Case Report

Viscoelastic-Induced Interlamellar Stromal Keratopathy (VISK) during Cataract Surgery in a Patient with a History of Laser in situ Keratomileusis

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Abstract
A 47-year-old patient status post uncomplicated bilateral LASIK treatment presented with interlamellar stromal keratopathy induced by viscoelastic material during cataract surgery, decreasing her vision to CF (count fingers) postoperatively. After recognition, the viscoelastic material was removed by interface irrigation. The keratopathy improved by postoperative day 1 and resolved by 6 weeks with best-corrected visual acuity being 20/30. We conclude that viscoelastic-induced stromal keratopathy requires correct recognition in order to undertake appropriate management.

Introduction
Post-LASIK keratopathy and keratitis may occur 1 day to several months post-surgery and has been attributed to toxic chemicals, interface foreign bodies, diffuse lamellar keratitis, elevated intraocular pressure, and infection [1–6]. To the best of our knowledge, we
report the first case of a patient status post LASIK who developed interlamellar stromal keratopathy during cataract surgery due to inadvertent viscoelastic interlamellar injection and retention.

**Case Report/Case Presentation**

At an outside center, a 47-year-old female underwent uncomplicated bilateral myopic LASIK; postoperative best-corrected visual acuity (BCVA) was 20/25 OD and 20/30 OS. Clear cornea phacoemulsification via temporal incision was performed in the right eye 1 year later. As care was given at an outside facility, it was unclear when the patient developed a cataract, and if it was present before refractive surgery. Toward the beginning of the procedure, the surgeon noted worsening stromal haze preventing clear visualization for the remainder of the surgery. As there was no improvement during an observation period of a few weeks during which glaucoma eye drops were used, the patient was referred to our clinic for further evaluation.

On presentation, BCVA was CF 3 feet OD and 20/30 OS. Intraocular pressure was 13 OD and 19 OS (measured by Tonopen in peripheral cornea). Slit-lamp examination revealed an edematous posterior corneal stroma with folds separated from the LASIK flap by fluid with large cells (shown in Fig. 1a, b). The peripheral cornea was clear; the rest of the exam was normal.

As the corneal haze developed during surgery, it was thought that viscoelastic entered the flap interface during its injection through the paracentesis wound located superiorly, at 12 o’clock, near the hinge above the collection of interface fluid. Flap irrigation of presumed trapped viscoelastic material was therefore planned.

The flap edge was lifted with a Sinskey hook, and large amounts of clear viscous material escaped from the interface. To remove as much of the substance as possible, the flap was massaged and the interface rinsed multiple times. As the irrigated material resembled a typical ophthalmic viscoelastic device, it was not sent for analysis. Examination with a handheld slit lamp yielded no residual interface fluid. Interrupted 10-0 nylon sutures secured the flap edge; fibrin sealant (Tisseel®; Baxter Inc., Deerfield, IL, USA) was applied at the wound site to prevent epithelial ingrowth. A bandage contact lens was placed, and prednisolone acetate 1% and moxifloxacin eye drops were prescribed four times daily.

On postoperative day 1, uncorrected visual acuity OD was 20/100. The flap was well-positioned with no interface fluid. By day 4, BCVA improved to 20/40. Intraocular pressure was normal, and the flap remained clear without interface haze (Fig. 2a, b). By 1 month, BCVA was 20/30. A 1.5-mm inferotemporal area of epithelial ingrowth was closely monitored.

![Fig. 1.](image_url)  
**Fig. 1.** a Viscoelastic material trapped in the interface of the LASIK flap. b Viscoelastic-induced stromal edema and keratopathy.
Discussion/Conclusion

Many cases of post-LASIK stromal keratopathy and interface haze have been reported. One cause of post-LASIK interface haze is diffuse lamellar keratitis (DLK), reported to have an incidence ranging between 0.13 and 18.9% [1]. DLK is an inflammatory lamellar infiltrate treated by aggressive topical corticosteroid with or without flap irrigation. Secondary DLK has been attributed to marking-pen toxicity, various chemicals, and following procedures such as corneal crosslinking [1–3].

There are reports of post-LASIK stromal keratitis resembling DLK, but with high intraocular pressures. Termed pressure-induced stromal keratitis (PISK), high intraocular pressure interferes with the corneal endothelial pump’s ability to draw fluid out of the stroma [4–6]. Treatment is to lower the intraocular pressure. These cases must be recognized early, as treating pressure-induced stromal keratitis as DLK could lead to further glaucomatous damage. Corneal deposits similar in appearance to calcific band keratopathy secondary to Viscoat use have also been reported and are another potential cause of corneal haze that may be considered post-cataract surgery [7].

Surgeons must consider all potential causes for postoperative interface haze. We present the first reported case of viscoelastic-induced interlamellar stromal keratopathy (VISK) occurring during cataract surgery in a patient with a history of LASIK. This new entity requires recognition in order to undertake appropriate management.

Statement of Ethics

The patient gave her written informed consent to publish her case, including publication of images. Ethical approval was not required for this study in accordance with local/national guidelines.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.
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Author Contributions

Matthew Chang, MD: Contributed to drafting and critical revising, and data acquisition. Rosalind Vo, MD: Contributed to drafting, critical revising, and data acquisition. Stewart Bernard, MD: Contributed to drafting, critical revising, and data acquisition. Stephanie Hoatson, MD: Contributed to drafting, critical revising, and data acquisition. Julio Narvaez, MD: Clinician responsible for treating patients detailed above. Contributed to drafting, critical revising, and data acquisition.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

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