Case report

Corneal melt following corneal tattooing with carbon-based ink

Albert John Bromeo a,*, Ruben Lim Bon Siong b, c

a Philippine General Hospital, University of the Philippines Manila, Manila, Philippines

b Asian Eye Institute, Makati, Philippines

c St. Luke’s Medical Center, Quezon City, Philippines

ARTICLE INFO

Keywords:
Corneal melt
Corneal tattooing
Carbon-based ink

ABSTRACT

Purpose: to report a case of corneal melting following corneal tattooing with carbon-based ink.

Observations: A 67 year old female with a phthisical eye underwent corneal tattooing with carbon-based ink for purpose of cosmesis. The procedure was uncomplicated. At 8 weeks postoperatively, she presented with almost complete corneal melt with uveal prolapse. There was no evidence of infection. The patient underwent evisceration. Histopathologic examination of the excised corneal button showed melting of the epithelium and anterior stromal layers, diffuse inflammation of the deeper stromal layers, and disorganized Descemet membrane and endothelium with adherent iris tissue.

Conclusions and Importance: Corneal melting can occur as a rare complication of corneal tattooing with carbon-based ink.

1. Introduction

Corneal tattooing is an option for patients with corneal opacities desirous of cosmesis. The most common technique involves intrastromal injection of pigment within the area of a corneal opacity. There are multiple pigments used for corneal tattooing, including metallic compounds such as gold and platinum chloride as well as organic pigments such as India ink, uveal pigments, and carbon-based inks. Complications from corneal tattooing include infection, recurrent corneal erosions, and penetrating injury with injection of pigment into the anterior chamber. Corneal melt from corneal tattooing is uncommon, with few previously reported cases in literature. The aim of this report is to present a case of corneal melting from corneal tattooing using carbon-based ink.

2. Case report

A 67 year old Filipino woman presented with a chief complaint of a corneal opacity on the right eye. The past medical history is unremarkable. The patient sustained a hacking injury to the right eye when she was 3 years. However, due to financial constraints, she did not seek medical advice. The injured eye eventually lost useful vision, with note of a white opacity on the cornea. The patient consulted because she was desirous of cosmesis.

The eye had a visual acuity of no light perception. Slit lamp biomicroscopy showed no conjunctival inflammation, a dense scar with band keratopathy and lipid keratopathy occupying the entire cornea with some areas of corneal neovascularization, shown in Fig. 1 A. The anterior chamber could not be assessed due to the corneal opacity. The intraocular pressure was 19 mmHg. Ocular ultrasound showed an unremarkable posterior segment.

The patient underwent corneal tattooing of the right eye with a carbon-based ink. Standard aseptic technique which included lid scrubbing and instillation of 5% povidone iodine solution in the conjunctival cul-de-sac was done preoperatively. Multiple intrastromal injections of carbon-based ink was done with each injection creating small pockets of ink within the stroma. The injections were repeated until most of the opacity was tattooed. A total of 0.23 mL of ink was injected. After the procedure, the patient was started on moxifloxacin and prednisolone acetate eye drops.

On the first day postoperatively, examination showed a tattooed cornea with multiple areas of epithelial defects, consistent with the injection sites, as shown in Fig. 1 B. There was minimal conjunctival congestion and no signs of infection. On the seventh day postoperatively, there was complete re-epithelialization of the cornea. The initial postoperative course was unremarkable.

* Corresponding author. Sentro Oftalmologico Jose Rizal, Philippine General Hospital, University of the Philippines Manila, Taft Avenue, Manila, 1000, Philippines.
E-mail address: albert.bromeo@gmail.com (A.J. Bromeo).

https://doi.org/10.1016/j.ajoc.2020.100779
Received 9 April 2019; Received in revised form 6 March 2020; Accepted 7 June 2020

Available online 10 June 2020

© 2020 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license...
On the eighth week postoperatively, the patient started noting eye pain on the tattooed eye described as a sharp needle-like sensation. Over the next few days, she noted protrusion of a brown-colored material from the area of the tattoo. Examination showed corneal melt with uveal prolapse, as shown in Fig. 1C. There were no signs of infection such as discharge, corneal infiltrates, or abscesses. Culture of tissue obtained from corneal scraping of the peripheral intact cornea showed no growth of organisms. The patient underwent evisceration of the right eye.

The excised cornea was sent for histopathologic examination. The specimen consisted of a hyperpigmented corneal button measuring 8.5 × 10 × 3.0 mm in size. Microscopic examination (Fig. 2) showed no identifiable epithelium and Bowman layer. The stroma was edematous with infiltration of polymorphonuclear leukocytes, lymphocytes, and macrophages. The Descemet membrane and endothelium were disorganized and infolded posteriorly with some adherent uveal tissue posteriorly. Culture of the corneal button showed no growth of bacterial nor fungal elements.

3. Discussion

The case presented has shown that despite the relative safety and widespread use of corneal tattooing, it is still associated with complications that may lead to unwanted outcomes. A thorough discussion on more conservative options for cosmesis, such as thick wide-rimmed spectacles, cosmetic contact lenses, or scleral shells, should be discussed with these patients. In this patient, however, the irregularity of the corneal surface precluded proper fit of a contact lens.

Corneal melting from corneal tattooing is uncommon, particularly without a background infection. There are several mechanisms that protect the structural integrity of the cornea after tattooing. Phagocytosis of pigments by corneal fibroblasts lead to a more stable and permanent tattoo as well as decreased inflammatory reaction. Electron microscopy of keratocytes after corneal tattooing have demonstrated the presence of intracellular granules of pigments. However, a mild inflammation reaction still invariably occurs.

The histopathology of the excised cornea showed an ulcerative type of keratitis with massive infiltration of polymorphonuclear leukocytes. The timeline of the melt following the procedure is more consistent with an inflammatory process than infection. Furthermore, the complete re-epithelialization of the cornea following the tattoo and the negative cultures all point to a profound immune response to the ink that triggered the corneal melt. However, it is important to note that infection cannot ever be completely ruled out after a procedure.

Although the exact mechanisms for melting after tattooing are still unknown, theories include poor adherence of the epithelium at the areas where the pigments are injected, failure of diffusion of nutrients from the aqueous humor into the cornea due to the pigments acting as a barrier, and increased levels of matrix metalloproteinases associated with increased inflammation. In addition, the ink may have a toxic effect on the keratocytes, leading to necrosis. The large size of the tattoo in the case presented may have also contributed to the melt, since a greater amount of pigment, as well as the corresponding greater number of intrastromal injections, may have caused more intense inflammation.

4. Conclusions

Corneal melting may occur as a complication of corneal tattooing. The clinician must be vigilant particularly in cases requiring a large corneal tattoo or corneas with a history of inflammation. Proper patient counselling in critical to advise patients regarding this potentially devastating complication.

Patient consent

The patient consented to publication of the case in writing.

Funding

The authors have no funding nor grant support.

Authorship

The authors attest that they meet the current ICMJE criteria for Authorship.

Fig. 1. Slit lamp biomicroscopic photographs of the cornea. A. Prior to tattooing B. After 1 Day of tattooing C. After 8 Weeks of tattooing showing corneal melt and uveal prolapse.

Fig. 2. Histopathology of the Excised Corneal Button (H&E, x100) Showing Keratitis with Ulceration of the Epithelium and Anterior Stroma (Asterisk) in the Presence of Pigments (Arrowhead) and Inflammatory Cells (Arrow) in the Deep Stroma.
Intellectual property

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

Research ethics

We further confirm that any aspect of the work covered in this manuscript that has involved human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

Written consent to publish potentially identifying information, such as details or the case and photographs, was obtained from the patient(s) or their legal guardian(s).

Declaration of competing interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

Acknowledgements

none.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ajoc.2020.100779.

References

1. Alsmman AH, Mostafa EM, Mounir A, Farouk MM, Elghobaier MG, Radwan G. Outcomes of corneal tattooing by rotring painting ink in disfiguring corneal opacities. J. Ophthalmol. 2018:5971290.
2. Alsmman AH, Abd Elhaliem Soliman NG. Intrastromal injection of China painting ink in corneas of male rabbits: clinical and histological study. J. Ophthalmol. 2016:8145926.
3. Pitz S, Jahn R, Frisch L, Duis A, Pfeiffer N. Corneal tattooing: an alternative treatment for disfiguring corneal scars. Br J Ophthalmol. 2002;86(4):397–399.
4. Al-Mezaine H. Corneal stromal melting after corneal tattooing with platinum chloride. Saudi J Ophthalmol. 2007;21(2):124–126.