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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

- **Characterisation of eyes implanted with a high-power intraocular lens**
- **Protective effects of modified vitrectomy surgical conditions on peripapillary microvasculature and RNFL changes using OCTA**
- **Closing eyes with artificial tears: A Simple and Effective Approach to Alleviate Screen-Induced Asthenopia and Dry Eye Symptoms**
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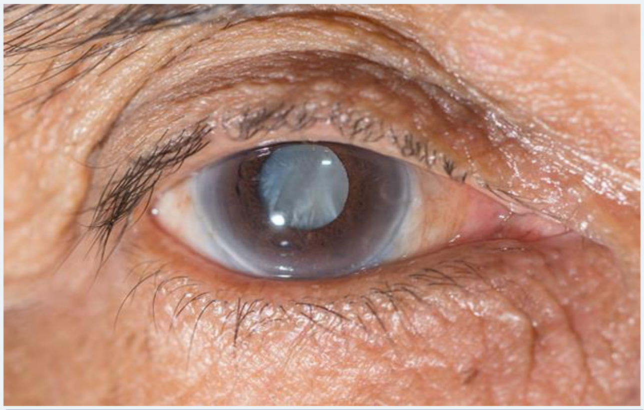
Medical Team, Micro Labs Limited

Characterisation of eyes implanted with a high-power intraocular lens

INTRODUCTION

High hyperopia (HH) with a very short axial length (AL) occurs in about 1–2% of the general population. There is limited data on the morphology and outcomes of cataract surgery in this group, especially when compared to those with high myopia. Extremely short eyes, which typically present with high hyperopia, can be classified as HH (posterior microphthalmos), relative anterior microphthalmos (RAM), and nanophthalmos (N), based on their axial length, anterior chamber depth, corneal diameter, and refractive status.[1] One common characteristic of short eyes is that they often necessitate high-power intraocular lenses (IOLs).[2] Due to a shallow anterior segment, cataract surgery outcomes in this group of patients tend to be less predictable and worse compared to those in emmetropic individuals.[3] Over the past 20 years, only a limited number of studies with at most moderate sample sizes have focused on this patient group. Therefore, this study aimed to characterize the morphology of individuals receiving high-power IOLs using real-world data from a tertiary ophthalmology center specializing in complex lens surgeries. To achieve this, the study examined IOL selection, intraoperative and postoperative complications, visual and refractive outcomes, and morphological changes in a subset of patients.



CATARACT

Although lens surgery improves the anterior chamber condition and is safe, it is not very accurate for very short eyes. It allows patients to be independent with their glasses, which improves patient satisfaction.

METHODS

This retrospective cohort study included 300 eyes from 191 patients undergoing cataracts or refractive lens surgery. All cases involved extremely short axial length, necessitating the implantation of a high-power IOL exceeding 30D. The eyes were classified into different morphological groups: nanophthalmos (N), relative anterior microphthalmos (RAM), and high or low/moderate hyperopia (HH and MH). The study analyzed comorbidities, intraoperative and postoperative complications, as well as preoperative and postoperative refraction and visual outcomes.

RESULTS

The average axial length measured 20.68±0.92 mm. Among the eyes studied, 19.3% were classified as MH, 45.3% as HH, 22.7% as N, and 12.7% as RAM. Common coexisting conditions included amblyopia (14.7%), prior strabismus surgery (7.3%), glaucoma (12.7%), and previous iridotomy (9.4%). The mean preoperative spherical equivalent (SE) was +6±2.85 D, while the postoperative SE was −0.42±1.56 D. Histograms illustrating preoperative and postoperative refraction are shown in Figure 1A and B. A comparison of preoperative and postoperative corrected distance visual acuity (CDVA) demonstrated a slight yet statistically significant improvement from 0.35±0.39 to 0.30±0.32 logMAR (logarithm of the minimum angle of resolution) (133 eyes, p=0.02). Additionally, postoperative uncorrected distance visual acuity (UDVA) was significantly better in highly hyperopic eyes than in nanophthalmic eyes (p=0.03). However, there was no statistically significant difference in postoperative CDVA across the three morphological groups. These findings are depicted in Figure 1C–E. The narrow anterior chamber angle improved notably, and the posterior capsule rupture rate (3%) remained within previously documented ranges.

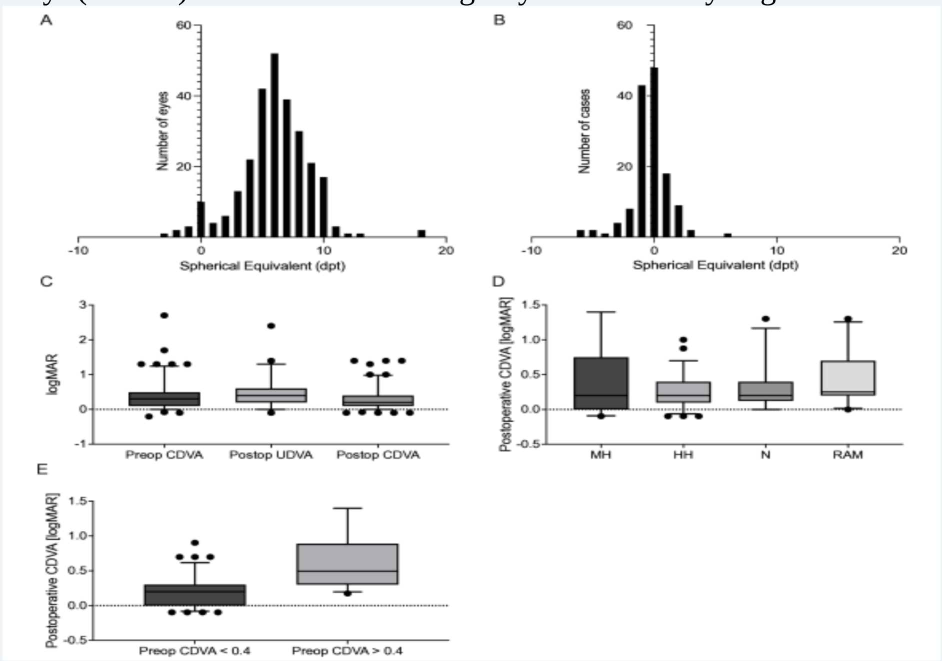


Figure 1. Eye refraction before and after surgery, with accessible statistics and visual results. (A) Prior to surgery, the individuals under study had spherical equivalents (SE) of 17.625 D, which indicates extreme hyperopia (N=269), (B) Most patients achieved a SE between -2 and +2 D after surgery. But there were refractive surprises. Only patients with emmetropia as the target refraction had postoperative values displayed (N = 138), (C) A modest improvement in visual acuity was noted in a subgroup of patients for whom postoperative CDVA data were available (N = 123), (D) CDVA following surgery based on morphologies (N = 142), (E) Postoperative outcomes were predicted by preoperative CDVA.

DISCUSSION

In contrast to this study, Yosar et al. reported that three out of four eyes showed visual improvement after surgery, while only one in eight had worse visual acuity postoperatively.[3] Similarly, Zheng et al. analyzed 11 eyes with simple N (AL <18 mm) and 11 eyes with RAM, finding that visual acuity improvement was significantly greater in the RAM group. However, they emphasized that visual prognosis remains guarded, with median CDVA in the nanophthalmic group improving from 20/200 preoperatively to 20/60 postoperatively.[4] Consistent with these findings, the present study observed a slight increase in CDVA after surgery, with no clinically significant differences in visual outcomes among the different morphologies. As expected, preoperative visual acuity was a strong predictor of postoperative success. Therefore, based on this comprehensive dataset, patients should be counseled that their expected postoperative UDVA will be comparable to their preoperative CDVA.

CONCLUSION

Lens surgery is a safe procedure for these eyes, though the high incidence of comorbidities such as glaucoma should be considered. While significant visual improvements are rare in this group, these findings indicate that uncorrected vision improves, resulting in high patient satisfaction.

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Protective effects of modified vitrectomy surgical conditions on peripapillary microvasculature and RNFL changes using OCTA

INTRODUCTION

RNFL and peripapillary microvascular damage may result from vitrectomy with ILM peeling. The recovery of peripapillary RNFL thickness and blood flow may be improved using modified surgical settings.

Pars plana vitrectomy (PPV) is an effective treatment for vitreoretinal diseases, but certain studies have shown vision field abnormalities. Several mechanisms have been suggested to explain the thinning of the peripapillary retinal nerve fiber layer (p-RNFL), such as mechanical damage to the inner retinal layers during ILM peeling, intraoperative increases in intraocular pressure, retinal toxicity from indocyanine green (ICG) dye, phototoxicity from endoillumination, and optic disc injury caused by posterior vitreous detachment induction. Despite these findings, no study has specifically investigated how modifications in surgical conditions influence peripapillary vessel density (pVD) and p-RNFL changes following vitrectomy with ILM peeling.[1] Optical coherence tomography angiography (OCTA) is an advanced imaging technique known for its high reproducibility, high resolution, efficiency, and non-invasive nature. It has been widely used to assess the perfusion status of retinal and choroidal tissues.[2] A recent study found a notable decrease in pVD in patients with retinal detachment. This reduction was associated with thinning of the p-RNFL, suggesting concurrent neuronal and microvascular damage.[3] This study focused on patients with relatively uncomplicated retinal conditions, such as idiopathic macular holes (MH) or idiopathic epiretinal membranes (ERM), and investigated the protective effects on peripapillary structures by lowering intraoperative intraocular pressure, minimizing the concentration and staining of ICG dye, and reducing endoillumination.

METHODS

In this retrospective study, the medical records of 37 patients diagnosed with idiopathic epiretinal membrane (iERM) or idiopathic macular hole (iMH) who underwent PPV with ILM peeling were reviewed. The primary endpoint was to evaluate the recovery of peripapillary vessel density, while the secondary endpoint focused on the restoration of retinal nerve fiber layer (RNFL) thickness following surgery. Inclusion criteria included: (1) eyes with idiopathic ERM or MH requiring PPV and ILM peeling and (2) patients who provided informed consent. Participants were divided into two groups based on different surgical conditions. Peripapillary OCTA images were obtained preoperatively and at 1 week, 1 month, and 3 months postoperatively. Best corrected visual acuity (BCVA) was documented, and intraocular pressure (IOP) was measured using a Goldmann applanation tonometer. Statistical analysis was conducted using Fisher's exact test, the Mann-Whitney U test, t-test, and repeated-measures analysis of variance (RM-ANOVA).

RESULTS

The main parameter assessed in this study was the small vessel density of the radial peripapillary capillary (RPC). Postoperatively, the RPC density was significantly higher in the protective group compared to the control group. At three months after vitrectomy, the mean peripapillary RNFL thickness and superior quadrant RNFL thickness in the protective group (106.63±8.06 μm and 128.37±15.97 μm) were significantly greater than in the control group (96.06±13.91 μm and 107.22±16.54 μm; both $p<0.01$). Additionally, the temporal quadrant RNFL thickness at three months post-surgery measured 78.37±11.43 μm in the protective group and 70.06±11.74 μm in the control group ($p=0.036$). In the protective group, the mean temporal p-RNFL thickness declined from 86.58±12.72 μm at baseline to 78.37±11.43 μm at three months postoperatively ($p=0.008$). The longitudinal changes in p-RNFL thickness across the average measurement and the four quadrants for both groups (Figure 1). BCVA showed significant improvement in both groups in three months after surgery. The baseline BCVA, measured as the logarithm of the minimal angle of resolution, was 0.54±0.36 in the protective group and 0.70±0.38 in the control group. These values improved to 0.31±0.23 and 0.49±0.36, at three months postoperatively (both p<0.01) respectively. The results also indicated a significant positive correlation between RNFL thickness and RPC vessel density in each quadrant measurement.

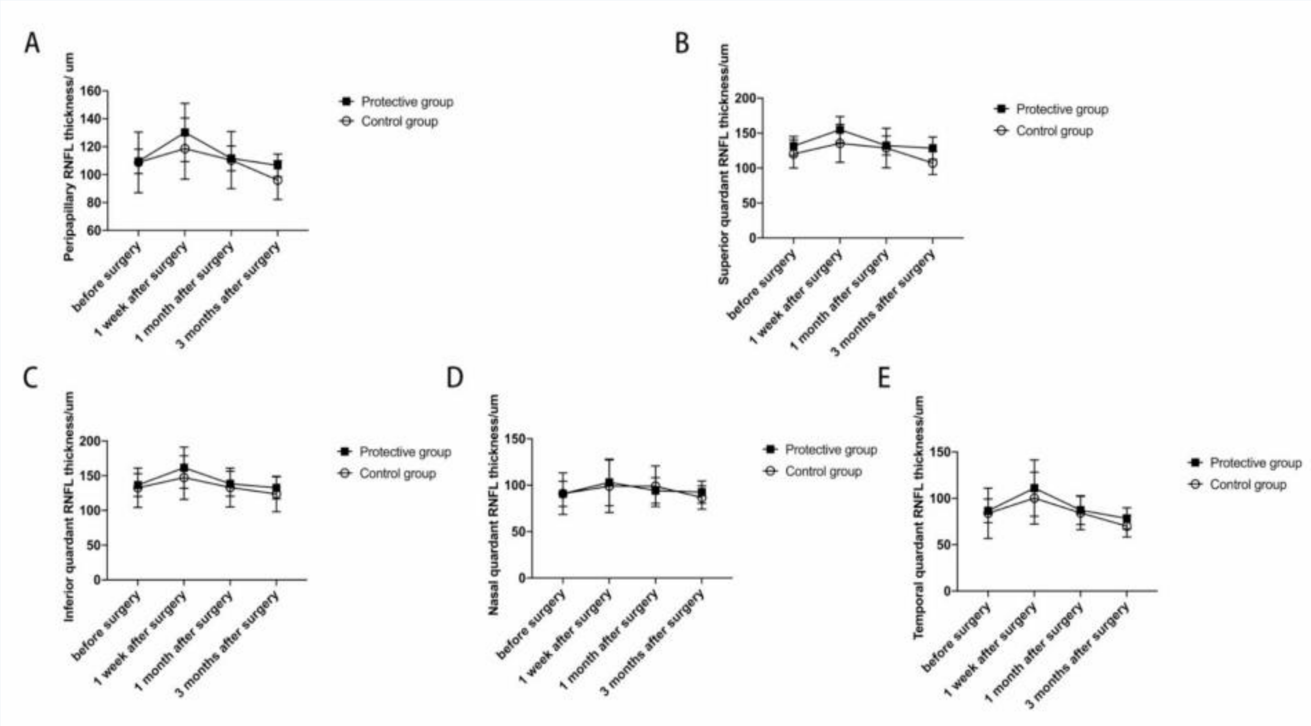

Figure 1. Longitudinal variations in the protective and control groups' peripapillary retinal nerve fiber layer (RNFL) thickness in the average (A) and four quadrants (B-E).

DISCUSSION

In this study, the RPC vessel density in the whole image, peripapillary region, and superior and inferior quadrants showed a significant decline in the control group one week after PPV. Although gradual recovery was observed at one and three months postoperatively, the values remained significantly lower than preoperative levels. Additionally, the temporal quadrant RPC vessel density exhibited a continuous decline throughout the follow-up period without signs of recovery in the control group. These findings align with a previous study, which reported a notable decrease in pVD in the inferior, temporal, and superior quadrants at 6 and 12 months after vitrectomy.[4] In this study, p-RNFL thickness showed a significant increase in both groups one week after vitrectomy, suggesting postoperative swelling that resolved one month after surgery. By 3 months postoperatively, the temporal p-RNFL thickness had significantly decreased in both groups, aligning with findings from the previous study.[5]

CONCLUSION

Vitrectomy with ILM peeling can lead to damage in the peripapillary microvasculature and RNFL. Implementing modified surgical conditions may aid in the recovery of peripapillary blood flow and RNFL thickness.

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Closing eyes with artificial tears: A Simple and Effective Approach to Alleviate Screen-Induced Asthenopia and Dry Eye Symptoms

INTRODUCTION

Artificial tears combined with close eye rest could be a practical and successful preventative measure for screen related asthenopia and DE.

The growing reliance on video display terminals (VDTs) like smartphones, has raised concerns about their effects on human health. Prolonged VDT use can lead to a range of ocular and extraocular symptoms are collectively known as video display terminal syndrome (VDTS), with dry eye (DE) and asthenopia being the primary ocular issues. Studies have suggested that VDT-related DE results from a reduced blink rate, blue light exposure compromising corneal epithelial cell viability, and an increased inflammatory response on the ocular surface.[1] Various factors can impact the severity of dry eye symptoms, including screen time, viewing position (such as distance and angle), cognitive demands, screen resolution, and contrast, image refresh rate, screen size, brightness, and spectral properties, along with other digital characteristics.[2] Existing treatments for VDT-induced dry eye and asthenopia have shown limited effectiveness, highlighting the importance of preventive measures. This study aimed to identify a simple, practical, and effective prevention strategy and explored an optimal reading pattern that minimizes the adverse effects of prolonged smartphone use.

METHODS

This prospective randomized controlled study included participants aged 18 and older with basic reading abilities. They were randomly divided into three groups and instructed to read on their smartphones for two hours. After one hour of reading, each group followed a different rest method: no rest (Group A), a 10-minute eye-closed rest (Group B), or a 10-minute rest with 0.1% sodium hyaluronate eye drops (Group C). All participants underwent ophthalmological assessments and completed questionnaires before and after the two-hour reading session. The study assessed DE and asthenopia using the following tests: subjective questionnaire, critical flicker frequency (CFF), non-invasive break-up time (NIBUT), fluorescein tear break-up time (FBUT), corneal fluorescein staining (CFS), and Schirmer I test (SIT).

RESULTS

In contrast, ocular surface disease index (OSDI) scores increased significantly in Groups A and B compared to baseline (Fig. 1A, $P \leq 0.001$; $P \leq 0.01$). The ΔOSDI analysis revealed notable differences among the three groups (Fig. 1B, $P \leq 0.001$; $P \leq 0.01$). In Group A, non-invasive break-up time (NIBUT) decreased significantly after prolonged smartphone reading compared to baseline ($P \leq 0.05$), following a similar trend as fluorescein tear break-up time (FBUT) ($P \leq 0.05$). Corneal fluorescein staining (CFS) also showed a significant change in Group A ($P \leq 0.05$). When comparing Group B and Group C, which implemented different rest strategies, no significant differences were observed in NIBUT or FBUT before and after reading ($P > 0.05$; $P > 0.05$). Inter-group comparisons revealed no changes in ΔNIBUT, ΔFBUT, and ΔCFS between Groups B and C ($P > 0.05$; $P > 0.05$; $P > 0.05$). However, significant differences in ΔCFS were found between Group A and the other two groups ($P \leq 0.01$; $P \leq 0.05$), while ΔNIBUT and ΔFBUT remained unchanged ($P > 0.05$; $P > 0.05$). Critical flicker frequency (CFF) significantly decreased after reading without rest compared to baseline ($P \leq 0.01$). A decline in CFF was also observed in Group B ($P \leq 0.05$), whereas no significant change was detected in Group C ($P > 0.05$). The ΔCFF comparison among groups showed significant differences ($P \leq 0.001$; $P \leq 0.01$).

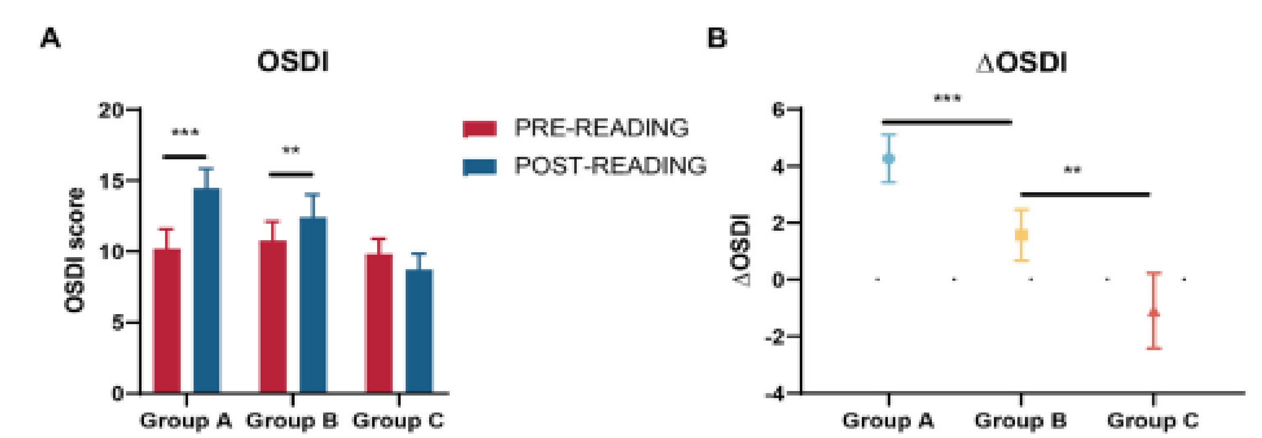

Figure 1. Subjective evaluations of the symptoms of dry eyes. (A) Illustrates how subjective measurements fluctuate between pre- and post-reading. (B) Shows how the OSDI varies between groups (Δ = post–pre). ****P ≤ 0.001, **P ≤ 0.01.

DISCUSSION

The findings of this study suggest that extended smartphone screen exposure can lead to damage to the ocular surface and cause noticeable discomfort. Closing the eyes and using artificial tears proved to be an effective preventive strategy for maintaining eye health in frequent smartphone users. Studies also indicated a link between smartphone usage and the development of asthenopia, with longer screen time contributing to increased eye strain and fatigue.[3] As noted earlier, prolonged smartphone use may disrupt the stability of the tear film, leading to an uneven and rough corneal surface. This irregularity contributes to an increase in wavefront aberration.[4] Research has also shown that sodium hyaluronate is effective in alleviating subjective symptoms in individuals with moderate dry eye.[5] According to the OSDI findings, promoting the use of artificial tears while keeping the eyes closed during prolonged smartphone reading is recommended.

CONCLUSION

To prevent dry eye and asthenopia during prolonged smartphone reading, it is essential to take regular breaks and use artificial tears. Implementing this easy and practical approach can help safeguard vision from the negative effects of extended screen time and support long-term eye health.

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A Rare Case Report of Bilateral Spontaneous Retinal Dialysis in Intermediate Uveitis Associated with Multiple Sclerosis

INTRODUCTION

Rhegmatogenous retinal detachment (RRD) is a severe complication of uveitis that can significantly impact vision. Studies have previously reported an RRD incidence of 3.1% in individuals with uveitis, compared to just 0.01% in the general population.[1] In intermediate uveitis (IU), RRD can arise due to inflammatory complications, including posterior vitreous detachment (PVD), structural changes in the vitreous base—particularly vitreous gel contraction—and tractional forces in areas with poor perfusion. These factors may contribute to retinal tear formation. However, a crucial question remains: should uveitis be regarded as an independent autoimmune condition or as an extension of central nervous system (CNS) disease? One possible explanation is the developmental link between the CNS and ocular tissues, both originating from the neuroectoderm, which may underly the well-documented association between multiple sclerosis (MS) and uveitis. Additionally, both MS and IU are linked to the HLA-DRB1*15:01 haplotype, a subtype of HLA-DR2.[2] This report presents a highly rare case of RRD resulting from spontaneous retinal dialysis in IU associated with MS.

Conventional vitrectomy and tamponading agents were used to treat retinal detachment. In cases of intermediate uveitis caused by MS, traction at the vitreous base was recommended.

CASE PRESENTATION

A 29-year-old Middle Eastern woman presented with blurred vision in her left eye for four days. Her best-corrected visual acuity (BCVA) was 6/6 in the right eye and 6/9 in the left eye. An anterior segment examination revealed +1 anterior chamber cells in the right eye and +2 in the left. The posterior segment examination showed +1 vitreous cells bilaterally, along with peripheral vascular sheathing and vitreous condensations. She was referred to the uveitis clinic, where she was diagnosed with bilateral IU. Magnetic resonance imaging (MRI) revealed multiple scattered bilateral cerebral white matter lesions appearing as small, rounded, and oval T2/FLAIR hyperintensities. Some lesions in the sagittal plane displayed the characteristic Dawson's finger appearance. Additionally, an intramedullary T2 bright lesion was observed at the T6-T7 vertebral level without post-contrast enhancement. Cerebrospinal fluid (CSF) analysis detected oligoclonal bands, while cytology showed mild cellular inflammation with small mature lymphocytes and polymorphonuclear neutrophils. Fundus fluorescein angiography indicated diffuse vascular leakage without macular involvement, and late-phase imaging revealed bilateral disc hyperfluorescence. She started the oral prednisolone at 60 mg daily with weekly tapering, followed by oral azathioprine at 50 mg daily, gradually increasing to 2.5 mg/kg/day over two months. She remained stable for several months until she was presented to the emergency department with a right-sided inferior visual field defect. Her visual acuity at this visit was 6/12 in the right eye and 6/6 in the left. Examination of the right eye revealed occasional vitreous cells, a large retinal tear, and superior retinal detachment (Figure 1). She underwent pars plana vitrectomy (PPV) with internal limiting membrane (ILM) peeling and 360-degree laser barrage, using silicone oil (5000 CS) as a tamponade. Postoperative recovery was uneventful, with a clear lens and normal intraocular pressure. One month after surgery, her BCVA in the right eye improved to 6/9 with a +6.5 D lens. The left eye showed similar findings, including vitreous base contraction, posterior hyaloid opacification, peripheral ischemia, and retinal thinning. As a preventive measure, prophylactic laser barrage and peripheral pan-retinal photocoagulation were performed. To preserve the lens, silicone oil removal was carried out six weeks after the initial surgery. Following this procedure, her BCVA was 6/12, the retina remained attached. Eight months later, she returned to the emergency department with floaters in her left eye revealing a superonasal retinal detachment with retinal dialysis while the macula remained intact. She underwent PPV with silicone oil (5000 CS) injection in the left eye, and postoperative recovery was smooth. By the final follow-up, her BCVA had improved to 6/6 in both eyes. A diagnosis of relapsing-remitting multiple sclerosis (MS) was confirmed, and she was initiated on interferon beta-1a (44 mcg) therapy.

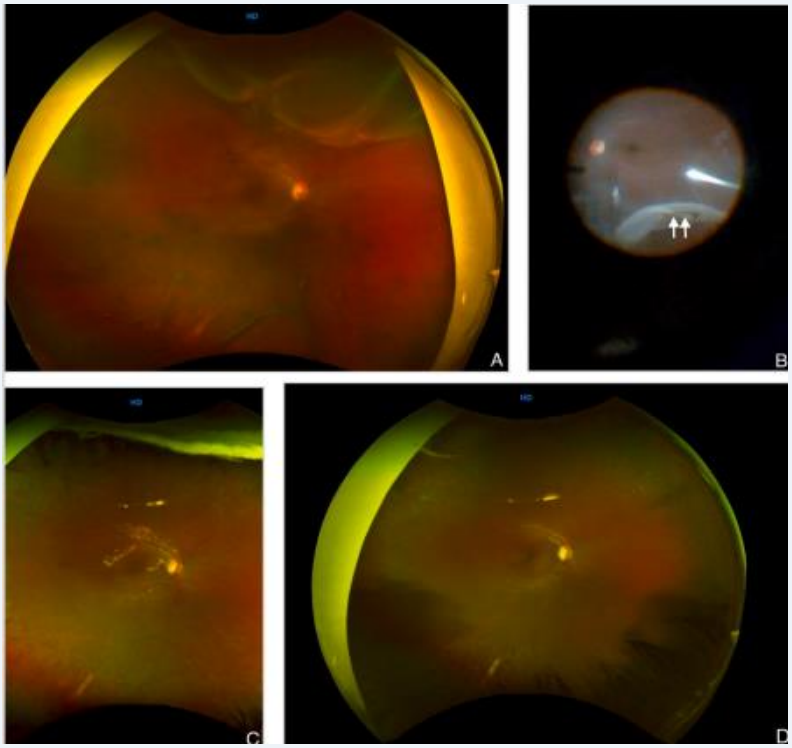

Figure 1. A) color fundus image of the right eye displaying a significant retinal tear and superior retinal detachment (B) An intraoperative image of the right eye displaying pigmentation at the tear's edge (white arrow) exposing the dialysis (C) Right eye collar fundus photo following pars plana vitrectomy with 360° laser barrage and internal limiting membrane peeling under silicone oil tamponade (D) Right eye color fundus photo following silicone oil removal.

DISCUSSION

In this case study, a patient with intermediate uveitis caused by multiple sclerosis experienced bilateral RRD as a result of spontaneous retinal dialysis. In a review, it was indicated that RRD was more frequently associated with uveitis of infectious origin, with cytomegalovirus (CMV) retinitis being the most common cause, followed by varicella-zoster virus (VZV).[3] This association is attributed to extensive retinal necrosis and atrophy, along with vitreous degeneration, which contributes to the formation of tractional membranes and retinal breaks. Among non-infectious uveitis cases, IU carries a potential risk for RRD due to its primary inflammatory activity near the ora serrata and vitreous base, where inflammatory debris accumulates in the vitreous cavity. Jalil et al. documented a case series involving 11 eyes from 7 patients, highlighting that IU was linked to inferior peripheral retinal elevation, manifesting either retinoschisis or tractional retinal detachment. This was likely caused by radial traction from pars plana gliosis. These retinal elevations were generally stable over time, with observation being the preferred management approach, while surgical intervention was only required in cases where macular involvement posed a threat to vision.[4]

CONCLUSION

This case study reports a rare instance of bilateral RRD resulting from spontaneous retinal dialysis in a patient with intermediate uveitis associated with MS. The retinal detachment was successfully treated using standard vitrectomy and a tamponade agent. The researchers recommend carefully assessing the vitreous base for traction in cases of intermediate uveitis related to MS.

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