Ophthal Focus

Dear Doctor,

Greetings from Micro Labs Limited. We are happy to bring you 'Ophthal Focus' which contains latest and interesting news in the field of Ophthalmology.

This issue contains

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- **Optical performance and safety of Novel Optical Design Multifocal Intraocular Lens**
- **Combination of Endoscopic Vitrectomy with 3D Heads-Up Visualization for Managing Traumatic Eye Injuries**
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Relationship Between Myopia and Dry Eye Disease

INTRODUCTION

DRY EYE

A high prevalence of dry eye disease (DED) was observed among teenagers with high myopia. There may be a reciprocal association between DED and myopia.

Myopia is characterized by a spherical equivalent refractive error of -0.50 diopters or less in the eye.[1] In high myopia (HM), the spherical equivalent refractive error is -6.00 diopters or greater when ocular accommodation is relaxed. HM can severely affect uncorrected vision and may lead to serious complications such as macular degeneration, retinal detachment, glaucoma, and cataracts, potentially resulting in blindness.[2] Dry eye disease (DED) is a complex condition affecting the eye and tear film, which can cause damage to the ocular surface.[3] Short tear film break-up time (BUT) type DED has been linked to users of visual display terminals (VDTs), such as smartphones. The rising prevalence of myopia among teenagers was likely related to the extensive use of these devices. Despite these observations, the connection between DED and high myopia (HM) has not been thoroughly explored. Recent studies have found a significant association between BUT and choroidal thickness, which correlates with axial length (AL); additionally, both AL and refraction have been linked to DED.[2] Therefore, this study aimed to explore the connection between DED and HM in a large cohort of teenagers.

METHODS

This retrospective, cross-sectional study, conducted in a clinical setting, evaluated DED in teenagers aged 10 to 19. Participants were included if they had a best-corrected visual acuity of better than 20/30 and were categorized into three groups: 106 with high myopia (HM, ≤ -6.00 D), 494 with mild myopia (MM, >-6.00 D and < -0.50 D), and 82 with no myopia (NM, ≥ -0.50 D). Subjective refraction and anisometropia were assessed, and DED symptoms such as dryness, irritation, pain, fatigue, blurring, and photophobia were recorded using a questionnaire. Tear film BUT and fluorescein corneal staining were also examined. Comparisons among the groups and regression analyses of myopic error and other variables were performed.

RESULTS

The prevalence of DED symptoms across the three groups as depicted in Figure 1. Dryness was notably more common in the HM group compared to both the MM and NM groups. Conversely, the HM group reported significantly lower levels of pain and photophobia compared to the NM group. There were no significant differences in irritation, blurring, or fatigue among the groups. Regression analysis showed a significant correlation between myopic error, astigmatic error, and anisometropia. This pattern persisted even after adjusting for age and sex. Additionally, parameters related to DED, such as reduced BUT and diagnosed DED, were significantly associated with myopic error. Dryness correlated positively with the degree of myopic error, while pain and photophobia had an inverse correlation.

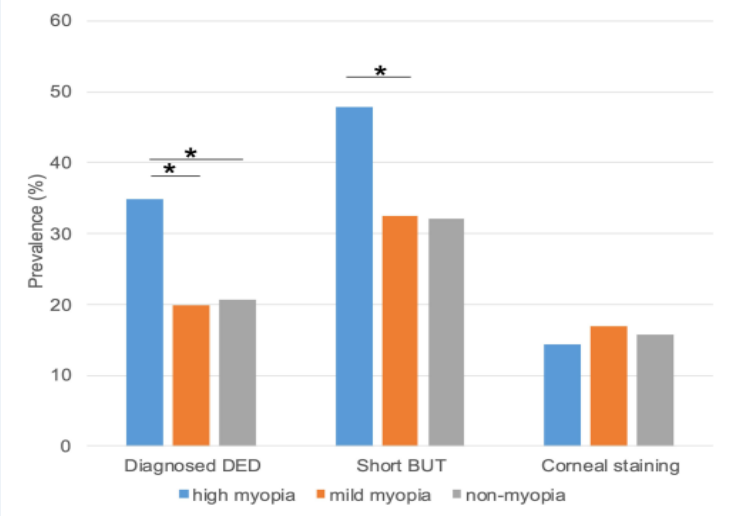

Figure 1. Prevalence of symptoms associated to dry eyes in teenagers with a myopic. The group with high myopia was most affected by both short BUT and diagnosed DED. Regarding corneal staining, no significant differences were found.

DISCUSSION

The HM group exhibited a significantly greater prevalence of diagnosed DED, reduced tear film BUT, and dryness. This finding aligns with previous reports indicating that as tear film break-up time decreases, the axial length (AL) tends to increase.[4] Individuals who engage in more near work were at a higher risk for both evaporative DED, which impacts tear film BUT, and changes in choroidal thickness, which can influence axial length. Additionally, the use of fluorescein instillation to assess tear film could trigger reflex tearing and relies on subjective evaluation, which represents a limitation of this study.[5]

CONCLUSION

A high prevalence of DED was observed among teenagers with high myopia, and a notable link between myopic error and tear film BUT was discovered. Short BUT, astigmatism, and anisometropia in patients with high myopia may reflect significant changes in the ocular surface and could contribute to the development of high myopia through a reciprocal relationship.

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Optical performance and safety of Novel Optical Design Multifocal Intraocular Lens

INTRODUCTION

Patients having cataract surgery demonstrated a broad range of visual acuity with the new multifocal IOL with a unique optical concept (5 foci), notably at intermediate and distant distances.

Cataract surgery with intraocular lens (IOL) implantation is one of the most commonly performed procedures in contemporary medicine globally. Given that cataracts typically develop in individuals later in life, presbyopia often accompanies this condition. Presbyopia, in fact, the most prevalent refractive disorder among those over 40 years old.[1] Recently, numerous new IOLs have been launched, featuring advanced or innovative optical designs that have shown promising initial clinical outcomes.[2] To enhance visual acuity at various distances and reduce the need for glasses, several extended depth of focus (EDOF) lenses and multifocal IOLs have been developed. While these lenses generally improve intermediate and near vision, they often fall short of perfect results. Multifocal lenses, in particular, can cause visual disturbances such as halos and glare, and have been linked to a higher rate of dysphotopsia and reduced contrast sensitivity in patient-centered assessments of existing multifocal IOL designs. The Intensity SL is a new multifocal IOL featuring a unique optical design with a lens profile consisting of 12 steps and a central zone measuring 1 mm in diameter.[3] So, in this study, the optical performance of the Intensity SL was assessed in a real-world clinical environment.

METHODS

This single-center, non-randomized, prospective observational study aimed to assess the efficacy and safety of the Intensity SL posterior chamber IOL for cataract surgery and presbyopia

correction. Thirty-one patients received implantation of the new multifocal IOL. Inclusion criteria included being 45 years or older with bilateral age-related cataracts requiring surgery, normal corneas with astigmatism not exceeding 0.75 diopters (D), and a fundus free of significant posterior segment pathology. Patients needed to be well-informed about the procedure and the IOL's characteristics and should have a preoperative endothelial cell count greater than 2000/mm^2. Postoperative evaluations focused on uncorrected and corrected visual acuity at distance, near, and at two intermediate distances (80 cm and 60 cm) over a period of three months.

RESULTS

Snellen visual acuity results at 1 to 3 months' post-surgery were detailed in figures 1, 2, 3, and 4. All 61 eyes (100%) achieved an uncorrected distance visual acuity of at least 0.7, with 57 eyes (93%) reaching 0.8 [0.1 logMAR], and 27 eyes (44%) achieving 1.0 [0.0 logMAR], resulting in a mean uncorrected distance visual acuity of 0.93 [0.04 logMAR] (Fig. 1). For binocular visual acuity, all patients had a best-corrected distance visual acuity (BCDVA) of 0.9 [0.05 logMAR], and 26 patients (83%) had a BCDVA of 1.0 [0.0 logMAR]. Regarding intermediate vision at 80 cm, 60 eyes (98%) had an uncorrected intermediate visual acuity (UCIVA) of at least 0.8 [0.1 logMAR], with 48 eyes (79%) achieving 1.0 [0.0 logMAR], resulting in a mean monocular UCIVA of 0.97 [0.02 logMAR] and a binocular UCIVA of 1.0 [0.0 logMAR] (Fig. 2). At 60 cm, similar results were observed: 98% (60 eyes) had an UCIVA of at least 0.8 [0.1 logMAR], with all eyes achieving at least 0.7 [0.15 logMAR], and average monocular and binocular UCIVAs of 0.96 [0.02 logMAR] and 0.98 [0.01 logMAR], respectively (Fig. 3). For near vision, all eyes had an uncorrected near visual acuity (UCNVA) of 0.9 [0.05 logMAR], with 57 eyes (93%) achieving 1.0 [0.0 logMAR], and an average binocular distance-corrected near visual acuity (DCNVA) of 1.02 [-0.02 logMAR] (Fig. 4). Visual phenomena were not reported by 20 of the 31 patients; 4 patients described them as "mild" when specifically questioned, while 7 patients reported halos, glare, and other visual disturbances. The Intensity SL demonstrated excellent tolerability, with none of the 61 eyes experiencing a loss of one or more lines of best-corrected visual acuity (BCVA) on the Snellen charts. No significant postoperative complications were observed. At 3 months, there was no significant posterior capsular opacification (PCO) or macular edema, and the IOL was well-centered with no dislocation or tilt. Intraocular pressure (IOP) measurements remained within normal ranges, and endothelial cell loss was moderate.

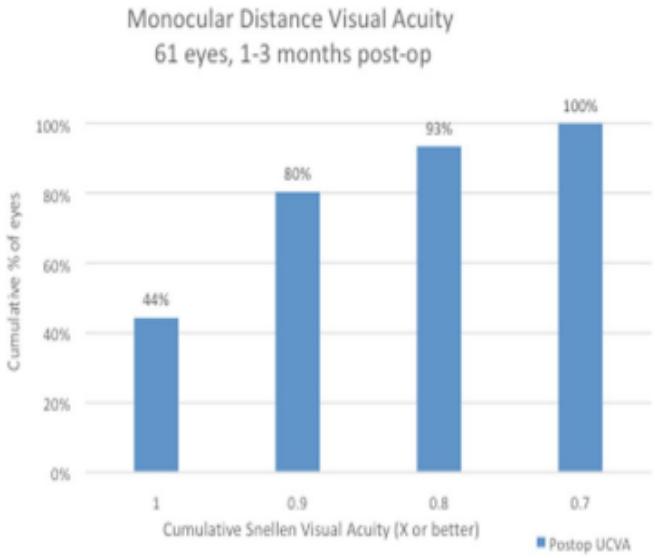

Fig 1. Monocular distance uncorrected visual acuity

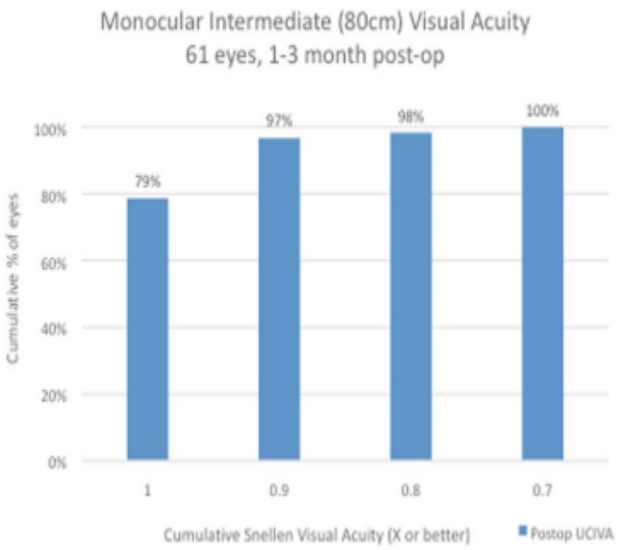

Fig 2. Monocular intermediate (80 cm) uncorrected visual acuity

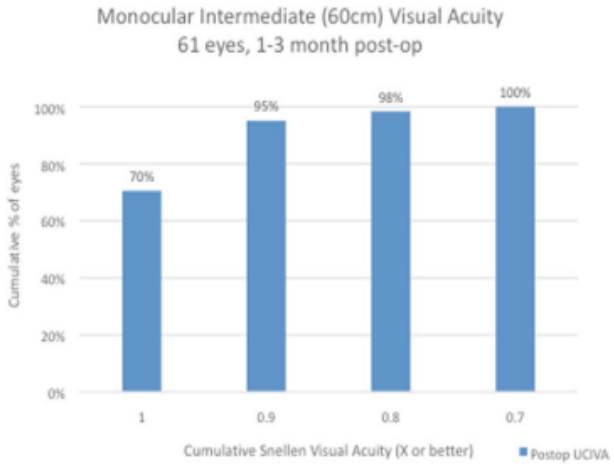

Fig 3. Monocular intermediate (60 cm) uncorrected visual acuity

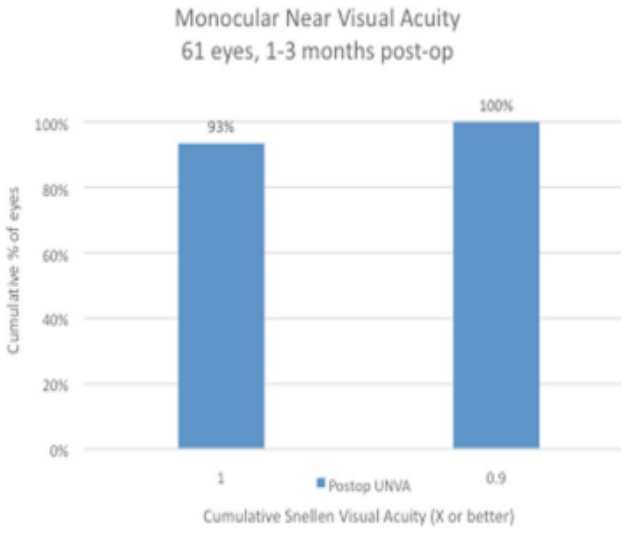

Fig 4. Monocular near uncorrected visual acuity

DISCUSSION

In this study, the new Intensity SL multifocal IOL delivered highly positive visual outcomes across various distances, including good intermediate vision. Bianchi implanted the Intensity IOL in 112 eyes of 56 patients, with none experiencing visual loss. Additionally, 94% of these patients had a final refraction within ±0.5 D. The uncorrected and corrected visual acuity results in Bianchi's study were similar to those observed in this study.[4] Ehud Assia and colleagues implanted the

Intensity SL in 20 patients (40 eyes) and observed mean uncorrected visual acuity for distance, intermediate, and near vision of 0.03, 0.09, and -0.22 logMAR, respectively. The outstanding near vision results reported align with this study finding. The authors also noted a high level of patient satisfaction.[5]

CONCLUSION

The Intensity SL multifocal IOL achieved highly favorable visual outcomes at various distances, including good intermediate vision, which was beneficial for using electronic devices like tablets, computers, and smartphones. It caused visual phenomena in only a few patients. This five-focus lens seems to have a strong tolerability profile, with most patients either not experiencing or being only slightly disturbed by optical phenomena such as halos and glare.

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Combination of Endoscopic Vitrectomy with 3D Heads-Up Visualization for Managing Traumatic Eye Injuries

INTRODUCTION

Early assessment and intervention in cases of traumatic eye injuries were made possible by vitrectomy utilising endoscopy in conjunction with a 3D heads-up viewing system.

Traumatic eye injuries are a frequent cause of ocular morbidity and long-term vision loss globally. Immediate treatment is crucial, as blindness can significantly impact both quality of life and productivity.[1] For open globe injuries affecting the posterior segment, the prognosis improves with earlier surgical intervention.[2] In cases of ocular trauma where the cornea is opaque, endoscopic surgery facilitates earlier diagnosis and helps prevent retinal issues like damage and detachment. A 3D surgical system enables the surgeon to work in a more comfortable "Heads-Up" position compared to using a traditional microscope.[1] It was employed in both anterior and posterior eye surgeries and regarded as a tolerable and ergonomically efficient surgical system for

ophthalmic procedures.[2] The 3D heads-up viewing system for vitreoretinal surgery has gained popularity. However, there were limited reports on its use in combination with endoscopic techniques for vitrectomy. So, this study aimed to explore the impact of combining endoscopic vitrectomy with the 3D heads-up viewing system in treating traumatic eye injuries.

METHODS

This was a retrospective interventional case series conducted at a tertiary referral center, involving patients with traumatic ocular injuries who underwent endoscopic vitrectomy using a 3D heads-up viewing system. Fourteen eyes from 14 patients were examined over a period of 30 months. The collected data encompassed patient demographics, trauma history, operative findings, surgical procedures, and ophthalmic evaluations from the initial visit through the final follow-up. Eye examinations included visual acuity assessment with a Snellen chart, evaluation for relative afferent pupillary defect (RAPD), and both anterior and posterior segment examinations. Eyes were classified according to the ocular trauma score (OTS) into the following categories: category 1 (0–44), category 2 (45–65), category 3 (66–80), category 4 (81–91), and category 5 (92–100).

RESULTS

Up to 6 months post-surgery, all eyes (100%) exhibited an attached retina, with most retinas reattached without the need for tamponade. During the initial procedures, silicone oil was used in six eyes, while SF6 gas was used in two eyes. Silicone oi l was removed from three of these eyes, while the remaining three retained the silicone oil until the last follow-up. The median logMAR best corrected visual acuity (BCVA) improved from 2.4 at the initial visit to 1.19 at the final visit. At presentation, 11 eyes (79%) had a visual acuity of less than 1/200. Based on the OTS, patients were classified into group 1 (eight eyes) and group 2 (six eyes). Postoperative vis ual acuity improvements were noted in 11 of the 14 eyes (79%). Two eyes maintained good visual acuity (6/6) after six months. One eye, initially affected by an open globe

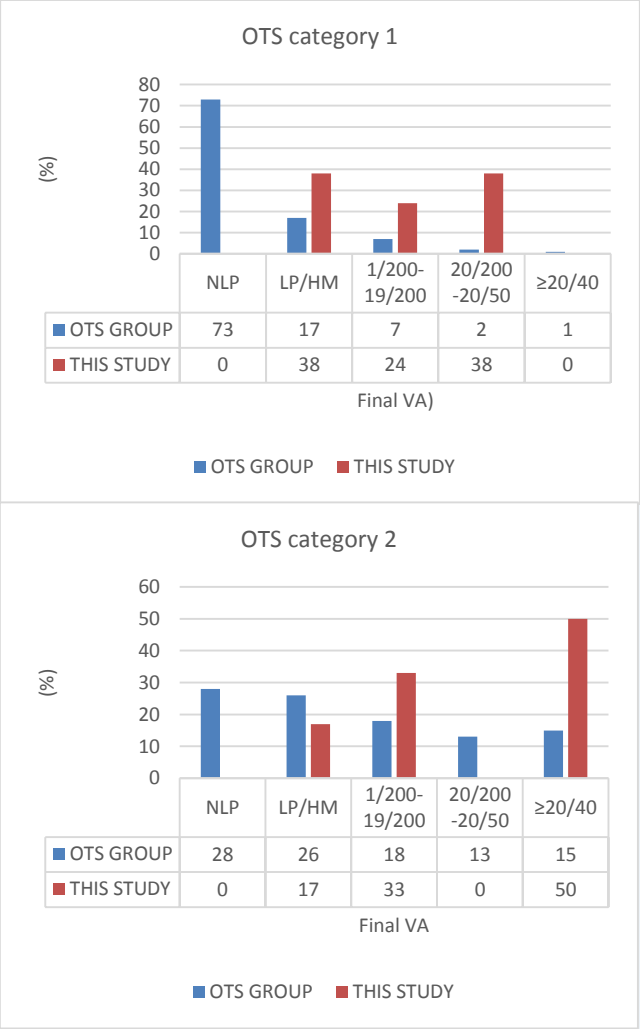

Table 1. Comparison of this study's series with OTS prediction for the final visual acuity distributions

injury, retinal detachment, and submacular hemorrhage, had its retina reattached but retained poor vision with only light perception due to optic atrophy. Final visual acuity distributions according to OTS categories were shown in Table 1, revealing a significant di fference in final visual acuity between the OTS groups in this case series. No intraoperative or postoperative complications, such as retinal detachment, endophthalmitis, or other severe issues, were observed.

DISCUSSION

The endoscopic approach provides significant benefits for vitreoretinal surgery in traumatic cases. Endoscopes allow for close access to the retina and intraocular structures, offering detailed views of important areas such as the ciliary body, pars plana, and peripheral retina.[3] While vitrectomy performed under air can effectively stabilize the retina, visualizing the retina can be significantly challenging in some cases.[4] Consequently, the endoscope enables close-up observation of the retina even under air. Sabti KA and Raizada S documented a series of cases where endoscopic-assisted vitrectomy was used to treat severe ocular trauma. In their study of 50 eyes with open globe injuries, 36 eyes (83.7%) experienced improved vision following surgery.[5] The 3D heads-up visualization system offered several advantages that enhance surgery, including improved depth perception and the ability to use digital color filters. These features aid in better visualization and more effective vitreous removal during surgery.[6]

CONCLUSION

This case series described ocular trauma treated with vitrectomy utilizing endoscopy combined with a 3D heads-up viewing system, resulting in favorable anatomical outcomes. This system enabled early evaluation and intervention in traumatic ocular injuries, even in the presence of an opaque cornea. It facilitated precise and thorough vitreous clearance during vitrectomy, thereby reducing the risk of anterior proliferation, which could lead to severe proliferative vitreoretinopathy (PVR), hypotony, and retinal redetachment.

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Case report on an uncommon Micropupil Resulting from Congenital Cataract Surgery

INTRODUCTION

The secondary pinhole pupil may help the affected eye develop normally by reducing imaging haze and halos. This instance provides more insight into the treatment of congenital cataracts.

Following congenital cataract surgery, various complications can arise, such as posterior capsule opacification (PCO), glaucoma in aphakic or pseudophakic eyes, uveitis, pupillary displacement, and decentration of the intraocular lens (IOL).[1] Proper and consistent development of ocular structures during childhood is crucial for achieving optimal vision.[2] The pupil regulates the amount of light reaching the retina by adjusting in response to light intensity. Congenital microcoria is an exceedingly rare autosomal dominant condition that impairs iris development and affects pupil function. It is characterized by a pinhole-sized pupil (<2 mm) due to iris hypoplasia, leading to visual disturbances such as hemeralopia and light sensitivity.[3] This case involves a patient who had congenital cataract surgery on one eye during infancy and subsequently developed a pinhole pupil (approximately 0.5 mm) as a result of the procedure. This condition was left untreated initially. Despite this, with consistent monocular occlusion therapy, the patient achieved relatively favorable ocular development in adulthood and preserved good visual acuity following pupilloplasty.

CASE PRESENTATION

A 17-year-old boy visited the clinic for management of poor vision in his left eye following congenital cataract surgery. Diagnosed with congenital cataract at 3 months, he underwent cataract extraction and IOL implantation in the left eye at 6 months under general anesthesia. Follow-up appointments occurred monthly post-surgery. By 3 months after the procedure, a pinhole pupil was observed in the left eye, but the ophthalmologist chose to monitor it without intervention. The patient received regular monocular occlusion therapy, starting with 6 hours of daily patching and reducing to 2 hours by age 6. Throughout this period, his guardian monitored the eye's vision weekly to ensure it remained at or above 0.5 logMAR (20/40). The eye did not receive any refractive corrections such as glasses or contact lenses. As he started school, he did not participate

in amblyopia training. Upon presentation to clinic, the patient's best corrected visual acuity (BCVA) in the right eye was 0.0 logMAR (20/20) with a refraction of −5.75 diopters (D) cylinder/−2.25 D sphere. The BCVA in the left eye was 0.5 logMAR (20/40) with a refraction of 0.0 D. The visual acuity in the left eye did not improve with correction. Intraocular pressures were 12 mmHg in the right eye and 15 mmHg in the left eye. Slit-lamp examination showed a transparent left cornea and a deep anterior chamber. A pinhole pupil (approximately 0.5 mm) was noted in the left eye, which exhibited high light reflex sensitivity (Fig. 1). Although iris sphincter and dilator muscle contractions were observed under light exposure, there was no response to pupil-dilating medications. The IOL was not visible. Endothelial cell counts were 2889/mm² in the right eye and 2876/mm² in the left eye. IOLMaster measurements showed the right eye's axial length as 27.02 mm, while the left eye could not be measured; A-ultrasound indicated an ocular axis of 24.21 mm. B-ultrasound showed no significant posterior segment abnormalities in the left eye, and there were no notable anterior segment or fundus abnormalities in the right eye. Left pupilloplasty was performed under corneal surface anesthesia. A 21 D IOL was prepared for potential intraoperative replacement, based on A-ultrasound results. On postoperative day 1, uncorrected visual acuity in the left eye was 0.9 logMAR (20/100). Refraction showed −2.23 D cylinder/−3.00 D sphere in the left eye, resulting in a BCVA of 0.0 logMAR (20/20). Intraocular pressure was 13 mmHg. The pupil was centrally located with a diameter of approximately 3 mm and retained light reflex sensitivity. The IOL was well-positioned. Fundoscopy revealed a reddish optic disc, well-aligned retinal vessels, and a flat retina. Optical coherence tomography confirmed normal macular structure in the left eye. Visual field comparison before and after surgery indicated substantial improvement.

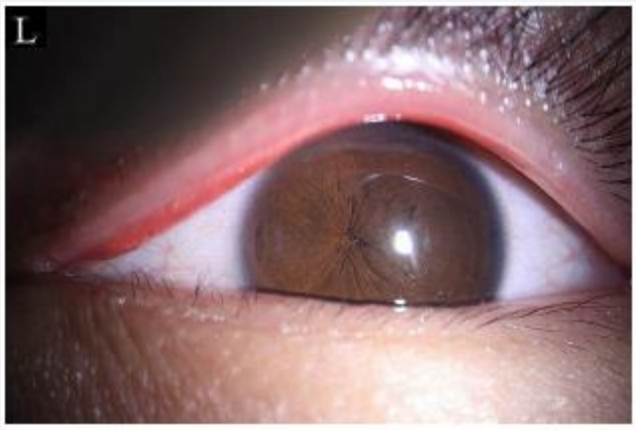

Figure 1. The left eye's preoperative slit-lamp test revealed a pinhole pupil (about 0.5 mm).

DISCUSSION

This study highlighted a case of micropupil formation without notable posterior synechiae following cataract phacoemulsification and IOL implantation performed during infancy. Some research indicates that intraoperative trauma to the iris and the induction of the IOL during phacoemulsification were primary contributors to pupillary abnormalities in patients with cataracts.[4] This team previously documented a case of congenital microcoria characterized by an exceptionally small pupil (<0.5 mm), severe amblyopia, and wasting exotropia. The BCVA in the affected eye was 2.0 logMAR. Although the patient underwent pupilloplasty, the procedure did not result in a significant improvement in visual acuity.[5]

CONCLUSION

This study described an unusual case of micropupil formation resulting from congenital cataract surgery, a rare complication, particularly in children. Unlike congenital microcoria, the secondary pinhole pupil might reduce imaging haze and halos, potentially benefiting the development of the affected eye. This case offers additional perspective on the management of congenital cataracts.

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