

# Treatment of retinal detachment after laser *in situ* keratomileusis

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## Abstract

• **AIM:** To study the characteristics of retinal detachment surgery after laser *in situ* keratomileusis (LASIK).

• **METHODS:** Eleven eyes of ten patients that experienced rhegmatogenous retinal detachment after LASIK procedure participated in the study. The characteristics of retinal detachment, management and complications after surgery were analyzed.

• **RESULTS:** Retinal detachment was characterized by the large percentage of multiple peripheral holes (73%) and giant tears (27%). All eyes underwent sclera buckling, and three of them combined with pars plana vitrectomy (PPV) and silicone oil tamponade. Silicone oil was removed after 1 month. Retina was reattached successfully at the first retinal detachment surgery in all eyes except one that succeeded at the fourth time. One eye of LASIK flap dehiscence and one eye of corneal subepithelial opacity occurred after surgery.

• **CONCLUSION:** Patients after LASIK should be carefully examined under pupillary dilation during follow-up. Sclera buckling is necessary to most retinal detachment after LASIK, and corneal protection is important in the treatment.

• **KEYWORDS:** LASIK; retinal detachment; sclera buckling

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## INTRODUCTION

Laser *in situ* keratomileusis (LASIK) has been one of the most popular options for the treatment of ametropias. As this technique is widely used, more concern has been focused on its safety and effects on the vitreous and retina. Arevalo *et al*<sup>[1]</sup>, Ruiz-Moreno *et al*<sup>[2]</sup> and Ozdamar *et al*<sup>[3]</sup> reported

eyes of retinal detachment after refractive surgery. There was no enough evidence to show that the retinal detachment was related to LASIK procedure, however, more considerations should be taken into retinal detachment surgery under such conditions. The ten cases we reported were consecutive rhegmatogenous retinal detachment after LASIK procedure at our institution.

## MATERIALS AND METHODS

**Materials** Among the 10 patients, 5 were male and 5 were female. Five eyes had laser coagulation of retinal lattice degeneration before LASIK procedure. One eye had photorefractive keratectomy (PRK) before LASIK. In these eyes, retinal detachment occurred from 1 month to 24 months after LASIK procedure (mean 6.09 months). Giant retinal tears were found in three eyes, and two of them combined with multiple peripheral holes. Pars plana vitrectomy (PPV) in combination with intraocular laser coagulation, silicone oil tamponade and encircling band were performed in them. Silicone oil was removed after 1 month. Eight eyes had multiple peripheral retinal breaks or broad retinal degeneration, they were managed with cryopexy, silicone sponge and encircling band.

## Methods

**Case 1** A 34-year-old man with high myopia in both eyes (-16.00D in the right eye) visited our institution because of unsatisfactory result of refractive correction 1 month after LASIK. The visual acuity was 0.01 in the right eye, and dilated funduscopy showed retinal detachment with giant tear 8 to 12 o'clock, with tear flap reversing to the disk (Figure 1A). He underwent PPV, endolaser retinopexy, silicone oil injection and encircling band. One month later, the silicon oil was removed and the retinal reattachment was achieved with visual acuity of 0.1 (Figure 1B).

**Case 2** A 24-year-old male patient with -8.00D in the right eye visited our institution because of vision loss for 1 week and giant retinal tear was observed on examination. He underwent LASIK procedure 2 months later. The retina got reattached with normal intraocular pressure and clear cornea after PPV, endolaser retinopexy, silicone oil injection and encircling band. One week later, the patient complained foreign body sensation, pain and tearing. Debris was found in the central of cornea beneath the LASIK flap in the right eye. Fluorometholone and hyaluronate sodium eye drops were prescribed, and the cornea got clear again with visual acuity of 0.3 two weeks later.

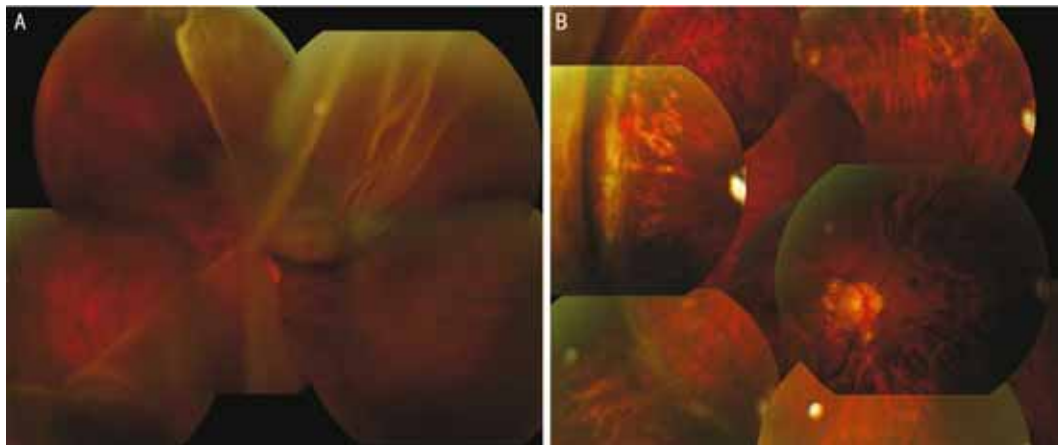


Figure 1 Case 1 A: Fundus photograph of case 1 shows giant tear 8 to 12 o'clock with tear flap reversing to the disk; B: After removing of silicon oil, the retina got reattached.

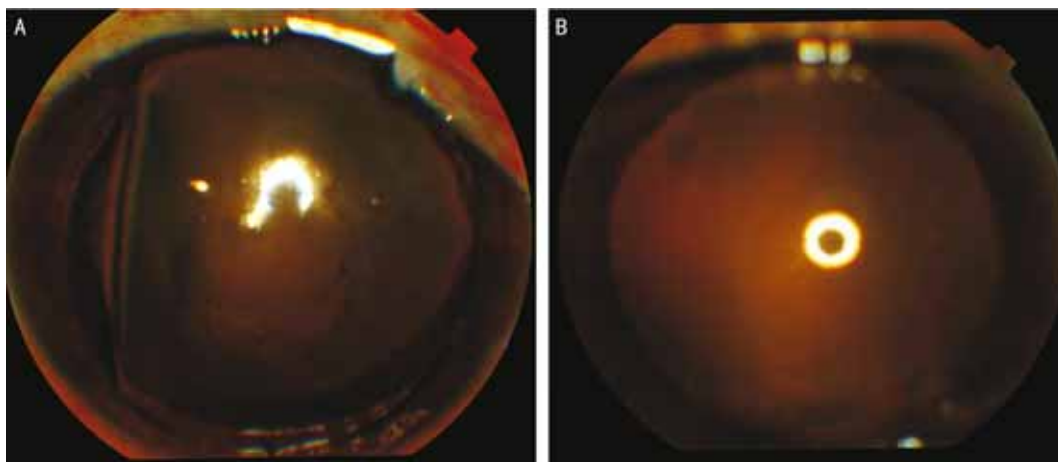


Figure 2 Case 3 A: Slit-lamp photograph of LASIK flap dehiscence 1 day after retinal detachment surgery in case 3; B: The flap reattached and cornea got clear.

**Case 3** A 29-year-old man with high myopia in both eyes (-12.00D in the left eye) visited our institution because of vision loss in the left eye for 1 year after LASIK procedure. The visual acuity was 0.02 with a total retinal detachment, broad peripheral lattice degeneration and atrophic holes. Hyaluronate sodium eye drops were used to protect cornea as routine for 3 days before transclera cryopexy and circumferential sclera buckling. Debridement of central corneal epithelium (5mm by 5mm) was performed because epithelial edema made it impossible to see the fundus clearly during the surgery. On examination of the first day after surgery, the retina got reattached, while the LASIK flap dehisced and reversed about one quarter subepithelium (Figure 2A). After relocation of the corneal flap twice and wearing soft contact lens, the flap was reattached. At the end of follow-up, the flap was repositioned completely, with inferior epithelium a little thinner and a macular approximately 2mm by 3mm. The visual acuity was 0.3 (Figure 2B).

**Case 4** A 20-year-old woman who had LASIK procedure in both eyes (-12.00D in the right eye; -13.00D in the left) with prophylactic laser photocoagulation complained about vision loss in the right eye 1 month later. Dilated funduscopy showed retinal detachment with multiple peripheral holes. After transclera cryopexy and circumferential sclera buckling,

the best-corrected visual acuity (BCVA) was 0.7. Seven months after LASIK, rhegmatogenous retinal detachment in the superonasal was observed on examination in the left eye. Retina reattached after cryopexy, and the visual acuity of 1.2 was preserved for 1 month. However, a new giant tear in the temporal quadrant was found without macular off. The flap tear repositioned after laser photocoagulation and  $C_3F_8$  injection for 10 days. Then the flap detached again with macular region involved. PPV, endolaser retinopexy, cryopexy, encircling band and  $C_3F_8$  injection were carried out. Two months after the procedure, another two holes occurred with total retinal detachment, inferonasal at first, and 6 o'clock next. The retina got reattached with silicon oil tamponade after repeated surgeries. Her BCVA in the left eye was 0.1.

## RESULTS

Retinal detachment was characterized by the large percentage of multiple peripheral holes (73%) and giant tears (27%) in these cases. All the eyes got retina reattached at the first surgery except case 4, which experienced cryopexy, argon laser retinopexy with  $C_3F_8$ , PPV combined with sclera buckling,  $C_3F_8$ , and in the end silicone oil tamponade.

## DISCUSSION

Retinal detachment is a complication of myopia due to a series

of vitreoretinal abnormalities such as longer axial length, lattice degeneration, poor blood circulation and nutrition. Although LASIK is a popular surgical option for correcting myopia, retinal detachment after LASIK raised questions on its safety and complications. Some studies have been focused on the relationship between LASIK procedure and retinal detachment. Aras *et al*<sup>[4]</sup> reported 10 eyes (0.22%) were observed of retinal detachment, retinal tears and posterior vitreous detachment in 4432 eyes at 5.2 months after LASIK; Arevalo *et al*<sup>[5]</sup> then reported that 20 eyes (0.06%) developed retinal detachment in 31 739 eyes during 36 months following up. Retinal detachment occurred at a mean of 13.9 months after LASIK. The frequency of retinal detachment in these reports was lower than that of myopia eyes in general, which was explained that all the patients had preoperative examination including dilated funduscopy or even prophylactic argon laser coagulation before LASIK surgery was performed<sup>[6]</sup>.

In the study, the earliest retinal detachment occurred 1 month after LASIK procedure. The mean time interval between LASIK surgery and retinal detachment was 6.09 months (range 1 month to 24 months), which was shorter than that of most reported cases. A multi-center study in China reported retinal detachment occurred at mean of 11.21 months<sup>[7]</sup>. It may relate to the different axial length between Eastern and Western myopic patients. We believe all patients should receive careful fundus examination during the follow-up of LASIK, however, the manipulation may lead to corneal complications immediately after LASIK surgery. So, we suggest patients have fundus examination under pupillary dilation once a week after LASIK for 1 month, and then once a month for at least 1 year. In addition, the manipulation during the examinations should be gentle in the whole follow-up.

The characteristic of retinal breaks in our study was the large percentage of multiple peripheral holes (73%) and giant tears (27%). Arevalo *et al*<sup>[5]</sup> reported the mean number of retinal breaks per RRD was 3.1 (range 1 to 9). Feki *et al*<sup>[8]</sup> reported two cases of giant tears in 15 eyes. Hernández-Ortega *et al*<sup>[9]</sup> also reported bilateral retinal detachment associated with giant retinal tear following LASIK. The unusual occurrence of giant tears and multiple holes, along with short time interval between LASIK and retinal detachment cast doubt on the effects of LASIK procedure. Generally, the effects of LASIK surgery to vitreous and retina are considered as the sudden increase of intraocular pressure mechanical stress induced in the eye by shock waves of the excimer laser<sup>[3]</sup> and ischemic status of optic nerve and retina<sup>[5,10,11]</sup>. Mirshahi *et al*<sup>[12]</sup> found that during the suction, the lens thickness decreased, whereas the vitreous distance increased, suggesting anterior traction on the posterior segment.

There may be vitreous modification, synchysis, and posterior vitreous detachment in high myopia eyes, along with multiple retinal degeneration. So, any disturbance to the vitreous by surgeries is a risk factor to normal structures and functions of

the retina. Five eyes had prophylactic laser coagulation in our series. Those who need prophylactic treatment of peripheral lesions usually have poor conditions of retina. They have a tendency to develop retinal breaks and detachment under intense physical activities or shock of head even if no surgeries are performed. There is no enough proof that LASIK procedure can cause bad effects to the vitreous and retina instantly or in the long run. So, patients who are proposed to have LASIK surgery should get preoperative examination carefully to find any lesions for prophylactic treatment and have a consideration of balancing the advantages and disadvantages of the surgery.

There are few comments on the treatment for retinal detachment after LASIK, and most believe that it will result in good vision. Ruiz-Moreno *et al*<sup>[2]</sup> observed a significant increase in the myopic spherical equivalent after scleral buckling. Arevalo *et al*<sup>[5]</sup> suggested to handle it without scleral buckling in case changing the shape or length of the globe when appropriate. However, only PPV with intraocular tamponading seemed inefficient to these retinal detachments, which were characterized by a large percentage of multiple holes, inferior holes as part of them of course. It is well known that intraocular tamponading can not act well on inferior retinal breaks. Although some reported that pneumatic retinopexy could achieve good results to inferior breaks, the potential complication of large intraocular pressure rise may be a risk factor to LASIK flap. Besides, in our study the patients were relatively young and there may be strong vitreoretinal adhesion. This condition made complete removal of the cortical vitreous more difficult during vitrectomy, resulting in complications, such as new breaks occurring or proliferative vitreoretinopathy<sup>[13]</sup>. In summary, we found scleral buckling a better choice when some cases showed peripheral tears and broad degeneration.

Take case 4 for example; the patient had bilateral retinal detachment with prophylactic laser photocoagulation for bilateral retinal degeneration before LASIK. Her right eye developed retinal detachment with multiple peripheral holes and achieved BCVA of 0.7 after cryopexy and scleral buckling. However, retinal tears appeared one by one in the left eye with good vision. It is the good vision that made us reluctant to perform scleral buckling till the macular was involved. Repeated surgeries made the patient despondent and resulted in complicated cataract. What's the key point under such condition? Should we perform scleral buckling without hesitation, or try to save her refractive condition after LASIK as possible as we can? We realized the complexity of such retinal detachment, and more factors should be taken into consideration before we select a treatment.

Corneal complications were other characters of retinal detachment after LASIK. We took hyaluronate sodium eye drops as routine for patients 3 days before surgery. In our series, corneal edema was observed at the beginning of retinal detachment surgery in an eye 1 year after LASIK, and the LASIK flap dehisced after the surgery. Another patient, who

underwent LASIK 2 months before, appeared opacity under corneal flap 1 week after retinal detachment surgery. Both patients had topical corticosteroid therapy, and resulted in clear cornea. The two patients called our attention to the cornea protection during examination and surgeries when we treated retinal detachment patients after LASIK. The protection of eye drops to cornea seemed limited and corneal edema may occur if proparacaine is used frequently or three-mirror examination for a long time. Sachdev *et al*<sup>[14]</sup> described a case of epithelial defect secondary to prolonged intraoperative exposure to topical anesthesia.

Besides, stretch during the surgery may cause inversion of corneal flap<sup>[15]</sup>. So we suggested to use corneal protective eye drops before operation and less topical anesthesia during the surgery. In addition, do not debride the epithelial as possible as you can, and manipulate gently in case of displacement of corneal flap. Encircling band is needed when there are multiple peripheral holes or giant tears in myopia eyes. The changes of corneal curvature, as the result of sclera buckling may affect corneal flap especially just a short while after LASIK. Surgeons should regard complications such as opacity under flap or even displacement of flap during the follow up and treat it in time.

In summary, LASIK is still a well acceptable option for the treatment of myopia nowadays, however, retinal detachment after LASIK exists and the treatment needs more consideration. Compliance with the follow-ups of LASIK is expected in the patients.

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#### 准分子激光术后视网膜脱离的病例分析

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#### 摘要

**目的:**探讨准分子激光术后视网膜脱离手术的特点。

**方法:**本研究选取准分子激光术后发生视网膜脱离患者10例(11眼),着重分析11眼的视网膜脱离特点,处理方法及手术并发症。

**结果:**视网膜脱离以多发裂孔(73%)和巨大裂孔(27%)为显著特征。所有患者行巩膜扣带术,其中3例联合玻璃体切割及硅油填充术。术后1mo取出硅油。9例患者视网膜均在首次手术中复位。术后发生LASIK角膜瓣脱离1例和角膜上皮混浊1例。

**结论:**准分子激光术后患者在随访中应密切观察,必要时散瞳检查,准分子术后视网膜脱离的手术中,巩膜扣带术是必要的,术中要注意保护角膜组织。

**关键词:**准分子激光原位角膜磨镶术;视网膜脱离;巩膜扣带术