

A Case Report Of Retained Lenticules After SMILE Surgery

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Case report

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Abstract

A 28-year-old female patient (right eye: -3.75DS, left eye: -4.00DS) underwent bilateral small incision lenticule extraction. One week after small incision lenticule extraction, her left eye uncorrected distance visual acuity (UDVA) did not reach her preoperative best corrected distance visual acuity (BCDVA) as expected. Examination confirmed that corneal stromal lens fragments remained in the left eye. The lens fragments were removed with a second surgery, and the patient's vision was restored to her preoperative BCDVA. The results of this case yield the following suggestions: ☐ The lens separation method must be gentle and performed in the same plane. ☐ It is necessary to confirm the integrity of the lens after the lens is removed.

Background

Small incision lenticule extraction (SMILE) is a myopic astigmatism correction surgery characterized as minimally invasive, flap-free, safe, effective and highly predictable^{1,2}. SMILE, as an innovative femtosecond laser surgery, has low tissue inflammation and apoptosis rates³ and produces better biomechanical stability of the cornea after surgery^{4,5}. Despite the advantages of SMILE over femtosecond laser-assisted LASIK (FS-LASIK) and photorefractive keratectomy (PRK), SMILE requires great skill by the surgeon, especially for the difficult microlens separation, which can produce lens residues⁶. In this case study, we report a case of lens remnants after SMILE and discuss microlens separation techniques and precautions to avoid similar problems in the future.

Case Presentation

A 28-year-old woman had a history of wearing glasses for 10 years. She occasionally wore contact lenses for 5 years and had stopped wearing them for 2 months. Preoperative examination revealed BCDVA in the OD was -4.00/-0.50×65=20/25 and in the OS was -4.25/-0.50×135=20/25. The intraocular pressure was measured with a corneal biomechanical analyzer (Corvis ST, Oculus Germany) and was 23 mmHg (1 mmHg = 0.133 kpa) in the right eye and 20.5 mmHg in the left eye. For central cornea thickness (CCT), the right eye was 562 μm, and the left eye was 569 μm. Corneal topography (Orbscan II; Bausch & Lomb, Rochester, New York, USA) showed a symmetrical left eye, and the front surface was classified as Type C, with a K1 of 42.10D and a K2 of 42.80D and a -0.70D corneal astigmatism at 52.6° (Figure 1). No obvious abnormalities were observed in the anterior segment from fundus examinations.

A VisuMax femtosecond laser system (Carl Zeiss Meditec AG, Jena, Germany) was used for bilateral SMILE for the correction of myopia and myopic astigmatism at The Army Military University Daping Hospital on January 1st, 2018. The patient had good fixation, excellent negative pressure absorption, and accurate center positioning during the operation. The laser pulse energy was 31, and the track distance was 4.5 .d. The thickness of the binocular corneal cap was 130 μm, binocular diameter was 7.1 mm, the side

cut angle was 95°, the incision position was 95°, and the incision width was 2.50 mm. During the operation, the process of microlens separation and removal went smoothly; upon the completion of the surgery, visual inspection revealed a complete microlens from each eye. After the operation, conventional local antibiotic and anti-inflammatory treatments were administered.

After one week of follow-up, the patient complained of poor vision in the left eye. Physical examination revealed a UCDVA of 20/20 in the OD and 20/40 in the OS and an IOP of 18.5 mmHg in the OD and 17.0 mmHg in the OS. Left eye subjective optometry showed BCDVA at +2.00×175=20/50, a K1 of 36.40D, a K2 of 37.90D, and a -1.50D corneal astigmatism at 162° (Figure 3). A slit lamp examination showed a faint trace of pale lines under the cornea of the left eye (Figure 4). Anterior segment optical coherence tomography showed a high corneal stroma; reflective, irregular signals(Figure 5); and so on. At this time, a diagnosis of postoperative remaining lenticules in the left eye was made. After the preoperative communication, lenticule fragment removal was performed on the left eye on February 27, 2018. The residual stromal lens was removed through the original incision (see video for attachment) and reviewed on February 28, 2018. UDVA of the OS was 20/20, The AS-OCT showed that the high reflectance and irregular signals disappeared from the corneal stroma (Figure 6). HE staining of the removed lens fragments suggested that the edges were not smooth, and the corneal stroma fibers ran irregularly (Figure 7).

Discussion And Conclusions

SMILE surgery requires extensive experience with surgical skills and a steep learning curve⁷. Possible intraoperative complications include tearing of the corneal margin or damage to the corneal epithelium at the incision; difficulty in separating the corneal stromal lens; loss of negative pressure; tearing or producing residual tissue of the corneal stroma; irregularity of the corneal stroma lens; the presence of a foreign body under the corneal cap; difficulties with corneal stroma lenses; perforation or dissection of corneal caps; corneal epithelial defects at non-incision sites; generation of opaque air bubbles; and dark areas within the corneal stroma scan area. The postoperative complications include diffuse lamellar keratitis, interlayer effusion, dry eyes, infection, overcorrection, undercorrection and regression of the refractive power⁸. For this patient, the operation was smooth, and a postoperative exam revealed a complete left microlens; however, the patient's irregular astigmatism and poor postoperative UDVA remained. To trace the fundamental cause, we consulted the video and surgical records of the initial surgery and the medical and nursing staff that participated in this surgery and finally verified the cause for the lens residue. At the time of the surgery, it was the peak of the winter holiday, and the volume of corneal refractive surgeries had doubled. Due to the speed of the surgery, when the surgeons were separating the microlens of the left eye, they failed to observe a slight cocking of the separator, thus resulting in the interlayer separation of the matrix lens causing the incomplete extraction of the lens. (2) Upon completion of the surgery, a visual exam revealed that the lens was round; thus, they assumed that the lens was complete and were confused by the poor outcome. On the basis of this case, SMILE

surgeons should consider the following: (1) when conducting lens separations, manipulations should be gentle, the disturbances of the corneal tissues should be minimized, and the separations should be conducted on the same plane; (2) upon removal of the lens, surgeons and nurses should perform a slit lamp examination carefully to observe the integrity of the lens; mere reliance on a visual observation could lead to a poor patient outcome.

Abbreviations

UDVA:uncorrected distance visual acuity;SMILE:small-incision lenticule extraction;BCDVA:best corrected distance visual acuity;FS-LASIK:femtosecond laser– assisted LASIK;PRK:photorefractive keratectomy;AS-OCT:Anterior segment optical coherence tomography;HE:Hematoxylin and eosin staining methods.

Declarations

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Availability of data and materials

All data supporting our findings are provided in the manuscript.

Authors' contributions

JB and TL contributed to conception and design,the operation performed by JB, YCZ, CKW and TY contributed to data collection, YCZ and CKW drafted the article, TL revised the article.All authors approved the final version.

Ethics approval and consent to participate

The study has been approved by the ethics committee of Daping Hospital and the patient's oral consent has been obtained.The authors declare that they adhered to the CARE guidelines/methodology.

Consent for publication

Written informed consent for publication of potentially identifying information and clinical images was obtained from the patient.

Competing interests

The authors declare that they have no competing interests.

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Figures

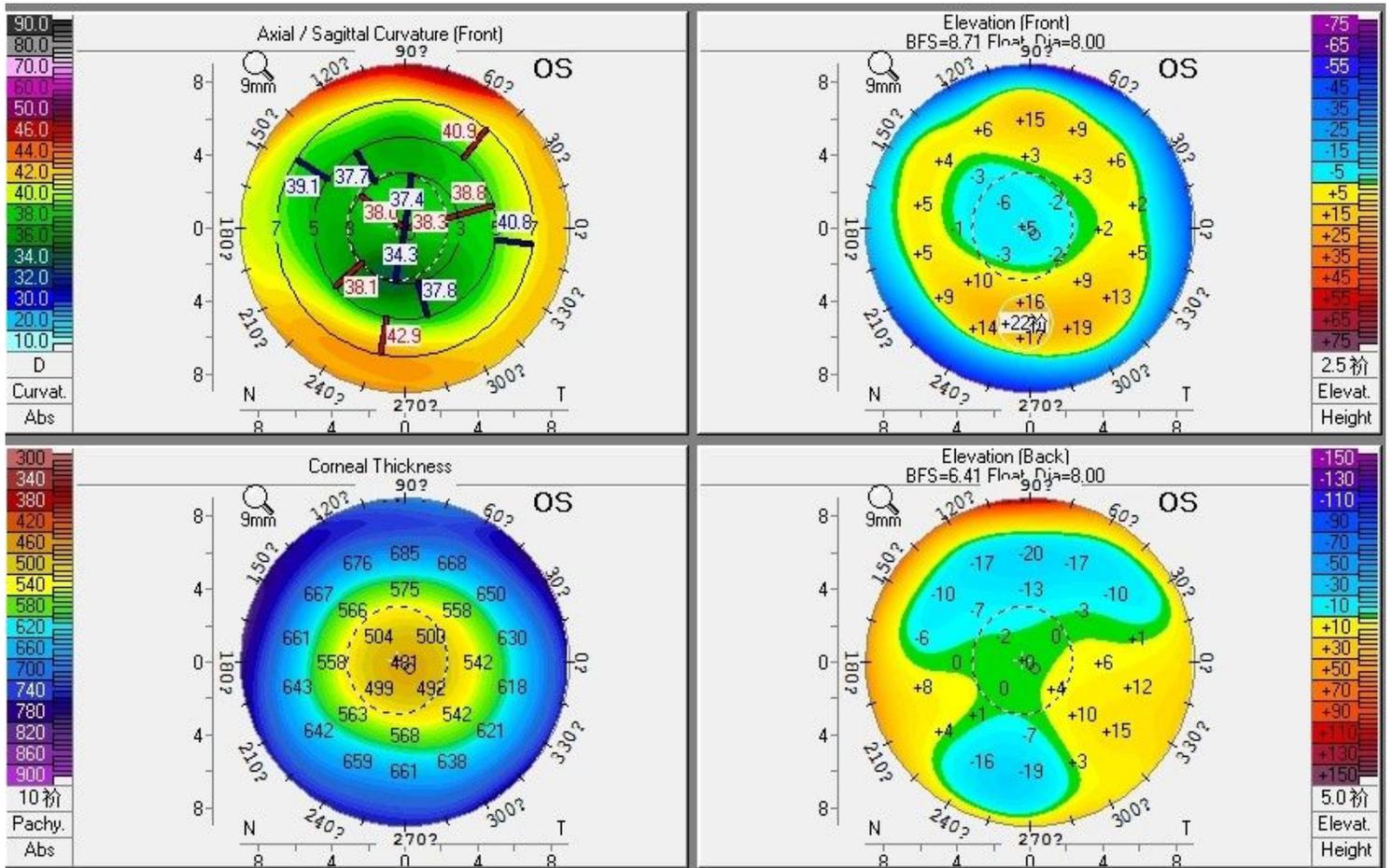


Figure 2

Corneal topography on the 1st day after the primary procedure.

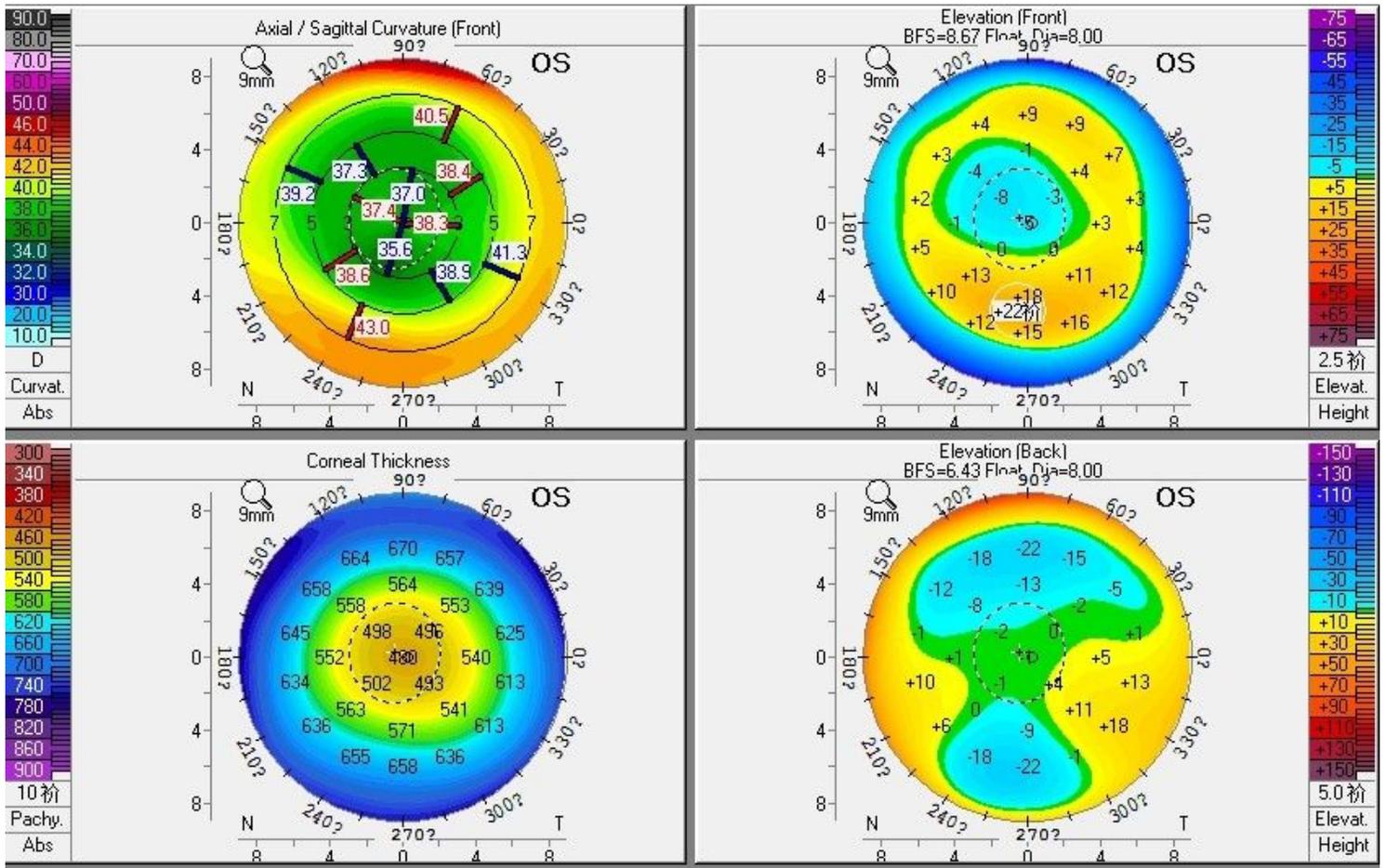


Figure 3

Corneal topography 1 week after the primary procedure.

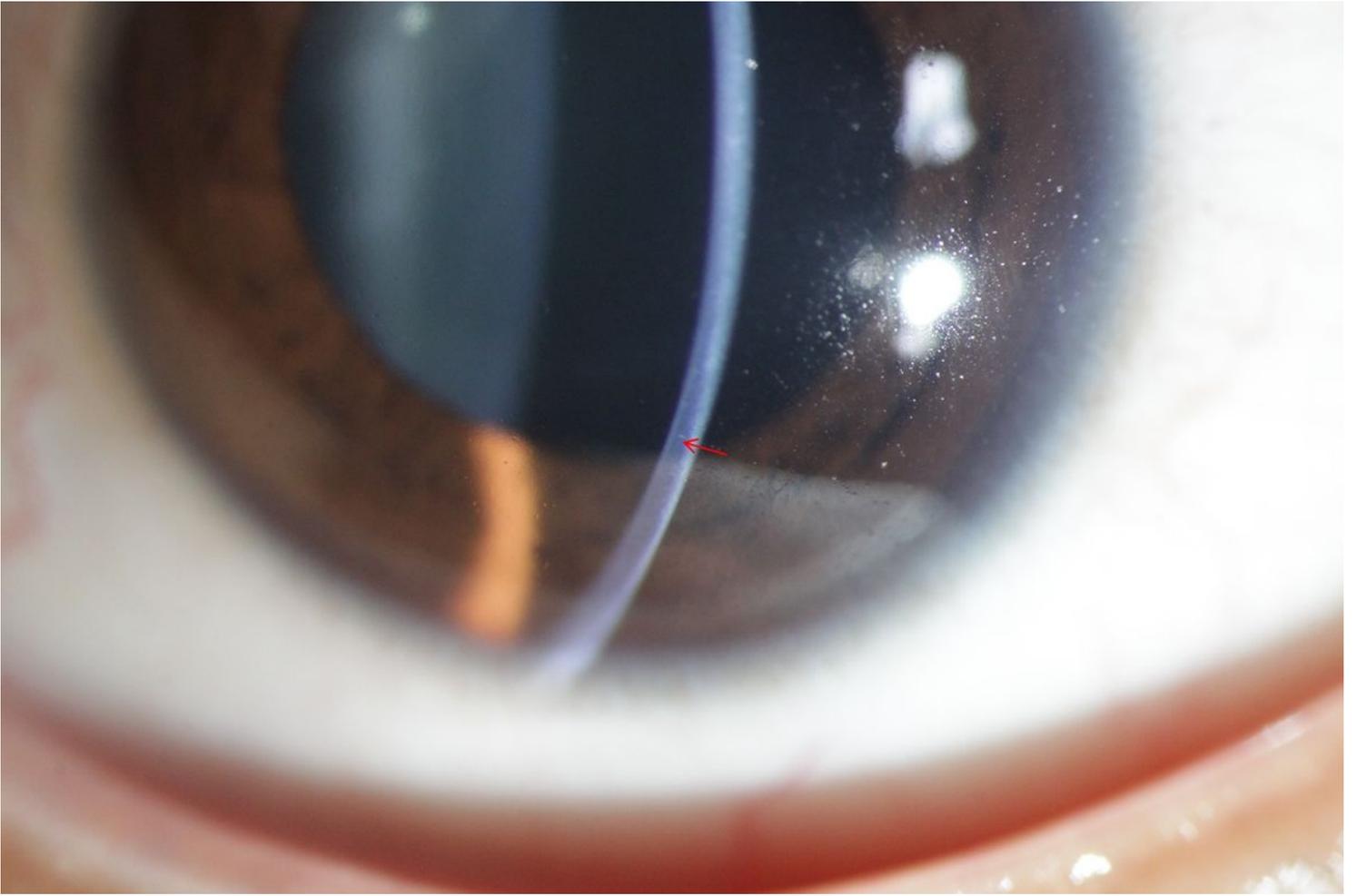


Figure 4

One week after SMILE; left eye slit lamp microscopy revealed a faint trace of pale lines under the left cornea.

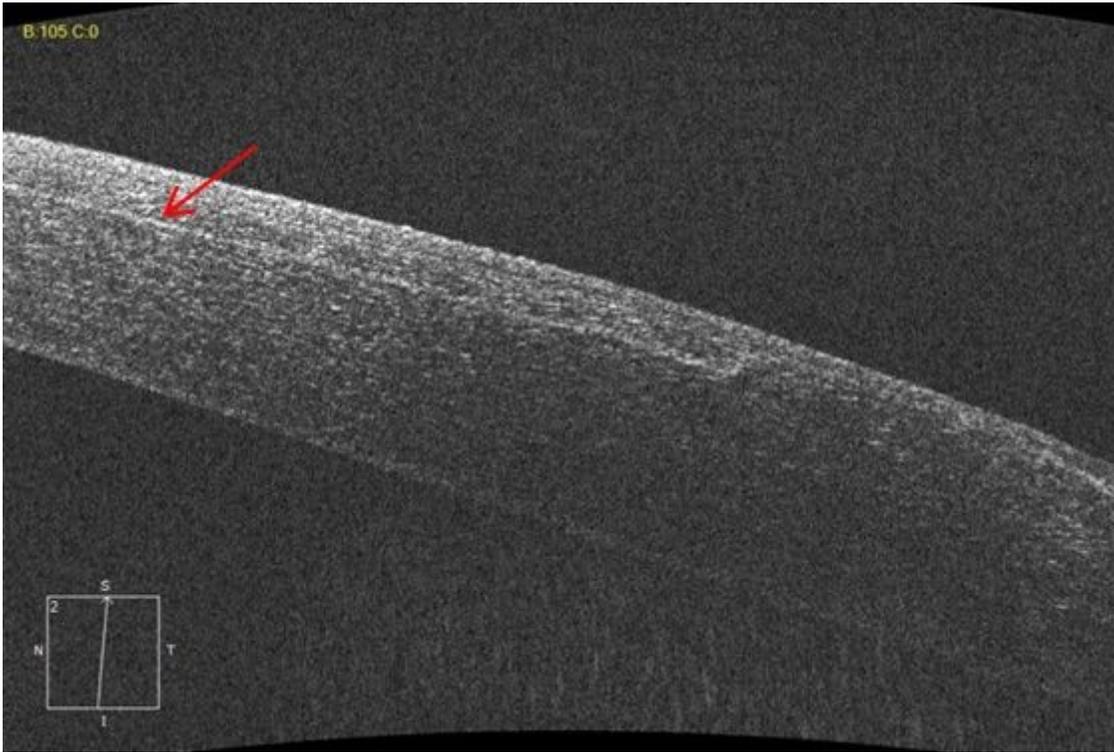


Figure 5

One week after SMILE; Cirrus HD-OCT anterior segment 5 line shows a high corneal stroma with reflective, irregular signals.

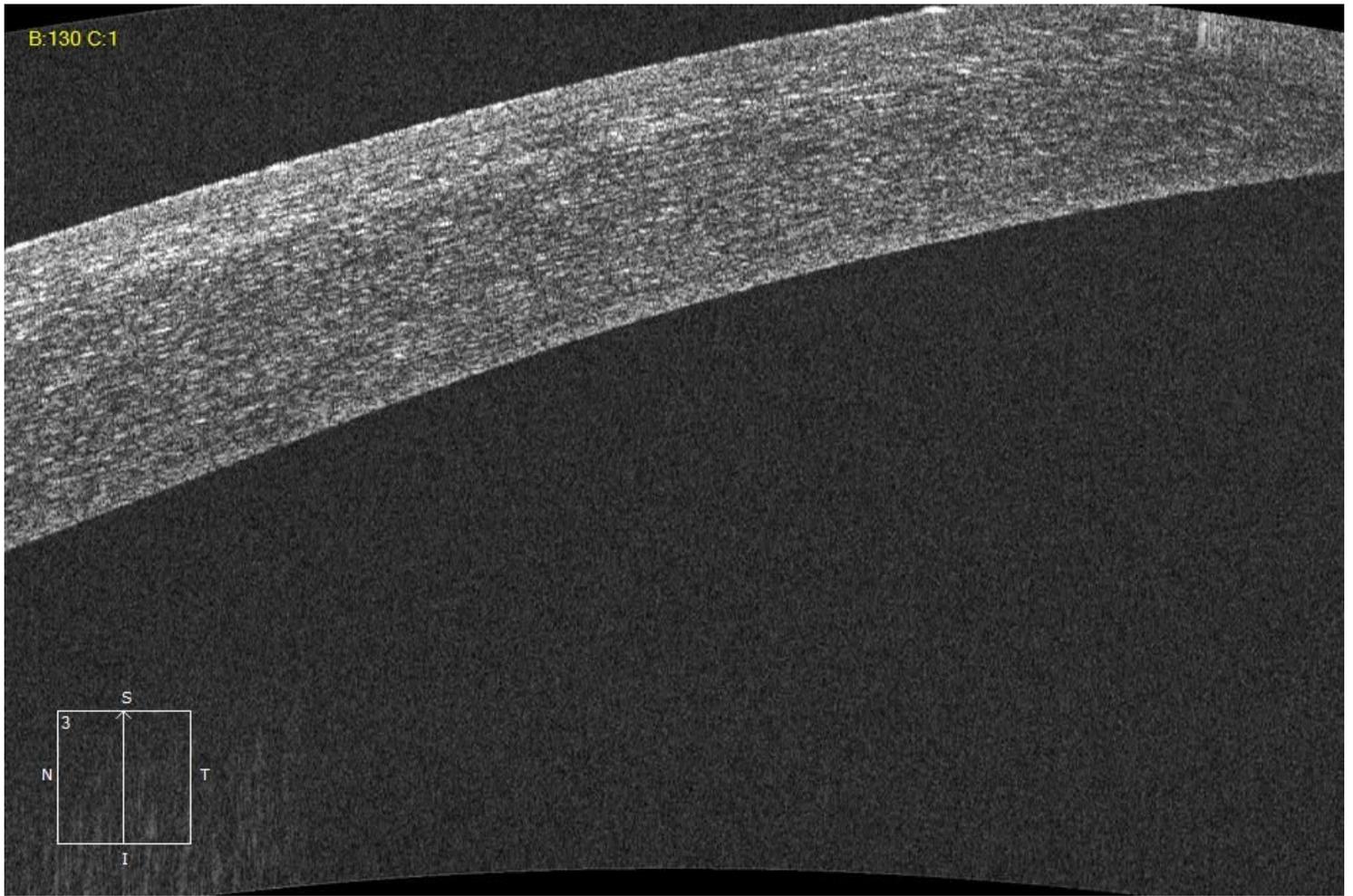


Figure 6

Left eye lenticule fragment removal; AS-OCT showed that high reflectance and irregular signals in the corneal stroma disappeared.



Figure 7

HE staining of the removed lens fragments suggested that the edges were not smooth, and the corneal stroma fibers ran irregularly.

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