

# Resolution of myopic macular schisis following cataract phacoemulsification

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Received: 2023-07-09 Accepted: 2024-04-17

**DOI:10.18240/ijo.2024.08.23**

**Citation:** Li YT, Jiang B, Chen XZ, Ren H, Xiao YH, Song ZY, Lu PR. Resolution of myopic macular schisis following cataract phacoemulsification. *Int J Ophthalmol* 2024;17(8):1568-1570

**Dear Editor,**

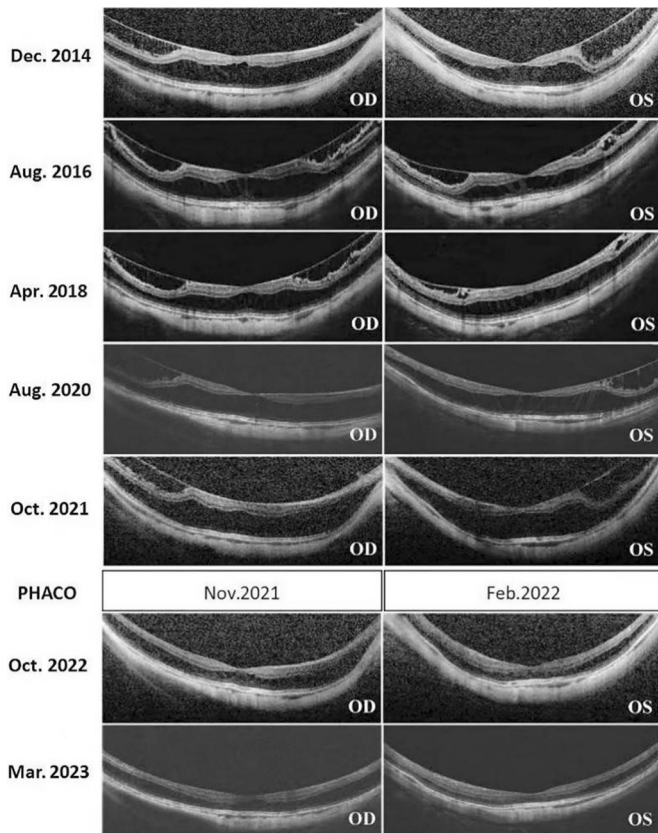
We write to introduce a case of high myopia who had bilateral macular schisis along with cataracts. During the following-up period from 2014 to 2021, the severity of macular schisis gradually worsened. However, following cataract surgery, there was a gradual improvement in the macular schisis, ultimately leading to near-complete resolution. We obtained the written informed consent from the patient, and this case study adhered to the principles in the Declaration of Helsinki.

## CASE PRESENTATION

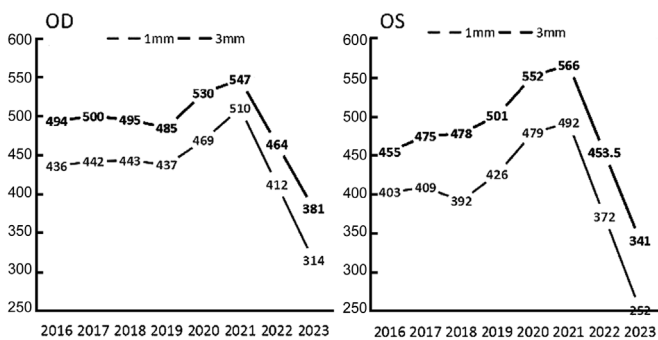
A 47-year-old male initially presented to the ophthalmology department in 2014, with a complaint of “blurred vision in both eyes”. The patient had a history of high myopia, characterized by an axial length exceeding 30 mm. Furthermore, the patient had previously undergone bilateral radial keratotomy, which resulted in significant corneal astigmatism. Upon slit-lamp examination, radial scars were observed on the corneal surface, along with reactive pupils and a cloudy lens. Optical coherence tomography (OCT) examinations of both eyes demonstrated macular schisis. Following the initial evaluation, the patient was enrolled in annual follow-up appointments with regular OCT examinations. The OCT provided cross-sectional views

of the macular fovea, allowing for the evaluation of the retinal condition. Additionally, the analysis of retina map model of OCT, which is used to measure retinal thickness within different diameter ranges of the macular area, revealed a significant thickening process (Figures 1 and 2).

On October 19, 2021, the patient sought treatment due to a significant decline in vision. Best-corrected visual acuity in both eyes was measured at 0.1, and clear signs of nuclear cataract were observed. OCT examination confirmed the persistence of macular schisis, which had even worsened compared to previous assessments. After extensive communication and consideration, it was decided to prioritize cataract surgery in both eyes, with the acceptance of the possibility of performing pars plana vitrectomy (PPV) if the macular schisis continued to deteriorate. On November 10, 2021, the patient underwent cataract surgery in the right eye, with the implantation of a +12.0 D Rayner intraocular lens (IOL). The unaided visual acuity on the first day after surgery improved to 0.4, and the intraocular pressure was measured at 18 mm Hg. During the follow-up examination on December 24, 2021, OCT revealed significant improvement in temporal traction within the macula of the right eye, and central macular thickness showed a tendency towards normalcy. On February 18, 2022, the patient underwent cataract surgery in the left eye, with the same +12.0 D Rayner IOL implanted. Similar to the previous procedure, the unaided visual acuity on the first day post-surgery was 0.4, and the intraocular pressure measured 14 mm Hg. On October 20, 2022, OCT indicated inner maculoschisis had resolved and outer maculoschisis was still present. During the ocular examination in March 2023, the refractive status of both eyes was approximately -3.00 D. The best correct visual acuity was measured at 0.5 in the right eye and 0.6 in the left eye. There were no signs of abnormal conjunctival congestion, the presence of radial corneal scars, or abnormalities in anterior chamber depth. The IOLs were correctly positioned. Fundus examination revealed myopic fundus changes, while OCT indicated that retinal anatomy and thickness was almost within normal limits in both eyes (Figures 1 and 2).



**Figure 1 OCT manifestations before and after phacoemulsification**  
 From 2014 to 2021, the OCT morphology of the macula showed a progressive worsening of macular schisis located in both inner and outer retina. About one year after cataract surgeries, the severity of the schisis was reduced to near normal and recovery of inner retinal split occurred before recovery of outer retinal split. OCT: Optical coherence tomography; OD: Right eye; OS: Left eye.



**Figure 2 Retinal thickness before and after phacoemulsification**  
 The average retinal thickness within different diameter ranges of the macular area, as depicted in the retina map mode of OCT, exhibited a significant increase during 2014 to 2021. There was a notable decrease in retinal thickness, approaching a near-normal level after 2022. OD: Right eye; OS: Left eye; OCT: Optical coherence tomography.

## DISCUSSION

High myopia is commonly associated with three major complications in the retina: atrophy, traction, and neovascularization (ATN). Macular schisis, a tractional retinal disorder, and is characterized by the separation of retinal layers, leading to an increase in retinal thickness. Macular

schisis can have a significant impact on visual function and tends to worsen progressively over time, potentially resulting in macular holes and retinal detachment<sup>[1]</sup>.

OCT is a commonly used visual examination method for assessing myopic macular schisis. A recent advancement in this field is the introduction of the Myopic Traction Maculopathy Staging System (MSS), which employs OCT morphology and disease progression to classify the stages of myopic macular schisis<sup>[2]</sup>. Studies have indicated a diverse progression of macular schisis<sup>[3]</sup>. Changes towards milder stages may involve the spontaneous resolution of macular schisis, while changes towards more severe stages can lead to the development of macular holes with or without retinal detachment.

Several studies have suggested that posterior vitreous detachment (PVD) may contribute to the spontaneous resolution of macular schisis<sup>[4]</sup>, also supported by the fact that surgical release of traction can achieve better anatomical restoration<sup>[5]</sup>. However, alternative viewpoints propose that the self-resolution of macular schisis is not strongly associated with PVD<sup>[6]</sup>, but rather with the rupture of the internal limiting membrane (ILM)<sup>[7]</sup>. Lai *et al*<sup>[8]</sup> reported spontaneous reattachment not associated with PVD or ILM rupture, even in cases that had undergone PPV.

In our case, the OCT images did not show the presence of posterior vitreous interface or signs of ILM rupture during the process. We hypothesize that changes in the forces exerted on the retina may play a critical role. The retina is subjected to traction not only from the vitreous but also from the choroid, ILM, and internal forces within the retina. When these forces remain stable, the retina maintains its normal structure, and the schisis may persist in a stable state over time. However, with advancing age, changes in vitreous strength, increasing myopia, or surgical interventions, the forces acting on the retina can shift from one stable state to another.

In this case report, we present a patient with myopic macular schisis whose condition gradually improved during the follow-up period after cataract surgery. Over a span of 10y, the patient's retina experienced forces from various sources, including pressure fluctuations following cataract surgery. It has been reported that spontaneous improvement of myopic foveoschisis may be related to the change of posterior scleral curvature<sup>[9]</sup>. These factors may have induced qualitative changes in the traction forces acting on the retina, ultimately leading to the process of the schisis.

This case study provides insights into the management of myopic macular schisis in patients with cataracts. The management of cataracts combined with retinal diseases such as macular schisis poses a challenge in determining the optimal timing and approach for surgery. Mirshahi *et al*<sup>[10]</sup> reported that a significant portion of post-phacoemulsification PVDs

occurred within the first month after surgery. Ashraf *et al*<sup>[11]</sup> suggested that uncomplicated phacoemulsification had no significant effect on pre-existing macular abnormalities in eyes with high myopia up to 6mo of follow-up. Hayashi *et al*<sup>[12]</sup> proposed that after cataract surgery, PVD progressed faster in eyes with high myopia, indicating that highly myopic eyes are at considerably higher risk for retinal disease postoperatively. Currently, there is no consensus on the ideal timing for vitreous surgery in cases of macular schisis, and performing cataract surgery alone may potentially exacerbate the condition.

Although more cases and longer period of follow up are needed before objective conclusions can be drawn, we speculate that intraoperative fluctuations in intraocular pressure, which can result in the detachment and release of vitreoretinal traction, could be a significant factor contributing to the improvement of the schisis. Further comprehensive research could be focused on to transform these uncontrollable factors during cataract surgeries into controllable ones to alleviate retinal schisis. Exploring the potential impact of intraoperative intraocular pressure fluctuations on intraocular tissues is a valuable topic for future investigations. It holds promise for further exploration and has the potential to enhance our understanding and management of myopic macular schisis in patients undergoing cataract surgery.

### ACKNOWLEDGEMENTS

**Conflicts of Interest:** Li YT, None; Jiang B, None; Chen XZ, None; Ren H, None; Xiao YH, None; Song ZY, None; Lu PR, None.

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