

phthal 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.

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Medical Team, Micro Labs Limited

Investigation of the Non-Linear Association Between Serum Albumin and Diabetic Retinopathy in Type 2 Diabetes Mellitus

INTRODUCTION

Diabetic retinopathy (DR), the most prevalent and distinctive complication of diabetes mellitus (DM), stands as a primary cause of avoidable blindness among working-age adults. Its incidence correlates closely with glycemic levels and the duration of diabetes mellitus. In developed nations, DR ranks as the foremost cause of blindness among individuals aged 20–74 years. Projections indicate that the global prevalence of DR will escalate to 160.5 million by 2045, based on the latest analysis.¹ Conventional risk factors associated with DR development encompass prolonged diabetes duration, hypertension, insulin use, elevated HbA1c levels, triglycerides, and low-density lipoprotein cholesterol. A recent investigation revealed a noteworthy negative correlation between serum albumin (sALB) levels and DR prevalence, suggesting sALB's potential as a biomarker for DR. It was widely recognized that oxidative stress and inflammatory responses play pivotal roles in DR progression among patients with type 2 diabetes mellitus. The diminished sALB levels may exacerbate oxidative stress and inflammation, thereby serving as primary mechanisms underlying DR advancement. The majority of studies have demonstrated a linear association between serum albumin (sALB) levels and DR prevalence.² Hence, the aim of this study was to explore whether their association exhibits a non-linear pattern.



DIABETIC RETINOPATHY

There was a non-linear association between the prevalence of DR and sALB. When sALB was less than 38.10 g/L, there was a negative correlation between sALB and the prevalence of DR.

METHODS

This retrospective cross-sectional study enrolled 426 patients diagnosed with type 2 diabetes, with all clinical data collected from electronic medical records. DR was categorized into five groups based on the international clinical grading criteria: (1) no retinopathy; (2) mild non-proliferative diabetic retinopathy (NPDR); (3) moderate NPDR; (4) severe NPDR; and (5) proliferative diabetic retinopathy (PDR). The primary outcome measure was the prevalence of DR. A two-piecewise logistic regression model was employed to examine the potential non-linear relationship between

sALB levels and DR prevalence. The inflection point was determined using maximum likelihood ratio and a recursive algorithm to ascertain any saturation effect.

RESULTS

Among the 426 patients, 167 were diagnosed with DR, yielding a prevalence of 39.20%. The distribution of DR severity was as follows: mild NPDR accounted for 8.92% (n=38), moderate NPDR for 15.96% (n=68), severe NPDR for 7.75% (n=33), and PDR for 6.57% (n=28). Individuals with DR exhibited a lower proportion of males, a longer diabetes duration, lower BMI, reduced

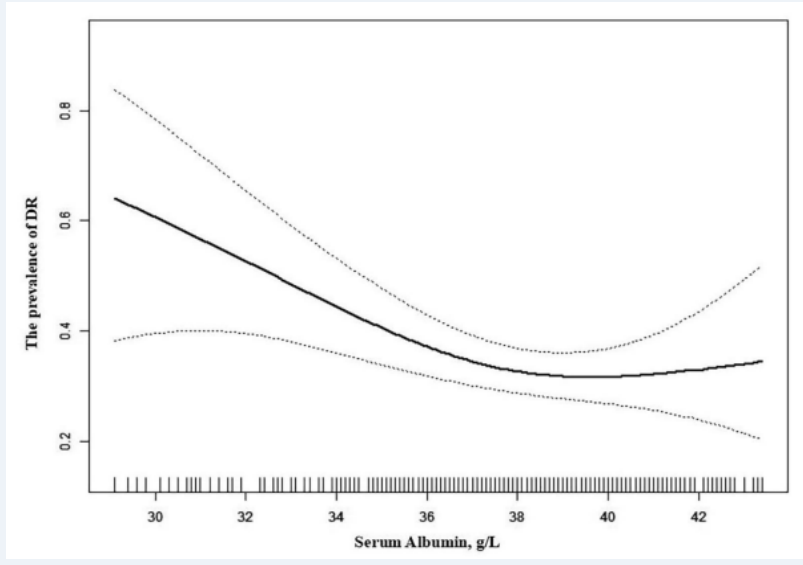


Figure 1. The relationship between sALB and DR prevalence

sALB, alanine aminotransferase (ALT), and aspartate aminotransferase (AST) levels, higher levels of blood urea nitrogen (BUN) and D-dimer, and a higher prevalence of hypertension, dyslipidemia, renal insufficiency, and diabetic macular edema (DME) compared to those without DR. In the crude model, sALB was inversely associated with DR prevalence (OR=0.89, 95% CI: 0.84–0.95, $P=0.0008$). Sensitivity analysis treating sALB as a categorical variable (quartiles) in the fully adjusted model revealed a non-significant increasing trend ($P=0.0742$), indicating a potential non-linear relationship between sALB and DR prevalence. Figure 1 illustrated a non-linear correlation between ALB and DR prevalence after full adjustment. Specifically, ALB was negatively correlated with DR prevalence when <38.10 g/L (OR=0.82, 95% CI: 0.72–0.94, $P=0.0037$), while the association between sALB and DR prevalence was not significant when sALB exceeded 38.10 g/L (OR=1.12, 95%CI: 0.92–1.35, $P=0.2637$). The dashed line represents the 95% CI.

DISCUSSION

Consistent with prior research, this study also suggests a potential negative correlation between sALB levels and the prevalence of DR. This observation aligns with the notion that sALB likely exerted a significant role in mitigating oxidative stress and inflammation.³ Wang et al. identified a notable negative association between sALB levels and the prevalence of DR through analysis of a substantial sample of individuals with type 2 diabetes mellitus (N=45,462) from the NHANES dataset spanning 2011–2020.⁴ Zhang et al. further substantiated that sALB could serve as an independent predictor for DR in individuals with type 2 diabetes mellitus.⁵ Collectively, these studies indicated the pivotal involvement of sALB in the pathogenesis of DR. While Wang et al.'s study suggested a potential non-linear relationship between sALB and DR prevalence, our current

investigation has not only confirmed this non-linear association but also identified a saturation effect with a saturation point (38.10 g/L) closely resembling normal sALB levels, utilizing curve fitting and a two-piecewise regression model. This constituted the primary outcome of this study.

CONCLUSION

This analysis revealed a negative and non-linear association between sALB levels and the prevalence of DR, with an inflection point identified at 38.10 g/L using a two-piecewise logistic regression model. When sALB levels fall below 38.10 g/L, there was an increased risk of DR. Therefore, maintaining sALB levels at or above 38.10 g/L was recommended to mitigate the risk of DR. It was advisable to monitor sALB levels closely and implement appropriate interventions, if necessary, in patients with type 2 diabetes mellitus in clinical practice. Further prospective studies were warranted to investigate whether alterations in sALB levels impact the incidence of DR.

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Comparison of Effectiveness and Safety Between Ab-Externo MicroShunt and Trabeculectomy in Primary Open-Angle Glaucoma

INTRODUCTION

Since its inception in 1968, the Cairns-type trabeculectomy has been the established surgical norm for reducing intraocular pressure (IOP) in glaucoma-affected eyes. Trabeculectomy is the preferred

choice for cases of advanced glaucoma or when aiming for significantly decreased IOP levels. However, its safety profile, characterized by potentially vision-threatening complications such as bleb leaks, choroidal effusions, hypotony maculopathy, and blebitis/endophthalmitis, may limit its appropriateness for cases with less

Both the MicroShunt and the trabeculectomy significantly decreased IOP and medication use after two years, with the trabeculectomy continuing to have better surgical outcomes.

aggressive treatment objectives. The emergence of "micro-invasive glaucoma surgery" (MIGS) procedures has expanded the scope of surgical intervention in glaucoma cases. MIGS procedures offer a safer profile compared to trabeculectomy, albeit with reduced effectiveness. Consequently, canal-based MIGS procedures may represent viable alternatives for patients seeking surgical IOP reduction, particularly when more conservative therapeutic goals may not warrant the risks associated with trabeculectomy.¹ The MicroShunt (Santen Inc) is an implantable device designed to offer ample resistance, thereby controlling pressure reduction and reducing the likelihood of hypotony.² This two-year study evaluated the efficacy and safety of the MicroShunt compared to trabeculectomy in individuals with uncontrolled primary open-angle glaucoma (POAG) who were receiving the maximum tolerated medical therapy. Earlier interim results from the trial at the one-year mark have been previously disclosed.³ This study presented the trial's outcomes over a span of two years.

METHODS

A prospective, randomized, multicenter trial enrolled adult patients between the ages of 40 and 85 with mild to severe POAG that was not adequately controlled on the maximum tolerated medical therapy and had IOP levels between 15 mmHg and 40 mmHg. Patients were randomly assigned in a 3:1 ratio to undergo either stand-alone MicroShunt implantation (395 patients) or trabeculectomy (132 patients), both supplemented with mitomycin C (MMC) at a concentration of 0.2 mg/ml for 2 minutes. The primary measure of effectiveness was surgical success, defined as a minimum 20% decrease in average diurnal IOP from baseline without requiring an increase in glaucoma medications. Secondary endpoints included changes in average IOP and medication usage from baseline, as well as the necessity for additional interventions postoperatively.

RESULTS

In the present study, 50.6% of patients in the MicroShunt group and 64.4% in the trabeculectomy group ($P=0.005$) had surgical success, which is defined as a 20% decrease in IOP from baseline without an increase in glaucoma drugs (Fig 1A). Subgroup analysis revealed differences in surgical success rates between the two groups based on baseline IOP levels (Fig 1B, 1C, 1D). The primary reason for failure in the MicroShunt group was the inability to achieve the target IOP reduction,

while persistent hypotony was the main cause of failure in the trabeculectomy group. Mean IOP was initially higher in the trabeculectomy group but became lower than the MicroShunt group from month 3 onwards, with a consistent difference of approximately 3 mmHg throughout the study. Medication-free rates were higher in the trabeculectomy group at month 24. Both groups showed a significant decrease in mean diurnal IOP from baseline to 2 years, with a similar

proportion of patient's medication-free at the end of the study. The composite primary endpoint of surgical success was achieved by fewer patients in the MicroShunt group compared to the trabeculectomy group, but non-inferiority was demonstrated. Rates of postoperative interventions and adverse events did not significantly differ between the two groups, although hypotony was more common in the trabeculectomy group. MicroShunt repositioning or explantation occurred in a small percentage of patients, usually concurrent with subsequent glaucoma surgery. Vision-threatening complications were rare in both groups.

DISCUSSION

The findings from this two-year prospective, randomized trial, which investigated the efficacy and safety of the MicroShunt compared to trabeculectomy in individuals with medically uncontrolled POAG, demonstrated that both the reduction in IOP and the rates of surgical success were significantly higher in the trabeculectomy group. These results were consistent with those observed at the one-year follow-up.³ Fu MX et al. study revealed that trabeculectomy resulted in a greater reduction in IOP and a decreased requirement for medications compared to the MicroShunt procedure.⁴

CONCLUSION

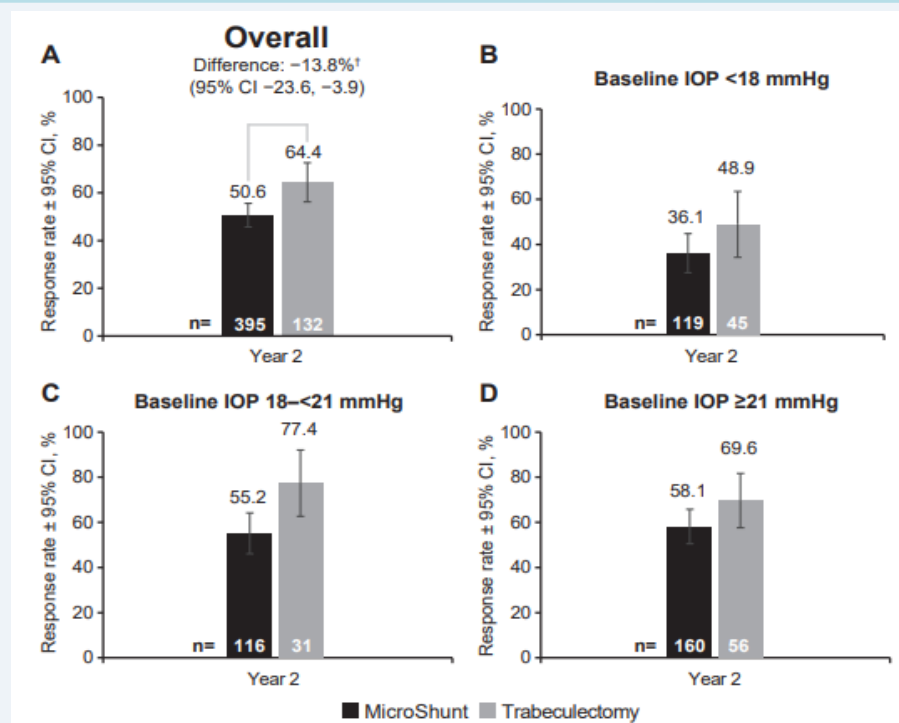


Figure 1. Comparison of the surgical success rates at 24 months for the following patient groups: (A) trabeculectomy and MicroShunt (Santen Inc.) groups overall; (B) patients with baseline intraocular pressure (IOP) < 18 mmHg; (C) patients with IOP between 18 and 21 mmHg; and (D) patients with IOP ~ 21 mmHg.

In this prospective, randomized, single-masked trial, both trabeculectomy and MicroShunt implantation achieved substantial and lasting reductions in IOP at the two-year mark. Trabeculectomy maintained superior surgical success according to the primary endpoint criteria.

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Analysis of the distribution characteristics of axial length to corneal curvature radius ratio (AL/CR) and other ocular biometric parameters in adult myopia patients and their association with myopia

INTRODUCTION

In recent times, myopia rates have surged globally, particularly among young individuals in East Asia, where the prevalence can soar to 80% to 90%. Consequently, myopia has emerged as the primary cause of vision impairment in this region. With the expanding myopic population worldwide, the anticipated repercussions of its prevalence were significant.¹ The development of myopia was influenced by a complex interplay of genetic and environmental factors, according to current research consensus. Mydriatic refraction (cycloplegic refraction) was widely considered the gold standard for diagnosing myopia and assessing its severity. However, in certain cases such as angle-closure glaucoma, alternative diagnostic methods were necessary due to patients' inability to undergo this examination. Studies have confirmed that

Independent of optometry, AL/CR may be used, under specific conditions, to analyse the dynamic changes of SE in the development of adult myopia. It was particularly well-suited for the diagnosis of high myopia in adults.

axial length (AL) was the primary ocular biological parameter influencing refractive status, while the relationship between corneal curvature radius (CR) and refractive state remained inconsistent. Grosvenor's pioneering work revealed a positive correlation between AL and CR, indicating that as AL increases, so does CR. The ratio of axial length to corneal curvature radius (AL/CR) can provide insights into the refractive state of myopia to some extent. Previous research focusing on children and adolescents aged 3–18 years has shown that corneal compensation reaches its limit when $AL/CR \geq 3$, and AL/CR was correlated with spherical equivalent (SE). However, limited studies have investigated AL/CR in adult myopia patients.² This study aimed to examine the distribution patterns of ocular biological parameters, including AL, CR, and the axial length to corneal curvature radius ratio (AL/CR), and their correlation with myopia in adult patients. The findings from this research were anticipated to offer novel insights into the clinical assessment of myopia status and severity among adult patients.

METHODS

A cross-sectional study was undertaken among individuals without eye diseases except for refractive errors who visited the optometry clinic from January 2022 to June 2022. A total of 187 eyes (right eye) from 187 myopic patients aged 18–35 years were randomly selected. Based on the spherical equivalent (SE, in diopters) determined through post-dilation optometry, all participants were categorized into three groups: mild myopia ($SE \leq -0.50D$ and $> -3.00D$, 42 eyes), moderate myopia ($SE \leq -3.00D$ and $> -6.00D$, 80 eyes), and high myopia ($SE \leq -6.00D$, 65 eyes). Initially, a range of ocular assessments including slit lamp examination, uncorrected visual acuity, intraocular pressure (IOP), AL, CR, central corneal thickness (CCT), lens thickness (LT), anterior chamber depth (ACD), and other ocular parameters were conducted under natural pupil conditions. Subsequently, mydriatic refraction was performed to determine the SE in myopic patients. The AL, CR, and the ratio of AL to CR (AL/CR) were measured and compared across the three myopia severity groups. The relationship between AL, AL/CR, and SE was analyzed using multiple linear regression. Furthermore, the potential of AL/CR as a predictor for high myopia was explored through ROC curve analysis.

RESULTS

There were no statistically significant differences observed in age, gender, or intraocular pressure among the three myopia severity groups. The mean values of axial length to corneal curvature radius ratio (AL/CR) in the mild, moderate, and high myopia groups were 3.17 ± 0.06 , 3.31 ± 0.08 , and 3.43 ± 0.10 , respectively, with a statistically significant difference noted between the groups ($P < 0.001$). Linear regression analysis revealed a strong negative correlation between both AL and AL/CR with spherical equivalent (SE) ($P < 0.05$), while CR displayed a weak positive correlation with SE, albeit without statistical significance ($P > 0.05$). The adjusted linear regression equation indicated that for every 0.1-unit increase in AL/CR, SE increased by 1.54 diopters. The area under the receiver operating characteristic (ROC) curve for AL/CR was 0.896 (95%

confidence interval: 0.851 to 0.941), which was significantly higher than that of AL (0.830, 95% confidence interval: 0.769 to 0.900) (Fig 1), indicating that AL/CR had superior diagnostic value for high myopia compared to AL alone ($P < 0.01$). The optimal AL/CR cutoff point, determined by the maximum Youden index (0.626), was 3.309, with corresponding sensitivity and specificity values of 0.954 and 0.672, respectively.

DISCUSSION

In this study, patients were categorized into three groups based on SE: mild myopia ($\leq -0.50\text{D}$ and $> -3.00\text{D}$), moderate myopia ($\leq -3.00\text{D}$ and $> -6.00\text{D}$), and high myopia ($\leq -6.00\text{D}$). Only AL ($P < 0.001$) and AL/CR ratio ($P < 0.001$) exhibited statistically significant differences among the three groups, with both AL and AL/CR values increasing with the severity of myopia. However, there were no significant differences observed in CR, CCT, LT, or ACD among the three groups. These findings slightly differ from those reported by Chu et al., as this study noted statistically significant differences not only in AL/CR and AL but also in CR between the high myopia group and the non-high myopia group ($P < 0.05$).³ This variance could be attributed to differences in the average age of the participants and the approach to grouping. While the majority of individuals in this study were adult myopes (aged 17–43), Chu et al. encompassed young myopic patients (aged 7–48) in their investigation.

CONCLUSION

This study demonstrated a significant negative correlation between AL and AL/CR ratio with SE in adult myopia patients, with AL/CR showing a stronger correlation with SE compared to AL alone. AL/CR emerges as a potential alternative method for evaluating refractive status in lieu of mydriatic refraction, exhibiting favorable specificity and sensitivity for diagnosing high myopia in adults. Future research should focus on large-scale, multicenter studies to validate these findings and provide guidance for the clinical application of AL/CR.

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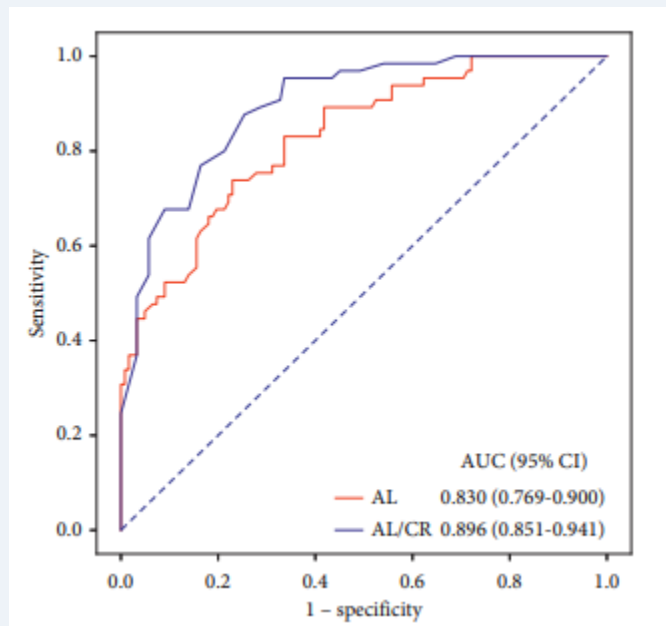


Figure 1. ROC curves for AL and AL/CR in high myopia diagnosis. AL=axial length (mm); AL/CR=ratio of axial length to the radius of corneal curvature.

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Case report on Iridoschisis with Partial Dislocation of the Lens in Bilateral Eyes

INTRODUCTION

Iridoschisis, a rare condition marked by anterior iris detachment from the posterior iris stroma, often leads to glaucoma as a common secondary ocular disorder. Conversely, corneal complications stemming from iridoschisis were infrequent.¹ The scarcity of epidemiological data and research surrounding this condition may be attributed to its rarity. Effective management of iridoschisis entails addressing its resultant complications, particularly when it advances to stages involving corneal endothelial loss. The long-term prognosis was influenced by factors such as the patient's overall ocular health, concurrent ocular conditions like cataracts and glaucoma, and the efficacy of surgical interventions.² An exceptional case highlighted a 48-year-old male who exhibited bilateral iridoschisis accompanied by partial lens dislocation, a notably rare presentation. The particulars of this case were delineated below.

Iridoschisis and other ocular problems can be brought on by repeatedly rubbing both eyes together. If any signs of ocular abnormalities appear, prompt medical attention was required.

CASE PRESENTATION

In ophthalmology department, a 48-year-old male patient admitted due to ongoing binocular visual acuity issues persisting for over a year, coupled with a significant decline in vision over the past month. The patient reported experiencing discomfort in both eyes characterized by dryness and photophobia, without accompanying signs of redness or pain. Upon ocular assessment, uncorrected visual acuity was found to be 20/80 in the right eye and 20/300 in the left eye, with no improvement upon correction. Intraocular pressure (IOP) measured using a Goldmann applanation tonometer was 14 mmHg in the right eye and 13 mmHg in the left eye. A slit-lamp

examination revealed iridoschisis in the right eye, primarily in the subnasal and temporal regions (Fig 1a), along with partial lens dislocation (Fig 1 b and c). The patient's right eye lens opacity was graded as C4N3P2 based on the Lens Opacities Classification System II (LOCS II). In the left eye, iridoschisis and partial lens dislocation were also observed, with lens opacity graded as C3N3P2. Due to significant lens opacity,

fundus deconstruction and optic disc analysis were limited. Ocular ultrasound indicated the

presence of cataracts and posterior scleral staphyloma in both eyes, while ultrasound biomicroscopy revealed iris root splitting, anterior displacement of the ciliary body, and other structural abnormalities. Phacoemulsification (Phaco) was performed in the left eye followed by intraocular lens (IOL) suspension surgery. Phaco surgery was subsequently performed in the right eye to manage the cataract. Post-surgery treatment included routine administration of anti-inflammatory, anti-infective, and dilating eye drops. At the 2-month follow-up, the patient showed no progression of iridoschisis in the right eye (Fig 1d), with optimal IOL positioning and improved visual acuity of 20/25. The IOP in the right eye remained stable at 14 mmHg, with endothelial cell density (ECD) measurements of 2278/mm², a hexagonal cell percentage (HEX) of 43%, and a coefficient of variation (CV) of 22%.

DISCUSSION

Some experts suggest a familial predisposition to iridoschisis with secondary glaucoma, prompting recommendations for individuals with affected relatives to undergo regular eye examinations.³ In this instance, the patient's close relatives underwent thorough ocular evaluations, revealing no signs of iridoschisis. It was worth mentioning that previous studies have associated iridoschisis with lens subluxation.⁴ In such cases, lens subluxation generates friction against the iris, leading to the development of iridoschisis.

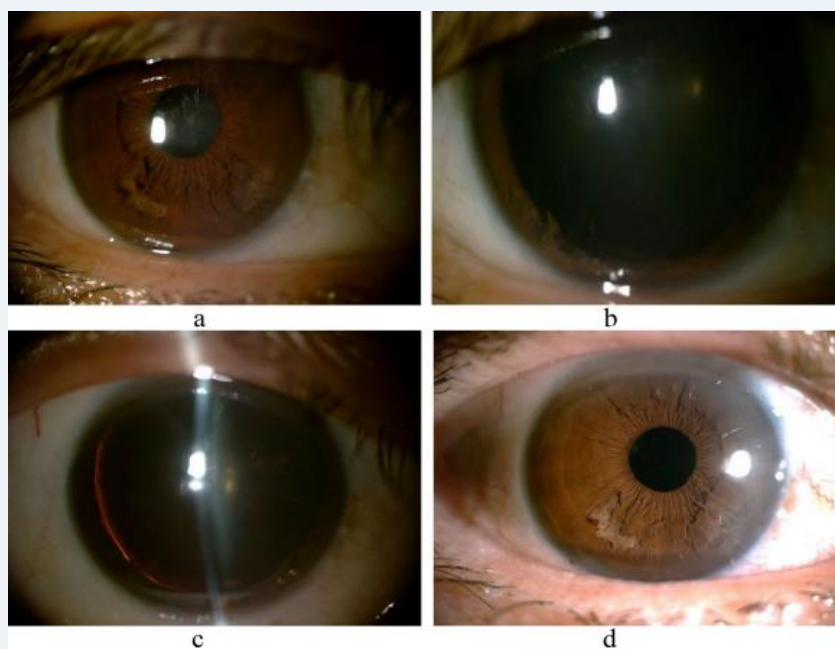


Figure 1. An image of the right eye's anterior chamber. A. Right eye iris dilation resulting in temporal and nasal iridoschisis; B and C. Right eye iris curvature, split iris floating in atrial fluid, disarticulation of the suspensory ligament at points 1-6, and partial dislocation of the lens; D. Two months after surgery, IOL in correct position and iris splitting not enlarged.

CONCLUSION

This case highlighted the potential for iridoschisis and other ocular issues to arise from frequent eye rubbing. Prompt medical attention was essential for managing such complications. Additionally, caution should be exercised when using neck massagers near the eyes, as they can cause serious harm. In summary, individuals should avoid using devices inappropriately, as this may lead to unintended harm.

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