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Successful Treatment of Tattoos with a Picosecond 755-nm Alexandrite Laser in Asian Skin

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Dear Editor:

Considerable advances have been made in laser treatment techniques for tattoo removal during recent decades[1]. Because the diameter of a tattoo ink particle is far less than that of a melanosome, energy delivery in the picosecond range has been reported to effectively achieve selective photothermolysis while protecting the surrounding normal tissues. Although picosecond lasers were commercially introduced in 2013, most laser treatments for tattoo removal are currently limited to nanosecond lasers[2,3]. To our knowledge, this is the first report of the successful treatment of tattoos using a picosecond 755-nm alexandrite laser in Asian patients.

Using a 755-nm alexandrite laser, Picosure (Cynosure, Inc.), we successfully treated six Korean patients with Fitzpatrick skin type IV who had black or red-colored tattoos. Several treatment sessions with 1-month intervals were performed with energy of 2.68 to 5.25 J/cm^2, pulse duration of 550 to 750 picosecond, and spot size of 2～3 mm. A single pass was performed with a zoom hand piece and a repetition rate of 5 Hz. Clearance rates were assessed by scoring photographs that were taken at each visit. These photographs were assessed by another clinician in a blind manner (Fig. 1). The range of the score was 0 to 3; 0, 0%～25%; 1, 25%～50%; 2, 50%～75%; 3, 75%～100%. The scoring results are as follows: patient 1, 3/3; patient 2, 2/2; patient 3, 2/3; patient 4, 5, and 6, 3/3. No side effects developed except for transient erythema and crusting in all patients. When observed 3 months after the end of the treatment, postinflammatory hypopigmentation remained in patients 1, 4, and 5.

Additionally, we obtained electron microscopic images of mel-Ab cells after both picosecond and nanosecond laser treatments. The picosecond laser achieved more selective photothermolysis of pigment particles than the nanosecond laser while minimizing damage to surrounding cells (Fig. 2).

In general, tattoo removal is thought to need an average of 8 to 9 conventional nanosecond laser treatment sessions[2]. However, after 1 to 5 picosecond laser treatment sessions, almost all the tattoos we treated showed greater than 75% clearance, indicating that picosecond lasers require fewer treatment sessions for equivalent tattoo removal, in accordance with the results of previous reports[3-5]. Our current study findings also suggest that the picosecond 755-nm alexandrite laser effectively treats red tattoos as well as black tattoos. In the literature, treatment outcomes for red tattoos have been diverse. Because a variety of chemical compounds can be used for tattoos which make it difficult to predict treatment outcomes[4,5]. In our cases, the tattoo of patient 3 was about 30 years old. This was relevant because the age of the tattoo has a marked effect on treatment results i.e., treatment of older tattoos is generally more successful[4].

Postinflammatory hypopigmentation was observed in 3 of our 6 patients (50%), a higher rate than previously reported[3,5]. Because all of our study patients were Asians with skin type IV, our findings suggest that picosecond la-

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Fig. 1. Photographs taken at baseline and the end of the treatments. All patients had a single black tattoo, except for patient 3 who had a black and red-colored tattoo. Partial hypopigmentation was observed in patients 1, 4, and 5. (A) Patient 1: prior to treatment and after two treatments to remove a tattoo at the groin. (B) Patient 2: prior to treatment and after six treatments to remove a tattoo on the back. (C) Patient 3: prior to treatment and after one treatment to remove a tattoo on the shoulder containing black and red pigments. (D) Patient 4: prior to treatment and after five treatments to remove a tattoo on the hand dorsum. (E) Patient 5: prior to treatment and after four treatments to remove a tattoo on the chest. (F) Patient 6: prior to treatment and after two treatments to remove a tattoo on the arm.

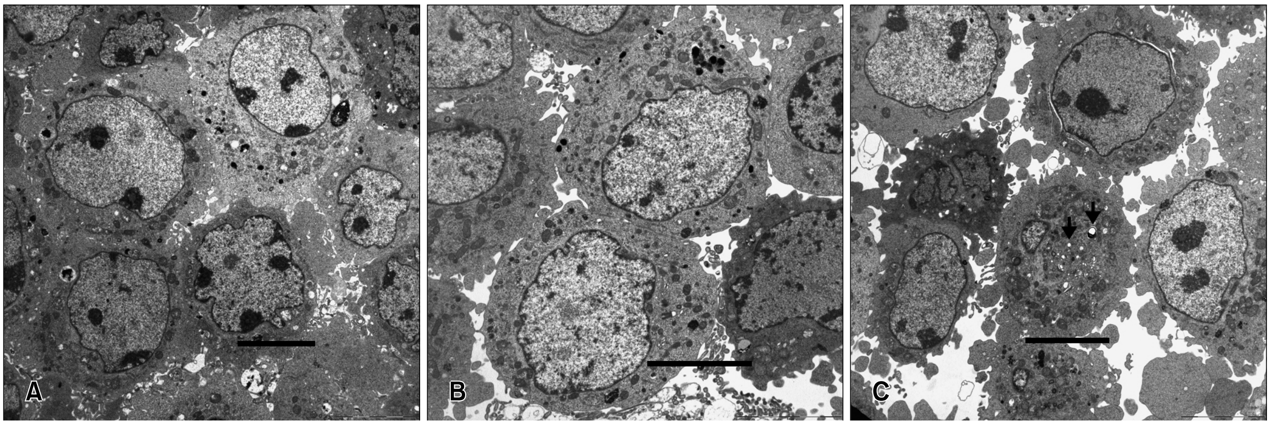

Fig. 2. Electron micrographs of mel-Ab cells (×4,000); bars, 5 μm. (A) Electron-dense particles were observed in the cytoplasm of normal mel-Ab control cells. (B) After treatment with a picosecond 755-nm alexandrite laser, particles in the cytoplasm of mel-Ab cells disappeared or broke down into smaller parts without cell damage. (C) After treatment with a nanosecond 1,064-nm neodymium-doped yttrium aluminum laser, the particles decreased in number and size but some cell walls were destroyed, and bubble-like vacuoles developed in the cytoplasm (arrows) indicating cell damage.

ser-related hypopigmentation appears to be more likely to occur in darker skin types.

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REFERENCES

1. Kent KM, Graber EM. Laser tattoo removal: a review. Dermatol Surg 2012;38:1-13.
2. Shah SD, Aurangabadkar SJ. Newer trends in laser tattoo removal. J Cutan Aesthet Surg 2015;8:25-29.
3. Saedi N, Metelitsa A, Petrell K, Arndt KA, Dover JS. Treatment of tattoos with a picosecond alexandrite laser: a prospective trial. Arch Dermatol 2012;148:1360-1363.
4. Brauer JA, Reddy KK, Anolik R, Weiss ET, Karen JK, Hale EK, et al. Successful and rapid treatment of blue and green tattoo pigment with a novel picosecond laser. Arch Dermatol 2012;148:820-823.
5. Alabdulrazzaq H, Brauer JA, Bae YS, Geronemus RG. Clearance of yellow tattoo ink with a novel 532-nm picosecond laser. Lasers Surg Med 2015;47:285-288.