Case report

Refractive surprise: twice the SMILE

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SUMMARY

A 35-year-old man presented with decreased vision in his left eye following small incision lenticule extraction (SMILE) surgery. The refractive error after surgery was nearly twice his preoperative refractive error in the left eye. The patient was diagnosed as having a retained lenticule after SMILE surgery, which was folded on itself and was successfully managed by conversion to a flap. Postoperatively, the patient maintained good uncorrected visual acuity and a low refractive error, with the best spectacle corrected acuity of 20/20.

BACKGROUND

Small incision lenticule extraction (SMILE) is gaining popularity and greater acceptance among surgeons and patients for correcting myopia and compound myopic astigmatism.^{1–3} The short term and long term results show good outcomes for safety and stability. The surgery appears to have a steep learning curve, especially in the removal of the lenticule from the pocket. A retained lenticule is not an infrequent complication of SMILE surgery and has been reported in about 3% of cases.⁴ This complication can lead to postoperative blurred vision with irregular astigmatism. The refractive error induced by a retained lenticule can be managed by a secondary surgery, such as surface ablation, or by converting the SMILE into a flap using the proprietary CIRCLE software (Carl Zeiss Meditec, Jena, Germany).^{5,6}

We present an unusual case of a folded retained lenticule after SMILE surgery, which presented with doubling of the refractive error post-SMILE, and its management.

CASE PRESENTATION

A 35-year-old man presented with complaints of blurred vision in his left eye (LE) for 1 month. He had previously undergone SMILE surgery elsewhere, 1 month previously. The patient's previous records revealed that he had a spherical refractive error of −6.5 D in both eyes. He reported good postoperative visual recovery in the right eye (RE) whereas his visual acuity decreased in the LE following surgery. On examination, his uncorrected distance visual acuity (UDVA) was 20/20 in his RE and counting fingers at 1 m in his LE. On refraction, his LE vision improved to 20/60 with −12.50 DS/−1.50 DC × 120. The RE was unremarkable except for a well apposed SMILE incision. The LE was noted to have a central mid-stromal clear zone with paracentral scarring ([figure 1A](#)).

On retroillumination, a retained lenticule was identified with a free dissected edge superiorly. The corresponding inferior edge was not visualised ([figure 1B](#)).

INVESTIGATIONS

On topography, the axial curvature map of the LE ([figure 2A](#)) showed central steepening with irregular astigmatism. Optical coherence tomography (OCT) scans of the LE ([figure 1C](#)) showed a hyporeflective mid-stromal space in the central cornea with a hyperreflective boundary in the inferior cornea. The central corneal thickness was 619 µm and the patient was diagnosed as having a retained lenticule.

TREATMENT

Under topical anaesthesia, the SMILE cap was converted to a flap of 7.8 mm with nasal hinge using the 'D' or junction up and down pattern of the CIRCLE software at 100 µm to access the retained lenticule. On lifting the flap, an intra-stromal pocket, similar to a new surgical plane, was identified inferiorly. The pocket appeared to have been created unintentionally by the previous surgeon while attempting dissection of the lenticule. The lenticule was noted to be inferiorly displaced and folded on itself in the inferior stromal bed and tucked partially into this pocket. The lenticule was dissected free and removed intact ([figure 1D](#)). The flap was replaced after a thorough wash of the interface with balanced salt solution.

OUTCOME AND FOLLOW-UP

On postoperative day 1, the patient had a UDVA of 20/60 which improved to 20/40 with pin hole. Interface haze was noted with surface irregularities. Postoperatively, the patient was started on prednisolone acetate 1% eye drops 1 hourly, moxifloxacin hydrochloride 0.5% eye drops four times a day and carboxymethyl cellulose 0.5% eye drops six times a day. Central stromal thickness on OCT decreased to 462 µm from a preoperative value of 560 µm.

At the 1 month follow-up, the patient had a UDVA of 20/60 and a best corrected visual acuity of 20/20 logMAR units with a refractive error of +2.50 DS. The mid-stromal scarring had decreased in density ([figure 1E](#), [figure 1F](#)) and on topography, the axial curvature map revealed central flattening ([figure 2B](#)). The patient was given tapering doses of 0.5% loteprednol etabonate eye drops.

Six months postoperatively, UDVA was 20/100 and best corrected visual acuity was 20/20 with a refractive error of +3.50 DS/−1.50 DC × 50 and

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Figure 1 (A) Preoperative diffuse illumination photograph showing paracentral stromal scarring. (B) Preoperative retroillumination photograph showing the superior edge (yellow arrow) of the retained lenticule, with no demarcation of the inferior edge (red arrow), cap opening incision (green arrow) and cap cut boundary (blue arrow). (C) Preoperative anterior segment-optical coherence tomography (AS-OCT) showing hyporeflective space in the mid-stroma, suggestive of a retained lenticule. (D) Gross photograph of the lenticule after removal. (E) Postoperative diffuse illumination photograph showing stromal scarring inferotemporally at the end of 2 months of follow-up. (F) AS-OCT, postoperative, suggestive of mid-stromal hyperreflective spaces in the area of stromal scarring after 2 months of follow-up.

Figure 2 (A) Axial curvature map of the left eye showing central steepening with irregular astigmatism. (B) Two months postoperatively, the axial curvature map showing flattening which also corresponded to central flattening in the right eye (39 D).

the stromal scar was less dense. The patient elected not to have any further surgical intervention and was prescribed glasses.

DISCUSSION

Lenticule dissection during SMILE is an important and difficult part of the surgery. Lack of proper identification of the edge of the lenticule, incomplete dissection from the underlying stroma and creation of a second plane with a sharp instrument due to poor visualisation can be some of the causes of this complication. The retained lenticule may be total or partial, and central or peripheral.

Management of a retained lenticule after SMILE has been described previously.⁷⁻¹⁰ A retained lenticule in the visual axis almost always warrants removal as it causes significant refractive error; small peripheral ones may be left alone if not visually significant. In a case series by Ganesh *et al*, one of the cases presented with irregular astigmatism due to a folded lenticule,⁷ whereas in our case, the spherical refractive error doubled due to the lenticule folding on itself. This was probably due to the lenticule being impacted within the artificially created stromal pocket with the central part of the lenticule folded on itself leading to a doubling of the refractive error. The doubling of the refractive error was also reflected by the keratometry values of the patient. The preoperative central keratometry value of the patient before surgery was 44.6 D, whereas after surgery it was 49.0 D. This increase in 4.4 D corresponds to an increase of refractive power of 5.2 D at the spectacle plane, hence the increase in myopia from 6.5 to 12.5 D.

The case was managed by converting the SMILE cap to a flap by CIRCLE software, as described previously. Immediate improvement in distance acuity was noted with removal of the lenticule. The surgical challenge in this case was identification of the cause of the increased refractive error and separating the lenticule from the lamellar planes of dissection. This was overcome by careful blunt dissection of the bed and by tracing the margins of the inner and outer circle of the original SMILE surgery. The postoperative keratometry values then decreased to 37.7 D and the patient has hyperopia of 3.5 D. This hyperopia can be explained by the excessive flattening that is seen instead of the anticipated flattening on keratometry for a 6.5 D correction. Recently, Ganesh *et al*¹⁰ have described two cases of retained lenticule which were managed successfully using the CIRCLE software.

Learning points

- ▶ Dissection of the lenticule is a critical step in SMILE surgery and should always be done meticulously.
- ▶ Doubling of the refractive error can be due to a retained lenticule folded in on itself.
- ▶ Such cases can be managed by converting the SMILE into a flap with help of CIRCLE software, dissecting the retained lenticule free of its adhesion and then removing it.

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