

What's New in Pediatric Ophthalmology Literature?

A semi-annual publication of the Professional Education Committee of the
American Association of Pediatric Ophthalmology and Strabismus

Last updated: September 2025

Table of Contents

What's New in Pediatric Ophthalmology Literature?	1
Table of Contents	1
All-Star Nominees (TBD)	3
Amblyopia, Refractive Error, and Vision Screening	3
Strabismus and Strabismus Surgery	6
Prematurity, ROP, Systemic Diseases / Practice Systems, and Education	9
Anterior Segment, Cataract, Glaucoma / Uveitis / Infectious Disease	10
Retina, Retinoblastoma, Intraocular Tumors, and Trauma	13
Neuro-ophthalmology, Nystagmus, Visual Impairment / Plastics and Orbit	16
Genetics	18
Amblyopia	21
Anterior Segment	31
Cataract	36
Cataract Surgery	39
Genetics	42
Glaucoma	64
Infections	73
Neuro-Ophthalmology	75
Nystagmus	79
Oculoplastics	81
Orbit	84
Pediatrics / Infantile Disease / Syndromes	85
Practice management / Health care systems / Education	88
Prematurity	93
Refractive Error	94
Refractive Surgery	109
Retina	110
Retinoblastoma	120
Retinopathy of Prematurity	127
Strabismus	139
Strabismus Surgery	148

Trauma.....	160
Uveitis	161
Vision Screening	165
Visual Impairment	167

All-Star Nominees

Amblyopia, Refractive Error, and Vision Screening

Early Patching Behaviors That Improve the Chances of Good Visual Acuity in Children Treated for Unilateral Congenital Cataract

Drews-Botsch C, Hartmann EE, Celano M, et al.

Ophthalmology 2025;132(5):561-568

The authors of this paper analyzed the patching habits of patients post unilateral cataract extraction to see if patterns of successful amblyopia therapy could be established. They hypothesized that patching every day at a consistent time or first thing in the morning was more likely to improve adherence to prescribed patching and improve chances that the child would obtain good vision. This study was a post-hoc analysis of data from the IATS. The primary outcome was the visual acuity in the treated eye. The cohort included 105 children who participated in the IATS and whose caregivers completed either a 7 day patching diary 2 months after surgery or at 13 months of age. It was established in an earlier analysis that children receiving an IOL or contact lens was not associated with better visual acuity outcomes, rather having access to private insurance as a proxy for socioeconomic status and access to healthcare and age of surgery were more closely correlated. Consistent patching was reported in patients whether or not the family had access to private insurance and was not associated with whether the child received an IOL. However the age of surgery was associated with consistent patching as reported at 13 months of age but not 2 months. On average children whose caregivers reported more consistent patching patterns had better visual acuity than those who reported missing one or more days of patching or patched less consistently according to a schedule time or after 9:00 a.m. Likewise the probability of achieving near normal vision was higher in those children who patched consistently every day at the same time or before 9:00 a.m. The chance of having visual acuity of 20/40 or better at 54 months was more than twice as high if a caregiver reported this pattern of patching behavior. This observed association between patching consistency and visual acuity may be due to resulting in more hours of patching being achieved within the first year and subsequent years. The authors state that infancy represents a unique opportunity to establish patching routines in children treated for unilateral cataracts and the early patching is also likely to associate with improvements in visual acuity which most likely helps to minimize later resistance to patching. In addition providing caregivers with evidence regarding efficacy of patching may be particularly important and help to improve adherence to patching regimens. The authors highlight a number of limitations. First, a child's visual acuity during this period may predict the amounts and consistency of patching that they can actually achieve. Additionally the small sample size may not allow for robust analysis, however they do assert that their findings suggest a true association. In addition the authors could not be sure of the completeness of the diaries that were submitted. This study is important in that it can help to provide a framework for patching in our patients with early cataract extraction as well as to help educate our families related to the importance of consistency as early onset of patching and helping to achieve good visual acuity outcomes.

Cost-effectiveness Analysis of Digital Therapeutics for Amblyopia

Koc I, Bagheri S, Chau RK, et al.

Ophthalmology 2025 Jun;132(6):654-660

This article evaluates the cost-utility of two FDA-cleared digital therapeutics, Luminopia and CureSight, for treating amblyopia compared to standard treatments (glasses, atropine drops, and patching). A cost-utility analysis was performed from a third-party payer perspective, using patient preference-based time trade-off utility values from prior literature. Costs included eye examinations (based on reimbursement data) and device costs (provided by Luminopia and CureSight sales representatives). The analysis assumed one initial comprehensive ophthalmology exam followed by monthly follow-ups, as per RCT protocols. Costs for 12 weeks of treatment were \$513.70 for glasses, \$540.28 for patching (2 hours/day, 7 days/week), and \$651.53 for atropine (1% daily for 16 weeks), whereas the cost of treating with Luminopia or CureSight for 12 weeks was \$1951 and \$1564 or \$1814, respectively. Cost-utility analysis has been used as a gold standard for determining cost-effectiveness of health care interventions in efforts to optimize society's limited resources compassionately. It expresses the value received from an intervention in quality-adjusted life-years (QALYs) for dollars spent, using both number of years gained and quality of life in the calculation to evaluate different outcomes that would not be comparable with other cost analyses. The authors felt that both Luminopia and CureSight were cost-effective. They demonstrated favorable cost-utility ratios, driven by their efficacy in improving visual outcomes and patient adherence, particularly for those unable to tolerate or adhere to traditional therapies like patching or atropine. Treatment with glasses and patching for 12 weeks resulted in costs per QALY gained of \$427 and \$101, respectively. Treatment with atropine for 16 weeks resulted in costs per QALY gained of \$151. Luminopia and CureSight treatment for 12 weeks resulted in costs per QALY gained of \$618 and \$368, respectively. Although current standard-of-care amblyopia treatments are lower cost and clinically effective, their effects are limited by low adherence. Digital therapeutics offer a viable alternative for amblyopia treatment, especially for patients with adherence challenges. The study suggests that Luminopia and CureSight can improve access to effective care, potentially reducing long-term visual impairment costs. The study supports integrating digital therapeutics into clinical practice and calls for further research to validate long-term cost-effectiveness and real-world applicability.

Multifocal Soft Contact Lenses for the Treatment of Myopia Progression in Children: A Report by the American Academy of Ophthalmology

Cavuoto KM, Trivedi RH, Prakashakorn SG, et al.

Ophthalmology 2025 Apr;132(4):495-503

This is a report by the American Academy of Ophthalmology, evaluating the efficacy and safety of multifocal soft contact lenses (MFCLs) for controlling myopia progression in children. The review included 10 studies (3 randomized controlled trials [RCTs], 7 nonrandomized studies) focusing on MFCLs compared to single-vision contact lenses or spectacles in children aged 5–18 years. Outcomes assessed were myopia progression (measured by spherical equivalent refraction [SER] and axial length [AL]) and safety (adverse events). MFCLs significantly reduced myopia progression compared to controls. In RCTs, MFCLs showed a mean reduction in SER progression of 0.23–0.46 diopters (D) and AL elongation of 0.07–0.16 mm over 1–2 years. Nonrandomized studies reported similar trends, with high-add power MFCLs (e.g., +2.00 D) generally more effective than low-add or center-distance designs. Peripheral defocus created by MFCLs is thought to slow axial elongation, a key factor in myopia progression. Adverse events

were minimal, with no significant increase in complications (e.g., corneal abrasions, infections) compared to single-vision lenses. Dropout rates were low, indicating good tolerability. The review notes variability in study designs, lens types, and follow-up durations (1–3 years), limiting long-term conclusions. Most studies were conducted in East Asian populations, potentially affecting generalizability. MFCLs are a viable, safe option for slowing myopia progression in children, particularly those at high risk of high myopia. However, long-term data and standardized lens designs are needed to optimize treatment protocols. The report supports the use of MFCLs as an effective and safe intervention for controlling myopia progression in children, with stronger evidence for high-add power lenses. Clinicians should consider patient-specific factors and monitor outcomes, while further research is needed to assess long-term efficacy and broader applicability.

Myopia Control Efficacy of Asymmetric Multipoint Defocus Technique Spectacle Lenses: One-Year Double-Masked Randomized Controlled Trial

Wang M, Ma R, Kuang L, et al

Ophthalmology 2025;132(9):972-979

This was a prospective multicenter randomized double-mask parallel control trial using AMDT spectacle lenses in the experimental group and single vision lenses in the control group. The primary aim of the study was to evaluate the myopia control efficacy of these AMDT lenses compared with single vision lenses over one year and to establish the safety and adaptation to these lenses. In the study participants were 8 to 13 years of age with refractions between minus 0.75 diopters and -5.00 diopters with astigmatism of 1.5 diopters or less and anisometropia of 1.5 diopters or less and best corrected visual acuity both eyes of 0.00 logMAR. Both the single vision and AMDT lenses were produced by the same manufacturer. Follow up visits were conducted on the day of lens dispensing, one week, 3 months, 6 months and 12 months afterwards with ophthalmic examination and visual performance questionnaire. The main outcome measures were the change in SER and axial length from baseline. After 12 months the AMDT group showed significantly less SER progression equivalent to 0.34 diopters less myopia progression in this group. In addition the axial elongation in this group demonstrated significantly less progression with 0.17 mm less axial elongation. Factors associated with progression were younger age of baseline, and axial elongation at 12 months. Patients in the AMDT group reported significantly more Image blur at one week, however this resolved by 3 months and did not recur. The author states that the key finding is that these AMDT spectacle lenses significantly reduced myopia progression both in SER and elongation over 12 months compared with single Vision lenses with no serious adverse events. There was a significant association between baseline age and myopia progression and that AMDT lenses had similar myopia control efficacy to other spectacle lenses designed for the same purpose. Several limitations existed in the study including only one year's worth of results, inclusion of only Chinese children, and refractive error limited to 0.75 to -5 diopters of refractive error. This study is significant because it evaluates an additional form of myopia control lenses that may increase our armamentarium of modalities in this condition.

Associations between School-Based Vision Program Outcomes and School Characteristics in 410 Schools

Kallem M, Guo X, Dai X, et al.

Ophthalmology 2025 Apr;132(4):452-460

This study evaluates the relationship between school-based vision program (SBVP) outcomes and school-level characteristics. This retrospective cross-sectional study analyzing data from Helen Keller International's United States Vision Program (2016–2022) across 410 public schools in the Northeastern U.S. The study focused on schools with at least 50 enrolled students aged 5–22, excluding those with less than 60% of grade levels served by the SBVP. Vision screening and eye examination data was used to assess SBVP outcomes, including screening failure rates, eyeglass prescriptions, and referral rates. These were correlated with publicly available school data on socioeconomic status (proportion of students qualifying for free and reduced-price meals [FARM]), race/ethnicity, and English language learner status. Schools with higher proportions of socioeconomically disadvantaged students (measured by FARM eligibility) showed increased vision care needs. A 10% increase in FARM-eligible students was associated with a 2.6% increase in screening failures, 1.8% increase in eyeglass prescriptions, and 0.86% increase in referral rates. Most schools had a plurality of Hispanic (61%) or Black (34.6%) students, with elementary (36.8%), middle (37.8%), and high schools (25.4%) evenly represented. The findings highlight significant demand for vision care in schools, particularly those serving lower-income communities. SBVPs help address disparities in pediatric vision care access, and the study suggests opportunities to optimize resource allocation (e.g., personnel and equipment) based on school demographics to maximize program impact.

Strabismus and Strabismus Surgery

Types of strabismus and strabismus surgery after retinal detachment repair: a health registry database analysis

Soetikno BT, Tran EM, Wai KM, et al.

J AAPOS 2025 Jun;29(3):104216

After a rhegmatogenous retinal detachment (RRD) repair, diplopia (double vision) and strabismus (eye misalignment) are potential complications, but their incidence varies depending on the surgical method. A retrospective cohort study analyzed data from over 126 million patients in the TriNetX Analytics platform to compare the risks of these complications after three types of RRD repair: pneumatic retinopexy (PR), scleral buckle (SB), and pars plana vitrectomy with or without scleral buckle (PPV+/-SB). The study identified 25,169 patients and found that the overall risk of diplopia and strabismus is low. However, SB carried the highest risk, with rates of 2.73% for diplopia and 1.79% for strabismus. PPV+/-SB had the next highest risk (2.28% for diplopia, 1.46% for strabismus), while PR had the lowest risk (1.54% for diplopia, 0.612% for strabismus). Both SB and PPV+/-SB had a significantly higher risk of diplopia and strabismus compared to PR ($P < 0.01$ and $P < 0.001$, respectively). Horizontal tropias were the most common type of strabismus, and Kaplan-Meier analysis showed that SB had the highest hazard for both diplopia and strabismus during the first year after surgery. The need for strabismus intervention, such as surgery or chemodenervation, was extremely rare. While the study's large and geographically and racially diverse sample size is a major strength, its limitations include a reliance on the accuracy of coding and the inability to separate some procedures. Nonetheless, the findings provide a

valuable perspective for clinicians, reassuring them that the risk of a patient needing strabismus surgery after RRD repair is extremely low.

Characteristic Thinning of Temporal Parafoveal Retinal Thickness in Patients With Intermittent Exotropia

Han M, Wen Y, Tang S, et al.

Am J Ophthalmol 2025;273:151-158

This study asks whether retinal structure differs in intermittent exotropia (IXT) in a way that could support sensory adaptations like anomalous retinal correspondence (ARC). Because many IXT patients avoid diplopia via suppression/ARC, the authors probed the temporal parafovea—where suppression/ARC would be expected—using high-resolution OCT. In a cross-sectional design, 20 basic-type IXT patients with a fixed 35-PD exodeviation were compared with 20 age-matched controls; OCT thickness was sampled at temporal parafoveal loci corresponding to 25, 30, 35, 40, and 45 PD, alongside standard motility, dominance, stereopsis, axial length, and synoptophore testing. Results showed interocular symmetry within IXT (no dominant–nondominant differences overall), but a marked localized thinning at the locus corresponding to the deviation angle: temporal parafoveal thickness at 35 PD was significantly reduced versus controls ($P<.0001$) with a “V-shaped” profile centered on 35 PD. Among IXT eyes, thinning at 35 PD was greater in ARC versus non-ARC, significant in nondominant eyes ($P=.007$) and right eyes ($P=.033$). Measurement reproducibility was excellent (single-measure ICC 0.913; average-measure ICC 0.969). Strengths include targeted, physiology-driven sampling of retinal structure, rigorous masking, and high interobserver reliability; limitations are the small, single-center sample, fixed angle (35 PD) restricting generalizability, cross-sectional design (no causality), and absence of layer-by-layer segmentation or longitudinal change after treatment. This work teaches that IXT may feature a subtle, localized temporal parafoveal “pseudo-fovea” anatomically aligned to the habitual deviation, especially in ARC—linking structure to sensory adaptation. For pediatric ophthalmology, it suggests OCT mapping of temporal parafovea could become a biomarker for ARC/IXT control, refine counseling and prognosis, and motivate trials tracking whether surgery or vision therapy normalizes this niche thinning or predicts postoperative binocular outcomes.

Small-angle vertical strabismus treatment in the elderly

Mason H, Kilduff C, Jain S

J AAPOS 2025 Apr;29(2):104177

Management of vertical strabismus in the elderly can be complex due to small angles of deviation, limited fusional vergence, and desire to be glasses/prism-free following cataract surgery. Standard recession surgery can lead to over-correction in this patient population. A review of 1,390 abstracts was conducted. 5 novel surgical techniques for management of small-angle vertical strabismus were identified, and 4 of these were reviewed. Graded partial tenotomy of up to 90% tendon-width, which is intended to be performed under topical anesthetic with immediate patient feedback, resulted in up to 10 prism diopters of correction, though effects were seen to decrease within 1 year of the procedure. Partial tenotomy, performed by creating an 80-90% tenotomy and recessing the severed muscle fibers by up to 4mm, showed maximum effect of 6 prism diopters without statistically significant effects on torsion or incomitance. Minitenotomy, which involves cutting the central 3-4mm of the vertical rectus tendon under local anesthesia

through intact conjunctiva, resulted in correction of about 2 prism diopters, and is suggested for patients with very small angles of deviation who have contraindications to anesthesia. Miniplication, tagging the central 3-4mm of the muscle 5mm posterior to the insertion and bringing them forward and attaching them at the insertion, achieved up to 8-9 prism diopters of correction, preserved anterior ciliary vessels, and allowed for surgical intervention where no vertical rectus muscles were appropriate for weakening. Limitations of this review article include small sample sizes and short follow-up periods. These surgical techniques provide viable alternatives for patients with small-angle strabismus for whom prism and/or general anesthesia is not an option.

Common Forms of Adult Esotropia Require Augmented Surgical Dosing

Yehezkeili V, Demer JL

Am J Ophthalmol 2025;273:74-81

Age-related distance esotropia (ARDE), often related to sagging eye syndrome, and decompensated esophoria (DE), a progressive esodeviation in younger adults, are two common forms of adult strabismus that pose challenges in surgical dosing. Traditional Parks' tables often undercorrect these entities, prompting recommendations for augmented medial rectus (MR) recession, but the degree of augmentation required has not been well quantified. This study was a retrospective, comparative interventional case series of 115 patients (54 DE, 61 ARDE) who underwent bilateral MR recessions between 2015 and 2024. Surgical dose-response was compared against Parks' tables, and long-term outcomes, including reoperations, were assessed. Results showed that both DE and ARDE required substantially greater MR recessions than standard dosing predicted. In DE, the first 4.6 mm of MR recession had no effect, with each additional millimeter correcting ~3 prism diopters (Δ); in ARDE, the intercept was 3.5 mm, with each extra millimeter correcting ~2.4 Δ . Despite initial success, 22% of DE patients developed late recurrences (~3 years), while 15% of ARDE patients experienced early undercorrections. Adjustable sutures improved immediate alignment but did not prevent long-term drift. Strengths of the study include the relatively large, well-defined cohorts and rigorous regression modeling of surgical dose-response. Limitations include its retrospective design, single-surgeon experience, and limited long-term follow-up for progressive conditions. This article highlights that DE and ARDE respond differently to surgical dosing and that augmented MR recession is mandatory to avoid undercorrections. For pediatric ophthalmology, the findings emphasize that adult strabismus cannot be approached with pediatric dosing assumptions, and that understanding condition-specific biomechanics is critical. The study may encourage pediatric ophthalmologists managing older adolescents or young adults with DE to anticipate late recurrences, consider more aggressive initial dosing, and counsel families on the likelihood of future surgical adjustments.

Three-year Outcomes of Botulinum Toxin Versus Strabismus Surgery for the Treatment of Acute Acquired Comitant Esotropia in Children

Nguyen MTB, Cheung CSY, Hunter DG, Wan MJ, Gise R

Am J Ophthalmol 2025;272:1-7

In a multicenter, retrospective, nonrandomized comparative study of 76 children with acute acquired comitant esotropia (AACE), botulinum toxin injection was found to be noninferior to strabismus surgery for achieving successful alignment and binocular vision at 36 months. The success rate at 36 months was 72% for the botulinum toxin group and 56% for the surgery group,

with similar median deviation and stereoacuity outcomes. Botulinum toxin treatment was associated with significantly shorter general anesthesia and postanesthesia care times. A longer delay from esotropia onset to intervention was independently associated with poorer sensorimotor outcomes, regardless of treatment modality. These findings may support botulinum toxin as an effective and less invasive alternative to surgery for pediatric AACE, provided that treatment is not delayed.

Prematurity, ROP, Systemic Diseases / Practice Systems, and Education

An AND versus OR study of retinopathy of prematurity screening criteria

Aaserud TL, Lam L, Pastore S, et al.

J AAPOS 2025;29(4):104272

Screening for retinopathy of prematurity (ROP) requires fellowship-trained ophthalmologists, multiservice coordination, and increases stress on the premature infant. This study aims to compare current US screening guidelines for ROP screening, which includes premature infants ≤ 30 weeks gestational age or ≤ 1500 g at birth, to only screening infants that meet both criteria. It is a retrospective study at a single institution that reviewed medical records of premature infants born between 2012-2022. The authors created two groups- one group of infants that met both ROP screening criteria (AND group) and one group of infants that met one of the ROP screening criteria (OR group). Diagnosis of treatment requiring type 1 ROP was the primary outcome, and need for follow-up ophthalmic examinations for ROP and maximum ROP stage were secondary outcomes. 759 infants were included in the study, 24% in the OR group and 76% in the AND group. Mean birth weight and mean gestational age were greater in the OR group. There were no infants in the OR group that showed severe type 1 or type 2 ROP requiring treatment as opposed to 15% of infants in the AND group that demonstrated type 1 or type 2 ROP disease, 9% requiring treatment. Limitations include retrospective study design and data collection at a single institution, which may limit generalizability of results. This study evaluates a simplification of the ROP screening guidelines by excluding the OR babies, which may reduce the patient load by about 24%.

Retinal Vascularization Rate Predicts Retinopathy of Prematurity and Remains Unaffected by Low-Dose Bevacizumab Treatment

Chang E, Josan A, Purohit R, et al

Am J Ophthalmol 2025;275:74-87

This retrospective cohort study from Oxford investigated whether ultra-widefield (UWF) retinal imaging could quantify retinal vascularization rate as a predictor of type 1 retinopathy of

prematurity (ROP) and assess whether anti-VEGF therapy alters vascular growth. ROP is a leading cause of childhood blindness, driven by delayed retinal vascularization and subsequent abnormal neovascularization in premature infants. The study analyzed 132 eyes from 76 preterm infants (mean GA 26 weeks, BW 815 g) using serial UWF images to calculate temporal vascularization rate (TVR), and then applied a machine-learning model using TVR, birthweight, and gestational age to predict ROP severity. Results showed that eyes requiring treatment (type 1 ROP) had significantly slower vascularization—29% lower TVR—than those with no or type 2 ROP. The predictive model incorporating TVR with birthweight and GA achieved 95.8% balanced accuracy in an independent validation cohort, outperforming models based on birthweight and GA alone. In a subset of 37 eyes, ultra-low-dose bevacizumab (0.16 mg) did not significantly affect TVR, suggesting physiological vascular growth continued post-treatment. Strengths of the study include use of UWF imaging to capture peripheral vasculature and the novel application of machine learning for individualized risk prediction. Limitations include its single-center design, modest sample size, and exclusion of cases with poor-quality imaging, which may limit generalizability. This work teaches us that quantifying vascularization rate can serve as an early, objective biomarker for identifying high-risk infants, allowing earlier and more precise intervention. For pediatric ophthalmology, these findings may shift practice toward integrating imaging-based vascular growth metrics into ROP screening protocols, refining treatment timing, and alleviating concerns that anti-VEGF therapy arrests physiological vascular development.

Utility, safety, and accessibility of phone call follow-up in strabismus surgery postoperative care
Shao CG, Morales N, Lee AR

J AAPOS 2025 Jun;29(3):104218

Given the common challenges of work conflicts and transportation, a study investigated whether a phone call follow-up could be a safe and effective alternative to a traditional in-person visit after pediatric strabismus surgery. The researchers conducted a retrospective review of 370 consecutive pediatric patients who underwent strabismus surgery between mid-2018 and 2021. They compared the success of a first postoperative week (POW1) follow-up via phone call versus an in-person visit. The results showed that both methods were highly successful, with a 96.2% success rate for phone calls and a 95.2% success rate for in-person visits ($P=0.66$). Importantly, there was no significant difference in the number of complications detected between the two groups; nine were found in the in-person group, and seven in the phone group, and none of these complications led to vision loss. The study also found that phone follow-ups were 81% more cost-effective per patient encounter. The findings are significant for clinical practice, as nearly half of the patients in the study had to travel over 50 miles for their appointments. The study suggests that implementing a standardized phone call follow-up is a safe and cost-effective way to improve healthcare access, particularly for patients who live far from the clinic, while maintaining the ability to detect early complications. The limitations of this study include its retrospective design, data from a single surgeon, and lack of patient satisfaction metrics.

Anterior Segment, Cataract, Glaucoma / Uveitis / Infectious Disease

Is Patching after Age 4 Beneficial for Children Born with a Unilateral Congenital Cataract?

Drews-Botsch CD, Cotsonis G, Celano M, et al.

Ophthalmology 2025 Apr;132(4):389-396

This study used data from the Infant Aphakia Trial to assess how early patching impacts VA outcome and whether patching after the age of 4 is beneficial in patients with unilateral congenital cataracts. The study included 105 patients who participated in IATS and did not have a vision threatening adverse event. For all patients, the average VA at both 4 and 10.5 years of age 20/151 with 41% having vision worse than 20/200. VA at age 4 was predictive of VA at age 10.5. Half had poorer vision at 10.5 years, but half also had better vision. Most changes of VA between 4 and 10.5 years was small. On average, children were patched 3 hours per day between 48 months and 60 months. 18 children did not patch at all, 15 reported at least 6 hours per day, and half patched between 0.66-4.83 hours per day. Amounts of patching earlier in life were strongly predictive of patching in the 5th year of life. The amount of patching strongly correlated with the patients VA – patients with worse vision were patched fewer hours on average than patient 20/40 or better in the first 5 years of life. Children with near normal vision (i.e., VA of 20/40 or better) averaged more hours of patching between 12 and 36 months of age than children in each of the other VA groups. However, the average hours per day of patching in the fifth year of life were not correlated with the change in VA between age 4 and 10.5 years overall. None of the children with a VA measurement of 20/200 or worse at age 4 years achieved VA of better than 20/100, irrespective of the amount of patching that was performed thereafter. These analyses suggest that optotype acuity measures obtained early in the fifth year of life are reliable and predictive of final visual outcomes. The results suggest that once optotype acuity can be reliably measured, less aggressive patching protocols may be warranted in some children following surgery for unilateral congenital cataract after careful consideration of the potential impact of patching on the child's quality of life, family relationships, and binocular visual field. This study has interesting and impactful results that have the potential to shift how we manage amblyopia in these patients after the age of 4.

Long-Term Refractive Changes After Pediatric Cataract Surgery: An Average Follow-up of 15 Years

Oshika T, Nishina S, Ura S, et al

Am J Ophthalmol 2025;277:305-312

This multicenter retrospective case series investigated long-term refractive outcomes after pediatric cataract surgery, a critical issue given the unpredictability of refractive development in young children compared to adults. A total of 451 eyes from 273 patients who underwent surgery at age six years or younger were followed for a mean of 15 years, allowing comparison of bilateral vs unilateral cases and aphakia vs pseudophakia. The study found that younger age at surgery was strongly associated with larger long-term myopic shifts, with children operated on at or before age two experiencing median shifts of -8 to -11 diopters in bilateral cases and comparable anisometropic changes in unilateral cases. In contrast, those treated after age two showed more modest shifts of -3 to -6 diopters. Importantly, both aphakic and pseudophakic groups demonstrated similar patterns, and in pseudophakia, longer axial length at surgery correlated with greater myopic progression. Glaucoma developed most often in aphakic eyes but was rare in pseudophakia, and its presence did not significantly alter refractive shifts. Strengths of this study include its large, multicenter design, long follow-up, and direct comparison across surgical types; limitations include retrospective design, lack of standardized surgical or IOL protocols, incomplete axial length data, and absence of detailed amblyopia therapy information. This work reinforces

that pediatric cataract surgery before age two carries a high risk of large, progressive refractive changes regardless of IOL status, underscoring the importance of cautious IOL power selection, hyperopic targeting, and vigilant long-term monitoring. For pediatric ophthalmology, these findings will guide more precise surgical planning, family counseling, and postoperative refractive management strategies to optimize long-term visual outcomes.

Screening Corneal Tomography for the Diagnosis of Keratoconus in Pediatric Patients With Trisomy 21

Smith CG, Edwards Mayhew RG, Singh JK, et al

Am J Ophthalmol 2025;277:349-355

This retrospective, cross-sectional study addressed the feasibility of corneal tomography in children with Down syndrome (DS) and whether high levels of astigmatism or myopia are reliable indicators of keratoconus in this group. A total of 358 patients with DS and 96 without DS, aged 4–18 years, were evaluated at a tertiary pediatric hospital from 2018–2020. Tomographic imaging was successfully obtained in at least one eye for 75.9% of children with DS. Among those diagnosed with keratoconus, children with DS had significantly lower amounts of astigmatism and less myopia at diagnosis compared to non-DS peers. Importantly, within the DS cohort, refractive error did not differ between those with and without keratoconus, suggesting that refractive thresholds alone are not reliable screening markers. Strengths of the study include its focus on a large, at-risk population with real-world applicability, while limitations include its retrospective design, single-center setting, selection bias in who underwent imaging, and variability in diagnostic criteria across physicians. The key teaching point is that keratoconus in children with DS often presents without the high astigmatism or myopia traditionally associated with the disease in other populations. For pediatric ophthalmology, this emphasizes the need for early and routine tomographic screening of children with DS regardless of refractive error. Incorporating systematic screening protocols could enable earlier detection and timely corneal crosslinking, potentially preventing vision-threatening progression and reducing reliance on interventions such as keratoplasty, which are often less successful in this vulnerable population.

Treatment Patterns of Childhood Glaucoma in the United States: Analysis of IRIS® Registry (Intelligent Research in Sight)

Fujita A, Vu DM, Aziz K, et al

Am J Ophthalmol 2025;271:210-221

Childhood glaucoma is rare but vision-threatening, and management varies because high-quality pediatric trials are scarce and disease phenotypes are heterogeneous. U.S. registry-based cohort (IRIS Registry, 2013–2020) examined real-world treatment patterns and drivers of surgery in patients <18 years. In 5,017 eyes (3,069 patients)—4.1% primary congenital glaucoma (PCG), 38.1% juvenile open-angle glaucoma (JOAG), 19.9% glaucoma following cataract surgery (GFCS), and 32.8% other secondary glaucomas—16.1% underwent a glaucoma-related procedure while 93.6% received IOP-lowering drops (most commonly β -blockers, then topical CAs and prostaglandin analogs, with PGAs/ α -agonists used more in older children). First-recorded procedure patterns differed by age and diagnosis: angle surgery predominated in PCG; tube shunts in GFCS and other secondary glaucomas; and laser trabeculoplasty (LTP) in JOAG,

largely performed by non-glaucoma, non-pediatric ophthalmologists. Cox modeling showed higher hazards of incisional surgery with PCG vs JOAG (HR 5.40), higher baseline IOP (HR 1.06 per mmHg), and age <1 year at index (HR 6.08), whereas care by a nonglaucoma subspecialist was linked to lower surgical likelihood (HR 0.32). Strengths include the large, nationwide, real-world dataset and multivariable modeling; limitations include reliance on billing codes, underrepresentation of academic centers (potentially undercapturing infant PCG surgeries), missing severity metrics, and procedures done outside the registry. This study teaches that U.S. pediatric glaucoma care leans heavily on medications, with procedure choice shaped by phenotype, age, and provider training. For pediatric ophthalmology, the findings support early referral of infants/PCG to subspecialists, caution against routine LTP in JOAG without clear benefit, and underscore the need for accessible, standardized guidelines to harmonize care and optimize surgical selection across practice settings.

Incidence and Predictors of Remission of Childhood Uveitis in a Large Community Cohort

Qian Y, Xu RH, Rabbani JW, Tucker LY

Am J Ophthalmol 2025;277:221-229

This large community-based cohort study provides new insight into the natural history of childhood uveitis and predictors of remission. Uveitis is an important cause of pediatric visual morbidity, often chronic and associated with systemic disease such as juvenile idiopathic arthritis (JIA), yet most prior studies have been from tertiary referral centers with limited generalizability. In this retrospective cohort, 1,643 children under 16 years with incident uveitis diagnosed in Kaiser Permanente Northern California between 2010–2020 were identified, of whom 277 had noninfectious uveitis and 145 had chronic disease requiring at least 3 months of treatment. The mean age at treatment was 9.8 years, with 70% anterior uveitis. Over an average 41 months' follow-up, the 5-year cumulative probability of drug-free remission was 50.8%. Older age at presentation and male sex were independent predictors of remission, with a dose-response effect: <6 years had only 20% remission vs 77% in those ≥14 years. Female sex and younger age strongly predicted non-remission, while other baseline factors (bilaterality, anterior vs nonanterior location, JIA, synechiae, cataract, socioeconomic status) were not significant after adjustment. Strengths include the large, diverse, insured community sample, systematic electronic records, and rigorous survival modeling, which provide more generalizable data than referral cohorts. Limitations include retrospective design, reliance on pharmacy refill data, absence of granular clinical dosing detail, and stringent remission definition. This study teaches that about half of children with chronic uveitis can achieve drug-free remission, but risk is highly

age- and sex-dependent. For pediatric ophthalmology, these findings will refine prognosis discussions, support closer long-term monitoring of young girls with uveitis, and highlight the value of community-based data in counseling families and planning early, sustained immunosuppression strategies.

Retina, Retinoblastoma, Intraocular Tumors, and Trauma

Factors Associated with Retinal Detachment after Pediatric Cataract Surgery in the IRIS® Registry

Altamirano F, Jeon JH, Lee JY, et al.

Ophthalmology 2025 Aug;132(8):888-894

This study uses the American Academy of Ophthalmology's IRIS® Registry (a large, representative electronic health record database) to identify risk factors for RD diagnosis and repair post-pediatric cataract surgery, aiming to inform preoperative decisions and monitoring. This is a retrospective cohort study performed between 2013-2020, including 7407 children (<18 years) undergoing cataract surgery at US IRIS-participating practices. Exclusions included pre-surgery RD history, stage 4/5 retinopathy of prematurity (ROP) and unknown laterality. The primary outcome was 5-year cumulative incidence of RD diagnosis/repair (exudative, tractional, rhegmatogenous). 168 RDs were diagnosed with 76 repairs. The 5-year cumulative RD diagnosis was 3.8% with RD repair 1.6%. Risk factors for RD included history of ocular trauma, aphakia, premature retina, PFV, and Hispanic ethnicity. Factors that were not statistically significant included degenerative high myopia and lens subluxation. Risk factors for RD repair were similar, including aphakia, premature retina, PFV, and Hispanic ethnicity. RD post-pediatric cataract surgery is uncommon but linked to trauma (e.g., vitreous alterations), aphakia (e.g., vitreous prolapse risk), premature retina (e.g., ROP-related fragility), PFV (e.g., tractional forces), and Hispanic ethnicity (possibly genetic/environmental factors). Findings align with prior studies but leverage IRIS's scale for rare outcomes. Strengths include the large, diverse sample with real-world data. Limitations include coding biases, missing variables (e.g., surgical details, follow-up loss). The authors recommend tailored monitoring for at-risk groups to mitigate RD.

Utility of Screening Examination for Cytomegalovirus Retinitis Among Patients With Cytomegalovirus Viremia

Li CY, Massa A, Krisch M, et al

Am J Ophthalmol 2025;277:230-241

With recent increases in universal and targeted congenital CMV screening policies across the U.S., the role of routine ophthalmic screening in neonates and other patient groups has come into question. This retrospective, multicenter diagnostic evaluation examined 234 patients with CMV viremia who underwent dilated fundus examination (DFE) between 2010–2023. The study assessed demographics, systemic risk factors, ocular symptoms, and outcomes. Overall, 18 patients (7.7%) were diagnosed with CMVR, of whom 5 had PCR confirmation from aqueous fluid and 13 were classified as presumed cases. Among pediatric patients, 2 of 49 (4.1%) had CMVR, including one with congenital CMV infection; importantly, no neonates screened at birth had CMVR. The strongest predictors of CMVR were HIV/AIDS infection (adjusted OR 4.1) and the

presence of ocular symptoms (adjusted OR 14.9), while plasma viral load was not predictive. Strengths include a relatively large, diverse cohort and systematic review of both pediatric and adult cases; limitations include retrospective design, diagnostic reliance on clinical exam without ocular PCR in most cases, and potential overdiagnosis in presumed cases. This study teaches us that CMVR remains an important risk for HIV/AIDS patients and for immunosuppressed individuals with ocular symptoms, warranting targeted ophthalmic screening. However, it also demonstrates that routine screening of neonates with congenital CMV infection but no clinical signs has little yield, suggesting that pediatric ophthalmology practice should move toward risk-stratified, symptom- and condition-driven screening rather than universal DFE in all congenitally infected newborns.

The Role of Intravitreal Chemotherapy as an Adjunctive Treatment for Retinoblastoma: A Systematic Review and Single-Arm Meta-Analysis

Bravo-Gonzalez A, Dominguez-Ruiz P, González M, et al

Am J Ophthalmol 2025;273:130-140

This systematic review addresses intravitreal chemotherapy (IVitC) for retinoblastoma, a modality increasingly used to control vitreous seeds that are poorly reached by systemic or intra-arterial routes and historically drove enucleation. Evidence has been fragmented, without large trials or meta-analyses to benchmark outcomes or drug-specific safety. The authors searched MEDLINE/EMBASE/Cochrane and pooled single-arm observational studies (≥ 10 eyes) using random-effects models; 25 studies (1,082 eyes) were included, examining melphalan, topotecan, or combinations, typically as adjuncts to intra-arterial (IAC) or intravenous (IVC) chemotherapy. Overall enucleation rate (ER) was 24.7% (95% CI 19.2–31.2%). Subgroups suggested lower ER with topotecan alone (14.2%) versus melphalan (27.8%) or combinations (23.8), and lower ER when IVitC was paired with IAC (21.5%) versus IVC (35.5%) (both $P < .05$). Toxicity profiles favored topotecan: pigmentary retinopathy occurred in 36.6% with melphalan versus 2.4% with topotecan ($P < .05$); other adverse events included cataract (17.8%), vitreous hemorrhage (12.1%), and retinal detachment (5.6%). Strengths include protocol registration, comprehensive search, prespecified subgroup analyses, and sensitivity checks supporting robustness. Limitations are substantial: all but one study had serious risk of bias, heterogeneity was high, IVitC was never monotherapy (confounding by concomitant treatments), and randomized data are lacking. Clinically, the review teaches that IVitC is an effective globe-salvaging adjunct—especially when integrated with IAC—and that drug choice matters: topotecan may offer comparable efficacy with markedly lower retinal toxicity than melphalan. For pediatric

ophthalmology, these data support wider, safety-conscious adoption of IVitC for vitreous seeds, reinforce building IAC+IVitC capability where feasible, and encourage prospective head-to-head melphalan vs topotecan studies to refine dosing and minimize vision-limiting toxicity.

Investigation of Sick Cell Retinopathy in Pediatric and Adolescent Patients Enrolled in a Large Cohort Study

Smith BD, Hankins JS, Kang G, et al.

Ophthalmology 2025 Aug;132(8):911-920

The study investigates sickle cell retinopathy (SCR) in pediatric and adolescent patients (aged 10-18) from the Sickle Cell Research and Intervention Program (SCCRIP) cohort, focusing on the effects of hydroxyurea therapy and chronic blood transfusions (CTXN) on SCR prevalence and progression. Among 630 patients, 36% had SCR, with 32% showing nonproliferative retinopathy (NPR) and 4% proliferative retinopathy (PR). HbSC patients had a higher SCR prevalence (51%) compared to HbSS/HbSB0-thalassemia (29%) and other genotypes (30%). Patients on hydroxyurea were 29% less likely to develop SCR (30% prevalence vs. 42% without, $P = 0.0028$), with a 38% reduced likelihood after adjusting for CTXN ($P = 0.037$). Only 5% of hydroxyurea-treated SCR patients progressed to PR vs. 16% without. Patients on CTXN were 68% less likely to develop SCR (17% prevalence vs. 40% without, $P < 0.001$), with a 76% reduced likelihood after adjusting for hydroxyurea ($P = 0.011$). Progression to PR was not significantly different (5% vs. 11%, $P = 0.70$). Both hydroxyurea and CTXN are associated with reduced SCR prevalence, supporting their use in managing sickle cell disease-related eye complications. The study suggests these therapies may lower SCR risk and slow its progression, though further research is needed.

Neuro-ophthalmology, Nystagmus, Visual Impairment / Plastics and Orbit

Neurofibromatosis Type 1 (NF1)-Related Ocular Signs: New Insights on Their Prevalence, Incidence, and Genotype-Phenotype Correlation in NF1 Children

Midena E, Cosmo E

Am J Ophthalmol 2025;275:58-73

This study clarifies when—and in whom—NF1 eye findings appear. In a single-center pediatric NF1 cohort ($n=237$; 2010–2022), the authors quantified prevalence, incidence, age of onset, and genotype–phenotype correlations for optic pathway glioma (OPG), Lisch nodules (LNs), choroidal abnormalities (CAs), and retinal vascular abnormalities (RVAs). Baseline prevalence was OPG 20.7%, LNs 43.5%, CAs 46.8%, and RVAs 6.8%; among 204 children with follow-up, new cases occurred in 6.4%, 22.4%, 21.4%, and 5.4%, respectively, with mean onset at 6.3 (OPG), 7.1 (LNs), 6.4 (CAs), and 6.6 (RVAs) years. Importantly, accumulation of new ocular signs was negligible after ~7 years. LNs and CAs behaved largely independently over time, supporting their use as separate diagnostic criteria. Genetically, truncating NF1 variants were associated with a greater burden of ocular signs than non-truncating variants (1.7 ± 1.0 vs 0.9 ± 0.9 findings/child; $P=.0019$), with higher rates particularly for CAs and RVAs, and a trend toward more OPG. Strengths include a relatively large pediatric sample, multimodal standardized ocular imaging (slit lamp + near-infrared reflectance) with longitudinal assessment, and genotype data in most

participants. Limitations are the single-center, predominantly White cohort; variable follow-up; MRI performed based on clinical suspicion (possible OPG ascertainment bias); and observational design precluding causal inference. Clinically, this work teaches that ocular surveillance in NF1 should be front-loaded to early childhood: prioritize careful slit-lamp examination for LNs and near-infrared imaging for CAs/RVAs by ages 5–7, and use OCT/RNFL plus targeted MRI for suspected OPG. Recognizing that truncating genotypes carry greater ocular risk may help tailor visit frequency. For pediatric ophthalmology, the practical impact is a tighter, earlier screening window, treating LNs and CAs as independent diagnostic pathways, and counseling families that new ocular NF1 signs after age 7 are unlikely.

Sociodemographic Disparities in Uncorrectable Visual Impairment Among US Adolescents
Fazal O, Slopen N, Galbraith AA, et al.
Am J Ophthalmol 2025;273:248-254

This study looks at how common uncorrectable vision loss is in U.S. adolescents—the age just beyond the effective treatment window for amblyopia—and which social factors put teens at risk. Using a cross-sectional analysis of NHANES 1999–2008, investigators assessed best-corrected visual acuity in 9,949 youths (12–19 years) to estimate prevalence and model sociodemographic associations. Uncorrectable visual impairment (UVI) was defined as unilateral (>2 -line inter-eye asymmetry with VA $\geq 20/40$ in the better eye) or bilateral (VA $< 20/40$ in both eyes). Overall UVI prevalence was 4.0% ($\approx 3.2\%$ unilateral; 0.9% bilateral). After adjusting for age and sex, higher odds of UVI were seen with family income below poverty level (OR 1.59), Mexican-American ethnicity (1.64) and non-Hispanic Black race (1.43) vs non-Hispanic White, food insecurity (1.67), caregiver education below high school (1.68), and public (1.67) or no insurance (1.71) vs private insurance. Strengths include a large, nationally representative sample and standardized acuity/autorefraction protocol; key limitations are the older survey years, cross-sectional design (no causality), non-cycloplegic refraction, and potential misclassification (not all UVI is amblyopia, though it is likely the leading cause). This paper teaches us that socioeconomic and racial/ethnic disparities in irreversible vision loss are already established by adolescence, implying missed screening/therapy earlier in childhood. For pediatric ophthalmology, it argues for: (1) earlier, equitable amblyopia detection and treatment—especially in low-income, food-insecure, publicly insured, and uninsured populations; (2) strengthened school- and community-based screening with rapid referral pathways; and (3) advocacy for coverage/policies that reduce access barriers

(e.g., ensuring comprehensive pediatric vision benefits and outreach in high-risk communities).

Targeted, earlier intervention is essential to prevent lifelong, avoidable visual disability.

Retinal findings in pediatric idiopathic intracranial hypertension

Curley MT, Heidary G, Gaier ED, Gise R

J AAPOS 2025;29(2):104179

Data describing retinal findings associated with pediatric idiopathic intracranial hypertension (IIH) has been historically limited. Authors performed a retrospective review of all IIH patients <19 years old without concomitant retinal diagnosis at an academic institution from 1998 to 2022. All patients were followed to resolution of disc edema. Data collected included demographics, vision, and presence of pathology on retinal imaging. 253 patients with IIH were reviewed; 24 of those had retinal findings, including retinal folds, macular exudates, subretinal fluid, and choroidal neovascular membrane. Visual acuity outcomes were significantly worse in patients with retinal findings, and presence of optic atrophy after resolution of edema was significantly higher in patients with retinal findings than without. Further, 1/3 of patient had persistent retinal pathology after resolution of disc edema. The study is limited by the retrospective nature and relatively low number of patients who were followed to disease resolution. These results may assist with prognostication, demonstrating that IIH patients with retinal findings have worse visual outcomes and suggesting that patients with retinal findings may have more severe disease.

Association of ganglion cell-inner plexiform layer thinning with visual function in pediatric papilledema

Malem AH, Reginald AY, Wan MJ

J AAPOS 2025;29(4):104253

In children with papilledema, assessing risk of vision loss is challenging due to variable cooperation with ancillary testing, particularly visual field, and possible optic nerve edema masking underlying optic nerve fiber loss. This study aims to evaluate whether using macula ganglion cell-inner plexiform layer (GCT) measured by the Cirrus OCT (Carl Zeiss, Meditec Inc, Dublin, CA) can predict vision loss in pediatric patients with papilledema. Patients <18 years of age diagnosed with papilledema at a single institution between 2012-2022 were retrospectively reviewed. In addition to demographic data, average mean and minimum macula GCT and optic nerve retinal nerve fiber layer (RNFL) were recorded at initial and final visit. Patients were divided into groups based on vision loss versus no vision loss. In comparing the two groups, at baseline, the group with vision loss had a statistically significant higher opening pressure on lumbar puncture and thicker RNFL, while the mean and minimum GCT were similar between the groups. At the final data point, the group with vision loss had significantly lower mean and minimum GCT than the group without vision loss. This study is the first comparison of GCT in two groups in the pediatric population with papilledema and different outcomes (vision loss and no vision loss). Limitations include variability and accuracy of data due to retrospective nature and unequal groups (14 in group with vision loss and 66 in group without vision loss). Receiver operating characteristic (ROC) curves showed area under the curve (AUC) to be 0.86 for average mean GCT and 0.89 for minimum GCT suggesting that GCT is a promising diagnostic parameter to

assist in predicting risk of vision loss in patients with papilledema due to primary or secondary pseudotumor cerebri.

Genetics

Outcomes of idebenone therapy for Leber hereditary optic neuropathy in a cohort of patients from Wales

Sanders FWB, Votruba M

Eye (Lond) Published online September 17, 2025.

This paper presents 12 individuals (8 males and 4 females) treated with idebenone 300 mg TDS for LHON for a mean period of 30.2 (± 9.9) months. Patients were treated regardless of time from vision loss, although a number of those with the longest potential durations of disease were either not being routinely followed up, or had been lost to follow-up, or had been discharged some years before. In the real-world environment of this cohort 86% (10 of 14 eyes) achieved clinically relevant recovery by 27 months. It does correlate with other observations of clinical response up to 2 years. The study brings evidence of clinically relevant recovery in a high proportion of patients reaching 27 months of treatment.

Stem cell-based therapies for retinal diseases: focus on clinical trials and future prospects

Sen S, de Guimaraes TAC, Filho AG, et al.

Ophthalmic Genet 2025 Aug;46(4):324-337

Stem cell-based therapy for retinal degenerative diseases is an exciting tool for future treatment strategies and holds great promise. In this narrative review, the authors summarize evidence from clinical trials related to the latest advances in this field of retinal therapeutics. A significant amount of patient education and awareness is needed on behalf of policymakers alongside creating appropriate guidelines regarding cell-based transplantation. Retinal regenerative medicine is undoubtedly complex, but it also offers great promise and now, with recent advances in biotechnology, genomics, cell biology, and improvement of surgical techniques, we are starting to see the prospects of cell-based therapies, and new prospects for erstwhile untreatable retinal conditions. This is an excellent review definitely worth reading.

Neovascular glaucoma as a predictor of retinoblastoma high-risk histopathology in an international multicenter study

Negretti GS, Ushakova T, Yuri S, et al

Retina 2025;45(3):565-573

Neovascular glaucoma (NVG) is a severe complication that can be seen in advanced retinoblastoma and may predict aggressive histopathologic features linked to increased metastatic risk. Understanding the prognostic significance of NVG may guide treatment decisions in retinoblastoma management. This retrospective international multicenter case series, across five continents, included 1,420 retinoblastoma patients undergoing primary enucleation. It analyzed clinical features, histopathologic grades, and survival outcomes comparing NVG patients to those with clinical stage cT2 using logistic regression and Kaplan-Meier survival analyses. NVG was present in 16% of patients; 58% of these had high-risk histopathology. NVG independently predicted high-risk pathology (OR approx. 1.77). NVG patients showed higher metastatic rates than cT2 patients, and clinical factors such as prolonged symptoms,

buphthalmos, and ectropion uveae correlated with higher histopathologic risk. Adjuvant chemotherapy reduced metastasis and mortality in high-risk groups. Strengths include the large multinational cohort with standardized data collection and comprehensive analysis of histopathologic and clinical outcomes. Limitations include retrospective design and variability in treatment protocols across centers. Retinoblastoma with NVG at diagnosis is associated with increased high-risk histopathology and increased metastatic rate that should be taken into consideration for treatment.

Long-term functional and clinical outcomes in familial exudative vitreoretinopathy

Chen H, Caldwell AS, Patnaik JL, et al.

Retina 2025;45(5):908-914

Familial exudative vitreoretinopathy (FEVR) is a rare inherited retinal vascular disorder with variable clinical severity, ranging from asymptomatic disease to severe vision loss. Previous studies have been limited by small cohorts and short follow-up durations. This retrospective chart review at a tertiary academic center evaluated 96 patients with FEVR over a 21-year period (2003-2024), collecting demographic, genetic, clinical, and treatment data, with visual acuity outcomes analyzed per patient. Among 90 eyes analyzed, 77.3% of patients retained functional vision ($\geq 20/40$) and 88.6% had ambulatory vision ($\geq 20/200$) after a mean follow-up of 9.1 years. Globe salvage was achieved in 98.4% of eyes. Retinal detachment at presentation was the only factor significantly associated with worse final vision in multivariable analysis. Treatment approaches included laser photocoagulation, vitrectomy, and scleral buckling, with reactivation and reattachment rates consistent with literature. Strengths of this study include a large cohort and extended follow-up allowing assessment of long-term functional outcomes. Limitations include its retrospective nature and incomplete genetic testing in nearly half the patients, limiting genotype-phenotype correlation. This study of FEVR is novel in reporting the longest duration of follow-up as well as visual acuity outcomes (per eye and per patient) and supports the importance of routine monitoring and treatment, when indicated, to optimize vision.

Detection and Characterization of RB1 Mosaicism in Patients With Retinoblastoma Receiving cfDNA Test

Gao C, Patel J, Robbins M, et al

JAMA Ophthalmol 2025;143(7):562-568

Plasma cell-free DNA (cfDNA) testing is increasingly used for disease diagnosis and monitoring in retinoblastoma, with RB1 allele fraction in cfDNA actively corresponding to disease status and treatment response. However, while RB1 mosaicism has been reported in retinoblastoma, its clinical implications and potential impact on cfDNA testing remain unclear. This study aims to

identify RB1 mosaicism using paired plasma and buffy coat (containing lymphocytes, monocytes, granulocytes, and platelets) DNA testing, and to characterize the implications of RB1 mosaicism on cfDNA testing outcomes. A total of 136 participants with retinoblastoma underwent testing with MSK-ACCESS (Memorial Sloan Kettering-Analysis of Circulating cfDNA to Examine Somatic Status), a clinical assay that combines plasma cfDNA and buffy coat genomic DNA sequencing. RB1 mosaicism was identified in buffy coat DNA from 20 patients (14.7%), with consistent results detected in all 11 participants tested concurrently by the MSK-IMPACT (Memorial Sloan Kettering-Integrated Mutation Profiling of Actionable Cancer Targets) germline assay. Four participants with RB1 mosaicism previously tested negative for germline RB1 variants. Compared with heterozygous participants, participants with RB1 mosaicism had a lower risk of developing bilateral disease (91.7% vs 55.0%, respectively). In cfDNA, the mosaicism variant was detected both before and after treatment, with variant allele fraction initially decreasing after treatment but then stabilizing at levels consistent with mosaicism, despite the absence of clinical disease. Accurate detection and quantification of RB1 mosaicism are crucial. RB1 mosaicism should be considered when RB1 variants persist in cfDNA after treatment without evidence of disease, to avoid false positives that lead to overtreatment. Identifying RB1 mosaicism may improve patient counseling, inform treatment decisions, and enhance surveillance efforts.

Amblyopia

Mobile Graphic Device Vision Screening for Unilateral Amblyopia in Pediatric Patients

Gold AS, Weitzman SA, Hans M, et al.

J Pediatr Ophthalmol Strabismus 2025;62(4):245-251

Screening for and detecting amblyopia in the pediatric population is of vital importance; however, it is often challenging for primary care providers to do so. Here, the authors introduce a novel manner of amblyopia detection using a video game platform and inter-ocular brightness disparity, recruiting 49 children to participate in a prospective interventional study. The participants wore orthogonally polarized lenses and watched image pairs on an iPad, choosing the image they perceived to be the brighter of the two until an endpoint of “equal brightness” was obtained. On average, the game took just under 2 minutes to complete. Using an inter-ocular brightness disparity greater than 0.3 log units as an indicator of a relative afferent brightness defect, and therefore amblyopia, the game detected unilateral amblyopia with 88% sensitivity and 95% specificity. Additionally, the positive predictive value was 78% and the negative predictive value was 98%. In other words, when the test was negative, the patient was exceedingly unlikely to have unilateral amblyopia. If the test was positive, there was a 78% that amblyopia was truly present. Overall, this game provides an interesting and approachable mechanism of amblyopia screening in children, one that holds much promise. However, with very high specificity and NPVs, it might be better suited as a “rule out” test than a screening test, as it would be liable to miss a few cases given its (relatively) lower sensitivity and PPV. Regardless, inter-ocular brightness disparity seems to hold promise as a diagnostic tool in the fight against amblyopia.

Prevalence of Blepharokeratoconjunctivitis and Refractive Amblyopia Risk Factors in Children With Chalazia: Safety Considerations in Telehealth Management

Dionne E, Henick D, Rotruck J

J Pediatr Ophthalmol Strabismus 2025;62(4):278-285

Given the relative shortage of pediatric ophthalmologists in the United States, telehealth visits are increasingly being utilized to help extend our reach. These visits are especially used for relatively “simple” visits, such as children with chalazia. However, this risks potentially missing more significant pathology. In this study, the authors reviewed the prevalence of corneal changes and refractive amblyopia risk factors (ARFs) associated with blepharokeratoconjunctivitis (BKC) in children with chalazia as a mechanism of evaluating the safety of potential telehealth visits for chalazia. In all, 10 of the 381 patients (2.62%) with a chalazion who were seen in the clinic had active corneal changes associated with BKC. Additionally, the rate of ARFs in such patients was 9.89% in patients younger than 4 years old and 21.79% in patients 4 to 9 years old. This is important data, as it suggests that telehealth visits alone, even for low acuity issues like a chalazion, may miss more significant pathology in children. Telehealth visits may need to be combined with appropriate ARF screening to ensure all children receive the care that they require in a timely manner.

Cost-effectiveness Analysis of Digital Therapeutics for Amblyopia

Koc I, Bagheri S, Chau RK, et al.

Ophthalmology 2025 Jun;132(6):654-660

This article evaluates the cost-utility of two FDA-cleared digital therapeutics, Luminopia and CureSight, for treating amblyopia compared to standard treatments (glasses, atropine drops, and patching). A cost-utility analysis was performed from a third-party payer perspective, using patient preference-based time trade-off utility values from prior literature. Costs included eye examinations (based on reimbursement data) and device costs (provided by Luminopia and CureSight sales representatives). The analysis assumed one initial comprehensive ophthalmology exam followed by monthly follow-ups, as per RCT protocols. Costs for 12 weeks of treatment were \$513.70 for glasses, \$540.28 for patching (2 hours/day, 7 days/week), and \$651.53 for atropine (1% daily for 16 weeks), whereas the cost of treating with Luminopia or CureSight for 12 weeks was \$1951 and \$1564 or \$1814, respectively. Cost-utility analysis has been used as a gold standard for determining cost-effectiveness of health care interventions in efforts to optimize society's limited resources compassionately. It expresses the value received from an intervention in quality-adjusted life-years (QALYs) for dollars spent, using both number of years gained and quality of life in the calculation to evaluate different outcomes that would not be comparable with other cost analyses. The authors felt that both Luminopia and CureSight were cost-effective. They demonstrated favorable cost-utility ratios, driven by their efficacy in improving visual outcomes and patient adherence, particularly for those unable to tolerate or adhere to traditional therapies like patching or atropine. Treatment with glasses and patching for 12 weeks resulted in costs per QALY gained of \$427 and \$101, respectively. Treatment with atropine for 16 weeks resulted in costs per QALY gained of \$151. Luminopia and CureSight treatment for 12 weeks resulted in costs per QALY gained of \$618 and \$368, respectively. Although current standard-of-care amblyopia treatments are lower cost and clinically effective, their effects are limited by low adherence. Digital therapeutics offer a viable alternative for amblyopia treatment, especially for patients with adherence challenges. The study suggests that Luminopia and CureSight can improve access to effective care, potentially reducing long-term visual impairment costs. The study supports integrating digital therapeutics into clinical practice and calls for further research to validate long-term cost-effectiveness and real-world applicability.

Factual Evidence on Digital Therapeutics in Pediatric Amblyopia: Insights into Rapid Axial Elongation Risk

Yao Y, He Y, Wen Y, et al.

Ophthalmology 2025 Jun;132(6):661-670

This is a retrospective cohort study aimed to assess whether 30 minutes of daily digital therapeutics (DTx) for amblyopia treatment increases the risk of rapid axial elongation (RAE) in children with amblyopia, using real-world clinical data from China. The study included 1,394 children aged 3-12 years diagnosed with amblyopia (e.g., anisometropic, isoametropic, strabismic) between 2019-2024, with at least 6 months of follow-up. 477 received DTx alongside traditional therapies; the rest did not. Exclusions included pre-existing RAE, myopia control treatments, prior DTx, or poor adherence (<90 days). DTx involved certified programs (e.g., perceptual learning tasks like orientation discrimination, visual search, binocular fusion) delivered via home-based cloud-monitored systems on computers/tablets with 2 × 15-minute sessions/day at 40-57 cm viewing distance. AL was measured via IOL Master 500 biometer at baseline and follow-ups. RAE defined was as annual AL elongation exceeding age/myopia-specific thresholds (e.g., 0.25 mm/year for non-myopic 3-5-year-olds). Over ~243 days median follow-up, 641 (46%)

experienced RAE (48.6% in DTx vs. 44.7% non-DTx). DTx increased RAE risk by 71% in univariable analysis (HR 1.71) and 65% after full adjustments. The absolute risk was calculated at ~4 extra RAE cases per 100 DTx-treated children. The risk was more pronounced in younger children, good BCVA, isoametropic/strabismic amblyopia, and moderate hyperopia (+3 to +6 D SER). The authors conclude that DTx may promote RAE due to increased near-work accommodative demand, potentially exacerbating peripheral hyperopic defocus and eye growth, especially in amblyopia patients with altered visual processing. While beneficial for visual function, this raises concerns for myopia progression. In hyperopic children, RAE might aid emmetropization, but in premyopic/myopic cases, it requires balancing benefits with risks. The authors recommend monitoring AL routinely during DTx and promoting outdoor time to counter risks. This study's strengths include its large sample size, precise AL measurements, cloud-tracked adherence. Limitations include its retrospective nature, single-center, short follow-up (~9 months), and no causality proven. The study emphasizes cautious DTx use in pediatric amblyopia, prioritizing personalized monitoring to optimize vision gains while minimizing ocular growth risks.

Axial Length Dynamics and Safety of Occlusion Therapy in Pediatric Amblyopia: A Longitudinal Analysis

Yu W, He Y, Qiu X, et al.

Invest Ophthalmol Vis Sci 2025 Jul 1;66(9):12

This study investigates the impact of occlusion therapy (patching) on axial length elongation in 2,932 children aged 3-15 years with amblyopia, using longitudinal data from the Zhongshan Ophthalmic Center (2019-2023). The study aims to assess the safety of patching therapy and its effects on ocular growth, particularly axial length, which influences refractive outcomes. Subjects showed mean annual axial length increase of 0.23 ± 0.22 mm, consistent with typical childhood ocular growth. Overall, patching therapy (0.5-6 hours/day) showed no significant effect on axial length elongation ($\beta = -0.02$, $P = 0.12$), even with long daily patching (≥ 5 hours/day). School-age children (6-12 years) with shorter baseline axial lengths (21.4-22.3 mm) exhibited reduced axial elongation in patched eyes. Preschool children (3-5 years) showed slight interocular differences, with patched eyes elongating less than fellow eyes ($\beta = 0.02$, $P = 0.005$). Occlusion therapy does not significantly alter axial length growth overall, supporting its safety. However, age and baseline axial length influence outcomes, suggesting tailored regimens could optimize treatment. The study highlights the need for further research into underlying mechanisms and diverse populations. The study is limited to East Asian children, potentially affecting generalizability. Unmeasured factors (e.g., genetics, near-work behavior) may influence results. Non-cycloplegic refraction could impact refractive findings.

Dichoptic Visual Search at Varied Fellow Eye Contrasts and Visual Function Deficits in Amblyopia

Shi S, Quagraine IM, Cakir GB, et al.

Invest Ophthalmol Vis Sci 2025 Jul 1;66(9):39

This study examines how reducing fellow eye (FE) contrast during dichoptic viewing affects visual search performance in amblyopic individuals, focusing on the amblyopic eye (AE) perception and related visual function deficits. 37 subjects (14 controls, 23 amblyopic) underwent comprehensive eye exams. Amblyopia severity ranged from treated/mild to moderate/severe. Visual search and spot-the-difference tasks were conducted monocularly and dichoptically, with AE contrast fixed at 100% and FE contrast varied (100%, 50%, 25%, 10%) using a 3D LCD display. Data assessed included accuracy, reaction time, interocular suppression (via motion coherence), visual acuity (logMAR), and stereoacuity (log arcsecs). Amblyopic participants (23 total, including 11 anisometropic and 12 strabismic/mixed) showed lower accuracies and longer reaction times in visual search and spot-the-difference tasks compared to 14 controls, especially at high FE contrasts (100%). Reducing FE contrast (to 50%, 25%, 10%) improved AE target identification, with greater benefits for anisometropic than strabismic participants. However, improvements plateaued at lower contrasts. Higher AE visual acuity deficits, suppression, and stereoacuity deficits were associated with reduced accuracies and increased reaction times, particularly at higher FE contrasts. At 10% FE contrast, these deficits still impacted performance in comparative tasks. The study highlights dichoptic therapy's potential to improve AE perception by reducing FE suppression, though effectiveness depends on amblyopia type and visual function deficits. It suggests that visual search tasks could help customize passive dichoptic video therapies for better compliance and outcomes. Limitations include the small sample size and variability in amblyopia types may limit generalizability. There is also lack of long-term follow-up data on therapy efficacy.

Monocular Contrast Sensitivity Visual Perceptual Learning Rebalances Adult Amblyopes' Two Eyes

Lin W, He Z, Zhou S, et al

Invest Ophthalmol Vis Sci 2025;66(5):25

This study investigated if ten days of monocular contrast sensitivity training could improve vision in adults with amblyopia and other binocular imbalances, addressing the limited success of traditional treatments. The research found that training the amblyopic or non-dominant eye significantly improved its contrast sensitivity and the visual acuity in both eyes. Critically, this monocular training successfully rebalanced binocular contributions in participants with amblyopia and myopic anisometropia, though it did not significantly improve binocular summation ratios. While the study's strengths include robust control groups, its primary limitation is the focus on an adult population. Nevertheless, the findings suggest that this form of perceptual learning is a promising adjunctive or alternative therapy to enhance both monocular and crucial binocular functions in older pediatric patients struggling with persistent amblyopia.

Multi-Feature Mapping of Distortions in Amblyopia With Localized Sampling

Molaei H, Abbas Farishta R, Farivar R

Invest Ophthalmol Vis Sci 2025 Jun 2;66(6):37

In this investigation, the authors explored the nature and distribution of perceptual distortions, specifically in position, orientation, and spatial frequency (SF), across the central 5° of the visual field in individuals with amblyopia. Twenty-one individuals with amblyopia, seven with strabismus, nine with anisometropia, and five with a combination of strabismus and anisometropia, were included in this study. All participants requiring glasses wore their most recent optical correction to ensure that observed effects were solely due to amblyopia. The study patients were asked to complete three distortion-mapping tasks using a 6×6 grid, where they matched the amblyopic eye's perception to their fellow eye. The results revealed that SF distortions were most prevalent (observed in 88.9% of participants), followed by position distortions (66.7%) and orientation distortions (22.2%). Interestingly, each distortion type appeared independent for each individual, spatial patterns across distortion types did not correlate, nor did similar distortion maps align across different participants. Decreases in visual acuity also showed no significant correlation with any distortion type. The authors conclude that a multi-dimensional distortion mapping approach is essential to fully characterize perceptual abnormalities in amblyopia, as relying solely on visual acuity or a single distortion type risks incomplete diagnosis, assessment, and treatment. This study highlights the importance of assessing multiple distortion types to fully characterize perceptual deficits in amblyopia. Limitations of the study include its small sample size and absence of data for normal controls.

Optical coherence tomography (OCT) parameters in amblyopia

Chedid A, Fronius M, Wenner Y, Cirina L, et al.

Strabismus Published online April 14, 2025

The aims of this prospective, observational case series were to compare OCT data of fellow and amblyopic eyes and to describe OCT changes after long-term occlusion therapy for amblyopia. The amblyopic eyes and fellow eyes of 30 patients were evaluated with 3D macular OCT. Average thickness (AT) and total volume (TV) were only marginally greater in the amblyopic eyes compared to fellow eyes. The effect of amblyopia therapy could only be studied longitudinally in a subgroup of 6 patients treated with occlusion therapy. A statistically significant decrease in AT and TV occurred in the amblyopic eye following occlusion therapy; however, correlation with visual acuity was not statistically significant. In some patients, the degree of macular thinning appeared to be associated with the duration of occlusion therapy, but this was not statistically significant. The strengths of the study are the prospective design and standardized collection of objective data to demonstrate anatomical features in amblyopic eyes. The weaknesses are the small overall sample size and very small sample evaluated longitudinally. The findings of this small study increase optimism for macular OCT to potentially assist in assessing amblyopia and responses to treatments at some point in the future.

Socioeconomic associations of amblyopia in the All of Us research program

Zhang R, Jeon J, Ness S

J AAPOS 2025;29(2):104160

Based on previous data collected from the National Health Interview Survey and the Intelligent Research in Sight database, there are significant disparities in access to vision screening and surgical treatment of strabismic amblyopia across the US population. Authors performed a

retrospective, case-control study of patients age 18-64 with a diagnosis of amblyopia collected from the All of Us survey online survey from 2018, focusing on demographic information including education, employment, housing situation, income, and health insurance type. They compared 601 amblyopic patients with 2404 age-, sex-, and race-matched controls. Amblyopic patients were more likely to be African American or Hispanic than controls and were significantly older. When comparing matched controls, amblyopic patients were significantly more likely to be unemployed, non-home owners, have Medicaid, or have annual income less than \$35,000. Multivariable analysis demonstrated that amblyopic patients were more likely to have Medicaid and be unemployed. Strengths of the study were inclusion of African American and Hispanic populations. Limitations were the use of self-reported data, exclusion of patients who did not include a complete set of demographic information, over-representation of African American and Hispanic participants as compared to the general population, lack of actual visual acuity data quantifying the severity of amblyopia, and under-representation of Asian and "other" race populations. This study demonstrates long-standing socioeconomic associations of amblyopia, emphasizes the importance of diverse recruitment for future studies, and highlights the need for expansion of screening and treatment options across lower-income populations.

Defining and measuring population-level amblyopia treatment outcomes: a proposal by the AAPOS Vision Screening and Research Committees

Arnold RW, Birch E, Bradford G, et al

J AAPOS 2025;29(4):104231

The AAPOS Vision Screening and Research Committees propose a standardized method of collecting data to assess community-level prevalence of residual amblyopia, which was defined as persistent best-corrected visual acuity worse than 20/40 in one or both eyes with corresponding amblyopia risk factors in children age 8 years. The proposal includes recommendations for cohort selection, data collection and storage, and outcome measures. The recommendations could be incorporated into existing vision screening practices to ensure efficient and simple data collection. The information could provide valuable information in comparing prevalence of residual amblyopia in different populations to identify gaps and areas for further study.

Characteristics and publication rate of registered clinical trials in amblyopia

Rahal DA, Khodeiry MM, Dihan Q, et al.

J AAPOS 2025 Jun;29(3):104182

Previous studies have assessed the discrepancies between registered clinical trials and publication rates in ophthalmic disorders. This study assessed amblyopia clinical trials completed prior to September 1, 2021, on ClinicalTrials.gov. Variables of interest included the location of the principal investigator, study type, trial phase (with phase 1 defined as early and phases 2/3, 3, and 4 defined as late), industry versus non-industry sponsorship, participants' age, intervention types, and study duration. Of the 54 clinical trials included, 42 yielded publications (78%). Publication rate was found to be associated with non-industry sponsorship ($P = 0.004$), and the relationship with late-phase trial status approached significance ($P = 0.053$). The majority of trials were conducted in the United States (69%), followed by United Kingdom (6%), most trials were interventional (69%), early phase or uncategorized (74%), non-industry-sponsored (80%), and involved children (0-17 years) as the participant age group (78%), with the most common

intervention types being devices (66%). Limitations included that only trials registered on ClinicalTrials.gov were included and older trials had more time to publish results. The impact on clinical practice is that while about $\frac{3}{4}$ of registered amblyopia clinical trials had associated publications, the $\frac{1}{4}$ of trials lacking publications may affect the validity of our understanding of amblyopia treatment and management.

Temporal Frequency Modulation of Binocular Balance in Normal and Amblyopic Vision

Zhou C, Zhou J, Min SH

Invest Ophthalmol Vis Sci 2025;66(4):8

This study examines how temporal frequency modulation (the process of varying the frequency of visual stimuli over time) affects binocular balance in both normal and amblyopic vision. The study investigates how binocular vision adapts to different temporal frequencies and how these mechanisms differ between individuals with normal vision and those with amblyopia. The researchers presented visual stimuli at varying temporal frequencies to both groups and assessed binocular balance by measuring the degree to which the two eyes worked together during the tasks. Results showed that normal vision could maintain binocular balance more effectively across different temporal frequencies, while amblyopic individuals exhibited disruptions in binocular coordination, particularly at higher temporal frequencies. The study suggests that temporal frequency modulation could play a role in how the brain integrates visual information from both eyes and that amblyopia alters this ability, leading to poor binocular performance at certain frequencies. The findings could help in developing targeted therapies, such as training or stimulation strategies, to improve visual processing in amblyopic individuals. The study does not mention whether any of the participants had received treatment for amblyopia.

Genome-Wide and Rare Variant Association Studies of Amblyopia in the All of Us Research Program

Lee KAV, Aboobakar IF, Jain A, et al

Ophthalmology 2025;132(7):758-766

The authors perform an analysis in the All Of Us Research program, of the genomics associated with amblyopia as emerging evidence highlights the potential role of these factors in amblyopia. It is long concluded that risk factors for amblyopia are highly heritable such as refractive error and strabismus. The study was designed to use data from the All Of Us Research program in which they extracted data from participants with available genetic data and a diagnosis of amblyopia. The authors identified rare and common variants in 15 genes that have statistically significant associations with amblyopia; some genes have known roles in neural development. While others presented novel findings, there were four common snps with possible associations with amblyopia. As an example CACNB2 encodes for a voltage-gated calcium channel which is important in synaptic transmission and plasticity. This may play a fundamental role in strengthening and weakening connections between neurons which is important in visual system development. These have also been implicated in bipolar disorder and other psychiatric disorders which can be associated with strabismus which is a major amblyopia risk factor. Overall the analysis identified that the significant genes were involved in two main pathways: one related to neurodevelopment and plasticity and the other involving translational regulation. The authors highlight several important limitations of the study. Firstly this included only adult patients and

phenotyping for amblyopia was derived from past medical records. This may lead to potential misclassification and underestimation of true associations. The analysis was also limited to participants of European genetic ancestry which limits its generalizability. Lastly they were not able to stratify amblyopia by subtype. The significance of this paper is that it provides a foundation for future research and may offer new insights into the molecular mechanisms contributing to amblyopia. This study suggests that amblyopia results from the interaction of underlying neurodevelopmental abnormalities with abnormal visual experiences. It may also help to explain the emerging evidence showing that other subtle nerve developmental differences such as slow reading speed and motor deficits are present in children with Amblyopia.

Early Patching Behaviors That Improve the Chances of Good Visual Acuity in Children Treated for Unilateral Congenital Cataract

Drewe-Botsch C, Hartmann EE, Celano M, et al.

Ophthalmology 2025;132(5):561-568

The authors of this paper analyzed the patching habits of patients post unilateral cataract extraction to see if patterns of successful amblyopia therapy could be established. They hypothesized that patching every day at a consistent time or first thing in the morning was more likely to improve adherence to prescribed patching and improve chances that the child would obtain good vision. This study was a post-hoc analysis of data from the IATS. The primary outcome was the visual acuity in the treated eye. The cohort included 105 children who participated in the IATS and whose caregivers completed either a 7 day patching diary 2 months after surgery or at 13 months of age. It was established in an earlier analysis that children receiving an IOL or contact lens was not associated with better visual acuity outcomes, rather having access to private insurance as a proxy for socioeconomic status and access to healthcare and age of surgery were more closely correlated. Consistent patching was reported in patients whether or not the family had access to private insurance and was not associated with whether the child received an IOL. However the age of surgery was associated with consistent patching as reported at 13 months of age but not 2 months. On average children whose caregivers reported more consistent patching patterns had better visual acuity than those who reported missing one or more days of patching or patched less consistently according to a schedule time or after 9:00 a.m. Likewise the probability of achieving near normal vision was higher in those children who patched consistently every day at the same time or before 9:00 a.m. The chance of having visual acuity of 20/40 or better at 54 months was more than twice as high if a caregiver reported this pattern of patching behavior. This observed association between patching consistency and visual acuity may be due to resulting in more hours of patching being achieved within the first year and subsequent years. The authors state that infancy represents a unique opportunity to establish patching routines in children treated for unilateral cataracts and the early patching is also likely to associate with improvements in visual acuity which most likely helps to minimize later resistance to patching. In addition providing caregivers with evidence regarding efficacy of patching may be particularly important and help to improve adherence to patching regimens. The authors highlight a number of limitations. First, a child's visual acuity during this period may predict the amounts and consistency of patching that they can actually achieve. Additionally the small sample size may not allow for robust analysis, however they do assert that their findings suggest a true association. In addition the authors could not be sure of the completeness of the diaries that were

submitted. This study is important in that it can help to provide a framework for patching in our patients with early cataract extraction as well as to help educate our families related to the importance of consistency as early onset of patching and helping to achieve good visual acuity outcomes.

Visual Outcomes after Strabismus Surgery in Pediatric Patients with Strabismic Amblyopia: An IRIS® Registry Study

Hoehn ME, Nabavi A, Rahdar A, et al.

Ophthalmology 2025;132(9):1005-1012

This paper was written because there are no established guidelines on the timing or benefit of strabismus surgery in the setting of strabismic amblyopia. The authors extracted records from the IRIS registry spanning 8 years for patients less than 17 years of age with a diagnosis of both amblyopia and strabismus. The index date was designated as the first recorded date of amblyopia diagnosis and only patients with esotropia, exotropia, or vertical strabismus were included. Visual acuity was compared between patients who underwent strabismus surgery before or within 6 months of the index date and also compared them with those who never underwent surgery. Primary outcomes were visual acuity at six, 12, and 24 months and at final assessment. As a secondary outcome, factors associated with amblyopia treatment success were examined. In the study most patients were between 3 and 7 years of age and esotropia was the most common type of strabismus. Patients in the strabismus surgery group were younger. Results showed that in the propensity score matching cohort visual acuity improved significantly over time from baseline and this was observed in both strabismus surgery and non-strabismus surgery groups with no significant difference between them. This was maintained across all time points. Overall, patients had an average improvement of 1.7 lines in visual acuity within two years after an amblyopia diagnosis and the findings did not indicate an added benefit from strabismus surgery in terms of visual acuity improvement. The authors conclude that strabismus surgery did not impact visual outcomes negatively or positively in strabismic amblyopia. An additional finding was that older patients up to at least 12 years of age may benefit from both strabismus surgery and amblyopia treatment. This paper is significant in terms of guiding clinicians in discussion with patients about timing of amblyopia therapy and strabismus surgery.

A Multihead Attention Deep Learning Algorithm to Detect Amblyopia Using Fixation Eye Movements

Upadhyaya DP, Cakir G, Ramat S, et al

Ophthalmol Sci 2025;5(5):100775

Current amblyopia screening practices rely heavily on photoscreening devices which unfortunately are prone to high false positive rates. Previous study by this group have demonstrated abnormalities in fixation eye movements FEM (involuntary movements such as microsaccades, drifts, and ocular tremor) in amblyopic eyes compared to non-amblyopic eyes during both binocular and monocular viewing conditions. This observational study was meant to develop and validate a deep learning model which uses FEM data to identify amblyopia. Subjects

categorized in the amblyopia cohort had ≥ 3 line difference in VA at time of diagnosis and were further classified as having anisometropia, strabismus, or combined types of amblyopia. Patients with deprivation amblyopia as well as infantile nystagmus were excluded from the study due to their relatively smaller prevalence and unique features to help create more homogenous cohort for DL. Eye tracking technology was used to record 45 second intervals under both monocular and monocular viewing conditions. The DL model performed best at identifying strabismic and mixed forms of amblyopia (74% and 72%) compared to isolated anisometropic amblyopia (64%) but was able to identify both mild/previously treated amblyopia as well as moderate/severe amblyopia with similar accuracy (73%, 75%). This study is limited by the fact that subjects were already known to have amblyopia which may have contributed bias to the sample, but with further standardization, the combined role of FEM tracking with existing screening strategies may improve accuracy of amblyopia screening in the primary care setting

Anterior Segment

Therapeutic Effect Observation of Surgery on Congenital Fibrovascular Pupillary Membrane

Shao Z, Xie F, Huang Y

J Pediatr Ophthalmol Strabismus 2025;62(4):286-296

A congenital fibrovascular pupillary membrane, sometimes considered a variant of persistent fetal vasculature, is a rare, typically unilateral eye condition in which a white, fibrous tissue crosses the pupil. Obviously, this has amblyogenic potential; however, data on treatment is limited given its rarity. Here, the authors describe 13 eyes of 12 children with CFPM, providing insight into an unusual condition. Of the 13 eyes, 3 received conservative treatment eyes with CFPM had thicker corneas and lenses, as well as decreased depth of the central anterior chamber. IOP was similar between affected and fellow eyes. Membranectomy led to improvements in both pupillary size and BCVA, and there were no cases of recurrence or cataract formation. However, amblyopia rates were still high, with 100% of eyes treated with surgery after age 3 having amblyopia, and 33% of eyes treated with surgery before age 3 having amblyopia. Overall, then, one can conclude that there are likely structural differences in the anterior segment in eyes with CFPM, though no obvious increase in rates of ocular hypertension. Moreover, membranectomy – the earlier the better – seems to be a safe and effective procedure leading to possible visual improvement.

Social Media Interventions and Postoperative Follow-Up in Congenital Ectopia Lentis: A Randomized Clinical Trial

Ma Y, Zhang X, Jin L, et al.

JAMA Ophthalmol 2025 May 1;143(5):438-445

Congenital ectopia lentis (CEL), a rare but severe condition characterized by lens dislocation, requires rigorous postoperative follow-up to reduce the risk of severe complications. However, follow-up rates are often suboptimal, indicating an urgent need for effective interventions to improve adherence. This randomized clinical trial assessed the effect of WeChat, a social media smartphone communication application, in delivering phone reminders and health education to improve postoperative follow-up adherence among families of children with CEL. The study was conducted at the Zhongshan Ophthalmic Center in Guangzhou, China, and involved 110 children, with 55 in the social media group and 55 in the standard-care group. The results of this randomized clinical trial reveal that social media smartphone application-based interventions significantly improved follow-up adherence and increased parental knowledge among families of children with CEL. These findings suggest that integrating mobile health technologies into standard care can enhance the management of progressive pediatric conditions with systemic risks, ultimately improving clinical outcomes.

Pediatric limbal stem cell deficiency: An overview of a rarely studied pathology

Tutas Günaydın N, Barut Selver O

European Journal of Ophthalmology 2024;35(3):821-833

This article provides a comprehensive overview of pediatric limbal stem cell deficiency, a rare but vision threatening corneal condition characterized by loss of corneal transparency due to limbal epithelial stem cell damage. The authors searched Pubmed, Enbase and Google Scholar databases with specific keywords related to pediatric limbal stem cell deficiency and found a total

of 66 articles, published from 1993 to 2023 in the English language or with English translations. Based on their review of these articles, the authors emphasize that although LSCD shares similarities between children and adults (i.e. arising from chemical burns), it poses unique risks in children, including rapid progression to corneal vascularization, opacity, and amblyopia. The authors highlight distinct pediatric etiologies like congenital aniridia, Stevens–Johnson syndrome, and immunologic disorders, and underscore the need for timely disease staging to guide treatment. Management strategies range from medical therapy, such as targeting inflammation and surface healing to minimally invasive cell based surgical interventions, reflecting a preference for less invasive approaches in children due to their longer life expectancy and developmental considerations. The management of LSCD is particularly more challenging in pediatric patients due to early diagnosis, non-adherence to treatment, and risk of amblyopia. The review aims to bridge a notable gap in the literature on pediatric LSCD, but is limited by the heterogeneity of included conditions and the lack of systematic methodology across all reviewed articles.

Insights from 1096 clinical cases: pioneering a universal grading system for vernal keratoconjunctivitis management

Chandrasekar A, Agarwal S, Chauhan G, et al.

Br J Ophthalmol 2025;109(7):735-741

Vernal keratoconjunctivitis (VKC) is a chronic recurrent allergic disease that can be seasonal or perennial. There have been a few studies in the past that utilized grading systems on standardizing evaluation of signs and symptoms (s/sx); however, these have not been incorporated into general practice much. The current study is a retrospective observational study from a tertiary center in India, looking at 1,096 VKC patients, in an effort to propose a universal grading system that include previous ocular history and corneal signs so as not to depend solely on active presentations. The mean age of onset was 7.05 ± 5.3 years with male predominance. Interestingly, perennial (57%) was more commonly seen than seasonal (37%) in terms of periodicity. The grading system was noted as: (1) Mild—presence of mild/seasonal s/sx; (2) Moderate—persistent s/sx without corneal signs; (3) Severe—chronic persistent s/sx $\pm$ intermittent corneal involvement OR asymptomatic-mild symptoms + pathognomonic corneal signs; (4) Very Severe—chronic persistent s/sx $\pm$ pathognomonic corneal signs OR active involvement/complication OR asymptomatic with complications. Complications include keratoconus (18.43%), steroid-induced cataract (11.41%), glaucoma (10.95%), and limbal stem-cell deficiency (5.29%). Treatment recommendations were for grade (1): seasonal dual-acting antiallergic/antihistamine; (2): perennial dual-acting antiallergy with intermittent low-dose steroids when active + Allergy referral; (3): additionally include topical immunomodulator, surgical intervention for papillae/shield ulcer, and corneal topography; (4): additionally include increased concentration of topical immunomodulator, pulsed dose high-potency topical steroids vs short course of oral steroids, and surgical interventions as needed. The limitation of this study was its retrospective nature, which was somewhat addressed by only including patients seen by corneal specialists for more uniform/specific disease descriptions. The study provides guidelines on including more historical elements and considerations of exam findings not just seen in active disease in order to more globally standardize the care for VKC patients. In this issue, there was also a letter to the editors that highlighted how prior grading systems have not become largely incorporated into general practice due to missing elements of exam or management or being

overly complicated. The letter writers praised the current study for its simplicity in use and for incorporating elements of history, exam, management, and diagnostics in its grading.

Oral Cyclosporine in Vernal Keratoconjunctivitis: Indications, Outcomes, and Effect on Corticosteroid Use

Kate A, Tallapelly HG, Jain N, et al.

Cornea 2025;44(9):1078-1083

Vernal keratoconjunctivitis (VKC) is a severe allergic eye disease that often requires frequent corticosteroid use. Oral cyclosporine A (oCsA) may be useful in more resistant or steroid-complicated VKC, but its indications, efficacy, and steroid-sparing effect needed evaluation. This is a retrospective review of 27 VKC patients (54 eyes) treated with oral cyclosporine between 2016 and 2024, with follow-up data of median 11 months. The study collected demographic/clinical data, noted indications for oCsA use, and compared the number of acute episodes requiring corticosteroids before vs after starting oCsA. After oCsA treatment, acute exacerbations dropped markedly—from 42 events over 403 person-months before treatment to 10 over 250 person-months during treatment. The odds of an acute exacerbation were approximately 2.6 times higher without oCsA compared to while on oCsA. Also, none of the eyes had progression of sequelae (e.g. limbal stem cell deficiency) during oCsA use. Strengths of this study include the quantification of corticosteroid reduction and a decent n for a unique treatment in a challenging patient population. Limitations include small sample size, retrospective design, relatively short follow through for some patients (under a year). In VKC cases recalcitrant to conventional therapy or where corticosteroid side effects are a concern, oral cyclosporine can substantially reduce both the frequency of acute episodes and corticosteroid requirement.

Demographic disparities in the prevalence of pediatric corneal neovascularization cases at a tertiary care center

Valadez J, Arreguin AJ, Padovani-Claudio DA

J AAPOS 2025 Jun;29(3):104224

Demographic data for pediatric patients with corneal neovascularization is scarce, hampering assessment of underlying causes. The purpose of this retrospective, single-center study was to investigate sex and racial/ethnic demographic patterns, interpreter requirements, and disease management burden/sequelae in their pediatric population with corneal neovascularization. In this case series of 40 patients with corneal neovascularization, the authors found that corneal neovascularization was relatively more common in female, Hispanic, and Black patients and identified blepharokeratoconjunctivitis spectrum diseases as the most commonly associated condition. They also identified important markers of health care use, showing high numbers of specialty visits, medication prescriptions, years of disease burden, and disease sequelae (ocular hypertension, amblyopia, and visual impairment) within their cohort. Limitations of the study include the small sample size, population from a single tertiary care academic center, and use of diagnosis codes to identify patients. The impact on clinical practice is that the burden of corneal neovascularization may not be shouldered equitably within our pediatric patients, which can compound and potentiate existing health and social disparities.

Corneal tomography under general anesthesia in the lateral decubitus position

Liu J, Puente MA, Edwards Mayhew RG, et al.

J AAPOS 2025 Jun;29(3):104205

Patients with intellectual and developmental disabilities (IDD), such as Down syndrome, are at increased risk of developing keratoconus. While corneal tomography is essential for assessing keratoconus, planning refractive surgeries, and diagnosing corneal and ocular surface conditions; it can be challenging to perform on young children and individuals with IDD on account of poor cooperation during image acquisition. The authors present a novel technique for conducting corneal tomography under general anesthesia in the lateral decubitus position using the Pentacam system. Following induction of anesthesia in the supine position, the patient is transitioned to a lateral decubitus position with their eyes aligned with the Pentacam apparatus. They performed this procedure without complications in 22 eyes of 13 patients with IDD. Of these, 5 eyes were diagnosed with keratoconus and subsequently underwent collagen cross-linking. Limitations of this procedure include cost and resource management, but timely screening and treatment is paramount as corneal transplant is not suitable for patients with IDD. The impact on clinical practice is that this approach not only addresses the challenges posed by patients with IDD but also underscores the adaptability of existing technology in accommodating diverse patient populations.

Clinical Classification and Management Outcomes of Anterior Segment-Dominated Persistent Fetal Vasculature: The CCPMOH Report

Chen H, Chen W, Zhou F, et al

Am J Ophthalmol 2025;271:316-328

Anterior segment–dominated PFV (aPFV) arises from incomplete regression of the fetal hyaloid system and can severely threaten vision through cataract, pupillary/retrolental membranes, shallow chambers, and secondary glaucoma. Evidence-based guidance has been limited, especially on how anterior disease phenotype and severity relate to outcomes. In this secondary analysis of a large longitudinal cohort (470 children; 619 eyes), the authors created an anatomically grounded classification (Type I: pupillary/iris/anterior lens; Type II: retrolental/anterior hyaloid; Type III: combined), each graded mild (a) vs severe (b), and reported standardized, predominantly limbal surgical approaches (lensectomy ± posterior capsulotomy/anterior vitrectomy; selective membranectomy; case-by-case IOL). Type II was most common (67.9%); cataract was present in 81.6% overall with type-specific patterns, posterior capsule abnormalities were frequent (e.g., tears largely in IIa), and Type III had the shallowest anterior chamber and greatest astigmatism. Surgery was performed in 96.9%; adverse events were uncommon to moderate (intravitreal hemorrhage 0.2%, visual axis obscuration 9.4%, ocular hypertension requiring drops 19.2%); 7.6% needed reoperation. Vision improved in 73.7% of eyes, with the poorest final acuity concentrated in IIb and IIIb. Strengths include the very large pediatric series, clear phenotype–severity taxonomy, and a pragmatic management algorithm; limitations include single-center design, reliance on mixed visual-function surrogates in very young children, and limited posterior-segment detail. Practically, this work teaches pediatric ophthalmologists to triage aPFV by location and severity, anticipate type-specific risks (e.g., capsular plaque/tear in II, shallow chamber in III), and tailor surgery (often lensectomy with posterior capsulotomy/anterior vitrectomy, cautious IOL use) plus vigilant IOP/VAO surveillance.

Adopting this schema may standardize counseling, timing, and technique, improving visual rehabilitation while minimizing complications and reoperations.

Screening Corneal Tomography for the Diagnosis of Keratoconus in Pediatric Patients With Trisomy 21

Smith CG, Edwards Mayhew RG, Singh JK, et al

Am J Ophthalmol 2025;277:349-355

This retrospective, cross-sectional study addressed the feasibility of corneal tomography in children with Down syndrome (DS) and whether high levels of astigmatism or myopia are reliable indicators of keratoconus in this group. A total of 358 patients with DS and 96 without DS, aged 4–18 years, were evaluated at a tertiary pediatric hospital from 2018–2020. Tomographic imaging was successfully obtained in at least one eye for 75.9% of children with DS. Among those diagnosed with keratoconus, children with DS had significantly lower amounts of astigmatism and less myopia at diagnosis compared to non-DS peers. Importantly, within the DS cohort, refractive error did not differ between those with and without keratoconus, suggesting that refractive thresholds alone are not reliable screening markers. Strengths of the study include its focus on a large, at-risk population with real-world applicability, while limitations include its retrospective design, single-center setting, selection bias in who underwent imaging, and variability in diagnostic criteria across physicians. The key teaching point is that keratoconus in children with DS often presents without the high astigmatism or myopia traditionally associated with the disease in other populations. For pediatric ophthalmology, this emphasizes the need for early and routine tomographic screening of children with DS regardless of refractive error. Incorporating systematic screening protocols could enable earlier detection and timely corneal crosslinking, potentially preventing vision-threatening progression and reducing reliance on interventions such as keratoplasty, which are often less successful in this vulnerable population.

A Narrative Medicine Approach to Navigating Barriers to the Diagnosis of Pediatric Neurotrophic Keratopathy

Tannir S, Mulenga C, Tran K, et al.

Am J Ophthalmol 2025;276:109-116

This is a qualitative study exploring the experiences of caregivers of pediatric patients with neurotrophic keratopathy (NK), focusing on barriers to diagnosis and the impact of corneal neurotization (CN) surgery. Through semi-structured interviews with ten caregivers, the study identified key themes including significant diagnostic delays due to limited specialist awareness, the proactive role of caregivers in seeking information, substantial lifestyle adjustments required by NK, and the positive effects of CN surgery on both corneal health and quality of life. The findings highlight the need for increased clinician awareness of pediatric NK and demonstrate that narrative medicine approaches can improve caregiver-provider communication and support, ultimately informing strategies to enhance the diagnostic and therapeutic journey for affected families.

Cataract

Is Patching after Age 4 Beneficial for Children Born with a Unilateral Congenital Cataract?

Drewe-Botsch CD, Cotsonis G, Celano M, et al.

Ophthalmology 2025 Apr;132(4):389-396

This study used data from the Infant Aphakia Trial to assess how early patching impacts VA outcome and whether patching after the age of 4 is beneficial in patients with unilateral congenital cataracts. The study included 105 patients who participated in IATS and did not have a vision threatening adverse event. For all patients, the average VA at both 4 and 10.5 years of age 20/151 with 41% having vision worse than 20/200. VA at age 4 was predictive of VA at age 10.5. Half had poorer vision at 10.5 years, but half also had better vision. Most changes of VA between 4 and 10.5 years was small. On average, children were patched 3 hours per day between 48 months and 60 months. 18 children did not patch at all, 15 reported at least 6 hours per day, and half patched between 0.66-4.83 hours per day. Amounts of patching earlier in life were strongly predictive of patching in the 5th year of life. The amount of patching strongly correlated with the patients VA – patients with worse vision were patched fewer hours on average than patient 20/40 or better in the first 5 years of life. Children with near normal vision (i.e., VA of 20/40 or better) averaged more hours of patching between 12 and 36 months of age than children in each of the other VA groups. However, the average hours per day of patching in the fifth year of life were not correlated with the change in VA between age 4 and 10.5 years overall. None of the children with a VA measurement of 20/200 or worse at age 4 years achieved VA of better than 20/100, irrespective of the amount of patching that was performed thereafter. These analyses suggest that optotype acuity measures obtained early in the fifth year of life are reliable and predictive of final visual outcomes. The results suggest that once optotype acuity can be reliably measured, less aggressive patching protocols may be warranted in some children following surgery for unilateral congenital cataract after careful consideration of the potential impact of patching on the child's quality of life, family relationships, and binocular visual field. This study has interesting and impactful results that have the potential to shift how we manage amblyopia in these patients after the age of 4.

Dysregulation of Autophagy Occurs During Congenital Cataract Development in $\beta A3\Delta G91$ Mice
Boateng AK, Joseph R, Srivastava OP

Invest Ophthalmol Vis Sci 2024 Apr 1;65(4):4

This study was prompted by the observation that mutations in the $\beta A3/A1$ -crystallin gene, specifically the G91 deletion ($\beta A3\Delta G91$), cause congenital nuclear cataracts in humans, yet the cellular mechanisms remain unclear. To explore this, the authors created a $\beta A3\Delta G91$ knock-in mouse model via CRISPR/Cas9 and compared lens development at P0, P15, and one month with wild-type controls. Through slit-lamp imaging, RT qPCR, Western blotting, immunohistochemistry, transmission electron microscopy, and TUNEL assays, the authors revealed that $\beta A3\Delta G91$ mice develop congenital nuclear cataracts and microphthalmia alongside impaired degradation of organelles, manifested as retention of nuclei and ER in lens fiber regions. These lenses also show elevated autophagy markers (ubiquitinated proteins, p62, LC3, LAMP2), accumulation of autophagic vesicles, and increased apoptosis (cleaved caspase 3 and 9). The findings suggest that the G91 deletion disrupts autophagy and induces apoptotic cell death, underlying cataract formation in this model. The findings in the study lend further insight into the pathophysiology behind the development of congenital cataracts in children, but are limited by use of just a single genetic mutation model, which limits generalizability to other cataract etiologies.

In vivo capsular bag size in children with congenital cataract: implications for placement of intraocular lens

Sukhija J, Kaur S, Gupta K, Kumari K, Sethi S
J Cataract Refract Surg 2025;51(6):483-487

In pediatric congenital cataract surgery, placement of an intraocular lens (IOL) in the capsular bag is often preferred but can frequently be challenging due to the variable anterior segment morphology in this patient population. The authors wanted to explore if there are pre-operative metrics measured via ultrasound biomicroscopy (UBM) that can help predict the successful placement of an intraocular lens in the bag. This was a prospective case series at a tertiary care center including children under 5 years with congenital cataract (excluding traumatic, corneal or retinal pathology, or prior surgery). Ultrasound biomicroscopy was used preoperatively to measure capsular bag diameter (CBD) and its correlation with age, axial length, and corneal diameter; outcomes of IOL placement (successful in-bag vs difficult) were then compared. Of 112 eyes in 68 children (mean age $\approx$ 11.4 months), eyes where the IOL was successfully placed in the capsular bag had a mean CBD of 8.27 ± 0.60 mm, whereas eyes where in-bag placement was difficult (aphakia or bicapsular capture required) had a significantly smaller mean CBD of 7.09 ± 0.99 mm. CBD correlated positively with age, axial length (AL), and corneal diameter. Having a larger bag diameter was strongly associated with successful in-bag IOL placement. Strengths include the reasonable sample size for this age group, the quality of the UBM measurements and the fact that it was done by a single surgeon. Preoperative measurement of capsular bag diameter should be considered in the planning for pediatric congenital cataract surgery, as they strongly predict whether in-bag IOL implantation is likely to succeed. The author suggests that this approach replace the more traditional use of measuring the corneal diameter.

Longitudinal Observation of Posterior Capsule Opacification in Pediatric Eyes with Marfan Syndrome after In-the-bag Intraocular Lens Implantation

Wang Y, Chen Z, Jia W, et al
J Cataract Refract Surg Published online April 23, 2025

Posterior capsule opacification (PCO) is a known complication after pediatric IOL surgery, but its incidence, timing, and risk factors in children with MFS and ectopia lentis are not well defined. This is a prospective cohort study of 152 pediatric eyes (one eye per child) with MFS and ectopia lentis undergoing in-the-bag IOL implantation (using either a modified capsular tension ring [MCTR] or capsular tension ring with capsular hook, CTR-CH), followed for a mean of 2.84 years.

The primary outcome was PCO requiring YAG capsulotomy. PCO developed in 69% of the eyes over the 2.8-year follow-up. Eyes operated on under age 5 developed PCO earlier, and use of AcrySof IQ IOL was associated with an earlier onset compared to TECNIS IOL. Also, less severe ectopia lentis, implantation with AcrySof IQ (versus TECNIS), and using the CTR-CH support method (versus the MCTR) were associated with higher incidence or earlier PCO. The strengths include the sample size, prospective design and use of multivariate models to control for confounders. Limitations are moderate follow-up time (just under 3 years on average). This study provides more precise data on a well-known complication with clarity on the risk factors being young age, use of AcrySof IQ IOLs, and the CTR-CH support model.

Cataract Surgery

Ophthalmic outcomes five years after lensectomy among children with Down syndrome

de Alba Campomanes AG, Repka MX, Wu R, et al

J AAPOS 2025;29(4):104273

Studies regarding the outcomes of cataract surgery in children with Down syndrome have been limited. This study aims to add to the literature by prospectively collecting data on ophthalmic outcomes of children with Down syndrome after lensectomy using a large database. Using the PEDIG cataract surgery registry, the authors report visual acuity, change in refractive error, glaucoma-related adverse events, other complications, and surgeries in children with Down syndrome. Thirty-one (3%) children with Down syndrome were identified out of 994 children who underwent lensectomy. Amblyopia was reported in 50% of patients with 17% of patients who could cooperate with optotype testing achieving 20/60 or better visual acuity. For aphakic eyes, there was a mean myopic shift of -10.61 compared to a mean myopic shift of -1.75 diopters in pseudophakic eyes. Prevalence of strabismus was 81% and incidence of glaucoma-related adverse events occurred in 38%. Strengths of this study include prospective design and longer follow-up. Limitations include small sample size of children with Down syndrome, missing refraction data at the 5-year follow-up visit, and limited optotype testing due to developmental delay in this population. This study highlights that overall postoperative outcomes and complications in children with Down syndrome undergoing lensectomy are similar to patients without Down syndrome.

Risk factors for capsular phimosis following congenital cataract extraction

Al-Lozi AM, McFadyen J, Shue A, et al.

J AAPOS 2025;29(4):104279

Cataract extraction in infants < 7 months, unilateral or bilateral, without placement of an intraocular lens has an increased risk of capsular phimosis, which may cause visual axis obscuration and hinder retinoscopy leading to deprivational amblyopia. This study aims to evaluate risk factors for capsular phimosis in this population. This was a retrospective review of surgical videos and patient charts from a single institution, analyzing infants <7 months who underwent lensectomy without intraocular lens implantation during 2018-2022. Two independent reviewers obtained measurements of the anterior and posterior capsulotomies using a specified protocol. Eleven eyes were included in the analysis. Capsular phimosis, which was first observed at a median of 2.3 months after the primary surgery, developed in 35% of eyes, with 25% requiring surgical intervention. Eyes with smaller anterior and posterior capsulotomy diameters were associated with phimosis. Male sex was also associated with increased risk, though other factors like age at surgery, duration of surgery, and cataract bilaterality were not associated with phimosis. A strength of the study is video-based measurements by independent reviewers to address a cause of visual axis obscuration that has not been studied previously. Limitations include retrospective nature, small sample size and short follow-up. This study suggests that when performing congenital cataract extraction in infants <7 mm, an anterior capsulotomy diameter greater than 5.5 mm and a posterior capsulotomy diameter greater than 4.5 mm may reduce the risk of capsular phimosis.

Refractive Change at 5 Years in the Toddler Aphakia and Pseudophakia Study VanderVeen DK, Wilson ME, Wang JY, et al
Ophthalmology 2025;132(5):610-616

The authors attempt to evaluate changes in refractive error after IOL implantation in cataract surgery performed at a young age. The TAPS registry consists of data collected retrospectively from children aged 7 to 24 months undergoing unilateral or bilateral cataract extraction by study surgeons during the IATS enrollment period. The primary aim of this paper was to evaluate change in the refractive error in eyes of children undergoing unilateral or bilateral cataract extraction with primary IOL implantation at 24 months of age or younger. The authors note that they did not have biometry measures in this cohort to study correlations in rate of refractive growth and axial elongation or the impact of keratometry or other baseline characteristics of refractive change over time. They also did not have consistent data regarding the surgeon's refractive target for post-operative refraction which would help to calculate prediction error. The authors conclude that there was a greater myopic shift for infants with unilateral or bilateral pseudophakia undergoing surgery younger than 7 months compared to those 7 to 24 months of age. They also had a higher myopic shift per year and also myopic shift in patients with the unilateral compared with bilateral cataracts in the group of 7 to 24 months of age also had greater variability. Despite this surgeons would do well adhere to standard recommendations for post-operative refractions.

Long-Term Refractive Changes After Pediatric Cataract Surgery: An Average Follow-up of 15 Years

Oshika T, Nishina S, Ura S, et al
Am J Ophthalmol 2025;277:305-312

This multicenter retrospective case series investigated long-term refractive outcomes after pediatric cataract surgery, a critical issue given the unpredictability of refractive development in young children compared to adults. A total of 451 eyes from 273 patients who underwent surgery at age six years or younger were followed for a mean of 15 years, allowing comparison of bilateral vs unilateral cases and aphakia vs pseudophakia. The study found that younger age at surgery was strongly associated with larger long-term myopic shifts, with children operated on at or before age two experiencing median shifts of -8 to -11 diopters in bilateral cases and comparable anisometropic changes in unilateral cases. In contrast, those treated after age two showed more modest shifts of -3 to -6 diopters. Importantly, both aphakic and pseudophakic groups demonstrated similar patterns, and in pseudophakia, longer axial length at surgery correlated with greater myopic progression. Glaucoma developed most often in aphakic eyes but was rare in pseudophakia, and its presence did not significantly alter refractive shifts. Strengths of this study include its large, multicenter design, long follow-up, and direct comparison across surgical types; limitations include retrospective design, lack of standardized surgical or IOL protocols, incomplete axial length data, and absence of detailed amblyopia therapy information. This work reinforces that pediatric cataract surgery before age two carries a high risk of large, progressive refractive changes regardless of IOL status, underscoring the importance of cautious IOL power selection, hyperopic targeting, and vigilant long-term monitoring. For pediatric ophthalmology, these findings will guide more precise surgical planning, family counseling, and postoperative refractive management strategies to optimize long-term visual outcomes.

Association of Age With Glaucoma and Visual Acuity Outcomes 10.5 Years After Unilateral Congenital Cataract Surgery

Wong CK, Forbes H, Kolosky T, et al

Am J Ophthalmol 2025;276:22-29

This study reported a post hoc analysis of a multicenter randomized clinical trial evaluating long-term outcomes in 112 infants who underwent unilateral congenital cataract surgery between 1 and 6 months of age. At 10.5 years postoperatively, younger corrected age at time of surgery was significantly associated with increased risk of glaucoma-related adverse events, while younger chronological age at time of surgery was significantly associated with better visual acuity. Gestational age alone was not significantly linked to either outcome. The findings suggest that both adjusted and chronological age should be considered when determining the timing of cataract surgery in infancy to balance the risks of glaucoma and optimize visual acuity outcomes.

Efficacy and Safety of Polypropylene Scleral Suture Fixation of Intraocular Lens in Pediatric Nontraumatic Ectopia Lentis: A Real-World Study

Liu S, Zhang X, Liu Z, et al

Am J Ophthalmol 2025;276:386-394

This study reports the efficacy and long term outcomes of scleral suture fixation of intraocular lens (SFIOL) for pediatric nontraumatic ectopia lentis. Among 220 eyes of 123 children included, 87.2% of eyes achieved a corrected distance visual acuity ≥ 0.5 at a median follow-up of 4 years. The procedure was associated with several long-term complications, including suture exposure (8.6%) and intraocular lens dislocation (7.7%), and need for additional surgeries (7.7%, including retinal detachment in 3 eyes and IOL dislocation in 14 eyes). This study also found a tendency toward postoperative myopia. Measured mean intraocular lens tilt and decentration were found to be 8.6° and 0.75 mm, respectively. This study emphasized the importance of vigilant long-term follow-up in this population to monitor for delayed complications and optimize visual outcomes.

Genetics

PRPH2-associated retinal diseases: a systematic review of phenotypic findings

AlAshwal SM, Yassin SH, Kalaw FGP, et al.

Am J Ophthalmol 2025;271:7-30

PRPH2-associated retinal diseases (PARD), caused by various pathogenic variants of the PRPH2 gene, present with a wide range of phenotypes that can overlap with other retinal dystrophies, making diagnosis challenging. A systematic review was conducted, adhering to PRISMA 2020 guidelines, to synthesize data from molecularly confirmed studies and relevant case literature on PARD phenotypes. The review found that PARD accounts for about 25% of pattern dystrophies and up to 5% of inherited retinal dystrophies globally, with significant variation in clinical presentation even among individuals with the same mutation. While newer imaging techniques like fundus autofluorescence and optical coherence tomography (OCT) have improved the ability to differentiate PARD subtypes, overlapping features with conditions such as age-related macular degeneration (AMD) and Stargardt disease still persist. The age of onset for PARD is typically the fourth or fifth decade, though it can occur as early as five years of age. A key strength of the review is its comprehensive inclusion of recent imaging and genetic data; however, it is limited by variable study sizes, the exclusion of non-English articles, and a lack of large cohorts that correlate genotype with phenotype. For clinical practice, the review emphasizes the need to integrate genetic testing with advanced imaging to create more precise diagnostic criteria and facilitate targeted treatments for PARD.

Subretinal Gene Therapy Drug AGTC-501 for XLRP Phase 1/2 Multicenter Study (HORIZON): 24-Month Safety and Efficacy Results

Yang P, Birch D, Lauer A, et al

Am J Ophthalmol 2025;271:268-285

X-linked retinitis pigmentosa (XLRP) is a severe, inherited retinal disease primarily affecting males, caused mainly by RPGR gene mutations that result in progressive and early vision loss. To test a potential treatment, a Phase 1/2, open-label, multicenter, dose-escalation study was conducted on 29 males with XLRP. Participants received a subretinal injection of AGTC-501 in one eye to target the affected retina. Over a 24-month period, AGTC-501 was generally well-tolerated, with most adverse events being mild and related to the injection procedure rather than the investigational gene therapy itself. The highest dose group showed the most significant improvements in retinal sensitivity; however, this dose was discontinued due to a high incidence of retinal pigment epithelial changes, which indicated toxicity. At the maximum tolerated dose, half of the treated patients maintained a significant retinal sensitivity gain of at least 7 dB in multiple retinal loci at 24 months. The study's strengths include its multicenter design and extended follow-up, which demonstrated both safety and preliminary efficacy. However, limitations include its open-label nature, a relatively small sample size, and the dose-dependent toxicity observed at the highest dose level. These findings support the continued clinical development of AGTC-501, showing that gene therapy holds promise as an effective treatment for XLRP, but highlight the critical importance of careful dose selection to ensure patient safety.

Clinical characterization, natural history, and detailed phenotyping of NMNAT1-associated Leber congenital amaurosis

Lee YJ, Jeong H, Kim J, et al.

Am J Ophthalmol 2025;271:396-406

NMNAT1-associated Leber congenital amaurosis (LCA) is a severe, early-onset inherited retinal dystrophy that causes rapid and profound visual impairment, particularly in East Asian populations. A retrospective, observational study was conducted to evaluate the clinical features and disease progression of 14 Korean patients with genetically confirmed NMNAT1 variants. The study used longitudinal ophthalmic records and multimodal imaging to document retinal changes over time. The results revealed a rapid bilateral retinal degeneration in early childhood, with most patients developing central retinal scarring by age two, which then stabilized by age four. Despite this early and significant damage, most patients retained light perception or better vision with minimal deterioration after age two. Multimodal imaging consistently showed outer retinal layer and retinal pigment epithelium (RPE) atrophy, highlighting a distinct temporal progression pattern that suggests a potential therapeutic window in early childhood. While the study's strengths include detailed longitudinal phenotyping and a genetically homogeneous population, its small sample size and retrospective design limit the generalizability of the findings. Nonetheless, this research underscores the critical importance of early diagnosis and monitoring of NMNAT1-associated LCA to identify the optimal timing for potential therapeutic interventions in affected children.

Clinical and structural characterization of a novel TGFB1 mutation linked to a lattice corneal dystrophy variant in a Greek family

Zacharogianni M, Papandreou NC, Marinakis NM, et al.

Am J Ophthalmol 2025;274:112-121

Lattice corneal dystrophies (LCD) are inherited corneal disorders caused by mutations in the TGFB1 gene, which lead to corneal amyloid deposits and a variety of clinical presentations. To better understand the link between a specific genetic mutation and its clinical effects, a single-family case-control study combined detailed ophthalmic examinations with genomic sequencing and advanced computational structural analyses. The study successfully identified a new TGFB1 insertion mutation that disrupts the α -helix within the FAS1-4 domain, leading to protein destabilization. This specific structural change was linked to a distinct clinical phenotype characterized by geographic subepithelial corneal opacities and early-onset recurrent erosions. The findings underscore the importance of understanding these genotype-phenotype relationships in LCD, as the structural impact of this new mutation correlated with a unique set of symptoms compared to other known variants. While the study's focus on a single family limits the generalizability of its findings, its strength lies in the integration of clinical data with sophisticated bioinformatics to clarify the effects of the mutation. This approach not only aids in the diagnosis of these variants but may also help guide targeted treatment strategies for patients with LCD.

Evaluating Practical Approaches for Including MYOC Variants Alongside Common Variants for Genetics-Based Risk Stratification for Glaucoma

Le NQ, He W, Law MH, et al

Am J Ophthalmol 2025;274:232-240

MYOC gene variants, especially the p.Gln368Ter variant common in European populations, are known to increase the risk of glaucoma. A retrospective study of 58,452 participants investigated whether combining the presence of this rare variant with a polygenic risk score (PRS) could improve early glaucoma diagnosis and risk assessment. The study validated the identification of p.Gln368Ter carriers through direct genotyping, finding it to have nearly perfect agreement with sequencing. The results showed that incorporating the p.Gln368Ter status into the PRS significantly improved the identification of high-risk individuals who carried this specific variant, raising their high-risk classification from about 32–38% to 75–79%. However, because the variant is so rare, its inclusion did not significantly enhance overall glaucoma risk prediction across the general population. While the study's large sample size and the cross-validation of genotyping with sequencing are major strengths, the variant's low prevalence and potential data variability across multiple cohorts are limitations. Nonetheless, these findings suggest that for clinicians, integrating precise MYOC p.Gln368Ter genotyping with polygenic risk scores could lead to more accurate, personalized risk stratification for glaucoma, allowing for earlier detection and targeted interventions for high-risk carriers.

Congenital X-linked retinoschisis in an Indian population: A single center study in 70 eyes

Das A, Shah PK, Saravanan VR, et al.

Am J Ophthalmol 2025;274:142-148

Congenital X-linked retinoschisis (CXLRS) is a hereditary retinal disease in males characterized by a splitting of the retinal layers, which can lead to complications like rhegmatogenous retinal detachment (RRD). To better understand its clinical features and management, a retrospective study was conducted at a single Indian tertiary center, analyzing 70 eyes from 35 CXLRS patients over an average follow-up of more than five years. The study found that the most common clinical phenotype was type 3 (complex, 77%), which includes both foveal and peripheral schisis. A relatively small percentage of eyes (10%) required surgical intervention, primarily for RRD, with pars plana vitrectomy with silicone oil being the most common procedure. The median final visual acuity improved significantly after surgery (logMAR 0.6), and most cases had good anatomical outcomes. The study's strengths include its relatively large pediatric cohort and the use of optical coherence tomography (OCT) to help classify the phenotypes and guide surgical decisions. However, the study is limited by its retrospective, single-center design and the absence of genetic testing data. The findings emphasize the clinical importance of family screening, multimodal imaging, and timely surgical management to preserve functional vision and aid in surgical planning for children with CXLRS.

Clinical characteristics of patients with less common causes of Leber congenital amaurosis/early-onset severe retinal dystrophy

Balbirsingh V, Daich Varela M, Michaelides M

Am J Ophthalmol 2025;276:297-306

While most cases of Leber congenital amaurosis (LCA) and early-onset severe retinal dystrophy (EOSRD) are linked to a few common genes, those caused by rarer genes are not as well understood and may have distinct clinical features. To address this, a retrospective single-center case series analyzed the clinical and genetic profiles of 19 patients with LCA/EOSRD caused by mutations in rare genes such as ALMS1, CABP4, KCNJ13, and OTX2. The study identified nine

new pathogenic variants and found that all patients experienced vision loss in early infancy, with most (68%) progressing to blindness. The most rapid vision loss was observed in those with ALMS1 and KCNJ13 mutations, reaching a mean logMAR acuity of 2.2–2.8 by their second decade of life. Macular atrophy and dense peripheral pigmentation were most common in patients with KCNJ13 and OTX2 genotypes, while those with ALMS1 and CABP4 showed fewer deposits, with a signature foveal hyporeflective zone seen in adult patients with the CABP4 mutation. Despite the study's small sample size and single-center design, its strength lies in the systematic characterization of these previously little-described subtypes and the identification of novel variants. This improved understanding of the genotype-phenotype relationship for these rare LCA/EOSRD forms is crucial for clinicians, as it can lead to more accurate diagnoses, better prognoses, and the development of future personalized management strategies for pediatric patients.

Catering to the Era of Gene Therapy: An Objective Staging Strategy for Bietti Crystalline Dystrophy using Principal Component Regression

Hang C, Zhang T, Chen Z, et al

Am J Ophthalmol 2025;277:269-279

Bietti crystalline dystrophy (BCD) is a progressive inherited retinal degeneration caused by mutations in the CYP4V2 gene, particularly affecting East Asian populations. As new gene therapies emerge, an objective system for staging disease severity is crucial for optimizing treatment timing. This retrospective study developed a quantitative severity score, the BCD-SA Score, by analyzing six clinical and imaging parameters from 127 BCD patients. The study found that the new scoring system correlated strongly with traditional staging methods but provided a more nuanced and improved stratification of the disease. By integrating multiple factors related to both eye structure and function, the BCD-SA Score better captured the heterogeneity and progression patterns of BCD. The study's strengths include its large sample size, objective quantitative measures, and the use of advanced statistical modeling, though its retrospective nature is a limitation. Ultimately, this new scoring system offers a valuable tool for clinicians, enabling a more standardized assessment of disease severity in BCD, which will facilitate patient selection and help evaluate the effectiveness of future gene therapy trials.

Associations of genetic variants for refractive error and axial length in adults with ocular endophenotypes in children: a cross-sectional and longitudinal study

Zaabaar E, Shing E, Zhang XJ, et al

Br J Ophthalmol 2025;109(3):377-382

Genetic variants have been identified as key contributors to refractive error and axial length in adults, but their roles in childhood ocular development remain unclear. Early childhood is a critical period for eye growth and refractive error development. This study examined 15 candidate single-nucleotide polymorphisms (SNPs) previously associated with axial length and spherical equivalent refraction in adults, which were genotyped in 2,819 Chinese children. Assessment was at baseline and over 3 years with refractive and biometric ocular parameters using linear regression. Variants in ZMAT4, TOX, and GRIA4 showed significant associations with refractive error, axial length, and corneal curvature ratios in children, consistent with adult findings. Additionally, RDH5 and CD55 variants correlated with longitudinal changes in axial length and

corneal radius, suggesting roles in eye growth regulation during childhood. Strengths of the study include a large pediatric cohort with longitudinal data and good phenotyping. Limitations include the absence of environmental exposure data and the focus on previously identified SNPs, possibly overlooking other genetic factors. The finding of this study indicates the involvement of certain genetic variants in regulating eye growth and refractive error development in childhood which can assist in early prediction of refractive error risk and potentially help with development of personalized interventions to manage myopia progression.

Neovascular glaucoma as a predictor of retinoblastoma high-risk histopathology in an international multicenter study

Negretti GS, Ushakova T, Yuri S, et al

Retina 2025;45(3):565-573

Neovascular glaucoma (NVG) is a severe complication that can be seen in advanced retinoblastoma and may predict aggressive histopathologic features linked to increased metastatic risk. Understanding the prognostic significance of NVG may guide treatment decisions in retinoblastoma management. This retrospective international multicenter case series, across five continents, included 1,420 retinoblastoma patients undergoing primary enucleation. It analyzed clinical features, histopathologic grades, and survival outcomes comparing NVG patients to those with clinical stage cT2 using logistic regression and Kaplan-Meier survival analyses. NVG was present in 16% of patients; 58% of these had high-risk histopathology. NVG independently predicted high-risk pathology (OR approx. 1.77). NVG patients showed higher metastatic rates than cT2 patients, and clinical factors such as prolonged symptoms, buphthalmos, and ectropion uveae correlated with higher histopathologic risk. Adjuvant chemotherapy reduced metastasis and mortality in high-risk groups. Strengths include the large multinational cohort with standardized data collection and comprehensive analysis of histopathologic and clinical outcomes. Limitations include retrospective design and variability in treatment protocols across centers. Retinoblastoma with NVG at diagnosis is associated with increased high-risk histopathology and increased metastatic rate that should be taken into consideration for treatment.

Long-term functional and clinical outcomes in familial exudative vitreoretinopathy

Chen H, Caldwell AS, Patnaik JL, et al.

Retina 2025;45(5):908-914

Familial exudative vitreoretinopathy (FEVR) is a rare inherited retinal vascular disorder with variable clinical severity, ranging from asymptomatic disease to severe vision loss. Previous studies have been limited by small cohorts and short follow-up durations. This retrospective chart review at a tertiary academic center evaluated 96 patients with FEVR over a 21-year period (2003-2024), collecting demographic, genetic, clinical, and treatment data, with visual acuity outcomes analyzed per patient. Among 90 eyes analyzed, 77.3% of patients retained functional vision ($\geq 20/40$) and 88.6% had ambulatory vision ($\geq 20/200$) after a mean follow-up of 9.1 years. Globe

salvage was achieved in 98.4% of eyes. Retinal detachment at presentation was the only factor significantly associated with worse final vision in multivariable analysis. Treatment approaches included laser photocoagulation, vitrectomy, and scleral buckling, with reactivation and reattachment rates consistent with literature. Strengths of this study include a large cohort and extended follow-up allowing assessment of long-term functional outcomes. Limitations include its retrospective nature and incomplete genetic testing in nearly half the patients, limiting genotype-phenotype correlation. This study of FEVR is novel in reporting the longest duration of follow-up as well as visual acuity outcomes (per eye and per patient) and supports the importance of routine monitoring and treatment, when indicated, to optimize vision.

Natural course of refractive errors in early onset inherited retinal diseases

Azmon R, Ezra Kahtan B, Hendler K, et al.

Eye (Lond) 2025 Sep 12

The authors retrospectively review a cohort of 199 patients diagnosed with inherited retinal diseases before age 10 to characterize the natural progression of refractive error in this cohort. Retinitis Pigmentosa and Achromatopsia were associated with high hypermetropia in early visits, with a decreasing RE trend over time. In contrast, Congenital Stationary Night Blindness and Blue Cone Monochromacy demonstrated high myopia, worsening over time in CSNB, with an increasing rate in high myopia from 51.5% to 69.7% from first to last visit. Mean myopic progression in TRPM1-patients was 0.56 diopters/year. Although the findings cannot be generalized to every individual patient, the study is highlighting the importance of early screening and refractive correction in this cohort of patients to prevent amblyopia and strabismus and also to maximize visual potential.

Personalised genomic strategies improve diagnostic yield in inherited retinal dystrophies: a stepwise, patient-centred approach

Esteve-Garcia A, Padró-Miquel A, Català-Mora J, et al.

Eye (Lond) 2025 Sep 9

The paper assesses the impact of a personalized genomic approach integrating whole-exome sequencing (WES) reanalysis, whole-genome sequencing (WGS), customized gene panels and functional assays to improve diagnostic yield in unresolved cases of Inherited retinal dystrophies. The stepwise re-evaluation included WES reanalysis with updated virtual panels, WGS in selected cases and targeted sequencing of complex regions. Variant interpretation was refined using updated classification criteria, segregation analysis and functional assays such as mRNA and minigene/midigene studies. The initial diagnostic yield of 59.6% (313/525) was achieved through first-tier genetic testing. Re-evaluation resulted in an increased the overall diagnostic rate for probands to 67.6% (355/525). This study highlights the importance of fennel type and understanding of genetic testing results to increase the likelihood of a complete diagnosis.

Correlation between quality of vision and clinical and structural parameters in patients with Autosomal Dominant Optic Atrophy

Camós-Carreras A, Figueras-Roca M, Albà-Arbalat S, et al.

Eye (Lond) 2025 Jun;39(9):1837-1842

This cross-sectional study aimed to evaluate vision-related quality of life in 27 patients with molecularly confirmed Autosomal dominant optic atrophy using the 25-item National Eye Institute Visual Function Questionnaire (NEI-VFQ-25) and its 10-item Neuro-Ophthalmic Supplement. Clinical and structural parameters were assessed to explore their association with quality-of-life scores. Significant reduction in Quality-of-life was observed across the board. Visual acuity, near activities, and distance activities were the most affected domains, while color vision surprisingly scored higher than expected. Multivariate analysis revealed that best-corrected visual acuity (BCVA) to be independently associated with VFQ-25 composite (β coefficient -66.46; $p < 0.001$). Additionally, macular vessel density correlated with specific subscales such as dependency and color vision. The study suggests that preserving visual acuity should be a primary therapeutic target in Autosomal dominant optic atrophy management, as well as a key for monitoring and guiding future therapeutic interventions.

Ophthalmological manifestations in a cohort of Cowden syndrome patients in a large tertiary healthcare system

Baroutis KG, Hoyek S, Correa VSMC, et al.

Eye (Lond) 2025 Sep 11

Cowden syndrome (CS) is a rare genetic disorder caused by mutations in the PTEN gene associated with multisystem hamartomas and predisposition to malignancies. On this retrospective cohort study 77 Patients met the clinical or genetic criteria for CS. Of these, 17 (22%) underwent ophthalmologic evaluation, and 4 (5%) exhibited CS-related ocular findings. Ocular findings were retinal hamartoma, eyelid hemangioma, trichilemmoma, and a peripapillary hamartoma-like lesion. Most patients maintained excellent vision over a median follow-up of four and a half years. Likely more findings exist if systematic ophthalmic evaluation is performed on these patients.

Outcomes of idebenone therapy for Leber hereditary optic neuropathy in a cohort of patients from Wales

Sanders FWB, Votruba M

Eye (Lond) Published online September 17, 2025.

This paper presents 12 individuals (8 males and 4 females) treated with idebenone 300 mg TDS for LHON for a mean period of 30.2 (± 9.9) months. Patients were treated regardless of time from vision loss, although a number of those with the longest potential durations of disease were either not being routinely followed up, or had been lost to follow-up, or had been discharged some years before. In the real-world environment of this cohort 86% (10 of 14 eyes) achieved clinically relevant recovery by 27 months. It does correlate with other observations of clinical response up to 2 years. The study brings evidence of clinically relevant recovery in a high proportion of patients reaching 27 months of treatment.

Stem cell-based therapies for retinal diseases: focus on clinical trials and future prospects

Sen S, de Guimaraes TAC, Filho AG, et al.

Ophthalmic Genet 2025 Aug;46(4):324-337

Stem cell-based therapy for retinal degenerative diseases is an exciting tool for future treatment strategies and holds great promise. In this narrative review, the authors summarize evidence from clinical trials related to the latest advances in this field of retinal therapeutics. A significant amount of patient education and awareness is needed on behalf of policymakers alongside creating appropriate guidelines regarding cell-based transplantation. Retinal regenerative medicine is undoubtedly complex, but it also offers great promise and now, with recent advances in biotechnology, genomics, cell biology, and improvement of surgical techniques, we are starting to see the prospects of cell-based therapies, and new prospects for erstwhile untreatable retinal conditions. This is an excellent review definitely worth reading.

Trio exome sequencing of an optic nerve hypoplasia cohort reveals evidence for polygenic architecture

Aparicio JG, Stachelek K, Garcia-Filion P, et al.

Ophthalmic Genet 2025 Aug 31:1-13

Optic nerve hypoplasia (ONH) is believed to be caused by multifactorial developmental events, but genetic causes are under-investigated. This study presents the result of exome sequencing from 34 patients and their parents. Inheritance-modelled variants were evaluated using population frequency, pathogenicity predictions, and mutational constraint metrics. Variants with the strongest genetic effect lacked evidence that they are monogenic and causal. The study did not identify a strong affect the candidate variant suggesting that causal monogenic defects are an uncommon cause of ONH.

The phenotypic spectrum of syndromic optic atrophy associated with variants in WFS1: with reclassification of p.Val606Gly as a likely benign variant

Hull S, Sheck L, Braatvedt G, Mouat F, et al.

Ophthalmic Genet 2025 Aug;46(4):362-369

Wolfram syndrome due to bi-allelic variants in WFS1 and mono-allelic Wolfram-like syndrome have variable ocular and syndromic associations. In this report, eight patients (6 F and 2 M) are described. This is an early onset syndromic optic atrophy. In this cohort mean age of diagnosis was 15 and follow-up was three years. Systemic associations are diabetes mellitus, diabetes insipidus, hearing loss, psychiatric disorders and bladder dysfunction. ON OCT demonstrated marked nerve fiber layer loss in all patients. In dominant disease, macular OCT demonstrated a linear splitting abnormality of the outer plexiform layer (OPL) not found in recessive disease. No patient in this cohort had isolated optic atrophy, however the systemic findings can be subtle and subclinical. Early recognition of potentially syndromic optic atrophy allows prompt diagnosis of systemic associations.

Clinical and Genetic Characteristics of Senior-Loken Syndrome Patients in Korea

Song JR, Jung S, Joo K, et al.

Genes (Basel) 2025 Jul 17;16(7):835

Senior-Loken syndrome (SLS) is a rare autosomal recessive renal-retinal disease caused by mutations in 10 genes. This study aimed to review the ophthalmic findings, renal function, and

genotypes of Korean SLS cases. Patients with NPHP1 mutations showed retinitis pigmentosa (RP) sine pigmento and preserved central vision independent of renal deterioration. Patients with NPHP4 mutations showed early renal dysfunction. Patients aged under 20 maintained relatively good visual function, but older individuals progressed to severe retinopathy. Patients with IQCB1 mutations were generally prone to early and severe retinal degeneration, typically manifesting as Leber congenital amaurosis (LCA). 40.0% maintained normal renal function at the time of diagnosis, and had large deletions in IQCB1. 1 patient with SDCCAG8 mutation exhibited both end-stage renal disease and congenital blindness due to LCA. Wide-field fundus autofluorescence (AF) revealed perifoveal and peripapillary hypoAF with a perifoveal hyperAF in younger patients across genotypes. Patients under 20 years old showed relatively preserved central vision, regardless of the underlying genetic mutation. The recommendations are for simultaneous comprehensive evaluations of both renal and ocular function should be performed at the initial diagnosis to guide timely intervention and optimize long-term outcomes.

Phenotypic and Genotypic Characterization of 171 Patients with Syndromic Inherited Retinal Diseases Highlights the Importance of Genetic Testing for Accurate Clinical Diagnosis

Kulyamzin S, Leibur R, Newman H, et al.

Genes (Basel) 2025 Jun 26;16(7):745

This paper phenotypically and genotypically characterizes a cohort of 171 individuals from 140 Israeli families with syndromic IRD. 51% of the families in the cohort were consanguineous. The largest ethnic group was Muslim Arabs. The most common phenotype was Usher syndrome (65%) followed by BBS (6%) and hypotrichosis with juvenile macular dystrophy (4%). The most common causative gene was USH2A (31%) followed by MYO7A (10%) and CLRN1 (6%). Individuals in this cohort were affected by 24 distinct syndromic IRD phenotypes, caused by 96 pathogenic variants in 41 different genes. In 29% of the families, genetic analysis led to a revised or modified clinical diagnosis. This cohort is enriched by ethnicity and consanguinity but matches previous reports and expands genotypical and phenotypical characterization of some syndromic retinal dystrophies.

Retinoblastoma outcomes based on the 8th edition American Joint Committee on Cancer pathological classification in 1411 patients

Vempuluru VS, Shields CL, Berry JL, et al.

Ophthalmology 2025;132:317-326

The 8th edition AJCC pathological classification helps to standardize retinoblastoma staging globally, provides guidance for risk assessment and treatment, especially in centers relying on primary enucleation. Previous outcome data lacked consistency due to varied risk definitions and management. A retrospective, multicenter global cohort study analyzed 1411 retinoblastoma patients undergoing primary enucleation, stratified by AJCC 8th pathology categories (pT1–pT4) and adjuvant treatment status, measuring orbital recurrence, metastasis, and tumor-related death at a mean 38-month follow-up. Increasing AJCC pathological category was strongly linked to elevating risk: orbital recurrence (1% pT1, 23% pT4), metastasis (1% pT1, 43% pT4), and death (2% pT1, 59% pT4). Multivariate analysis identified AJCC pT stage and adjuvant therapy as independent prognostic factors; adjuvant therapy significantly reduced these risks, especially for pT3 and pT4 disease. Strengths of this study include a large, global dataset and strong outcome

analysis based on standardized pathology classification. Limitations include retrospective design, variable adjuvant therapy protocols, and potential loss to follow-up in global cohorts. The AJCC 8th edition pathological staging can be used predict outcomes following primary enucleation; This study clarifies how to use staging to best inform decisions for adjuvant therapy in high-risk retinoblastoma categories to reduce recurrence, metastasis, and mortality.

Retinopathy in mucopolysaccharidoses

Noor M, Mehana O, de la Mata G, et al

Ophthalmology 2025;132(4):461-475

Mucopolysaccharidoses (MPS) are a group of heterogeneous group of genetic disorders characterized by lysosomal storage disorder in which glycosaminoglycan accumulation can cause significant progressive ocular complications, including retinopathy and vision loss. The timing, pattern, and variability of retinopathy in MPS remain insufficiently characterized and makes diagnosis and clinical management more difficult. This prospective, longitudinal observational study included 75 MPS patients from a UK tertiary center, employing multimodal retinal imaging (OCT, fundus autofluorescence, widefield photography) and electroretinography to define phenotypic patterns and track retinopathy onset and evolution. Retinopathy was confirmed in 32/75 patients, especially those with MPS I (25/45), and less often in other MPS subtypes. Detection age ranged from 2 to 53 years. Early signs often appeared on advanced imaging and ERG, with nyctalopia as a typical symptom. Phenotypic findings included RPE mottling, macular changes, and atypical autofluorescence patterns. About half of the retinopathy cases had symptomatic night blindness, and ERG often showed rod-cone dysfunction. Strengths include large, well-characterized cohort, prospective design, and detailed multimodal imaging correlation. Limitations include the single-center nature and missing or incomplete advanced imaging/ERG for all cases. Routine, multimodal retinal imaging and electrophysiological testing should be considered in MPS patients to allow for early retinopathy diagnosis, assist in management and identify candidates for emerging therapies.

Investigating the Immunogenic Potential of Variations in Host Cell Protein Levels in Clinical-Grade AAV8 Products

Seitz IP, Rodríguez-Bocanegra E, Bucher K, et al

Invest Ophthalmol Vis Sci 2025;66(6):38

Adeno-associated virus (AAV) formulations for gene therapy contain manufacturing-associated impurities such as residual host cell protein (HCP). This study aimed to study whether high levels of HCP in AAV formulations are associated with increased inflammation. Three lots of clinical-grade AAV8 vectors were analyzed using mass spectrometry and showed up to 40-fold variation in HCP levels. The AAV8 vectors' capacity to induce a cytokine response in primary human plasmacytoid dendritic cells (pDCs) and THP-1 cells were then compared, and did not show a significant difference. To correlate this to in vivo data, the authors reanalyzed results from a prior ocular safety study in nonhuman primates, where the subjects received different concentrations of AAV8 vector subretinal injections. Results showed no difference in clinical signs of uveitis in the different groups, but significantly larger choroidal atrophy lesions on retinal imaging in higher concentration AAV8-treated eyes, suggesting a correlation to a difference in reaction to HCP level. As gene therapy becomes a more common treatment modality, it is important to consider

possible side effects from the AAV8 vehicle, and this study suggests some possible side effects from AAV8's HCP.

Expansion of the ABCA4-Associated Retinopathy Spectrum: Severe Variants Can be Associated With Early-Onset Severe Retinal Dystrophy

Panneman DM, Hitti-Malin RJ, McKibbin M, et al

Invest Ophthalmol Vis Sci 2025;66(6):19

Leber congenital amaurosis (LCA) and early-onset severe retinal dystrophy (EOSRD) are inherited retinal diseases that are characterized by severe visual loss very early in life, with EOSRD thought to be a milder subtype. This study demonstrates the association of ABCA4 mutations in EOSRD. Probands in this study were examined by at least two ophthalmologists to reach a clinical diagnosis. Genetic diagnoses were then established with pathogenic biallelic variants in ABCA4 for each. Whole genome sequencing was performed and identified two NBAS variants in patient 1 and a homozygous hypomorphic missense variant in CNGB3 in patient 3. This study demonstrates that ABCA4 mutations, particularly in combination with other variants causing retinal dystrophy, may lead to severe early onset phenotype seen in EOSRD. ABCA4 variants are well studied for their role in a later-onset phenotype in Stargardt disease, but should be considered in evaluation of EOSRD patients as well.

Novel BEST1 Variant Characterization in a Large French Cohort in Light of Updated Bestrophin-1 Structure-Function Correlation

Bitan J, Poncet AF, Lecigne C, et al

Invest Ophthalmol Vis Sci 2025;66(12):4

BEST1 is involved in inherited macular dystrophies, with a heterogeneity of associated phenotypes and inheritance patterns. BEST1 variants are inherited in both autosomal dominant and recessive manners and are linked to five distinct phenotypes referred to as “bestrophinopathies.” This study aims to update knowledge on bestrophin-1 structure and function with the aim of assessing the pathogenicity of variants reported in the Leiden Open Variation Database (LOVD) and in a large French cohort of bestrophinopathies. All unique variants (488) reported in the BEST1-LOVD database were examined. The authors also described all BEST1 variants identified in 450 patients analyzed at a French hospital between 2008 and 2024: inclusive of 150 different variants, 40 of which were novel. Specific recurrent variants were identified in the French population. All new variants cause changes in chemical interactions within the protein and are associated with clinical pictures of bestrophinopathy. This study comparing two large cohorts highlight variants specific to the French population. The in silico analyses further strengthen likelihood of pathogenicity of identified variants. Results of this study further expand the genotype-phenotype correlation of BEST1 associated dystrophies.

A Phenotypic Study of CRB1 Retinopathy Secondary to the Variant p.(Pro836Thr) Prevalent in Those of Black African Ancestry

Wong WM, Robson AG, Baker RA, et al

Invest Ophthalmol Vis Sci 2025;66(9):3

CRB1 variants have been found to have a high prevalence in inherited retinal disease patients of certain ethnic populations. This study evaluated 14 patients from 11 families with African ancestry

and molecularly confirmed CRB1-associated retinal dystrophy, each possessing at least one p.(Pro836Thr) variant. Clinical phenotype including imaging and ERG were analyzed. All patients showed ERG findings showing both cone and rod dysfunction, with pattern ERG consistent with macular dysfunction. This study further characterizes IRD phenotype in patients with the p.(Pro836Thr) variant of CRB1. Testing of this gene should be considered when evaluating patients with African ancestry.

Dicer Loss in Müller Glia Leads to a Defined Sequence of Pathological Events Beginning With Cone Dysfunction

Larbi D, Rief AM, Kang S, et al

Invest Ophthalmol Vis Sci 2025;66(3):7

The loss of Dicer in Müller glia (MG) results in severe photoreceptor degeneration, as it occurs in retinitis pigmentosa or age-related macular degeneration. This study aims to elucidate a chronological functional and structural characterization of the pathological events in MG-specific Dicer-conditional knockout (cKO) mice in vivo and histologically. Conditional Dicer1 knockout mouse strains were evaluated using OCT, ERG, and histological analyses. Both strains of mice showed impairments of the area spanning from the external limiting membrane to the retinal pigment epithelium, cone photoreceptor dysfunction, and retinal remodeling and functional loss of the inner retina at 1, 3, and 6 months after Dicer loss. Additionally, in one of the strains, rod impairment was found 4 months after Dicer depletion, accompanied by alteration of RPE integrity. These results suggest an important role for MG Dicer in supporting cone health, and that impairment of RPE may accelerate rod degeneration in addition. These findings may help identify Dicer pathway as a future therapeutic target.

Insights Into the FOXE3 Transcriptional Network and Disease Mechanisms From the Investigation of a Regulatory Variant Driving Complex Microphthalmia

Plaisancié J, Angée C, Erjavec E, et al

Invest Ophthalmol Vis Sci 2025;66(11):47

FOXE3 pathogenic variants are associated with a spectrum of ocular anomalies, ranging from congenital cataracts to complex microphthalmia. This study aimed to investigate the regulatory landscape of FOXE3 and its contribution to CM. A patient with CM was found to have heterozygous FOXE3 variants including a trans-acting regulatory variant 3 kb upstream. Mouse models were generated carrying mutations in the regulatory region or a frameshift mutation. Ocular phenotypes showed correlation to genotype, with homozygous frameshift mutation model exhibiting more severe expression consistent with CM, showing early anterior lens epithelium disorganization, triggering progressive lens degeneration and ocular involution. Transcription factor binding studies identified USF2 as a key regulator of FOXE3 expression. This study highlights the critical role of regulatory variants in ocular pathology, which should be evaluated when performing gene testing in patients with IRD.

Genome-Wide Insights Into the Genes and Pathways Shaping Human Foveal Development: Redefining the Genetic Landscape of Foveal Hypoplasia

Hunt C, Yoon HJ, Lirio A, et al

Invest Ophthalmol Vis Sci 2025;66(12):22

This study aims to define the genetic architecture of foveal morphology and explore its relevance to foveal hypoplasia (FH), a hallmark of developmental macular disorders. A genome-wide association study was used to identify candidate genes from UK Biobank participants, which also provided data on foveal pit depth measured by OCT. 126 sentinel variants, including 47 novel associations were found. Integrative mapping prioritized 129 putative causal genes, with 64 not previously implicated in foveal biology. Enriched pathways included retinoic acid metabolism, photoreceptor differentiation, extracellular matrix organization, and pigmentation. Missense variants in ACTN3 and ESYT3 were identified as being associated with FH features. Overlap was observed with monogenic FH genes (TYR, OCA2, PAX6, AHR) and with genes underlying systemic diseases (COL11A1, KIF11, TUBB4B, PHYH). Re-examination of OCTs in affected individuals confirmed FH in select cases. This GWAS study of foveal morphology suggests complex interplay of pathways that govern foveal morphology, and helped identify novel candidate genes that may be associated with FH.

Revisiting the Trans-Ancestry Genetic Correlation of Refractive Error

Clark R, He X, Nguyen TN, et al

Invest Ophthalmol Vis Sci 2025;66(11):60

Trans-ancestry genetic correlation quantifies the similarity in genetic predisposition to a trait or disease between different populations. This study examines the trans-ancestry genetic correlation of refractive error across Europeans, South Asians, East Asians, and Africans. Two methods were applied: (1) trans-ancestry genetic correlation with unbalanced data resources (TAGC-UDR) and (2) trans-ancestry bivariate genomic-relatedness-based restricted maximum-likelihood (TAB-GREML). Both methods were used to study thousands of participants of different ancestries. Results show trans-ancestry genetic correlation of refractive error was in the range 0.7-1.0 for the European versus African, European versus East Asian, and European versus South Asian ancestry pairs. Results from both methods were consistent. This suggests that the genetic susceptibility to refractive error is largely shared across different ethnicities, and that perhaps geographical and environmental factors play a larger role in refractive error development.

Clinical and Molecular Landscape of GLRA2 in X-Linked Early-Onset High Myopia

Li X, Wang S, Wang Y, et al

Invest Ophthalmol Vis Sci 2025;66(4):30

Variants in the GLRA2 gene have been linked to early-onset and nonsyndromic high myopia. This study aims to elucidate clinical and genetic characteristics of GLRA2-associated early-onset high myopia (eoHM). Variants in 17 genes found to contribute to eoHM were evaluated for pathogenic level based on in-silico prediction, associated phenotypes, and cosegregation analysis. Pathogenic and likely pathogenic variants in 7 of 17 genes were identified in 47 of 389 probands with eoHM. For GLRA2, 15 pathogenic variants (10 missense and 5 truncation) were identified in 16 families, showing X-linked inheritance. These patients had a high rate of posterior staphylomas. This study characterized GLRA2-associated eoHM to have X-linked inheritance, with detailed phenotype description. When evaluating patients with eoHM, monogenic causes should be considered, including GLRA2, to establish molecular diagnosis.

Novel Grm6 Variant in a no b-wave (nob) Mouse Model: Phenotype Characterization and Gene Therapy

Lin PH, Kang EY, Makrides N, et al

Invest Ophthalmol Vis Sci 2025;66(12):20

This study uses a no b-wave (nob) mouse model of congenital stationary night blindness (CSNB) caused by a Grm6 variant for phenotype characterization. Further, the authors evaluate the efficacy of gene therapy in restoring visual function. ERG study of these mice show scotopic b waves were absent, whereas a waves remained normal, indicating intact rod function but impaired bipolar cell function. SD-OCT revealed thinning of the retinal nerve fiber layer and outer plexiform layer (OPL) in affected mice. Immunofluorescence and immunoblotting revealed decreased mGluR6 (a postsynaptic protein) levels and associated signaling proteins. Gene therapy in these mice restored mGluR6 expression and reestablished synaptic protein localization in the OPL, although improvements in b/a ratios and OPL thickness were modest. Notably, the hGRM6 promoter at P5 was more effective at restoring OPL. This new nob mouse model for the study of CSNB illustrated likely pathophysiology in CSNB associated with Grm6 variant, and showed that gene therapy can at least restore postsynaptic protein expression level. While functional improvement after gene therapy was limited, this study identifies a therapeutic target that is worthy of further investigation.

Clinical and Biochemical Characterization of Specific GUCY2D Alleles Associated With a Rare Form of Night Blindness

Ba-Abbad R, Peshenko IV, Daich Varela M, et al

Invest Ophthalmol Vis Sci 2025;66(6):22

GUCY2D is associated with a form of stationary night blindness (SNB). Six patients from five families with a history of longstanding night blindness, no fundus features suggestive of retinitis pigmentosa, and an unusual electroretinographic phenotype were the subjects of this study. All participants were confirmed to have biallelic variants in GUCY2D. Clinical characteristics showed that the visual acuity was normal or moderately reduced (20/20-20/60) with three patients having a tritan defect on color vision testing. Retinal imaging showed central macular hypopigmentation with temporal vascular attenuation. Rod photoreceptor-mediated electroretinogram (ERG) components were undetectable or severely reduced in all but one case, and cone-mediated responses were variable. A high degree of ERG stability was demonstrated in three cases. While biallelic pathogenic variants in GUCY2D are usually associated with Leber's congenital amaurosis, this study illustrates the phenotypic variability of GUCY2D retinopathies, with characterization of a unique form of SNB. This again illustrates the variability of phenotype in IRDs and shows the importance of molecular diagnosis.

Clinical Spectrum and Molecular Characteristics of Inherited Ocular Diseases in a Cohort of Pediatric Patients With Infantile Nystagmus Syndrome

Gong X, Boydston IP, Lawhon WT, et al

Invest Ophthalmol Vis Sci 2025;66(4):39

Infantile nystagmus syndrome (INS) is the most prevalent form of nystagmus in children. This study aims to characterize the clinical and genetic landscape of inherited ocular diseases (IODs) in children with INS. In this retrospective study, clinical and genetic data from 205 unrelated

pediatric patients with INS enrolled in an IRB-approved nystagmus registry were evaluated. All underwent next-generation sequencing with targeted gene panels to detect pathogenic variants. The most common INS-associated IODs included albinism, Leber congenital amaurosis, and achromatopsia. Genetic testing achieved a definitive diagnosis in 85 of 205 patients, yielding a molecular diagnostic rate of 41.5%. A total of 83 pathogenic and likely pathogenic variants were identified across 30 genes. The seven most frequently disease-causing genes-TYR, CNGB3, RPGR, GPR143, ABCA4, OCA2 and FRMD7, these accounted for 65% of the genetically solved cases. This study highlights the role of genetic testing using gene panels to achieve molecular diagnosis in children with INS, which has important implications as gene therapy becomes more widely available in the future.

Iris Pigmented Lesions: Unraveling the Genetic Basis of Iris Freckles and Nevus

Boldu-Roig J, Sorli-Clemente E, Kuljuh-Causevic et al.

Invest Ophthalmol Vis Sci 2025;66(4):62

Iris pigmented lesions, both freckles and nevi, are a common finding. This study investigates the diversity of pigmented benign lesions in the human iris and their genetic basis. A cohort of 1014 individuals of Spanish descent was analyzed using digital slit-lamp photographs for iris pigmentation traits. A candidate gene association study was performed on these pigmentation traits. SNP genotyping identified a positive significant association between the presence of iris freckles and variants in the IRF4, HERC2, and OCA2 genes, as well as SLC45A2, although only in females. The prevalence of iris nevi was significantly lower compared to freckles. The presence of iris nevi also showed positive associations with genetic variants in IRF4 and HERC2, as well as TYR in brown-eyed individuals only. No association was identified between MC1R, the major cutaneous freckle gene, and the presence of iris freckles or nevi. This study found association between iris pigmented lesions and several pigmentation genes, though interestingly, a common cutaneous freckle gene was not found to have an association. This study provides further understanding of iris pigmentation. The identified genes associated with freckles and nevi may be useful in future studies of uveal melanoma.

Corneal Biomechanics Are Associated With FBN1 Mutations in Patients With Marfan Syndrome and Ectopia Lentis

Huo QY, Zhang RZ, Jia WN, et al

Invest Ophthalmol Vis Sci 2025;66(3):23

Patients with Marfan Syndrome (MFS) have shown significant alterations in corneal biometry. This study investigated the corneal biomechanical properties and their genotype-phenotype correlations in patients with (MFS) and ectopia lentis (EL). Patients with MFS with EL underwent panel-based next-generation sequencing in this retrospective cohort study. The FBN1 genotypes were categorized into the dominant-negative (DN) group and the haploinsufficiency (HI) group. The DN variants were further subclassified based on the affected residues and their locations. Corneal biomechanical parameters were measured using dynamic Scheimpflug-based biomechanical analysis. Patients with HI and DN variants affecting critical residues exhibited significantly higher deformation amplitude ratios and lower stress-strain index values compared with those in the DN (others) group, indicating lower corneal stiffness in the former group. Variants in different regions were associated with different corneal biomechanical characteristics. This study

illustrates that FBN1 variant genotype can impact corneal biomechanical properties, which is a novel area of study in the ocular findings of MFS patients.

Quantitative Choroidal Analysis of Molecularly Characterized Retinitis Pigmentosa

Stephenson KAJ, Tse T, Hwang J, et al

Invest Ophthalmol Vis Sci 2025;66(9):11

Retinitis pigmentosa (RP) is a genetically diverse group of disease characterized by progressive retinal degeneration. While retinal phenotypes have been described in detail, little is known about choroidal characteristics in these patients. This study provides quantitative choroidal evaluation in 65 molecularly characterized RP. Patients with genetically confirmed RP were evaluated using OCT to assess choroidal thickness (CT), choroidal area (CA), and choroidal volume (CV). The choroidal vascularity index (CVI) was also calculated. Comparisons were made between X-linked (RPGR), autosomal-recessive (USH2A), and autosomal-dominant (RHO, PRPF31) genotypes. Results show that CT was thinner in RP patients than controls. A thinner choroid was associated with older age and worse BCVA but not spherical equivalent. No statistically significant differences were found for choroidal measures between groups. Leptochoroid ($\leq 100 \mu\text{m}$) was associated with advanced age and worse BCVA, but not greater myopia. Greater CVI was associated with better BCVA and no other parameters. This study provides important information on the characteristics of choroid tissue in patients with RP. CT changes in RP are not explained solely by age-related choroidal thinning, and may be associated to disease severity.

EFEMP1-Mediated Regulation of Choroidal Vascular Dysfunction in Myopia: Insights Into the FOXO3/VEGFA Pathway as a Therapeutic Target

Shi WQ, Li B, Shao Y, et al

Invest Ophthalmol Vis Sci 2025;66(3):43

EFEMP1 was previously identified as a key regulatory factor in the remodeling of the scleral extracellular matrix, with increased expression in the tears of myopic individuals. In this study, the authors investigate the role of EFEMP1 in choroidal vascular dysfunction and its implications for myopia progression. An adeno-associated virus (AAV) was used to overexpress and knock down EFEMP1 in the choroid of guinea pigs. Proteomic analyses were then conducted on the choroidal tissue. Silencing EFEMP1 significantly reduced choroidal vascular dysfunction and slowed the progression of myopia. Proteomic analysis demonstrated that EFEMP1 regulates FOXO3 activity, resulting in increased VEGFA expression in RF/6A cells and promoting angiogenesis. Conversely, knockdown of FOXO3 led to decreased VEGFA levels. These studies in the animal model suggest that EFEMP1 play an important role in myopia development and progression through the FOXO3 pathway. This study further elucidates the pathophysiology of myopia, and provides potential therapeutic targets.

Establishing Preclinical Quantitative Parameters for Future Assessment of Corneal and Retinal Therapeutics for Aniridia

Kaad SG, Korecki AJ, Simpson EM

Invest Ophthalmol Vis Sci 2025;66(9):60

Aniridia is a rare congenital-blinding disorder caused by pathogenic variants in PAX6. This study of the mouse model of aniridia aims to provide quantitative data sufficient to provide preclinical testing of therapeutic approaches. B6129F1-Sey mouse model of aniridia were used for histological study of the peripheral thickness of the cornea, retina, and their sublayers, as compared to wildtype mice. Results show significant thinning of the total cornea and the corneal epithelium. However, the corneal stromal-endothelial layer thickness was unaffected by Sey. There is significant thinning of the total retina, ganglion cell layer (GCL), inner nuclear layer (INL), and outer nuclear layer (ONL) sublayers. Using the data generated, the authors calculated the number of mice needed to demonstrate a full or partial correction of the Sey aniridic phenotype. For example, at 80% power a 50% effect will require: for the epithelium, 21 Wt and 21 Sey mice; total cornea, 58 Wt and 58 Sey mice; and total retina, 28 Wt and 28 Sey mice. This study provides important baseline characteristics of an aniridia mouse model histologic database, and provides power calculation for future therapeutic testing.

RHO-Associated Retinitis Pigmentosa: Genetics, Phenotype, Natural History, Functional Assays, and Animal Model - In Preparation for Clinical Trials

Daich Varela M, Romo-Aguas JC, Guarascio R, et al

Invest Ophthalmol Vis Sci 2025;66(9):69

This study characterizes the largest cohort of RHO-associated retinitis pigmentosa (RP) to date, providing genotype-phenotype correlations. 200 patients from 140 families with likely disease-causing variants in RHO were identified. Generalized RP was diagnosed in 64%, sector RP in 34.5%, and 1.5% were asymptomatic carriers. A total of 56 variants were identified, with the majority classified as class 2. Variants in class 1 were associated with earlier symptom onset, generalized RP, and the worst baseline visual acuity. Pro347Leu was the most prevalent variant (17%). Longitudinal analysis showed slower progression in sector RP compared to generalized RP. Imaging revealed distinct phenotypes, including choroideremia-like features in generalized RP and inferior retinal involvement in sector RP. This study provides detailed descriptions of genotypes and phenotypes in a large cohort of RHO-associated RP patients. These findings provide important insights for patient counseling and guiding future potential therapeutics.

Determination of the Population Frequency of Monoallelic and Biallelic Predicted Pathogenic RPE65 Variants in a Normal Database

Abdul R, Liu X, Choi K, et al.

Invest Ophthalmol Vis Sci 2025;66(11):73

RPE65-associated retinopathies include biallelic Leber congenital amaurosis 2 and severe early childhood-onset RP, and monoallelic RP with choroidal involvement. The population frequencies of these diseases have previously been estimated from epidemiological studies. This study uses bioinformatic analyses of carrier variants in a normal cohort to calculate the rate of heterozygous mutation. RPE65 variants were downloaded from gnomAD database. The population frequency

of heterozygous predicted pathogenic variants was calculated from the numbers of pathogenic structural and copy number variants, null variants, rare missense changes classified disease-causing computationally, and from founder variants not already included. The computed population frequency was 1 in 408, similar ClinVar's report of 1 in 415. A possible founder variant was found in the Amish population. Variants were most common in Admixed American and African American, and least common in Middle Eastern and Ashkenazi people. This study's strength is in its bioinformatics computations to estimate disease variant in a large normal population and its evaluation of data of multiple ethnicities. This is a useful tool in estimating prevalence of pathogenic variants that can be applied broadly to other genetic disease.

Detailed Clinical, Ophthalmic, and Genetic Characterization of MYO7A-Associated Usher Syndrome

Romo-Aguas JC, de Guimarães TAC, Kalitzeos A, et al

Invest Ophthalmol Vis Sci 2025;66(4):60

This is a retrospective study aimed to analyze the clinical spectrum and natural history of MYO7A-associated Usher syndrome type I (USH1). A cohort of 80 patients were included in this study. The mean age of onset of symptoms was 12.0 ± 5.8 years of age. BCVA was 0.4 ± 0.5 LogMAR at baseline, and 0.7 ± 0.8 LogMAR at the last visit for both eyes. The change in BCVA over time was 0.02 LogMAR per year. A hyperautofluorescent ring was present in 51% of the patients. The mean ellipsoid zone width decreased bilaterally over time. Electrophysiology revealed rod and cone dysfunction with relative or complete sparing of macular function. Genetic analysis identified 83 variants in MYO7A, including 18 novel variants. This study of a large MYO7A-Associated USH1 patients characterized clinical findings and changes over mean follow up of 16 years, and showed that majority of patients retain central visual function and structure until the fifth decade of life. It provides important information for counseling these patients of the prognosis.

An Ocular Gene-Set Expression Library for Heritability Partition and Cell Line Enrichment Analyses

Hysi PG, Hammond CJ

Invest Ophthalmol Vis Sci 2025;66(3):11

This study aimed to create and make available an expression library platform that can be used with popular and versatile tools such as the linkage disequilibrium score regression techniques to identify specific cell lines enriched in ocular diseases. The authors used transcriptome information from six publicly available single-cell and single-nucleus RNA sequence datasets to obtain matrices of normalized gene expression and estimated enrichment of the 10% most expressed transcripts in each cell line. They then used simulated GWAS datasets and LDSC regression analyses to study the enrichment in different eye diseases. Gene expression databases for over 197 ocular cell lines were generated. Cell line-specific analyses were performed with published GWAS. The refractive error GWAS found association with cone, rod, and peripheral Müller cells. For POAG, the cell lines included juxtacanalicular (cribriform) cells, stromal keratocytes, and Beam A cells in the trabecular meshwork. For AMD, the cell lines included RPE and Müller cells. This study provides a structured ocular transcriptomics library to estimate cell line enrichment among association signals from GWAS studies. The identified cell lines in different diseases

suggest the pathophysiology of each disease, and provides a platform for future research for these common eye diseases.

My child can't see-workup and management of children with low vision: a joint workshop of the AAPOS Low Vision Rehabilitation and Genetic Eye Diseases Committees

Ditta L, Utz VM, Chandna A, et al

J AAPOS 2025;29(3):104229

Children with low vision often present diagnostic, work up, and management challenges as there is a big range of differential diagnoses that vary by age and clinical presentation. This article provides a practical framework for approaching children who present with decreased vision at different ages. The discussions on diagnostic work up includes recommendations on genetic testing, including which patients are appropriate for referral for genetic testing, how to order testing, and the utility of genetic testing in guiding prognostication and management. Additionally, this paper offers a multidisciplinary approach that is helpful in treating children with low vision.

Myopia progression in children with Stickler syndrome: a longitudinal cohort study

Nixon N, Cheng KH, Richards A, et al.

J AAPOS 2025;29(3):104206

Stickler syndrome is associated with congenital myopia, and represents the most common cause of rhegmatogenous retinal detachment in children. The purpose of this retrospective study was to determine the rate of myopia progression in a cohort of 40 children (75 eyes) with type 1 Stickler syndrome (COL2A1 mutation) and 5 children (10 eyes) with type 2 Stickler syndrome (COL11A1 mutation). In this cohort, the median rate of progression was -0.08 D per year over a mean follow up period of 6 years for those with type 1 Stickler syndrome, and -0.12 D per year over a mean follow up period of 5 years for those with type 2 Stickler syndrome. These results show that there is minimal progression in myopia for children with Stickler syndrome, indicating that it is a different clinical entity than developmental myopia. This paper provides helpful guidance on the expected progression of myopia in children with Stickler syndrome.

Safety and Vision Outcomes Following Gene Therapy for Bietti Crystalline Dystrophy: A Nonrandomized Clinical Trial

Chen X, Liu X, Cui S, et al

JAMA Ophthalmol 2025;143(2):126-133

Bietti crystalline dystrophy (BCD) is a severe genetic retinopathy caused by variants in the CYP4V2 gene. This study aims to evaluate safety and vision outcomes following gene therapy with adeno-associated virus (AAV) encoding CYP4V2. This is an open-label, dose-escalation nonrandomized clinical trial conducted at 2 study sites in China. Patients with genetically confirmed biallelic disease-linked CYP4V2 variants received subretinal injections of rAAV2-hCYP4V2 at 1 of 2 dosage levels and were followed up for 12 months. 12 patients were enrolled, 6 patients in each dose group. No severe adverse events related to the treatment were observed. Mild intraocular inflammation was noted in 1 participant. The median (IQR) baseline BCVA letter score for the study eye was equivalent to 20/200 Snellen, while the nonstudy eye had a median BCVA equivalent to approximately 20/63 Snellen. At 12 months, the study eye improved to a media BCVA for the study eye of 20/80 Snellen equivalent, and was 20/50 Snellen equivalent for

the nonstudy eye. This study showed no significant safety concern for BCD gene therapy, and showed mild improvement in vision in the treatment eye, though the improvement seen in the nonstudy eye suggest possible learning effect. Nevertheless, this safety profile is promising for future studies in gene therapy as a treatment for BCD.

Founder Homozygous Nonsense CREB3 Variant and Variable-Onset Retinal Degeneration

Salameh M, Abu Tair G, Mousa S, et al

JAMA Ophthalmol 2025;143(8):692-701

This study evaluates the association of a homozygous nonsense variant in CREB3 with IRDs. a founder homozygous nonsense variant in CREB3 was found in 13 patients from 4 unrelated families. All patients had a clinical diagnosis of retinitis pigmentosa or cone-rod degeneration, and presented with 2 main phenotypes, rod-cone and cone-rod dystrophies, demonstrating variable electrophysiological and fundoscopic findings. Expression analysis was performed on patient-derived skin fibroblasts using rt-PCR and Western blot analysis, which showed a truncated CREB3 protein. Immunohistochemistry staining on wild-type mouse retinal sections using an anti-CREB3 antibody revealed CREB3 expression in various retinal cell types, indicating its role in photoreceptor function. This study found an association between CREB3 and IRDs. Future studies of other pathogenic variants of CREB3 will help further elucidate this gene's role in IRDs.

Five-Year Outcomes of Lenadogene Nolparvovec Gene Therapy in Leber Hereditary Optic Neuropathy

Yu-Wai-Man P, Newman NJ, Biousse V, et al

JAMA Ophthalmol 2025;143(2):99-108

This is the 5 year follow up of lenadogene nolparvovec gene therapy in patients with LHON due to the MT-ND4 variant. In the initial clinical trials, patients with LHON due to the MT-ND4 gene variant received lenadogene nolparvovec in 1 eye and a sham injection in the other eye in the RESCUE/REVERSE studies. A total of 76 patients completed these studies, and 55 patients completed the 5-year follow-up. Participants were mostly male (79%) with a mean age of 35.9 years at treatment. At baseline, the mean BCVA was 20/600 Snellen in eyes to be treated with lenadogene nolparvovec and 20/500 in sham eyes. At the end of the RESCUE/REVERSE trials, ie, 2 years after treatment, eyes treated with lenadogene nolparvovec and eyes treated with sham reached a mean BCVA value of 20/500. Five years after treatment, the bilateral improvement from nadir was similar to that observed at 2 years, with a mean change in BCVA of more than +4 lines for eyes treated with lenadogene nolparvovec and +4 lines for eyes treated with sham. An improvement of at least +3 lines from the nadir in at least 1 eye was observed in 66.1% of participants. Between 2 and 5 years, intraocular inflammation was noted in 4 participants with 8 events in eyes treated with lenadogene nolparvovec and 1 event in an eye treated with sham. In this analysis of the follow up trial, lenadogene nolparvovec gene therapy demonstrated a sustained bilateral improvement in BCVA and a good safety profile up to 5 years after treatment. While the data on BCVA improvement is flawed, given the improvement is compared to previous nadir rather than baseline BCVA, the excellent safety profile is encouraging for future gene therapy studies.

Detection and Characterization of RB1 Mosaicism in Patients With Retinoblastoma Receiving cfDNA Test

Gao C, Patel J, Robbins M, et al

JAMA Ophthalmol 2025;143(7):562-568

Plasma cell-free DNA (cfDNA) testing is increasingly used for disease diagnosis and monitoring in retinoblastoma, with RB1 allele fraction in cfDNA actively corresponding to disease status and treatment response. However, while RB1 mosaicism has been reported in retinoblastoma, its clinical implications and potential impact on cfDNA testing remain unclear. This study aims to identify RB1 mosaicism using paired plasma and buffy coat (containing lymphocytes, monocytes, granulocytes, and platelets) DNA testing, and to characterize the implications of RB1 mosaicism on cfDNA testing outcomes. A total of 136 participants with retinoblastoma underwent testing with MSK-ACCESS (Memorial Sloan Kettering-Analysis of Circulating cfDNA to Examine Somatic Status), a clinical assay that combines plasma cfDNA and buffy coat genomic DNA sequencing. RB1 mosaicism was identified in buffy coat DNA from 20 patients (14.7%), with consistent results detected in all 11 participants tested concurrently by the MSK-IMPACT (Memorial Sloan Kettering-Integrated Mutation Profiling of Actionable Cancer Targets) germline assay. Four participants with RB1 mosaicism previously tested negative for germline RB1 variants. Compared with heterozygous participants, participants with RB1 mosaicism had a lower risk of developing bilateral disease (91.7% vs 55.0%, respectively). In cfDNA, the mosaicism variant was detected both before and after treatment, with variant allele fraction initially decreasing after treatment but then stabilizing at levels consistent with mosaicism, despite the absence of clinical disease. Accurate detection and quantification of RB1 mosaicism are crucial. RB1 mosaicism should be considered when RB1 variants persist in cfDNA after treatment without evidence of disease, to avoid false positives that lead to overtreatment. Identifying RB1 mosaicism may improve patient counseling, inform treatment decisions, and enhance surveillance efforts.

Genome-wide and rare variant association studies of amblyopia in the All of Us Research Program

Lee KA, Aboobakar IF, Jain A, et al.

Ophthalmology 2025;132(7):758-766

Amblyopia is characterized by decreased visual acuity due to abnormal visual experience during development in childhood, affecting approximately 3% of the population, and is associated with abnormal visual cortical development and variable response to therapy. This case-control genetic analysis leveraged the All of Us Research Program, examining 764 adult amblyopia cases versus 122,305 controls of European ancestry with whole genome sequencing, performing genome-wide association (GWAS) and rare variant association study (RVAS). GWAS identified four loci approaching significance, each as eQTLs for neurodevelopmental genes. RVAS revealed 15 genes (including DCP1B, NEU1, CACNB2) with significant rare variant burden in amblyopia, implicating neurodevelopmental pathways rather than models limited to visual deprivation. These findings suggest amblyopia susceptibility reflects an interaction between genetic neurodevelopmental factors and abnormal visual experience, explaining individual variability in disease risk and treatment outcome. Strengths of this study are the large, diverse genetic population and incorporation of both common and rare variants. Limitations include the analysis restricted to European ancestry and only adult patients. Identification of neurodevelopmentally

relevant genetic risk factors in amblyopia points to the interaction of underlying neurodevelopmental abnormalities with abnormal visual experiences. This may help to determine differences in treatment options therefore personalize screening and potentially new treatment approaches.

Clinical stage of retinoblastoma based on presenting signs of 4578 patients from 121 countries
Yanagihara RT, Takayasu JSK, et al.

Ophthalmology 2025;132(9):1045-1053

Retinoblastoma is the most common intraocular malignancy in childhood where presenting clinical signs correlate with disease stage and curability, and global disparities affect early detection and patient outcomes. This large, cross-sectional study analyzed clinical and staging data from 4578 treatment-naïve children recruited from 121 countries and 259 referral centers, examined the association between presenting clinical signs (frequency, distribution, and prognostic importance) and presenting stage of retinoblastoma. Patients with orbital mass or cellulitis presented at later, less curable stages than those with leukocoria or strabismus. Most presenting signs (except orbital mass) occurred predominantly in children with potentially curable disease (IRSS 0-II). Leukocoria was the commonest sign worldwide; strabismus was second in high-income countries and orbital mass second in low-income settings. The proportion of curable disease was highest with strabismus (95%), leukocoria (90%), and lowest with orbital mass (34%). Strengths include one of the largest most geographically and demographically diverse sample sizes, and use of standardized staging and sign classification. Limitations include cross-sectional and retrospective design and possible referral/information bias. Any child presenting with unexplained ocular signs such as orbital cellulitis, persistent red eye, hyphema, orbital mass or iris/anterior chamber changes should undergo prompt ophthalmic evaluation for retinoblastoma, facilitating early diagnosis and improving survival.

Glaucoma

Initial Results of the Paul Ahmed Comparison (PAC) Study in Refractory Childhood Glaucoma
Elhusseiny AM, Khaled OM, Chauhan MZ, et al.

Am J Ophthalmol 2025;271:71-78

Head to head evaluation of Paul glaucoma implant and Ahmed. randomized, two-center trial compared PGI vs AGV in children ≤ 18 years with refractory glaucoma scheduled for GDD surgery. Forty-four eyes (PGI $n=25$; AGV $n=19$) completed 1-year follow-up. Primary outcome was intraocular pressure (IOP) reduction; secondary outcomes included medication burden, composite success (IOP 6–21 mmHg with ≤ 3 drops, no reoperation, no vision-threatening events or progression), and complications. At 12 months, mean IOP and medications were similar (PGI 14.9 ± 4.1 mmHg vs AGV 15.5 ± 3.5 ; $P=.6$; meds 1.1 ± 1.0 vs 1.6 ± 1.03 ; $P=.1$), and noninferiority for IOP change was met (upper 95% CI difference 1.81 mmHg < 2.5 -mmHg margin). Success rates were comparable (PGI 80% vs AGV 73.6%; $P=.2$). Early (1-month) IOP favored AGV (9.05 vs 14.6 mmHg; $P=.003$), likely reflecting the PGI ripcord, but differences disappeared by 3–12 months. Complications were similar (3 eyes each); hypotony occurred in 1 PGI vs 2 AGV, and one AGV case developed endophthalmitis; PGI had isolated tube extrusion/exposure managed surgically. Strengths include randomized design, prespecified outcomes, and pragmatic techniques; limitations include small sample, heterogeneous etiologies, interim 1-year horizon, exclusion of two early AGV losses, and reliance on rebound tonometry. Takeaway: PGI and AGV yield equivalent 1-year IOP control, medication reduction, success, and safety in pediatric refractory glaucoma; AGV may lower IOP faster early, whereas PGI's ripcord strategy may temper hypotony risk. For pediatric ophthalmology, both devices are reasonable choices; device selection can be individualized (e.g., hypotony risk, surgeon familiarity, anatomy), while longer-term results may clarify durability and guide device preference.

Anterior segment structure after angle-based surgery in childhood glaucoma: descriptive findings using overhead-mounted optical coherence tomography

Wang B, Saleem Z, Sigireddi RR, et al

J AAPOS 2025;29(4):104265

To understand post-operative changes after angle surgery, this study aimed to evaluate post-surgical angle structures in children with primary congenital glaucoma, glaucoma following cataract surgery, and or juvenile open angle glaucoma using overhead-mounted anterior segment

optical coherence tomography (AS-OCT). Children aged 0-12 years of age who underwent clinically indicated exam under anesthesia were prospectively enrolled and images of the nasal and temporal angle were examined. Of 28 eyes (17 children) enrolled, the following structures were identified: cleft after angle surgery (89%), residual trabecular meshwork (57%), open collector channels (89%), peripheral anterior synechiae (0%), and open angle (100%). Limitations include small sample size, lack of pre-operative angle images for comparison, only nasal and temporal images can be obtained, and possible selection bias for children with uncontrolled IOP requiring an exam under anesthesia. This study demonstrates the potential value of angle images in understanding the effects of angle surgery to help improve treatment and outcomes.

Long-term outcomes of Ahmed ClearPath in childhood glaucoma: four-year results

Elhusseiny AM, Sayed MS, Khodeiry MM, et al.

J AAPOS 2025;29(2):104172

The Ahmed Clear Path (ACP) is a recently introduced non-valved glaucoma drainage device. Its small size (250mm²) and flexible material make it ideal for working with small orbits and buphthalmic eyes. Authors performed a retrospective chart review across multiple centers of all patients <18 years old who underwent ACP placement and had at least four year follow up. They evaluated for reduction in IOP, reduction in glaucoma medications, and major complications. Success was defined as IOP between 6-21mmHg with or without glaucoma medications, no further need for glaucoma surgery, and no vision-threatening complications. Of 19 eyes included, success rate was 90% at 1 year and 79% at 4 years. Median number of glaucoma medications decreased from 2.5 pre-operatively to 1 after 4 years. No serious complications occurred. Though study is limited by the small size, this is the largest study evaluating outcomes of non-valved drainage devices in children. Based on this data, the ACP has a favorable success rate with low risk of complication and is a good surgical option for management of pediatric glaucoma.

Outcomes of Circumferential Versus Hemi-gonioscopy-Assisted Transluminal Trabeculotomy for Congenital Glaucoma

Gupta S, Panigrahi A, R A, et al

Am J Ophthalmol 2025;271:149-155

Comparison of 360 GATT vs 180 GATT. Prospective randomized trial compared circumferential (360-GATT) versus hemi-GATT (180-GATT) in PCG eyes with clear corneas and CD <14 mm. Fifty-two eyes (360-GATT n=22; 180-GATT n=30) were followed ≥12 months (median ~22.5 months). The primary endpoint was IOP reduction; secondary endpoints included medication use, need for re-operation, success (absolute: IOP ≤18 mmHg [A] or ≤15 mmHg [B] without meds; qualified: with meds), and complications. Results: IOP fell 49% with 360-GATT versus 20.5% with 180-GATT, with significantly lower final IOP in the 360-GATT group (P= .0003). Kaplan–Meier analyses showed superior absolute success for 360-GATT at 1 year for both criterion A and B (e.g., A: 91% vs 67%, P= .009; B: 91% vs 67%, P= .002). Structural reversal favored 360-GATT:

VCDR, corneal diameter, and axial length improved significantly only in the 360-GATT cohort. More 180-GATT eyes needed medications (10 vs 2) or re-surgery (8 vs 2) by 12 months (trend $P = .06$). Safety was similar: transient microhyphema predominated and resolved; one localized iridodialysis occurred with 360-GATT; no severe, enduring adverse events were reported. Strengths include randomized design, prespecified success criteria, and multimodal functional-structural outcomes; limitations include single-center setting, modest sample size, short horizon (~2 years), and enrollment of less-severe PCG. Take-home: circumferential GATT provides superior pressure lowering, higher medication-free success, and favorable ocular growth/optic disc metrics versus hemi-GATT. In pediatric ophthalmology, these data support 360-degree ab-interno trabeculotomy as the preferred primary angle procedure for non-severe PCG, with expectations of fewer meds, fewer re-operations, and better anatomic recovery.

Treatment Patterns of Childhood Glaucoma in the United States: Analysis of IRIS® Registry (Intelligent Research in Sight)

Fujita A, Vu DM, Aziz K, et al

Am J Ophthalmol 2025;271:210-221

Childhood glaucoma is rare but vision-threatening, and management varies because high-quality pediatric trials are scarce and disease phenotypes are heterogeneous. U.S. registry-based cohort (IRIS Registry, 2013–2020) examined real-world treatment patterns and drivers of surgery in patients <18 years. In 5,017 eyes (3,069 patients)—4.1% primary congenital glaucoma (PCG), 38.1% juvenile open-angle glaucoma (JOAG), 19.9% glaucoma following cataract surgery (GFCS), and 32.8% other secondary glaucomas—16.1% underwent a glaucoma-related procedure while 93.6% received IOP-lowering drops (most commonly β -blockers, then topical CAs and prostaglandin analogs, with PGAs/ α -agonists used more in older children). First-recorded procedure patterns differed by age and diagnosis: angle surgery predominated in PCG; tube shunts in GFCS and other secondary glaucomas; and laser trabeculoplasty (LTP) in JOAG, largely performed by non-glaucoma, non-pediatric ophthalmologists. Cox modeling showed higher hazards of incisional surgery with PCG vs JOAG (HR 5.40), higher baseline IOP (HR 1.06 per mmHg), and age <1 year at index (HR 6.08), whereas care by a nonglaucoma subspecialist was linked to lower surgical likelihood (HR 0.32). Strengths include the large, nationwide, real-world dataset and multivariable modeling; limitations include reliance on billing codes, underrepresentation of academic centers (potentially undercapturing infant PCG surgeries), missing severity metrics, and procedures done outside the registry. This study teaches that U.S. pediatric glaucoma care leans heavily on medications, with procedure choice shaped by phenotype, age, and provider training. For pediatric ophthalmology, the findings support early referral of infants/PCG to subspecialists, caution against routine LTP in JOAG without clear

benefit, and underscore the need for accessible, standardized guidelines to harmonize care and optimize surgical selection across practice settings.

Outcomes of Preserflo MicroShunt Implantation in Refractory Childhood Glaucoma Following Ahmed Glaucoma Valve Surgery

García-Bardera J, Garcia-Feijoo J, Morales-Fernández L, et al
Ophthalmol Glaucoma Published online May 2, 2025

Preservlo MicroShunt (PMS) is a subconjunctival bleb-forming device which is designed to be implanted ab externo and has small flanged wings that help to stabilize its position within the scleral tract. Previous studies of this device have primarily focused on an adult population, thus this study aimed to evaluate outcomes of PMS implantation+MMC in patients with refractory childhood glaucoma with history of previous Ahmed glaucoma valve. This retrospective cohort evaluated 23 eyes of 22 patients who received PMS+ MMC 0.04% placed for 2.5 minutes; surgeries were done by a single surgeon from 2015 to 2024 at an institution in Spain. Patients had a mix of PCG, SWS-associated glaucoma, NF, microphthalmos, and uveitis associated glaucoma, all of whom had previous glaucoma surgeries (Mean 4.6, median 2 surgeries/eye). One year after surgery, IOP was reduced by a mean of 12.5mmHg from baseline of 27mmHg and number of medications needed was reduced by 2.8. There continued to be a high success rate at 2 years post op with 72.7% maintaining IOP reduction >20% (45.5% with no medication, 27.2% with the help of medication), 63.6% maintaining >30% IOP reduction. There was one case of shunt extrusion in the follow up period. The surgical outcomes of this technique are encouraging, particularly for patients who have had previous surgical intervention with recurrence of poor IOP control. Unfortunately, the PMS is not yet available in the United States, so cannot be generalized to our practice yet, but continues studies in Europe with larger cohorts will be helpful to understand the possible future utility of this tool.

Two-Site Trabeculotomy vs Gonioscopy-Assisted Transluminal Trabeculotomy in the Treatment of Primary Congenital Glaucoma: A Randomized Prospective Study

Aboulhassan RM, ElSayed YM, Esmael A, et al.

Ophthalmol Glaucoma Published online May 8, 2025

This prospective interventional randomized study aimed to compare surgical success of two site traditional ab-externo trabeculotomy with rigid probe versus GATT using 5-0 polypropylene suture in the treatment of PCG in children <5yo who required incisional angle surgery in the setting a clear cornea. Seventy-seven eyes of 60 patients were randomized to treatment with trabeculotomy or GATT and had to have at least 6 months of follow up unless additional glaucoma surgery was needed. Both treatment groups significantly lowered IOP and the number of IOP lowering medications required, showed decrease in cup-to-disc ratio from baseline, and had similar complications (most commonly hyphema). In addition, pre and post operative AS-OCT was collected showing that most patients had abnormal anterior iris root insertion as well as higher incidence of membrane or abnormal tissue occluding the angle. Both procedures had high rates of success (RPT 100%, GATT 95%) which was not statistically different. This study is the first known prospective comparison of these two procedures and is strengthened by a paired eye design. The main limitation of this study is the short period of follow-up. Longer term follow-up would be helpful in elucidating any propensity to late failures in these groups.

Gonioscopy-Assisted Transluminal Trabeculotomy for Myocilin-Associated Juvenile Open-Angle Glaucoma: A Case Series of 8 Eyes Over 2.2 to 4.1 Years

Boese EA, Alward WLM, Fingert JH

Ophthalmol Glaucoma Published online April 4, 2025

Myocillin-related JOAG is known to have pathology primarily localized to the trabecular meshwork due to the effect of abnormal myocilin on the apoptosis of trabecular meshwork cells and decrease in aqueous humor outflow. This localized anatomical variation suggests that patients with MYOC-associated JOAG particularly good candidates for angle-based surgery. Based on this hypothesis, a retrospective case series of 4 patients <18yo with known MYOC-associated JOAG who underwent GATT in both eyes, separated by about 1 month as a primary surgery in the setting of poorly controlled IOP despite maximal therapy was completed. After >2.5 years of follow up for all subjects, IOP has remained well-controlled in both eyes with no significant progression from their baseline optic nerve parameters or visual fields and maintaining 20/20 vision. Of note, all four patients experienced IOP spikes between 1-7 weeks in the post operative period and were temporarily placed back on glaucoma medications which were ultimately weaned. The small number of patients in this case series potentially limits generalizability to other populations including older adults with JOAG, but the conversation regarding MYOC driving abnormal trabecular meshwork that can be addressed in a targeted manner is supportive of the continued development of genetic understanding of the diseases which we treat.

Outcomes of Gonioscopy-Assisted Transluminal Trabeculotomy in Children with Early-Onset Glaucoma Secondary to Sturge-Weber Syndrome

Aktas Z, El Sayed Y, Ucgul AY, et al.

Ophthalmol Glaucoma 2025;8(4):407-413

Early onset glaucoma in patients with SWS is often particularly aggressive, frequently requiring surgical intervention to manage due to underlying angle structure abnormalities. Previous studies have reported higher success rates with circumferential ab externo trabeculotomy compared to standard rigid metal trabeculotomy, presumably secondary to larger area of treated angle. Given that GATT also provides circumferential treatment of the angle, this retrospective study was aimed at evaluating preliminary outcomes of GATT with 5-0 or 6-0 prolene suture performed for children with early onset glaucoma. 22 eyes of 16 patients with mean age 33.6 months and mean follow up of 16.3 months were treated, 37.5% of whom had bilateral glaucoma. There was significant reduction in IOP from average baseline 25.4mmHg to post op 15.7mmHg with associated reduction in CDR, and qualified success rate of 81.8% (although total success requiring no medications was markedly lower at 45.4%). Four patients (18.1%) had treatment failure with IOP remaining >30, ultimately requiring additional surgery. The most common post-op complication was transient hyphema, but 2 patients did develop uveal effusions necessitating surgical intervention via scleral window. This study is a relatively small cohort and lacks a direct comparison group but offers encouraging outcomes suggesting a role for GATT as a good option for first surgical procedure for patients with early-onset SWS-associated glaucoma.

Silicone Oil and Glaucoma-Related Adverse Events in Pediatric Vitreoretinal Surgery

Sharma M, Huertas L, Taylor Gonzalez DJ, Garakani R, et al.

Ophthalmol Glaucoma 2025;8(4):393-399

Silicone oil is commonly used during vitreoretinal surgery as a tamponade for support of the retina, but the role of silicone oil in the development of post-surgical glaucoma in patients undergoing vitreoretinal surgery is not well described. This retrospective cohort study reviewed 186 patients with mean age of 8.1 years who underwent vitreoretinal surgery, 34.4% of whom had silicone oil exposure. The median survival time to development of glaucoma related adverse event (GRAE) was 2.0 months in patients exposed to silicone oil compared to 25.3 months for those with no oil exposure. There was a 52% increased risk of GRAE in patients exposed to silicone oil, and multivariate analysis suggested that risk of GRAE increased by 6% for every 1 year increase in patient's age at time of surgery. Importantly, the most common GRAE in this study was elevated IOP, which can be driven by a number of post-surgical factors, but none of the children were diagnosed with glaucoma, possibly because of early identification of elevated IOP during follow up. There are a number of confounding factors present in patients who require silicone oil as part of their VR surgical treatment, thus further study would be beneficial to better understand driving factors for GRAE in this patient population. Yet, this highlights the importance of IOP monitoring in these patients post-operatively

Influence of Social Determinants of Health on Presentation and Outcomes of Primary Congenital Glaucoma

Ramirez DA, Shaman B, Rossen JL, et al.

Ophthalmol Glaucoma 2025;8(3):312-322

Limited information exists in the literature regarding the effects of social determinants of health (SDOH) on the outcomes of treatment for patients with PCG. This retrospective case series identified patients with PCG receiving care at two academic institutions from 2011 through 2023, excluding patients with anterior segment dysgenesis or systemic syndromes causing their glaucoma. In addition to demographic data including age, race, sex, ethnicity, distance from hospital, income, initial IOP, and presence of amblyopia, this study also used the US Census Bureau's report of community resilience factors (>3) as a proxy for possible barriers to care. Of 105 eyes from 59 patients, the average age of presentation was 294 days, with black patients presenting earlier in this cohort than white patients. There was no racial, ethnic, insurance, median home income, or CRE risk factors in IOP, number of glaucoma medications, spherical equivalent, or CDR at final follow up, but there was a statistically significant worse final BCVA in patients with higher presenting IOP as well as those with >3 CRE risk factors. Patients with Medicaid insurance also required more surgical intervention than those with commercial insurance. Due to its retrospective nature, this study is unable to fully assess possible delays in presentation after initial recognition of abnormal ocular findings and the possible impact that may have on final BCVA. Similar to previous adult studies, this highlights the role that SDOH may play on access to care and final outcomes in patients with PCG.

Distribution of Port-Wine Birthmarks and Glaucoma Outcomes in Sturge-Weber Syndrome

Vu DM, Gjerde H, Elhusseiny AM, et al.

Ophthalmol Glaucoma 2025;8(2):181-187

This study aimed to evaluate biomarkers found in the setting of Sturge Weber disease and their correlation with SWS-associated glaucoma. Records of patients with Sturge-Weber under 18

years old from a single academic institution were reviewed retrospectively, collecting demographic data, medications, surgical outcomes and complications, as well as systemic conditions and treatments. Over the six year period of the study, 44 patients with SWS were seen, 23 (52.3%) of which were diagnosed with SW-glaucoma, 69% of those were diagnosed in the first year of life. Biomarkers associated with higher rates of glaucoma included port-wine birthmark involving the lower eyelid or bilateral eyes, or the presence of choroidal hemangioma; this was similar to data reported by previous studies and suggests that the proximity of these SWS-associated markers to the eye increases the risk of glaucoma. Sixteen patients required surgery, and the time to needing a second surgery was shortest in those receiving goniotomy, then trabeculotomy, and finally tube shunt. This study adds to existing literature which helps prognosticate risk of glaucoma development in patients with SWS as well as providing data that can help guide conversations regarding need for surgical interventions over time in these patients.

The Robison D. Harley, MD Childhood Glaucoma Research Network International Pediatric Glaucoma Registry: The First 872 Cases

Beldick SR, Rockter A, Beck AD, Levin AV

Ophthalmol Glaucoma 2025;8(2):175-180

The Robison D. Harley, MD CGRN International Pediatric Glaucoma Registry is an international database of cases of childhood glaucoma described based on the CGRN classification developed in 2013. The registry at the time of the study includes cases from 4 continents, 10 countries, across 20 clinical sites. The countries with the most cases submitted included the United States (462), Iran (179), and India (132). Researchers can submit data requests to the database to answer clinical questions related to childhood glaucoma, and this study aimed to quantify the demographic data of the first 872 patients in the registry, particularly the subset of patients submitted by the United States, Iran, and India. Cases thus far in the database are majority male (66.6%), 14.3% have a family history of glaucoma, parental consanguinity was reported in 15.5% of cases, and the median age of glaucoma onset was 8 months. While the database as a whole as well as the cohorts from Iran and India reported PCG as the most common type of glaucoma, the United States had higher rates of glaucoma following cataract surgery. Visual acuity in glaucomatous eyes was reported, and followed the expected trend that non-glaucomatous eyes had better VA. This registry is limited by the retrospective nature and the authors describe some requirements for data entry which is aimed at standardizing data for comparison. As the registry grows, it will help to guide understanding of demographics of this relatively rare disease.

Fractal Dimension Analysis of Peripapillary Microvasculature in Primary Congenital Glaucoma

Tam EK, Ji MH, Fayed AE, et al

J Glaucoma 2025;34(8):625-629

Most studies using OCT-A have been performed on adult populations, and in the absence of standardized data to assess vascular patterns seen on OCT-A, this prospective, multicenter, comparative study aimed to study the peripapillary microvascular pattern in PCG compared to healthy controls using fractal dimension analysis (FD). FD is a novel imaging technique that quantifies complexity of structures, so higher FD correlates to higher vascular density. 41 eyes (17 PCG, 24 controls) of children <18yo were assessed using FD as well as collecting baseline characteristics including VA, IOP, glaucoma medication use, and CD. PCG eyes were found to

have reduced vascular parameters in the vitreo-retinal and ILM-NFL layers compared to controls with similar baseline characteristics. This novel imaging modality may have utility in the future, but currently is limited by the lack of standardized controls to consistently compare for reduced vascular density in disease such as PCG.

Efficacy and Safety of the Preserflo MicroShunt in Pediatric Glaucoma

Duarte SR, Lima-Cabrita A, Barão RC, et al

J Glaucoma 2025;34(6):455-461

This retrospective, multicenter, observational study aimed to assess the utility of the Preservlow Microcatheter in the use of select cases of childhood glaucoma (failure of angle surgery with low visual potential and or increased risk of tube exposure, uveitic glaucoma refractory to max medical therapy until full response to anti-inflammatory medications, steroid induced glaucoma refractory to maximum medical therapy. For the 20 eyes included in the study, the rate of qualified success at 12 months 65%, 60%, and 45% at 6, 12, and 24 months for criterion A (>20% IOP reduction) and 65%, 55%, and 45% for criterion B (>30% IOP reduction). Complete success was only 35% at 12 and 24 months. While complication rates were low in this cohort, there have been significant complications reported in other studies. In addition, the low complete success rate highlights the higher rate of fibrosis with children which may limit the wide use of Preserflow in the pediatric population, but still offers another tool in the toolbox for certain cases.

Outcome of Goniotomy Over 120, 240 and 360 Degrees in Juvenile Open Angle Glaucoma: A Multicenter Study

Yang Z, Wang Z, Fan H, et al

J Glaucoma 2025;34(6):433-439

While previous studies have compared the efficacy of 120 degree vs 360 degree goniotomy for the treatment of JOAG, this is the first study to compare the outcomes of 120, 240, and 360 degree goniotomy. This retrospective study included patients receiving goniotomy for JOAG at 13 institutions in China from April 2019-December 2024. The technique for 120 and 240 degree goniotomy was ab interno with a gonio microhook where as the 360 degree goniotomy was performed by GATT using an iTrack catheter. 120 eyes were included (33 treated 120 deg, 31 treated 250 deg, 38 treated 360 deg). At the end of follow-up (average 8.1 months post op), complete success was 18.2%, 45.2% and 63.2% for 120, 240, and 360 degrees of treatment respectively. Importantly, the difference in complete success for 240 and 360 degrees of treatment was not statistically different, but both were significantly higher than 120 degrees. All three treatment strategies achieved >90% qualified success with the use of additional glaucoma medications. Hyphema was the most common complication and was greatest in 360 degree goniotomy. While the study is somewhat limited by its retrospective nature, the author's discussion of the relatively higher simplicity and lower rate of significant hyphema with 240 degree goniotomy for similar success compared to 360 degrees is an important consideration in surgical approach when using goniotomy to treat JOAG.

Goniotomy for Childhood Glaucoma Secondary to Uveitis: Long-Term Outcomes

Ewing T, Correa N, Armarnik S, et al.

J Glaucoma 2025;34(5):371-375

Previous studies have reported on the utility of goniotomy in the surgical treatment of glaucoma secondary to uveitis, but this retrospective review of children <16yo treated with goniotomy from 2001 to 2023 at a single institution aimed to evaluate the long-term outcomes of goniotomy for non-infectious uveitis associated glaucoma. Of 31 eyes of 21 patients with mean age at time of surgery of 10.3yrs, qualified success was 0.94 at 12 months, 0.86 at 3 years, and 0.71 at 7 years after one or two goniotomies. Of the 10 eyes requiring second goniotomy, success was only 50%, and those that failed after secondary goniotomy ultimately received GDD. Patients with longer-standing uveitis at the time of surgery had higher rates of failure (mean years of disease in successful cases was 3.6 years vs 6.3 in failed cases). As a conjunctiva-sparing procedure, goniotomy leaves opportunity for future GDD or trabeculectomy as needed and had low rates of complication. While the population of this study is small, the findings reinforce previous studies completed which supported the use of goniotomy in this patient population and the advent of biologic agents for perioperative inflammatory control further supports positive long term outcomes.

Outcomes of Second Trabeculectomy Versus Glaucoma Drainage Device in Juvenile Open Angle Glaucoma After Primary Trabeculectomy Failure

Seresirikachorn K, Annopawong K, Parivisutt N, et al.

J Glaucoma 2025;34(4):297-303

Patients with JOAG are known to have a high rate of failed medication-only treatment strategies requiring surgical intervention. This retrospective study reviewed surgical outcomes in patients 18-40 years old at two academic institutions in Thailand who underwent primary trabeculectomy for JOAG and ultimately required a secondary surgery due to treatment failure (rise in IOP). Outcomes were compared for secondary trabeculectomy versus GDD (Ahmed or Baerveldt) at time points 1 day, 1 month, 6 months, 1 year, 5 years, and 10 years after the secondary surgery. Of 131 eyes, 52 eyes underwent secondary surgery at a mean time of 27.1 months from primary surgery (30 trab, 10 Ahmed, 7 Baerveldt, 3 CPC, 2 excluded). There was no significant difference in rate of complete or qualified success between trab and GDD groups, although GDD group required more medications at 5 years (1.3 vs. 2.3, $p=0.3$) and there were two cases of tube exposure in the GDD group. While the demographics of both groups were similar, the lack of randomization may contribute to bias in technique applied for certain patients and there may be limited generalizability of this group of Thai patients to other patients with JOAG. Yet, it is encouraging to have similar outcomes on both groups with extended follow up.

Guardian Knowledge in Primary Congenital Glaucoma

Alfaar AS, Hassan DM, Bawazir M, et al.

J Glaucoma 2025;34(3):216-223

This observational survey-based study aimed to assess the impact of guardian/caregiver demographics (including education level, locality of residence (urban/rural), number of surgeries that a patient has had, and the child's order among siblings, etc), on guardian's knowledge of PCG disease understanding, treatment, and risk/prognosis. 96 guardians (80.2% female) of patients with PCG at a single academic institution who presented over the course of one year participated in a 20-question survey covering various knowledge points about glaucoma. The factors that seemed to have the most significant positive correlation with higher knowledge of

PCG included the guardian's education level, particularly education secondary school or higher, time since the patient's diagnosis with PCG, status of having had previous surgery for PCG, older age of the child, and locality of residence in an urban community rather than rural community. This study touches on the importance of understanding the socio-demographic factors of patient families in developing targeted education for guardians. This study is limited by its observational nature and could have also benefited from commentary on if there were certain areas of knowledge gap that seemed more prevalent to allow adjustments in patient counseling. Consideration for continued development of education-level appropriate materials for guardians would be an important takeaway from this study.

Infections

Incidence of orbital cellulitis in children: a population-based study

Vloka CN, Summers RC, DeSantis D, et al.

J AAPOS 2025 Jun;29(3):104214

Orbital cellulitis (OC) is the most common ophthalmic cause of hospital admission among children in the United States. To quantify the incidence of OC according to age, sex, race, and ethnicity among children in Colorado and to project the incidence rate and burden of OC to the national level. This was a population-based cohort study of 185 patients <18 years of age with clinically and radiographically confirmed OC in an at-risk population of 6,215,564 person-years from Colorado from January 1, 2018, to December 31, 2022. The crude rate and age adjusted incidence rate (ASR) of OC were 2.98/100,000 and 3.00/100,000, respectively. Five-year-old patients had the highest age-specific incidence rate (ASIR) of OC (5.97/100,000). Age between 5-7 years is an independent risk factor for OC, while very young age (<1 year) and older age (16-17 years) are associated with significantly lower risk of OC. Males (versus females), Black/African American (versus White) children, and non-Hispanic/Latino (versus Hispanic/Latino) were affected more commonly. Projecting to the national level, the ASR of OC was estimated to be 3.21/100,000, and the estimated burden of pediatric OC in the United States was 2,331 cases/year. This is the first large, population-based study evaluating age, sex-, race- and ethnicity-specific incidence rates of OC focusing specifically on children 0 to <18 years of age over a 5-year period. The impact on clinical practice is that the incidence rate of OC is highly dependent on age, sex, race, and ethnicity.

A one-year prospective study of chorioretinal scars and optic disk characteristics in children with congenital Zika syndrome

Martins TT, Ventura CV, Aragão IO, et al.

J AAPOS 2025 Jun;29(3):104217

Children with congenital Zika syndrome (CZS) can exhibit a broad spectrum of congenital anomalies, including microcephaly, brain malformations, hearing impairment, and ocular findings. The purpose of this prospective cohort study was to evaluate early changes of chorioretinal scars and optic disk in CZS over 1 year after its initial detection. This study included 35 eyes of 23 children with CZS who presented with chorioretinal scars, which were assessed by retinal imaging at diagnosis and at 1 year's follow-up. ImageJ software was used to measure the chorioretinal scar area. Scar pigmentation, and the vertical (v) and horizontal (h) cup:disk ratios (CDRs) were rated at baseline and follow-up. Ocular ultrasounds were performed to calculate the ocular growth rate and to compare with the chorioretinal scar growth rate. The authors found the mean area of the chorioretinal scar increased from baseline to 1 year later ($P < 0.001$). The chorioretinal scar area increased in 32 eyes (91%) eyes, and pigmentation increased in 14 eyes (40%) eyes. The vCDR presented a 4% increase ($P = 0.030$), while the hCDR remained stable ($P = 0.530$). No significant correlation was found between the vCDR or hCDR and chorioretinal scar growth or between the chorioretinal scar growth rate and the ocular globe growth rate. This was a single-center prospective cohort study with a limited sample size, limited axial length measurements, and only 1 year follow up. The Impact on clinical practice is that in children with CZS, it is unclear if changes in chorioretinal scars, including growth and increase in pigmentation, and increase in

vCDR after 1 year signify disease progression, but no signs of reactivation were noted including new satellite lesions, vitritis, and/or chorioretinitis activity of the primary scar.

Neuro-Ophthalmology

Neurotoxic Implications of Vincristine in Pediatric: Ophthalmology: A Case Series

Adhan IK, Martin J, Strombeck T, et al.

J Pediatr Ophthalmol Strabismus 2025;62(4):e51-e53 Vincristine is a relatively common chemotherapeutic agent in childhood, often used for both solid and hematologic malignancies. In this case series, the authors describe 3 children – ages 14 months, 15 months, and 4 years – who developed some combination of ptosis and/or esotropia secondary to abduction deficits. While the neurotoxicity of vincristine is well known, these particular ocular effects have not been frequently reported in the ophthalmologic literature. In each case, the ptosis and motility deficits improved with cessation or reduced dosing of vincristine. Importantly, vincristine was then restarted at full dose at a later time point without recurrence. While this is a small case series, it is important in that it highlights ocular side effects from a common pediatric chemotherapeutic agent, one that all pediatric ophthalmologists should have an awareness of. Reducing or temporarily stopping the medication can lead to improvement or resolution of symptoms.

Ophthalmic Outcomes in Children With Spina Bifida Myelomeningocele in Ireland

O'Regan S, Dunne M, Devitt L, et al.

J Pediatr Ophthalmol Strabismus 2025;62(3):196-202

Children with spina bifida myelomeningocele (SBM) often have ophthalmic pathology; this study sought to describe and quantify that pathology, as well as evaluate the effect of shunt status and spinal lesion level on the eye pathology. In all, the retrospective review looked at 129 children with SBM. The majority of lesions were lumbar (60.47%), followed by sacral (20.16%), thoracic (18.60%), and occipital (0.78%). Shunts were present in 2/3rds of patients. Most had good vision, with only 18% having significant visual impairment. Significant refractive errors were present in 40% patient, while 33% had strabismus, most commonly esotropia. Papilledema, optic atrophy, and CVI were present in 12.4%, 5.4%, and 4.7% of participants. Higher spinal lesion levels were significantly associated with worse visual acuity. Overall, then, patients with SBM should be screened for ophthalmic disorders, particularly refractive error and strabismus, but also for optic nerve pathology. Higher suspicion should be had for higher spinal cord lesions.

Prevalence of Vision and Eye Movement Abnormalities in Children Referred to the Children's Epilepsy Surgery Service: A 5-Year Observational Study

Chan SC, Warnes P, Warsame M, et al.

J Pediatr Ophthalmol Strabismus 2025;62(3):211-219

Ophthalmologists are often consulted for abnormal vision and/or eye movements in the setting of seizures or epilepsy. In this study, the authors reviewed all children referred to a single epilepsy service over a five year. Overall, 53% of these children (117/221) were found to have at least one ophthalmic abnormality. Strabismus (16%, 36/221) was the most common, followed by visual field defects (14%, 27/198), and reduced visual acuity (12%, 26/219). Interestingly, 54% (63/117) of children with ophthalmic findings had not been diagnosed or evaluated by ophthalmology prior to the visit with the epilepsy service. Given this high prevalence of ophthalmic pathology in children with epilepsy, one might suggest that all patients with a seizure disorder be evaluated by an

ophthalmologist, or at least closely screened by the treating neurologist, to prevent impactful ocular pathology from going undiagnosed.

Predictors of Final Visual Outcome in Patients With Leber Hereditary Optic Neuropathy Treated With Lenadogene Noparvovec Gene Therapy

Sergott RC, Carelli V, Newman NJ, et al.

Invest Ophthalmol Vis Sci 2025 Jul 1;66(9):42

The study explores factors influencing the best-corrected visual acuity (BCVA) outcome 1.5 years after treatment with lenadogene noparvovec in patients with Leber hereditary optic neuropathy (LHON) harboring the m.11778G>A mutation. This is a retrospective analysis of RESCUE, REVERSE, and REFLECT trials, evaluating BCVA and OCT parameters (GCL and RNFL thickness) at 1.5 years post-treatment. They analyzed 113 eyes from 61 patients treated at least 6 months after disease onset across three phase 3 trials (RESCUE, REVERSE, REFLECT). Thicker baseline optical coherence tomography (OCT) measurements, specifically outer ganglion cell layer (GCL) segments (superior: -0.28 logMAR, 95% CI -0.41 to -0.16; temporal: -0.26 logMAR, 95% CI -0.38 to -0.13; both $P < 0.001$) and retinal nerve fiber layer (RNFL) quadrants (superior, inferior, nasal; $P < 0.05$), were significantly associated with improved final BCVA. Better baseline BCVA during the dynamic disease phase (6-12 months) was linked to better final BCVA (-0.09 logMAR, 95% CI -0.11 to -0.08, $P < 0.0001$). Age, gender, and treatment timing (within 6-12 months) did not significantly predict BCVA improvement. Thicker baseline GCL and RNFL on OCT, along with better baseline BCVA, are key predictors of improved visual outcomes 1.5 years after lenadogene noparvovec treatment in MT-ND4 LHON patients treated at least 6 months post-onset. These findings can guide patient selection and expectations for gene therapy efficacy. The study is limited to m.11778G>A mutation patients; applicability to other LHON mutations is unclear. Small sample size and retrospective design may affect generalizability.

Etiologies underlying pediatric papilledema at a tertiary care children's hospital

Fischer AF, Muntean G, Biousse V, et al.

J AAPOS 2025;29(2):104158

Papilledema evaluation is a frequent consult for ophthalmologists in the emergency and inpatient settings. Determination of the presence or absence of papilledema on ophthalmic exam often drives an extensive work-up involving many specialties. Authors performed a retrospective review of all patients diagnosed with papilledema at a single institution from 2021 to 2023. Patient demographics, reason for consult, symptoms, and final diagnosis were collected. 71 patients, mean age 13 years and 68% female, were diagnosed with papilledema, representing 3.7% of all consults. 51% of patients with confirmed papilledema were diagnosed with idiopathic intracranial hypertension (IIH). Other common diagnoses included subdural hematoma (7%), venous sinus thrombosis (6%) and meningitis (6%). The study is limited in that data was collected from a single institution and that all data was taken from retrospective chart review. This study draws attention to the fact that half of cases of papilledema were found to have a cause other than IIH. Authors emphasize the importance of maintaining a broad differential and pursuing comprehensive work-up for increased intracranial pressure.

Retinal findings in pediatric idiopathic intracranial hypertension

Curley MT, Heidary G, Gaier ED, Gise R

J AAPOS 2025;29(2):104179

Data describing retinal findings associated with pediatric idiopathic intracranial hypertension (IIH) has been historically limited. Authors performed a retrospective review of all IIH patients <19 years old without concomitant retinal diagnosis at an academic institution from 1998 to 2022. All patients were followed to resolution of disc edema. Data collected included demographics, vision, and presence of pathology on retinal imaging. 253 patients with IIH were reviewed; 24 of those had retinal findings, including retinal folds, macular exudates, subretinal fluid, and choroidal neovascular membrane. Visual acuity outcomes were significantly worse in patients with retinal findings, and presence of optic atrophy after resolution of edema was significantly higher in patients with retinal findings than without. Further, 1/3 of patient had persistent retinal pathology after resolution of disc edema. The study is limited by the retrospective nature and relatively low number of patients who were followed to disease resolution. These results may assist with prognostication, demonstrating that IIH patients with retinal findings have worse visual outcomes and suggesting that patients with retinal findings may have more severe disease.

Association of ganglion cell-inner plexiform layer thinning with visual function in pediatric papilledema

Malem AH, Reginald AY, Wan MJ

J AAPOS 2025;29(4):104253

In children with papilledema, assessing risk of vision loss is challenging due to variable cooperation with ancillary testing, particularly visual field, and possible optic nerve edema masking underlying optic nerve fiber loss. This study aims to evaluate whether using macula ganglion cell-inner plexiform layer (GCT) measured by the Cirrus OCT (Carl Zeiss, Meditec Inc, Dublin, CA) can predict vision loss in pediatric patients with papilledema. Patients <18 years of age diagnosed with papilledema at a single institution between 2012-2022 were retrospectively reviewed. In addition to demographic data, average mean and minimum macula GCT and optic nerve retinal nerve fiber layer (RNFL) were recorded at initial and final visit. Patients were divided into groups based on vision loss versus no vision loss. In comparing the two groups, at baseline, the group with vision loss had a statistically significant higher opening pressure on lumbar puncture and thicker RNFL, while the mean and minimum GCT were similar between the groups. At the final data point, the group with vision loss had significantly lower mean and minimum GCT than the group without vision loss. This study is the first comparison of GCT in two groups in the pediatric population with papilledema and different outcomes (vision loss and no vision loss). Limitations include variability and accuracy of data due to retrospective nature and unequal groups (14 in group with vision loss and 66 in group without vision loss). Receiver operating characteristic (ROC) curves showed area under the curve (AUC) to be 0.86 for average mean GCT and 0.89 for minimum GCT suggesting that GCT is a promising diagnostic parameter to assist in predicting risk of vision loss in patients with papilledema due to primary or secondary pseudotumor cerebri.

Fetal Growth Restriction Is Associated With Altered Optic Nerve Head Morphology in Term-Born Children and Adolescents

Fieß A, Gißler S, Grabitz S, et al

Invest Ophthalmol Vis Sci 2025;66(4):35

This retrospective cohort study with a prospective ophthalmologic examination included 732 eyes from full-term born children aged 4 to 17 years who were grouped according to their birth weight correlated to gestational age (GA). The research found that children who experienced severe fetal growth restriction (FGR) exhibited thinner global peripapillary RNFL and children with moderate FGR had a thinner minimum rim width (MRW). The study emphasizes the potential long-term neurological consequences of FGR, suggesting that these structural changes in the optic nerve could be indicators of vision or neurodevelopmental issues. The study involved detailed imaging of the optic nerve head and used a robust sample size, making the findings more generalizable. The study focuses on morphological changes but does not provide direct evidence of functional vision impairments, which would strengthen the clinical relevance of the findings. Additional studies are needed to explore causal pathways, the functional impact of these morphological changes, and to account for potential confounders.

Neurofibromatosis Type 1 (NF1)-Related Ocular Signs: New Insights on Their Prevalence, Incidence, and Genotype-Phenotype Correlation in NF1 Children

Midena E, Cosmo E

Am J Ophthalmol 2025;275:58-73

This study clarifies when—and in whom—NF1 eye findings appear. In a single-center pediatric NF1 cohort (n=237; 2010–2022), the authors quantified prevalence, incidence, age of onset, and genotype–phenotype correlations for optic pathway glioma (OPG), Lisch nodules (LNs), choroidal abnormalities (CAs), and retinal vascular abnormalities (RVAs). Baseline prevalence was OPG 20.7%, LNs 43.5%, CAs 46.8%, and RVAs 6.8%; among 204 children with follow-up, new cases occurred in 6.4%, 22.4%, 21.4%, and 5.4%, respectively, with mean onset at 6.3 (OPG), 7.1 (LNs), 6.4 (CAs), and 6.6 (RVAs) years. Importantly, accumulation of new ocular signs was negligible after ~7 years. LNs and CAs behaved largely independently over time, supporting their use as separate diagnostic criteria. Genetically, truncating NF1 variants were associated with a greater burden of ocular signs than non-truncating variants (1.7 ± 1.0 vs 0.9 ± 0.9 findings/child; $P=.0019$), with higher rates particularly for CAs and RVAs, and a trend toward more OPG. Strengths include a relatively large pediatric sample, multimodal standardized ocular imaging (slit lamp + near-infrared reflectance) with longitudinal assessment, and genotype data in most participants. Limitations are the single-center, predominantly White cohort; variable follow-up; MRI performed based on clinical suspicion (possible OPG ascertainment bias); and observational design precluding causal inference. Clinically, this work teaches that ocular surveillance in NF1 should be front-loaded to early childhood: prioritize careful slit-lamp examination for LNs and near-infrared imaging for CAs/RVAs by ages 5–7, and use OCT/RNFL plus targeted MRI for suspected OPG. Recognizing that truncating genotypes carry greater ocular risk may help tailor visit frequency. For pediatric ophthalmology, the practical impact is a tighter, earlier screening window, treating LNs and CAs as independent diagnostic pathways, and counseling families that new ocular NF1 signs after age 7 are unlikely.

Nystagmus

Disrupted Motor Neuron and Neuromuscular Junction Development in an Albino Mice Model of Infantile Nystagmus

Vemula S, Osman A, Yang X, Aet al.

Invest Ophthalmol Vis Sci 2025 Jul 1;66(9):25

This study investigates the early developmental defects in motor neuron (MN) innervation and neuromuscular junction (NMJ) formation in albino mice, a model for infantile nystagmus syndrome (INS). The study aims to understand the pathogenesis of INS, which involves involuntary eye movements starting before six months of age, often linked to albinism. Albino mice and wild-type littermates were studied at various postnatal stages (P0 to 12 weeks) using immunostaining, immunohistochemistry, and confocal microscopy. Significant deficits in MN axon innervation were observed in horizontal extraocular muscles (EOMs) of albino mice, starting at postnatal day 7 (P7). Endplate band width was notably smaller in albino lateral rectus (LR) and medial rectus (MR) muscles compared to controls, with no differences in vertical muscles. Abnormal NMJ maturation was evident from P7, with reduced synaptophysin expression, fewer presynaptic axon contacts, delayed acetylcholine receptor (AChR) cluster maturation, and fewer subsynaptic nuclei in albino mice. By adulthood, albino NMJs remained immature compared to the mature pretzel-like structures in controls. An increased proportion of multiply-innervated fiber (MIF)-innervating MNs was detected in the oculomotor nucleus (CN3) of albino mice as early as P10, preceding myofiber differences (P14), suggesting early brainstem circuit abnormalities. These defects occur before eye opening (P14), indicating they are not secondary to low vision but likely contribute to INS pathogenesis by impairing EOM function. The study identifies early disruptions in MN innervation and NMJ formation in albino mice, occurring before eye opening. These anomalies suggest a failure in establishing stable synapses, potentially driving INS by affecting EOM function. The findings highlight the role of prenatal or early postnatal developmental defects in albinism-related INS. This study is limited to a mouse model, with potential differences from human INS. Focus on horizontal EOMs may overlook vertical muscle contributions.

Clinical Spectrum and Molecular Characteristics of Inherited Ocular Diseases in a Cohort of Pediatric Patients With Infantile Nystagmus Syndrome

Gong X, Boydstun IP, Lawhon WT, et al

Invest Ophthalmol Vis Sci 2025;66(4):39

This study retrospectively analyzed clinical and genetic data (next-generation sequencing (NGS) with targeted gene panels) from 205 unrelated pediatric patients with an average age of 8 years-old, within an IRB-approved nystagmus registry from 2010–2024 and the clinical diagnosis of Infantile Nystagmus Syndrome (INS). INS develops within the first 6 months of life and it can be associated with a range of underlying genetic conditions. The most common INS-associated IODs included albinism (32%), Leber congenital amaurosis (LCA) (14%), and achromatopsia (14%). Genetic testing achieved a definitive diagnosis in 85 of 205 patients, yielding a molecular diagnostic rate of 41.5%. A total of 83 pathogenic and likely pathogenic variants were identified across 30 genes. The seven most frequently disease-causing genes—TYR, CNGB3, RPGR, GPR143, ABCA4, OCA2 and FRMD7—accounted for 65% of the genetically solved cases. Additionally, eight genes associated with LCA (AIPL1, CABP4, GUCY2D, IMPDH1, NMNAT1, RDH12, PRPH2, and RPGRIP1) contributed to 15% of these cases. The findings of potential retinal degeneration and other associated ocular conditions suggest that early genetic screening

for INS could help clinicians plan for appropriate monitoring and intervention, improving patient outcomes over time.

Oculoplastics

Epac1 Inhibits Orbital Fibroblast Activation to Ameliorate Thyroid-Associated Orbitopathy-Like Features Through the JAK/STAT Signaling Pathway

Liu R, Xin X, Ma S, et al.

Invest Ophthalmol Vis Sci 2025 Jul 1;66(9):68

The study investigates the role of Epac1 in modulating orbital fibroblast (OF) activation in thyroid-associated orbitopathy (TAO), an autoimmune disorder causing orbital inflammation and fibrosis. Orbital adipose tissues from 6 TAO patients and 6 healthy volunteers, plus a TAO mouse model (Ad-TSHR adenovirus) were used in this study. They compared Epac1 levels, fibrosis markers, and STAT3 phosphorylation across groups. Clinical TAO samples and a TAO mouse model showed reduced Epac1 expression and increased vimentin, indicating fibroblast activation. TGFβ1 stimulation enhanced cell viability, migration, and fibrosis markers (α-SMA, fibronectin, collagen I, collagen III) in both normal and TAO OFs. Overexpression of Epac1 in OFs inhibited TGFβ1-induced fibrosis by reducing cell viability, migration, and fibrotic marker expression, while knockdown exacerbated these effects. In vivo, AAV-Epac1 injection improved TAO-like symptoms in mice. Epac1 overexpression suppressed STAT3 phosphorylation, a key step in the JAK/STAT pathway, in vitro and in vivo. The JAK/STAT inhibitor Stattic reversed the pro-fibrotic effects of Epac1 knockdown. Epac1 inhibits OF activation and ameliorates TAO-like features by suppressing the JAK/STAT signaling pathway, suggesting its potential as a therapeutic target for TAO fibrosis. The study is limited by sample size and reliance on a mouse model may affect generalizability.

Management strategies for chalazia in pediatric patients: A scoping review

Kornhauser T, Elhusseiny AM, Pemberton JD

Eur J Ophthalmol 2025;35(4):1481-1494

There is a lack of clear, evidence-based guidelines for managing chalazia, the most common acquired eyelid lesions in children, even though these can impair vision if not treated. To address this, a scoping review synthesized data from 127 studies, including case reports and prospective and retrospective designs, to summarize current pediatric treatment options and identify knowledge gaps. The review found that conservative treatments, like warm compresses and eyelid hygiene, are the standard initial approach, but there's little data on their effectiveness specifically in children. While some studies on topical antibiotics and steroids show mixed results and potential side effects, newer therapies such as probiotics, omega-3 supplements, and intense pulsed light show promise but need more research. The review also noted that intralesional steroid injections have a high success rate but come with a risk of rare complications, and surgical excision is an effective option for chalazia that don't go away. The authors suggest that a tailored approach is best, one that takes into account any underlying conditions like vitamin A deficiency or rosacea. While the review's strength lies in its comprehensive summary of the available literature and its proposal of a preliminary management algorithm, its main limitation is the general lack of high-quality, child-specific studies, which forces reliance on data from adults and lower-level evidence. This highlights the urgent need for more robust, child-focused research to create better evidence-based guidelines for clinical practice.

Three-Dimensional Culture of Orbital Fibroblasts From Thyroid Eye Disease Induce In Vivo-Like Tissue Remodeling and Fibrosis

Bao X, Xu Z, Wang X, Zhang T, et al.

Invest Ophthalmol Vis Sci 2025 Jun 2;66(6):67

In this study, the authors developed a three dimensional (3D) microsphere culture model of orbital fibroblasts derived from patients with thyroid eye disease (TED) to better mimic the in vivo tissue environment. Orbital connective tissue samples were collected from 6 patients with thyroid eye disease (TED) and 6 normal control subjects for primary cell culture and 3D spheroid culture. Additionally, orbital connective tissue samples from 6 TED patients and 6 control subjects were collected for PCR validation. For high-throughput RNA sequencing, orbital connective tissue was further collected from 12 TED patients and 6 control subjects. Fibroblasts harvested from TED patients and healthy controls were cultured into 3D spheroids using the hanging drop method and analyzed after nine days via biomechanical testing, transmission electron microscopy, immunofluorescence for fibrosis markers (α -SMA, COL1A1, FN1), and RNA sequencing. Compared to control spheroids, the TED derived 3D cultures displayed greater contractility, dense extracellular matrix deposition, increased stiffness, and elevated expression of fibrosis markers. Transcriptomic profiling further revealed that the gene expression patterns in TED 3D cultures closely resembled those of actual TED tissue, far more so than in traditional 2D cultures, highlighting the 3D model's fidelity in simulating disease-related fibrosis and remodeling. The findings of this study may hold promising implications as a model to further evaluate treatments for TED but are limited by its small sample size and technical complexity to the protocol.

Pediatric Orbital High-Grade B-Cell Lymphoma: A Case Report and Review of the Literature

Nguyen KK, Regner MF, Olson SB, et al.

Ophthalmic Plast Reconstr Surg 2025;41(4):e120-e122

In this study, the authors present a unique case and review of the literature regarding orbital B-cell lymphoma in an otherwise healthy 10-year-old patient who presented with painless edema of the left upper lid for 2 weeks. The patient was initially treated with antibiotics and prednisone for orbital cellulitis. Swelling persisted warranting imaging and intervention by an oculoplastic surgeon. Biopsy of an upper lid mass yielded a diagnosis of high-grade B-cell lymphoma. After 3 cycles of chemotherapy, the orbital symptoms improved. The relevance to practice is to consider a more broad differential diagnosis and more aggressive work-up in cases of orbital swelling without pain or lack of response to therapy.

Association between congenital nasolacrimal duct obstruction and otitis media

Linaburg TJ, Binenbaum G, Buzi A, et al.

J AAPOS 2025 Jun;29(3):104211

Anatomic abnormalities causing congenital nasolacrimal duct obstruction (cNLDO) may be coincident with abnormalities predisposing to otitis media (OM). The authors evaluated the association between cNLDO and OM, considering surgical intervention as a marker of more severe disease. This was a retrospective cross-sectional study of 43,793 children <5 years of age who received care from both a pediatrician and ophthalmologist at Children's Hospital of Philadelphia. Primary outcomes were associations between diagnoses of cNLDO by ophthalmologists and OM by pediatricians or otolaryngologists, and between cNLDO requiring surgical intervention and OM requiring surgical intervention. 1,571 children (3.6%) had cNLDO, 1,262 (2.9%) underwent cNLDO surgery, 16,947 (38.7%) had OM, and 4,433 (10.1%) underwent

OM surgery with myringotomy tubes (MT) placement. cNLDO was significantly associated with OM (OR = 2.9; 95% CI, 2.6-3.2 [P < 0.001]). cNLDO surgery was significantly associated with MT placement (OR = 2.8; 95% CI, 2.4-3.2 [P < 0.001]). In children with OM, cNLDO requiring surgery was significantly associated with need for MT (OR = 2.0; 95% CI, 1.7-2.4 [P < 0.001]), but cNLDO not requiring surgery was not associated with need for MT (OR = 0.9; 95% CI, 0.7-1.1). The study included a large population of patients, but did not assess the timing between the two procedures. Impact on clinical practice: cNLDO requiring surgery in children who also have recurrent OM requiring MT insertion may represent a population with altered nasomaxillary anatomical development that involves both the eustachian tube and nasolacrimal duct.

Frontalis flap advancement versus PTFE (Gore-Tex) frontalis sling operations in the management of congenital blepharoptosis

Abdelbaky SH, Shahin HI, El Essawy R, et al.

J AAPOS 2025;29(2):104180

Frontalis sling surgery is widely used in children with severe ptosis and poor levator function. Frontalis suspension by frontalis muscle flap is a relatively new surgical technique which reduces the risk of implant extrusion or rejection of foreign material. Authors performed a prospective comparative study of children >1 year with severe congenital ptosis from multiple centers over 2 years. They were randomly assigned to 1 of 2 groups, frontalis suspension with PTFE suture or frontalis muscle flap. 21 eyes underwent sling surgery and 21 eyes underwent frontalis muscle flap advancement, and patients were followed for 6 months. Both groups showed improvement in margin reflex distance 1 (MRD 1) without significant difference. Additionally, recurrence rates had no statistically significant difference. Patients who underwent frontalis muscle advancement had higher satisfaction rates with lid contour and lid crease. There was a high rate of hematoma (38%) in the muscle flap group, though all resolved spontaneously. There was a 10% infection rate in the sling group (requiring explantation), compared to 0% in the flap group. The study is limited by small size, as well as subjectivity of determination of cosmetic outcomes. Authors concluded that both methods produce comparable results.

Orbit

Langerhans cell histiocytosis of the orbit: pediatric case series

Azzam SH, Kassem S, Bushager F, et al

Can J Ophthalmol 2025;60(3):e429-e435

Langerhans cell histiocytosis is a rare pediatric condition with primary orbital involvement further being a rare orbital lesion. This was a retrospective case series of 16 patients with orbital LCH from 4 centers with a mean age of 6.56 ± 4.38 years (range 1–18 years). The most common presentations were eyelid swelling (81%), proptosis (5%), eyebrow swelling (5%), and swelling over temple (5%). The majority of patients (n=13) showed superior orbital lesions with osteolytic defects on imaging. All patients were diagnosed through orbital tissue biopsy. The majority (n=13) received systemic steroids & chemotherapy while the remaining 3 underwent curettage ± intraoperative steroid injection. The study acknowledges that treatment is controversial, though. Despite it being a retrospective series of a small number of patients, this is a helpful study in that it provides a summarized view for a rare pediatric condition with regards to physical exam findings, imaging results, and treatment options while stressing the importance of biopsy for a definitive diagnosis.

Pediatrics / Infantile Disease / Syndromes

Growth Curve for Infant's "Fixation To Light" Using Gaze Reaction Time

Thakur M, Saha R, Nagarajan K, et al.

Invest Ophthalmol Vis Sci 2025 Jul 1;66(9):26

The study aimed to investigate the developmental pattern of infants' gaze reaction time (time to initiate fixation on a light stimulus) as a function of age, hypothesizing a reduction with age. A growth curve model was developed to quantify this trend. A cross-sectional study was conducted from September 2020 to mid-April 2021, involving 694 healthy infants aged 3-8 months. Gaze reaction time was measured using the Baby Vision Screener (BaViS), a dome-shaped device with LED stimuli, in a dark room with infants in a supine position. Reaction time was extracted via semi-automated video analysis, focusing on the first eye or head movement toward the stimulus. Reaction time was quantifiable in 682 infants. It significantly decreased with age ($P < 0.001$), from a median of 684 ms (P25-P75: 548-846 ms) at 3 months to 397 ms (350-457 ms) at 8 months in the upper visual field. Variability also reduced with age, with the 5th to 95th percentile range dropping from 925 ms at 3 months to 385 ms at 8 months. No significant sex or vertical asymmetry effects were found. The study confirmed a developmental trend in gaze reaction time, with reduced variability suggesting neural maturation. The resulting percentile growth curve could serve as a quantitative clinical measure for assessing infant vision development, particularly for monitoring long-term care cases like congenital cataract.

Ophthalmic manifestations of systemic lupus erythematosus at a quaternary children's hospital

Teng RW, Estrela T, Meidan E, et al.

J AAPOS 2025;29(4):104276

Childhood-onset systemic lupus erythematosus (SLE) may be more acute and require more aggressive treatment than adult-onset SLE. This study aims to evaluate the ocular manifestations and complications of treatment for pediatric SLE. Medical records of children diagnosed with SLE by the Rheumatology Department at Boston Children's Hospital were retrospectively reviewed for rheumatology and ophthalmology notes, autoimmune labs, and additional ophthalmologic testing (visual fields, spectral domain optical coherence tomography). Of the 180 children (87% female) identified with SLE, 84 were evaluated by ophthalmology. Of those, thirty-three (39%) had at least one ocular manifestation secondary to the disease or medications to treat the disease. Ocular manifestations included papilledema (7%), focal retinal finding (ischemia, hemorrhage, or cotton wool spots) (7%), hydroxychloroquine retinal toxicity (7%), dry eye (6%), cataract (6%), suspected glaucoma or glaucoma (4.8%), hypertensive retinopathy (2.4%), subretinal fluid (2.4%), episcleritis (1.2%), uveitis (1.2%), optic nerve swelling due to NMO (1.2%), and vitreous cell (1.2%). A strength of this study is the characterization of both disease-related and treatment-related ophthalmic manifestations of pediatric SLE over time. Limitations include the retrospective nature of the study as well as lack of ophthalmic evaluation of all patients in the study leading to a smaller sample size. This study highlights the importance of ophthalmic evaluation at baseline and routinely thereafter due to risk of disease-related and treatment-related ocular manifestations.

Baseline ophthalmic findings and complications in pediatric patients treated with MEK inhibitors

Hazariwala V, Rossen JL, Lasky-Zeid J, et al.

J AAPOS 2025 Apr;29(2):104157

MEK inhibitors are used increasingly for targeted tumor therapy. Ocular complications are well documented in adults but have not been well characterized in children. Authors reviewed all charts from a single institution of patients <21 years old treated with MEK inhibitors between 2016 and 2023 who had a baseline eye exam and at least one follow-up appointment. Data collected included patient demographics, baseline ophthalmic history, treatment details; best corrected vision, sensorimotor exam findings, and anterior segment and retinal exam findings were collected at pre- and post-treatment visits. 45 total charts were reviewed, 42 patients with tumors and 3 without. Due to the frequent presence of neurologic tumors, the majority of patients had ophthalmic findings at baseline. Three of the 45 patients, all of whom had neurologic tumors not related to neurofibromatosis, developed side effects between 6 and 7 months into treatment, one with severe dry eye and two with anterior uveitis. None of the patients who developed side effects experienced decrease in BCVA. The main limitation of the study is retrospective nature with lack of OCT data, impeding ability to assess for serous retinal detachment, the most common side effect of MEK inhibitors in adults. This study highlights the need for further, larger studies to determine appropriate screening guidelines for children on MEK inhibitor therapy.

Visual and refractive outcomes in pediatric Marfan syndrome

Altamirano F, Nihalani BR, Miller KB, et al.

J AAPOS 2025;29(2):104175

Marfan syndrome (MFS) is associated with numerous ocular pathologies that impact vision and refractive status. Authors performed a retrospective chart review of patients with MFS who were first examined at <21 years old at a single institution between 2015 and 2023. Eyes were grouped by lens status at last follow-up: (A) no subluxation, (B) subluxation with phakic refraction, (C) subluxation with aphakic refraction or aphakia following lensectomy, and (D) pseudophakia. 105 patients (210 eyes) met inclusion criteria. 59 eyes fell into group eye, 77 to group B, 43 to group C, and 31 to group D. Group C had the highest percentage of eyes with 20/40 vision or worse, most of these cases attributed to amblyopia. Patients without lens subluxation had better visual outcomes than patients with lens subluxation. Major ocular complications documented included 3 patients with retinal detachments, all of whom had history of intraocular surgery and extreme axial elongation. Strengths of the study include relatively large cohort of MFS patients. The study is limited by reliance on patient compliance with refractive correction for best visual outcomes and selection bias in groupings due to patient and/or surgeon preference. Results of the study suggest that patients with lens subluxation may benefit in terms of visual outcome from lensectomy with placement of intraocular lens, though risk of major complication such as RD in patients with extreme axial length must be considered.

Ophthalmic findings in pediatric patients with craniofacial scleroderma

Eldib A, Aldhmour M, Feistritz C, et al

J AAPOS 2025;29(4):104269

Craniofacial scleroderma is a rare autoimmune disorder that is associated with ocular involvement in 14%-35% of affected individuals. This study aims to describe the ophthalmic findings and incidence in patients with this disease followed at a single center. The medical records of pediatric patients (<18 years) diagnosed with craniofacial scleroderma and referred for ophthalmic

evaluation during an approximately 3.5-year time frame were retrospectively reviewed for ophthalmic conditions. 94.4% of the patients were found to have at least one abnormal ophthalmological finding, with the most common being dry eye disease. Abnormalities in the ocular adnexa, anterior segment, posterior segment, refractive error, accommodation, and oculomotor exam were identified, with two patients having vision threatening posterior segment findings requiring urgent treatment. Limitations include variable data due to retrospective nature of study design and difficulty establishing causal relationship of ocular findings to the disease. This study provides valuable information using a large cohort of patients on ocular findings associated with the rare autoimmune disorder of craniofacial scleroderma.

Practice management / Health care systems / Education

Revisiting Medicaid Reimbursements and Their Effects on the Economics of Pediatric Ophthalmology Two Years Later

Adhan IK, Sussberg RM, Nelson LB, et al.

J Pediatr Ophthalmol Strabismus 2025;62(3):160-165

This study evaluated changes in Medicaid reimbursement rates for pediatric ophthalmology visits across the United States between 2022 and 2024, addressing the economic pressures that influence access to care. Using CPT codes 92004 (new patient) and 92014 (follow-up), reimbursement schedules were collected from 45 states and the District of Columbia. States lacking publicly available data (Alabama, Maryland, Minnesota, South Carolina) or with atypical structures (Tennessee, Virginia HCPCS codes) were excluded. Non-facility fees were analyzed to reflect outpatient practice settings. Mean Medicaid reimbursement rates increased modestly over the two years: from \$107.17 to \$112.38 (+3.8%) for new patient visits and from \$86.39 to \$93.05 (+5.0%) for follow-up visits. While 21 states showed increased new patient rates and 21 showed increases in follow-up rates, others remained unchanged or declined. Pennsylvania demonstrated the largest gains, with new patient rates rising 34.6% and follow-ups 37.9%, following sustained state-level advocacy. Similar legislative-driven increases occurred in Illinois, Indiana, Hawaii, and New Mexico, where reimbursements were adjusted closer to Medicare levels. Conversely, some states, including the District of Columbia and Delaware, experienced decreases. Clinically, persistently low Medicaid reimbursement continues to discourage many pediatric ophthalmologists from accepting Medicaid patients, restricting access and prolonging wait times. This study highlights the potential of targeted state-level advocacy—exemplified by Pennsylvania—to substantially improve reimbursement rates and, by extension, patient access to timely pediatric eye care.

Edutainment videos for teaching pediatric ophthalmology and strabismus to medical students and residents: a pilot study

Li J, Nguyen AM, Cabrera MT, et al.

J AAPOS 2025 Jun;29(3):104212

A multicenter prospective study was conducted to determine if edutainment videos—content that is both educational and entertaining—could improve clinical knowledge and interest in pediatric ophthalmology and strabismus (PO&S) among trainees. The study involved 52 medical students and residents from six US academic institutions, who completed pre- and post-video questionnaires to assess their learning and engagement. The results showed a statistically significant improvement in test scores for both medical students and residents after watching the videos ($P \leq 0.0003$). Furthermore, all 52 participants reported that the videos enhanced their understanding of strabismus, and 89% felt more comfortable with examining pediatric patients. A large majority of respondents (87%) indicated a preference for video-based study materials over

traditional formats like book chapters or lectures, and 58% expressed an increased interest in the field of PO&S after viewing the content. While the study's findings are promising, it has several limitations, including the exclusion of participants who did not complete both the pre- and post-tests, the absence of a control group, and the focus on only short-term knowledge acquisition. Despite these limitations, the results suggest that edutainment videos are a highly effective and engaging supplement to traditional teaching methods, with the potential to boost trainees' knowledge, confidence, and interest in pediatric ophthalmology.

Assessing the competitiveness of applicants in the ophthalmology match based on interest in pediatric ophthalmology

Cubells C, Martinez P, Heilenbach N, et al.

J AAPOS 2025 Jun;29(3):104215

Although pediatric ophthalmology and strabismus (PO&S) has consistently fewer filled fellowship positions than other specialties, it's not clear where along the recruitment path trainees lose interest. A study sought to understand this by analyzing the competitiveness of applicants who expressed interest in PO&S. The researchers reviewed 631 ophthalmology residency applications submitted to a single program during the 2022-2023 cycle. Of the 125 applicants who stated a subspecialty interest, 34 (27.2%) were interested in PO&S. The study found that applicants interested in PO&S were more likely to be female ($P<0.001$), but there were no significant differences in their academic performance, research activities, or extracurriculars when compared to other applicants or those interested in more competitive subspecialties like cornea, retina, or glaucoma. This suggests that applicants interested in PO&S are just as competitive as their peers who choose other fields. While the study is limited by its small sample size from a single institution and only includes a pool of competitive applicants, its findings indicate that a high proportion of medical students who express a fellowship interest are initially drawn to pediatrics. This means recruitment efforts should be focused on encouraging medical students with a stated interest in pediatrics to apply for ophthalmology residency, as these individuals are a promising target for filling future PO&S fellowship spots.

Utility, safety, and accessibility of phone call follow-up in strabismus surgery postoperative care

Shao CG, Morales N, Lee AR

J AAPOS 2025 Jun;29(3):104218

Given the common challenges of work conflicts and transportation, a study investigated whether a phone call follow-up could be a safe and effective alternative to a traditional in-person visit after pediatric strabismus surgery. The researchers conducted a retrospective review of 370 consecutive pediatric patients who underwent strabismus surgery between mid-2018 and 2021. They compared the success of a first postoperative week (POW1) follow-up via phone call versus an in-person visit. The results showed that both methods were highly successful, with a 96.2% success rate for phone calls and a 95.2% success rate for in-person visits ($P=0.66$). Importantly, there was no significant difference in the number of complications detected between the two groups; nine were found in the in-person group, and seven in the phone group, and none of these

complications led to vision loss. The study also found that phone follow-ups were 81% more cost-effective per patient encounter. The findings are significant for clinical practice, as nearly half of the patients in the study had to travel over 50 miles for their appointments. The study suggests that implementing a standardized phone call follow-up is a safe and cost-effective way to improve healthcare access, particularly for patients who live far from the clinic, while maintaining the ability to detect early complications. The limitations of this study include its retrospective design, data from a single surgeon, and lack of patient satisfaction metrics.

Practices of a United States school-based vision program in referring children to community eye care

Ambrosino CM, Guo X, Nguyen A, et al

J AAPOS 2025;29(2):104164

Though school-based vision programs (SBVPs) improve access to care and assist in managing refractive error in school-aged children, many children require further professional management for more complex medical issues like strabismus and amblyopia. This study evaluated the referral patterns of a large US SBVP by performing a retrospective cross-sectional analysis of data collected from students from Pre-K through 12th grade who underwent an SBVP exam (noncycloplegic optometric exam) after failed vision screen. Student characteristics such as demographics and refractive error were assessed, as well as school-level indicators of socioeconomic status. Logistic regression models were used to determine if associations existed between student and school characteristics and referral patterns. Of 97,107 students from 504 schools, 13,884 were referred to community eye care due to best corrected visual acuity of 20/50 or worse, poor cooperation, or suspicion for ocular pathology. The mean age of referred children was significantly lower than those not referred, and students from schools in more disadvantaged areas were more likely to be referred. Students with more extreme refractive error (high hyperopia or high myopia) were more likely to be referred than students with emmetropia. Students who were not referred were more likely to be given a glasses prescription at the school exam. Refractive error was the most common reason for referral. Limitations of this study include use of de-identified data, meaning some children could have had multiple screenings/exams during the study period. Some demographic information was inferred for individuals based on school-level socioeconomic data. Variability existed in referral patterns due to provider discretion, and no data was collected on follow-up rates after referral. This study highlights the importance of SBVPs in improving access to care but also shows the need for more resources in schools to ensure appropriate referral and follow-up for patients needing professional care, particularly younger children and those from underserved communities.

The timing and impact of factors influencing the pursuit of pediatric ophthalmology fellowship training

Lin M, Bradfield Y, Soni A, et al.

J AAPOS 2025;29(4):104256

As the pediatric ophthalmology and strabismus (PO&S) workforce is experiencing a shortage, this study aims to evaluate the motivations and deterrents to a career in pediatric ophthalmology of US PO&S fellows who completed fellowship between 2022-2024. A survey of US PO&S fellows graduating between 2022-2024 was conducted using a questionnaire to assess factors that both

positively influenced and drew concern regarding their choice of career in PO&S. The responses were analyzed for timing of career choice, influential experiences, motivators, concerns, and additional comments provided in a free response section. The most frequent timing of choosing PO&S as a career was in medical school (40%) followed by PGY3 (24%) and PGY2 (18%) in residency. Among the respondents who decided in medical school, experience in clinic and faculty mentorship ranked the most important, and those who decided during residency similarly most valued faculty mentorship and experience in the operating room and clinic. Top motivators for a career in PO&S were types and varieties of surgeries performed, patient demographics, and opportunity to fill a need. Top concerns were financial compensation, difficulty of the field, and providing care for retinopathy of prematurity. A strength of this study is that it adds to the literature by evaluating the timing and qualities of exposure to PO&S during medical school. Limitations include response bias from questionnaire format. This study suggests that exposure to PO&S in medical school and mentorship are key motivators in choosing a career in PO&S.

Pediatric residents' perceptions of eye care curriculum and training

Saleem Z, Vorias T, Skanchy D, et al.

J AAPOS 2025 Jun;29(3):104181

Optimizing residency training is important to bolster primary eye care, yet pediatric residency directors report dissatisfaction with their programs' ophthalmic curriculum. The purpose of this study was to understand the perspectives of pediatric residents regarding their ophthalmic training. An anonymous 17-question survey was administered electronically to pediatric residents at five large, geographically diverse US programs assessing participants' levels of agreement with statements addressing their confidence in providing eye care, knowledge about managing common eye problems, and satisfaction with ophthalmic curricula. Of 173 (32%) respondents of 540 residents invited to participate, 91% were not confident performing instrument-based vision screening, and 47.4% felt confident using a wall chart to test visual acuity. Seventy percent of respondents felt confident performing an eye examination, including red reflex test or pupil examination. Regarding common eye problems, 22.5% chose an inappropriate management of viral conjunctivitis and 20.2% would not urgently refer an infant with asymmetric red reflexes to ophthalmology. 19.7% did not know the recommended age to begin testing visual acuity. Dissatisfaction with their eye care training was noted by 68%. Limitations included low response rate. The impact on clinical practice is that there is a need for more robust ophthalmic training in pediatric residencies to increase adherence to current eye care screening guidelines.

Geographic distribution and coverage of pediatric ophthalmologists in the United States

Franco JJ, Shapiro JN, Johnson-Griggs MA, Mian SI

J AAPOS 2025 Jun;29(3):104223

The United States faces a persistent shortage of pediatric ophthalmologists (POs). Improved characterization of the geographic distribution and reach of providers is needed to inform health policy, trainee recruitment, and care delivery efforts. The study used drive time-based service area analysis to characterize the geographic coverage of 1099 POs in the United States and show that 1 in 7 American children live outside 60 minutes of PO care, and about half of counties have a pediatric majority beyond 60 minutes of PO care. Areas with greater racial homogeneity (by racial homogeneity index) and a higher proportion of uninsured and very low income residents

exhibited significantly higher odds of reduced access (ie,>60 min), in contrast with areas with higher proportions of pediatric-age, Hispanic/Latino, and college-educated residents demonstrate lower odds of reduced access. A limitation to this study was it presumed access to a personal automobile and only PO fellowship trained providers were included. The impact on clinical practice is that there is a need for improving geographic access to PO care.

Pediatric Eye-Related Emergency Department Visits and Pediatric Eye Provider Location and Density

Oatts JT, Xu A, Morse JR, Neemann JM, et al.

Ophthalmol Sci 2025;5(5):100776

There is a shortage of pediatric ophthalmologists in the United States, and the majority of communities, particularly those positioned more rurally, do not have easy access to pediatric eyecare provider. This population based cross-sectional study aimed to address the incidence of pediatric eye-related ED visits in California in relation to access to pediatric eye care in the community. Patients presenting to the ED for an eye related concern as the primary or secondary diagnosis were identified using the California Department of Health Care Access and Information Emergency Department Dataset. Pediatric eye care providers (ophthalmology and optometry) were identified using publicly available databases. Of all ED visits in California from 2012-2021, 23.3% were for children <18yo and 1.4% were eye-related concerns. The most common diagnoses for these visits included conjunctivitis (63.8%), chalazion/blepharitis (14.4%) and other disorders of the eye/adnexa (3.3%). There was a disproportionate use of the ED for these types of encounters by patients of Black and Hispanic race. In California, there are 142 pediatric eyecare providers, which amount to one for every 61, 413 children. Importantly, due to clustering of providers, 91.8% of zip codes had no pediatric eye care provider. While the use of zip codes for classification is limiting due to their varying size and variable socioeconomic make-up, and the retrospective nature of this study does not allow for evaluation of other factors such as parental health literacy, this study points to the deep importance of addressing geographic disparities in access to pediatric eye specialists, particularly as it relates to ED utilization for ocular conditions that could be easily managed in the outpatient clinical setting.

Prematurity

Visual and refractive outcomes up to 5 years of age of dome-shaped macula detected by handheld spectral domain optical coherence tomography in preterm infants

Adan NM, Ohan M, Wu JG, et al.

J AAPOS 2025 Jun;29(3):104219

The visual implications and pathophysiology of dome-shaped macula (DSM) in premature infants are not well understood, despite it being observed in at least 65% of cases using handheld spectral domain optical coherence tomography (SD-OCT). A prospective, observational study was conducted to evaluate the long-term visual and refractive outcomes of DSM in preterm infants. The study included 95 preterm infants, 58 of whom (61%) had DSM in at least one eye. Visual and refractive outcomes were assessed by a single, masked pediatric ophthalmologist at 9 months, 2 years, and 5 years of age. The results showed no significant differences in logMAR visual acuity, spherical equivalent, or the rates of astigmatism and strabismus between infants with and without DSM at any of the follow-up points. While the study's findings are limited by an increasing rate of patients being lost to follow-up over time and a relatively short follow-up period, the results suggest that DSM detected by handheld SD-OCT in premature infants during infancy does not appear to be associated with differences in visual acuity, refractive error, or strabismus up to 5 years of age. This indicates that clinicians can reassure parents that this finding may not lead to significant long-term visual issues in their children.

Refractive Error

The Short-term Effect of Atropine 0.1% on the Axial Length and Choroid of Children Treated for Myopia Progression Prevention, Measured by Optical Coherence Tomography Angiography

Koulalis JA, Nelis P, Cools W, et al.

J Pediatr Ophthalmol Strabismus 2025;62(4):265-270

Although well-established as a treatment for progressive myopia, the exact mechanism of action of atropine drops in this setting has yet to be fully determined. In this study, the authors used optical coherence tomography angiography to investigate the structural effects of short term, low dose atropine administration in children. For this study, the authors recruited 25 children with documented myopic progression and assigned them to use 0.1% daily atropine drops in both eyes for one month. They then compared OCT-A data from before and after the month of treatment. Following one month of treatment with these low dose atropine drops, there was a statistically significant increase in choroidal thickness and a statistically significant decrease in axial length. While certainly not definitive, the authors posit that these structural changes may underlie the mechanism and efficacy of atropine in myopia control. Given the increase in use of low dose atropine worldwide, understanding its mechanism is imperative, and this study adds the body of literature.

One-Year Results of 0.1% and 0.05% Atropine Eye Drops in Childhood Myopia Progression
Akdemir SC, Akalın I, Günay BÖ

J Pediatr Ophthalmol Strabismus 2025;62(4):297-302

Myopia is a growing global health issue. Atropine, a non-selective antimuscarinic agent, is among the most effective treatments studied, though its exact mechanism remains unclear. Prior research has shown that low concentrations of atropine (0.01–0.05%) reduce myopia progression with fewer side effects than higher doses. This retrospective study evaluated the safety and efficacy of 0.01% and 0.05% atropine eye drops administered every other day in 46 children (92 eyes) aged 5–15 years. After 12 months, both concentrations significantly slowed myopia progression, with mean spherical equivalent changes of -0.41 D (0.01%) and -0.19 D (0.05%). Axial length changes were similar between groups. Side effects were dose-dependent: photophobia occurred in 12.5% and near-vision blur in 33% of the 0.05% group, but neither was reported in the 0.01% group. The findings suggest that alternate-day dosing of both 0.01% and 0.05% atropine is effective for myopia control, with 0.01% being better tolerated. The most interesting aspect of this study, to me, was the efficacy of every other day dosing. Most of the larger trials have focused on daily atropine, while this suggests that every other day dosing of low-dose atropine still may be effective. This warrants further consideration and study.

Multifocal Soft Contact Lenses for the Treatment of Myopia Progression in Children: A Report by the American Academy of Ophthalmology

Cavuoto KM, Trivedi RH, Prakashakorn SG, et al.

Ophthalmology 2025 Apr;132(4):495-503

This is a report by the American Academy of Ophthalmology, evaluating the efficacy and safety of multifocal soft contact lenses (MFCLs) for controlling myopia progression in children. The review included 10 studies (3 randomized controlled trials [RCTs], 7 nonrandomized studies) focusing on MFCLs compared to single-vision contact lenses or spectacles in children aged 5–18 years. Outcomes assessed were myopia progression (measured by spherical equivalent refraction [SER] and axial length [AL]) and safety (adverse events). MFCLs significantly reduced myopia progression compared to controls. In RCTs, MFCLs showed a mean reduction in SER progression of 0.23–0.46 diopters (D) and AL elongation of 0.07–0.16 mm over 1–2 years. Nonrandomized studies reported similar trends, with high-add power MFCLs (e.g., +2.00 D) generally more effective than low-add or center-distance designs. Peripheral defocus created by MFCLs is thought to slow axial elongation, a key factor in myopia progression. Adverse events were minimal, with no significant increase in complications (e.g., corneal abrasions, infections) compared to single-vision lenses. Dropout rates were low, indicating good tolerability. The review notes variability in study designs, lens types, and follow-up durations (1–3 years), limiting long-term conclusions. Most studies were conducted in East Asian populations, potentially affecting generalizability. MFCLs are a viable, safe option for slowing myopia progression in children, particularly those at high risk of high myopia. However, long-term data and standardized lens designs are needed to optimize treatment protocols. The report supports the use of MFCLs as an effective and safe intervention for controlling myopia progression in children, with stronger evidence for high-add power lenses. Clinicians should consider patient-specific factors and monitor outcomes, while further research is needed to assess long-term efficacy and broader applicability.

Behavioral Intervention with Eye-Use Monitoring to Delay Myopia Onset and Progression in Children: A Cluster Randomized Trial

Hu Y, Yu M, Han X, et al.

Ophthalmology 2025 Jun;132(6):701-712

This is a cluster-randomized controlled trial (open-label, examiner-masked) aimed to evaluate whether an intervention using the Eye-Use Monitor—with vibration reminders alone or combined with behavioral feedback—could delay myopia onset and progression in schoolchildren. The study included 413 children (grades 2–4, aged ~8 years) from one primary school in Huantai County, Shandong, China (Oct 2021–Dec 2023). They were randomized by class (stratified by grade) into: reminder and feedback (6 classes, n=156), reminder-only (5 classes, n=147), control (3 classes, n=110). Exclusions included prior myopia interventions, amblyopia, high astigmatism/anisometropia, eye diseases. All received myopia education. Eye-Use Monitor (clip-on device) measured behaviors every 5 seconds during near work (10–60 cm) and was worn 2 weekdays/week (~2 hours school, 1 hour home) for 49 weeks, then 49-week observation without intervention. For the reminder-only group, the device gave vibration alerts for prolonged near work (>20 min), close distance (<33 cm), head tilt (>10°), and low light (<300 lux). For the reminder

and feedback group, the device gave alerts + tailored feedback (teacher praise/rewards, school certificates, parental weekly reports/scores [0-10 scale]). Data was collected at baseline, 25, 49, and 98 weeks. At 49 weeks, there was less SE myopic shift in the reminder + feedback group (-0.52 ± 0.35 D) vs. reminder-only (-0.59 ± 0.43 D) vs. control (-0.73 ± 0.48 D). This was Similar at 98 weeks and the differences persisted. AL increase was smallest in reminder+feedback (0.30 ± 0.14 mm at 49 weeks) Myopia incidence was 13.3% in reminder+feedback vs. 21.6% reminder-only vs. 27.8% control at 49 weeks; no difference at 98 weeks. Fast myopic shift was 54.5% vs. 63.3% vs. 71.8% at 49 weeks. Behaviors improved most in reminder+feedback (shorter near-work bouts, greater distance, better lighting/posture but regressed post-intervention. The study showed that intervention, especially with feedback, effectively reduced myopic shifts (SE/AL) and incidence by promoting better eye-use behaviors, likely via reduced accommodative demand and supportive environments (family/school). Benefits waned after cessation, emphasizing need for sustained efforts.

Association of Attention-Deficit Hyperactivity Disorder With Myopia Among School Children

Chen XN, Zhang XJ, Zhang Y, et al.

Invest Ophthalmol Vis Sci 2025 Jul 1;66(9):36

The study investigates the association between attention-deficit hyperactivity disorder (ADHD) and myopia among 10,424 Hong Kong school children aged 6-8 years, using data from the Hong Kong Children Eye Study (2016-2021. ADHD children (5% of the sample) showed a lower age- and sex-adjusted myopia prevalence (21% vs. 26% in controls, $P=0.02$), higher spherical equivalent refraction (SER) (0.26 D vs. 0.16 D, $P=0.09$), and shorter axial length (AL) (22.95 mm vs. 23.05 mm, $P<0.001$) compared to controls. Children with ADHD treated with MPH had an even lower myopia prevalence (19% vs. 26%, $P=0.08$), higher SER (0.43 D vs. 0.16 D, $P=0.01$), and shorter AL (22.77 mm vs. 23.05 mm, $P<0.001$). Longer MPH use correlated with increased SER and reduced AL. Higher inattention scores were linked to less myopia ($OR=0.88$, $P=0.01$), higher SER ($\beta=0.07$, $P=0.003$), and shorter AL ($\beta=-0.04$, $P=0.001$), while hyperactivity showed no significant association. Myopia prevalence in ADHD children rose from 23% pre-pandemic to 32% during the pandemic ($P=0.04$), mirroring trends in controls (25% to 36%, $P=0.007$), linked to reduced outdoor time and increased near-work/screen time. Effect sizes were small (e.g., 0.1 D SER difference), suggesting cautious interpretation of clinical significance. Limitations include the cross-sectional design, small MPH-treated subgroup, and potential population-specific findings, warranting further longitudinal and diverse population studies.

Longitudinal Study of Changes in Retinal Curvature and its Relationship With Myopia Shift in Chinese Children

Wu Y, Liu X, Qian W, et al.

Invest Ophthalmol Vis Sci 2025 Jul 1;66(9):37

This study investigates longitudinal changes in retinal curvature (RC) and their relationship with myopia progression in Chinese children aged 6-16 years over a 12-month period. Conducted by researchers from Shanghai Jiao Tong University School of Medicine, the study used swept-source optical coherence tomography (SS-OCT) and a customized 3D reconstruction algorithm

to assess RC in the macular region. Participants included 111 children (58 boys, 53 girls) with an average age of 9.46 years. Children were divided into myopic shift (36) and non-myopic shift (75) groups based on changes in spherical equivalent refraction (SER) over one year (myopic shift defined as SER decrease ≥ 0.5 D). Significant increases in central RC (0-6 mm region) were observed in the myopic shift group, particularly in the 0-3 mm central circle (C0), temporal 3-6 mm (T1), 6-9 mm (T2), and inferior 3-6 mm (I1) regions. A negative correlation was found between baseline nasal-temporal retinal surface asymmetry index (R-SAI) and myopic shift. Age, axial length (AL) elongation, and smaller baseline curvature were associated with larger RC changes. RC changes are closely linked to myopia progression, suggesting that longitudinal RC monitoring could be a quantitative measure for assessing morphological changes in myopic children. This research highlights RC as a potential marker for myopia development, offering insights into ocular shape changes in children.

IMI-Instrumentation for Myopia Management

Jones D, Chow A, Fadel D, Gonzalez Meijome JM, et al.

Invest Ophthalmol Vis Sci 2025 Jul 1;66(9):7

This article discusses advanced tools for managing the rising prevalence of myopia. It emphasizes the role of instrumentation in early diagnosis, monitoring progression, and tailoring treatment plans. The focus is on optical and structural assessment tools, excluding functional and multimodal methods. Optical Assessment included ocular refraction (e.g., cycloplegic methods for accurate measurement in children), corneal curvature (via topography/tomography for lens fitting), aberrometry (measuring optical imperfections), and pupillometry (pupil size analysis). Structural Assessment involves dimensional measurements (e.g., axial length via biometers) and imaging (e.g., fundus photography, OCT for posterior segments, and Scheimpflug imaging for anterior structures). These tools enable precise, repeatable measurements, supporting personalized myopia control strategies like orthokeratology and spectacle lenses. They also aid in patient education and adherence to treatment. The article highlights how integrating these technologies enhances global efforts to manage myopia, particularly in at-risk populations.

Diversified Segmental Defocus Optimization Lenses With and Without Atropine for Myopia Prevention: A Randomized Clinical Trial

Lu Y, Yang X, Zhou J, et al.

JAMA Ophthalmol 2025 Aug 1;143(8):684-691

A randomized clinical trial was conducted to evaluate the efficacy of diversified segmental defocus optimization (DSDO) spectacle lenses with or without 0.01% atropine for myopia prevention. The study involved 370 children aged 5 to 12 years with spherical equivalent refraction (SER) of 0.00 to 1.00 diopters after cycloplegia. The primary outcomes were the cumulative incidence rate of myopia and the percentage of participants with fast myopic shift over 1 year. The results showed

that both DSDO and DSDOA groups showed significantly lower 1-year cumulative myopia incidence and the percentage of patients with fast myopic shift compared to the control group. No significant differences were observed between the DSDO and DSDOA groups. The study suggests that daily use of diversified segmental defocus optimization (DSDO) spectacles may delay the onset of myopia in children without myopia, supporting DSDO spectacles without atropine as an alternative preventive method for children without myopia. The results suggest that DSDO spectacles without atropine could be an effective preventive method for children without myopia, if supported with longer follow-up and replication by others.

Orthokeratology, 0.04% Atropine and 0.01% Atropine for Myopia Control: A Randomized Clinical Trial

Xu H, Chen M, Ye L, et al

JAMA Ophthalmol 2025 Jul 24:e252321

The study aimed to evaluate the efficacy and safety of orthokeratology, 0.04% atropine, and 0.01% atropine in controlling myopia among older children and adolescents over a 2-year treatment period. The study involved 209 children aged 8 to 15 years with refractive errors between -1.0 diopter (D) and -4.0 diopter. The primary outcome was 2-year axial length (AL) growth. The results showed that children receiving 0.04% atropine had a significantly reduced AL increase than those receiving 0.01% atropine. A nonsignificant but clinically meaningful difference was found between the 0.01% atropine group and the orthokeratology group. Regression analyses revealed that older age was associated with less AL growth for all groups, while a more myopic SE at baseline predicted slower axial elongation for the orthokeratology group. The 0.04% atropine group had a higher risk of photophobia than the 0.01% atropine group. In conclusion, 0.04% atropine was more effective than 0.01% atropine or orthokeratology to control myopia, despite a higher incidence of photophobia.

Cone Density Changes After Repeated Low-Level Red Light Treatment in Children With Myopia

Liao X, Yu J, Fan Y, et al.

JAMA Ophthalmol 2025 Jun 1;143(6):480-488

The study aimed to evaluate the changes associated with repeated low-level red light (RLRL) therapy on cone photoreceptor density in children with myopia using high-resolution adaptive optics scanning laser ophthalmoscopy (AOSLO). The study involved 99 children with myopia aged 5 to 14 years, who were assigned to the RLRL group or the control group. Cone density measurements were obtained from AOSLO retinal images. Results showed that RLRL therapy for at least 1 year was associated with reduced cone density in the paracentral fovea and other subtle retinal abnormalities in some children receiving this therapy for myopia control. These findings support the need for further research to evaluate the longer-term safety of RLRL therapy in similar individuals.

Prevalence and Severity of Astigmatism in Children After COVID-19

Kam KW, Shing E, Zhang Y, et al.

JAMA Ophthalmol 2025 May 1;143(5):383-391

The study aimed to report the prevalence of refractive and corneal astigmatism in schoolchildren from 2015 to 2023 and explore the associations between the pandemic and astigmatism. The study involved 21 655 children aged 6 to 8 years who underwent comprehensive ocular examinations at two academic medical centers in Hong Kong from 2015 to 2023. The prevalence rate of refractive astigmatism of at least 1.0 diopter (D) was 21.4% in 2015, and corneal astigmatism of at least 1.0 D 59.8% in 2022-2023. The pandemic was associated with a 20% increase in the risk of refractive astigmatism, a 26% increase in the risk of corneal astigmatism, and a magnitude of refractive astigmatism and corneal astigmatism. Corneal changes, especially along the steepest meridian, may explain some of the progression of corneal astigmatism. The potential impact of higher degrees of astigmatism may warrant dedicated efforts to elucidate the relationship between environmental and/or lifestyle factors, as well as the pathophysiology of astigmatism.

Three-Year Change in Subfoveal Choroidal Thickness and Area With Multifocal Contact Lens Wear in the Bifocal Lenses in Nearsighted Kids (BLINK) Study

Walker MK, Berntsen DA, Robich ML, et al

Invest Ophthalmol Vis Sci 2025;66(5):5

In a three-year, double-masked, randomized clinical trial called the BLINK study, researchers investigated the role of the choroid, a vascular tissue that influences scleral growth, in myopic children aged 7-11. The study, which involved 281 participants, aimed to understand how multifocal contact lenses (MFCLs) affect choroidal thickness and myopia progression. Children were assigned to wear one of three types of lenses: single vision lenses (SVCLs), MFCLs with a +1.50 D add, or MFCLs with a +2.50 D add. Using optical coherence tomography (OCT), subfoveal choroidal thickness and area were measured at baseline, after 2 weeks, and annually thereafter. The results showed that the group wearing the +2.50 D add MFCLs experienced a rapid and significant increase in both choroidal thickness (8 μm) and area (0.07 mm^2) within the first two weeks, a change that was sustained over the three-year study. This initial choroidal thickening was directly associated with less axial elongation, accounting for 20% of the treatment effect on thickness and 29% on area. In contrast, the +1.50 D add MFCL group showed no significant choroidal changes or reduction in axial elongation. While the study's strength lies in its long-term, longitudinal data collection, a limitation is its inability to account for factors like diurnal variations that can affect choroidal thickness. Ultimately, the findings suggest that the choroid's rapid response to certain lens designs may play a role in slowing myopia progression, though it doesn't fully explain the total treatment effect.

Peripheral Blur Perception in Young Children at Low Risk or High Risk of Myopia: Longitudinal Data

Dhungel D, Bex PJ, McCullough A, et al.

Invest Ophthalmol Vis Sci 2025;66(5):40

This three-year longitudinal study investigated whether peripheral blur sensitivity could predict myopia onset in young, functionally emmetropic children by adapting a psychophysical blur discrimination task for ages 6-9. Participants were categorized as being at low or high risk for myopia and were tested with stimuli simulating defocus and spherical aberration. Although all children consistently showed poorer blur perception in the periphery compared to their central vision, there was no overall significant difference between the low-risk and high-risk groups. Interestingly, the high-risk group demonstrated a significantly greater decrease in intrinsic blur over time. Despite the study's strengths, including its longitudinal design and child-friendly task adaptation, a considerable data exclusion rate and a small number of children who developed myopia limited some statistical analyses. Ultimately, the findings suggest that peripheral blur perception, as measured in this study, may not serve as a direct predictive factor for myopia risk in this age group.

Linear relationship between triglyceride-glucose-body mass index and myopia in United States adolescents

Jin Z, Liu Y, Luo Y

Eur J Ophthalmol 2025;35(4):1255-1263

Myopia, or nearsightedness, is a growing global health concern among adolescents, influenced by a complex mix of genetic, environmental, and lifestyle factors. While some research has linked nutrition and body mass index (BMI) to the condition, the role of a more comprehensive metabolic marker like the triglyceride-glucose-body mass index (TyG-BMI) has been less studied, especially in U.S. adolescents. To address this, a cross-sectional study analyzed data from the National Health and Nutrition Examination Survey (NHANES) from 1999–2006, including 3,367 adolescents aged 12–19. Using multivariate logistic regression and other statistical models, the study sought to determine the relationship between TyG-BMI and the incidence of myopia, which was defined as a spherical equivalent of -0.50 diopters or less. The findings revealed a myopia prevalence of 42.17% in the sample and a significant, positive, and linear association between TyG-BMI and myopia. Specifically, adolescents in the highest TyG-BMI quartile had a 20% higher risk of myopia than those in the lowest, even after accounting for other factors. The study's strengths include its large, nationally representative sample and rigorous statistical methods, though its cross-sectional design prevents drawing conclusions about cause and effect. Additionally, the lack of medication data might have underestimated the true association. Ultimately, the results suggest that incorporating metabolic health monitoring, like TyG-BMI, into routine eye care could help with early identification and prevention of myopia in adolescents.

Artificial intelligence in the diagnosis and management of refractive errors

Nguyen T, Ong J, Jonnakuti V, et al

Eur J Ophthalmol 2025;35(4):1456-1480

While traditional diagnosis and management of refractive error—a leading cause of global visual impairment—relies on specialized eye exams, limited access to these services has prompted a shift toward innovative solutions. A review of 128 research articles published up to February 2024 explored the immense potential of artificial intelligence (AI) in this field. The findings show that AI, specifically through machine learning and deep learning, can be trained to analyze clinical data to not only detect refractive errors but also to predict the risk of conditions like myopia progressing.

The technology also proves valuable in optimizing lens fittings, such as for implantable collamer and orthokeratology lenses, with high accuracy and in improving surgical planning for other refractive procedures. Additionally, integrating AI with digital tools like telehealth, smartphone apps, and virtual reality offers new ways to screen for refractive errors. A major strength of AI is its ability to provide scalable and early detection tools that can bridge service gaps, particularly for children in underserved areas. However, its widespread clinical adoption faces challenges, including the need for more robust validation datasets, standardized data, and better image quality, as well as addressing issues of population diversity and patient privacy. Ultimately, AI has the potential to transform pediatric ophthalmology by enabling early detection, risk stratification, and better treatment planning while expanding access to remote eye care services for children.

Long-term effect of repeated low-level red light therapy on myopia control: A systematic review and meta-analysis

Ullah S, Umer MF, Chandran SP

Eur J Ophthalmol 2025;35(4):1432-1444

Myopia is a growing global health issue in children, leading to axial elongation of the eye and a higher risk of serious ocular complications. Given that traditional treatments can be invasive or carry risks, there is a push to find non-invasive alternatives like Repeated Low-Level Red Light (RLRL) therapy. To evaluate its effectiveness, a systematic review and Bayesian meta-analysis was conducted, which synthesized data from 10 randomized controlled trials with a total of 1,714 participants. The study compared the long-term efficacy of RLRL therapy combined with single-vision spectacles (SVS) to SVS alone over at least 12 months. The results showed that RLRL therapy was significantly more effective in slowing myopia progression, leading to a substantial reduction in both axial length (pooled effect size of 0.953 mm) and spherical equivalent refraction (pooled effect size of 1.521 D). While the study's strengths include its use of advanced Bayesian analysis and the large number of trials reviewed, its limitations are the single-blinded nature of most studies, the short follow-up period which prevents a full assessment of potential rebound effects, and the fact that all included studies were from Chinese populations, which limits the generalizability of the findings. Nonetheless, these results suggest that RLRL therapy is a promising, effective, and minimally invasive adjunctive treatment option for managing myopia in children, though further long-term research is needed.

Prevalence of Myopia and Axial Length Distribution in China: The Wuhu Children and Adolescents Eye Study

Dong L, Zhou WD, Hu YB, et al.

Invest Ophthalmol Vis Sci 2025 Jun 2;66(6):33

This large-scale, cross-sectional analysis of the longitudinal Wuhu Children and Adolescents Eye Study (WCAES) assessed myopia prevalence, ocular biometry (including axial length), and fundus findings in 315,569 children and adolescents aged 2 to 19 in the Wuhu, Anhui Province, achieving a 95.6% participation rate across 513 schools. Using non cycloplegic autorefraction and AI-assisted fundus photography, the authors found that 56.9% had myopia (≤ -1.00 D), with

4.3% exhibiting high myopia (≤ -6.00 D); among high schoolers, myopia prevalence reached 92.2%. Myopia and high myopia were strongly associated with older age, female sex, longer axial length, and fundus tessellation; yet less than half (48%) of myopic children used corrective lenses, and 65.8% had suboptimal presenting visual acuity despite myopia. These results indicate a continuing surge in myopia, especially high myopia, among younger Chinese generations compared to prior reports. The study has several limitations including the lack of cycloplegic data (which may overestimate myopia prevalence), AI assessments without manual validation, and cross-sectional nature which limits conclusions about progression or causality. Furthermore, the finding that a significant number of students were either under-corrected or uncorrected likely highlights public health disparities specific to this study region of China and cannot be generalized to all patient populations.

Myopia Development During Transition From Kindergarten to Early Grades in Elementary School: Population-Based Evidence From an Epidemic Area in Taiwan

Yang YC, Tsai DC, Fang SY, et al.

Invest Ophthalmol Vis Sci 2025 Jun 2;66(6):48

In this population-based cohort study conducted in Yilan County, Taiwan, the authors aimed to investigate the incidence of myopia and its risk factors among children transitioning from kindergarten to early elementary school. They linked cycloplegic refractive data and caregiver questionnaires collected between December 2023 and March 2024 for first- and second-grade students (ages 5–7) with their kindergarten eye health records. Among 1,428 preschoolers who were non myopic initially, the incidence density of myopia was 8.70% per person-year. Multivariate analysis revealed that children with pre-myopia (SE between -0.5 and $+0.75$ D) in kindergarten had a 9.6 fold increased risk of developing myopia; having two myopic parents and older age at examination were also significant risk factors. Conversely, spending more than 30 minutes per weekday outdoors during kindergarten was protective. Study limitations include its overrepresentation of suburban students that may affect generalizability and potential recall bias from parent reported behaviors. The findings of this study support many of the myopia studies in the literature regarding risk factors for myopia progression.

Refractive changes in children in the Chicago area during the COVID-19 pandemic: a retrospective observational study

Kim E, Stec M, Shaikh N, Huang J, et al.

Br J Ophthalmol 2025;109(5):543-548

Near work and decreased time outdoors have been shown to be associated with myopic progression in school-aged children in East Asian populations. This study investigated myopic progression in Chicagoland children prior to and during the COVID-19 pandemic when there had been mandated remote learning (from March 2020 – February 2021) that led to increased screen time and decreased outdoor time. This was a retrospective observational study that included

2,064 patients aged 2–17 years old who obtained cycloplegic refractions at a tertiary children's hospital during the months of January 2019 – March 2021. On average, there was a significant increase (2.2x) myopic progression during the pandemic 2020 –2021 (with change in mean spherical equivalent of 0.42D) compared to pre-pandemic 2019–2020 (change of 0.19D). A subset of 109 patients who returned in the same month all three years also demonstrated a significant myopic shift 2020–2021 but not 2019–2020. The greatest myopic shift occurred in the low myopic patients (-3.00D to -0.50D). The strength of this study was the sizeable population cohort within a diverse (sub-)urban region in a Western population. The weaknesses were the retrospective nature and that behavioral changes and environmental factors were not quantitatively assessed. This is a helpful study that corroborates similar findings in Western schoolchildren compared to those seen in other global studies and provides more public health evidence towards the impact of styles in school learning and activity on the myopic epidemic.

Evidence for hypermetropia, astigmatism, and anisometropia associated with, and early glasses preventing, the development of amblyopia and accommodative esotropia

Steltman JS, Loudon SE, Simonsz HJ

Strabismus Published online September 2, 2025

In this thorough review and analysis of previously published longitudinal studies of children aged 6 to 24 months with hyperopic refractive errors, the authors aimed to evaluate the potential for developing amblyopia and/or accommodative esotropia and potential to mitigate with glasses. Of the 5,458 articles identified, only 16 (including 1 RCT) met the strict inclusion criteria. The results indicated that children in this age group with increasing hyperopia were at a >9 times greater risk for developing subsequent amblyopia and/or accommodative esotropia without treatment with glasses. Risks associated with increasing astigmatism were still greater, but risks were much less for patients with anisometropia. The one RCT included in this review did not show a significant benefit by prescribing glasses in this young age group, but compliance issues were cited as limiting the benefits of glasses. This paper compiles decades of research on this topic into one well-written review article. The pediatric ophthalmologist may find this paper useful in discussing options of whether to prescribe glasses to 6 to 24-month-old patients with hyperopic refractive errors and in discussions when compliance is limited.

Association of Optic Nerve Head Metrics and Parapapillary Gamma Zone With Myopia Onset and Progression in Children: The Hong Kong Children Eye Study

Zhang XJ, Li Y, Zhang Y, et al

Invest Ophthalmol Vis Sci 2025;66(11):1

The article investigates the association between various optic nerve head (ONH) metrics, parapapillary gamma zone, and the development and progression of myopia in children. The study addresses the need to understand how these ocular features contribute to the onset and worsening of myopia. This was a prospective cohort study that enrolled 765 of children and monitored them over time. The researchers used spectral-domain optical coherence tomography (SD-OCT) to measure ONH parameters and gamma zone area, and they performed cycloplegic refraction to assess myopia status. The study found that ONH parameters like nasal and temporal border tissue angle, disc torsion, and optic disc-fovea distance may have predictive value for myopia onset and progression. A key strength of the study is its prospective, longitudinal design

and large cohort. A limitation is that the study was conducted in a specific population (Hong Kong children) and there was a propensity for dropout of the study amongst patients with more myopic progression. The findings suggest that certain OCT findings could serve as a useful clinical biomarker for predicting myopia progression in children.

Comparison of axial length measurements of myopic eyes from ocular biometers versus axial length estimator

Ha T, Ganesh S, Narendran K, et al

J AAPOS 2025;29(4):104254

Axial length (AL) is a key parameter in assessing myopia in children, with longer AL associated with higher risk of complications. While non-invasive optical biometers like the IOLMaster 700 and Lenstar 900 are accurate, their cost and limited availability in low-resource settings necessitate considering alternative methods like the Axial Length Estimator (ALE) developed by Morgan and colleagues, which has been studied in non-Asian populations with controversial results. This study aims to compare the ALE to IOLMaster 700 and Lenstar 900 in Indian and Vietnamese cohorts, respectively. This was a retrospective study using data from a prospective trial conducted in Vietnam between 2019-2020 and a medical records review of clinical ophthalmology visits from India during the same time. Ocular refraction was obtained with autorefractometry, AL and keratometry measurements were obtained using the IOLMaster 700 in India and the Lenstar 900 in Vietnam. The ALE formula was also used to predict AL from the refraction and keratometry using two methods, 1) direct entry into the formula on a website (rounds the keratometry readings) and 2) manually calculating the AL with unrounded keratometry readings. 237 children (474 eyes) aged 5-16 years with myopia ≤ -0.50 D or worse were included in the study. ALE consistently overestimated AL compared to optical biometers, with mean differences of 0.26 mm (ALE formula) and 0.21 mm (ALE data input). Intraclass correlation coefficients (ICCs) showed strong agreement (0.89–0.90) between estimated and actual AL. Indian children had slightly smaller discrepancies than Vietnamese children and using rounded keratometry values improved ALE accuracy. This study extends validation of AL estimation to a large, diverse, pediatric Asian population. Age differences in AL estimation were not evaluated, which may contribute to the accuracy of the formula. Axial length estimation may serve as a practical alternative in resource-limited settings, aiding in myopia risk assessment when direct biometry is unavailable for initial measurements.

Myopia progression in children with Stickler syndrome: a longitudinal cohort study

Nixon N, Cheng KH, Richards A, et al.

J AAPOS 2025 Jun;29(3):104206

Studies of myopia progression in congenital myopia, as seen in genetically confirmed Stickler syndrome, are scarce. Stickler syndrome represents the most common cause of rhegmatogenous retinal detachment in children. The purpose of this retrospective study was to determine the rate of myopia progression in a cohort of 40 children (75 eyes) < 18 years of age with type 1 Stickler syndrome (COL2A1 mutation) and 5 children (10 eyes) with type 2 Stickler syndrome (COL11A1 mutation) using the NHS England Stickler Highly Specialised Service database. In this cohort, the median rate of progression was -0.08 D per year for those with type 1 Stickler syndrome and -0.12 D per year for those with type 2 Stickler syndrome, indicating minimal myopia progression in

these children. A limitation is that 38 of 40 type 1 Stickler syndrome patients underwent prophylactic bilateral 360 degree cryoretinopexy, lack of axial length data, and its retrospective nature. The impact on clinical practice is that there appears to be minimal progression in congenital myopia associated with Stickler syndrome.

Clinical and Molecular Landscape of GLRA2 in X-Linked Early-Onset High Myopia

Li X, Wang S, Wang Y, et al

Invest Ophthalmol Vis Sci 2025;66(4):30

Multiple genes are known to be associated with no syndromic early-onset high myopia (eoHM). Variants in the GLRA2 gene which encodes a ligand-gated chloride channel, have been recently found to be associated with early-onset, no syndromic, high myopia with a X-linked inheritance. This research expanded the mutational spectrum of GLRA2 and reveals GLRA2 as the third most frequently implicated gene for Mendelian eoHM. Truncations and highly scored missense variants in GLRA2 are pathogenic. Myopia due to GLRA2 mutations manifest with mild cone impairment, and progresses to pathologic myopia. The study acknowledges variability in the clinical presentation of myopia caused by GLRA2 mutations, which could make it difficult to predict the exact nature or progression of the disease in individual patients. While the study links GLRA2 mutations to myopia, it does not fully explore the pathophysiological mechanisms by which these mutations lead to myopia. Understanding the cellular or molecular pathways involved could reveal potential targets for therapeutic intervention.

Association of Retinal Microvasculature With Myopia Progression in Children: The Hong Kong Children Eye Study

Lin ZX, Zhang XJ, Tang FY, et al

Invest Ophthalmol Vis Sci 2025;66(4):64

This study investigates the relationship between retinal microvasculature and myopia progression in children, using data from the Hong Kong Children Eye Study. Optical coherence tomography angiography (OCTA) was used to assess the retinal microvascular structure in 920 children. They found that children with myopia progression had a decrease in the vascular density of the superficial retinal layer and larger foveal avascular zone at baseline. The study also examined potential confounding factors like age, sex, and baseline myopia, finding that these variables did not significantly alter the relationship between retinal microvasculature and myopia progression. The findings suggest that retinal microvasculature could be used as a biomarker for monitoring myopia progression in children, aiding in early identification and potentially improving myopia management strategies. While the cohort is from Hong Kong, there could be regional or ethnic differences in the progression of myopia or retinal characteristics, which may limit the generalizability of the findings to populations outside of East Asia.

Myopia Control Efficacy of Asymmetric Multipoint Defocus Technique Spectacle Lenses: One-Year Double-Masked Randomized Controlled Trial

Wang M, Ma R, Kuang L, et al

Ophthalmology 2025;132(9):972-979

This was a prospective multicenter randomized double-mask parallel control trial using AMDT spectacle lenses in the experimental group and single vision lenses in the control group. The

primary aim of the study was to evaluate the myopia control efficacy of these AMDT lenses compared with single vision lenses over one year and to establish the safety and adaptation to these lenses. In the study participants were 8 to 13 years of age with refractions between minus 0.75 diopters and -5.00 diopters with astigmatism of 1.5 diopters or less and anisometropia of 1.5 diopters or less and best corrected visual acuity both eyes of 0.00 logMAR. Both the single vision and AMDT lenses were produced by the same manufacturer. Follow up visits were conducted on the day of lens dispensing, one week, 3 months, 6 months and 12 months afterwards with ophthalmic examination and visual performance questionnaire. The main outcome measures were the change in SER and axial length from baseline. After 12 months the AMDT group showed significantly less SER progression equivalent to 0.34 diopters less myopia progression in this group. In addition the axial elongation in this group demonstrated significantly less progression with 0.17 mm less axial elongation. Factors associated with progression were younger age of baseline, and axial elongation at 12 months. Patients in the AMDT group reported significantly more Image blur at one week, however this resolved by 3 months and did not recur. The author states that the key finding is that these AMDT spectacle lenses significantly reduced myopia progression both in SER and elongation over 12 months compared with single Vision lenses with no serious adverse events. There was a significant association between baseline age and myopia progression and that AMDT lenses had similar myopia control efficacy to other spectacle lenses designed for the same purpose. Several limitations existed in the study including only one year's worth of results, inclusion of only Chinese children, and refractive error limited to 0.75 to -5 diopters of refractive error. This study is significant because it evaluates an additional form of myopia control lenses that may increase our armamentarium of modalities in this condition.

The Noninvasive Measurement of Ocular Rigidity and the Pulsatile Choroidal Volume Change in Children and Young Adults

Reyes M, Smith S, Lam K, et al.

Ophthalmol Sci 2025;5(5):100814

This study aimed to assess the viability and repeatability of a non-invasive measure of choroidal rigidity and pulsatile choroidal volume change using OCT videos with enhanced depth imaging to measure choroidal filling using a technique previously described in adults. This topic was of interest due to the possible role of scleral rigidity in contributing to myopia progression in children and young adults. Of 67 patients enrolled, 93% completed the study and the neural network successfully segmented 98% of the OCT videos, with 79% yielding valid results. Importantly there was excellent repeatability on secondary imaging and the test was largely well-tolerated. This biomarker may have a future role in understanding and possibly predicting risk factors for myopia progression and suggests that ocular rigidity could be a good target for future study interventions to increase rigidity and slow myopia. The model is limited by the assumption of sphericity, and therefore presence of staphyloma or other irregular contours of the eye could influence volume estimates

Myopia Control Efficacy of Spectacle Lenses with Dual-Index Aspherical Lenslets: A 1-Year Randomized Clinical Trial

Wong YL, Tan A, Lim EW, et al

Ophthalmol Sci 2025;5(4):100766

This prospective, double-masked clinical trial aimed to evaluate the efficacy of a new myopia control spectacle with Dual-Index Aspherical Lenslets (DIAL) compared with single vision spectacles over a 1 year period at a single institution in Singapore. Children aged 8-13 yo with myopia spherical equivalent -0.75 to -4.75D were randomized to treatment with DIAL or SVL and had evaluation of axial length, non-cycloplegic SRx, BCVA, and questionnaire of adaptation/compliance at baseline, 6 months, and 1 year. Seventy-six of 80 recruited children completed the one-year follow up evaluation; three of those that left the trial reported change to an alternative myopia control strategy. Axial length was found to progress less in DIAL than SVL (-0.18mm, $p<0.001$) and myopia progression was less as well (mean difference 0.26D, $p=0.01$). Compared to the older patients (11-13 years), patients 8-11 years had more prominent reduction in AL elongation and myopia progression. There was no significant difference in final BCVA and the lenses in both groups were well-tolerated. This study is limited by relatively short period of follow up, and the clinical difference of 0.25D of myopia progression is small, but longer periods of follow-up would be helpful to understand the cumulative impact that DIAL lenses may have on myopia development, particularly if started at younger ages prior to the induction of significant school-age myopic progression.

Annual Trend of Myopia and High Myopia in Children in Japan: A Nationwide Claims Database Study

Kamei T, Miyake M, Kido A, et al

Ophthalmol Sci 2025;5(4):100729

In an effort to document ongoing trends of myopia prevalence in Japan, this retrospective study used claims based data from a health insurance claims database that covers >95% of the claims issued in Japan. At the time of the 2020 census, there were 14,955,692 children <14 years of age, with 36.8% reported to have myopia in the claims database. The incident number of cases of myopia was found to be highest at 8 years of age and the rate of incident cases increased from 2014 to 2020 (853 cases/year to 911 cases/year) despite possible low rates of seeking medical care for minor/non-COVID-associated pathology in 2020 due to the COVID pandemic. The rate of high myopia was also noted to increase over this six-year period. This data set is limited by the claims-based nature as it does not capture care received outside of the hospital system or covered by welfare aid groups. Despite this, the increasing incidence of myopia across the globe remains a hot topic due to the public health concerns related to possible vision impact of myopia, particularly high myopia.

Changes in Choroidal Thickness of Healthy Children during Myopia Progression over 4 Years: Boramae Myopia Cohort Study Report 5

Lee JH, Shin JY, Kim M, et al

Ophthalmol Sci 2024;5(3):100688

This retrospective cohort study followed patients <13 years with myopic spherical equivalent ≤ -0.75 D for four years after enrollment to monitor progression of spherical equivalent, axial length, and choroidal thickness, measured every 2 years after baseline. Of the 46 eyes of 23 patients

with a mean baseline age of 9.6, average SE myopia progressed from baseline as follows: -4.26, -5.26, and -8.67D, with an average progression of myopia of 4.41D over 4 years. During the first 2 years of follow up with slower progression of myopia, there was found to be minimal change in choroidal thickness, but in the second 2 year follow up there was significant choroidal thinning which correlated with the greater degree of myopic progression. This study outlines the relationship of choroidal thickness with myopic progression, but is not yet able to fully elucidate the etiology for either of these. Interestingly, previous studies have shown some thickening of the choroid in patients treated with dilute atropine for myopia, which may be a marker for effective slowing of myopic progression. The small nature of this study and retrospective nature limit generalizability, but given the positive correlation warrants further study in the global understanding of the myopia progression epidemic.

Quantitative Mapping of Posterior Eye Curvature in Children Using Distortion-Corrected OCT: Insights into Temporal Region Morphology

Hiraoka T, Tamura M, Moriguchi Y, et al

Ophthalmol Sci 2025;5(3):100695

This cross-sectional observational study aimed to describe the posterior geometry/curvature of the eye using distortion-corrected wide-field OCT imaging. Eighty-eight children were recruited and 169 quality images were ultimately included in the study. Gaussian curvature maps were used to illustrate intrasubject symmetry and intersubject variability in the geometry of the eye's posterior curvature, but also consistently noted a maximum point of curvature in the temporal periphery which appeared to be associated with entry point of the long posterior ciliary artery. The mean curvature of the eye had positive correlation with AL, negative correlation with cycloplegic SE, and mean choroidal thickness. Conversely, the temporal region correlated with the LPCA insertion had inverse relationships with these measures compared to the other regions of the posterior geometry, although these correlations were not significant. By developing understanding of patterns in posterior geometry of the eye, this data may help guide understanding monitoring and treatment of progression of myopia.

Refractive Surgery

Pediatric refractive surgery: Review article

Alkharashi M, Alowairdhi M, Albdaya N, et al.

European Journal of Ophthalmology 2024;35(3):799-808

Refractive surgery is one of the most commonly performed elective procedures in ophthalmology, the majority of cases reserved for the adult population. While the safety of refractive surgery in adults has been supported by multiple studies in the literature, little is known about the safety and efficacy of refractive surgery in pediatric patients. There may be a significant role of refractive surgery in children who have high refractive error but cannot tolerate spectacle correction as an option in treating amblyopia and other conditions like accommodative esotropia. The authors conducted a search using 3 different databases: PubMed, Google Scholar, and Scopus, with keywords pertinent to refractive surgery to evaluate procedures such as laser-assisted refractive surgery, phakic intraocular lenses, and clear lens exchange. With the data gathered from multiple studies, the authors concluded that special considerations are required prior to performing refractive surgeries in children. Indications for laser-assisted refractive surgery include moderate to severe amblyopia and failure to other conventional methods of treatment including spectacle correction, as well as for patients with craniofacial abnormalities precluding the comfortable wear of glasses. Phakic intraocular lenses can be considered for pediatric patients with very high refractive errors that are not amenable to correction with laser techniques, and clear lens exchanges should be reserved for those patients with shallow anterior chambers (<3.2 mm) that preclude IOL placement. The authors also emphasize that given the complexity of post-operative management, requirement of general anesthesia, and natural progression toward myopia in the pediatric population, refractive surgery should be reserved for very specialized cases when non-surgical interventions are not feasible and after careful consideration of benefits versus risks analysis. A current limitation on this topic is the lack of long-term and standardized data of refractive surgery in the pediatric population, highlighting the need for additional studies.

Retina

Retinopathy in Mucopolysaccharidoses

Noor M, Mehana O, Mata G, et al.

Ophthalmology 2025 Apr;132(4):461-475

This study investigates the onset, variation, and progression of retinopathy in patients with mucopolysaccharidoses (MPS). This is a prospective, longitudinal, observational study performed at Manchester Royal Eye Hospital from November 2015 to March 2023. It included 75 patients in total – 45 with MPS I, 9 with MPS II, 13 with MPS IVA, and 8 with MPS VI (8), aged 3–53 years. Patients underwent comprehensive eye assessments, including visual acuity, corneal clouding, IOP, funduscopy, color fundus photography, fundus autofluorescence, OCT, and ERG. Retinopathy was identified through clinical examination, imaging, or ERG, with signs such as retinal depigmentation, bone-spicule pigmentation, vascular tortuosity, retinal pigment epithelium (RPE) changes, macular atrophy, and ERG evidence of rod-mediated or rod-cone dystrophy. Retinopathy was confirmed in 32 patients (42%): 25 with MPS I, 4 with MPS II, 1 with MPS IVA, and 2 with MPS VI. Onset varied widely, from age 2 to 53 years. Fifteen patients reported nyctalopia. Fundus photography, FAF, and OCT were critical for diagnosis, with 31 of 32 cases identified via imaging, compared to 5 via clinical examination alone. ERG abnormalities were noted in 21 patients. The study highlights retinopathy as a common and vision-threatening complication in MPS, particularly in MPS I and II. It underscores the importance of advanced imaging and ERG for early detection, especially in young patients (as young as 2 years). Emerging treatments like gene therapy may stabilize or prevent retinopathy, emphasizing the need for detailed phenotypic and natural history data. The study notes variability in retinopathy presentation and calls for further research to assess the impact of systemic treatments (e.g., enzyme replacement therapy, hematopoietic stem cell transplantation) on ocular outcomes.

Factors Associated with Retinal Detachment after Pediatric Cataract Surgery in the IRIS® Registry

Altamirano F, Jeon JH, Lee JY, et al.

Ophthalmology 2025 Aug;132(8):888-894

This study uses the American Academy of Ophthalmology's IRIS® Registry (a large, representative electronic health record database) to identify risk factors for RD diagnosis and repair post-pediatric cataract surgery, aiming to inform preoperative decisions and monitoring. This is a retrospective cohort study performed between 2013-2020, including 7407 children (<18 years) undergoing cataract surgery at US IRIS-participating practices. Exclusions included pre-surgery RD history, stage 4/5 retinopathy of prematurity (ROP) and unknown laterality. The primary outcome was 5-year cumulative incidence of RD diagnosis/repair (exudative, tractional, rhegmatogenous). 168 RDs were diagnosed with 76 repairs. The 5-year cumulative RD diagnosis was 3.8% with RD repair 1.6%. Risk factors for RD included history of ocular trauma, aphakia, premature retina, PFV, and Hispanic ethnicity. Factors that were not statistically significant included degenerative high myopia and lens subluxation. Risk factors for RD repair were similar, including aphakia, premature retina, PFV, and Hispanic ethnicity. RD post-pediatric cataract surgery is uncommon but linked to trauma (e.g., vitreous alterations), aphakia (e.g., vitreous prolapse risk), premature retina (e.g., ROP-related fragility), PFV (e.g., tractional forces), and Hispanic ethnicity (possibly genetic/environmental factors). Findings align with prior studies but

leverage IRIS's scale for rare outcomes. Strengths include the large, diverse sample with real-world data. Limitations include coding biases, missing variables (e.g., surgical details, follow-up loss). The authors recommend tailored monitoring for at-risk groups to mitigate RD.

Investigation of Sickle Cell Retinopathy in Pediatric and Adolescent Patients Enrolled in a Large Cohort Study

Smith BD, Hankins JS, Kang G, et al.

Ophthalmology 2025 Aug;132(8):911-920

The study investigates sickle cell retinopathy (SCR) in pediatric and adolescent patients (aged 10-18) from the Sickle Cell Research and Intervention Program (SCCRIP) cohort, focusing on the effects of hydroxyurea therapy and chronic blood transfusions (CTXN) on SCR prevalence and progression. Among 630 patients, 36% had SCR, with 32% showing nonproliferative retinopathy (NPR) and 4% proliferative retinopathy (PR). HbSC patients had a higher SCR prevalence (51%) compared to HbSS/HbSB0-thalassemia (29%) and other genotypes (30%). Patients on hydroxyurea were 29% less likely to develop SCR (30% prevalence vs. 42% without, $P = 0.0028$), with a 38% reduced likelihood after adjusting for CTXN ($P = 0.037$). Only 5% of hydroxyurea-treated SCR patients progressed to PR vs. 16% without. Patients on CTXN were 68% less likely to develop SCR (17% prevalence vs. 40% without, $P < 0.001$), with a 76% reduced likelihood after adjusting for hydroxyurea ($P = 0.011$). Progression to PR was not significantly different (5% vs. 11%, $P = 0.70$). Both hydroxyurea and CTXN are associated with reduced SCR prevalence, supporting their use in managing sickle cell disease-related eye complications. The study suggests these therapies may lower SCR risk and slow its progression, though further research is needed.

Elevated Visual Crowding in CRB1-Associated Retinopathies: Understanding Functional Visual Deficits Using Child-Friendly Computerized Testing

Rodriguez-Martinez AC, Tailor-Hamblin VK, Higgins BE, et al

Invest Ophthalmol Vis Sci 2025;66(5):32

To address the shortcomings of standard vision charts for assessing CRB1-associated retinopathies, particularly in children, researchers conducted a prospective study comparing the traditional ETDRS test with a novel, child-friendly computerized VacMan task designed to measure both visual acuity and visual crowding. The study found that patients with biallelic CRB1 variants had significantly elevated visual acuity thresholds and more pronounced crowding effects compared to age-matched controls. A key strength was the VacMan test's 100% completion rate among patients and its strong correlation with ETDRS results; furthermore, it was overwhelmingly preferred by 88% of participants. Despite the limitation of a small sample size, the findings strongly suggest that integrating objective and engaging measures of visual crowding provides valuable insights into the functional deficits of CRB1 retinopathies and holds promise as a sensitive, patient-preferred outcome metric for monitoring disease and treatment efficacy in pediatric inherited retinal diseases.

Review: Clinical findings and genetic characterization of children affected with X-linked retinoschisis in the Spanish population

D'Anna Mardero O, Arruti Vázquez N, Coca Robinot JF, et al

European Journal of Ophthalmology 2024;35(3):809-820

X-linked retinoschisis (XLRS) is an inherited retinal disorder secondary to mutations in retinoschisin 1 and manifests clinically with impaired central vision secondary to parafoveal cystic cavities and visual field loss by splitting in the retinal nerve fiber layer in the peripheral retina. It is the leading cause of juvenile macular degeneration in young males. A retrospective review of the medical records of 17 children with confirmed XLRS seen in the Pediatric Ophthalmology Department of La Paz University Hospital from the January 2009 to June 2023 was conducted. Complete ophthalmological exams, genetic testing and full-field electroretinogram were performed in all patients. Topical brinzolamide was given to patients with foveoschisis, and oral acetazolamide was added in those patients whose foveoschisis did not improve with topical treatment alone or with very extensive foveoschisis at diagnosis. Surgical treatment was performed if retinal detachment (RD) occurred or in cases with non-clearing vitreous hemorrhage. Mean age at diagnosis was 5.86 years and the most common reason for consultation in the ophthalmology clinic was strabismus, followed by RD. The most frequently affected retinal layer on optical coherence tomography was the inner nuclear layer, and the authors found a trend toward a decrease in central macular thickness over time in the study patients. The authors also found some genotype-phenotype correlation in their series of patients and attributed more severe phenotypes to mutations in the first amino acid of the protein or in frameshift mutations. In this study, the authors also found that medical treatment with carbonic anhydrase inhibitors (topical and oral) improved foveoschisis, and that surgery was associated with poor outcomes, especially in younger patients. The study adds interesting insight into the clinical manifestations and course of patients with XLRS at this university center, especially in the context of limited literature on the condition. Its small sample size of only 17 patients limits its generalizability, and other study limitations include its single-center model and retrospective nature.

Pediatric MEK inhibitor-associated retinopathy: 8-year experience at a tertiary academic center and report of 2 cases

Liu J, Edwards Mayhew RG, Imbornoni LM, et al

J AAPOS 2025;29(2):104178

MEK inhibitor associated retinopathy (MEKAR) occurs in up to 90% of adults taking these medications, but is not well described in children. Authors conducted a retrospective chart review of pediatric patients (<18 years) on MEK inhibitor therapy for neurofibromatosis-related or other neurologic tumors at a single institution between 2015 and 2023. Patient who did not have an OCT macula at screening visit were excluded. Out of 104 patients who met criteria, 2 were identified who developed MEKAR, and both improved without adjusting the dose of medication. The main limitation of this study is the lack of standardized timing of screening exams, making it likely that cases of self-resolving MEKAR were missed. Though cases in this study were self-resolving, unidentified MEKAR could lead to vision loss. Authors emphasize the need for a prospective study to determine risk factors, incidence, and outcomes to help inform standardized screening guidelines.

Utility of Screening Examination for Cytomegalovirus Retinitis Among Patients With Cytomegalovirus Viremia

Li CY, Massa A, Krisch M, et al

Am J Ophthalmol 2025;277:230-241

With recent increases in universal and targeted congenital CMV screening policies across the U.S., the role of routine ophthalmic screening in neonates and other patient groups has come into question. This retrospective, multicenter diagnostic evaluation examined 234 patients with CMV viremia who underwent dilated fundus examination (DFE) between 2010–2023. The study assessed demographics, systemic risk factors, ocular symptoms, and outcomes. Overall, 18 patients (7.7%) were diagnosed with CMVR, of whom 5 had PCR confirmation from aqueous fluid and 13 were classified as presumed cases. Among pediatric patients, 2 of 49 (4.1%) had CMVR, including one with congenital CMV infection; importantly, no neonates screened at birth had CMVR. The strongest predictors of CMVR were HIV/AIDS infection (adjusted OR 4.1) and the presence of ocular symptoms (adjusted OR 14.9), while plasma viral load was not predictive. Strengths include a relatively large, diverse cohort and systematic review of both pediatric and adult cases; limitations include retrospective design, diagnostic reliance on clinical exam without ocular PCR in most cases, and potential overdiagnosis in presumed cases. This study teaches us that CMVR remains an important risk for HIV/AIDS patients and for immunosuppressed individuals with ocular symptoms, warranting targeted ophthalmic screening. However, it also demonstrates that routine screening of neonates with congenital CMV infection but no clinical signs has little yield, suggesting that pediatric ophthalmology practice should move toward risk-stratified, symptom- and condition-driven screening rather than universal DFE in all congenitally infected newborns.

Vessels Spanning Avascular Retina in Familial Exudative Vitreoretinopathy

Redick DW, Barnett JM, Hubbard GB 3rd

Ophthalmol Retina 2025;9(7):711-712

Familial exudative vitreoretinopathy (FEVR) is a genetic disorder characterized by abnormal retinal vascular development leading to peripheral avascular retina (PAR) and associated complications. There are numerous vessel abnormalities that have been described. Thick bridging vessels spanning an area of PAR is a newly described feature of FEVR in fluorescein angiograms (FAs). This retrospective chart review was performed on all patients diagnosed with FEVR at an academic center from 2014-2023. FAs obtained during exams under anesthesia were analyzed to evaluate for bridging vessels spanning an area of PAR with insertion to an area of fibrosis peripherally. FA images from a total of 128 eyes were examined and 9 eyes exhibited these bridging vessels spanning an area of PAR. 44% of eyes with bridging vessels spanning PAR had worsening traction after treatment, compared to 7.3% of eyes without these bridging vessels. The presence of these bridging vessels spanning an area of PAR may be a poor prognostic indicator and may portend an increased risk of worsening traction after treatment, especially with laser to the area of these bridging vessels. It may be advisable to avoid lasering areas with bridging vessels spanning an area of PAR, although a larger sample size is needed to draw these definitive treatment recommendations.

Fluorescein Angiography May Predict Surgical Outcomes of Tractional Retinal Detachment in Familial Exudative Vitreoretinopathy

Oga T, Mano F, Kuniyoshi K, et al.

Ophthalmol Retina 2025;9(8):739-746

Familial exudative vitreoretinopathy (FEVR) is a genetic disorder with heterogenous retinal abnormalities and varied inheritance patterns. The retinal findings range from asymptomatic peripheral vascular abnormalities with a good visual prognosis to extraretinal fibrovascular proliferation (FVP) with associated macular dragging, retinal fold, and eventually tractional retinal detachment. This retrospective chart review included 47 eyes of 36 patients who underwent surgery for tractional retinal detachment in the setting of FEVR. All 47 eyes underwent vitrectomy, and 26 eyes underwent simultaneous lensectomy. FEVR disease stage, FA grading (1-mild leakage, 2-severe leakage), and extent of FVP were analyzed to determine factors associated with retinal reattachment. With a multivariate logistic regression analysis, it was only the FA stage that was associated with retinal reattachment, with lower grade FA being more likely to have retinal reattachment, with an odds ratio of 9.0 with a large 95% confidence interval (1.2 – 7.0x10). While this study shows an interesting link between leakage of FA and chances of anatomic success after vitrectomy for TRD in FEVR, this does not necessarily link to vision or functional outcomes. FA may be a useful tool, however, for counseling patients and families on possible surgical outcomes, although true predictive value of FA grading requires further study.

Retinal vascularization from a new angle: A systematic review of temporal retinal vessel angles in familial exudative vitreoretinopathy

Maloof AG, Pavic NV, Zhang S, et al.

Retina Published online May 15, 2025

The heterogenous clinical features of familial exudative vitreoretinopathy (FEVR) create challenges for prognostication. FA remains the gold standard for diagnosis of FEVR, but it often requires anesthesia for young children. Retinal temporal vessel angle (TVA) is a novel biomarker referring to the angle formed by major temporal retinal vessels as they emerge from the optic disc toward the periphery of the retina. A narrow TVA is thought to be secondary to macular dragging and may be a useful biomarker. This review included studies evaluating TVA in FEVR, with a aim of exploring TVA as a biomarker. While 767 studies were initially identified, only 3 studies were included. All included studies found that patients with FEVR had significantly smaller temporal retinal artery angle compared with controls, suggesting that TVA could be a potential marker for assessing and diagnosing FEVR. Limitations in the data include a small number of studies and an overall small difference in TVA between FEVR (37.43deg) and controls (39.50deg), which may make clinical application of this marker difficult. Additionally, accurate measurement of TVA in infants remains a challenge.

Temporal Retinal Vessel Angle as a Biomarker for Familial Exudative Vitreoretinopathy

Qian Go CZ, Ping Chew GR, Oi-Lam Wu S, et al

Retina Published online May 7, 2025

Familial exudative vitreoretinopathy (FEVR) is an inherited retinal vascular disorder with heterogenous inheritance patterns and clinical findings. Fluorescein angiograms are the gold standard for diagnosis of FEVR but often require general anesthesia in young children. Given FEVR is a disorder characterized by peripheral non-perfusion with associated temporal macular dragging, temporal retinal vessel angle (TVA) has been proposed as a biomarker of FEVR that may be helpful in predicting clinical outcomes. This retrospective case series conducted at a single center included 117 eyes of 65 patients with FEVR (13 eyes were excluded due to stage 4

or 5 disease with a tractional retinal detachment). ImageJ was used to calculate the TVA for artery and vein, measuring the angle that the vessels exit the optic disc temporally. Using logistic regression analysis, TVAs exhibited a negative correlation and BCVA and foveal hypoplasia, with lower TVAs implying worse disease. These findings were significant for both the TVA measured with arteries and veins, in both cases with lower TVAs associated with an increased odds of decreased BCVA and foveal hypoplasia. The study provides support that temporal retinal vessel angle may be a useful biomarker in FEVR, but the lack of a control group limits applicability, especially for diagnosis of FEVR.

Surgical Outcomes Of Tractional Maculopathy Associated With Familial Exudative Vitreoretinopathy In Children

Ma J, Yuan MZ, Liu JH, et al

Retina 2025;45(4):649-659

Familial exudative vitreoretinopathy (FEVR) is an inherited disorder with a broad range of clinical findings, ranging from mild peripheral vascular changes and nonperfusion to tractional retinal detachment. Vision loss in FEVR occurs from tractional maculopathy, with macular edema, macular dragging, and tractional detachment. This retrospective case series of 15 eyes of 14 children age <14 with FEVR and tractional maculopathy explored factors associated with clinical outcomes after vitrectomy. In general, patients with FEVR underwent vitrectomy if they developed BCVA of 20/70 or worse or a drop in BCVA of greater than 2 lines in 1 year. A 25G vitrectomy was performed by a single surgeon with peeling of the premacular membrane to relieve traction on the macula. The peripheral membrane was partially excised and segmented to relieve traction, ranibizumab was administered if there was significant hemorrhage or leakage on FA, and laser applied in accordance with peripheral pathology. Better postoperative visual acuity was associated with a shorter time from symptom onset to surgery and better preoperative BCVA. Preoperative widening of the outer nuclear layer and foveal avascular zone and postoperative integrity of the ellipsoid and interdigitation zones, widening of the outer nuclear layer and foveal avascular zone, and absence of inner retinal layer at the fovea were associated with a better postoperative BCVA. Overall, this study illustrates the possible positive visual outcomes of children with tractional maculopathy from FEVR treated with vitrectomy. The very small sample size and single surgeon limit generalizability, especially as the exact surgical procedure performed was unique to each patient.

Long-Term Functional And Clinical Outcomes In Familial Exudative Vitreoretinopathy

Chen H, Strong Caldwell A, Patnaik JL, et al

Retina 2025;45(5):908-914

Familial exudative vitreoretinopathy (FEVR) is an inherited disorder characterized by peripheral retinal vascular abnormalities and nonperfusion. The inheritance and clinical findings are diverse, with the rarity of the disease leading to limited data on functional and visual outcomes. This study was a retrospective chart review of all patients with FEVR examined at a single academic center and its associated children's hospital over a 21-year period. A total of 186 eyes of 96 patients were seen during the study period and 90 eyes from 46 patients met the inclusion criteria (patients without a quantifiable Snellen VA were excluded, adult relatives of children with FEVR who were examined once to confirm diagnosis were also excluded). 31% of included eyes with FEVR were

initially observed without treatment. The most frequent treatment was PRP alone (42%) followed by laser with PPV and scleral buckle (11.1%), PPV alone (5.6%), and laser separate from PPV (7.8%). Around half (43%) of treated patients required further treatment after their initial treatment. Around three quarters of patients (77.3%) had functional vision at their last exam (VA 20/40 or better in one eye) and 89% had ambulatory vision (greater than or equal to 20/200 in at least one eye). Around a third of patients (35%) were functionally monocular. Interestingly, the average visual acuity did not decrease in a stepwise fashion with FEVR stage. Eyes with stage 2, 3, or 4 disease presenting with exudation had a better final BCVA than those without exudation. Absence of exudation at presentation across all stages was associated with a higher risk of reactivation. This study presents a large cohort of FEVR patients with a long follow-up interval (average 9.1 years), adding important insights to the clinical course of FEVR, although limited by a single academic center.

Vitreous Hydro-dissection with a Flute Needle for Inducing Posterior Vitreous Detachment in Pediatric Retinopathies

Guo J, Zhou Y, Zhao C, et al

Retina Published online October 29, 2024

Induction of a posterior vitreous detachment is an important procedure in surgical treatment of pediatric vitreoretinopathies but is often challenging due to tight adhesion of the cortical vitreous. The authors propose a novel method for inducing a PVD involving using a flute needle with BSS to separate the vitreous when standard methods for inducing a PVD fail. The sample size is small (two patients), which limits conclusions about feasibility and success rate.

Evaluation Of The Effects Of Different Mydriatic Drops Used On Choroidal Vascularity In Healthy Children

Gürbostan Soysal G, Seyyar SA, Mercanlı M, et al

Retina 2025;45(5):939-945

Drops for pharmacologic dilation are an important part in a complete eye exam, especially in children where cycloplegia is necessary for refraction. The choroid is a highly vascular structure, and the changes in the choroidal vasculature after administration of mydriatic drops is uncertain. This prospective observational study included 90 eyes of 90 healthy children. Baseline OCT was obtained on all eyes. Patient were then randomly divided into two groups; 46 children were dilated with 0.5% tropicamide x3 and 44 dilated with 2.5% phenylephrine x3. Repeat OCT was then performed following dilation. All measurements were taken between 10am and 12-noon to help minimize variability of choroidal thickness with time of day. Using image analysis, the choroidal vascularity index was determined using the subfoveal choroidal thickness and an area 1500um from the fovea. The subfoveal choroidal thickness decreased significantly after dilation for both the phenylephrine and tropicamide groups. There was no significant change in the choroidal vascularity index values before or after dilation in any group. This study illustrates that for studies looking at choroidal vascularity and disease, the decrease in choroidal thickness with mydriatic agents should be considered. This study does not, however, examine the combination of multiple mydriatic drops commonly given during eye exams.

Ophthalmic Manifestations in a Diverse Pediatric Population with Type I and Type II Stickler Syndrome

Drackley A, Ralay Ranaivo H, Allegretti V, et al

Ophthalmol Retina 2025;9(7):690-698

Stickler syndrome is a genetically heterogeneous collection of collagenopathies with multiple ocular and systemic manifestations. Retinal detachments are common, affecting around 50% secondary to vitreous abnormalities, and Stickler syndrome is a leading cause of retinal detachment in children. Type I Stickler syndrome is caused by heterozygous mutations of COL2A1 and type II is caused by heterozygous COL11A1 mutations. This retrospective case series included patients younger than 18 years on initial presentation at a single academic center from 2014 to 2023 with either a clinical diagnosis or suspicion of Stickler syndrome and molecular confirmation of type I or type II Stickler syndrome. A total of 26 patients were included, 13 with type I Stickler syndrome and 13 with type II. The average follow-up was around 5-6 years. The majority of patients with type II identified as Hispanic (69%). On average, there was higher myopia in type II and a similar number of retinal detachments in type I vs type II (46% vs 39%). Most patients in both groups received prophylactic laser (69% in type I and 85% with type II). This study adds evidence to the natural history of Stickler syndrome and raises the possibility that type II may be underdiagnosed in diverse populations. Given the retrospective and observational nature, there are minimal applications to direct patient management, although the results are helpful for prognosis and counseling of patients and families with Stickler syndrome.

Clinical Characteristics and Treatment Outcomes in Unilateral Coats Disease: A Global Collaborative Study

Tsai ASH, Wang CT, Lee TC, et al

Ophthalmol Retina 2025;9(6):570-579

Coats disease is an idiopathic congenital progressive vasculopathy, often unilateral and in young males. Laser photocoagulation and cryotherapy, with surgery in advanced cases, are the mainstays of treatment. The advent of anti-VEGF, however, has shifted this paradigm with intravitreal anti-VEGF used to reduce exudation and regress abnormal vasculature. Given the uncommon disease, there is limited data in the post-anti-VEGF era on treatment outcomes in unilateral Coats disease. This retrospective chart review included 20 institutions around the world (15 in the USA). Patients with a diagnosis of unilateral Coats disease of all ages were included. A total of 656 eyes of 656 patients were included. Early stage (1-2) and advanced stage (3-5) Coats disease was compared using functional and anatomic factors. Subjects with early-stage disease group were significantly older (17 years vs 7 years). Strabismus was also more common in the advanced disease group (20% vs 7%). Patients with early-stage disease more often received PRP as monotherapy, and they also received more adjunctive anti-VEGF injections compared to the advanced-stage group. Worse presenting VA and advanced disease were associated with a lower chance of anatomic success (no phthisis, massive fibrosis, RD, or need for enucleation). Interestingly, despite their increased use especially in early-stage disease, there was no statistically significant improvement in functional outcomes with anti-VEGF agents as adjuncts. This study presents a large and diverse sample of unilateral Coats disease, although does not reach any statistical significance to comment on the use of anti-VEGF agents, which will be helpful to explore in further studies.

Retinal Imaging Biomarkers and Correlation to Systemic Disease Activity in Pediatric Sickle Cell Disease

Hoyek S, Chaaya C, Lemire CA, et al

Ophthalmol Sci 2025;5(5):100774

This retrospective series of pediatric patients with sickle cell disease was performed to see if retinal imaging findings could be correlated with systemic disease activity. A total of 606 eyes from 303 children <18yo (mean 8.84 years) who were evaluated at a single large academic institution were included. Macular OCT and OCTA images were acquired and used to measure retinal thickness as well as vessel density (VD) of the superficial and deep capillary plexus and superficial foveal avascular zone. A patients' systemic history including SC genotype, number of hospitalizations, history of stroke, hydroxyurea treatment, Hgb and HgbF levels, and time averaged maximum mean velocity in the RMCA and LMCA. The main findings were that retinal thinning on OCT correlated with systemic signs of disease activity including greater number of hospitalizations, stroke, and hydroxyurea treatment. Lower vascular density on OCTA was also associated with increased hospitalization and stroke rate. And finally, higher Hgb levels correlated with higher prevalence of retinopathy on HbSC, but lower prevalence and severity in HbSS. Given the systemic nature of SC disease, it makes sense that vascular changes in the eye might reflect other complications being seen at the global level, but this study is the first to directly correlate ocular imaging with systemic history of SC complications/severity. Although automated measurement of these parameters is likely to have some error involved, these retinal biomarkers may help act more proactively in stabilizing patients showing signs of vascular changes based on the correlation noted in this study.

Longitudinal Imaging of the Parafoveal Cone Mosaic in Congenital Achromatopsia

Chen N, Litts KM, Nikezic D, et al

Ophthalmol Sci 2025;5(4):100765

The success of treatment of congenital achromatopsia (ACHM) with gene therapy aimed at restoring cone function relies heavily on the presence of remnant cones in retina of patients being treated. Previous studies with OCT have reported conflicting data regarding the stability of foveal cone structure in ACHM, and thus this study aimed to use adaptive optics scanning light ophthalmoscope (AOSLO) to assess parafoveal cone structures in a non-invasive manner. Nineteen patients with ACHM with average age of 21.6 ± 10.7 years with mean follow up of 3.83 years. While there was a statistically significant decrease in parafoveal cone density, in the setting of previous repeatability studies and the possible confounding loss of cones with age which has previously been documented in normal patients, this decrease was not felt to be clinically significant. The generalizability of these findings to patients with ACHM as a whole may be limited by the difficulty in obtaining AOSLO imaging in some patients due to nystagmus etc. and thus there may be changes in parafoveal cones that are not fully elucidated in this study. Yet, this data reinforces previously reported suspicion that ACHM is a slowly progressive or stable disease as it relates to cones.

Retinoblastoma

Optic Nerve Invasion in Retinoblastoma: Impact of Eye Salvage and Adjuvant Chemotherapy

Feng ZX, Zhao J, D'Souza D, et al.

Invest Ophthalmol Vis Sci 2025 Jun 2;66(6):65

In this retrospective multicenter cohort study of 386 eyes with isolated optic nerve invasion (ONI) in retinoblastoma (2012–2017, across 29 Chinese centers), the authors examined how timing of enucleation, pre enucleation chemotherapy, and adjuvant chemotherapy influenced cause specific survival (CSS). They found that delaying enucleation beyond six months from diagnosis markedly increased the risk of tumor presence at the transected optic nerve (21% vs. 2%), and significantly worsened five year CSS, particularly for eyes undergoing secondary enucleation (e.g., retrolaminar ONI without transecting end involvement: CSS was 85.6% vs. 100% with primary enucleation; $P = 0.022$). Overall five year CSS was excellent (96.7%) for prelaminar, intralaminar, and retrolaminar ONI without transected end involvement, but dropped sharply to 58% when tumor was present at the transected end. While adjuvant chemotherapy showed improved survival trends, especially in cases with tumor at the transected end (80% vs. 45%), these differences did not reach statistical significance. Based on the findings of this study for the patient population included, the authors conclude that timely enucleation reduces the risk of tumor involvement at optic nerve transection, and a delay in enucleation by pre-enucleation chemotherapy may reduce the effectiveness of subsequent adjuvant chemotherapy. Key study limitations include its retrospective design, variability in chemotherapy regimens across centers, potential under-detection of metastasis when advanced imaging (like MRI) was not used, and non standardized pathology preparation.

Effect of intra-arterial chemotherapy drug regimens on globe salvage outcomes of retinoblastoma patients

He X, Han M, Zhou M, et al

Br J Ophthalmol 2025;109(8):888-893

The introduction of intra-arterial chemotherapy (IAC) into the arsenal for RB treatment has allowed for eye preservation with generally mild systemic issues. IAC drug regimens vary from center to center. This study performed a retrospective review of 83 patients (87 eyes) who received two-drug IAC (melphalan + topotecan) vs 95 patients (97 eyes) who received three-drug therapy (melphalan + topotecan + carboplatin). All patients were staged as group C/D/E. Stratified analysis showed higher progression-free ocular survival among group D (88.5% vs 60.6%) and E (42.9% vs 23.5%) eyes, respectively, in 3-drug vs 2-drug therapy. Overall survival and adverse effects (e.g., relapse rate, moderate–severe myelosuppression, ophthalmic artery obstruction) were similar between the two drug regimens. The study is limited by its retrospective nature and lack of randomization; furthermore, none of the practitioners opted for 1-drug therapy (melphalan) such that this could not be compared. This study was impactful in finding better outcomes with 3-drug vs 2-drug IAC for RB — raising the need to further assess the varied chemotherapeutic regimens that are being performed to best create standardize guidelines.

Mortality of uveal melanoma in children and adolescents from 2004 to 2020

Bade YM, Salman AR, Ahmed AK, et al.

J AAPOS 2025 Jun;29(3):104213

While uveal melanoma (UM) is the most common primary intraocular malignancy in adults, they are rare in children. The purpose of this study was to analyze epidemiological factors, tumor characteristics, and mortality rates in a cohort of pediatric patients with UM from the National Cancer Database (NCDB). This retrospective cohort study included 129 patients ≤ 20 years of age in the NCDB diagnosed with UM who were identified using ICD-10 and ICD-O-3 codes. Main outcome measures were demographics, clinical features, and overall survival, where mortality was assessed using Kaplan-Meier survival analysis and Cox logistic regression. Most patients were female (53%) and White (91.5%), followed by Black (3.1%), and other races (5.4%) with a mean age at diagnosis was 15.9 years. Tumors were primarily in the choroid (75.2%), followed by ciliary body (13.2%) or iris (7.0%). Choroidal melanomas had the worst survival rate (53.2% at 15 years). Kaplan Meier overall survival at 5-, 10-, and 15-years was 93.6%, 80.3%, and 63.4%, respectively. Survival was worse with more advanced tumor T category (10-year survival 73.8% for cT1, 82.6% for cT2, 0% for cT4 [$P = 0.022$]) and American Joint Committee on Cancer stage (15-year survival 61.9% for stage I vs 45.5% for stage III [$P < 0.001$]). Cox logistic regression analysis identified older age at presentation (OR = 1.618, $P = 0.036$) and non-White race (OR = 21.39, $P = 0.045$) as significant predictors of mortality. This is the largest retrospective review of UM in the pediatric population, but is limited in its retrospective nature, the small number of patients with iris and ciliary body disease, incomplete data on cancer staging, lack of detailed information on metastatic outcomes, and lack of details about treatment. The impact on clinical practice is that with regard to UM, adolescents have a similar prognosis to adults, whereas children have more favorable outcomes.

Clinical Stage of Retinoblastoma Based on Presenting Signs of 4578 Patients from 121 Countries

Yanagihara RT, Takayasu JSK, Crotty EE, et al

Ophthalmology 2025;132(9):1045-1053

The author's objective of this study was to evaluate the association between presenting signs of retinoblastoma and associated tumor stage using a large International sample of patients with retinoblastoma. Two large international cross-sectional studies have collected presentation characteristics and these were analyzed in an observational study using all patients from both of these cross-sectional studies. The variables that were looked at were presenting sign, age of presentation, sex, laterality, lag time between first sign and seeking treatment, income level of

country, and clinical and pathologic tumor stages in grades. If the patient demonstrated more than one sign the individual was included in each corresponding category. Given that this was an international study and various centers use different grading classification systems they were reported separately and then combined to be able to analyze with some generalizability. The authors were able to analyze 4,578 patients from 121 countries. Following presenting signs were noted in 10 or more patients with leukocoria being the highest percentage followed by strabismus, orbital mass, red eye orbital cellulitis, iris color change, and hyphema. The most common intraocular grade was E. Relatively high rates of late stage disease also were found in patients with orbital cellulitis. The authors also found that in high income and upper middle income countries leukocoria and strabismus were the most common presenting signs and leukocoria and orbital mass were the most common presenting in low-income and lower middle income countries. This paper is significant as one of the largest and most geographically and demographically diverse neuroblastoma data sets to date. It reaffirms that leukocoria, strabismus and orbital mass are the most common presenting signs of retinoblastoma globally. It also demonstrates that relatively late presentation is higher in the number of those with signs that are reported less frequently. Greater than 90% of patients with leukocoria and strabismus sought treatment with low stage disease, and those with orbital mass showed higher stage grading. The authors concluded that retinoblastoma should be considered in patients with orbital cellulitis and unexplained red eye or iris color change or unexplained hyphema given that these are less common presenting signs and may lead to late diagnosis and treatment which could have a poor prognosis. This article is important given that it makes clinicians aware of these concerns as well as being one of the largest studies to look at redoblastoma over many countries.

The Role of Intravitreal Chemotherapy as an Adjunctive Treatment for Retinoblastoma: A Systematic Review and Single-Arm Meta-Analysis

Bravo-Gonzalez A, Dominguez-Ruiz P, González M, et al

Am J Ophthalmol 2025;273:130-140

This systematic review addresses intravitreal chemotherapy (IVitC) for retinoblastoma, a modality increasingly used to control vitreous seeds that are poorly reached by systemic or intra-arterial routes and historically drove enucleation. Evidence has been fragmented, without large trials or meta-analyses to benchmark outcomes or drug-specific safety. The authors searched MEDLINE/EMBASE/Cochrane and pooled single-arm observational studies (≥ 10 eyes) using random-effects models; 25 studies (1,082 eyes) were included, examining melphalan, topotecan, or combinations, typically as adjuncts to intra-arterial (IAC) or intravenous (IVC) chemotherapy. Overall enucleation rate (ER) was 24.7% (95% CI 19.2–31.2%). Subgroups suggested lower ER with topotecan alone (14.2%) versus melphalan (27.8%) or combinations (23.8), and lower ER when IVitC was paired with IAC (21.5%) versus IVC (35.5%) (both $P < .05$). Toxicity profiles favored topotecan: pigmentary retinopathy occurred in 36.6% with melphalan versus 2.4% with

topotecan ($P<.05$); other adverse events included cataract (17.8%), vitreous hemorrhage (12.1%), and retinal detachment (5.6%). Strengths include protocol registration, comprehensive search, prespecified subgroup analyses, and sensitivity checks supporting robustness. Limitations are substantial: all but one study had serious risk of bias, heterogeneity was high, IVitC was never monotherapy (confounding by concomitant treatments), and randomized data are lacking. Clinically, the review teaches that IVitC is an effective globe-salvaging adjunct—especially when integrated with IAC—and that drug choice matters: topotecan may offer comparable efficacy with markedly lower retinal toxicity than melphalan. For pediatric ophthalmology, these data support wider, safety-conscious adoption of IVitC for vitreous seeds, reinforce building IAC+IVitC capability where feasible, and encourage prospective head-to-head melphalan vs topotecan studies to refine dosing and minimize vision-limiting toxicity.

Changes of Cytokines in Aqueous Humor of Retinoblastoma with Intravitreal Melphalan

Zhou X, Meng F, Ren H, et al

Retina Published online March 26, 2025

Retinoblastoma is the most frequent intraocular malignant tumor in childhood, and the trend has moved toward globe salvage and visual rehabilitation when possible. Melphalan is a crucial drug for intraarterial chemotherapy but has shown to have toxicity when injected intravitreally. This study sought to explore the cytokines in aqueous humor with intravitreal melphalan and how those may relate to ocular toxicity. 28 eyes of 27 patients with group D or E retinoblastoma who received intravitreal melphalan (IVM) were included. The control group consisted of 14 eyes of 14 patients with congenital cataracts. Aqueous humor was collected before the first IVM and following. The levels of a variety of cytokines were measured. IL-8, IL-17A, Eotaxin, G-CSF, and platelet-derived growth factor BB (PDGF-BB) increased significantly after IVM administration in patients with retinoblastoma ($P < 0.05$). Post-IVM treatments, the levels of IL-5, IL-8, IL-9, IL-12p70, IL-15, IL-17A, G-CSF, interferon-induced protein 10 (IP-10), macrophage inflammatory protein-1a (MIP-1a), platelet-derived growth factor BB (PDGF-BB), tumor necrosis factor- α (TNF- α), and vascular endothelial growth factor (VEGF) were higher in eyes that developed ocular toxicity than those eyes that did not. The ocular toxicity group received a higher cumulative dose and mean per dose of IVM. This well-organized study presents interesting relationships between cytokines in the aqueous humor and IVM, although does not provide any current clinical applications but may help elucidate mechanisms of toxicity and how to help prevent these in the future.

Outcomes Of Cryotherapy For The Treatment Of Retinoblastoma In 92 Consecutive Patients

Kim Y, Negretti GS, Westcott M, et al.

Retina Published online April 24, 2025

Cryotherapy is a well-established treatment modality for retinoblastoma, well-suited to small peripheral tumors. Despite its widespread use, data on the complications of cryotherapy in retinoblastoma are limited. 124 eyes of 92 patients who received cryotherapy and had at least

one year of follow-up were included. Retinal detachment developed in 15 eyes (12%, 6% rhegmatogenous RDs, 5% exudative, and 2% tractional retinal detachment). Vitreous hemorrhage developed in 9 eyes (7%). Rhegmatogenous retinal detachment resolved in all but 1 patient and vitreous hemorrhage persisted in 5 eyes. Increased cryotherapy applications were associated with an increased risk of vitreous hemorrhage, as was prior intraarterial chemotherapy. Despite these complications, baseline vision was preserved in most cases. Overall, the complications of cryotherapy are low, but increased applications may increase the risk of vitreous hemorrhage. This study offers additional data to the safety profile of cryotherapy for retinoblastoma but does not fully address any success outcomes.

Secondary Enucleation in Retinoblastoma: Clinical features predictive of high-risk histopathology Features in 295 Eyes

Vempuluru VS, Bakal K, Agarwal P, et al.

Retina Published online May 6, 2025

Early enucleation was initially advocated for retinoblastoma in the 1800's. With advancements in chemotherapy delivery, more emphasis is placed on globe salvage today, even in eyes with advanced retinoblastoma. Despite these advances, secondary enucleation remains necessary in some cases. This retrospective chart review included 295 eyes of 289 patients who underwent a secondary enucleation for retinoblastoma from 1999 to 2022. Most patients (83%) underwent secondary enucleation for recurrent or progressive active tumor and a smaller group (17%) underwent secondary enucleation for loss of view to the fundus. High-risk histopathologic features (factors that help predict risk of systemic metastasis in retinoblastoma) were present in less than a quarter (17%) of enucleated eyes. Systemic metastasis and death occurred in 2 patients (<1%). The predictors of high-risk histopathology feature in cases of secondary enucleation included age >36 months at the time of enucleation, an interval of >12 months from first treatment to enucleation, an interval of >1 month from last treatment to enucleation, and persistent/recurrent/progressive tumor despite >9 cycles of systemic chemotherapy before enucleation. These features may be useful when considering globe salvage versus secondary enucleation in patients, and prompt secondary enucleation should be performed once planned.

Ophthalmic Artery Chemosurgery for Retinoblastoma Babies Less than 3 Months Old or under 6-kg Weight

Abramson DH, Francis JH, Knopman J, et al.

Ophthalmol Retina 2025;9(9):908-914

Ophthalmic artery chemosurgery for retinoblastoma has gained increasing popularity worldwide as a technique for delivering chemotherapeutic agents in a more localized function for globe salvage. Despite its widespread adoption, it is challenging in very young and very small infants. This retrospective review of 17 retinoblastoma patients treated with OAC under the age of 3 months or <6 kg were included. A total of 23 eyes received OAC a total of 60 times. One child was not treated as the femoral artery was unable to be accessed. In all cases, the drug was delivered in the internal carotid/ophthalmic artery. Complications were minimal, all patients are alive, no eye has come to enucleation, and no patient has developed a second neoplasm. No cases of vascular occlusion or optic atrophy occurred in an average of 4 years of follow-up. ERG function improved

after treatment. This important review shows that OAC can successfully be performed by skilled clinicians on small infants, changing the way that young infants with retinoblastoma are managed.

Intra-arterial Chemotherapy for Retinoblastoma, Outcomes Analysis in 357 Eyes: Thirteen Years of Experience in a Referral Center in Brazil

Teixeira LF, Macedo CRPD, Fonseca JRF, et al

Ophthalmol Retina 2025;9(8):798-806

Treatment for retinoblastoma has greatly improved in the last 2 decades, with more children being treated with intraarterial chemotherapy (IAC) with the goal of globe salvage. The analysis includes 357 eyes of 300 patients treated with IAC at a tertiary care center in Brazil. The mean age at time of first IAC cycles was around 21 months, and the median number of cycles was 4. Two-thirds of eyes (66%) were group D or E stage eyes. 6% failed treatment and were enucleated during or shortly after their first IAC course. 24% of eyes experienced a recurrence, and some received rescue IAC. The overall 5-year survival rate for children who experienced a recurrence was 77%. The subset of children who experienced a recurrence and received rescue IAC had an improved survival rate of 85%, similar to the overall survival rate of all children of 86% in this study. When administering the IAC, use of the ophthalmic artery ostium was a protective factor against enucleation and may be the preferred route when feasible. This study presents interesting outcomes in IAC but may not be full generalizable to other populations. The overall 5-year survival rate of 86% is low in comparison to the USA and other countries, suggesting that there are population, healthcare, or treatment differences.

High-Risk Retinoblastoma Based on International Classification Systems: Analysis of 1362 Eyes
Kurian DE, Kaliki S, Shields CL; High-Risk Retinoblastoma Collaborative Group

Ophthalmol Retina 2025;9(8):787-797

There are 3 widely used versions of the International Intraocular Retinoblastoma Classification that stratify tumors from groups A-E. When the criteria are similar for A and B, there is considerable variation in group C, D, and E. The risk for metastasis is determined by histopathological high-risk features (HRFs), which require tissue for diagnosis. This study sought to explore how the grading (A-E) is predictive of high-risk features. A total of 1362 patients with primary enucleation from 16 centers in 11 countries were included. The positive predictive value of high-risk features was around 40% for group D eyes, regardless of classification scheme. Similarly, the risk of HRFs was around 59% for group E eyes regardless of classification scheme. The survival rates were also similar regardless of classification scheme. The authors suggest that subcategorization amongst group E might improve risk stratification. Using the AJCC system may be preferable as it helps delineate these subgroups within group E. The authors advocate widespread adoption of AJCC grading for retinoblastoma and moving away from the traditional A-E classification.

Diminished MYCN Dosage Endows Cavitory Transformation in Retinoblastoma

Xu M, Shi H, Shen Y, et al

Ophthalmol Sci 2025;5(5):100820

Cavitory retinoblastoma (CRB) is a unique variant of the disease which presents with visible lucent cavities within the tumor that manifest as hollow spaces on ultrasound and are hypofluorescent

on angiography. Compared to other forms of RB, CRB has been suggested to have lower rates of relapse and possibly better prognosis, thus further evaluation of immunohistopathology as well as additional xenograft model experiments were undertaken to better understand this CRB subtype. Over the course of this 13-year longitudinal study with 1154 RB patients, CRB was identified in 48 eyes (4% incidence). Patients with CRB were found to have higher metastasis-free, overall survival rates, and reduced incidence of vitreous seeding relative to the total RB population. CRB patients were also found to have lower expression of MYCN, thus xenograft models were used to see if the CRB phenotype with improved differentiation and rosette formation was reproducible by silencing MYCN, which it was. This strategy of decreasing MYCN expression may act as a strategy to artificially shift a patient's RB phenotype toward a less aggressive one.

Novel Risk Factors for Uveal Melanoma in Adolescent and Young Adult Patients: A Comprehensive Case-Control Analysis Nisanova A, Park SS, Amin A, et al Ophthalmol Sci 2024;5(4):100687 This cross-sectional case-control study aimed to investigate sociodemographic and past medical history of adolescent and young adult patients aged 13-45 years old treated for uveal melanoma at a single academic institution with proton beam radiation therapy from 1994-2020. The cohort included 247 patients and 401 age and sex matched controls. Retrospective review of patients' chart as well as a follow up phone call to obtain missing data was performed to review demographic information, environmental exposures, social and medical history. This study identified several significant novel risk factors for uveal melanoma in this younger cohort including: family history of melanoma, Ashkenazi Jewish ancestry, prior eye trauma, secondhand cigarette smoke exposure, and previous head and neck surgery. There was also confirmation of previously known risk factors including choroidal nevi, light eye color, white race, outdoor sunlight exposure, recent pregnancy, occupational and toxic chemical exposure, family history of any cancer, lack of UV blocking eyewear use, indoor tanning, and propensity to sunburn. The fact that many environmental risk factors needed to be clarified by phone call inherently induces recall bias, but despite this, this study identified several new risk factors to UM and highlights the importance of thorough review of medical, social, and family history in patients at risk for UM.

Retinoblastoma with and without Extraocular Tumor Extension: A Global Comparative Study of 3435 Patients

Kaliki S, Vempuluru VS, Fabian ID; Global Retinoblastoma Study Group

Ophthalmol Sci 2024;5(2):100637

As the most common intraocular malignant tumor in children, the global impact of retinoblastoma (RB) is significant, and this multicenter intercontinental collaborative prospective study which followed 3435 RB patients with and without extraocular extension from 2017 to 2020 from time of treatment-naïve presentation. This particular subset of the Global RB Outcome Study aimed to report the incidence and outcomes of RB-EOE compared to RB-w/o-EOE as well as the demographics of the country at which the patient presented for care. Of the 3435 patients, 9% had RB-EOE and there was an inverse relationship between the percentage of patients with RB-EOE and national income level (31% low income, 6% low-middle income, 1% high income). Compared to RB-w/o-EOE, there was a significantly higher lag time from onset of symptoms to presentation to RB treatment center (7 months vs. 4 months, $p=0.0001$), mean age at presentation

(37 months vs. 24 months $p=0.0001$), and unilateral presentation (76% vs. 67%, $p=0.003$). Family history of RB was lower in those with RB-EOE. Outcomes of care were more positive in patients with RB-w/o-EOE: systemic metastasis (4% vs. 32%, $p=0.0001$), and metastasis related death (6% vs. 63%, $p=0.0001$); OR=13.5 for metastasis and OR=33 for metastasis related death in RB-EOE. Trimodal treatment (surgery+IVC+EBRT) had lower risk of death for RB-EOE than unimodal or bimodal treatment ($p=0.004$). This study takes a comprehensive, global approach to understanding the RB patient population and highlights the importance of collaboration to optimize multi-modal treatment of this life-threatening subset of RB pathology

Retinopathy of Prematurity

Social Determinants of Health Affecting Retinopathy of Prematurity Follow-up Attendance

Strelnikov JI, Burkland J, Plattner AS, et al

J Pediatr Ophthalmol Strabismus 2025;62(3):173-181

Outpatient follow-up after NICU discharge is essential for continued management of ROP, but families may not always attend the visits. In this study, the authors examine common social determinants of health (SDOH) to see what effect they may have on successful outpatient follow up within 8 weeks to 1 year after discharge. By performing a retrospective chart review of all preterm infants screened for ROP over a 4 year span, they determined that only 42% (303 of 723) attended follow-up in the designated interval. Infants with private insurance (odds ratio [OR]: 4.47), maternal non-Hispanic White identity (OR: 1.80), ROP treatment history (OR: 3.67), and longer NICU stay (OR: 1.06) had higher odds of attending follow-up appointments. These findings suggest that both health factors (longer NICU stay and ROP treatment) and socioeconomic/sociodemographic factors may influence follow up, which is a helpful starting point for potential targeted interventions to improve follow up rate.

Evaluating the Utility of Initial Examinations in Retinopathy of Prematurity: Proposal of FIRST-ROP Algorithm for a Medium-Risk Cohort

Altamirano F, Yuan M, Hoyek S, et al.

Ophthalmology 2025 Jun;132(6):713-717

This study assesses the necessity of first/second inpatient exams in medium-risk infants (not microprematurity [24-26 weeks GA, 600-799 g BW] or nanoprematurity [<24 weeks GA, <600 g BW]) and proposes guideline optimizations. This is a retrospective consecutive study including medium risk ROP patients between Jan 2017-Aug 2023 at 3 tertiary NICUs in Massachusetts. Subjects included 1125 infants (56.1% of 2004 screened) born at ≥ 27 weeks GA and ≥ 800 g BW. Exclusions criteria included missing data, external treatments, micro/nanopremature infants. They compared 3 models: 1. Traditional (start 4 weeks post-birth/31 weeks PMA) 2. Traditional minus the first exam, and 3. Traditional minus the first & second exams. The mean GA was 30 weeks and BW 1270 g. 237 (21.1%) had ROP (72.6% stage 1, 19.4% stage 2, 7.6% stage 3, 0.4% stage 4 in worst eye). Median PMA at diagnosis: Stage 1 (35.6 weeks, IQR 33.7-37.3), stage 2 (36.4, 35.3-37.8), stage 3 (39.3, 38.3-41.2). 11 (1.0%) patients at treatment-warranted ROP with median PMA at treatment of 39.6 weeks. The median PMA first ROP diagnosis was 35.3 weeks. Median number of exams before diagnosis = 1. ROP was detected in the first exam in, 22.8%, by second in 38%. No stage 3 or type 1 treatment-warranted ROP was seen at first/second exams (100% sensitivity if eliminating them or starting at 35 weeks PMA). Delaying the first exam to 34 weeks

PMA showed an estimated 30.6% in cost savings. The authors conclude that in medium-risk infants no type 1 ROP occurred at initial exams, suggesting over screening. They propose the FIRST-ROP algorithm: Start screening at 34 weeks PMA (safety buffer; data supports 35 weeks). Strengths include the large multi-NICU cohort. The limitations include the retrospective/single-region (bias, limited generalizability to low-resource/developing settings), potential missed exams with varied protocols.

Area deprivation index predicts follow-up in retinopathy of prematurity

Tanenbaum RE, Mokhashi N, Warren AK, et al.

J AAPOS 2025 Jun;29(3):104227 Since the risk of retinopathy of prematurity (ROP) can continue after a baby leaves the hospital, consistent outpatient care is critical but challenging to coordinate. A retrospective study reviewed charts from a single academic medical center between 2016 and 2023 to understand the impact of social drivers of health on clinic attendance. The researchers used the area deprivation index (ADI), a measure of neighborhood affluence and opportunity, which was calculated using maternal demographic data. The study found that of 540 infants who needed further ROP exams after discharge, 32% missed their first outpatient appointment, and 2.6% did not complete their evaluations at all. After adjusting for other factors, the only significant predictors of a missed first appointment were a higher ADI score and having Medicaid insurance. For every one-point increase in the ADI score, the adjusted odds of missing the first follow-up appointment rose by 17%. While the study's findings are limited by being conducted at a single center and using a specific ADI dataset, they suggest that clinicians should be aware that infants from disadvantaged neighborhoods are at a higher risk of missing these crucial appointments. This awareness could help healthcare providers tailor their follow-up plans to better support these vulnerable patients and ensure they receive the necessary care during the critical phase of ROP evaluation.

Alteration of Tear Metabolomics Profiling in Infants With Retinopathy of Prematurity

Fan Z, Yang S, Lu X, et al.

Invest Ophthalmol Vis Sci 2025 Jun 2;66(6):61

This prospective study evaluated the tear metabolomic profiles of premature infants with retinopathy of prematurity (ROP) compared to those without, aiming to uncover noninvasive biomarkers for early diagnosis. The authors analyzed Schirmer-strip-collected tear samples from 94 eyes (47 infants): 23 with ROP (15 requiring treatment, 8 not) and 24 non-ROP controls, using untargeted ultra-performance liquid chromatography–mass spectrometry (UPLC MS). Detailed fundus examinations were also conducted for all patients. After adjusting for key variables (sex, postmenstrual age, gestational age, birth weight), they identified 11 metabolites that were differentially expressed in ROP infants—three upregulated (3,5-di-tert-butyl-4-hydroxybenzaldehyde, caffeine, trehalose) and eight downregulated (including uric acid, dihomo- γ -linolenic acid, 6 keto prostaglandin F1 alpha, and pyridoxal). Notably, 6 keto prostaglandin F1 alpha demonstrated excellent diagnostic potential (AUC 0.893). The authors suggest that the alteration of tear metabolites in ROP (i.e. 6-keto-PGF1 alpha) could be utilized as potential

noninvasive biomarkers for ROP screening. They found that the differentially expressed metabolites were associated with inflammatory response, oxidative stress, angiogenesis, and even environmental factors, providing potential indication into the disease pathophysiology in ROP. The study highlights a potential new modality to aid in ROP screening but is limited by its small sample size, the unclear causal relationship between tear metabolites and vitreal metabolites/retinal pathology, potential confounding by ocular surface microbiota, the need for targeted validation in independent cohorts, and exclusion of critically ill infants, limiting generalizability.

G-ROP versus WINROP for retinopathy of prematurity screening: a Calgary perspective

Moorjani R, Sanders E, Lavery K, et al.

Can J Ophthalmol 2025;60(4):238-242

ROP screening in most established centers have high sensitivity but low specificity, which leads to an undue burden of neonatal exams, especially with there being a limited amount of qualified and interested ROP screening physicians. This was a retrospective study in Calgary, Canada that looked to compare the G-ROP and WINROP algorithms in their own institution (n=1,001 infants), taking into account postnatal growth in the former screening protocol and weight and IGF-1 levels in the latter. In their cohort, the median GA was 28 weeks and median birth weight was 1050 g. 217 (21.7%) infants developed ROP of which 46 (4.6%) required treatment. Both guidelines indicated need for screening in a lower number of infants (WINROP = 601; G-ROP = 711) with lower median birth weights (WINROP = 880 g; G-ROP = 921 g). Applying WINROP correctly identified 174/217 that had ROP and 44/46 needing treatment (sensitivity = 95.7%; specificity = 41.7%). Applying G-ROP correctly identified 177/217 that had ROP and all of the ones needing treatment (sensitivity = 100%; specificity = 30.4%). This was reported as the largest Canadian study comparing the validity of WINROP and G-ROP with mention of higher favor to G-ROP that was a study with a larger and more diverse cohort. No infants who required treatment were missed via G-ROP while allowing for 290 fewer infants that would have had to undergo exams. The weaknesses of this study include its retrospective nature and lack of oxygenation data, which are known to have an impact on ROP development.

Tetracaine versus proparacaine for retinopathy of prematurity exams

Newby B, Eslami M

Can J Ophthalmol 2025;60(3):e475-e476

ROP screening exams can be associated with pain and distress for the neonates receiving them. This was a research letter based on a QI project performed at a single Canadian NICU wherein a plan-do-study act was performed changing the regular use of pre-exam tetracaine 0.5% eye drops to proparacaine 0.5% eye drops. Two ophthalmologists performed the ROP exams with application of the topical anesthetic drop 30–60 seconds prior to evaluation. The neonatal pain, agitation, and sedation scale (NPASS) was assessed prior to and at the maximal level during each ROP exam by 1 of 4 pharmacists who observed all the eye exams. 154 exams with tetracaine were compared against 51 exams with proparacaine. Gestational age, birthweight, and pre-exam NPASS scores were comparable between the two groups. Severe pain consistent with an NPASS score of 7–10 was 23% in the tetracaine group and 2% in the proparacaine group with an average NPASS score being lower in the proparacaine group (4.2 vs 5.1, $p < 0.05$). This was a

straightforward QI study that provided info on a potentially better tolerance with proparacaine eye drops to tetracaine eye drops for use in ROP exams. This is consistent with adult literature that found proparacaine to have a faster onset and lesser discomfort. This is a helpful study for institutions/groups looking to institute a change in their current ROP exam protocol regarding choice of topical anesthetic eye drops.

Semiautomated measures of foveal immaturity from handheld swept-source optical coherence tomography are associated with retinopathy of prematurity severity

Tam EK, Lee KE, Lawson SE, et al

Br J Ophthalmol 2025;109(5):549-553

There is a known association between prematurity and abnormal foveal development with handheld OCT findings in early gestational age (GA) related to a failure of centrifugal migration of the inner retinal layer from the fovea leading to a thicker, shallower fovea with intact parafoveal thickness (i.e., fovea-to-parafoveal or F/P ratio) showing thicker inner retina, thinner outer retina, and shallow foveal pit. This study was a prospective, observational study using noncontact, handheld swept-source OCT (SS-OCT) that looked at 26 preterm infants undergoing ROP screening to assess for foveal findings in ROP severity. Average GA was 29.1 ± 2.0 weeks, and average birth weight was $1,057.6 \pm 324.8$ g. The majority of infants had Stage 0 or mature exams (54/99 images; 54.5%) while Stage 3 ROP was found in 16/99 images (16.2%) and no infants had Zone I or Plus disease. A total of 99 imaging sessions were included due to image quality based on masked graders' review. Semiautomated segmentation analysis was performed to obtain thickness measurements at the fovea and, two parafoveal locations of the inner retina, outer retina, and choroid with masked graders calculating the foveal angle, total cross-sectional area, and retinal & choroidal thicknesses, enclosing macula edema. Shallower foveal angle and higher F/P ratio correlated with more posterior ROP zone, while inner retinal F/P ratio was greater with higher staging though this was not seen with regards to the outer retinal F/P ratio. This study appears to indicate that inner retina is more of a driver between foveal immaturity and ROP severity. Larger retinal cross-sectional area also correlated with worse ROP staging. Choroidal thickness did not appear to be associated with ROP severity, which differed from prior studies. This study was limited by the small cohort and lack of severe ROP with the possibility of excluding imaging from sicker infants where the quality would have been poorer but then missing out on higher ROP severity. This study adds to the literature in looking for quantitative biomarkers via a noncontact method to aid in the assessment of ROP screening and risk.

Analysis of regional coverage for retinopathy of prematurity in the United States

Ali AA, Chauhan MZ, Bindi JM, et al

J AAPOS 2025;29(4):104280

Overall, retinopathy of prematurity (ROP) incidence is increasing in the US which requires an increased demand for ophthalmologists to conduct ROP screening and treatment. This study aims to identify the current workforce providing ROP care by analyzing geographic distribution and demographic characteristics of pediatric ophthalmologists and retina specialists in the US. Using databases maintained by the American Association of Pediatric Ophthalmology and Strabismus (AAPOS), American Academy of Ophthalmology (AAO), and American Society of Retina Specialists (ASRS), provider demographics of city, state, and zip code were collected. The

Neonatology Solutions Database and previously reported regional counts of ROP diagnosis codes were used to calculate an estimate of numbers of NICU beds and ROP cases per provider for each region and state. The distribution of potential providers for ROP cases is disproportionate in more urban or populated areas. The South had the highest number of providers but also the highest number of ROP cases, making it the region with the most significant shortage of potential providers for ROP care. Limitations of this study included possible under or over estimation of workforce due to reliance on self-reported databases and assumption that all pediatric ophthalmologists and retina specialists provide ROP care. However, the authors did address this partly by including adjustments as a function of percentage of practitioners providing care (i.e. 100%, 75%, 50%, 30%, 20%, and 10%). This study highlights the regional disparities that exist in providing ROP care and the urgent need to increase the workforce to care for this population.

Longitudinal Assessment of Retinopathy of Prematurity (LONGROP) Study: Impacts of Viewing Time and Ability to Compare on Detection of Change

Rosenblatt TR, Ghoraba HH, Ji MH, et al

Am J Ophthalmol 2025;271:31-37

A prospective study was conducted to compare the accuracy of a simulated bedside indirect ophthalmoscopy (sBIO) exam with a telemedicine ROP image review (TELE) in assessing the progression, or "Tempo," of retinopathy of prematurity (ROP). The study involved 12 pediatric retina specialists who evaluated images from a curated database over two six-week periods. The specialists' overall accuracy was similar for both methods (51.7% for sBIO vs. 51.9% for TELE), with the highest agreement on stable disease (over 90%) and the lowest on worsening disease (around 46%). Both methods showed a decline in accuracy later in the study, suggesting grader fatigue. A key finding was that the specialists' overall "gestalt" judgments of Tempo poorly correlated with granular, feature-level changes in the images, with agreement as low as 5%, indicating a significant inconsistency. While the study's strengths include its prospective design and the use of expert graders and a validated image database, its limitations involve using a simulated rather than a real bedside exam, which may overestimate in-person accuracy. The results suggest that while telemedicine is reliable for managing stable disease and improving access to care, its accuracy may drop with progressive disease and with grader fatigue. . Therefore, while telemedicine can be a valuable adjunct for expanding screening capacity in pediatric ophthalmology, future tools, possibly with AI support, will be needed to improve the detection of disease trajectory and ensure timely intervention.

An AND versus OR study of retinopathy of prematurity screening criteria

Aaserud TL, Lam L, Pastore S, et al.

J AAPOS 2025;29(4):104272

Screening for retinopathy of prematurity (ROP) requires fellowship-trained ophthalmologists, multiservice coordination, and increases stress on the premature infant. This study aims to compare current US screening guidelines for ROP screening, which includes premature infants ≤ 30 weeks gestational age or ≤ 1500 g at birth, to only screening infants that meet both criteria. It is a retrospective study at a single institution that reviewed medical records of premature infants

born between 2012-2022. The authors created two groups- one group of infants that met both ROP screening criteria (AND group) and one group of infants that met one of the ROP screening criteria (OR group). Diagnosis of treatment requiring type 1 ROP was the primary outcome, and need for follow-up ophthalmic examinations for ROP and maximum ROP stage were secondary outcomes. 759 infants were included in the study, 24% in the OR group and 76% in the AND group. Mean birth weight and mean gestational age were greater in the OR group. There were no infants in the OR group that showed severe type 1 or type 2 ROP requiring treatment as opposed to 15% of infants in the AND group that demonstrated type 1 or type 2 ROP disease, 9% requiring treatment. Limitations include retrospective study design and data collection at a single institution, which may limit generalizability of results. This study evaluates a simplification of the ROP screening guidelines by excluding the OR babies, which may reduce the patient load by about 24%.

Outcomes after unilateral bevacizumab treatment for infants with asymmetric retinopathy of prematurity

Nelson DG, Hubbard GB, Hutchinson AK

J AAPOS 2025;29(2):104091

After the publication of the BEAT-ROP trial led to increasingly frequent use of anti-VEGF treatment as primary treatment for retinopathy of prematurity (ROP), unilateral treatment for asymmetric disease became increasingly possible as treatment could occur at bedside without sedation. Authors asserted that intravitreal injection therapy lends itself more easily to unilateral and possible subsequent treatment than does laser. They retrospectively evaluated a small cohort of patients who received a unilateral bevacizumab injection (0.25mg or 0.5mg) at a single institution from 2011 to 2021 to determine the rate at which the contralateral eye required treatment. 22 patients met inclusion criteria, and 50% required treatment of the other eye. This study contained a small population with variability in gestational age, birthweight, other demographics, and treatment dosing (though no correlation was found between treatment dose and need for consecutive injection. The data was inconclusive regarding possibility of systemic effects of anti-VEGF preventing the need for treatment in the contralateral eye. However, the fact that 50% of patients did not require further anti-VEGF treatment may encourage providers to treat unilaterally first in hopes of reducing exposure to unnecessary medication.

Retinal Vascularization Rate Predicts Retinopathy of Prematurity and Remains Unaffected by Low-Dose Bevacizumab Treatment

Chang E, Josan A, Purohit R, et al

Am J Ophthalmol 2025;275:74-87

This retrospective cohort study from Oxford investigated whether ultra-widefield (UWF) retinal imaging could quantify retinal vascularization rate as a predictor of type 1 retinopathy of

prematurity (ROP) and assess whether anti-VEGF therapy alters vascular growth. ROP is a leading cause of childhood blindness, driven by delayed retinal vascularization and subsequent abnormal neovascularization in premature infants. The study analyzed 132 eyes from 76 preterm infants (mean GA 26 weeks, BW 815 g) using serial UWF images to calculate temporal vascularization rate (TVR), and then applied a machine-learning model using TVR, birthweight, and gestational age to predict ROP severity. Results showed that eyes requiring treatment (type 1 ROP) had significantly slower vascularization—29% lower TVR—than those with no or type 2 ROP. The predictive model incorporating TVR with birthweight and GA achieved 95.8% balanced accuracy in an independent validation cohort, outperforming models based on birthweight and GA alone. In a subset of 37 eyes, ultra-low-dose bevacizumab (0.16 mg) did not significantly affect TVR, suggesting physiological vascular growth continued post-treatment. Strengths of the study include use of UWF imaging to capture peripheral vasculature and the novel application of machine learning for individualized risk prediction. Limitations include its single-center design, modest sample size, and exclusion of cases with poor-quality imaging, which may limit generalizability. This work teaches us that quantifying vascularization rate can serve as an early, objective biomarker for identifying high-risk infants, allowing earlier and more precise intervention. For pediatric ophthalmology, these findings may shift practice toward integrating imaging-based vascular growth metrics into ROP screening protocols, refining treatment timing, and alleviating concerns that anti-VEGF therapy arrests physiological vascular development.

Evaluation Of Foveal Hypoplasia In Children With A History Of Retinopathy Of Prematurity

Çelik G, Oto BB, Kizilay O, et al.

Retina 2025;45(4):660-666

Foveal hypoplasia results when there is abnormal foveal development that causes a shallow or absent foveal depression. Normal foveal development begins around 22 weeks gestation and continues until around age 15. This cross-sectional study of 166 eyes from 83 patients evaluated foveal development in different gestational ages and ROP status. On average, participants were 7.8 years old at the time that OCT images were acquired. Foveal development differed significantly between the groups with spontaneous ROP regression and those requiring ROP treatment, with worse foveal hypoplasia in the ROP treatment group. Two thirds of patients with spontaneously regressed ROP had normal foveal development, compared with around 40% in the treatment-requiring ROP group. Despite the evidence of foveal hypoplasia on OCT, most patients (88.5%) had excellent visual acuity. This study provides support that ROP can affect foveal development and it is possible that treatment may result in worse foveal hypoplasia, although causation cannot be determined by this cross-sectional study. Despite the anatomic changes, most patients with foveal hypoplasia associated with prematurity have normal visual acuity.

Foveal Avascular Zone Development By Optical Coherence Tomography Angiography: Weighing the Influence of Gestational Age and Neonatal Early Growth Independently of Retinopathy of Prematurity

Campo-Gesto A, Rodríguez-Fernández CA, Baltazar ST, et al.

Retina 2025;45(5):946-953

Premature birth affects retinal vascular development, resulting in retinopathy of prematurity and other abnormalities in some patients. Previous work has shown that the foveal avascular zone

(FAZ) is smaller in patients with premature birth and ROP. This cross-sectional study analyzed OCTA images in 71 children ages 4-12 years old at a single academic center and compared various factors including birth weight, gestational age, comorbidities, and ROP status. On statistical analysis, a smaller FAZ was associated with preterm birth. Children with a greater weight at 15 days of life had a larger FAZ. Retinopathy of prematurity stage was associated with a less circular FAZ. Despite these anatomic changes on OCTA, there was no statistical difference between FAZ size and visual function or need for optical correction. The study also found that FAZ alterations in the superficial capillary plexus were associated with learning disabilities, although additional study is needed. Prematurity affects vascular development and is associated with a smaller FAZ. These anatomic changes, however, were not shown to have a functional impact on children.

Bilateral Anti-VEGF on Same-Day-Investigation on Safety in Retinopathy of Prematurity: A Multicenter Retrospective Study

Gangwe AB, Agrawal A, Jalali S, et al

Ophthalmol Retina 2025;9(5):484-492

Anti-VEGF injection has become the first-line treatment for aggressive ROP and ROP in zone 1. Given the often critical health status of the neonates, injections may be done in the NICU (opposed to the OR), which poses sterility concerns. Given ROP is often symmetric between eyes, many neonates require same-day bilateral injections. This multicenter, retrospective case series included 9984 eyes of 4992 patients who received same-day bilateral anti-VEGF injections, either in the NICU or OR. Most (83%) underwent bilateral injections in the operating room using a 29G needle 1-1.5mm from the limbus. Overall, anti-VEGF injection was very safe, with only 26 eyes having complications, which included lens injury (15 eyes) and presumed endophthalmitis (7 eyes). Only 1 eye had culture-proven endophthalmitis with *Pseudomonas aeruginosa*. There was no bilateral endophthalmitis in the study. Looking at the location for injection, there was no difference in endophthalmitis rates between NICU and OR, but lens injury was more frequent in the NICU, possible due to positioning and movement when performing these injections at bedside. This is a large study showing that bilateral anti-VEGF injections are safe, although may not be fully generalizable given the majority of injections occurred in the OR in this study. Especially when performing injections at bedside, care must be taken to properly direct the needle to avoid lens injury.

Outcomes and Need for Additional Interventions after Intravitreal Bevacizumab for Retinopathy of Prematurity

Sun AJ, Garcia BY, Patrick H, et al.

Ophthalmol Retina 2025;9(6):564-569

Retinopathy of prematurity (ROP) is significant cause of vision impairment in children resulting from impaired retinal vascularization and abnormal vessel growth. Anti-VEGF has emerged as a leading treatment for threshold ROP, but limited data exists on its effects on disease progression and need for further treatment. This retrospective chart review included 73 premature infants from 2 affiliated sites that were treated with anti-VEGF for threshold ROP (the vast majority zone II stage 3 disease). The average gestational age of the infants was 24.6 weeks and average age at treatment was 36.4 weeks. One-third (33%) had complete retinal vascularization after 1

intravitreal bevacizumab injection (IVB). Around one-third (36%) had persistent avascular retina (PAR) after IVB and most underwent laser to PAR. Around one-fifth (18%) had recurrence of proliferation after IVB and required laser or an additional injection. 7% of patients had no regression with IVB, and 7% died. The single center study illustrates the possible outcomes and anti-VEGF, with a third completely vascularizing, a third developing PAR, and around a third with either no regression, recurrence, or death after IVB. The single center limits this generalizability to diverse NICU populations. The study does not address optimal management of PAR after IVB, which remains a topic for further study.

Follow-up Algorithm after Bevacizumab Treatment for Retinopathy of Prematurity

Isaac M, Mireskandari K, Kertes PJ, et al.

Ophthalmol Retina 2025;9(7):709-711

Off-label use of intravitreal bevacizumab (IVB) is increasingly used for treatment of retinopathy of prematurity (ROP), especially for zone I disease. Long-term follow-up is required after injection due to the risk of reactivation, and many clinicians perform prophylactic laser after IVB. This review describes a follow-up and re-treatment algorithm for neonates after a single injection of IVB. A total of 251 eyes of 135 patients were included over a period of 11 years. Around one-third of eyes (27%) required re-treatment (for active disease in 9% and laser to PAR 18%). PAR was treated when there were greater than 6 DD temporally with or without peripheral leakage on FA. More eyes had a favorable visual outcome if they did not require re-treatment. Myopia and high myopia were more common in children that received re-treatment. This study suggests that all neonates treated with IVB may not require repeat treatment with laser, but the lack of follow-up and limited information on the follow-up for infants not treated limits the generalizability of the study.

United States versus Non-United States Retreatment Rates after Intravitreal Anti-VEGF Injections for Retinopathy of Prematurity

Patel NA, Acaba-Berrocal LA, Hoyek S, et al

Ophthalmol Retina 2025;9(8):812-814

The practice patterns in treatment of retinopathy of prematurity have shifted from laser photocoagulation as first-line to intravitreal anti-VEGF in many cases. There are many geographic and population differences with ROP which may effect efficacy of these treatments. This study included data from infants treated with anti-VEGF from 2007 to 2021 across 16 US and 7 global centers. A total of 1290 eyes of 844 patients were included. For baseline characteristics, the US group had on average lower birthweights, lower gestational ages, and had a higher gestational age at time of treatment. Retreatment was more common with ranibizumab compared to bevacizumab. Combined, a total of 122 eyes (less than 10%) required a repeat injection, more common in the aggressive ROP group. The US group had higher retreatment rates overall, but this may be confounded by smaller babies and more posterior and aggressive ROP in the US group. In the US group, higher bevacizumab dose was associated with a lower risk of retreatment, but this was not repeatable in the non-US group. Overall, additional study is need to clarify the optimal dose and medication for ROP, but the findings suggest that bevacizumab in higher doses results in fewer retreatments, especially within the US.

Low-Dose Bevacizumab 0.03 mg for Treatment of Type 1 Retinopathy of Prematurity

Hejkal TW, Sinha S, Rishi P, et al.

Ophthalmol Retina 2025;9(8):807-811

Intravitreal bevacizumab has become a common first-line treatment for retinopathy of prematurity (ROP), especially in zone I disease. The initial studies used a dose of 0.625mg, but this may be higher than the dose needed for treatment. Given that small amounts of intravitreal bevacizumab are absorbed systemically, there is interest in determining the optimal dose to minimize any detrimental systemic effects. This retrospective chart review included 123 eyes of 64 infants treated with low dose (0.03mg) bevacizumab across 4 hospitals. On average, infants were treated at 36 weeks gestational age. 100% of eyes showed initial regression after IVB and half (50%) of eyes developed full retinal vascularization without any further treatment. Around a third (34%) required laser for PAR (28%) or reactivation (7%). The remaining 16% did not have long enough follow-up to determine outcome due to transfer to another hospital or death. Most factors did not differ between those patients achieving full retinal vascularization and those requiring laser for PAR, although interestingly those with full retinal vascularization after low-dose bevacizumab had a lower mean birth weight compared to those needing treatment for PAR. Overall this study illustrates the similar efficacy of low-dose IVB compared to other studies, with the potential added benefit for lower systemic absorption. The high number (50%) of patients who achieved full retinal vascularization may also suggest that lower doses are less inhibitory to normal retinal growth, although the lack of a comparison group limits these conclusions.

A Meta-Analysis of Intravitreal Ranibizumab versus Laser Photocoagulation for the Treatment of Retinopathy of Prematurity

Baiad AA, Sun C, Yin GS, et al

Ophthalmol Retina 2025;9(7):677-689

Laser photocoagulation was the traditional treatment for ROP prior to the advent of anti-VEGF, which is an increasingly common treatment, especially for zone I disease. This meta-analysis included 1947 eyes from 1007 infants to determine the outcomes of treatment with intravitreal ranibizumab (IVR) versus laser. 7 cohort studies, 1 case-control study, and 2 randomized control trial were included. There was no significant difference in disease regression between IVR and laser, but eyes that underwent IVR had a higher risk of requiring retreatment. The risk of retreatment after laser was much lower and was often for incomplete regression opposed to reactivation. Myopia was less common in the IVR group compared to the laser group, around 1 D more of myopia during the study period in the laser group. There was no statistical difference in adverse events between groups. This meta-analysis concludes with moderate to low certainty that infants who receive IVR and nearly three times as likely to require retreatment. These results may not be generalizable to other anti-VEGF agents (bevacizumab) with a longer duration. Additional high-quality studies are needed to fully elucidate these findings.

Association between Area Deprivation Index and Retinopathy of Prematurity

Jordan JA, Turner C, Oke I, Oatts JT

Ophthalmol Retina 2025;9(5):495-498

Examinations for retinopathy of prematurity (ROP) are time-sensitive and required for early detection and treatment of ROP to minimize vision loss. Ability to follow-up for these examinations

may be affected by social determinants of health. This study utilized the area deprivation index (ADI), a neighborhood-level index composed of a variety of measures related to education, employment, housing, and poverty to explore effects of ADI on ROP outcomes. A total of 663 infants were included in the analysis. Just under half (41%) developed ROP and 5% required treatment. There was a trend towards higher birth weight in more advantaged neighborhoods. Infants that developed ROP had a lower BW and GA as predicted but were also more likely to be on public insurance and in the most disadvantaged quartile. On a multivariate analysis, however, the insurance status and ADI was not significant, suggesting that this was mediated by BW and GA. The study illustrates more disadvantaged neighborhoods had on average lower BW but does not definitively prove any relation to ROP status. Additional study is needed to evaluate the possible impact of ADI on infant birthweight and ways to mitigate.

Telescreening for Retinopathy of Prematurity after 40 Weeks Postmenstrual Age

Raja D, Zhao CS, Shah SV, et al.

Ophthalmol Retina 2025;9(9):921-923

Retinopathy of prematurity (ROP) is a leading cause of blindness in children and requires careful screening and follow-up. One approach to ROP screening is telemedicine ROP screening with at least weekly screening for all infants. This screening is most relevant prior to 40 weeks gestation, as most treatment-requiring ROP occurs prior to 40 weeks and complete retinal vascularization occurs around 45 weeks. For infants that remain in the NICU at 40 weeks, this study explored whether extending screening to biweekly had any adverse effects. Patients greater than 40 weeks PMA without active disease were included and screened biweekly. 111 patients met inclusion criteria. Only 17 patients (15.3%) developed ROP and any point, and 16 of those regressed between 33 and 36 weeks. No patient developed treatment-requiring ROP after 40 weeks PMA but two infants did have reactivated ROP but had no adverse effects from ROP reactivation. Although the results of the study are promising, the sample size is insufficient to identify rare adverse events and further study is needed prior to widely adopting biweekly telescreening after 40 weeks PMA.

Intravitreal Melphalan versus Topotecan for Vitreous Seeds in Retinoblastoma: A Comparative Study of 64 Asian Indian Eyes

Agarwal A, Tanna V, Vempuluru VS, et al.

Ophthalmol Retina 2025;9(6):589-597

Vitreous seeds have been a major limiting factor for globe salvage in retinoblastoma. Intravitreal chemotherapy has been used to address vitreous seeds, traditionally with melphalan but topotecan has emerged as a potential treatment with a better safety profile. This retrospective comparative case series included 25 eyes that received intravitreal melphalan and 39 eyes that received intravitreal topotecan. Complete resolution of vitreous seeds was seen in 92% of eyes in the melphalan group and 72% of eyes in the topotecan group (did not reach statistical significance between groups). The rates of globe salvage were higher in the intravitreal topotecan group (77%) vs the melphalan group (60%), but again did not reach statistical significance. Complications including retinal toxicity, optic atrophy, vascular attenuation, and retinal/subretinal hemorrhage were significantly higher in the melphalan group. This study suggests that intravitreal topotecan is as effective as intravitreal melphalan for vitreous seeds in the retinoblastoma, with a

favorable safety profile. Additional study with a larger sample size may be helpful as some measures (rates of resolution, globe salvage) approached but did not reach statistical significance. The study may be underpowered to detect these subtle differences that are important when considering intravitreal topotecan over melphalan. Additionally, eyes with increased pigmentation are shown to be at increased risk of toxicity, so these results may not be generalizable to a population where children have less ocular pigmentation.

Underlying Disease in Atypical Retinopathy of Prematurity

Cruz NFSD, Hudson JL, Sengillo JD, et al

Am J Ophthalmol 2025;274:67-75

This retrospective case series examined the overlap between retinopathy of prematurity (ROP), familial exudative vitreoretinopathy (FEVR), and telomere biology disorders (TBD) in pediatric patients presenting with atypical retinopathy. Eighteen patients with phenotypic and genetically confirmed FEVR or TBD were included. A significant proportion of children initially diagnosed with ROP were ultimately found to have genetically confirmed FEVR or TBD, with common variants in LRP5 (5, 33.3%), FZD4 (3, 20%), and CTC1 (3, 75%) genes. The study introduces the terms "ROPER" (ROP and FEVR) and "ROPHERE" (ROP and TBD) to better classify these patients, emphasizing the importance of genetic evaluation and sustained surveillance for infants with atypical retinal findings to ensure accurate diagnosis and management.

Validation of the SCREENROP Criteria for Retinopathy of Prematurity Screening: A Canadian Model for Consideration

Tai F, Jindani Y, Mukerji A, Sabri K

Am J Ophthalmol 2025;276:230-234

This study evaluated the sensitivity of the SCREEN-ROP criteria for retinopathy of prematurity (ROP) screening in a Canadian cohort of 823 unique babies undergoing ROP screening. The SCREEN-ROP guidelines included birth weight <1200 g or gestational age <30 weeks. The authors found that these criteria achieved 100% sensitivity for identifying all infants who required ROP treatment, while reducing unnecessary screenings by 7.41% compared to previous criteria. The findings suggest that the SCREEN-ROP model may decrease the number of infants exposed to potentially stressful and resource-intensive ROP examinations without missing any cases requiring intervention, supporting further validation and potential broader adoption of these guidelines in other settings.

Prediction Models for Retinopathy of Prematurity Using Nonimaging Machine Learning Approaches: A Regional Multicenter Study

Takeda Y, Kaneko Y, Sugimoto M, et al.

Ophthalmol Sci 2025;5(4):100715

In an effort to continue to optimize screening practices for ROP, this study aimed to develop a non-imaging-based machine learning model that uses clinical data present at the time of first ROP screening to predict the occurrence of ROP. A total of 35 variables obtained for 215 patients (including GA, BW, BW at first screen, IGR, sex, Apgar scores, ET intubation, surfactant

administration, RDS, TTON, caffeine administration, chronic lung disease, hydrocephalus, PVL, IVH, sepsis, NEC, PDA +/- treatment, EPO administration, blood transfusion, human milk feed, maternal age, placental abruption, PROM, placenta previa, GDM, PGDM, pregnancy induced hypertension, chorioamnionitis, and steroid administration at delivery) were provided to five different machine learning models and correlated with the presence of ROP on baseline screening exam. The AUC-ROC, accuracy, sensitivity, and specificity for the two most accurate models were as follows: Random Forest (0.93, 90.1%, 95.7%, 66.0%) and Naïve Bayes (0.94, 90.6%, 94.6%, 73.6%). While the performance of these models is higher than some previous deep learning models and has the benefit of not relying on fundus photography, the non-100% sensitivity warrants further exploration to ensure that no cases of ROP are missed. Of note, Japan uses wider screening parameters than the United States (<1800g and ≤ 34 weeks) which should increase sensitivity relative to our narrower criteria. There are cases (such as corneal opacity), that predictive models that do not rely on a view of the posterior pole would be helpful in prognosticating risk of ROP development.

Strabismus

Long-term Motor and Sensory Outcomes After Unilateral Lateral Rectus Recession-Medial Rectus Resection for Infantile Constant Exotropia

Mohan K, Sharma SK

J Pediatr Ophthalmol Strabismus 2025;62(3):203-210

Compared to infantile esotropia and intermittent exotropia, constant infantile exotropia is a relatively understudied Phenomenon. Here, the authors describe the long term outcomes in these patients following unilateral strabismus surgery. In all, a retrospective chart review found 20 patients that underwent a unilateral lateral rectus recession – medial rectus resection for constant infantile exotropia that had at least four years of post-operative follow up. The mean preoperative angle of deviation was 70 prism diopters, and the mean duration of exotropia prior to surgery was three years. At last follow up, 12 out of the 20 patients (60%) had successful motor outcomes; 20% of patients had residual exotropia, while 15% had recurrent exotropia. Five of the patients had peripheral binocular single vision, though none had stereopsis. Similar to infantile esotropia, patients with infantile exotropia seem to have a low capacity of fine stereopsis, regardless of motor success of the surgery. However, the authors show that a recess/resect procedure is a viable option for these patients, with relatively good rates of motor success and a tendency toward undercorrection in those that did not achieve motor success.

Accuracy and Readability of ChatGPT Responses to Patient-Centric Strabismus Questions

Gary AA, Lai JM, Locatelli EVT, et al.

J Pediatr Ophthalmol Strabismus 2025;62(3):220-227

This study evaluated the accuracy and readability of ChatGPT's responses to patient-centered questions about strabismus. Thirty-four commonly asked questions spanning diagnosis, epidemiology, symptoms, prognosis, treatment, and research were entered into ChatGPT 3.5 (free) and ChatGPT 4.0 (subscription) from two geographic locations (Florida and California) at three time points (day 0, one week, and one month). Two pediatric ophthalmologists graded responses as "acceptable," "accurate but missing key information or minor inaccuracies," or "inaccurate and potentially harmful." Readability was assessed using Flesch-Kincaid Grade Level and Flesch Reading Ease scores. Of all responses, 63.5% were rated "acceptable," 32.4% "accurate but incomplete," and 4.2% "inaccurate and potentially harmful," with harmful answers concentrated in prognosis, treatment, and research. ChatGPT 4.0 produced more "acceptable" responses than 3.5 (67.2% vs 59.8%), and California outputs were significantly more accurate than Florida's. Readability was consistently poor, averaging a grade level of 15 and a low ease score of 27, well above the AMA's recommended sixth-grade level. Notably, "acceptable" responses were also more readable than inaccurate ones. Over time, "acceptable" responses increased, suggesting possible refinement with repeated queries. Clinically, ChatGPT shows promise as an adjunctive educational tool for patients and caregivers but cannot replace professional counseling. Improving readability, accuracy in nuanced topics, and consistency across versions is critical before AI can be fully trusted for patient education.

Are optic nerve head and choroidal circulation affected by eye movements?

Orenc P, Yalcin E

Eur J Ophthalmol 2025;35(4):1389-1393

It is known that eye movements can mechanically affect the **optic nerve**, but the physiological impact on the optic disc's blood flow remains poorly understood, especially when measured by optical coherence tomography angiography (OCTA). To investigate this, a prospective study was conducted on 30 healthy volunteers between the ages of 15 and 73. The study measured peripapillary capillary density (RPCD) parameters using OCTA at three different gaze positions: primary gaze, 30° abduction, and 30° adduction. The results showed that horizontal eye movements generally cause minimal significant changes in OCTA parameters. A minor, but statistically significant, decrease in superior hemifield all-vessel density was only observed in the left eye during adduction, and this change was also found to be related to the patient's age. The study's prospective design is a strength, but its small sample size and wide age range limit its applicability, particularly to pediatric populations. These findings suggest that for healthy individuals, short-term horizontal eye movements have a negligible impact on most OCTA parameters, which is important for the interpretation of routine clinical imaging.

Characteristics of two subtypes of nonacute acquired comitant esotropia with distance diplopia

Eng K, Chang YH, Zurakowski D, et al.

J AAPOS 2025 Apr;29(2):104154

The purpose of this study was to determine the incidence, demographics, and ophthalmic characteristics of non-acute acquired comitant esotropia with distance diplopia (NACEDD). Patients were divided into Type 1 (divergence insufficiency) or Type 2 (all other types) by the presence or absence of near diplopia. A retrospective, single institution, cohort study was

performed evaluating all patients 10 and older with gradual onset comitant esotropia with distance diplopia over a 5 year period (2017-2022), excluding patients with neurologic, restrictive, and autoimmune causes; 249 patients were reviewed. Metrics collected included age, sex, race, cycloplegic refraction, use of presbyopia correction, symptoms, and strabismus measurements at distance and near. Patients were also identified as probable sagging eye syndrome (SES) based on external lid findings. While both types were more common in females and myopes, Type 1 patients were significantly older (60.3 ± 19.3) and had a higher incidence of SES. Distance angle of diplopia was comparable between the two groups, but near angle was significantly larger in Type 2 patients, though neither group was typically symptomatic at near. The use of progressives was more common in a middle-aged population rather than the elderly (70+), though causation could not be proven. Other limitations of the study include population size and single institution sample, which did not include enough patients in each race category to determine influence on characteristics of esotropia. Further, the determination of probable SES was not verified with orbital imaging. This paper suggests a classification system for two types of NACEDD which can be used to categorize patients presenting with similar symptoms; however it does not raise the question of different methods of management between the two types.

Comparison of subjective cyclovertical deviation and objective ocular torsion in sagging eye syndrome and superior oblique palsy

Kawai M, Goseki T, Ishikawa H, et al.

Strabismus Published online June 24, 2025

The authors of this prospective, cross-sectional study compared the torsion found in cyclovertical sagging eye syndrome (CSES) and superior oblique palsy (SOP). Specifically, the authors compared the subjective cyclovertical deviations in each group (measured by synoptophore) and objective ocular torsion in each group (measured by determining the disc-fovea angle [DFA] in fundus photographs). There was no difference in mean subjective cyclodeviation in primary gaze, but there was a statistically significant difference in downgaze with SOP causing greater torsion. There was no difference between the two groups in DFA of the hypertropic eyes whereas there was a statistically significant difference between the two groups in DFA of hypotropic eye with the SOP having more torsion. The strength of the study is the prospective collection of detailed objective measurements obtained for each group although sample size is relatively small. Although this study demonstrates a difference in downgaze torsion among patients with CSES and SOP, the applicability may be limited to providers who routinely use synoptophores.

Optic nerve head changes in esotropia

Al-Haddad C, Slim A, Wehbi Z, et al.

J AAPOS 2025;29(2):104163

Previous studies have demonstrated significantly smaller optic nerve head size in eyes with hyperopia and either esotropia or amblyopia as compared to eyes with hyperopia without esotropia or amblyopia. Further, recent studies have also suggested morphological and vascular changes to the optic nerve head associated with adduction. Authors performed a prospective, single institution study over 4 years comparing axial length measures (obtained through IOL master) and optic nerve head measurements (obtained through OCT) in age- and sex-matched patients with and without esotropia, excluding patients with amblyopia and known optic nerve or

retinal pathologies. Disc area, rim area, C:D ratio, cup volume, and RNFL thickness were compared using multiple regression analysis while adjusting for spherical equivalent and axial length. 174 participants were evaluated, including 83 with esotropia. Esotropic patients were found to be significantly more hyperopic with smaller axial lengths (93% were accommodative esotropes). After adjustment for hyperopia and axial length, esotropic patients were found to have statistically lower C:D ratio and lower cup volumes as compared to controls. There was no significant difference in RNFL thickness between groups; if anything, esotropes had a higher average RNFL thickness than controls. The main limitation of this study is the significantly different average spherical equivalents and axial length measures of study patients compared to controls. It is unknown at this time if findings are clinically significant.

Types of strabismus and strabismus surgery after retinal detachment repair: a health registry database analysis

Soetikno BT, Tran EM, Wai KM, et al.

J AAPOS 2025 Jun;29(3):104216

After a rhegmatogenous retinal detachment (RRD) repair, diplopia (double vision) and strabismus (eye misalignment) are potential complications, but their incidence varies depending on the surgical method. A retrospective cohort study analyzed data from over 126 million patients in the TriNetX Analytics platform to compare the risks of these complications after three types of RRD repair: pneumatic retinopexy (PR), scleral buckle (SB), and pars plana vitrectomy with or without scleral buckle (PPV+/-SB). The study identified 25,169 patients and found that the overall risk of diplopia and strabismus is low. However, SB carried the highest risk, with rates of 2.73% for diplopia and 1.79% for strabismus. PPV+/-SB had the next highest risk (2.28% for diplopia, 1.46% for strabismus), while PR had the lowest risk (1.54% for diplopia, 0.612% for strabismus). Both SB and PPV+/-SB had a significantly higher risk of diplopia and strabismus compared to PR ($P < 0.01$ and $P < 0.001$, respectively). Horizontal tropias were the most common type of strabismus, and Kaplan-Meier analysis showed that SB had the highest hazard for both diplopia and strabismus during the first year after surgery. The need for strabismus intervention, such as surgery or chemodenervation, was extremely rare. While the study's large and geographically and racially diverse sample size is a major strength, its limitations include a reliance on the accuracy of coding and the inability to separate some procedures. Nonetheless, the findings provide a valuable perspective for clinicians, reassuring them that the risk of a patient needing strabismus surgery after RRD repair is extremely low.

Periodic alternating esotropia associated with disorders of neural tube closure

Lewis JR, Malem AH, Buncic JR

J AAPOS 2025 Jun;29(3):104226

Periodic alternating esotropia (PAE) is a rare, involuntary, and cyclical eye movement disorder that can occur alongside periodic alternating gaze (PAG) and a compensatory head turn. A case series was conducted to better understand this phenomenon, reviewing the medical records of five children with PAE who also had neural tube defects and hydrocephalus. In all five cases, the PAE was seen with PAG and a contraversive head turn, and the patient always preferred to fixate with the eye that was abducting (moving away from the nose). All these patients were born with neural tube defects and had hydrocephalus that required the insertion of a ventriculoperitoneal

shunt within their first month of life. When these five cases are considered alongside five others previously published in the literature, they suggest that PAE, when combined with these specific ocular and neurological findings, may be a genuine clinical entity in some patients with neural tube closure defects. While the study is limited by its small sample size as a case series, the findings are important for clinical practice, as they suggest that PAE should be considered in any patient who has a neural tube defect and a compensatory head turn.

Clinical profile of patients with monocular elevation deficiency undergoing strabismus surgery
Akbari MR, Masoomian B, Azizi E, et al.

J AAPOS 2025 Jun;29(3):104221

Monocular elevation deficiency (MED), also known as double elevator palsy, is a specific type of strabismus marked by a limited ability to move one eye upward. A retrospective chart review was conducted at a single institution to better understand the visual and strabismic characteristics of 105 patients with MED who underwent corrective surgery. The review found a variety of clinical presentations, with the affected eyes showing significantly higher cylindrical refractive error and lower spherical equivalent compared to the unaffected fellow eyes. Visual acuity was also significantly worse in the MED eyes. A high percentage of patients, 60%, had unilateral amblyopia (38 of those cases were in the MED eye), and 85% of the patients had ptosis (drooping eyelid) in the affected eye. The most common deviation was hypotropia alone (50%), followed by hypotropia with exotropia (33%) and hypotropia with esotropia (17%). Additionally, 34% of patients had an abnormal head posture (AHP), most commonly a pure chin-up position (86% of those with AHP). While the study is limited by its focus on patients who received surgery at a single institution, the findings highlight the diverse clinical features associated with MED and underscore the need for a comprehensive approach to its management. This knowledge is crucial for clinicians when evaluating and treating patients with this condition.

Surgical Realignment Reverses Contrast Sensitivity Deficits in Children With Intermittent Exotropia: One-Year Results of a Cohort Study

Yang Y, Lou J, Tan S, et al

Invest Ophthalmol Vis Sci 2025;66(11):71

This study addresses the previously established deficit in contrast sensitivity function (CSF) in children with intermittent exotropia (IXT). The core objective was to determine if this sensory deficit is reversible through surgical correction and to compare the developmental trajectory of CSF in affected children with that of healthy controls. This was a 1-year prospective cohort study that enrolled 45 children with IXT (ages 7-13 years) and 30 age-matched healthy controls. The IXT cohort was partitioned into a surgical intervention group and an observation-only group. Binocular and monocular CSF, stereoacuity, and sensory fusion were assessed at baseline and again at 12 months. One year post-operatively, the surgical group demonstrated statistically significant improvements in binocular CSF, specifically at spatial frequencies of 3, 12, and 18 cycles per degree (cpd) ($p < 0.05$). Despite this, their CSF values remained below the healthy control group. In contrast, the observation group of children with IXT exhibited no significant change in any measured CSF metric over the study period. The article is novel in that it takes a known relationship between IXT and CSF and follows the relationship prospectively with and without surgery, and simultaneously comparing this population to a control group without IXT. A

key limitation is the non-randomized allocation of participants to the surgical vs. observation groups; the surgical cohort had more severe initial eye deviations, which could represent a confounding variable. In summary, this article does provide additional insight to the value of early surgical intervention in IXT in improving patient's CSF, which strongly correlates with vision-dependent daily activities.

Stereopsis in children with fully versus partially accommodative esotropia

Hecht I, Diehl NN, Mohny BG

J AAPOS 2025;29(4):104255

Children with accommodative esotropia wearing their hyperopic correction may be fully corrected (fully accommodative esotropia (FAET)), while others have a residual deviation (partially accommodative esotropia (PAET)). This study aims to evaluate and compare stereopsis in these two populations. This study retrospectively reviewed medical records of all patients < 19 years of age diagnosed with accommodative esotropia living in Olmstead County, Minnesota between 1975-1994. After wearing full optical correction for 6-8 weeks, the two groups were defined by esotropia ≤ 8 prism diopters (FAET) and esotropia ≥ 10 prism diopters of esotropia (PAET). Of 306 patients that were included in the study, 79.7% had FAET and 20.3% had PAET. Children with FAET presented at an older age with smaller initial deviations and were significantly more likely to have high-grade stereopsis than children with PAET. Limitations include incomplete data and irregular follow-up inherent to a retrospective study and possible crossover between the groups at extended follow-up that was not captured. This study provides valuable data to help clinicians predict stereoacuity outcomes in children with accommodative esotropia.

Fifteen-minute monocular occlusion test compared with 45-minute monocular occlusion test in the evaluation of divergence excess intermittent exotropia

Uzbek S, Walsh L, Smith D, Wan MJ

J AAPOS 2025;29(4):104252

The prolonged monocular occlusion (PMO) test has been used to eliminate effects of tenacious proximal fusion to determine the mechanism of near-distant disparity in intermittent exotropia. This study aims to compare 15-minute occlusion with 45-minute occlusion in determining classification, size of deviation, and presence of AC/A ratio in testing patients with intermittent exotropia. Participants were prospectively studied and divided into group A (PMO for 15 minutes, followed by 45 minutes) and group B (PMO for 45 minutes initially followed by 15 minutes). Control and size of deviation were assessed at baseline and after each treatment phase. A total of 22 children participated in the study with a mean age of 8 years. The near deviation increased a clinically significant amount in 82% of participants in both groups. There was no statistically significant difference in the size of the near or distant deviation between the two groups.

Limitations include unmasked, single examiner and cycloplegic refraction within 2 years, rather than the standard one year. This study suggests that 15-min PMO is comparable to 45-minute PMO in determining the mechanism of near-distant disparity in intermittent exotropia, which has the potential to save clinicians and patients time during clinic evaluations.

Adaptive Responses of Accommodation and Vergence Following Exposure to Augmented Reality in a Head-Mounted Display

Yego WK, Gilson SJ, Baraas RC, Svarverud E

Invest Ophthalmol Vis Sci 2025;66(12):1

This study investigated how short-term exposure to augmented reality (AR) using a head-mounted display (HMD) affects the oculomotor system—specifically, accommodation, vergence, and their neural cross-links. Sixteen young adults performed a 3D cognitive task (Tower of London) in both AR and physical environments across two sessions. Pre- and post-task measurements of tonic accommodation (TA), tonic vergence (TV), and the accommodation-vergence cross-links (AC/A and CA/C ratios) were collected. This study was a 2x2 experimental crossover design with two sessions per day on two separate days. Participants were given an AR version of a 3D executive function task using Microsoft hololens 2 with virtual content at a 0.4 M fixed accommodation demand and vergence demand varying to match the 3D tasks. The patients then had a physical version of the same task using a real model. Patients had tonic accommodation, tonic vergences ca/c ratio and ACA ratio measured. The authors found that after AR exposure tonic accommodation significantly decreased as well as the ca/c ratio. Tonic vergence and ac/a ratio remains unchanged. None of these changes were noted in the physical environment. These results suggest that even 25 minutes of AR exposure with a vergence accommodation conflict can induce short-term neural adaptation and the ocular motor system appears to reduce the influence of vergence on accommodation to minimize discomfort or effort. The authors note that there were a number of limitations including modest exposure time and effects were short-term in this situation. It's possible that long-term adaptation or repeated use may lead to permanent shifts. The AR display used maintained fixed accommodation demand (~0.5 D). Different AR systems with variable-focus elements might produce different adaptation patterns. The authors suggest that short-term exposure to AR tasks can alter oculomotor function (accommodation in particular), so designers of AR content / displays should be aware of this when considering usage durations, break schedules, and ergonomic / comfort guidelines. This might help explain some of the discomfort, visual fatigue, or blur that users report after AR sessions: if the accommodation system is being “down-regulated,” then shifting to natural/physical viewing might transiently feel blurry or require adaptation. Also, potential for adaptation training / “preconditioning” AR exposure to reduce negative symptoms.

Functional Anatomy of Ocular Counter-Rolling in Superior Oblique Palsy

Demer JL, Clark RA

Invest Ophthalmol Vis Sci 2025;66(12):6

The authors set out to use functional MRI in order to evaluate the displacement of rectus extraocular muscle pulleys in superior oblique palsy which may account for incomitant strabismus patterns even without superior oblique contractile weakness. The authors were looking at how rectus ocular muscle pulleys reorient during head tilt and unilateral sop and further interested in

studying whether the differences in eoms especially the paretic super oblique versus the fellow super oblique change their posterior partial volumes during head tilt. Is ocular counter rolling preserved or altered in this condition? 13 people with unilateral SOP were enrolled with confirmation of atrophy by MRI. High resolution MRI was done with subjects into lateral decubitus positions and some supine and the pulley positions of the four rectus muscles and the superior oblique were measured. The authors found that paretic Superior obliques had significantly smaller ppv than the fellow Superior oblique confirming atrophy and functional impairment, no major significant change in whole rectus movement associated with head tilt in either the palsied or fellow orbit. There were compartmental ppv changes in the fellow orbit in the lateral rectus and superior rectus as well as with the superior oblique and these compartmental differences were largely absent in the palsied orbit. The authors interpreted this finding and conclude that counter-rolling at the level of the rectus is not lost in sop even in the palsy orbit, the palsied eye had an excyclorotated pulley configuration at baseline relative to the fellow eye, and the palsied SOP loses much of its Ability to exhibit differential compartmental activation and other muscles may compensate. The take home from this study is that this strabismus may not be solely attributed to superior muscle weakness but rather some of the mechanical geometry and compartmental behavior of multiple muscles.

Characteristic Thinning of Temporal Parafoveal Retinal Thickness in Patients With Intermittent Exotropia

Han M, Wen Y, Tang S, et al.

Am J Ophthalmol 2025;273:151-158

This study asks whether retinal structure differs in intermittent exotropia (IXT) in a way that could support sensory adaptations like anomalous retinal correspondence (ARC). Because many IXT patients avoid diplopia via suppression/ARC, the authors probed the temporal parafovea—where suppression/ARC would be expected—using high-resolution OCT. In a cross-sectional design, 20 basic-type IXT patients with a fixed 35-PD exodeviation were compared with 20 age-matched controls; OCT thickness was sampled at temporal parafoveal loci corresponding to 25, 30, 35, 40, and 45 PD, alongside standard motility, dominance, stereopsis, axial length, and synoptophore testing. Results showed interocular symmetry within IXT (no dominant–nondominant differences overall), but a marked localized thinning at the locus corresponding to the deviation angle: temporal parafoveal thickness at 35 PD was significantly reduced versus controls ($P<.0001$) with a “V-shaped” profile centered on 35 PD. Among IXT eyes, thinning at 35 PD was greater in ARC versus non-ARC, significant in nondominant eyes ($P=.007$) and right eyes ($P=.033$). Measurement reproducibility was excellent (single-measure ICC 0.913; average-measure ICC 0.969). Strengths include targeted, physiology-driven sampling of retinal structure, rigorous masking, and high interobserver reliability; limitations are the small, single-center sample, fixed angle (35 PD) restricting generalizability, cross-sectional design (no causality), and absence of layer-by-layer segmentation or longitudinal change after treatment. This work teaches that IXT may feature a subtle, localized temporal parafoveal “pseudo-fovea” anatomically aligned to the habitual deviation, especially in ARC—linking structure to sensory adaptation. For pediatric ophthalmology, it suggests OCT mapping of temporal parafovea could become a biomarker for ARC/IXT control, refine counseling and prognosis, and motivate trials tracking whether surgery or vision therapy normalizes this niche thinning or predicts postoperative binocular outcomes.

Congenital Restrictive Strabismus Associated With Anomalous Orbital Structures: MRI Findings and Clinical Characteristics

Wang D, Yang YY, Chang QL, et al

Am J Ophthalmol 2025;276:195-200

This was a retrospective case series of 35 patients with congenital restrictive strabismus associated with anomalous orbital structures (AOS), characterized and classified by MRI findings. All patients exhibited varying degrees of restricted ocular motility and strabismus, with frequent findings of amblyopia and eyelid malposition in the affected eye. The study identified three main types of AOS: discrete anomalous bands from rectus muscles to the posterior sclera (most commonly involving the inferior rectus), anomalous connections between extraocular muscles (predominantly between the superior and medial rectus), and abnormal connections between the posterior sclera and the optic nerve sheath. Eyelid malposition may serve as a clinical indicator of underlying AOS in congenital restrictive strabismus.

Is the Incidence of Concomitant Esotropia with Diplopia in the United States Increasing? Kim

DH, Lambert SR

Ophthalmol Sci 2025;5(5):100799

Acquired comitant esotropia with diplopia is an umbrella term that includes multiple subtypes of esotropia (i.e. acquired ET, DI, CI, convergence excess ET, and sagging eye). Some studies have reported increased incidence of comitant ET with diplopia in single-center observations, thus this study aimed to use a large commercial database to further investigate this possible trend. All patients with ICD-10 codes related to comitant esotropia with diplopia from 2007-2022 in a single commercial health insurance claims database were included; patients with codes related to paralytic, neurological, mechanical, and congenital strabismus were excluded. The cohort was then split into first and second half (2007-2014 and 2015-2022) and the mean age of diagnosis, sex, and ratio of total strabismus to comitant esotropia was compared between the two time periods. There was noted to be a significant increase in the rate of comitant ET over time, from 1.27% in 2007 to 3.49% in 2022. In the first half of the cohort, there was a male predominance in ET patients <39yo which switched to a female predominance in the second half of the cohort. There was a female predominance at both time points for patients >40yo. The authors postulated that younger female patients may be more susceptible to new causes of ET (including possible impacts of higher rates of near work/screen time) given the trend in this population, but given the lack of clinical data in this type of claims database study, this cannot be measured objectively.

Strabismus Surgery

An Analysis of Treatment Success of Acute Acquired Comitant Esotropia With a Single Injection of Botulinum Toxin A: An Observational Case Series Study

Ganesh SC, Lusobya RC, Jogitha, et al

J Pediatr Ophthalmol Strabismus 2025;62(4):237-244

Although strabismus surgery remains the mainstay of treatment for most ocular misalignments, botulinum toxin injection into the extraocular muscles can be a useful adjunct or, in some cases, a replacement. In this study, the authors reviewed outcomes for all patients who received a pre-determined dose of botulinum toxin in the medial rectus muscle for acute, acquired, comitant esotropia over a 3 year span at a single institution. They defined motor success after injection as esotropia less than 8 prism diopters, and the defined sensory success as an absence of diplopia. In all, 72 patients with an average age of 10.39 ± 5.73 years, and an age range of 2 to 24 years old, were included. Following treatment with botulinum toxin, the percentage of patients with diplopia decreased from 79.2% at presentation to 18.6% (post-procedure week 1), 4.9% (post-procedures month 1), 2.2% (post-procedure month 3, and 0% (p1 year post-procedure. Of the patients who followed up for at least one year (28 total), 85.7% achieved both sensory and motor success. This study suggests that botulinum toxin A is an effective first line treatment for AACE, often achieving good sensory outcomes (though not as good motor outcomes, overall). Given the hesitancy to perform strabismus surgery immediately after the onset of an acute deviation, chemical denervation of the medial rectus muscle would seem to offer a safe and relatively effective option for cases of AACE in which the patient or family want a more immediate intervention.

Botulinum Toxin A for Management of Consecutive Exotropia: Factors Affecting Treatment Success

Tugcu B, Yildirim H, Kunduracı MS, et al.

J Pediatr Ophthalmol Strabismus 2025;62(4):258-269

Consecutive exotropia is a relatively common outcome following surgery for esotropia, and one that is frustrating for both provider and patient. While typically addressed with a second strabismus surgery, the authors of this study sought to determine if injection of five units of botulinum toxin A into a single lateral rectus muscle would suffice as a treatment for consecutive exotropia. A total of 34 patients with consecutive esotropia were included in the study, with an average age about 14 years old. The mean exotropic deviation prior to injection was 20.03 ± 8.42 PD at near and 21.41 ± 8.87 PD at distance. Following injection, the mean exotropic deviation was 9.65 ± 7.42 PD at near and 10.82 ± 7.33 PD at distance. Defining success as a distance deviation within 10 prism diopters of orthotropia, the authors reported a 73.5% success rate with an average number of injections of 1.6 ± 1.1 . Although successful by the authors criteria, this study suggests an average of about 10 PD improvement with injection of five units of botulinum toxin A into a single lateral rectus muscle, though many had to have multiple injections. For patients wishing to avoid surgery for consecutive exotropia and an ocular deviation on the smaller side, it appears to be a reasonable treatment choice.

Palpebral Fissure Changes After Bilateral Recession Versus Unilateral Recession-Plication of Horizontal Rectus Muscles for Correction of Intermittent Exotropia

Ellessawy KB, Ibrahim MMM, Kassem RR, Fouad HM

J Pediatr Ophthalmol Strabismus 2025;62(3):182-189

It is often taught that unilateral recession-resection or recession-plication can lead to a narrowed palpebral fissure following strabismus surgery. Among surgeons who favor or perform unilateral recession-resection or recession-plication for exotropia, then, this is a post-operative concern. To investigate this phenomenon, the authors here performed a prospective, comparative, randomized study that divided 40 patients with intermittent exotropia into two groups: 20 patients who underwent BLR recessions and 20 patients who underwent unilateral LR recession and MR muscle scleral plication. They then measured and compared the MRD1 and MRD2 at post-op weeks 1, 6, and 12. To summarize the data, they found no significant difference in eyelid measurements and palpebral fissure height (PFH) between the groups. Though there were some changes in PFH in the early post-operative period, this was similar between the groups and largely resolved by 12 weeks regardless. They also found no difference in lateral incomitance or ocular alignment following the surgeries. This is interesting because, although it goes against some anecdotal experience, it suggests that narrowing of the palpebral fissure may not be as problematic a side effect in unilateral recession/plication surgeries as previously thought. Lastly, it is worth noting that this study limited patients to deviations between 25 and 50 PD, so this may not be applicable outside this range. Additionally, the study was not blinded, potentially introducing some bias into the measurement of the results.

Changes in PAX7 Positive Satellite Cells in Extraocular Muscle After Strabismus Surgery

Kang E, Ha SG

J Pediatr Ophthalmol Strabismus 2025;62(3):190-195

PAX-7 positive satellite cells are muscle stem cells that are essential to growth and repair of skeletal muscle. When skeletal muscle is injured, these cells activate and act to restore muscle function and structure. The authors hypothesize that the relative activation or activity of such cells following the trauma of strabismus surgery may play a role in healing and, subsequently, outcomes. As such, they performed a study in which they either resected or recessed a single superior rectus in 20 rabbit eyes. Four weeks after the procedure, they then excised the operated superior rectus, as well as the ipsilateral inferior rectus (antagonist muscle) and contralateral superior rectus (control muscle), and analyzed the muscles for PAX7 positive satellite cells using immunohistochemistry. They found that the number of PAX7 positive satellite cells was highest in the operated muscle, next highest in the antagonist muscles, and lowest in the control muscle. Additionally, the number of PAX7 positive satellite cells in operated and antagonist muscles was higher after resection surgery than after recession surgery. Although not seemingly of clinical utility yet, further investigation into myogenic repair and remodeling may shed light on the healing process following strabismus surgery, which could be crucial for optimizing outcomes.

Small-angle vertical strabismus treatment in the elderly

Mason H, Kilduff C, Jain S

J AAPOS 2025 Apr;29(2):104-177

Management of vertical strabismus in the elderly can be complex due to small angles of deviation, limited fusional vergence, and desire to be glasses/prism-free following cataract surgery. Standard recession surgery can lead to over-correction in this patient population. A review of

1,390 abstracts was conducted. 5 novel surgical techniques for management of small-angle vertical strabismus were identified, and 4 of these were reviewed. Graded partial tenotomy of up to 90% tendon-width, which is intended to be performed under topical anesthetic with immediate patient feedback, resulted in up to 10 prism diopters of correction, though effects were seen to decrease within 1 year of the procedure. Partial tenotomy, performed by creating an 80-90% tenotomy and recessing the severed muscle fibers by up to 4mm, showed maximum effect of 6 prism diopters without statistically significant effects on torsion or incomitance. Minitenotomy, which involves cutting the central 3-4mm of the vertical rectus tendon under local anesthesia through intact conjunctiva, resulted in correction of about 2 prism diopters, and is suggested for patients with very small angles of deviation who have contraindications to anesthesia. Miniplication, tagging the central 3-4mm of the muscle 5mm posterior to the insertion and bringing them forward and attaching them at the insertion, achieved up to 8-9 prism diopters of correction, preserved anterior ciliary vessels, and allowed for surgical intervention where no vertical rectus muscles were appropriate for weakening. Limitations of this review article include small sample sizes and short follow-up periods. These surgical techniques provide viable alternatives for patients with small-angle strabismus for whom prism and/or general anesthesia is not an option.

Improvement of stereopsis following strabismus surgery in adults: a retrospective analysis

Rock O, Golani T, David S, et al

Can J Ophthalmol 2025;60(4):e598-e601

Although strabismus surgery in adults is generally felt to be beneficial from a motor alignment, visual acuity, and cosmetic perspective, there have been reports on partial recovery or improvement in sensory fusion and stereopsis. This was a retrospective observational study of adult strabismus patients at a single institution who underwent surgery (n=132). Overall, the average age of surgery was 40.98 years (range 18.06–9.43) with strabismus being due of childhood-onset (n=55), neurological (37), decompensated phoria (17), TED (13), and other causes (10). Of the 68% that were checked for fusion through Worth-4-Dot, 59% had fusion, and 38% did not. About half of patients (n=65) had stereopsis better than 100" and about a fifth (29) had nil stereo. Of the 40% that had pre-surgery stereo, 35% showed improvement. The study also found a statistically significant correlation between postoperative alignment ≤ 10 PD and achieving stereo of 800" or better; however, this did not retain significance when the cut-off was decreased to 4 PD. No correlation was found with pre-op angle of deviation, direction of strabismus, or type. Although patients with neurologic and TED causes showed more stereo in general than childhood-onset, this was not statistically significant (p=0.6579). The weaknesses of this study are the retrospective nature, use of the Titmus test with its potential monocular cues, variety of strabismus types, lack of pre-op stereopsis assessment in over half of patients (59%).

This study does provide added generalized information on the potential surgical benefit to sensory outcomes in adult strabismus patients.

Assessment of the reliability of anterior segment optical coherence tomography measurements in cases of strabismus reoperations: a tertiary care center study

Singh K, Saini A, Tomar V, et al

Strabismus Published online June 4, 2025

Anterior Segment Optical Coherence Tomography (AS-OCT) is a noncontact, high-resolution imaging modality that may be used to measure Limbal Muscle Insertion Distance (LMID) for the recti without the need for anesthesia. This study assesses the reliability of AS-OCT LMID measurements performed on horizontal rectus muscles that had previously undergone strabismus surgery. AS-OCT LMID measurements were captured on 30 patients (60 muscles, all had previous strabismus surgery) prior to undergoing yet another strabismus surgery. LMID measurements were then performed with calipers during surgery and compared with the pre-operative AS-OCT LMID measurements. All intra-operative LMID measurements were within 1 mm of the pre-operative AS-OCT LMID measurements, and 30 intra-operative measurements were within 0.5 mm of the pre-operative AS-OCT LMID measurements. Strengths of this prospective study are that all AS-OCT LMID measurements were obtained by a single masked examiner using only one device and all surgeries were performed by another individual who was masked to the pre-operative AS-OCT LMID measurements. Weaknesses include small sample size and relatively narrow age range of 18-45 years. Despite the study weaknesses, the reliability of AS-OCT in predicting the location of a previously operated horizontal rectus muscle would be useful in planning re-operation surgeries in which the surgeon may be otherwise uncertain of the muscle location.

Clinical profile and surgical outcomes of Duane syndrome with primary position hypertropia with or without coexisting horizontal deviation

Sachdeva V, Vepakomma T, Chandrasekharan A, et al.

Strabismus Published online August 28, 2025

In this retrospective case series, the authors report the clinical findings and surgical outcomes of patients with Duane retraction syndrome (DRS) with coexistent significant hypertropia in primary gaze. Most (72%) of the 18 patients enrolled in this study had DRS type III followed by 22% with type 1. Ten patients underwent surgery, and of those, all had overshoots, and 9 had horizontal strabismus in primary gaze of greater than 15 PD. With surgery, the median pre-operative horizontal deviation decreased significantly from 25 PD to 3.5 PD post-operatively and the median pre-operative vertical deviation decreased significantly from 10 PD pre-operatively to 6 PD post-operatively. Several different types of surgery were done in this series, but the most common procedure was lateral rectus recession with Y-split. Only 3 patients had surgery on any vertical rectus or oblique muscle. The strength of this paper is that it adds to our understanding of interventions in this uncommon clinical scenario. Study weaknesses are the small sample size and the diversity of pre-op patterns of strabismus and the variety of surgeries performed, making it difficult to generalize about these interventions. The value to the practicing pediatric

ophthalmologist who might encounter a case of DRS with hypertropia with primary gaze would benefit from reviewing the individual cases described in this series.

Comparative evaluation of surgical outcomes in acute acquired comitant esotropia managed with and without pre-operative prism adaptation test

Verma P, Khurana M, Tomar V, et al.

Strabismus Published online April 25, 2025

In this prospective interventional case series, the authors aim to evaluate the efficacy of using in-office prism adaptation testing (PAT) to determine the dose of surgery for patients with acute acquired comitant esotropia (AACE). Authors enrolled 20 patients with AACE of 15-30 prism diopters and randomized patients to either PAT followed by surgery or surgery without PAT. PAT was performed by applying Fresnel prism to glasses for patients to wear for 30 minutes based on the magnitude of esotropia determined by prism and alternating cover testing. PAT significantly increased measured esotropia from a mean of 24 PD to a mean of 37 PD. The measured esotropia following PAT was used for surgical dosing in the PAT group. At 12 weeks postoperatively, the PAT demonstrated a small but statistically significant benefit with mean residual postoperative misalignment of 1.7 PD vs 4.8 PD for those without PAT. In the PAT group, 100% of patients achieved primary motor success as compared to only 80% of patients without PAT. There was a greater improvement in stereopsis in the PAT group. The strength of this study includes a practical means for performing PAT to yield more predictable surgical results. Weaknesses include small sample size, short duration of post-op follow-up and the limited range of pre-op esotropia measured. The strabismus surgeon may consider augmenting surgical dosages in cases of AACE depending on the response to in-office PAT.

Superior oblique tendon elongation with bovine pericardium for Brown syndrome

Pelińska K, Simiera J, Loba P

J AAPOS 2025 Apr;29(2):104155

Implantation of silicone spacer allows for graded elongation of the superior oblique tendon in patients with Brown syndrome but can cause complications including adhesions, extrusion, and orbital inflammation. Authors speculated that Tutopatch bovine pericardium could be used for tendon lengthening without introducing synthetic material into the orbit. The study included 10 patients with unilateral Brown syndrome with hypotropia in primary, anomalous head position, restriction of elevation in adduction (REA), and positive forced ductions (FDT). Surgery was performed using varied lengths of Tutoplast graft (8-10mm) depending on REA, ensuring FDT was negative at the end of the case. Patients were evaluated 1 day and 6 months post-operatively. 8/10 patients showed improvement in AHP, and 9/10 showed improved REA. 2/10 required re-operation, one for under-correction and one for iatrogenic superior oblique palsy. At 6 months, none of the patients experienced foreign body reaction or extrusion. Study is limited by small sample size, but based on results, Tutoplast is an appropriate material for graded tendon lengthening in Brown syndrome and avoids risk of foreign body reaction.

Medial rectus recession combined with bridge faden procedure in esotropia associated with poor vision in the deviating eye

İnal A, Erdogdu E, Taskapili M, Gökyigit B

J AAPOS 2025 Apr;29(2):104170

In patients with sensory esotropia, particularly those with distance-near disparity, the use of a posterior fixation suture can allow for operation on the poorly seeing eye only and reduce the risk of over-correction. A bridge-Faden procedure, during which a non-absorbable suture can be passed partial-thickness through the sclera on either side of the muscle 12-13mm posterior to the original insertion and tied over the muscle belly, can be performed without causing any damage to the muscle tissue. Authors performed a retrospective review of the surgical results of 57 patients with sensory esotropia (20-45 PD at near) who underwent medial rectus recession (3-4.5mm dose determined by the near angle) with bridge-Faden procedure over a 7-year period. Success was considered orthophoria plus/minus 10 prism diopters at distance and near. They reported 86% success rate at 1-year follow-up. Only a single patient had a consecutive exotropia. The main limitation of this study is the lack of direct comparison to other surgical procedures, including medial rectus recession alone. This study confirms high success rates of medial rectus recession with bridge-Faden in patients with sensory esotropia, providing a good 1-muscle surgical option in this patient population.

Inferior oblique muscle myectomy versus anterior transposition in the management of unilateral superior oblique muscle palsy, a comparative study

Farvardin H, Ebrahimi F, Farvardin H, et al.

Strabismus Published online February 21, 2025

This retrospective, comparative study aims to analyze the surgical results and complications of IO myectomy (IOM) and IO anterior transposition (IOAT) in patients with unilateral superior oblique palsy (SOP). A total of 124 patients with SOP were included and most underwent IOM (56%). Although both procedures successfully corrected the abnormal head tilt, IOAT achieved significantly more correction of hypertropia (HT) compared to IOM. In subgroup analysis of patients with the largest degrees of HT, IOAT resulted in significantly more primary position correction of HT than IOM. However, IOAT resulted in anti-elevation syndrome in 5.4%. The strengths of this study are that all surgeries were performed by a single surgeon, and the sample size was relatively large compared to other publications on this topic. Study weaknesses stem from the retrospective study design and absence of randomization. This study is relevant to practice in that it appears to confirm findings of other smaller studies regarding strengths and weakness of two surgical options for SOP treatment.

Non-absorbable sutures use in bilateral lateral rectus recession reduces the rate of overcorrection in exotropia

Gazit I, Or L, Pras E, Morad Y

Strabismus Published online July 16, 2025

The aim of this retrospective study was to compare the incidence of consecutive esotropia (ET) when absorbable or nonabsorbable sutures are used in pediatric bilateral lateral rectus recession (BLR) surgery for exotropia (XT). Patients included in the study had surgery performed by a single surgeon who made a practice pattern change absorbable to nonabsorbable sutures in 2018. Results before and after this change in practice were compared. Consecutive ET was significantly more common in patients treated with absorbable sutures. The consecutive ET were similar between the two groups during the first 2 months post-operatively due to over-recession but

during the subsequent 8 months a divergence in results emerged. The increase in consecutive ET between 2 and 10 months was attributed to the dissolution of absorbable sutures and formation of stretched scars in the absorbable group. Strengths of this study are that surgical techniques performed by a single surgeon were unchanged except for the type of suture used. Weaknesses include the small sample size and lack of randomization. Although small, this study suggests an advantage to using nonabsorbable sutures if a surgeon is observing later onset overcorrections after BLR surgery.

Prism adaptation versus conventional orthoptic measurement for symptomatic esophoria: a retrospective study Hofslie M, Torp-Pedersen T, Saunte JP, et al Strabismus Published online February 19, 2025 The primary aim of this retrospective observational study of patients with symptomatic esophoria was to compare the frequency reoperations in a group of patients who underwent prism adaptation testing (PAT) in addition to conventional orthoptic measurements, with another group that had conventional orthoptic measurements alone. The reoperation rate was significantly lower at 11% among the 44 patients in the PAT group as compared with 34% in the non-PAT group. However, the PAT group did have significantly more overcorrections than the non-PAT group at 11.6% vs 1.7%, respectively. Preoperatively, PAT significantly increased the median measured angle of deviation at distance and at near by 16PD and 14PD, respectively. Strengths of the study are the practical method of performing PAT in clinic in addition to an orthoptic exam. Weaknesses of this study include the retrospective nature of the study, lack of randomization of patients and possibly some variation in defining certain esodeviations as esophorias instead of intermittent esotropias. This study is applicable to practice by suggesting the use of PAT in pre-operative assessment and planning for patients with symptomatic intermittent esodeviation.

Surgical dose-responses of bilateral medial rectus muscle recession in acute acquired comitant esotropia compared to infantile esotropia

Honglertnapakul W, Lertduailap W, Meethongkam K, et al.

Strabismus Published online March 10, 2025

The aim of this retrospective study was to compare the surgical dose-responses of the bilateral medial rectus recession (BMRR) in patients with acute acquired comitant esotropia (AACE) with those of patients with infantile esotropia (IET). The surgical dosage for BMRR in patients with infantile esotropia was selected according to our institute standard table; whereas the surgical dosage for cases of AACE was determined by adding 1–2 mm to the usual the standard table dose. The dose-responses of BMRR in the AACE group and IET group were 2.67 PD/mm and 3.91 PD/mm, respectively. The variation in dose-responses in each group are demonstrated by relatively low r^2 correlation values of 22.8% in the AACE group and 17.8% in the IET group. Strengths of this paper include descriptions of additional measurements with near fixation and sensory outcomes. Weaknesses include the retrospective design, small number of patients with AACE and short duration of follow-up after surgery. This paper is useful in supporting an increased dose for BMRR in patients with AACE to achieve a successful postoperative result.

Surgically induced incomitance following unilateral versus bilateral medial rectus recessions for esotropia

Stupnicki A, Dosanjh S, Jain S

Strabismus Published online July 9, 2025

The authors of this retrospective study aimed to evaluate the prevalence and magnitude of iatrogenic incomitance following unilateral medial rectus recession (UMR) and bilateral medial rectus recessions (BMR) for non-accommodative esotropia. Postoperative incomitance was defined as a difference in deviation of > 5 PD between lateral and primary gaze. A similar number of recruited patients underwent unilateral (n = 21) and bilateral medial rectus recessions (n = 22); however, the mean preoperative angle of deviation for the UMR and BMR groups were significantly different at 15 PD and 34 PD, respectively ($p < 0.01$). Two patients in each group developed incomitance and all 4 experienced postoperative diplopia. No difference in the magnitude of incomitance was observed. The strength of the paper is in the attempt to answer a very pertinent question. The weaknesses are the small sample size and limited postoperative follow-up. This topic is relevant to many pediatric ophthalmologists and may offer insights into whether to offer UMR for smaller esotropias and BMR for larger esotropias.

Comparative analysis of clinical features following inferior oblique recession surgery for unilateral congenital superior oblique palsy

Kang E, Ha SG

J AAPOS 2025;29(2):104169

Previous studies have judged the success of surgery for congenital superior oblique palsy based on improvement in hypertropia in primary gaze. In this study authors considered the success of unilateral inferior oblique recession in improving 3 clinical features, hypertropia, head tilt, and torsion. They retrospectively reviewed charts of all patients who underwent inferior oblique recession for congenital unilateral superior oblique palsy at a single center by a single surgeon from 2020 to 2023. They documented pre- and post-operative measurements of hypertropia in primary gaze, angle of head tilt calculated through digital imagery, and degrees of extorsion measured using fundus photography. Post-operative improvements were calculated as a percentage reduction from pre-operative measures. Out of 81 cases reviewed, the average amount of post-operative improvement was 77% for hypertropia, 58% for head tilt, and 75% for extorsion. There was a statistically significant correlation in percent improvement in hypertropia and extorsion, but not in hypertropia and head tilt, nor head tilt and extorsion. Limitations of the study include lack of subjective torsion measures through double maddox rod testing. Further, authors only looked at inferior oblique recession and did not compare outcomes to inferior oblique myectomy or superior oblique tuck procedures. Results of this study suggest that patients who undergo inferior oblique recession for unilateral congenital superior oblique palsy are less likely to experience improvement in head tilt than in hypertropia and extorsion.

Strabismus patterns and surgical results in teprotumumab-treated thyroid eye disease: insights from a single-center study

Walsh HL, Aldhahwani B, Tibi C, et al

J AAPOS 2025;29(4):104275

Over recent years, teprotumumab has been used to medically manage thyroid eye disease (TED). This study aims to evaluate the strabismus and surgical outcomes in thyroid eye disease patients treated with teprotumumab from 2014-2023 at a single institution. Medical records of patients with

thyroid eye disease and strabismus were retrospectively reviewed for demographic information, number of teprotumumab infusions, ocular motility evaluations, and strabismus surgery data. The cohort included 28 patients (68% female) that all reported diplopia after completing teprotumumab treatment with 71% having both horizontal and vertical deviations with distant fixation and 50% having both horizontal and vertical deviations with near fixation. In the 9 patients that were evaluated prior to teprotumumab treatment, all had duction deficits pre-teprotumumab which improved post-teprotumumab along with a reduction in the angle of strabismus, vertical more significant than horizontal. Fifteen patients underwent strabismus surgery with 67% achieving motor success and 73% achieving sensory success after the initial surgery. Limitations include partial sensorimotor data prior to teprotumumab treatment, small sample size, and retrospective nature without a control group. This study includes important data on the role of strabismus surgery and its outcomes after a relatively new medical treatment for thyroid eye disease.

Combined strabismus and cataract surgery in adults with longstanding horizontal strabismus and coexisting senile cataract

Bisani A, Chandrasekaran A, Settu S, et al.

J AAPOS 2025;29(4):104274

Horizontal strabismus and senile cataract in adults often coexist, requiring surgical intervention. Combined surgery can reduce the number of procedures, costs, and recovery time, but its outcomes and safety remain unclear. This study aims to evaluate outcomes of combined surgery for strabismus and senile cataracts. This retrospective study analyzed adults with longstanding horizontal strabismus and visually significant senile cataract who underwent combined strabismus and cataract surgery between January 2022 and January 2024. Visual acuity, motor alignment, and other outcomes were assessed preoperatively, on postoperative day 14, and at the final follow-up. Visual acuity and motor alignment were primary outcome measures. All eyes (40 of 34 patients) achieved visual success (≤ 0.3 logMAR), and 88% of patients achieved motor success. No intra- or postoperative complications were reported, and preoperative factors did not significantly predict motor success. The study's strengths include its uniform patient cohort and detailed analysis of combined surgery outcomes. Limitations include its retrospective design, small sample size, lack of randomization, and relatively short follow-up duration. This study suggests combined strabismus and cataract surgery is a safe and effective option for adults with uncomplicated horizontal strabismus and senile cataract, offering predictable visual and motor outcomes.

Effect of Prophylactic Topical Antibiotics on Rates of Infectious Complications After Strabismus Surgery: A Large Database Study

Binczyk NM, Koo EB, Lambert SR
 Am J Ophthalmol 2025;271:299-303

Post-strabismus surgical infections are rare yet potentially vision-threatening; because drops are poorly tolerated by children, costly, and may foster antimicrobial resistance, many surgeons question routine postoperative topical antibiotics. Retrospective cohort leveraged the TriNetX international EHR registry to compare infection rates in patients who did vs did not receive prophylactic topical antibiotics after strabismus surgery. Using CPT to identify surgeries, RxNorm to capture antibiotic prescriptions (within -7 to +1 days of surgery), and ICD-10 to ascertain infections within 30 days, 84,052 patients were analyzed over 20 years; 46% received antibiotics. Results: overall infection was 0.112%; endophthalmitis 0.019% (16 cases), orbital cellulitis 0.029% (24), and preseptal cellulitis 0.065% (55). There were no differences between antibiotic and no-antibiotic groups for endophthalmitis ($p=0.855$), orbital cellulitis ($p=0.684$), or preseptal cellulitis ($p=0.925$), and age-stratified analyses were similarly null. Strengths include the very large, multicenter dataset enabling study of rare outcomes and standardized code-based ascertainment; limitations include retrospective design, potential misclassification/coding bias (e.g., unrecorded in-office drops, inability to distinguish ointment vs drops), lack of surgical/operative detail or severity data, international heterogeneity, and small absolute event counts that limit subgroup analyses. What it teaches: routine postoperative topical antibiotics after strabismus surgery do not measurably reduce surgical-site infections and may add burden and resistance risk. For pediatric ophthalmology, these data support de-implementation of routine prophylactic topical antibiotics in uncomplicated cases, with emphasis on proven perioperative antisepsis (e.g., povidone-iodine), careful postoperative monitoring (especially in higher-risk children), caregiver education to avoid eye rubbing/poor hygiene, and antimicrobial stewardship—potentially lowering costs and improving the child and family experience without compromising safety.

Common Forms of Adult Esotropia Require Augmented Surgical Dosing
 Yehezkeli V, Demer JL
 Am J Ophthalmol 2025;273:74-81

Age-related distance esotropia (ARDE), often related to sagging eye syndrome, and decompensated esophoria (DE), a progressive esodeviation in younger adults, are two common forms of adult strabismus that pose challenges in surgical dosing. Traditional Parks' tables often

undercorrect these entities, prompting recommendations for augmented medial rectus (MR) recession, but the degree of augmentation required has not been well quantified. This study was a retrospective, comparative interventional case series of 115 patients (54 DE, 61 ARDE) who underwent bilateral MR recessions between 2015 and 2024. Surgical dose–response was compared against Parks’ tables, and long-term outcomes, including reoperations, were assessed. Results showed that both DE and ARDE required substantially greater MR recessions than standard dosing predicted. In DE, the first 4.6 mm of MR recession had no effect, with each additional millimeter correcting ~ 3 prism diopters (Δ); in ARDE, the intercept was 3.5 mm, with each extra millimeter correcting $\sim 2.4\Delta$. Despite initial success, 22% of DE patients developed late recurrences (~ 3 years), while 15% of ARDE patients experienced early undercorrections. Adjustable sutures improved immediate alignment but did not prevent long-term drift. Strengths of the study include the relatively large, well-defined cohorts and rigorous regression modeling of surgical dose–response. Limitations include its retrospective design, single-surgeon experience, and limited long-term follow-up for progressive conditions. This article highlights that DE and ARDE respond differently to surgical dosing and that augmented MR recession is mandatory to avoid undercorrections. For pediatric ophthalmology, the findings emphasize that adult strabismus cannot be approached with pediatric dosing assumptions, and that understanding condition-specific biomechanics is critical. The study may encourage pediatric ophthalmologists managing older adolescents or young adults with DE to anticipate late recurrences, consider more aggressive initial dosing, and counsel families on the likelihood of future surgical adjustments.

Surgical Management of Masquerading Superior Oblique Palsy

Meng Q, Yehezkeli V, Demer JL

Am J Ophthalmol 2025;273:240-247

This study addresses whether “masquerading” superior oblique palsy (mSOP)—patients who fulfill the 3-step test but have normal SO size on MRI—behaves differently from true SO palsy (SOP) with MRI-confirmed SO atrophy. In a comparative interventional case series, 57 consecutive patients (39 SOP, 18 mSOP) from 1991–2024 underwent standardized orbital MRI to classify SOP vs mSOP and received conventional cyclovertical strabismus surgery; hypertropia was measured pre- and post-operatively across gazes and head tilts. Preoperative central hypertropia was similar ($\approx 15\Delta$ SOP vs 11Δ mSOP). After mean follow-ups of 41 ± 65 months (SOP) and 22 ± 41 months (mSOP), central hypertropia fell to 1.7Δ in SOP and -2.9Δ (mild overcorrection) in mSOP; surgical “dose effect” was comparable (≈ 13 – 14Δ). Across gaze positions and head-tilt differences, both groups showed parallel, significant improvements. The most powerful strategy in either group was ipsilateral inferior oblique (IO) weakening plus contralateral inferior rectus (IR) recession (≈ 20 – 22Δ correction); IO weakening alone averaged ≈ 6 – 8Δ . Reoperation rates were low and similar, though overcorrections (often from IR slippage)

clustered in mSOP. Strengths include MRI-anchored diagnosis, standardized measurement/surgical approaches, and long follow-up; limitations are the retrospective design, single-surgeon setting, smaller mSOP cohort, and variable follow-up that may obscure late drift. Take-home: mSOP and true SOP are clinically and surgically indistinguishable in effect—conventional algorithms (IO weakening $\pm$ contralateral IR recession) work for both, with vigilance for overcorrection in mSOP. For pediatric ophthalmology, where congenital SOP is common, these data support using standard SOP procedures without mandating MRI solely to guide surgical choice, inform families that outcomes are similar even when MRI is “normal,” and highlight intraoperative/postoperative care to prevent IR slippage and manage small overcorrections that can be poorly tolerated in children.

Efficacy of Botulinum Toxin Type A for Acute Acquired Comitant Esotropia: An Age-Stratified 2-Year Follow-Up Study

Yu X, Pan W, Tang X, et al

Am J Ophthalmol 2025;277:463-470

This study tackles the growing problem of acute acquired comitant esotropia (AACE) in the near-work era and asks how well botulinum toxin A (BTXA) works across ages. In a single-center, retrospective cohort (2019–2023), 276 consecutive AACE patients received bilateral medial rectus BTXA and were followed 2 years; those >12 years with very large angles ($>50\Delta$) were generally steered to surgery (a design caveat). Outcomes included Kaplan–Meier motor/sensory success and Cox modeling of relapse risk. Overall 2-year motor success was 69.0% (95% CI, 62.3–74.8), but declined with age: ≤ 6 y 86.5%, $>6\text{--}\leq 12$ y 80.0%, $>12\text{--}\leq 20$ y 74.1%, $>20\text{--}\leq 30$ y 67.5%, and >30 y 44.3% (post-hoc $P<.05$ vs younger groups). Stereopsis recovery similarly lagged in >30 y. On multivariable analysis, each additional year of age (HR 1.04, 95% CI 1.02–1.06) and each extra hour/day of near work (HR 1.09, 95% CI 1.01–1.17) increased relapse risk. Preserved/achieved normal stereopsis after treatment predicted greater stability. Strengths include the relatively large, age-spanning cohort, standardized motor/sensory endpoints, and 2-year follow-up. Limitations are the retrospective, single-center design; selection bias (older, large-angle cases funneled to surgery); exclusion of seven early BTXA nonresponders; recall bias for symptom duration; and missing stereopsis data in a subset. Clinically, BTXA is a reasonable first-line option for AACE in children, adolescents, and young adults (≤ 30 y), with counseling that

success and stereo recovery diminish after 30—prompting earlier discussion of surgery in older or large-angle cases. Monitoring stereoacuity post-injection provides prognostic value, and addressing modifiable near-work behaviors may help mitigate relapse risk. Early diagnosis and timely BTXA may maximize binocular recovery and long-term alignment stability.

Three-year Outcomes of Botulinum Toxin Versus Strabismus Surgery for the Treatment of Acute Acquired Comitant Esotropia in Children

Nguyen MTB, Cheung CSY, Hunter DG, Wan MJ, Gise R

Am J Ophthalmol 2025;272:1-7

In a multicenter, retrospective, nonrandomized comparative study of 76 children with acute acquired comitant esotropia (AACE), botulinum toxin injection was found to be noninferior to strabismus surgery for achieving successful alignment and binocular vision at 36 months. The success rate at 36 months was 72% for the botulinum toxin group and 56% for the surgery group, with similar median deviation and stereoacuity outcomes. Botulinum toxin treatment was associated with significantly shorter general anesthesia and postanesthesia care times. A longer delay from esotropia onset to intervention was independently associated with poorer sensorimotor outcomes, regardless of treatment modality. These findings may support botulinum toxin as an effective and less invasive alternative to surgery for pediatric AACE, provided that treatment is not delayed.

Strabismus Surgery in Patients Aged Over 80 Years: Indications, Safety, and Outcomes

Yehezkeli V, Pineles SL, Demer JL, et al.

Am J Ophthalmol 2025;272:145-149

This was a retrospective cohort study evaluating strabismus surgery in patients over 80 years old focusing on indications, safety, and outcomes. Among 165 patients (mean age 83), the primary indication for surgery was diplopia, with sagging eye syndrome as the most common diagnosis. Surgery was performed under either general or topical anesthesia, with no intraoperative or anesthetic complications observed. The most common preoperative deviation was esotropia and hypertropia. Diplopia resolved in 75% of patients after the initial surgery and in 87% after up to two additional procedures, with a 13% reoperation rate. The findings may indicate that strabismus surgery in this age group is safe and effective for resolving diplopia and improving binocular alignment, without significant perioperative risk.

Trauma

Traumatic Macular Hole in Children: Characteristics, Management and Outcomes

Kitic N, Chehaibou I, Chapron T, et al.

Retina Published online May 6, 2025

Full-thickness macular hole (FTMH) is an uncommon retinal disorder occurring primarily in older adults secondary to vitreomacular traction. FTMH can occur in children as well but is less common and often secondary to trauma: the axial compression with compensatory equatorial expansion results in shearing forces on the macula causing hole formation. Due to the rarity of FTMH in children, outcomes are uncertain. This retrospective consecutive case series included 70 patients under age 18 with a macular hole seen at a single institution. The majority of macular holes were traumatic (77%) and soccer-related injury was the most common mechanism, followed by laser injury. A third of patients (34%) had spontaneous closure of their FTMH and around half of patients (56%) underwent surgery for FTMH, with around 80% of FTMH's closing after surgery. Factors associated with spontaneous closure included smaller size FTMH, macular serous detachment and hyphema. Despite the small sample size, the study adds important information on the natural history and management of pediatric FTMH. The authors suggest that observation of posttraumatic pediatric FTMH should continue for up to 3 months after the injury as the rates of spontaneous resolution are high.

Global Burden of Eye Injuries in Children and Adolescents, 1990 to 2021: A Systematic Analysis From the Global Burden of Disease Study

Sun G, Luo H, Ran Q, et al

Am J Ophthalmol 2025;276:374-385

This study sought to analyze the global distribution of pediatric eye injuries from 1990 to 2021 utilizing data from the Global Burden of Disease study. Incidence, years lived with disability (YLD), age-standardized incidence rates (ASIR) and age-standardized YLD rates (ASYR) were calculated and were stratified by age, sex, and sociodemographic index (SDI). In 2021 the global ASIR of pediatric eye injuries was 434.24 per 100,000. There was a decline in both the ASIR and YLD due to eye injuries, but the overall burden remained substantial, particularly in regions with higher sociodemographic indices (i.e. countries with more favorable sociodemographic indices had higher rates of injury). Boys had a 1.8 times higher incidence rate than girls. The most common mechanisms were foreign bodies, mechanical forces, and falls. Over the study period, Afghanistan, Yemen, Libya, the Central African Republic, and Chile experienced the most significant increases in eye injury rates. These findings underscore the need for targeted preventive education and ocular protection strategies worldwide.

Uveitis

Risk of Developing Pediatric Uveitis Among Patients With Early-Onset Atopic Dermatitis

Chu YY, Sung CH, Lin YS, et al.

JAMA Ophthalmol 2025 May 1;143(5):421-428 'The study aimed to evaluate the risk of pediatric uveitis among children with early-onset atopic dermatitis (AD) compared with a matched control population. The primary outcome was the hazard ratio (HR) for developing pediatric uveitis in the AD cohort compared with the matched controls. Cox proportional hazards models were applied to assess the risk. A total of 114,889 patients were identified in the AD cohort and the control cohort. The AD cohort demonstrated a higher risk of developing pediatric uveitis compared with controls. Sensitivity analyses among patients without dupilumab use and those without autoimmune conditions similarly indicated an increased risk in the AD cohort. Additionally, patients with severe AD had a higher risk of developing pediatric uveitis compared with those with nonsevere AD. The findings support the potential need to consider ophthalmologic monitoring in children with early-onset AD to try to detect and manage uveitis if it develops. Atopic dermatitis is a chronic inflammatory skin disorder affecting 5% to 20% of children globally. Most cases of AD are early onset, developing in infancy, with 45% of patients developing symptoms by 6 months of age and 60% by 12 months.

Incidence, sociodemographic and presenting clinical features of childhood non-infectious uveitis: findings from the UK national inception cohort study

Solebo AL, Kellett S, McLoone E, et al

Br J Ophthalmol 2025;109(8):955-961

Although childhood non-infectious uveitis is infrequent, there can be significant ramifications on vision, eye health, development, and quality of life. Through multicenter surveillance in the UK Uveitis in Childhood National Cohort Study, this study looked at patients younger than 18 years old with childhood-onset non-infectious uveitis during March 2020–February 2023 to provide descriptive analysis on sociodemographic factors and incidence. 468 new cases were identified over a 3-year period with a national incidence of 1.89/100,000. Among 255 children, the most common presentations were anterior uveitis (76.9%) and bilateral (65.2%). The top two associated disorders were found to be less (JIA at 14.5%) and more (TINU at 4.7%) prevalent than expected, respectively. However, given the typical dominance of JIA in the question of childhood non-infectious uveitis, there were theories that the uveitis may have manifested before the arthropathy and that the efficacy of DMARDs may be leading to under-representation of JIA numbers in the cohort. The median age of onset of the varying uveitis types ranged between 9.9–11.3 years (peak incidence: 11–15 years old) with anterior uveitis being more towards the younger end while posterior/panuveitis was more towards the older end of the range. 44.3% had vision loss in at least one eye, while bilateral poor vision was less common (16.8%). Incidence was higher than expected relatively socioeconomic deprived areas or from ethnic minority backgrounds. The limitations of this study include the timing of initiation around the time of COVID-19 pandemic and how that may have influenced access to care. This study provided a good epidemiological insight into a relatively rare pediatric eye condition that can have notable impact and indicated a rise in non-JIA related uveitis.

Epidemiologic Study of Pediatric Uveitis and its Ophthalmic Complications Using the Korean National Health Insurance Claim Database

Hong EH, Kim J, Kang MH, et al

Am J Ophthalmol 2025;275:1-13

This nationwide, population-based cohort study from South Korea provides the most comprehensive assessment to date of the incidence and complications of pediatric uveitis. Using the National Health Insurance database, investigators identified 9,495 children <18 years newly diagnosed with uveitis between 2010–2014, followed for seven years. Annual incidence was 2.0 per 10,000 children (1.8 anterior, 0.2 nonanterior), increasing with age and higher in boys. During follow-up, 42% developed at least one complication—most commonly glaucoma or presumed ocular hypertension, followed by cataract, macular disease, and amblyopia. Nonanterior uveitis, though less common, carried significantly higher risks of glaucoma, cataract, retinal detachment, amblyopia, and surgical interventions compared with anterior disease. Strengths include the large, nationwide dataset capturing essentially the entire population and long-term follow-up, allowing reliable estimates of rare events. Limitations are reliance on diagnostic codes, inability to separate true glaucoma from transient IOP elevation, and lack of treatment details (e.g., steroid exposure), which may influence complication rates. This study teaches us that pediatric uveitis, while rare, carries a substantial risk of vision-threatening sequelae, particularly in nonanterior forms, and that glaucoma remains a persistent long-term challenge even with modern care. For pediatric ophthalmology, the findings highlight the need for early recognition, aggressive monitoring, and long-term follow-up of affected children—especially those with systemic autoimmune disease—to prevent amblyopia and irreversible vision loss during critical years of visual development. These results may also guide resource allocation, screening strategies, and counseling of families about prognosis and the importance of adherence to care.

Efficacy and Safety of Biologics in Pediatric Noninfectious Retinal Vasculitis

Karaca I, Thng ZX, Bromeo A, et al

Am J Ophthalmol 2025;277:57-70

This retrospective interventional case series evaluated the efficacy and safety of three biologic agents—adalimumab (ADA), infliximab (IFX), and tocilizumab (TCZ)—in pediatric retinal vasculitis (RV), a vision-threatening inflammatory condition often linked with juvenile idiopathic arthritis or idiopathic uveitis. Pediatric RV differs from adult disease in its severity, chronicity, and potential for poor visual outcomes, making effective treatment strategies crucial. The study included 35 children (59 eyes) treated with ADA (18 eyes), IFX (30 eyes), or TCZ (11 eyes) for at least six months, with outcomes measured by fluorescein angiography (FA) scoring, OCT central subfield thickness (CST), and clinical parameters of intraocular inflammation. Results showed significant improvement across all groups, with mean FA scores reduced from 6.8, 13.4, and 12.8 at baseline to 0.9, 3.6, and 4.4 at final follow-up in the ADA, IFX, and TCZ groups, respectively. Complete RV resolution was achieved in 67% of ADA-treated eyes, 43% of IFX-treated eyes, and 9% of TCZ-treated eyes, though >50% improvement was seen in most patients. CST improved significantly, and cystoid macular edema resolved in nearly all cases. Safety profiles were favorable, with only one discontinuation due to IFX-related hair loss. Strengths include the use of a validated FA scoring system and relatively large pediatric cohort for this rare disease; limitations include its retrospective design, single-center setting, small sample sizes, and concurrent use of

other immunosuppressants. This study demonstrates that biologics, particularly TNF- α inhibitors, are effective in controlling pediatric RV, with IFX and TCZ appearing most beneficial in severe or refractory cases. For pediatric ophthalmology, these findings reinforce the need for early FA-based monitoring, highlight ADA as suitable for mild-to-moderate disease, and support IFX or TCZ as critical options for more severe or resistant RV, thereby expanding the therapeutic armamentarium to prevent long-term visual loss in children.

Incidence and Predictors of Remission of Childhood Uveitis in a Large Community Cohort
 Qian Y, Xu RH, Rabbani JW, Tucker LY
 Am J Ophthalmol 2025;277:221-229

This large community-based cohort study provides new insight into the natural history of childhood uveitis and predictors of remission. Uveitis is an important cause of pediatric visual morbidity, often chronic and associated with systemic disease such as juvenile idiopathic arthritis (JIA), yet most prior studies have been from tertiary referral centers with limited generalizability. In this retrospective cohort, 1,643 children under 16 years with incident uveitis diagnosed in Kaiser Permanente Northern California between 2010–2020 were identified, of whom 277 had noninfectious uveitis and 145 had chronic disease requiring at least 3 months of treatment. The mean age at treatment was 9.8 years, with 70% anterior uveitis. Over an average 41 months' follow-up, the 5-year cumulative probability of drug-free remission was 50.8%. Older age at presentation and male sex were independent predictors of remission, with a dose–response effect: <6 years had only 20% remission vs 77% in those ≥ 14 years. Female sex and younger age strongly predicted non-remission, while other baseline factors (bilaterality, anterior vs nonanterior location, JIA, synechiae, cataract, socioeconomic status) were not significant after adjustment. Strengths include the large, diverse, insured community sample, systematic electronic records, and rigorous survival modeling, which provide more generalizable data than referral cohorts. Limitations include retrospective design, reliance on pharmacy refill data, absence of granular clinical dosing detail, and stringent remission definition. This study teaches that about half of children with chronic uveitis can achieve drug-free remission, but risk is highly age- and sex-dependent. For pediatric ophthalmology, these findings will refine prognosis discussions, support closer long-term monitoring of young girls with uveitis, and highlight the value of community-based data in counseling families and planning early, sustained immunosuppression strategies.

Illness Uncertainty, Burden, and Capacity Among Caregivers of Children With Chronic Uveitis: A Stress and Coping Theory Perspective

Huang J, Liu R, Huang X, et al

Am J Ophthalmol 2025;274:221-231

This was a cross-sectional study of 134 caregivers of children with chronic uveitis. Using three validated instruments, the authors found that caregiver burden partially mediates the relationship between illness uncertainty and caregiver capacity, with the indirect effect accounting for approximately 40% of the total effect. Higher levels of illness uncertainty and caregiver burden were significantly associated with reduced caregiver capacity. These findings highlight the importance for clinicians to address both illness uncertainty and caregiver burden when designing interventions to support caregiver capacity in this population.

Vision Screening

Associations between School-Based Vision Program Outcomes and School Characteristics in 410 Schools

Kallem M, Guo X, Dai X, et al.

Ophthalmology 2025 Apr;132(4):452-460

This study evaluates the relationship between school-based vision program (SBVP) outcomes and school-level characteristics. This retrospective cross-sectional study analyzing data from Helen Keller International's United States Vision Program (2016–2022) across 410 public schools in the Northeastern U.S. The study focused on schools with at least 50 enrolled students aged 5–22, excluding those with less than 60% of grade levels served by the SBVP. Vision screening and eye examination data was used to assess SBVP outcomes, including screening failure rates, eyeglass prescriptions, and referral rates. These were correlated with publicly available school data on socioeconomic status (proportion of students qualifying for free and reduced-price meals [FARM]), race/ethnicity, and English language learner status. Schools with higher proportions of socioeconomically disadvantaged students (measured by FARM eligibility) showed increased vision care needs. A 10% increase in FARM-eligible students was associated with a 2.6% increase in screening failures, 1.8% increase in eyeglass prescriptions, and 0.86% increase in referral rates. Most schools had a plurality of Hispanic (61%) or Black (34.6%) students, with elementary (36.8%), middle (37.8%), and high schools (25.4%) evenly represented. The findings highlight significant demand for vision care in schools, particularly those serving lower-income communities. SBVPs help address disparities in pediatric vision care access, and the study suggests opportunities to optimize resource allocation (e.g., personnel and equipment) based on school demographics to maximize program impact.

Evaluation of the QuickSee portable autorefractor system in a pediatric population

Loayza A, Lewis A, Trivedi RH, et al.

J AAPOS 2025 Jun;29(3):104228

The QuickSee (QS) and its newer, monocular version, the QuickSee Free (QSF), are portable autorefractors that use Hartman-Shack wavefront technology to measure refractive error. A prospective study was conducted to evaluate the QS platform's ability to detect and measure refractive error in 157 children aged 3 to 17 years, with a mean age of 7.58 years, by comparing it to the gold standard of cycloplegic retinoscopy in a clinical setting. The study found that the QS system had a high testability rate of 98.1%. While there was moderate-to-good agreement between the QS system and retinoscopy for spherical equivalent (SE) and astigmatism, the QS measurements showed a slight underestimation compared to retinoscopy. The system proved to be highly effective at detecting various refractive errors, with an area under the curve greater than 0.9 for all definitions of hyperopia, myopia, and astigmatism. Furthermore, it demonstrated sensitivities and specificities greater than 0.8 for these conditions at all levels of refractive error. Based on modified Orinda and AAPOS 2021 guidelines, the QS system had high sensitivities of 89.2% and 94.4%, and specificities of 56.5% and 68.6%, respectively. Despite the study's limitations, which include a small sample size and a study population likely to have a higher prevalence of disease, the findings suggest that the QS system is an effective autorefractor and screening tool in a pediatric population, capable of screening most children in about 90 seconds.

Instrument-based vision screening and outcomes in young children following prenatal exposure to buprenorphine or methadone: a retrospective cohort study

Bush E, Nidey N, Merhar S, et al

J AAPOS 2025;29(4):104259 Methadone or buprenorphine is recommended for treatment in pregnant females with opioid use disorder. This study aims to use instrument-based vision screening to describe outcomes in infants with prenatal exposure to medication for opioid disorder. This retrospective study reviewed the medical records of infants receiving care at Cincinnati Children's Hospital Medical Center's Neonatal Opioid Withdrawal Syndrome (NOWS) clinic during a 5-year period. Primary outcome was vision screening results using the SPOT vision screener. Of the 236 infants included in the study, 57.6% had prenatal buprenorphine exposure, and 42.4% had prenatal methadone exposure. Infants exposed to methadone prenatally were 2.1 times more likely to fail the vision screening. The overall failed vision screening rate was 33% of the cohort, of which 29% were referred for ophthalmology evaluation. Failed vision screening outcomes were similar in the two groups, except for strabismus, which demonstrated a statistically significant likelihood in children exposed to prenatal methadone compared to children exposed to prenatal buprenorphine. Limitations include variability and potential of missing data due to the retrospective design, lack of family ocular history, and a high number of patients lost to follow-up prior to recommended ophthalmologic evaluation. This study highlights the increased risk of abnormal visual development in infants with prenatal exposure to medication for opioid disorder and the importance of vision screening in this population.

Visual Impairment

Impact of video display terminal use on ophthalmic symptoms and mental health in adolescents

Zhang L, Peng C, Li L

J AAPOS 2025;29(4):104270

Computer vision syndrome (CVS) is associated with prolonged use (>2 hours) of video display terminals (smartphone, tablet, laptop). Given the increased use of video display terminals (VDTs) among adolescents (average of 27.9 hours/week in this study population), this study aims to evaluate the effects of VDT use on CVS symptoms and mental health in the adolescent population. This cross-sectional prospective study included patients seen in the ophthalmology clinic of a single center between 2022-2023. Recruited patients completed a questionnaire regarding VDT use, CVS symptoms, and mental well-being. Patients were divided into 3 groups based on VDT use: ≤ 3 hours/day, 3 - <6 hours/day, and ≥ 6 hours/day. The study included 120 participants with an average age of 14.22 years. At least one CVS symptom was reported in 81.7% with visual fatigue being most common. Only double vision was found to have a significant association with duration of VDT use. The adolescent participants reported positive mental health feelings with the use of VDT. Limitations include possible biases in self-reported questionnaires, lack of information on long-term effects, and inability to generalize to other populations. This study may help clinicians discuss possible effects of prolonged VDT use with patients and parents.

The Influence of Changes in Microglia Development on the Plasticity of the Developing Visual Cortex Circuit in Juvenile Mice

Wang X, Li K, Guo L, Liu X, Guo Y, Zhang W

Invest Ophthalmol Vis Sci 2025;66(4):45

This study investigates how changes in the development of microglia affect the plasticity of the developing visual cortex in juvenile mice. The visual cortex undergoes significant plastic changes within the first few months. This study looked at postnatal day 1-42. The researchers manipulated microglial development and assessed how these changes influenced plasticity in the visual cortex. They found that disrupting microglial function during development led to impairments in visual cortex plasticity, evidenced by reduced responsiveness to visual stimuli and altered synaptic organization in the cortex. The study suggests that microglia play a crucial role in supporting the structural and functional plasticity of the developing visual cortex, likely through mechanisms like synaptic pruning and regulation of neuronal activity. Microglia are traditionally thought of in the context of immune response, but this research highlights their role in brain circuit development, making the study highly relevant to neurobiology and developmental neuroscience. The ability to target microglial function could lead to new therapeutic strategies to enhance or correct plasticity deficits in conditions such as amblyopia, developmental delay, or neurodegenerative diseases.

The study focuses specifically on the visual cortex, but the role of microglia in plasticity may be different in other brain regions. Expanding the research to other cortical and subcortical areas could provide a broader understanding of microglial involvement in overall brain development.

Sociodemographic Disparities in Uncorrectable Visual Impairment Among US Adolescents
 Fazal O, Slopen N, Galbraith AA, et al.

Am J Ophthalmol 2025;273:248-254

This study looks at how common uncorrectable vision loss is in U.S. adolescents—the age just beyond the effective treatment window for amblyopia—and which social factors put teens at risk. Using a cross-sectional analysis of NHANES 1999–2008, investigators assessed best-corrected visual acuity in 9,949 youths (12–19 years) to estimate prevalence and model sociodemographic associations. Uncorrectable visual impairment (UVI) was defined as unilateral (>2 -line inter-eye asymmetry with VA $\geq 20/40$ in the better eye) or bilateral (VA $< 20/40$ in both eyes). Overall UVI prevalence was 4.0% ($\approx 3.2\%$ unilateral; 0.9% bilateral). After adjusting for age and sex, higher odds of UVI were seen with family income below poverty level (OR 1.59), Mexican-American ethnicity (1.64) and non-Hispanic Black race (1.43) vs non-Hispanic White, food insecurity (1.67), caregiver education below high school (1.68), and public (1.67) or no insurance (1.71) vs private insurance. Strengths include a large, nationally representative sample and standardized acuity/autorefracton protocol; key limitations are the older survey years, cross-sectional design (no causality), non-cycloplegic refraction, and potential misclassification (not all UVI is amblyopia, though it is likely the leading cause). This paper teaches us that socioeconomic and racial/ethnic disparities in irreversible vision loss are already established by adolescence, implying missed screening/therapy earlier in childhood. For pediatric ophthalmology, it argues for: (1) earlier, equitable amblyopia detection and treatment—especially in low-income, food-insecure, publicly insured, and uninsured populations; (2) strengthened school- and community-based screening with rapid referral pathways; and (3) advocacy for coverage/policies that reduce access barriers (e.g., ensuring comprehensive pediatric vision benefits and outreach in high-risk communities). Targeted, earlier intervention is essential to prevent lifelong, avoidable visual disability.

Mental Health of US Children With Vision Impairment: An Analysis of the National Health Interview Survey

Du K, Patil P, Boland MV

Am J Ophthalmol 2025;277:451-462

This study addresses a key evidence gap: the mental-health burden associated with pediatric vision impairment, which has been far less studied than in adults. Using nationally representative 2022 National Health Interview Survey data, the authors conducted a cross-sectional analysis of 6,429 U.S. children (0–17 years), linking caregiver-reported vision difficulty (despite correction) with Strengths and Difficulties Questionnaire (SDQ) indicators and service use. Five percent had visual impairment. Compared with peers, visually impaired children had higher crude rates of depression (44% vs 33%) and anxiety (64% vs 53%); in adjusted models, vision impairment was associated with greater odds of depression (OR 1.17–1.20) and anxiety (OR 1.29), as well as learning (OR 1.92) and borderline remembering difficulties (OR 1.35). SDQ results showed higher total difficulties (OR 1.08), driven by peer problems (OR 1.30), emotional symptoms (OR 1.19), and hyperactivity/inattention (OR 1.15). Notably, there was a 30–50% lower use of mental-health therapy and special-education services among vision-impaired youth with mild–moderate versus severe depression/anxiety, suggesting a treatment gap. Strengths include a large, contemporary, population-based sample; standardized behavioral measures; and multivariable adjustment. Limitations include cross-sectional design (no causality), reliance on caregiver report (misclassification risk), potential nonresponse/selection bias (46% response rate), exclusion of institutionalized children, and residual confounding. This work teaches that vision impairment in childhood co-travels with meaningful emotional, cognitive, and behavioral challenges—and that many affected youth with less-severe symptoms may be under-served. For pediatric ophthalmology, it supports routine mental-health and school-function screening for visually impaired patients (eg, brief SDQ/PHQ-A/GAD-7), proactive referral pathways to counseling and educational supports, and closer collaboration with primary care, psychology, and schools to intervene earlier—ideally before symptoms become severe.

Cerebral/Cortical Visual Impairment Classification and Categorization Using Eye Tracking Measures of Oculomotor Function

Chang MY, Borchert MS

Ophthalmol Sci 2025;5(3):100728

Cortical vision impairment is a leading cause for pediatric visual impairment, and efforts to improve classification and diagnosis of CVI have been an active area of research in recent years. This prospective longitudinal study evaluated eye tracking data of 39 children with known CVI as well as 41 age-matched controls with mean age of 4.7 years. Eye tracking measures (fixation latency, fixation frequency, fixation off screen, saccade latency, saccade frequency, saccades off screen, fixation duration, saccade peak velocity, and saccade amplitude) were obtained 4 times, at baseline, 1 month, 6 months, and 12 months for the study group and once for the control group. Patients with CVI were significantly different from controls in all measures other than saccade peak velocity and saccade amplitude, but the difference between groups was most prominent in fixation frequency and fixation latency. There were also three distinct groups that emerged among patterns of these oculomotor characteristics in patients with CVI. This current study's limitations included a small sample size and the exclusion of patients with nystagmus, which is a feature present in approximately 20% of the CVI population. Further evaluation of eye tracking provides objective data that may help to further classify patients with CVI and provide understanding of differing subgroups of CVI based on patterns of these oculomotor parameters.

