

Descemet Stripping Automated Endothelial Keratoplasty (DSAEK) for Pseudophakic Bullous Keratopathy Secondary to a Retained Baikoff Anterior Chamber IOL with Synechiated Haptics and Traumatic Iridodialysis: A Case Report

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Abstract

Purpose: To report the surgical management of late-onset Pseudophakic Bullous Keratopathy (PBK) in an eye with a Baikoff-type angle-supported Anterior Chamber Intraocular Lens (AC-IOL) with all three haptics synechiated to the peripheral iris stroma, in the context of a pre-existing traumatic superior iridodialysis.

Methods: A 72-year-old male with a history of traumatic cataract and superior iridodialysis who had undergone extracapsular cataract extraction with implantation of a three-haptic Baikoff-type AC-IOL approximately 30 years prior presented in 2021 with decreased visual acuity. Best-Corrected Visual Acuity (BCVA) was Hand Motions (HM) in the affected eye. Diffuse corneal edema (central corneal thickness 838 μ m) with bullous keratopathy unresponsive to medical therapy was diagnosed. Slit-lamp examination revealed synechiae of all three IOL haptics to the peripheral iris stroma, precluding safe explantation. Descemet Stripping Automated Endothelial Keratoplasty (DSAEK) was performed retaining the AC-IOL *in-situ*.

Results: Intraoperative air tamponade was achieved, but the air bubble migrated to the posterior chamber through the superior iridodialysis in the immediate postoperative period. Despite the absence of sustained anterior chamber air tamponade, the endothelial graft remained adherent and bullous keratopathy resolved. At the final follow-up visit (6 months postoperatively), BCVA had improved to 0.1 (20/200), Intraocular Pressure (IOP) was 14 mmHg and progressive corneal clearing was documented on biomicroscopic examination and Anterior Segment Optical Coherence Tomography (AS-OCT).

Conclusion: DSAEK may be considered a viable surgical option for PBK secondary to retained AC-IOLs when explantation carries prohibitive risk. The presence of iridodialysis, though complicating air tamponade, does not necessarily preclude successful graft adhesion. The inherent rigidity of the DSAEK lenticule may confer

an advantage over DMEK in anatomically complex anterior segments.

Keywords: Baikoff Lens; Anterior Chamber Intraocular Lens; Pseudophakic Bullous Keratopathy; Descemet Stripping Automated Endothelial Keratoplasty (DSAEK); Endothelial Keratoplasty; Iridodialysis; Corneal Decompensation

Introduction

Angle-supported Anterior Chamber Intraocular Lenses (AC-IOLs) were widely implanted during the 1980s and 1990s as a solution for aphakia following complicated cataract surgery or as phakic IOLs for the correction of high myopia. The Baikoff ZB and ZB5M lenses, among the most prevalent of this design, featured rigid Polymethylmethacrylate (PMMA) optics with angulated haptics intended to rest in the iridocorneal angle. While initially considered a satisfactory alternative to posterior chamber IOL implantation in the absence of capsular support, long-term follow-up has revealed a significant risk of progressive corneal endothelial cell loss leading to irreversible decompensation [1,2].

The pathophysiology of endothelial damage in angle-supported AC-IOLs is multifactorial. Mechanisms include chronic low-grade inflammation, intermittent or sustained contact between the IOL optic and the corneal endothelium in eyes with shallow anterior chambers, disruption of aqueous flow dynamics and mechanical trauma from haptic movement [3]. Studies with follow-up exceeding ten years have demonstrated high rates of corneal decompensation for angle-supported designs underscoring the need for long-term surveillance and timely surgical planning [4].

The surgical management of PBK in eyes with retained AC-IOLs ideally involves IOL explantation combined with endothelial keratoplasty or Penetrating Keratoplasty (PK). However, in cases where haptics have become synechiated to iris or angle structures, explantation carries a substantial risk of intraoperative hemorrhage, iridodialysis extension, vitreous loss and hypotony [5]. In such circumstances, endothelial keratoplasty without IOL removal may be the most prudent approach. Staged IOL extraction with secondary scleral-fixated or iris-fixated IOL implantation, combined DSAEK and IOL exchange and PK in complex anterior segment anatomy represent alternative strategies that must be considered and balanced against patient-specific risk.

DSAEK has emerged as a preferred technique for endothelial replacement in anatomically complex eyes. Compared to Descemet Membrane Endothelial Keratoplasty (DMEK), DSAEK grafts are more rigid and easier to orient, less prone to fall into the vitreous cavity through large iris defects and adhere more readily to irregular posterior stromal surfaces [6,7]. These properties are particularly relevant in eyes with iridodialysis, aphakia or large iris defects, where maintaining a sufficient gas bubble in the anterior chamber is challenging.

We report a case of DSAEK performed without AC-IOL explantation in an eye with long-standing PBK secondary to a Baikoff-type lens with all haptics adherent to the iris stroma, further complicated by a pre-existing traumatic superior iridodialysis.

Case Report

A 72-year-old pseudophakic male was referred to the Cornea Unit of Hospital Clínico Universitario Lozano Blesa (Zaragoza, Spain) in 2021 with a several-month history of progressive decrease in visual acuity in his right eye. The eye was pseudophakic with a retained AC-IOL; no posterior capsular remnants were present as the original surgery had been extracapsular without posterior capsule preservation. His past ocular history was significant for traumatic cataract and superior iridodialysis sustained approximately 30 years prior, for which he had undergone extracapsular cataract extraction with implantation of a three-haptic Baikoff-type angle-supported PMMA AC-IOL. The postoperative course had been uneventful and the patient had remained stable and asymptomatic for three decades. The contralateral eye showed no corneal pathology, with clear cornea, normal endothelial appearance on specular microscopy and preserved visual function.

On presentation, Best-Corrected Visual Acuity (BCVA) in the affected eye was Hand Motions (HM). Intraocular Pressure (IOP) was 12 mmHg. Slit-lamp biomicroscopy revealed diffuse corneal stromal edema with epithelial bullae consistent with advanced pseudophakic bullous keratopathy (Fig. 1). The AC-IOL was in place, with all three haptics clearly synechiated to the peripheral iris stroma. A well-established superior iridodialysis was present. There was no evidence of elevated IOP or active inflammation. Gonioscopic assessment was precluded by the degree of corneal opacification. Specular microscopy of the affected cornea was not obtainable due to the degree of edema; donor tissue endothelial cell density was 2,450 cells/mm². Central corneal thickness by pachymetry was 838 µm.

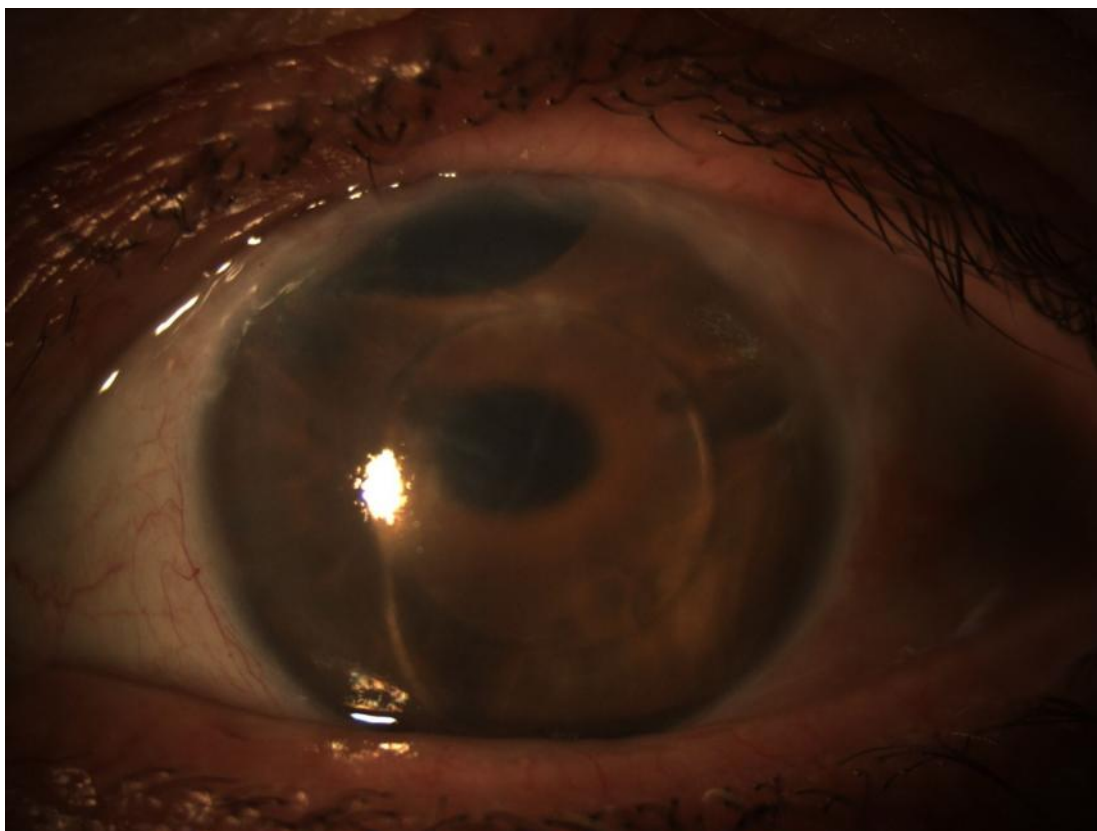


Figure 1: Slit-lamp biomicroscopy demonstrating advanced pseudophakic bullous keratopathy with diffuse stromal edema and epithelial bullae. The Baikoff AC-IOL is visible with its haptics (arrows) synechiated to the peripheral iris stroma; a superior iridodialysis is present at the 12 o'clock position.

Conservative management with hypertonic saline drops was initiated but failed to produce sustained improvement. Surgical intervention was therefore indicated. After a thorough risk-benefit analysis, the decision was made to perform DSAEK without explantation of the AC-IOL. Staged AC-IOL removal with secondary scleral-fixated IOL, combined DSAEK with IOL exchange and PK were considered. Explantation was ultimately judged unjustifiably hazardous given the synechiae at all three haptics and the pre-existing superior iridodialysis, which together substantially increased the risk of intraoperative hemorrhage, iridodialysis extension and vitreous prolapse. The patient provided written informed consent for surgery and for publication of clinical details and images.

Descemetorhexis was performed and a donor posterior lamellar graft (8.0 mm diameter, approximately 130 μm thick) was prepared using an automated microkeratome. The lenticule was introduced into the anterior chamber via a 5.0 mm scleral tunnel incision and unfolded using a glide technique. No venting incisions were used; interface fluid was evacuated by gentle irrigation at the graft–host interface before air fill. At the conclusion of surgery, the anterior chamber was filled with air to achieve graft tamponade; the patient was instructed to maintain strict face-up positioning for 24 hours postoperatively and was placed on topical corticosteroids and antibiotics. Biomicroscopic examination immediately postoperatively confirmed satisfactory positioning of the graft with the air bubble visible at the superior iridodialysis (Fig. 2). AS-OCT demonstrated marked corneal thickening (838 μm) preoperatively, confirming severe endothelial decompensation (Fig.3).

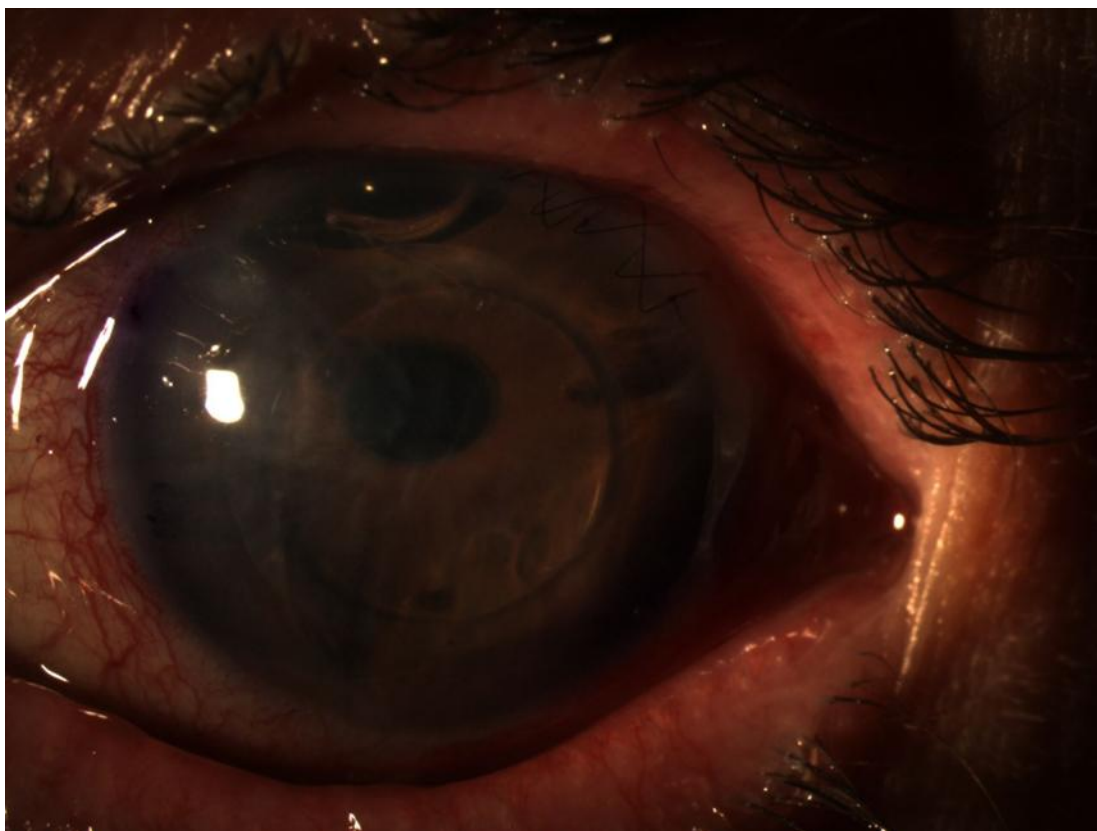


Figure 2: Slit-lamp biomicroscopy showing the air bubble (arrow) visible at the superior iridodialysis immediately following DSAEK. The graft interface is visible inferior to the air meniscus.



Figure 3: Preoperative anterior segment OCT (AS-OCT) demonstrating diffuse corneal thickening (central pachymetry 838 μm) consistent with severe endothelial decompensation and stromal edema.

In the immediate postoperative period (within the first 24 hours), the air bubble was observed to have migrated entirely into the posterior chamber through the superior iridodialysis, with complete loss of anterior chamber air tamponade. Despite this complication, no rebubbling procedure was performed given persistent graft adherence on slit-lamp examination. Repeat assessment over the following days demonstrated continued graft apposition without the need for further intervention. Progressive corneal clearing was documented over six months, with resolution of the stromal edema and bullae (Fig. 4). At the final follow-up visit at 6 months, BCVA had improved to 0.1 (20/200), IOP was 14 mmHg and the graft remained clear. Postoperative pachymetry at 6 months measured 540 μm , representing a substantial reduction from the preoperative value of 838 μm . No late complications were observed within the follow-up period. Postoperative endothelial cell counts were not obtainable at the time of this report.

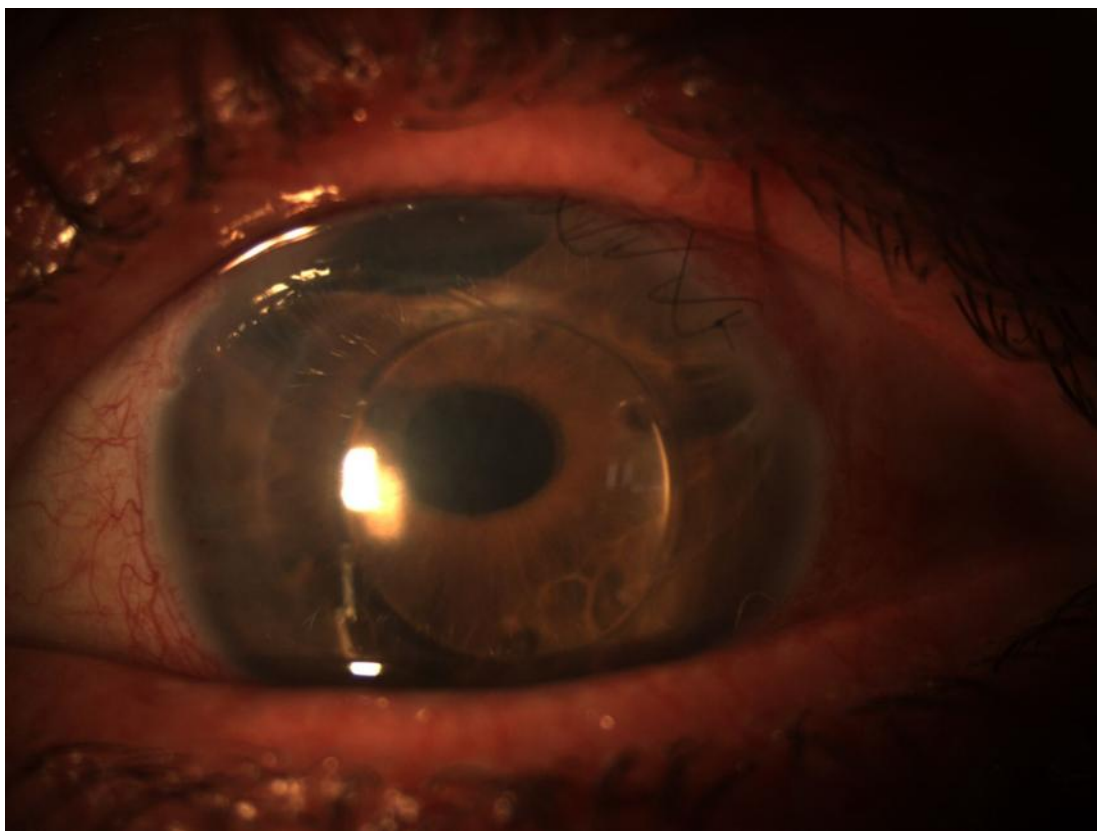


Figure 4: Slit-lamp biomicroscopy at 6 months postoperatively showing progressive corneal clearing with resolution of bullous keratopathy. The graft interface (arrow) is visible; the Baikoff AC-IOL remains *in-situ*.

Discussion

This case illustrates several clinically important challenges in the management of PBK secondary to angle-supported AC-IOLs: the decision to retain a firmly adherent IOL *in-situ* during endothelial keratoplasty and the management of air tamponade failure due to a coexisting iridodialysis. To our knowledge, the specific combination of all three haptics synechiated to the iris stroma, pre-existing superior iridodialysis, posterior migration of the air bubble and ultimately successful graft adherence without rebubbling has not been previously reported.

Long-term corneal endothelial cell loss following AC-IOL implantation is well documented. Tang, et al., reported high rates of corneal decompensation among angle-supported AC-IOL eyes at a mean follow-up of 12 years [4]. The progressive nature of endothelial damage in these eyes is attributed to chronic mechanical and inflammatory insults from the IOL and the absence of reliable endothelial regeneration in the adult cornea [3]. The pathophysiology involves intermittent IOL–endothelium contact, chronic aqueous flow disruption and low-grade uveitis. In our patient, a latency of approximately 30 years before decompensation, though on the longer end of reported intervals, is consistent with described cases of late PBK following AC-IOL implantation [8].

When PBK occurs in the setting of a synechiated AC-IOL, the surgeon faces a difficult decision. Explantation is conceptually ideal, as it removes the ongoing source of endothelial damage to the retained graft; however, adherent haptics significantly increase the risk of intraoperative hemorrhage, extension of iridodialysis, zonular disruption and vitreous prolapse. Alternative approaches must be considered: staged AC-IOL removal with secondary scleral-fixated or iris-fixated IOL; combined endothelial keratoplasty and IOL exchange; or PK, which avoids the need for graft adherence altogether but carries its own risk profile in complex anterior segment anatomy. In our case, the combination of all three haptics being synechiated and the pre-existing superior iridodialysis tipped the risk–benefit analysis firmly against explantation. The decision was also influenced by the patient's advanced age and the absence of any posterior chamber IOL support that would facilitate exchange. Reports of successful endothelial keratoplasty in eyes with retained AC-IOLs support the feasibility of this approach in selected patients [5,9].

The choice of DSAEK over DMEK in this anatomical context was deliberate and technically justified. DMEK grafts, consisting solely of Descemet's membrane and endothelium, tend to scroll tightly and can fall into the vitreous cavity through large iris defects or in aphakic eyes [6]. The presence of a wide superior iridodialysis in our patient would have represented a significant risk of DMEK graft loss into the vitreous. The additional posterior stromal component of the DSAEK lenticule confers rigidity and greater resistance to posterior displacement, which may make it more suitable for anatomically complex anterior segments in cases such as this [7]. A direct comparison between techniques is, however, beyond the scope of a single case report.

The most clinically distinctive aspect of this case is the adhesion of the DSAEK graft despite the failure of anterior chamber air tamponade. Air tamponade is considered essential for DSAEK graft adhesion in the early postoperative period [10]. Cases of successful DSAEK without sustained tamponade are rarely reported. One plausible explanation in our case is that the broad AC-IOL optic, positioned immediately posterior to the graft, may have provided a degree of mechanical support preventing graft detachment in the absence of the air bubble. This hypothesis is speculative and was not directly confirmed by postoperative AS-OCT imaging of the graft-IOL interface. Surgeons facing similar cases should be aware of this risk and may consider using longer-acting gases such as 20% SF₆ instead of air, meticulous evacuation of interface fluid intraoperatively and early postoperative monitoring with a low threshold for rebubbling.

The main limitation of this report is its single-case nature; no general conclusions regarding the effectiveness of DSAEK over alternative approaches in this setting can be drawn. Longer follow-up will be required to determine whether the retained AC-IOL causes progressive graft endothelial failure. The absence of postoperative endothelial cell counts is an additional limitation.

Conclusion

DSAEK without AC-IOL explantation may be considered in selected patients with PBK where IOL removal carries prohibitive risk due to synechiated haptics. In this case, pre-existing iridodialysis complicated air tamponade, but graft adhesion was ultimately achieved. The DSAEK lenticule's rigidity may represent a technical advantage over DMEK when large iris defects are present. These observations suggest feasibility in this anatomical scenario but cannot establish general effectiveness. Individualised surgical planning and careful patient counselling regarding the risk of graft failure secondary to the retained IOL remain essential.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethical Statement

Written informed consent was obtained from the patient for publication of clinical details, photographs and imaging data. This case report was prepared in accordance with the CARE reporting guidelines.

Informed Consent Statement

Informed consent was obtained from all participants included in the study.

Authors' Contributions

All authors contributed equally to this paper.

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