

## RESEARCH LETTERS

### Phototherapeutic Keratectomy for Treatment of Long-term Dye Migration After Corneal Tattooing

The history of corneal tattooing dates back to 129 AD, when Galen pioneered it as a technique to conceal leukomata. In modern times, keratoplasty and contact lenses (CLs) have largely replaced corneal tattooing as treatment for leukomata. However, newer techniques have helped corneal tattooing regain its popularity. In addition to concealing corneal opacities and iris defects for cosmesis, corneal tattooing may improve vision by reducing aberrant light that causes glare and light scattering. All methods of tattooing, however, suffer from long-term instability as the result of dye dispersion and fading. This process appears to occur by endocytosis of dye particles into cells and then subsequent migration.<sup>1-3</sup>

Various forms of lamellar dissection of the cornea have been attempted using specialized tools followed by intralamellar dyeing. Unfortunately, they all have difficulty accurately delineating the margin of the tattoo bed, resulting in an irregular tattoo border and irregular distribution of stain. Thus, researchers have been focused on accurately delineating the margin of the tattoo bed. Two studies<sup>4,5</sup> have used the femtosecond laser to create a lamellar free flap. Kim et al<sup>4</sup> lifted the corneal flap and injected dye into the lamellar stromal bed. Kymionis et al<sup>5</sup> removed the flap and immersed it in dye. In both studies, the flap was then repositioned on the residual corneal bed.

**Report of a Case.** A 45-year-old woman was referred for consideration of corneal tattooing of the left eye in 1983. Her ocular history was significant for a congenitally abnormal left eye with retinal atrophy and an inferior iris coloboma as well as secondary exotropia following surgery for esotropia as a child. She underwent an intracapsular cataract extraction on her left eye 12 years earlier; her left eye was aphakic and had a superior iris sectoral defect (**Figure 1A**). Baseline best-corrected visual acuity was counting fingers OS. She had been wearing a custom-designed aphakic/cosmetic soft CL on the left eye for years to improve peripheral vision and minimize exotropia. This CL had built up protein deposits causing CL intolerance, and it was not possible to have a replacement made. Standard tinted CLs had been tried but did not disguise the iris defects to the patient's satisfaction. For this reason, corneal tattooing of the left eye was performed in 1983 using a No. 75 Beaver blade (Beaver-Visitec International) along with brown, gray, green, and white dyes in an attempt to match the color of the right iris while maintaining a central clear zone 4 mm in diameter (**Figure 1B and C**). Following the procedure, the patient was able to wear tinted CLs with satisfactory cosmetic and functional results.

In 2010, the patient was referred back for consideration of revision of the corneal tattoo in the left eye due to slowly worsening cosmetic appearance and dimming of vision during the past 10 years. Examination showed significant lightening of corneal pigment compared with original postoperative photographs as well as migration of tattoo pigment into the central 4-mm clear zone (**Figure 2A**). Phototherapeutic keratectomy was performed in a 5-mm-diameter central zone to "reopen the pupil" by ablating the pig-



**Figure 1.** Aphakic left eye with a superior iris sectoral defect (A), and photographs taken 3 months after corneal tattooing of the left eye (B and C).



**Figure 2.** The left eye 27 years after corneal tattooing showing significant lightening of corneal pigment compared with original postoperative photographs as well as migration of tattoo pigment into the central 4-mm clear zone (A), and photographs taken after phototherapeutic keratectomy of the left eye in a 5-mm-diameter central zone and reapplication of dye to the peripheral cornea (B and C).

ment in that area, and dye was reapplied to the peripheral cornea to better match the hue of the contralateral iris (Figure 2B and C). The patient underwent the procedure without complication. This allowed her to continue wearing a tinted CL with an improved cosmetic appearance and functional results.

**Comment.** In this case, the excimer laser was used in a novel fashion to ablate central corneal tissue where dye had migrated from the previous tattooing procedure 27 years earlier. This procedure allowed for the creation of a precisely circular central clear corneal “pupil,” enhancing both cosmesis and light passage to maximize the patient’s residual vision. We believe that this method offers a simple and effective technique to clear the areas of aberrant dye that is known to migrate over time following corneal tattooing.

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### Optical Coherence Tomography and Autofluorescence Findings in Photic Maculopathy Secondary to Distant Lightning Strike

Ophthalmic injuries due to lightning occur mainly from direct or indirect transmission of electric charge, resistance-induced heat, or heat-induced shock wave.<sup>1</sup> Most reports of lightning-induced maculopathy quote direct or indirect electric transmission as the cause and associate maculopathy with oculofacial injuries and sometimes loss of consciousness.<sup>1-3</sup> However, a high-voltage electric current can also induce photic retinopathy without contribution from the electric charge.<sup>4</sup> We report a case of photic retinopathy caused solely by viewing a lightning strike.

**Report of a Case.** A 40-year-old healthy man visited our outpatient clinic with bilateral blurring of vision for 10 days, after watching a lightning strike about 2 m away through an open window. He was not using a computer or telephone at that moment and was not holding or leaning out of the window. He immediately noted a yellow after-image, but he experienced vision decline only after a day. There was no history of smoking, sun gazing, or exposure to a solar eclipse or welding arc. On examination, best-corrected visual acuity was 20/70 N10 OU. Eyelids, adnexa, and anterior segments—including the pupillary reactions—were unremarkable bilaterally. Both fundi showed a faint yellow spot at the central fovea (Figure 1 A and B). Color vision, contrast sensitivity, and visual fields (Humphrey 10-2, macular program) were unaffected. The Amsler grid test revealed bilateral metamorphopsia. Spectral-domain optical coherence tomography (OCT; Topcon 1000) showed central hyperreflective echoes and disruption of the inner segment–outer segment junction in each eye (Figure 1 C and D). Fundus camera–based autofluorescence (FAF; Zeiss Vi-