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**Case Report**

# Femtosecond Laser-Assisted Anterior Lamellar Keratoplasty as a Treatment Modality for Recalcitrant Post-Laser in situ Keratomileusis Epithelial Ingrowth

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**Keywords**
Laser in situ keratomileusis · Epithelial ingrowth · Femtolaser · Anterior lamellar keratoplasty

**Abstract**
The purpose is to present the outcomes of anterior lamellar keratoplasty for a case of post-laser in situ keratomileusis (LASIK) epithelial ingrowth. A 40-year-old male patient presented with epithelial ingrowth 14 years after primary LASIK with a microkeratome blade in the right eye following trauma. Multiple stromal bed washing was done over a period of 3 years, but recurrence of epithelial ingrowth was seen every time. Femtosecond laser-assisted anterior lamellar keratoplasty was performed in the right eye. Twelve months after the procedure, the patient's corrected distance visual acuity improved to 6/9, and no recurrence was noted. Femtosecond laser-assisted anterior lamellar keratoplasty is an effective treatment modality in cases of recurrent recalcitrant epithelial ingrowth seen after LASIK.



## Introduction

Pallikaris et al. [1] performed the first LASIK procedure, and since then LASIK is one of the most widely performed refractive eye surgeries worldwide. The safety and efficacy of LASIK has been established by many studies, but it is not free from intraoperative or postoperative complications although the rates of these are very low [2]. The creation of potential

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space between the flap and stromal surface is the cause of complications like free flap, flap dislocation, diffuse lamellar keratitis, interface fluid syndrome, and epithelial ingrowth (EI). EI after LASIK is a rare complication and occurs due to migration of surface epithelial cells on the stromal bed underneath the LASIK flap. The incidence of EI following LASIK is reported to be around 0–3.9% [3]. This rate significantly rises up to 20% in cases where the flap is lifted for retreatment [4]. In most cases, EI is self-resolving, but around 3.2% of the cases require interventions. The common indications for the treatment of EI are reduced visual acuity, induced astigmatism, and EI reaching the visual axis causing glare and visual disturbances or causing flap melt. Various treatment modalities have been tried for the management of post-LASIK EI with good success rate. The commonest procedure is flap lifting followed by scraping of the epithelium from the stromal bed and underside of the flap [5, 6]. Treatments such as suturing the flap after interface scraping, use of mitomycin C, use of fibrin glue, phototherapeutic keratectomy, amniotic membrane patch, and Nd:YAG laser have also been described in the literature [7]. Despite the abovementioned treatment modalities, recurrence of EI is common. The reported rate of recurrence can be as high as 23.3–44% [8].

## Case Report

A 40-year-old male patient underwent microkeratome LASIK in the year 2002 at our center. His refractive error at that time was −8.00 DS/−2.00 DC at 170° in the right eye and −6.00 DS/−1.50 DC at 150° in the left eye. The patient came to our refractive clinic after 14 years of surgery with complaints of diminution of vision, watering, glare, and photophobia persisting since the last 3 months in the right eye. There was a history of trauma to the right eye few months back which was managed by a local ophthalmologist (reports not available with the patient). There was no history of diabetes or any other chronic illness. On ocular examination, his best-corrected visual acuity (BCVA) was 6/12 in the right eye with a refractive error +1.0 DS/−5.0 DC and the left eye 6/9 with refractive error −3.25 DS/−3.00 DC. On slit-lamp examination, EI was noted in the right eye. The cornea in the right eye showed extensive areas of EI at superior and inferior flap margins (Fig. 1a).

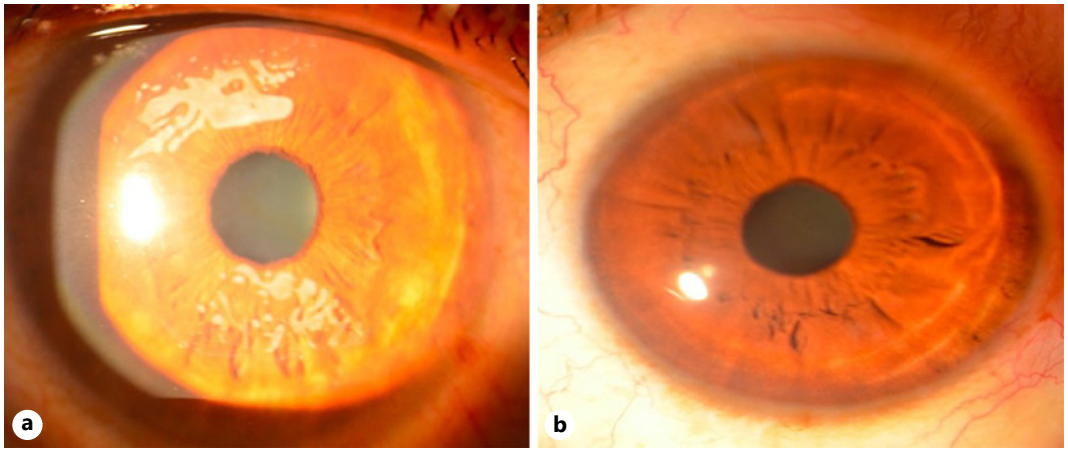


**Fig. 1. a** Slit-lamp photograph of the cornea of the right eye shows islands of epithelial ingrowth at superior and inferior flap margins. **b** Postoperative slit-lamp photograph of the right eye after femto-anterior lamellar keratoplasty showing the clear graft.

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After discussing with the patient about the condition, mechanical debridement was planned in the right eye. During the procedure, the LASIK flap was lifted, and the stromal bed and flap undersurface were cleaned. The flap was reposited, and bandage contact lens was placed. On the first postop day, the stromal surface showed mild edema and LASIK flap in place, and bandage contact lens was removed after complete re-epithelization at day 4. The patient did well initially, but at the 3-month postoperative period, recurrence of EI was seen. After an informed consent, mechanical debridement was repeated in the right eye. This time, mitomycin C 0.02% was used for 1 min after cleaning the stromal surface. A similar postoperative regime was followed upon. Three months after the procedure, recurrence of EI was noted again. The procedure of flap lift and mechanical debridement was repeated 5 times in the right eye over a period of 3 years. With each procedure, the recurrence of EI became more aggressive and reached up to the visual axis in the right eye. The patient's BCVA dropped to 6/60 in the right eye, and other visual symptoms also became worse over time. In view of the progressive nature of the ingrowth and a reduction in BCVA, it was planned to intervene surgically by femtosecond laser anterior lamellar keratoplasty in the right eye (online suppl. Digital Content [SDC] Video; for all online suppl. material, see www.karger.com/doi/10.1159/000519189). FEMTO LDV Z8 (Zeimer Ophthalmic Systems, Port, Switzerland) was used as a laser platform for performing the procedure. The Eye Bank serologically cleared the donor tissue for transplantation. The corneoscleral button was placed in an anterior chamber maintainer. A flap diameter of 8.20 mm and a depth of 255 micron was used as a laser setting for the donor while 8.10-mm flap diameter for the recipient with the same depth. The laser cuts were complete without any tissue bridges. The donor graft was sutured with 10-0 nylon-interrupted sutures. Twelve sutures were placed and knots buried. Topical antibiotics + steroids combination eye drops were used in tapering doses for a period of 9 months. Selective suture removal was done. At 1-year postoperative period, visual acuity in the right eye was 6/12 (−1.5 DS/−2 DC at 145°). The lenticule was well attached with well apposition of the peripheral rim of corneal tissue (Fig. 1b). Postoperative AS-OCT images show the well-attached lenticule (Fig. 2a, b). There was no evidence of recurrence.

## Discussion

EI occurs due to migration of epithelial cells onto the corneal stromal surface and proliferation in an interface created by LASIK. While small nonprogressive areas of EI not affecting visual acuity can be observed, mechanical debridement for complete removal of epithelial cells from the stromal surface and underneath the LASIK flap is the primary treatment in most cases of EI requiring intervention. Apart from this, many other treatment modalities are also available for treatment of post-LASIK EI [8].

Our patient underwent microkeratome LASIK which is known to cause more EI then femtosecond LASIK. Also, multiple debridement procedures with flap lift enhancement were done, which led to recurrence of EI [9]. The main challenge in our case was to prevent recurrence. The ingrowth was gradually progressing and was reaching the visual axis and causing significant visual disturbances. A previous study reported debridement combined with flap suturing for reducing the recurrence rates [10, 11]. Also, Nd:YAG laser has been shown in treating recurrences of EI. However, in our case, these procedures were probably not a good approach because attempting such a procedure could have caused permanent visual axis opacity. Although other surgical approaches such as flap edge suturing to manage the EI could have been implemented, authors were not familiar with such surgical options, and therefore they decided to proceed with anterior lamellar keratoplasty (ALK).

The ALK technique has been reported to treat stromal corneal pathology such as keratoconus, stromal dystrophies, and anterior corneal scars providing accurate restoration of

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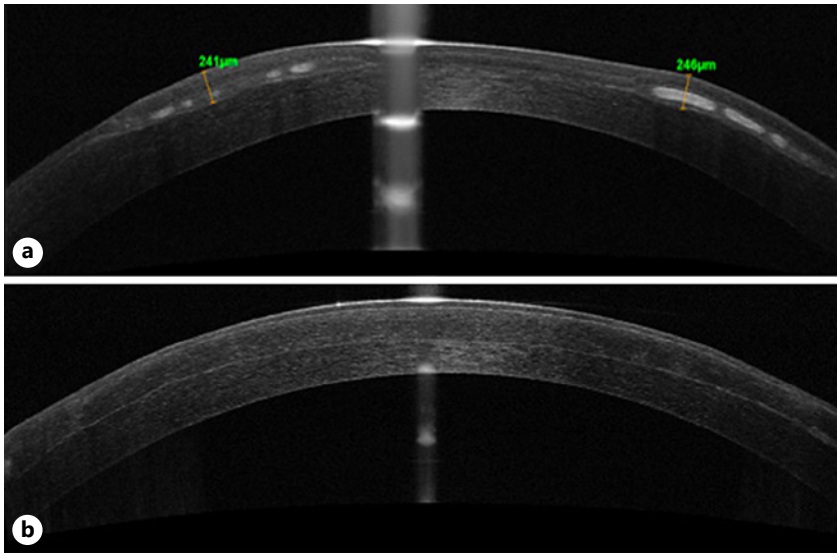


**Fig. 2. a** Anterior segment OCT imaging showing areas of epithelial ingrowth under the LASIK flap. **b** Postoperative AS-OCT images show the well-attached lenticule after femto-anterior lamellar keratoplasty.

corneal thickness and contour. It is a valuable surgical option for post-LASIK EI, especially when there are multiple recurrences as it replaces the entire EI complex and irregular LASIK flap with a healthy clear donor cornea [12]. Femtosecond laser-assisted corneal surgery, particularly with the use of intraoperative anterior segment optical coherence tomography to estimate the depth of corneal scarring, has gained more popularity owing to increased precision, safety, and accuracy as compared to traditional ALK.

## Conclusion

ALK could be done in recurrent cases of EI where other treatment modalities fail. Femtosecond laser-assisted ALK seems to be a favorable treatment modality for the management of severe and recalcitrant post-LASIK EI.

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## Statement of Ethics

This report followed guidelines to be HIPAA compliant, and permission was obtained from the patient to publish identifiable photographs. The study conduct adhered to the tenets of the Declaration of Helsinki, and the Bharti Eye Foundation Ethics Board Committee (ECR/1408/Inst/DL/2020) reviewed and approved the study. Written informed consent was obtained from the patient for publication of this case report and any accompanying images. This report does not contain any personal information that could lead to the identification of the patient.

## Conflict of Interest Statement

The authors of this manuscript do not have any conflicts of interest to declare.

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## Author Contributions

Bhupesh Singh contributed to case report writing and editing and surgery done. Sourabh sharma contributed to case report writing. Neha Bharti contributed to editing and proof-reading. Sudhank Bharti contributed to the idea and final version of case report approval.

## Data Availability Statement

All data generated or analyzed during this study are included in this article and its online suppl. Files. Further enquiries can be directed to the corresponding author.

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