

A Case of Intraoperative Bullous Corneal Epithelial Detachment: An Unusual Presentation of Keratopathy During Cataract Surgery

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ABSTRACT

Cataract surgery has evolved as a promising surgery in the field of ophthalmology with newer advancements and faster recovery. The present case report highlights an unusual presentation of bullous corneal epithelial detachment in a 58-year-old male patient who underwent cataract surgery by phacoemulsification. The intraoperative changes that occurred subsided in the postoperative phase, and there was no significant change noted in slit lamp examination and Anterior Segment Optical Coherence Tomography (AS-OCT). A detailed evaluation of the patient in the pre-operative period can prevent many mishaps during the intra and postoperative periods and aid in improving the patient's visual quality. However, at times, the findings might be so subtle that a proper correlation during the pre-operative period is not possible regarding the expected outcome. The present case report is one of its kind, necessitating the importance of appropriate preoperative history, examination and meticulous surgical technique of the patient posted for surgery.

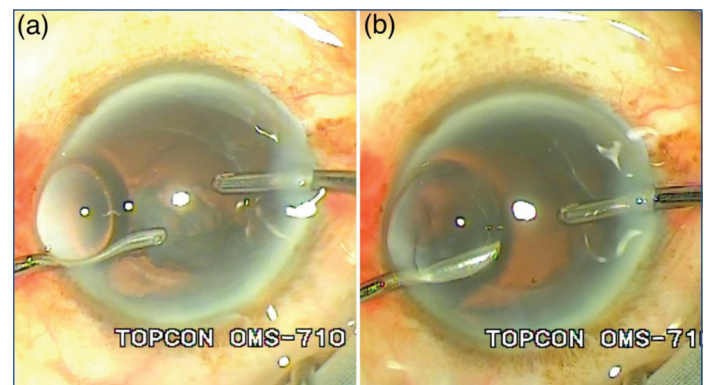
Keywords: Cornea, Disease, Health, Illness, Visual acuity

CASE REPORT

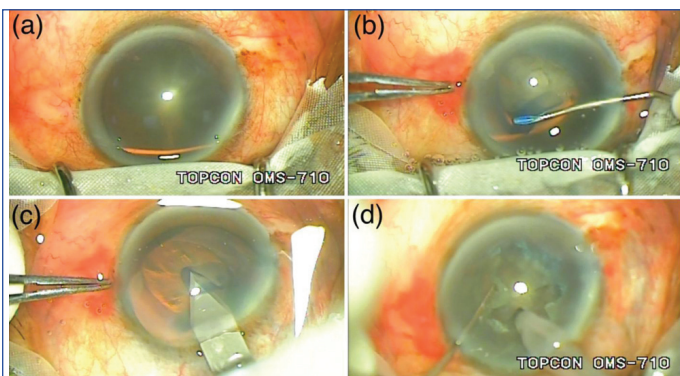
A moderately built male patient, 58-year-old, presented to the Department of Ophthalmology with complaints of a diminution of vision in his left eye for the past six months. The patient had reported no systemic complaints or history of any medications. The patient was evaluated and his Best-Corrected Visual Acuity (BCVA) in the left eye was 20/120 with no improvement in the pinhole measurement as noted in Snellen's chart. According to the Lens Opacities Classification System (LOCS) III grading system, he had a cataract in his left eye of NO3NC3C1P2 (Nuclear Colour 3, Nuclear Opalescence 3, Cortical Cataract 1, Posterior Subcapsular Cataract 2) [1]. The rest of the anterior segment evaluation was uneventful, and the patient was planned for cataract surgery by phacoemulsification with posterior chamber Intraocular Lens (IOL) placement.

The patient was taken up for surgery, and the procedure went smoothly with adequate rhexis, clear corneal incision, a side port incision using Micro Vitreoretinal (MVR) blade and phacoemulsification of the lens by the divide and conquer technique [Table/Fig-1]. The duration of surgery was 40 minutes. Cortex removal was performed using a bimanual irrigation aspiration cannula. The irrigating fluid used was balanced salt solution. During this procedure, an unusual

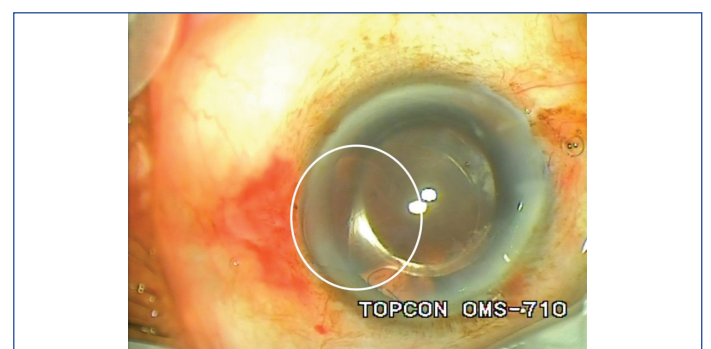
localised swelling was noticed of the corneal epithelium at the site of the side-entry wound, which progressed to a localised bullous epithelial detachment [Table/Fig-2]. Immediately, viscoelastic 2% hypromellose was applied over the cornea to settle the bulla and the procedure was resumed. However, bullous epithelial detachment resumed during viscowash, and once the surgery was over, the detached epithelium could be seen, with a demarcating line from the intact epithelium [Table/Fig-3].



[Table/Fig-2]: a,b) Intraoperative bullous epithelial detachment noticed during cortex removal.

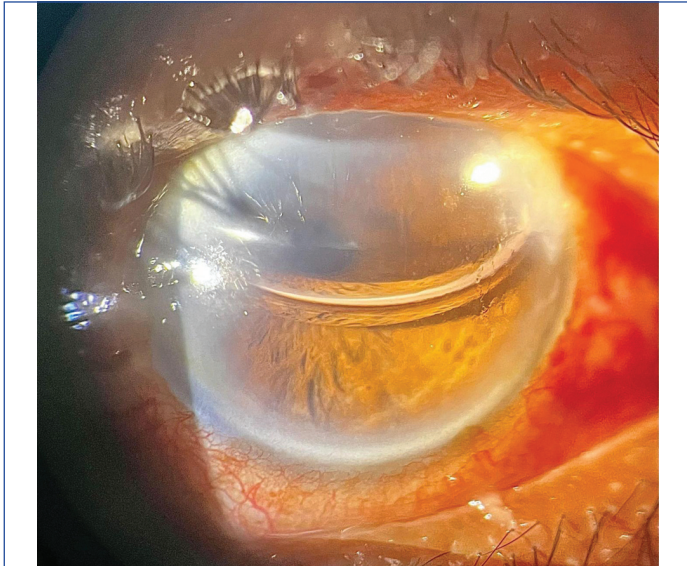


[Table/Fig-1]: a) Starting the cataract surgery; b) Performing continuous Curvilinear Capsulorhexis; c) Performing clear corneal incision; d) Phacoemulsification by divide and conquer technique.

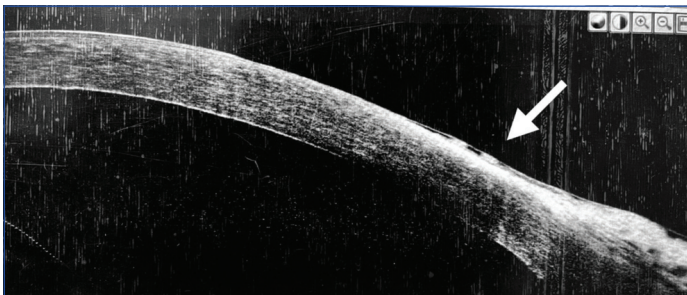


[Table/Fig-3]: Bullous detachment immediately after the procedure is seen as a demarcation line within a white circle.

On postoperative day 1, the cornea was completely clear with no signs of oedema or bullous detachment [Table/Fig-4]. AS-OCT was done to determine the level of separation and it was found to be superficial, indicating the epithelial detachment [Table/Fig-5]. The patient was started on topical Moxifloxacin 0.5% and topical Prednisolone 1%, 6 times per day. The patient's visual acuity was 20/30 on postoperative day 1 and improved to 20/20 on the next day [Table/Fig-6]. After one month, the patient came for a final refraction, and the visual acuity was 20/20 in the left eye.



[Table/Fig-4]: Postoperative day 1 picture showing clear cornea.



[Table/Fig-5]: AS-OCT imaging of cornea showing detachment of the epithelium superficially (white arrow).



[Table/Fig-6]: Postoperative day 2 slit lamp imaging of the left eye.

DISCUSSION

The corneal epithelium comprises seven layers of stratified cells with a basement membrane. The epithelial basement membrane on exposure to deposits of cellular by-products including advanced glycation end product [2], becomes thickened and discontinuous, resulting in the epithelial cells loosening [3]. The abnormal basement membrane anchoring complex leads to poor adherence to the corneal stroma, contributing to epithelial instability [4]. The abnormal changes in the corneal epithelium can present clinically in various

forms, such as chronic epithelitis, delayed wound healing, epithelial fragility, filamentary keratitis, epithelial defects, microcystic oedema, bleb formation, superficial corneal ulcers, and superficial punctate keratopathy [5,6]. Among these, severe issues like corneal epithelium loosening, bleb formation, and detachment can occur during ocular surgery. These complications are more likely with prolonged operating times and may require the removal of the epithelium [7,8]. Studies have shown that the Epithelial debridement frequency for diabetic vitrectomy was 17.4% [7,9], which is attributed to prolonged surgical time. However, with cataract surgery being relatively short, there are rarely any reported incidences of intraoperative epithelial detachments. As per the authors' knowledge, only one similar case was reported by Ye H and Lu Y in 2015 in China where a diabetic patient developed intraoperative corneal epithelial bullous detachment [10]. The causation of epithelial detachment in the previous case was attributed to elevated glucose levels, which could change the normal corneal structure. The causal factor for epithelial detachment in our case could have been the incision in the side entry wound, which led to leakage of infused fluid beneath the loosened epithelium. This can be avoided by maintaining proper preoperative serum glucose control, handling the corneal incisions gently, and using appropriate techniques that prevent the irrigation port from directly contacting the incision site. The corneal epithelium in this patient was clinically reattached on the immediate postoperative day without any intervention, indicating that basement membrane abnormality is the main pathology over other possible mechanisms [11]. Moreover, to prevent this intraoperative complication, it is critical during surgery to: i) Opt for a sharper knife for a smoother, clearer corneal incision, ensuring flatter and more regular surfaces that effectively seal together, reducing the likelihood of fluid leakage from the anterior chamber; ii) Maintain swift and steady movement during puncturing when creating the incision; iii) Opt for a larger corneal incision to minimise repeated friction on the incision surfaces caused by the phaco handpiece; iv) Avoid direct water flow against the incision surfaces.

CONCLUSION(S)

The present case highlighted an unusual presentation of intraoperative bullous corneal epithelial detachment that occurred during routine cataract surgery, most likely precipitated by fluid leakage through the side-port incision in the presence of an underlying basement membrane vulnerability. The spontaneous postoperative reattachment of the epithelium further supports this mechanism. The aim is to emphasise the importance of recognising this rare complication and to outline practical surgical modifications that may help prevent its occurrence. Careful incision construction, avoidance of direct irrigation toward the wound, and attention to patient-specific risk factors such as glycaemic status are essential to minimising the risk of epithelial detachment during cataract procedures.

Authors' contribution: GJ was the chief surgeon who performed the surgery and wrote the manuscript with image acquisition. BP was the senior consultant surgeon supervising the case and guided in manuscript writing. SS added references and reviewed the manuscript.

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