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Application of femtosecond laser-assisted cataract surgery in patients with corneal pathologies

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1. Introduction

Some of the patients undergoing cataract removal have associated corneal problems. Corneal opacities may impair visibility during the surgery with subsequent increase in intra-operative complications. Femtosecond laser (FL) offers a new and innovative way of performing cataract surgery. Since it has been available for assistance in cataract surgery, evidence has shown significant reduction in the amount of ultrasound (US) energy used during surgery.[1] Reduction in US energy may minimize biomechanical damage to the cornea and result in lower rates of corneal edema and endothelial cell loss.

The following two cases report on the potential of FL in treating complex cases with corneal pathologies while preventing and minimizing the complications seen either intra- or post-operatively.

2. Findings

2.1. Case 1

The first case is a 71-year-old male, who presented to the clinic with a senile nuclear cataract in the left eye. He had a significant corneal opacity with significant stromal scarring and haze due to a history of herpes keratitis in this eye (Fig. 1A and B). Pre-operative best corrected visual acuity (BCVA) was 20/200. Decision was made to perform simultaneous femtosecond laser-assisted cataract surgery (FLACS) with penetrating keratoplasty (PK). 5 mm capsulotomy and lens softening were performed by use of FL (Vid. 1). After this step, the patient was transported to the operating room. During the host cornea trephination, the capsulotomy was noted to exit from the trephined space. A centered, round capsulotomy was noted. This allowed for the insertion of the Intraocular Lens (IOL) into the capsular bag without difficulty (Vid. 2).

Uncorrected visual acuity (UCVA) one day post-operatively was 20/125 as well as 3 months after surgery. BCVA was 20/40 after 3 months and remained stable during the follow-up period. On the last follow-up visit, the corneal graft was centered and clear.

Supplementary video related to this article can be found at http://dx.doi.org/10.1016/j.ajoc.2018.06.015.

2.2. Case 2

The second case is a 54-year-old female with a history of PK complicated by endophthalmitis which necessitated pars plana vitrectomy (PPV). There was a concern about posterior capsular touch due to a poor visualization during the PPV surgery. Rapid cataract formation was noticed after the PPV. Based on this history, the patient requested FLACS due to the general perceived benefit of the laser. UCVA preoperatively was 20/400. Pre-operative corneal pachymetry was 545. Arcuate incisions, 5 mm capsulotomy and lens softening were performed by use of FL (Video 2).

UCVA was 20/500 on post-operative day one and improved to 20/250 three months post-operatively. BCVA after 3 months was 20/100, and remained stable during the follow-up period. There were no signs of rejection or failure of corneal graft during the follow-up period (corneal pachymetry on the last follow-up visit was 621).

3. Discussion

The aim of this paper was to study the possible advantage of FLACS in patients with corneal pathologies. Some of these advantages include decreased damage to collateral structures in the eye[2] and lower phacoemulsification energy and time.[3]

Patients with underlying corneal pathologies are extremely challenging to perform cataract surgery on. Corneal scarring or edema may limit the visibility of the intraocular structures. This may affect the safety of the surgery. Specifically, creation of a continuous curvilinear capsulorhexis (CCC) is very challenging in such cases. In the first case report, we have demonstrated the successful creation of CCC despite a rather opaque cornea. Creation of the CCC in such case was significantly easier by the FL than would have been manually. To the best of our knowledge, we are presenting the first case of simultaneous PK with FLACS.

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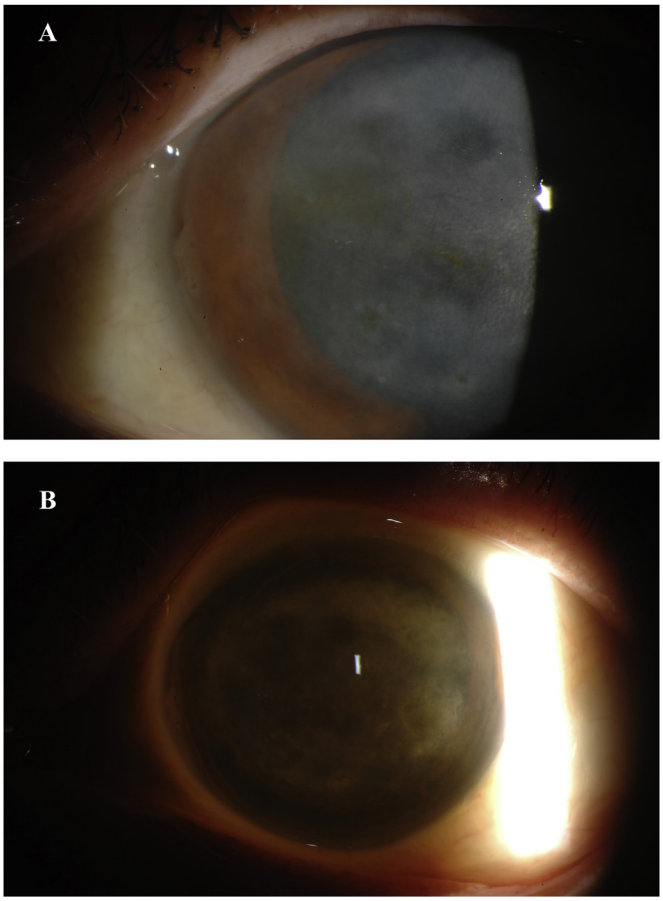

Fig. 1. Biomicroscopic image of the left eye showing significant corneal opacity with stromal scarring and haze due to a history of herpes keratitis.

The trauma caused by the phacoemulsification machine's sonic waves may lead to loss of corneal endothelial cells (CEC), or worse, corneal decompensation.[4] Studies have shown the loss in CEC after conventional phacoemulsification cataract surgery ranging from 4.01 to 12.94%[5,6] 3 months post-operatively.

Use of FL as a pretreatment decreases the effective phacoemulsification time and energy[3] used during the procedure, which is essential in protecting the corneal endothelium. Abell et al. showed an 83.6% reduction in effective phacoemulsification time.[7] Krarup et al. showed similar results, with a 33% reduction in phacoemulsification energy when using FL.[8] In the second case, we showed successful use of FL in a patient with previous PK.

4. Conclusion

In our case series, FLACS was proven to be reliable and safe in treating complex cataract cases with a history of PK. Simultaneous FLACS and PK also demonstrated promising results, shown by the lack of intra- and post-operative complications.

Patient consent

Consent to publish the case report was not obtained. This report does not contain any personal information that could lead to the identification of the patient.

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Conflict of interest

The authors have no conflict of interest to disclose.

Authorship

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

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.ajoc.2018.06.015.

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