Aspiration of femtosecond laser-induced anterior chamber cavitation bubbles using a fine needle technique

Anterior chamber (AC) cavitation bubble formation is a known but infrequent complication of flap creation in femtosecond LASIK, typically occurring during the lamellar cut with an incidence of 0.14%–1% and with a slight Asian preponderance.[1,2] Unlike opaque bubble layer formation, the mechanism of action is not well understood. The predominant hypothesis is bubble generation moving through the cornea into the trabecular meshwork and subsequent coalescence into the AC.[3] Larger bubbles may interfere with iris registration and pupillary tracking of the excimer laser. Current management options involve waiting for natural absorption, which may delay the excimer treatment. Such delays can necessitate several hours of waiting, even to the next day. This may cause lack of confidence on the part of the patient due to their interrupted surgery, perceived complication and potential greater exposure at a time when crowding in waiting rooms and surgical spaces should be minimized during a pandemic. We propose a simple and novel technique to address AC bubbles in safe, expedited manner.

Case #1

A 30-year-old Caucasian man with myopia underwent femtosecond laser flap creation of the left eye using the iFS femtosecond Intralase laser (Abbott Medical Optics, AMO, Santa Ana, Calif) at a depth of 100 μm using a diameter of 8.7 mm (C.C). Anterior chamber cavitation bubbles were noted during flap creation, and the excimer laser (WaveLight EX500 Alcon Laboratories, Fort Worth, Tex) was unable to complete iris registration and pupil tracking on 3 occasions. After waiting 1 hour in the recovery area, the bubbles persisted.

With written informed consent, the patient was placed supine under the operating microscope. The eye was anaesthetised with topical tetracaine hydrochloride drops 1% and prepared with topical povidone-iodine 5% solution. A sterile drape and speculum were placed. The patient was asked to maintain their head position with slight left gaze to ensure the bubbles migrated nasally. A bent 27-gauge needle attached to a 1 ml syringe filled with 0.5 ml of balanced salt solution was inserted at the 10 o'clock position, bevel side up, into the anterior chamber and advanced until the needle tip was in the bubble. Then minimal gentle aspiration was performed directly. Caution was exercised not to aspirate any excess anterior chamber fluid so as to maintain physiological intraocular pressure and corneal shape integrity. After the bubbles were aspirated, the needle was carefully withdrawn, and the patient proceeded to uneventful flap elevation and excimer laser treatment. There were no intraoperative complications and the flap elevation tactile dynamics felt similar to the normal routine case. Postoperatively, the patient was given topical antibiotic and steroid drops without deviation from the usual protocol.

Preoperatively, the patient's manifest refraction was −4.00−0.50 × 95 giving a vision of logMAR 0 (Snellen 20/20) with a pachymetry of 575 μm. Uncorrected distance visual acuities at day 1, week 1, months 1, 3, and 6 were logMAR 0 (Snellen 20/20). Last postoperative refraction at 6 months was +0.25−0.25 × 180. No postoperative complications occurred.

Case #2

A 35-year-old female patient with myopia presented for LASIK and underwent femtosecond laser corneal flap creation using the same laser (depth at 100 μm, diameter at 8.6 mm) (D.S.R). Although flap creation was successful, AC bubbles were noted in the right eye and iris registration was not possible. A speculum was inserted and the patient was asked to look inferiorly. A straight 30-gauge needle was inserted close to the limbus, away from the cut flap edge in the level of the iris plane and the AC bubble was aspirated with minimal excess fluid. Care was taken not to touch the endothelium. The patient then underwent the planned excimer laser ablative treatment with uneventful flap elevation.

Preoperative manifest refraction was OD −4.25/−0.25 × 155 giving a vision of logMAR 0 (Snellen 20/20) with normal topographic and tomographic maps. Postoperatively, her uncorrected visual distance acuity was logMAR 20/20 at 3 weeks.

Discussion

Anterior chamber bubble formation during femtosecond corneal flap creation was first reported in 2005.[4] Its presence can interfere with iris registration and pupillary tracking in 64%–100% of cases.[1,5] Since 2005, very little literature has been published regarding its management. Options include proceeding with excimer laser ablation without iris registration or pupil tracking, but this is not desirable—especially in cases where high degrees of astigmatic correction are planned. More commonly, surgeons wait for bubble absorption, which may take several hours and can lead to disrupted surgical flow, increased patient anxiety, and perceived complication. In particular, during the time of the coronavirus pandemic, prolonged wait times expose patients to higher risk of potential viral exposure by crowding in waiting rooms and surgical spaces.

This described technique allows controlled and timely removal of AC bubbles. Patient selection should involve (*i*) good compliance, (*ii*) deep AC, (*iii*) use of a speculum, and (*iv*) supine positioning under a surgical microscope. We emphasize attempting this only if flap creation is already complete. For the

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right-handed surgeon, the needle may be bent (bevel facing upwards) to access the left eye when negotiating the nasal bridge, but bending the needle is not necessary for the right eye. The surgeon's hand should be braced securely with the elbow supported on the operating chair armrest, minimizing hovering movements. There should be minimal disruption of the AC with virtually no fluid aspiration. If there is concern about more fluid aspiration, we would recommend resting the eye for 1 hour, allowing reformation of normal AC volume. In terms of flap elevation, the corneal dynamics were found to behave in a similar fashion to routine LASIK eyes. As the corneal profile is unaltered, excimer laser ablation is able to be performed in the usual manner.

The most obvious main risk with this technique is exogenous endophthalmitis given the introduced intraocular component, which remains one of the most serious complications of intraocular surgery and must be taken seriously. However, the safety profile of AC paracentesis has been evaluated with large studies in the uveitis diagnostic work-up and was found to be an extremely safe outpatient procedure following adequate aseptic precautions at the slit lamp,[6,7] arguably an even less sterile environment than the laser operating room. Other complications of AC paracentesis may include iris, lens, or endothelial trauma if the AC is shallow or if the patient moves; inadvertent air injection; malignant glaucoma; intraocular hemorrhages; or decompression retinopathy and hyphema.[6–8]

Conclusion

We believe that fine needle aspiration is an elegantly simple, safe, and effective technique to remove AC bubbles expeditiously with very low risk.

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Footnotes and Disclosure

The authors have no proprietary or commercial interest in any materials discussed in this article.

Peripheral ulcerative keratitis as the primary clinical manifestation of type 2 cryoglobulinemia

Peripheral ulcerative keratitis (PUK) is an inflammatory corneal disorder characterized by epithelial defect and juxta-limbal crescent-shaped stromal thinning.[1] PUK has been associated with vasculitis in systemic chronic inflammatory diseases (i.e., rheumatoid arthritis) in about half of the noninfectious systemic disorders.[1]

Among systemic vasculitis, cryoglobulinemia is an immune-complex-mediated disease characterized by the presence of cryoglobulins, defined as immunoglobulins, precipitating at temperatures <37°C. The main clinical manifestations involve skin, joints, peripheral nervous system, and kidneys.[2]

In this report, we describe the case of a patient with essential mixed cryoglobulinemia firstly presenting with a PUK.

On March 24, 2020, a 90-year-old Caucasian man presented with a 4-day history of right eye redness, pain, foreign-body sensation, and photophobia.

Past medical history was positive for marginal zone B-cell lymphoma and occult hepatitis B virus (HBV) infection. The patient's family history was remarkable for Crohn's disease in his daughter and vitiligo in his nephew.

As part of the ophthalmological history, bilateral recurrent episodes of herpetic dendritic keratitis, atrophic age-related macular degeneration, and a 22-year history of ocular glaucoma were reported.