neodymium-doped yttrium aluminum garnet (Nd:YAG) laser. Tissue section demonstrated refractile granules around the eccrine glands under dark-field microscopy.

## CASE REPORT

A 42-year-old Thai woman was treated at a dermatology clinic in Siriraj Hospital and had a 3-year history of multiple asymptomatic dark spots on her face, both dorsa of the hands, wrists, legs, and dorsa of the feet. She stated that the lesions had developed approximately 2 months after frequent acupuncture (approximately 20 sessions) to relieve her bilateral tinnitus. She denied previous systemic treatment, history of tattoo dye, or any other topical formulations before the procedure. Her only underlying disease was allergic rhinitis. Physical examination revealed bilateral, symmetric, round, faint, blue-gray macules with size ranging from 1 to 3 mm in diameter on preauricular regions, nasolabial folds, both dorsa of the hands, wrists, legs, and dorsa of the feet (Fig 1). No similar lesions were observed elsewhere on the skin and mucosa. Incisional biopsy of the right side of the leg was performed because of suspicion of argyria.

### Abbreviation used:

Nd:YAG: neodymium-doped yttrium aluminum garnet

The histopathologic findings of the blue-gray macule demonstrated normal epidermis and numerous clumps of black globoid particles of various size, appearing within the walls of the superficial and deep vascular plexus (Fig 2). Dark-field microscopy displayed numerous refractile white particles around the eccrine glands (Fig 3) and vascular structures.

Based on clinical presentation and pathologic examination, acupuncture-induced argyria was diagnosed. She was then treated with a Q-switched 1064-nm Nd:YAG laser (Medlite C3; HOYA ConBio, Fremont, CA). The lesions on the right preauricular region (Fig 4, A) were initially treated as test spots at a fluence of 4 J/cm<sup>2</sup> with a 3-mm spot size. The immediate end point was an ash-white response of the blue-gray macule. Two weeks after the first trial, there was complete clearing of the lesions (Fig 4, B). Consequently, we applied the laser with the same parameters on the left preauricular region, nasolabial folds, both dorsa of the hands, wrists, legs, and dorsa of the feet. After 3 months, the second session of treatment was repeated on the residual lesions on the extremities. The fluence value was adjusted to 4.6 J/cm<sup>2</sup> with a 4-mm spot size. After the last session of treatment, the patient's acupuncture-induced argyria fully resolved, without visible discoloration or

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Funding sources: None.

Conflicts of interest: None disclosed.

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JAAD Case Reports 2020;6:984-7.

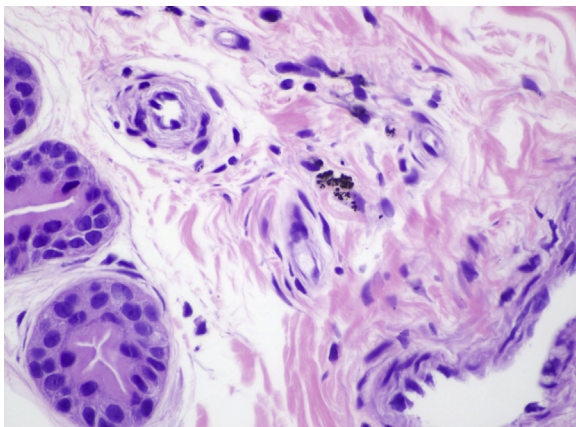
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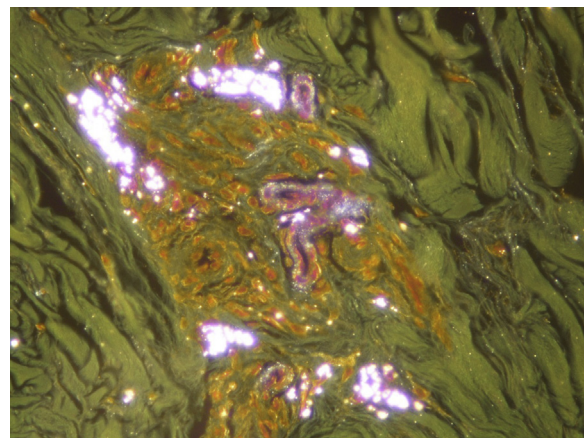
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**Fig 1.** Bilateral, symmetric, round, faint, blue-gray macules ranging from 1 to 3 mm in diameter on both preauricular regions and nasolabial folds.



**Fig 2.** The section revealed numerous clumps of black globoid particles varying in size and appearing within the walls of the deep vascular plexus. (Hematoxylin-eosin stain; original magnification:  $\times 400$ .)



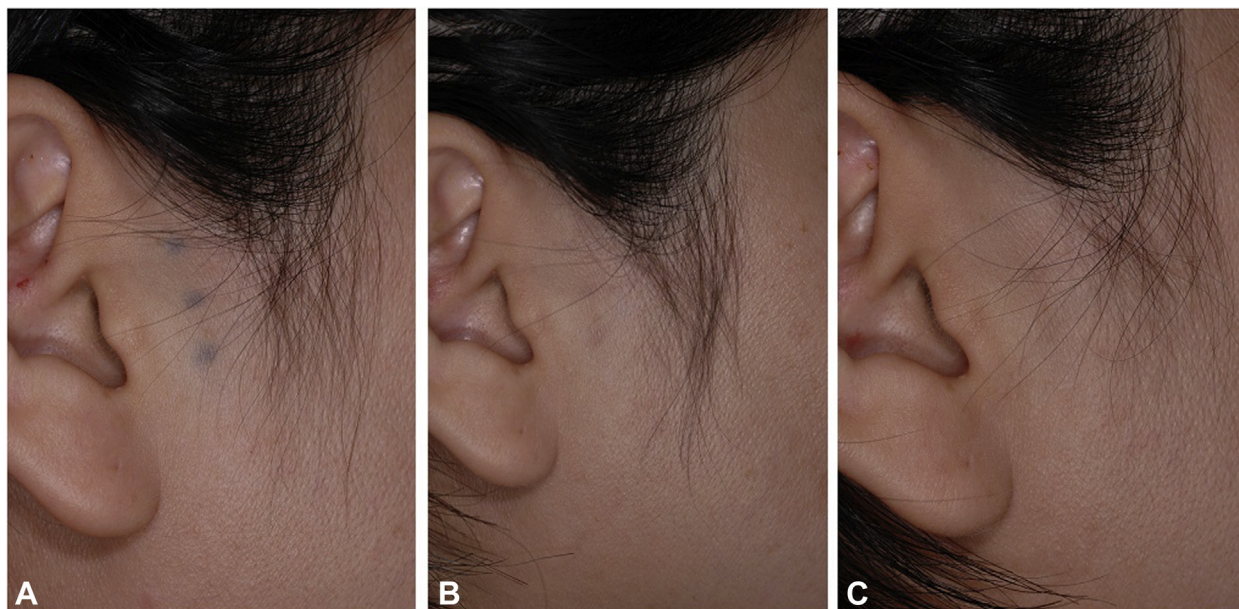
**Fig 3.** Dark-field microscopic examination showed numerous refractile granules predominantly around the eccrine glands. (Original magnification  $\times 40$ .)

textural change (Fig 4, C). There were no long-term adverse effects associated with the procedure. The patient was followed for 12 months and no recurrence of argyria was observed.

## DISCUSSION

Localized argyria is a benign pigmented lesion resulting from impregnation of silver particles in the skin by various exposure sources, including

acupuncture.<sup>4</sup> Acupuncture-induced argyria is the fourth most common adverse event after a procedure (8.1%), particularly with silver needles.<sup>5</sup> The pathogenic mechanism of this condition is oxidation of soluble compounds that are picked up by elastic fibers and the basement membrane.<sup>6</sup> In contrast to generalized argyria, localized argyria usually presents with solitary or multiple blue-gray macules that may resemble blue nevi or malignant melanoma



**Fig 4.** Acupuncture-induced argyria at baseline before treatment (**A**), at 2 weeks (**B**), and 3 months after (**C**) 1 session of Q-switched 1064-nm neodymium-doped yttrium aluminum garnet laser.

without nail, mucous membrane, and internal organ involvement.<sup>4,7</sup>

Histologic findings of argyria, either localized or generalized, reveal deposition of brownish-black granules observed in the basement membrane of eccrine glands, in sebaceous glands, in hair follicle sheaths, within the blood vessel walls, in perineural tissue, around arrector pili muscles, in elastic fibers, and in collagen bundles.<sup>1,4</sup> The granules can be highlighted by Fontana-Masson silver and Gomori iron stains,<sup>4</sup> and discolored by incubation with 1% potassium ferricyanide in 20% sodium thiosulfate.<sup>8</sup> Under dark-field microscopy, brilliantly refractile particles are exhibited around the eccrine glands, including blood vessels, and also dispersed in the dermis.<sup>9</sup> Other techniques available to demonstrate silver granules include scanning electron microscopy, energy-dispersive x-ray analysis, and electron probe microanalysis.<sup>4,9</sup>

Regarding difficulties in treating localized argyria, most patients are advised to avoid further silver impregnation, to apply sunscreen, and to limit sun exposure. During the past decade, Q-switched 1064-nm Nd:YAG laser has been introduced as a therapeutic option with excellent outcome.<sup>10,11</sup> Varied power settings, spot sizes, and pulse durations have been previously mentioned in the literature. However, the laser parameters should depend on the treatment end point of immediate whitening.

The exact mechanisms of Q-switched Nd:YAG treatment for argyria are still questioned. Some

experts have proposed a theory similar to that of conventional tattoo removal. The photoacoustic breakup of the particles occurs after light absorption. Subsequently, small fragments undergo phagocytosis by macrophages and are removed via the draining lymphatics.<sup>12</sup> However, recurrence of argyria was reported after Q-switched Nd:YAG treatment by Krase et al<sup>13</sup> in 2017. The laser beam converts surface plasmon resonance, resulting in emission of a distinct optical spectrum and alteration of silver sulfide to sulfate. After sun exposure, the residual particle is in reduced state and finally black silver sulfide is reformed.

In conclusion, localized argyria secondary to acupuncture needles is a benign condition that should be established in the differential diagnosis of acquired pigmented lesion. The present case report aims to verify that Q-switched 1064-nm Nd:YAG laser provides an effective and safe treatment for this condition. Moreover, our patient demonstrated dark-field microscopic findings that could be used to confirm the diagnosis of localized argyria.

The authors are grateful to Viboon Omcharoen, BSc, Dermatology Department, Faculty of Medicine Siriraj Hospital, Mahidol University, for assistance in dark-field microscopic examination.

#### REFERENCES

1. Morton CA, Fallowfield M, Kemmett D. Localized argyria caused by silver earrings. *Br J Dermatol.* 1996;135(3):484-485.

2. Rongioletti F, Robert E, Buffa P, Bertagno R, Rebora A. Blue nevi-like dotted occupational argyria. *J Am Acad Dermatol.* 1992;27(6 pt 1):1015-1016.
3. Dupuis LL, Shear NH, Zucker RM. Hyperpigmentation due to topical application of silver sulfadiazine cream. *J Am Acad Dermatol.* 1985;12(6):1112-1114.
4. Rackoff EM, Benbenisty KM, Maize JC, Maize JC Jr. Localized cutaneous argyria from an acupuncture needle clinically concerning for metastatic melanoma. *Cutis.* 2007;80(5):423-426.
5. Yamashita H, Tsukayama H, White AR, Tanno Y, Sugishita C, Ernst E. Systematic review of adverse events following acupuncture: the Japanese literature. *Complement Ther Med.* 2001;9(2):98-104.
6. Sugden P, Azad S, Erdmann M. Argyria caused by an earring. *Br J Plast Surg.* 2001;54(3):252-253.
7. Yang CY, Chen YJ, Shen J-L. Generalized argyria- a case report. *Dermatol Sin.* 2008;26:75-79.
8. Pellowski DM, Hiatt KM. Cutaneous toxicities of drugs. In: Elder DE ER, Rosenbach M, Murphy GF, Rubin AI, Xu X, eds. *Lever's Histopathology of the Skin.* 11th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2015:380-381.
9. Robinson-Bostom L, Pomerantz D, Wilkel C, et al. Localized argyria with pseudo-ochronosis. *J Am Acad Dermatol.* 2002; 46(2):222-227.
10. Griffith RD, Simmons BJ, Bray FN, Falto-Aizpurua LA, Yazdani Abyaneh MA, Nouri K. 1064 nm Q-switched Nd:YAG laser for the treatment of argyria: a systematic review. *J Eur Acad Dermatol Venereol.* 2015;29(11):2100-2103.
11. Han TY, Chang HS, Lee HK, Son SJ. Successful treatment of argyria using a low-fluence Q-switched 1064-nm Nd:YAG laser. *Int J Dermatol.* 2011;50(6):751-753.
12. Leuenberger ML, Mulas MW, Hata TR, Goldman MP, Fitzpatrick RE, Grevelink JM. Comparison of the Q-switched alexandrite, Nd:YAG, and ruby lasers in treating blue-black tattoos. *Dermatol Surg.* 1999;25(1):10-14.
13. Krase JM, Gottesman SP, Goldberg GN. Recurrence of argyria post Q-switched laser treatment. *Dermatol Surg.* 2017;43(10): 1308-1311.