What's New in Pediatric Ophthalmology Literature?

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American Association of Pediatric Ophthalmology and Strabismus

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All-Star Nominees

Amblyopia, Refractive Error, and Vision Screening

Amblyopia prevalence in patients with alternating esotropia
Khorrami-Nejad M, Akbari MR, Masoomian B, Shakor YA, Narooie-Noori F
J AAPOS 2025;29(6):104700
The global prevalence of amblyopia has been reported to be 0.7-2.9%. The purpose of this retrospective, cross-sectional, single-center study was to determine the frequency of amblyopia in preschoolers and school-age children with alternating esotropia. Only preoperative medical records were reviewed from patients 3-10 years of age with confirmed alternating esotropia evaluated between 2012 and 2024. They excluded those with motor or cognitive disabilities, ocular pathologies, or craniofacial anomalies, and those with prior ocular surgeries or vertical deviations. They included 767 subjects (mean age, 6.9 ± 1.8 years; 41.4% female) with alternating esotropia, of which 151 (19.7%) were diagnosed with varying degrees of amblyopia: 57.6% mild, 39.8% moderate, and 2.7% severe. Thirty-seven of the amblyopic patients (24.5%) showed evidence of anisometropia; specifically, 21.2% anisohyperopia, 2.7% anisomyopia, and 0.7% anisoastigmatism. Of the 616 nonamblyopic participants, 5.8% had anisometropia. They concluded that the alternating nature of esotropia does not necessarily ensure the absence of amblyopia (> 95% were mild or moderate amblyopia) in children who are candidates for strabismus surgery. limitations: retrospective and single-center study, exclusively included patients referred for surgery, only a small number had severe amblyopia. Impact on clinical practice: Be mindful that alternating esotropia does not ensure the absence of amblyopia.

Does Past Myopia Progression Predict Future Progression?
Beaulieu WT, Repka MX, Pineles SL, et al
Invest Ophthalmol Vis Sci 2026;67(1):38
This post hoc analysis of a randomized controlled trial (MTS1) evaluated whether a child's past myopia progression—measured by Spherical Equivalent Refractive error (SER) and Axial Length (AL)—can accurately predict how much their vision will worsen in the following year. Researchers analyzed 136 children (ages 5–12) and compared their progression in the first 12 months to their progression in the second 12 months. The study found that prior changes were poor predictors of future behavior. Specifically, if a child's myopia increased by 0.50 D in the first year, there was only a 42% chance they would progress at that same rate the next year. Statistically, the "prior change" variable accounted for a mere 3% to 6% of the variation in future progression meaning factors like age and measurement noise are far more influential than a child's recent history of "fast progression." This study challenges some common clinical assumptions such as waiting to see if a child is a fast progressor before starting myopia control therapy because past progression cannot reliably predict future change so early intervention may be indicated regardless. Pediatric ophthalmologists may also need to consider other factors such as family history and outdoor time in assessing risk.

Establishment of Myopia Occurrence Prediction Model in Children without Myopia Using Cycloplegic Refraction and Prior Axial Length Change
Xu S, Ruan Z, Wang Y, et al

Ophthalmology 2025;132(11):1260-1272
This was a 5-year prospective school-based study where the authorsfollowed 1,907 Chinese children aged 6–9 years without myopia to develop and validate a model predicting who would become myopic. Children underwent yearly exams with cycloplegic refraction and axial length (AL) measurements, and the main outcome was new-onset myopia (spherical equivalent ≤ −0.50 D) over 1-, 2-, and 4-year periods. The researchers found that a child's baseline refractive error was the strongest predictor overall, while faster eye growth (greater 1-year AL elongation) added important additional risk information; including changes over 2 years did not meaningfully improve prediction. The final model, which also included sex and parental myopia, showed high accuracy in both the development and external validation groups (AUCs ~0.88–0.94), good agreement between predicted and observed outcomes, and clear clinical usefulness; models that did not use cycloplegic refraction performed worse. Using this tool, the authors proposed more individualized refractive cutoffs to define "premyopia" based on eye growth and family history and created a free online risk calculator. Limitations include the need for prior axial length data, restriction to urban Han Chinese children, lack of data about behavioral factors (e.g., outdoor time), and possible effects of the COVID-19 pandemic on myopia rates due to increased indoor and screen time, which may limit generalizability. Overall, this study provides a practical approach to identifying children at highest risk for myopia to help create more targeted prevention strategies for myopia.

Spatio-Temporal Optical Phase Kit for Myopia Control: Stage 1 Results from a Randomized Controlled Clinical Trial in Chinese Children
Fedtke C, Chen Z, Tilia D, et al
Ophthalmology 2025;132(12):1344-1356
This is a prospective, multi-sight, double masked randomized controlled trial investigating the efficacy of the Spatio-Temporal Optical Phase (S.T.O.P.) kit in reducing myopia progression vs. single vision spectacles (control group). The STOP technology has been developed to produce a dynamic, or a spatially and temporally varying, optical signal that is hypothesized to mitigate myopia progression while maintaining efficacy over time – it is a film that goes over single-vision spectacles and is much more economical than peripheral defocus lenses. Please refer to paper for a more detailed description of the technology behind the films. The study includes health children between ages 6-14yo with myopia between -0.75 to -5.00D, astigmatism of 1.50D or less, and anisometropia of less than 1.00D or less spherical equivalent who had not previously used dilute atropine. 160 eligible participants were randomly assigned to STOP kit 1 group (53), STOP kit 2 group (54), or single vision spectacles (53). The different STOP kits had different optical elements in the films. The primary outcomes measured were change in axial length and change in spherical equivalent from time dispensed to 6 months. Both the S.T.O.P. kit 1 and S.T.O.P. kit 2 groups showed significantly less change in AL compared with the control kit group at the 1-month, 4-month, and 6-month visits. All 3 groups showed a significant increase in AL at the 6-month visit compared with the dispensing. Both the S.T.O.P. kit 1 and S.T.O.P. kit 2 groups showed significantly less change in autorefraction (i.e., less refractive change, specifically less negative autorefraction or less change in autorefraction magnitude) compared with the control kit group at the 6-month visit. All 3 groups showed a significant change in autorefraction (more negative autorefraction) at the 6-month visit compared with baseline. This 6-month randomized

controlled clinical trial demonstrated that both S.T.O.P. kits reduce myopia progression in children 6 to 14 years of age compared with single-vision control lenses. Of note, the investigators also looked at vision and satisfaction with the kits, and they did maintain acceptable visual performance and high wearer satisfaction. This study is valuable because it offers a more cost-effect method for myopia management as compared to current options for spectacles. This is stage 1 of an ongoing project, which will be investigating the efficacy of these kits compared to other film designs and compared to static peripheral defocus spectacles.

Instrument-Based Screening for the Detection of Amblyopia and Amblyopia Risk Factors: A Report by the American Academy of Ophthalmology
Oatts JT, Collins ME, Cavuoto KM, et al
Ophthalmology 2025;132(11):1294-1303
This Ophthalmic Technology Assessment reviewed the evidence on the diagnostic accuracy of instrument-based vision screening devices for detecting amblyopia and amblyopia risk factors (ARFs). The authors performed a systematic PubMed search through January 2025 and included 33 prospective studies (28,072 children, mostly ≤6 years old), all rated level III evidence due to risk of bias or incomplete reporting. The primary outcomes were sensitivity, specificity, and referral rates for detecting amblyopia or ARFs compared with a comprehensive eye examination by an ophthalmologist or optometrist. Nine devices were evaluated, most commonly Plusoptix, Spot, and Retinomax, with wide ranges of sensitivity (e.g., 32%–100% for Plusoptix, 60%–94% for Spot, 70%–95% for Retinomax) and specificity (roughly 39%–100%), and referral rates ranging from 2% to 63%, often higher in ophthalmology clinic settings. Most studies used referral thresholds based on guidelines from AAPOS though criteria varied and influenced test performance. Overall, most devices showed higher sensitivity than specificity, meaning they detected many at-risk children but sometimes over-referred. Key limitations included variability in study design and setting, inconsistent reporting (many lacked confidence intervals or referral rates), reliance on ARFs rather than true amblyopia as the reference standard, and limited direct device comparisons. The panel concluded that instrument-based screening is a useful, rapid, and practical tool for early detection, especially in young or pre-verbal children, but emphasized the need for standardized reporting and clearer referral criteria to optimize screening programs. This study highlights the importance of ophthalmologist involvement in selecting devices, setting referral thresholds, and designing effective community screening strategies to prevent irreversible vision loss.

Strabismus and Strabismus Surgery

Adult-Onset Comitant Esotropia: Patient Characteristics and Medical Evaluation
Adhan IK, Lam L, Wallingford M, et al
J Pediatr Ophthalmol Strabismus 2025;62(6):387-395
This large retrospective series from Wills Eye Hospital characterized the demographics, clinical features, and diagnostic yield of medical work-up in adults with acute-onset comitant esotropia (AOCET) without a history of childhood strabismus, trauma, concussion, duction deficits, sixth nerve palsy, or neurologic symptoms other than diplopia. The authors identified 268 patients seen between 2020 and 2023, with a mean age of onset of 53.7 years and a female predominance (62.7%) across every age decade. The cohort showed a bimodal distribution of

onset, peaking in the third and seventh decades. Among those with race recorded, most were White, though over half of the cohort had unreported race data. Refractive status was notable for a predominantly myopic phakic population (mean spherical equivalent −3.22 D), with nearly two-thirds of phakic patients being myopic and most falling into the moderate myopia range. Younger onset cohorts were more likely to be myopic, whereas hyperopia became progressively more common with increasing age. Mean distance esotropia at presentation was 17.2 PD, and the magnitude of esotropia decreased as age of onset increased. Divergence insufficiency–type esotropia accounted for 19% of cases and was most common in older decades. Work-up was performed in 44% of patients, more frequently in younger individuals. Despite this, the diagnostic yield was low. Thyroid testing, neuroimaging, and myasthenia labs were abnormal in a minority, and truly new explanatory diagnoses were rare: 4 cases of thyroid eye disease, 1 myasthenia gravis, and 1 multiple sclerosis. No intracranial tumors were detected. The authors conclude that AOCET in adults most often presents in myopic women and that extensive medical testing infrequently identifies a new underlying cause when classic neurologic symptoms and motility deficits are absent. Clinically, this supports a more selective approach to work-up while still recognizing that a small number of serious systemic diagnoses can present with isolated comitant esotropia and diplopia.

Smooth Pursuit Velocity After a Season of Repetitive Head Impacts in American Football Players
Murray NG, Fenner M, Szekely B, et al
JAMA Ophthalmol 2025;143(10):866-873
Smooth Pursuit Velocity After a Season of Repetitive Head Impacts in American Football Players examines the effects of repetitive head impacts (RHI) on oculomotor control in 25 Division I football players during a single season. The study identified two groups based on head impact exposure: high-dose and low-dose, assessed using instrumented mouthguards. Participants completed an eye-tracking task at preseason, midseason, and postseason to measure smooth pursuit eye movement velocity. Results indicated that high-dose players had slower velocities than controls at preseason and midseason, suggesting pre-existing deficits rather than significant changes due to the season. The study underscores that current clinical assessments may not detect RHI-related deficits, emphasizing the need for improved monitoring of athletes' brain health despite the small sample size and exploratory nature of the research.

Strabismus and Strabismus Surgery Reoperation Rates at 1, 3, and 5 Years: Analyses from the IRIS® Registry (Intelligent Research in Sight)
Repka MX, Lum F, Li C, Saseendrakumar BR
Ophthalmology 2026;133(2):203-213
This is a retrospective cohort analysis of data from the American Academy of Ophthalmology IRIS® Registry (Intelligent Research in Sight). In 2018, this group previously reported the first 4 years of data (2013—2016) on strabismus and strabismus surgery in approximately 30 million patients. At that time, they found that surgery was performed in 0.13% of patients, most often for horizontal strabismus. There was an overall mean 1-year reoperation rate of 6.72%. The reoperation rate increased with increasing age at the first surgery. This is an update to the 2018 report on the demographic and clinical characteristics of strabismus and strabismus surgery with

an additional 6 years of data, now including 70 million patients of all ages. They also reported reoperation rates at 1, 3, and 5 years and evaluated risk factors associated with the performance of a strabismus reoperation. The results showed a total of 1,951,001 patients (2.46%) had strabismus. Diagnoses included esotropia (17.8%), exotropia (21.8%), hypertropia (13.5%), and paralytic strabismus (16.1%). At least 1 surgery was performed in 125,984 patients; 79% of reported codes were for horizontal surgery; 58% of cases were performed in patients aged less than 20 years. Reoperation rates were 5.61% (95% CI, 5.43—5.81), 8.53% (8.30—8.76), and 10.13% (9.88—10.38) within 1, 3, and 5 years, respectively. When compared with Medicare Part B, the odds ratios for a reoperation were lower for patients with commercial insurance (0.72) and Medicaid (0.82). The odds ratios of a reoperation when compared with the Northeastern United States were significantly lower in the Midwest (0.75), South (0.88), and the West (0.73). The strength of this study is its vast sample size and inclusion of data over a 10-year period. This information can be useful for developing patient information and counseling as well as for physician benchmarking.

Surgical Dosing for Correction of Consecutive Exotropia
Meng Q, Parunakian E, Yehezkeli V, Demer JL
Am J Ophthalmol 2025;280:176-181
This retrospective case series examined surgical dosing for consecutive exotropia. The study included 44 patients (average age 35 years) with mean preoperative exotropia of 29Δ at distance and 33Δ at near. Patients were excluded if they had previous medial rectus (MR) advancement surgery or paralytic/restrictive exotropia. Thirty patients underwent bilateral MR advancement, 4 underwent unilateral MR advancement, 2 patients had bilateral MR advancement with unilateral lateral rectus (LR) recession, 6 patients had unilateral MR advancement with unilateral LR recession, and 2 patients had unilateral MR advancement with bilateral LR recessions. 11 patients had concurrent vertical muscle surgeries. At final follow-up, distance exotropia was reduced from 26Δ to 7Δ in the MR advancement group and from 39Δ to 9Δ in the MR advancement + LR recession group, though exoshift of 6.6-7.5Δ occurred between initial and final follow-up. 10 patients required additional surgery due to undercorrection. Regression analysis of surgical dose-response suggested each MR advancement should be augmented by 2 mm more than Parks' general surgical recommendations for treating exotropia by MR resection. The authors concluded that this augmentation strategy may improve correction of consecutive exotropia while providing the opportunity to explore the MR muscle during surgery.

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

Treating Retinopathy of Prematurity with Dexamethasone Eye Drops: A Difference-in-Differences Study in Sweden Using Register Data
Gränse LAKC, Öhnell HMV, Holmström G, et al
Ophthalmology 2026;133(2):248-256
This is a retrospective cohort study based in Sweden from a center that started giving infants diagnosed with type 2 ROP dexamethasone drops (1 drop/day) in 2020. They compare their rates of traditional (laser/injection) ROP treatment during 2015-2018 vs 2020-2021 with rates from 3 other sites in Sweden that did not introduce dexamethasone in 2020. The study aimed to

evaluate whether low-dose dexamethasone eye drops (1 mg/ml, typically 1 drop/day per eye) could prevent progression from type 2 ROP to type 1 ROP. Data was obtained from the Swedish National Quality Register for ROP (SWEDROP). They included 2,017 preterm infants born before 30 weeks' gestation. Babies born 2015–2018 (no dexamethasone drops) were in the control group. Those born 2020–2021 were in the intervention group (dexamethasone introduced at the intervention site for type 2 ROP; not used at control sites). At the intervention site traditional treatments fell from 72% (23/32) in control years to 13% (4/32) in intervention years ($P < 0.001$) amongst infants with severe ROP. Among all infants at the site, treatment fell from 5.6% (23/409) to 1.8% (4/217) ($P = 0.03$). Of 32 infants with type 2 ROP in intervention years, 28 received drops; 24 (86%) regressed without needing further treatment (median duration: 4 weeks). No reactivations, cataracts, or glaucoma was reported up to 3 years post-screening. At the control sites, in infants with severe ROP, traditional treatment increased slightly from 47% (82/175) to 56% (32/57) ($P = 0.22$). In all screened infants, there was a minor decrease in treatment from 8.6% (82/950) to 7.3% (32/441) ($P = 0.38$). The authors concluded that he introduction of dexamethasone eye drops at type 2 ROP diagnosis was associated with a marked reduction in the need for invasive treatments, potentially offering a simple, noninvasive, cost-effective alternative. Additional randomized trials are needed to confirm these findings.

Optic Disc Characteristics in Children Born Preterm With and Without ROP: Results From the Gutenberg Prematurity Eye Study Young (GPESY)
Fieß A, Gißler S, Grabitz S, et al
Invest Ophthalmol Vis Sci 2025;66(13):21
The aim of this prospective cohort study was to identify variations in optic nerve head architecture among former premature infants with and without ROP. Included were 793 children aged 4–17 years born preterm or full term, peripapillary retinal nerve fiber layer (pRNFL) thickness, minimal rim width (MRW), Bruch’s membrane opening (BMO), and vertical cup-to-disc ratio (vCDR) in relation to perinatal factors. Children born extremely preterm had significantly thinner pRNFL overall except temporally. Those who received treatment for ROP showed thicker temporal and inferotemporal pRNFL but thinner superonasal sectors. Perinatal adverse events and maternal smoking were both associated with thinner pRNFL. Breastfeeding, in contrast, was linked to slightly thicker pRNFL measurements. MRW was reduced in extremely preterm children, especially in inferior sectors. Both moderate and extremely preterm groups demonstrated larger vertical cup-to-disc ratios. Overall, prematurity correlated with thinner nerve fiber and rim measurements and larger cups, while ROP treatment showed sector-specific thickening effects. The application to practice is better understanding of typical optic nerve head features in former premature infants to better differentiate from other congenital or acquired optic nerve abnormalities.

PREVALENCE AND DEGREE OF RETINAL VASCULATURE ALTERATIONS IN ADULTS BORN PRETERM WITH VERY LOW BIRTH WEIGHT: A Birth Cohort Study
Kulmala MK, Kajantie E, Morken TS, Majander A
Retina 2025;45(12):2383-2392

The vascularization of the retina is complete a birth in term neonates, but those born premature have incomplete vascularization and are at risk of retinopathy of prematurity. While there are many studies exploring incomplete peripheral vascularization in neonates after treatment for ROP, the natural history of retinal vascularization in preterm neonates without ROP treatment is less certain. This cohort study included 175 adults aged 34 to 42 and were stratified into very low birth weight (<1500g) and controls. No infants had been treated for ROP, but there were also no strict screening guidelines. Very low birth weight eyes had altered foveal thickness and mild foveal ectopia. The foveal avascular zone was also smaller in very low birth weight eyes. Almost a quarter (23%) of the very low birth weight eyes had persistent avascular retina, although none had any lattice degeneration or retinal holes. These anatomic changes did not affect visual acuity and no patients had retinal complications. This study has the advantage of looking at retinal changes many years after birth, although given there was no standardized ROP screening, the prior stage or zone of ROP in these participants is unknown. The study does not address optimal management and follow-up of persistent avascular retina in infants who do not require ROP treatment, although suggests that persistent avascular retina is very common in very low birth weight infants, with few complications in this cohort, although there may be selection bias.

Timing of Retinopathy of Prematurity Diagnosis and Treatment in Micro-Premature and Nano-Premature Infants during Inpatient Screening
Yuan M, Altamirano F, Hu D, et al
Ophthalmol Retina 2025;9(12):1219-1224
Retinopathy of prematurity (ROP) remains a significant cause of vision in children, particularly in extremely premature infants. Current screening guidelines recommend the first screening at 31 weeks postmenstrual age, or 4 weeks of life, whichever is later. The natural history of ROP in extremely premature infants, however, is more uncertain, and some have suggested modification of these screening guidelines in very high-risk neonates. This study included all infants screened for ROP a three tertiary care NICUs born at <26 weeks gestation or <800g. A total of 650 infants met the inclusion criteria, and most (80%) developed ROP. The average PMA of initial ROP diagnosis was 33.7 weeks. Around one third of patients had ROP at their initial screening exam. Around 20% of infants developed type I ROP and required treatment, at an average PMA of 37 weeks. Only 9 patients (1.4%) had type I ROP diagnosed at their first or second screening exam, and they generally did well with treatment. This large, multicenter study supports the current ROP screening guidelines for these high-risk infants and provides interesting insights on the natural history of ROP in extremely premature infants.

Comparing Rhegmatogenous and Tractional Retinal Detachment in Regressed Retinopathy of Prematurity: An International, Multicenter Study
Hsu HT, Kang EY, Blair MP, et al
Am J Ophthalmol 2026;282:1-10
This international, multicenter retrospective study examined late-onset retinal detachment (RD) occurring at least 2 years after resolution of acute retinopathy of prematurity (ROP) in 177 eyes from 156 patients. The study found that the vast majority of these late-onset RDs were rhegmatogenous (95%) rather than tractional (5%), with patients presenting at an average age

of approximately 20 years. Rhegmatogenous RD showed favorable outcomes with significant visual improvement after surgery, though poor anatomic outcomes were associated with retinal breaks larger than 1.5 mm and prior acute-stage ROP surgery. In contrast, tractional RD presented earlier, required multiple surgeries in 77.8% of cases, and had significantly poorer final reattachment rates (66.7% versus higher rates in rhegmatogenous RD). The authors concluded that patients with regressed ROP remain at elevated risk for RD, particularly before age 30, and recommend regular ocular examinations for early detection and timely intervention to optimize outcomes.

Enhancing patient and parent education in pediatric ophthalmology using artificial intelligence: a report by the AAPOS Public Information Committee
Dihan QA, Brown AD, Alzein AF, et al
J AAPOS 2025;29(6):104693
Parental health literacy significantly affects pediatric ophthalmology follow-up care and adherence to treatment regimens, yet patient education materials (PEMs) often exceed the American Medical Association's recommended 6th-grade reading level. This study evaluated the baseline readability, quality, and accuracy of PEMs by the American Association for Pediatric Ophthalmology and Strabismus (AAPOS) and assessed how LLMs may improve these PEMs. This cross-sectional study analyzed 111 PEMs from the AAPOS website. Readability was assessed using the Flesch-Kincaid Grade Level (FKGL) and Simple Measure of Gobbledygook (SMOG) which found Baseline PEMs were written on average at a 9th-grade reading level (SMOG, 9.0 ± 1.6; FKGL, 9.6 ± 2.1), with only 3.6% meeting the 6th-grade recommendation. Quality and understandability were evaluated using the DISCERN and the Patient Education Materials Assessment Tool (PEMAT), respectively. Accuracy was assessed using the Likert misinformation scale. Each PEM was separately rewritten by ChatGPT-4 and Gemini Advanced after initial analysis and it was noted that ChatGPT-4 rewrites improved readability to a 7th-grade level without compromising quality, while Gemini Advanced rewrites met the 6th-grade threshold but showed modestly reduced quality (DISCERN: 3; $P < 0.001$). Both models enhanced understandability (ChatGPT-4, 90.9%; Gemini Advanced, 91.3%; [$P < 0.001$]), and their rewrites contained no misinformation (Likert = 1). limitations: focus only on textual PEMs, did not include any direct patient assessments, only included English -language PEMs, Impact on clinical practice: AAPOS PEMs were high in quality and accurate at baseline, but written at a 9th-grade reading level. As supplemental tools, LLMs can improve PEMs' readability and understandability, but should be thoroughly reviewed by physicians to ensure optimal safety and education.

Anterior Segment, Cataract, Glaucoma / Uveitis / Infectious Disease

Severe Blepharokeratoconjunctivitis in Children-The Toronto Experience
Barbara R, Khalili S, Rachdan D, Khan MS, Ali A, Mireskandari K
Am J Ophthalmol 2026;281:642-649
This retrospective consecutive cohort study from the Hospital for Sick Children (Toronto, Canada; 2006–2021) analyzed 197 children (315 eyes) with severe blepharokeratoconjunctivitis (BKC), defined as lid margin blepharitis with conjunctivitis and significant corneal involvement (inflammation, neovascularization, scarring, thinning, lipid deposits affecting peripheral and/or

central cornea), requiring ≥6 months follow-up. Mean age at presentation was 7.6 years (range 0.8–17.3; 61% <8 years), with female predominance (63%) and bilateral disease in 60%. Chalazion history was common (65%). Corneal findings included peripheral scarring (77%), neovascularization (53%), and inflammation (53%); central involvement featured scarring (92%) and neovascularization (43%). Initial BCVA averaged 0.28 logMAR (worse with central involvement); final BCVA improved to 0.16 logMAR (P < .001), with BCVA ≤0.3 logMAR in 83% at follow-up (vs 71% initially; P < .001). Central involvement and astigmatism ≥1.5 D were associated with poorer final vision. Seventy-two percent (142/197) required systemic antibiotics (erythromycin, clarithromycin, doxycycline, or azithromycin) plus topical therapy; 28% managed with topical antibiotics alone. Complete response (no ongoing systemic antibiotics/topical steroids) occurred in 91% overall (77% after one systemic course). Flare-ups (requiring treatment escalation) affected 23% (33/142 systemic-treated), with 75% within the first year post-cessation (Kaplan-Meier survival: ~75% flare-free at 1 year, ~70% at 2–3 years). No significant difference in flare-up risk by antibiotic type or age/sex/chalazion history, though age >5 years trended toward fewer flare-ups (OR 0.39, P=.034). Fifteen eyes (4.7%) needed corneal surgery (mostly DALK for visual rehabilitation; one amniotic membrane graft, two tectonic procedures for perforation). Strengths include the largest reported pediatric severe BKC cohort, long mean follow-up (3.1 years), detailed corneal phenotyping (central vs peripheral), clear treatment response/flare-up definitions, and survival analysis for flare-up risk. Limitations are retrospective design (potential referral bias to tertiary center, missing compliance data, no standardized mite evaluation), variable systemic antibiotic regimens/durations, small flare-up subgroup limiting power for antibiotic comparisons, and exclusion of milder cases (focus on severe BKC). These findings will impact clinical practice by emphasizing that severe pediatric BKC is underrecognized, often presents with chalazion history and asymmetric/severe corneal involvement (central scarring/neovascularization in >40%), and carries substantial vision risk (initial BCVA >0.3 logMAR in 29%, persistent in ~17%) due to amblyogenic astigmatism/scarring; early aggressive management (lid hygiene, topical antibiotics/steroids, systemic antibiotics in ~72%—weekly azithromycin preferred for compliance) achieves high complete response (91%) and visual improvement, but flare-ups occur in 23% (mostly first year post-cessation), necessitating close monitoring (especially <8 years/amblyogenic age) and counseling on potential surgical needs (5%). Central involvement and ≥1.5 D astigmatism warrant urgent intervention to prevent irreversible morbidity.

Effects of Age at Surgery and Laterality of Cataract on Visual Acuity 5 Years after Surgery in Infants Left Aphakic
Repka MX, Sutherland DR, Hatt SR, et al
Ophthalmology 2025;132(11):1284-1293
This prospective cohort study used data from the Pediatric Eye Disease Investigator Group (PEDIG) cataract registry to evaluate the association between age at cataract surgery and visual outcomes 5 years postoperatively in infants operated on before 12 months of age and left aphakic, with a secondary analysis examining the development of nystagmus. The primary outcomes were monocular visual acuity (VA) at 5 years, proportions achieving VA better than 20/200 or age-normal VA, and prevalence of nystagmus, analyzed by age at surgery (<2 months, 2 to <6 months, 6 to <12 months) and laterality (bilateral vs unilateral). Among 149

infants (203 eyes) with completed 5-year VA testing, bilateral cataract cases demonstrated better overall VA than unilateral cases, but in bilateral cataracts there was no significant difference in 5-year VA by age at surgery, whereas in unilateral cataracts surgery before 2 months of age was associated with significantly better mean VA and a higher likelihood of achieving VA better than 20/200 compared with surgery at 2 to <6 months. No significant differences in age-normal VA or nystagmus prevalence at 5 years were observed by age at surgery for either laterality. Strengths include the prospective, multicenter design and standardized follow-up, while limitations include exclusion of primary IOL cases, loss to follow-up for one-third of eligible infants, variability in postoperative management, and small sample sizes in some subgroups. These findings are clinically significant for pediatric ophthalmology because they refine the timing trade-off in infantile cataract surgery, suggesting that while unilateral cataracts benefit visually from surgery before 2 months of age, bilateral cataracts may allow for modest surgical delay—potentially reducing glaucoma risk—without compromising long-term visual acuity.

Multifocal Versus Monofocal Intraocular Lens Implantation in Children With Cataracts
Ding Y, Wan X, Kong L, et al
Am J Ophthalmol 2026;281:151-161
This prospective, nonrandomized comparative clinical study from a single Chinese center (Qingdao Eye Hospital, Shandong First Medical University) evaluated real-world outcomes of multifocal versus monofocal intraocular lens (IOL) implantation in 571 eyes of 402 pediatric cataract patients (219 children/311 eyes with multifocal IOL optic implantation in Berger space; 183 children/260 eyes with monofocal IOL implantation plus primary posterior capsulorhexis and anterior vitrectomy), with rigorous screening excluding severe comorbidities (e.g., retinopathy of prematurity, retinoblastoma). Mean age at surgery was ~5.8–6.5 years across groups (no significant differences). Multifocal IOLs (e.g., ZFR00V, AM4UH, Tecnis ZMB00, DiffaAy) targeted mild postoperative hyperopia (age-adjusted: +0.5 to +3.0 D); monofocal IOLs (e.g., A1UL22, iSert 251) used standard formulas. Berger space implantation achieved optic capture in 93.25% of multifocal cases without vitrectomy. Efficacy outcomes favored multifocal IOLs: postoperative corrected distance visual acuity (CDVA), distance-corrected near visual acuity (DCNVA), and (in some analyses) intermediate acuity were significantly better in both bilateral and unilateral cases (all $P < .05$ where reported). More patients achieved Titmus stereopsis ≤100 arcseconds after multifocal implantation (bilateral: 70% vs 40%, P=.006; unilateral: 59% vs 38%, P=.003). Optical quality improved significantly postoperatively (higher modulation transfer function cutoff and Strehl ratio, lower ocular scatter index; all $P < .001$), with no differences between unilateral/bilateral or multifocal/monofocal groups. Spectacle independence was higher with multifocal IOLs (51.67% vs 37.31%; P=.033). Safety favored multifocal IOLs in Berger space: significantly lower rates of early corneal edema (2.28% vs 9.84%; P=.017), transient intraocular hypertension (2.28% vs 12.02%; P=.006), and visual axis opacification (VAO; 0% vs 6.56%; P=.014) during mean ~29–35 months follow-up. No retinal detachment or cystoid macular edema occurred. Mild IOL decentration was rare (0.45% multifocal). Strengths include the largest reported pediatric cohort comparing multifocal vs monofocal IOLs, real-world data with rigorous screening, comprehensive outcomes (visual acuity, stereopsis, optical quality via OQAS, complications), direct comparison of bilateral/unilateral cases, and high success of

Berger space implantation avoiding vitrectomy/VAO. Limitations are nonrandomized design (potential selection bias; families/surgeons chose IOL type after discussion), single-center setting (limited generalizability), variable follow-up (mean ~2.5–3 years; insufficient for long-term myopia shift or late complications), incomplete baseline optical/stereopsis data in some young/opaque-lens cases, and lack of contrast sensitivity/glare/haloes quantification despite multifocal concerns. These findings will impact clinical practice by supporting multifocal IOL optic implantation in Berger space as a safe, effective option for rigorously screened pediatric cataract patients, offering superior distance/near vision, better stereopsis, higher spectacle independence, and markedly lower VAO risk without vitrectomy compared to monofocal IOL with PCCC/AV; surgeons should counsel families on potential selection factors, emphasize rigorous preoperative screening to exclude high-risk cases (e.g., severe nystagmus, maculopathy), and consider multifocal IOLs preferentially in cooperative children needing full-range vision, while awaiting longer-term multicenter randomized data on myopia progression and rare late complications.

Two-Year Results of Gonioscopy-Assisted Transluminal Trabeculotomy Versus Ab Externo Visco Circumferential Suture Trabeculotomy in Primary Congenital Glaucoma
Elwehidy AS, Elhofi AS, Abdelkader AME, GabAllah NM
J Glaucoma 2025;34(10):811-818
Various surgical approaches have been used in the treatment of primary congenital glaucoma, most recently with gonioscopy-assisted transluminal trabeculotomy (GATT) showing promising outcomes. Ab-externo 360-degree trabeculotomy (micro-catheter or polypropylene suture) can facilitate similar angle treatment for patients with hazy corneas, but the cost of the microcatheter may limit access to this technology. This study aimed to compare outcomes of GATT to ab externo visco circumferential suture trabeculotomy (AVCST) which uses viscoelastic to facilitate SC cannulation with polypropylene suture. Sixty-five eyes of 39 patients with PCG were selected to have either AVCST (n=34) or GATT (n=31); decision for which procedure was largely driven by corneal clarity, but also by surgeon preference. Other than corneal clarity, there were no statistically significant differences in demographics or baseline clinical characteristics between the two surgical groups. Post-op evaluations at 1, 3, 6, 9, 12, 18, and 24 months showed no statistically significant difference between the rates of success for GATT vs. AVCST. Even when cases in which SC could not be cannulated 360 degrees are counted as failures (7 AVCST, 1 GATT), the cumulative rate of success at 2 years post op remains high (82.4% AVCST and 93.5% GATT). This is the first known study to directly compare these two surgical techniques for PCG, and while the cohort is relatively small and retrospective in nature, the similarity in outcomes is encouraging for both as viable primary treatment options with the option to default to partial angle treatment if full cannulation is not possible.

Retina, Retinoblastoma, Intraocular Tumors, and Trauma

Association between retinal findings and risk of mortality in pediatric abusive head trauma
Elhusseiny AM, Azhari JO, Ercanbrack CW, Chauhan MZ, Phillips PH, Grigorian F
J AAPOS Published online January 27, 2026

Abusive head trauma (AHT) is strongly associated with multilayered retinal hemorrhages, which have been linked to an increased risk of mortality. This study evaluates how specific retinal hemorrhage characteristics, comorbid systemic conditions, and socioeconomic factors relate to in hospital mortality among children diagnosed with AHT. Conducted as a single institution retrospective review over ten years, the study included hospitalized children with confirmed AHT and retinal hemorrhages documented with RetCam imaging. Two fellowship trained pediatric ophthalmologists independently graded the hemorrhages using a three part system assessing extent, spread, and morphology, with analysis based on the more severely affected eye. Neighborhood context was assessed using the Child Opportunity Index. Among 91 patients, the mean age at injury was approximately eight months, and all had retinal hemorrhages. Mortality was 20%. Higher mortality was associated with greater hemorrhage grade, wider spread, and the presence of retinoschisis, while optic disc edema, vitreous hemorrhage, hemorrhage morphology, and patient age were not associated with increased risk. Younger infants trended toward more severe hemorrhages, and age statistically correlated with hemorrhage spread. Hypoxic ischemic injury was the only comorbidity significantly linked to mortality, whereas skeletal fractures, demographic factors, and socioeconomic measures were not. This study fills an important knowledge gap regarding how hemorrhage severity relates to outcomes in AHT, though its retrospective design and modest sample size limit generalizability. Clinically, the results highlight that higher grade and more extensive retinal hemorrhages are strong predictors of mortality in children with AHT.

At What Age Could Screening for Familial Retinoblastoma Be Stopped?: Revised Dutch Retrospective Population-Based Cohort Study 1991-2019
Badalova NA, van Hoefen Wijsard M, Dommering CJ, et al
Ophthalmology 2025;132(10):1152-1160
There is currently no universally accepted protocol for screening children at risk for familial retinoblastoma. Recommendations vary on timing and duration of screening. A consensus report from the American Association of Ophthalmic Oncologists and Pathologist recommends screening all children at risk of familial retinoblastoma until 7 years of age. This prompted them to investigate the latest age of familial retinoblastoma diagnosis to assess whether this extended screening is justified at their center. A recent systematic review conducted by the same group identified 4 years as the latest age of detection of a primary retinoblastoma tumor in systematically screened at-risk children from birth from 1945-1998. For various reasons, the investigators felt the reported age may be an overestimate with the detection of tumor possibly being earlier. In the current study, they reexamine the age at diagnosis of familial retinoblastoma using data from their nationwide retinoblastoma registry covering the past 28 years, during which at-risk children in The Netherlands were screened in a single center by a team of dedicated retinoblastoma ophthalmologists. This study primarily relied on the age at diagnosis of familial retinoblastoma in high-risk patients. In The Netherlands, all at-risk children are screened soon after birth and continue screening until 4 years of age. A diagram of their screening protocol can be found in the article. 28 patients were considered “completely screened” meaning initial screening occurred before 4 weeks of age and followed the recommended frequency in their protocol. All 28 completely screened children received a diagnosis before 1 year of age, with a median age at diagnosis of 18 days. Sixteen children

(57.1%) received a diagnosis at the first examination within the first month after birth, and 82.1% received a diagnosis within the first 6 months. A primary motivation for this study was to refine screening protocols for low-risk children (3% risk), aiming to minimize the burdens of prolonged screening. The results showed that stopping screening after 1 year of age may be safe for low-risk children because no tumors were diagnosed beyond this age in completely screened patients. They revised their screening protocol in 2024 and screening is discontinued for unaffected children at low risk (< 3%) of familial retinoblastoma developing at 2 years, to ensure a safety margin. They emphasize screening children with low risk early and under general anesthesia from 6 months to 2 years of age before discontinuing screening. In children with higher risk, ophthalmic examination will continue until 4 years of age, even when no retinoblastoma tumor has developed, adhering to the same screening protocol as during the study period.

Oral fluorescein angiography allows for more precise detection of sickle cell retinopathy in pediatric patients
Lindquist M, Stafie ST, Ward C, et al
J AAPOS 2025;29(6):104683
Current screening protocols for sickle cell retinopathy (SCR) based on expert consensus recommend dilated fundus examination starting at age 10 and every 1-2 years thereafter, regardless of genotype, based on low-quality evidence. This retrospective study compared oral ultrawide-field fluorescein angiography (UWF-FA) to fundus photography in the detection of SCR. They included patients with known sickle cell disease (SCD) who were referred to the ophthalmology clinic at Seattle Children's Hospital for SCR screening who underwent both modes of imaging (October 2022 – January 2025). Four retina specialists masked to clinical information assessed SCR severity using the Goldberg classification system; their findings were compared to grades by an unmasked pediatric vitreoretinal specialist. They included 32 patients, 7-21 years of age (24 were diagnosed with HbSS (75%), 6 with HbSC (18.75%), and 2 HbSb-thal (6.25%)). Sixteen patients (50%) were diagnosed with SCR by the unmasked grader. In evaluating the UWF-FA images, the masked graders identified SCR in all 16 cases, as did the unmasked grader, but using fundus photographs they indicated the presence of SCR in only 75% of the same cases. SCR was more prevalent among HbSC (83%) and Hb-beta thalassemia trait (100%) patients compared with HbSS (38%). In this cohort, angiographic evidence of disease was found as early as age 7. Limitations: small sample size, retrospective study. Impact on clinical practice: Findings suggest screening should be considered before age 10 years and oral UWF-FA may be more effective compared to fundus photography in the detection of SCR.

Late-Onset Retinoblastoma: Clinical and Genetic Features in Children Presenting Over 5 Years Old
Evans WI, Thompson BN, King BA, et al
Ophthalmol Retina 2026;10(1):95-101
Retinoblastoma is the most common intraocular malignancy in children, and at least 90% of children present by age 5 of age. There is limited data on those children that present later, and many may have atypical features that lead to the delayed diagnosis. This retrospective chart

review included 25 patients who were diagnosed with retinoblastoma at age 5 of later (4.7% of all children with retinoblastoma at this institution). The majority of patients (22/25) had symptoms that prompted referral, while a few (3/25) were discovered on routine examination. Around a third of patients (9/25) were misdiagnosed prior to referral. Most of the patients (24/25) had unilateral disease. The growth pattern was variable between in patients. Of the children that underwent genetic testing, 25% had a germline mutation identified. The study includes a large period of time (1999-2022) but is retrospective. It highlights that retinoblastoma can and does occur in older children (oldest age in this study was 13), and should remain on the differential, including atypical presentations of retinoblastoma. A high level of suspicion is needed, as delay in diagnosis can result in metastatic disease (2/3 patients in this study with metastatic disease had PPV followed by enucleation for a presumed blind, painful eye).

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

Long-term Cardiovascular, Renal, and Safety Outcomes of Teprotumumab versus Systemic Glucocorticoids in Thyroid Eye Disease: A Target Trial Emulation
Lo JE, Freitag SK, Liu CY, Barbesino G, Ma KS
Ophthalmology 2025;132(10):1142-1151
There is limited data on the long-term safety of teprotumumbab compared to systemic glucocorticoids in patients with TED. The study aimed to investigate the long-term cardiovascular, renal, infectious, and safety outcomes of teprotumumab vs GCs for the management of TED. This is a population based cohort study that included patients >18yo with TED who initiated tepro, GCs, or conservative treatment from 80 health care organizations in the US. 685 tepro initiators were compared to 685 propensity-score matched IV GC initiators. 741 tepro initiators were compared to 741 oral GC initiators. Teprotumumab was associated with markedly lower all-cause mortality and reduced risks of acute myocardial infarction, acute kidney failure, emergency department visits , hospitalizations, urinary tract infection pneumonia and severe sepsis compared to IV and oral GCs. There was no difference in the risks of diabetes, chronic kidney disease, or inflammatory bowel disease, or complications requiring a hearing device, whereas there was a higher risk of hearing loss after starting teprotumumab compared with GCs. All-cause mortality was also markedly reduced in teprotumumab-treated patients when compared with patients receiving conservative treatment. The strengths of this study include its large sample size and long-term follow-up. Weaknesses include the use of billing codes to identify diagnosis – this could have skewed the data if primary care for medical conditions was being received at a system outside the organizations included in this study. In any case, this study does help demonstrate that tepro has an overall good safety profile and lower risk of resulting in systemic disease compared to GCs.

Dacryocystorhinostomy outcomes for congenital nasolacrimal duct obstruction associated with craniofacial abnormalities
Ashby GB, Sinha K, Kuchhangi AD, Odorico SK, Oatts JT, Wagner LH
J AAPOS Published online September 18, 2025
Children with craniofacial abnormalities are often excluded from dacryocystorhinostomy (DCR) outcome studies because they have known risk factors for failed surgery. This study aimed to compare clinical characteristics of patients with and without craniofacial abnormalities who

underwent DCR for intractable congenital nasolacrimal duct obstruction (CNLDO). Authors performed a retrospective, multi-center study of patients less than 17 years old who underwent either endoscopic or external DCR between 2003 and 2023. They captured data points on demographics, presence of craniofacial abnormality, persistent symptoms, and need for further surgery and compared continuous variables using two-sample t-tests and categorical variables using X^2 tests. Data included 55 eyes of 40 patients. There was no difference in the demographics between the two groups. While there was no difference to surgical approach to DCR between the two groups, children with craniofacial anomalies were more likely to require multidisciplinary surgical care (primarily ENT). Children with craniofacial anomalies were also significantly more likely to have proximal nasolacrimal pathology such as punctal or canalicular agenesis. This group had a higher rate of persistent symptoms following surgery than the group without craniofacial anomalies. In the craniofacial group, patients who underwent multidisciplinary surgery were more likely to experience resolutions of symptoms. Limitations include retrospective nature and possibility of incomplete data in patients lost to follow-up. Further, patients with craniofacial abnormalities may have other factors contributing to persistent epiphora. Results suggest that in children with craniofacial anomalies, surgeons should be prepared to address proximal nasolacrimal pathology and should have low threshold to involve other surgical specialties if needed.

Correction of abnormal head position in pediatric nystagmus using yoked low-value prism glasses: a retrospective study
Nsour G, Misawa MAM, Adamuccio J, et al
Invest Ophthalmol Vis Sci 2026;67(2):3
Nystagmus affects approximately 24 per 10,000 individuals and frequently leads to abnormal head positions (AHP) as patients align their eyes with the "null zone" to minimize oscillations and optimize visual acuity. While surgery remains the standard treatment for AHP, yoked prisms represent an underutilized non-surgical alternative. This retrospective study reviewed 31 pediatric patients (mean age 10.3 ± 3.6 years) with nystagmus and AHP who were prescribed low-value yoked prisms tailored to their head turn direction. Outcomes assessed were binocular best-corrected visual acuity (BBCVA) and AHP measurements at distance and near vision with and without prisms, using goniometer measurements by two ophthalmologists. The mean prism prescription was 3.9 ± 1.25 prism diopters, with each prism diopter correcting approximately 3.67° of AHP at distance and 3.34° at near—approximately seven times more effective than traditional optical formulas predicted. AHP improved dramatically from 16.9° ± 9.9° to 4.6° ± 5.8° at distance ($P < 0.0001$, large effect size) and from 12.7° ± 12.9° to 3.8° ± 6.2° at near ($P < 0.0001$, large effect size), while BBCVA showed modest improvement from 0.44 ± 0.22 to 0.41 ± 0.23 logMAR ($P = 0.001$, small effect size). The study provides the first quantitative assessment of minimal prism values needed for AHP correction and demonstrates immediate, well-tolerated benefits. Limitations include the retrospective design, absence of objective eye-tracking to quantify nystagmus changes, small sample size for subgroup analyses, lack of sham controls, and inability to assess long-term neural plasticity effects. Low-value yoked prisms represent a safe, non-invasive adjunctive or primary treatment option that can reduce the physical and psychosocial burden of AHP in pediatric nystagmus while allowing use of primary gaze position.

Genetics

Genotype–phenotype correlations of COL2A1 and COL11A1 patients
Constant A, Daruich A, Bernabei F, et al
Am J Ophthalmol 2026;281:17 24
Stickler syndrome is a multisystem collagenopathy and the leading cause of syndromic rhegmatogenous retinal detachment in children, most often due to variants in COL2A1 or COL11A1. This was a retrospective cross sectional study of genetically confirmed Stickler patients followed at two Paris tertiary centers between 2016 and 2024. Records were reviewed for demographics, ophthalmic findings. Among 110 patients, 90 (82%) had COL2A1 variants and 20 (18%) COL11A1 variants, with 10.8 years of median follow up. Retinal detachment rates were similar in the groups (about half in each group), but the COL11A1 group showed a more aggressive ocular course. Patients with COL11A1 variants had significantly longer axial lengths, earlier onset of retinal detachment, and a shorter interval to fellow eye detachment compared with COL2A1 patients, and they also had substantially higher rates of deafness. This suggests that lifetime detachment risk is comparable, but that COL11A1 related Stickler syndrome manifests earlier and progresses faster. Strengths include a large Stickler cohort with long follow up. Limitations are the retrospective design, the smaller size of the COL11A1 subgroup, and restriction to two centers in one country. This study supports potentially more intensive, earlier retinal surveillance and systemic (especially hearing) monitoring in COL11A1 patients as these patients can have earlier retinal detachment and shorter time to fellow retinal detachment compared to COL2A1. This may impact patient management and prophylactic strategies.

Inherited retinal disease pathway in the UK: a patient perspective and the potential of AI
Wong W, Sumodhee D, Morris T, et al
Br J Ophthalmol 2025;109(11):1266-1271 Inherited retinal diseases are a leading cause of blindness in young UK adults despite improvement in genomics, but ~40% remain genetically undiagnosed after extensive testing, this cross-sectional electronic survey collected 242 responses from UK IRD patients/relatives/caregivers using Likert-scale and open-ended questions about diagnostic experiences, genetic counseling, information needs, and attitudes toward AI tools like Eye2Gene. Diagnostic journeys showed wide variability with median 3 consultations, 1-year specialist wait, 25-mile travel, and 35.8% diagnosis changes, 22.4% never received genetic testing. Over 90% of patients were in favor of integration of AI into the IRD pathway to improve genetic diagnosis and care. Strengths include the large sample size for rare disease, co-designed with patient advisors capturing real-world disparities and AI enthusiasm, while limitations include distributed through UK-based charities, UK-only, and recall of pre-2020 testing. The findings suggest most patients are in favor of responsibly using AI tools like Eye2Gene to reduce diagnostic delays and variability. This may help with standardizing IRD pathways and help with management and care.

Measuring historical variant reclassification in inherited retinal disease and its impact on clinical genetic testing
Kern K, Gordon A, Drackley A, et al
Ophthalmic Genet 2025;7:1-8

Inherited retinal diseases (IRDs) are disorders causing vision loss whose heterogeneity makes molecular diagnosis challenging. Next-generation sequencing improves diagnosis, but variant interpretation discordance hinders gene targeted therapy for IRD. Accurate variant classification using American College of Medical Genetics and Genomics (ACMG) and Association for Molecular Pathology (AMP) guidelines is important amid fast expanding IRD gene knowledge.In this study, 140 variants from a cohort of 28 pediatric IRD patients using blinded ACMG/AMP workflows and compared results to original labs, while analyzing RPE65 ClinVar submissions from different years for discordance trends. In the pediatric cohort, 77.8% of reclassifications were concordant, with 22.1% discordance seen more by downgrades from definitive to VUS than upgrades. Discordance peaked at 37.5% for 2016 reports but fell post-ACMG/AMP standardization. Strengths include blinded reanalysis by genetic specialists and ClinVar benchmarking. Limitations include single-center retrospective design and exclusion of non-ACMG-interpretable variants. Improvement in IRD reclassification is needed, in the setting of rapid increase in genetic testing, to enhance management including accurate eligibility for therapies.

Low population penetrance of variants associated with inherited retinal degenerations
Zaslavsky K, Chen L, Park C, et al
Am J Hum Genet 2026;113(1):71-82
Inherited retinal degenerations (IRDs) have traditionally been considered monogenic Mendelian disorders with near-complete penetrance, but studying specialty clinic-based patients may inflate estimates by selecting severely affected cases, leaving population-level penetrance unknown. The study screened 317,964 All of Us biobank participants for 167 pathogenic/loss-of-function variants in 33 IRD genes, identifying 481 with definite IRD-compatible genotypes, then calculated disease annotation frequency (DAF) using ICD code sets and validated with Biobank retinal imaging. Population penetrance ranged 9.4%-28.1% across code sets, well below assumed ~100%, with gene-specific variability. Biobank imaging confirmed 16.1%-27.9% abnormality rates in 68 variant carriers. IRD-compatible genotypes may affect 0.7%-2.1% of populations—orders of magnitude above diagnosed IRD prevalence—indicating frequent incomplete penetrance requiring genetic/environmental modifiers for disease manifestation. Strengths include unbiased biobank approach overcoming bias from obtaining information of genomics/EHR/imaging across >300,000 individuals. Limitations include biobank recruitment biases, peripheral retina imaging gaps, and potential age-related macular degeneration confounding broader code sets. Low population penetrance in IRD-associated genes suggest widespread variable expressivity with permissive genetic or environmental factors may play a role. This knowledge may help with predicting IRD risk, counseling and treatment development.

Update on Gene Therapy Clinical Trials for Eye Diseases
Lonfat N, Moreno-Leon L, Punzo C, Khanna H
Hum Gene Ther 2025;36(19-20):1287-1300
The IRDs constitute a spectrum of disorders that vary by age of onset, location (peripheral or central retinal involvement), and severity (age of onset and rate of progression). Remarkable progress has been made in developing gene therapies for IRDs. This review article has been

compiled to provide an update on the outcomes of clinical trials that have recently been completed and of the new clinical trials that have been initiated to tackle these blinding diseases. Gene therapy trials have yielded promising outcomes, although considerable variation exists across studies. Following the success of the first human gene therapy for RPE65-LCA, several programs have reached the clinical trial stage, but we have yet to see results confirming safety and/or improvements in visual acuity and function in larger studies. Most clinical studies have focused on monogenic forms of visual impairment. A major focus is on assessing the advantages and disadvantages of subretinal delivery, which is currently being used in most RP trials. New studies on ascertaining the advantages of IVT and suprachoroidal delivery over subretinal delivery are also being conducted.

Advanced therapies for inherited optic neuropathies
Wong DCS, Makam R, Yu-Wai-Man P
Eye (Lond) 2026;40(2):177-184
Inherited optic neuropathies (IONs), typically lead to irreversible severe vision loss due to mitochondrial dysfunction causing retinal ganglion cell degeneration. Clinical trials in LHON have demonstrated the efficacy of idebenone, an oral neuroprotective agent, and of gene-replacement therapy using allotopic gene expression. Early-phase clinical trials are underway for ADOA caused by variants in the nuclear gene OPA1, using innovative techniques to modulate gene expression in a variant-agnostic manner. This review critically appraised a range of therapeutic strategies, including gene editing and stem cell-based optic nerve regeneration, and discussed the barriers to translation. Future studies focusing on understanding genetic heterogeneity, disease variability, and optimising patient selection for clinical trials are essential to improve patient management and fast-track transformative therapies for IONs.

Efficacy and safety of intravitreal rAAV2-ND4 therapy for Leber's hereditary optic neuropathy
Jiang L, Guo S, Li B, Xiao S, Wang F, Wei W
Eye (Lond) 2025;39(17):3099-3104
This study aimed to assess the safety and efficacy of a rAAV2 carrying normal ND4 (rAAV2-ND4) in individuals with visual loss due to LHON carrying the m.11778G>A mutation. Additionally, it aimed to determine a safe dose for intravitreal injection. A single-arm, open-label, dose-finding clinical trial. A total of 12 participants with the m.11778G>A mitochondrial DNA mutation and vision loss exceeding 6 months in both eyes were enrolled in this trial. The participants received NR082 by unilateral intravitreal injection. 6 participants received 1.5 × 109 vg, 0.05 mL (Group I), and 6 participants received 4.5 × 109 vg, 0.05 mL (Group II). They were followed for 52 weeks and underwent safety assessments, including visual structure and function examinations. No serious ocular or systemic adverse events or dose-limiting toxicity were reported. In Group I, the mean baseline BCVA in injected eyes improved from 1.86 ± 0.36 LogMAR at baseline to 1.59 ± 0.10 LogMAR at week 52 post-intravitreal rAAV2-ND4. In Group II, baseline BCVA was 2.15 ± 0.23 LogMAR, improving to 1.92 ± 0.32 LogMAR in week 52. Two eyes in Group I and four eyes in Group II showed significant improvement (at least 0.3 LogMAR BCVA improvement) after 52 weeks. A dose of 4.5 × 109 vg, 0.05 mL was to be used in the future Phase 3 study.

Next generation sequencing in children with isolated congenital cataract
Amanova G, Er E, Isik E, et al
Eur J Ophthalmol 2025;35(6):2075-2082
This study evaluated the etiology of congenital cataracts without known etiology in 10 families using whole exome sequencing (WES). Of the 10 patients diagnosed with isolated CC, 9 (90%) had bilateral cataracts, and 1 (10%) had unilateral cataract. Nuclear cataracts were found in 8 patients, and polar cataracts were found in 2. All patients underwent comprehensive ophthalmological, metabolic, and genetic assessments. DNA samples from the probands were analyzed using WES. Parental consanguinity was present in 7 out of the 10 families. An unidentified variant in the RAB3GAP1 gene (c.491C >G) associated with Martsolf syndrome was found in one patient. Two novel and one previously identified gene variants associated with congenital cataract were detected in 3 of the remaining 9 patients: a novel c.463C > T in CRYGD, a previously identified c.965dup in HSF4, and a novel c.3330C > A in FYCO1. This study shows that WES is a valuable tool in determining the genetic etiology of isolated congenital cataract, and identifies new pathogenic variants.

Pedigree analysis of an unusual low penetrance retinoblastoma mutation resulting in multiple silent carriers and a discordant effect on monozygotic twins
McDermott JJ 4th, Nyalakonda RR, Schefler AC
J AAPOS Published online September 18, 2025
This study investigates low-penetrance heritable retinoblastoma (RB) mutations. The authors report a pair of monozygotic twins with molecularly proven discordant RB, as well as the largest pedigree published describing a low-penetrance RB1 mutation with multiple successive generations of silent carriers. The proband in the case report was found to have RB1 mutation, c.54_76dup in exon 1, coding for a premature translational stop signal secondary to frameshift. Monozygotic twins were later born in this family, only one twin developed a unilateral tumor, while the other twin remained disease free (at latest follow up at 42 months). This paper demonstrate that low penetrance germline RB variants can result in discordant disease in monozygotic twins, inviting further studies on the mechanisms of pathogenesis that may offer therapeutic targets.

Early-Onset Retinopathy in Patients With Variants in SLC6A6 Leading to Impaired Taurine Transport
Ullah M, Rehman AU, Shetty M, et al
JAMA Ophthalmol 2026;144(1):70-78
This study identifies pathogenic variants in the SLC6A6 (encoding TauT, the main transporter for taurine) and assess their role in the molecular pathogenesis of hereditary early-onset retinal dystrophy (EORD) in affected individuals from diverse ethnic backgrounds. This is a retrospective, multicenter observational study involving 7 affected and 10 unaffected individuals from 4 unrelated families. The 7 affected individuals exhibited LCA/EORD, with extraocular findings in some. Genetic analysis identified homozygous pathogenic SLC6A6 variants in all affected individuals, while unaffected relatives were heterozygous carriers. Functional studies demonstrated that both missense variants are associated with complete loss of taurine transport

in HEK-293 cells and patient-derived fibroblasts. Plasma taurine levels in affected individuals were reduced compared with heterozygous carriers and healthy control individuals. These findings confirm the role of SLC6A6 in LCA/EORD due to impaired taurine transport. This study also invites futures studies looking at oral taurine supplementation as a treatment of SLC6A6 associated EORD.

Amblyopia

Dynamic Stereopsis Is Abnormal in Treated Anisometropic Amblyopia
Chen Y, Chen Y, Hess RF, Zhou J
Invest Ophthalmol Vis Sci 2025;66(14):10
The study aimed to evaluate dynamic stereoscopic function in treated anisometropic amblyopes who have restored visual acuity. Twelve treated amblyopes, twelve age-matched emmetropes, and eight non-amblyopic anisometropes were assessed using stimuli involving lateral motion. Results showed that treated amblyopes had significantly reduced dynamic stereo sensitivity compared to the other groups, despite similar speed-tuning shapes. Notably, dynamic stereopsis sensitivity did not correlate with the degree of anisometropia or static stereopsis, revealing persistent binocular deficits in treated amblyopes. This underscores the necessity for therapies aimed at restoring binocular visual function for comprehensive treatment of amblyopia.

Visuo-Cognitive Executive Functions in Amblyopia and Strabismus: Associations With Function and Quality of Life
Rakshit A, Schmid KL, Majhi D, Webber AL
Invest Ophthalmol Vis Sci 2025;66(14):48
The study investigates the visuo-cognitive executive functions in adults with amblyopia and/or strabismus, focusing on their relationship with functional capabilities and vision-related quality of life (VRQOL). It included 114 participants categorized into four groups: amblyopia, amblyopia with strabismus, strabismus, and healthy controls. Assessments revealed significant performance differences across groups in visuo-cognitive tests, indicating slower completion times and deficits in divided attention, visual search, and cognitive flexibility for those with visual disorders. Regression analyses showed that executive function performance is linked to manual dexterity and reading speed, while psychosocial VRQOL is affected by strabismus presence. The findings emphasize the long-term impact of these conditions on cognitive functions and highlight the need for targeted interventions to address visual and functional impairments in affected adults.

Ocular Risks of Topical Atropine Prescriptions Among Taiwanese Children
Liu YL, Tsai JY, Chiu KY, et al
JAMA Ophthalmol 2025;143(10):855-863
This retrospective cohort study investigates the ocular risks associated with atropine prescription for myopia control in Taiwanese children aged 8 to 15 years. Data from Taiwan's National Health Insurance Research Database from 2000 to 2021 included 1,213,846 children, of whom 606,923 had myopia, with 406,383 prescribed atropine. The study found a higher incidence of ocular complications (cataracts, glaucoma, and maculopathy) in children with myopia compared to nonmyopic counterparts. However, there was no significant difference in ocular complications between atropine users and nonusers. Increased risk was noted in those with over three years of cumulative atropine use, but this trend did not emerge for high myopia cases. The findings suggest that while myopia increases the risk of ocular issues, atropine

prescription is not definitively linked to these complications, helping inform the risk-benefit assessment of atropine use in clinical practice

Amblyopia prevalence in patients with alternating esotropia
Khorrami-Nejad M, Akbari MR, Masoomian B, Shakor YA, Narooie-Noori F
J AAPOS 2025;29(6):104700
The global prevalence of amblyopia has been reported to be 0.7-2.9%. The purpose of this retrospective, cross-sectional, single-center study was to determine the frequency of amblyopia in preschoolers and school-age children with alternating esotropia. Only preoperative medical records were reviewed from patients 3-10 years of age with confirmed alternating esotropia evaluated between 2012 and 2024. They excluded those with motor or cognitive disabilities, ocular pathologies, or craniofacial anomalies, and those with prior ocular surgeries or vertical deviations. They included 767 subjects (mean age, 6.9 ± 1.8 years; 41.4% female) with alternating esotropia, of which 151 (19.7%) were diagnosed with varying degrees of amblyopia: 57.6% mild, 39.8% moderate, and 2.7% severe. Thirty-seven of the amblyopic patients (24.5%) showed evidence of anisometropia; specifically, 21.2% anisohyperopia, 2.7% anisomyopia, and 0.7% anisoastigmatism. Of the 616 nonamblyopic participants, 5.8% had anisometropia. They concluded that the alternating nature of esotropia does not necessarily ensure the absence of amblyopia (> 95% were mild or moderate amblyopia) in children who are candidates for strabismus surgery. limitations: retrospective and single-center study, exclusively included patients referred for surgery, only a small number had severe amblyopia. Impact on clinical practice: Be mindful that alternating esotropia does not ensure the absence of amblyopia.

Spatiotemporal Dynamics of Binocular Interaction in Anisometropic Amblyopia Revealed by Classification Image
Zhu J, Feng Y, Huang X, et al
Invest Ophthalmol Vis Sci 2026;67(1):18
This study utilizes a high-precision classification image technique to map the "Perceptive Fields" (PFs) of individuals with amblyopia compared to those with normal vision. By embedding a target bar within dynamic noise across different space and time intervals, researchers were able to quantify how the brain weights visual information from each eye. The findings reveal that amblyopic eyes (AE) suffer from a significant temporal advancement and spatial broadening of their PFs—essentially, the AE processes visual information more crudely and with greater temporal uncertainty than a normal eye. Furthermore, the study identifies a dramatic interocular imbalance in dichoptic conditions: the fellow eye (FE) exhibits an abnormally concentrated, high-peak PF with nearly no lateral inhibition, while the AE is heavily suppressed. This suggests that in amblyopia, binocular interaction is not just weaker, but is fundamentally reorganized in its spatiotemporal dynamics, with the dominant eye's signals overriding the amblyopic eye's ability to localize targets in space and time. This research is significant because it can help us understand why patients sometimes don’t respond to amblyopia therapy, how neuroplasticity may be harnessed in novel ways to help with amblyopia and may help to develop targeted dichoptic therapies.

The effects of amblyopia on simulated driving behavior in an urban setting

Al-Haddad C, Kobeissi H, Wehbi Z, et al
J AAPOS Published online January 30, 2026
This prospective observational study examined whether amblyopia affects driving behavior by integrating eye tracking technology with a driving simulator. Previous research has not demonstrated increased crash risk among individuals with amblyopia or impaired stereoacuity, and this study further explored that relationship by comparing adults with amblyopia to matched controls during a standardized simulated urban driving task. Participants underwent comprehensive demographic, medical, and ophthalmologic evaluations before completing the simulation, which measured average speed, lane position, braking reaction time, steering behavior, and a range of eye tracking metrics such as gaze position, fixation patterns, and saccadic movements. Eligible amblyopic participants were adults with anisometropic or strabismic amblyopia who were active drivers, and controls were age and gender matched drivers with normal visual acuity and refractive error between –2.50 and +2.50 diopters. Among the 30 participants (14 amblyopic, 16 controls), most amblyopic individuals had anisometropic amblyopia, reduced stereoacuity, or suppression, whereas controls had normal stereopsis. Despite these visual differences, the study found no statistically significant differences in driving performance or eye tracking measures, although amblyopic participants showed slightly greater gaze variability and tended to exhibit lower deceleration rates. Post simulation surveys also revealed no differences in driving habits or prior crash history. Strengths of the study included integration of eye tracking with realistic simulation and the use of a matched control group, while limitations involved the small sample size, relatively “low-stress” driving scenarios, and possible self selection bias. Clinically, the findings suggest that anisometropic amblyopia does not impair driving performance or visual attention compared with individuals who have normal stereopsis.

Self-reported physical activity in school age children with amblyopia
Koritala BA, Jost RM, Cheng-Patel C, et al
J AAPOS Published online January 30, 2026
Amblyopia can affect visual acuity and binocular function, but it is unclear whether residual amblyopia influences physical activity levels in children aged 8–13 years, prompting this study to evaluate whether affected children participate less in physical activity than their peers. This prospective cross sectional study included three groups of children aged 8–13: those with amblyopia, those without amblyopia but with anisometropia or strabismus (treated or never affected), and controls with normal vision and no amblyopia risk factors. Participants completed a validated physical activity questionnaire, and additional data were collected using parent-reported physical activity, height, weight, body mass index, Movement Assessment Battery for Children-2, Self-Perception Profile for Children, and Functional Vision-Related Quality of Life Assessment. Among 262 participants, 59 were amblyopic, 29 had risk factors or previously treated amblyopia, and 174 were controls. There were no significant differences in physical activity or related measures across groups, except children with amblyopia showed lower functional vision scores on both child and proxy versions of the PedEyeQ compared with controls. Strengths of the study included use of validated questionnaires, diagnosis by fellowship trained pediatric eye specialists, and inclusion of both residual and successfully treated amblyopia groups, while limitations included its single center design, recall bias, lack of activity intensity data, and incomplete participation in all testing. Clinically, the findings suggest

that children aged 8–13 years with amblyopia engage in physical activity at levels comparable to their peers.

Adaptive, social, and repetitive behaviors in children with autism spectrum disorder and comorbid amblyopia and/or strabismus
Tavasoli K, O'Neil SH, Chang MY
J AAPOS Published online January 29, 2026
Children with autism spectrum disorder (ASD) have been shown to have a higher likelihood of ophthalmologic disorders, with one study reporting an adjusted odds ratio of 3.23, though the influence of these visual conditions on behavioral differences in ASD remains unclear. This study investigates whether children with both ASD and binocular vision disorders (BVD)—specifically amblyopia and/or strabismus—exhibit greater behavioral abnormalities compared with children who have ASD but normal binocular vision. Children aged 3 to 17 years with a clinical diagnosis of ASD underwent comprehensive ophthalmologic evaluation and neuropsychological testing, while parents completed three standardized behavioral questionnaires. Among the 43 participants, 14 were classified as ASD+/BVD+ and 29 as ASD+/BVD-. Although both groups performed similarly on measures of verbal, nonverbal, and composite IQ, the ASD+/BVD+ group showed significantly lower scores in social functioning across domains such as written communication, community living, interpersonal relations, and play and leisure. They also demonstrated increased “sameness” behaviors, including resistance to change and insistence on routines, though no differences were observed in other repetitive behavior categories. Strengths of the study include its prospective design and comprehensive neuropsychological assessment, while limitations include a small sample size, reliance on parent-reported questionnaires, lack of correction for multiple comparisons, and absence of data on behavioral interventions. The findings suggest that visual disorders in children with ASD may contribute to greater socialization challenges, highlighting the potential benefit of treating amblyopia or strabismus as part of a broader behavioral management strategy.

Binocular Contrast Sensitivity Function in Children With Anisometropic Amblyopia
Liao N, Jiang H, Qin Y, et al
Invest Ophthalmol Vis Sci 2025;66(13):35
Previous research has emphasized monocular contrast sensitivity in amblyopia, but binocular contrast sensitivity function (CSF) in children with anisometropic amblyopia (AA) has been less studied. This study evaluated binocular CSF in untreated and treated children with AA and compared them with normal controls. Participants included 20 untreated AA children, 20 treated AA children, and 15 age-matched controls who underwent visual acuity, refraction, stereopsis, and CSF testing. Binocular summation ratio (BSR) was calculated by dividing binocular CSF by the better-eye CSF. Amblyopic eyes in untreated AA showed significantly reduced CSF compared with controls. Despite this, binocular CSF did not significantly differ among the groups. However, children with AA demonstrated reduced BSR, indicating less efficient binocular summation. Binocular CSF area strongly correlated with contrast sensitivity at 6 cycles per degree and with fellow-eye CSF. Overall, findings suggest that although monocular deficits and reduced summation occur in AA, binocular CSF can remain normal, implying compensatory

binocular mechanisms. The results are applicable to practice in counseling patients and parents about the compensatory mechanisms of binocular vision.

Intact Perceptual Interactions of Interocular Temporal Phase and Contrast Disparities in Amblyopia
Kosovicheva A, Ahmed Z, Chaudhry N, et al
Invest Ophthalmol Vis Sci 2025;66(13):55
This study investigated how combining interocular temporal and contrast differences affects binocular integration in individuals with amblyopia and normally sighted controls. Researchers developed a dichoptic flicker integration task using sinusoidally flickering gratings with a 90-degree spatial and temporal offset to create perceived motion. Participants (12 amblyopic and 12 control) reported the direction of motion while interocular phase delays were varied from −80 to +80 degrees across three contrast conditions: 50%-50%, 70%-30%, and 85%-15%. Both groups showed broad temporal tuning, with peak accuracy occurring at negligible phase delays in the balanced contrast condition. High contrast disparities (85%-15%) reduced overall accuracy and shifted peak performance toward the higher contrast eye, requiring a temporal delay of 28.6 degrees. These results demonstrate that temporal and contrast disparities interact predictably, influencing binocular integration similarly in amblyopic and control participants. Importantly, the negative effects of contrast imbalance can be offset by introducing a temporal lead for the eye receiving the lower contrast stimulus. Although the sample size was small, the findings provide insight into how timing and contrast manipulations could be combined to improve binocular vision in amblyopia.

Extending Treatment Duration in Perceptual Learning for Amblyopia
Zhou Y, Ye Q, Qiu X, et al
Ophthalmol Sci 2025;6(2):101005
Perceptual learning is a novel therapeutic approach for amblyopia treatment that involves repetitive visual tasks aimed at enhancing visual performance and has shown promise in older amblyopic patients in studies thus far. This retrospective observational study aimed to understand if extending the period of treatment to 6 months from previous shorter treatment periods would produce better results. The training sessions involve screen-based exercises, each session lasting about 35-40 minutes, in which the unilateral amblyopia received treatment every other day and bilateral amblyopia was instructed to train daily with alternating eyes. Ninety three patients with amblyopia (8.6% isoametropic, 67.7% anisometropic, 12.9% strabismic, 1.1% deprivation, 9.7% mixed) ≥8yo underwent treatment. BCVA improved significantly by -0.12 logMAR at 3 months and further to -0.17 at 6 months. Stereopsis showed modest improvement at 3 months, but was not statistically different from 3 months at further 6 month follow-up. Patients baseline lack of stereo was cited as a limitation to assessing training effectiveness. Importantly, the cohort was primarily composed of anisometropic amblyopia, so it is difficult to determine if varying types of amblyopia might respond differently to the treatment. Given continued improvement from 3 to 6 months before reaching vision plateau, this study suggests that at least 6 months of PL may be beneficial if considering this treatment strategy. The extended time needed for engagement with this exercise may limit treatment adherence in a non-study environment.

Anterior Segment

Establishing Normative Data for Pediatric Corneal Sensitivity
Akçay P, Kiyat P, Köse T, Barut Selver O
J Pediatr Ophthalmol Strabismus 2025;62(6):401-406
This cross-sectional study aimed to establish normative pediatric corneal sensitivity values using the Cochet-Bonnet esthesiometer, an area where clinical reference data are notably sparse compared with adults. The authors evaluated 122 healthy children presenting for routine eye examinations at a single tertiary center in Turkey, excluding any ocular pathology, prior surgery/trauma, contact lens exposure, or systemic disease (including diabetes). To reduce inter-eye correlation, only right-eye values were used for primary analyses. Corneal sensitivity was measured in five regions (central, superior, inferior, nasal, temporal), with standardized testing conditions and a single examiner, and each location was tested three times with averaged results. Overall, corneal sensitivity was high and relatively uniform across the cornea. Mean sensitivity values clustered tightly around ~5.16–5.19 cm in all regions, and there were no statistically significant differences between quadrants or between sexes. The most clinically meaningful finding was a clear, consistent age effect: corneal sensitivity decreased as age increased, with moderate-to-strong negative correlations across all regions (r approximately −0.59 to −0.65). When children were stratified into age groups (2–7, 8–13, and 14–18 years), sensitivity declined stepwise in every quadrant. For example, central sensitivity decreased from 5.57 cm (ages 2–7) to 5.13 cm (8–13) and 4.89 cm (14–18), with similar patterns in the peripheral quadrants. The authors emphasize the practical value of these data for interpreting suspected pediatric corneal hypoesthesia (eg, neurotrophic keratopathy, post-surgical states, or neuropathic conditions), where adult norms may be misleading. Limitations include the single-center design, cross-sectional methodology, and the inherent constraints of Cochet-Bonnet testing (ceiling/floor effects, environmental sensitivity, and reliance on patient cooperation). Despite this, the study provides a useful baseline reference set and reinforces that pediatric corneal sensation is not static, but progressively declines throughout childhood and adolescence.

Tectonic Corneal Transplant in the Management of Congenital Anterior Staphyloma
Rodrigues R, Scanga H, Potluri P, et al
Cornea 2025;44(10):1208-1218
Congenital anterior staphyloma is a rare, severe anterior segment malformation that can threaten globe integrity and vision, often requiring surgical intervention. Tectonic corneal transplantation may help preserve the eye, but outcomes and indications in this condition are not well established.This was a retrospective case series evaluating pediatric patients with congenital anterior staphyloma who underwent tectonic corneal transplantation, assessing anatomical globe preservation, complications, and visual outcomes over follow-up. Tectonic keratoplasty successfully preserved the globe in most treated eyes, but graft survival and visual outcomes were limited: approximately 4 of 10 eyes maintained a clear graft, while 3 of 10 developed complete graft opacification, with others showing partial failure or requiring repeat procedures. Many patients required additional interventions, including glaucoma management or further anterior segment surgery, and functional vision remained poor in most cases,

reflecting the severity of associated ocular malformations. Overall, the procedure primarily provided structural stabilization rather than reliable visual rehabilitation. Strengths include detailed surgical and longitudinal outcome data in a rare pediatric condition. Limitations include the retrospective design, small sample size, and heterogeneity of associated ocular anomalies, which restrict generalizability and visual prognosis interpretation. Tectonic corneal transplantation should be considered a globe-saving procedure for congenital anterior staphyloma, with counseling that structural success is more likely than meaningful visual recovery.

Long-Term Outcomes of Pediatric Keratoplasty at a Tertiary Care Center
Majmudar SP, Chhadva P, Tu EY, et al
Cornea 2025;44(11):1333-1340
Pediatric keratoplasty is used to treat corneal opacity from congenital and acquired causes, but long-term graft survival and visual rehabilitation remain challenging. This study evaluated real-world outcomes to better define prognosis and risk factors in children undergoing corneal transplantation.This was a retrospective review of 73 eyes of 46 pediatric patients (≤16 years) undergoing keratoplasty at a tertiary care center, assessing graft survival, visual outcomes, and predictors of failure over a mean follow-up of 5.82 years. Graft failure occurred in 40 of 73 eyes (56%), at a mean of 16.3 months, and 25 of those eyes (62.5%) required repeat transplantation. Cumulative graft survival declined over time to 60% at 1 year, 55% at 3 years, and 44% at both 5 and 7 years. Despite this, 47 eyes (64%) achieved ambulatory vision (≥20/800) at final follow-up; younger age (<5 years) at surgery improved visual outcomes in congenital disease, while Black ethnicity (HR 4.72), mixed/other ethnicity (HR 6.67), and combined procedures (HR 2.88) were associated with higher graft-failure risk. Strengths include a relatively large pediatric cohort with long follow-up and formal survival analysis identifying risk factors. Limitations include the retrospective single-center design and heterogeneous diagnoses, which may limit generalizability and confound visual outcome comparisons. Pediatric keratoplasty carries substantial long-term graft-failure risk (~56%), but still provides ambulatory vision in most children, supporting surgery when indicated while emphasizing careful timing, counseling, and long-term monitoring.

Visual and Orthoptic Development After Descemet Stripping Automated Endothelial Keratoplasty for Congenital Hereditary Endothelial Dystrophy in Children Younger Than 8 Years: Case Series and Literature Review
Neugebauer A, Gietzelt C, Fricke J, et al
Cornea 2025;44(11):1359-1366
Congenital hereditary endothelial dystrophy (CHED) causes early corneal opacity during the critical period of visual development, increasing the risk of amblyopia. The study seeks to evaluate the results/outcomes of early Descemet stripping automated endothelial keratoplasty (DSAEK) for CHED. This retrospective case series analyzed 11 eyes of 6 children younger than 8 years with CHED treated with DSAEK or partial/non-DSAEK procedures, with a mean surgical age of 3.45 years and mean follow-up of 47 months, alongside a literature review of published pediatric CHED surgeries. Among treated eyes, 3 required additional interventions, including 2 repeat DSAEKs for early graft failure, but at final evaluation all 10 grafts with >1-month follow-up

were clear, with only 2 showing mild stromal opacification. In cooperative patients with adequate follow-up, 9 eyes achieved final visual acuity between 0.8 and 0.2 logMAR (mean 0.49), indicating generally functional vision, although postoperative hyperopia >5 D occurred in 6 eyes. Review of 58 procedures in 36 children from the literature suggested a trend toward better visual outcomes with younger surgical age and more complications after non-DSAEK approaches.Strengths include relatively long follow-up for a rare pediatric disorder and inclusion of orthoptic/visual developmental considerations with literature context. Limitations include the small sample size, retrospective design, mixed surgical approaches, and limited reliable acuity testing in very young children.Early DSAEK in children with CHED can achieve durable corneal clarity and functional vision, supporting timely endothelial keratoplasty during the amblyopia-sensitive developmental period.

Keratoconus Detection in High-Astigmatism Pediatric Patients: Optimal Pentacam Indices and Cutoff Points
Souza Oliveira R, Gil JQ, Rosa A, Quadrado MJ, Campos M
Cornea 2025;44(12):1521-1527
Pediatric keratoconus (KC) often progresses rapidly, making early detection crucial, especially in children with high astigmatism who are at increased risk. Standard Pentacam thresholds derived from adults may not be accurate for pediatric or highly astigmatic populations. This prospective multicenter cross-sectional study evaluated 312 eyes of 167 patients aged 6–18 years (mean 13.1 ± 3.2) using Pentacam HR, comparing keratoconus, forme fruste keratoconus, high-astigmatism (≥2 D and ≥4 D), and controls, and analyzing 23 tomographic indices with ROC curves to determine diagnostic accuracy and optimal cutoffs. Several indices showed excellent ability to distinguish keratoconus from high-astigmatism eyes, including anterior surface high-order aberration RMS (AUC 0.987), BAD-D (0.971), index of vertical asymmetry (0.971), average pachymetric progression index (0.962), maximum Ambrosio relational thickness (0.960), posterior elevation (0.952), and anterior elevation (0.948). Diagnostic accuracy was best when comparing KC to normal controls and reduced in very high-astigmatism eyes (≥4 D), while AUC values were lower for forme fruste KC than for manifest KC, reflecting greater diagnostic difficulty in early disease. Optimal cutoff values for detecting KC were higher in astigmatic children than in non-astigmatic children and differed from adult thresholds. Strengths include a large pediatric multicenter cohort and comprehensive ROC-based comparison of multiple Pentacam indices. Limitations include the cross-sectional design and lack of longitudinal progression data. In children with high astigmatism, Pentacam screening should prioritize tomographic indices (e.g., HOA RMS, BAD-D, ARTmax, PPI, IVA) and use higher pediatric-specific cutoffs, improving early keratoconus detection and referral for monitoring or cross-linking.

Outcomes of Corneal Collagen Crosslinking Under General Anesthesia in Down Syndrome
Barrientos LC, Frisbie R, Jung JL, et al
Cornea 2026;45(1):36-40
Down syndrome is a strong risk factor for keratoconus, and corneal collagen crosslinking (CXL) is the standard treatment to slow progression. However, many affected patients require general anesthesia for treatment, and outcome data in this population remain limited. This retrospective

descriptive case series evaluated 34 eyes of 20 patients with Down syndrome undergoing epithelium-off Dresden-protocol CXL under general anesthesia at a tertiary pediatric hospital, assessing corneal parameters, visual outcomes, and complications. Patients were treated at a mean age of 20.2 years, typically with advanced disease (mean preoperative Kmax 62.3 D, range 45.5–95.4; mean corneal thickness 466 µm, range 306–538). Postoperative visual acuity at 1 week was stable or improved, and complications were uncommon: one eye developed transient corneal edema resolving within 3 weeks, and one eye developed apical scarring at 1 year, with no other reported adverse events. Overall, the findings indicate that CXL under general anesthesia was well tolerated and feasible in this population despite late-stage presentation. Strengths include one of the larger reported cohorts of Down syndrome patients undergoing CXL and standardized surgical technique. Limitations include retrospective design, limited follow-up duration, and lack of long-term progression data. Epithelium-off CXL under general anesthesia is a safe and practical option for patients with Down syndrome who cannot tolerate awake treatment, supporting proactive management even in advanced keratoconus.

Hispanic ethnicity associated with worse pediatric blepharokeratoconjunctivitis at a tertiary children's hospital in the United States
Lai JM, Patnaik JL, Wise R, McCourt EA, Edwards Mayhew RG
J AAPOS Published online February 12, 2026 Pediatric blepharokeratoconjunctivitis (PBKC) is a chronic inflammatory condition affecting the eyelids, conjunctiva, and cornea. New international diagnostic criteria require at least one clinical sign from each area. It has been shown to affect Hispanic children at disproportionately higher rates, and this retrospective study aimed to compare disease severity and complications between Hispanic and non-Hispanic patients using these updated criteria. Conducted at a single tertiary center, the study used ICD 10 codes to identify affected patients and collected data on demographics, disease severity, insurance status, interpreter needs, median income by ZIP code, and Child Opportunity Index, categorizing patients by corneal involvement as mild, moderate, or severe. Among 175 patients, 66.3% were Hispanic, and Hispanic children demonstrated a higher proportion of moderate to severe corneal involvement. Although they were also more likely to require an interpreter, have public or no insurance, and reside in lower income or lower COI areas, multivariable modeling showed that only Hispanic ethnicity remained significantly associated with disease severity. Strengths of the study include its relatively large cohort, while limitations stem from reliance on ICD 10 coding, its single center design, and lack of assessment of treatment adherence, which may influence outcomes. Clinically, these findings reinforce that Hispanic children are disproportionately affected by PBKC and experience more severe disease.

Severe Blepharokeratoconjunctivitis in Children-The Toronto Experience
Barbara R, Khalili S, Rachdan D, Khan MS, Ali A, Mireskandari K
Am J Ophthalmol 2026;281:642-649 This retrospective consecutive cohort study from the Hospital for Sick Children (Toronto, Canada; 2006–2021) analyzed 197 children (315 eyes) with severe blepharokeratoconjunctivitis (BKC), defined as lid margin blepharitis with conjunctivitis and significant corneal involvement (inflammation, neovascularization, scarring, thinning, lipid deposits affecting peripheral and/or central cornea), requiring ≥6 months follow-up. Mean age at presentation was 7.6 years (range 0.8–17.3; 61% <8 years), with female

predominance (63%) and bilateral disease in 60%. Chalazion history was common (65%). Corneal findings included peripheral scarring (77%), neovascularization (53%), and inflammation (53%); central involvement featured scarring (92%) and neovascularization (43%). Initial BCVA averaged 0.28 logMAR (worse with central involvement); final BCVA improved to 0.16 logMAR (P < .001), with BCVA ≤0.3 logMAR in 83% at follow-up (vs 71% initially; P < .001). Central involvement and astigmatism ≥1.5 D were associated with poorer final vision. Seventy-two percent (142/197) required systemic antibiotics (erythromycin, clarithromycin, doxycycline, or azithromycin) plus topical therapy; 28% managed with topical antibiotics alone. Complete response (no ongoing systemic antibiotics/topical steroids) occurred in 91% overall (77% after one systemic course). Flare-ups (requiring treatment escalation) affected 23% (33/142 systemic-treated), with 75% within the first year post-cessation (Kaplan-Meier survival: ~75% flare-free at 1 year, ~70% at 2–3 years). No significant difference in flare-up risk by antibiotic type or age/sex/chalazion history, though age >5 years trended toward fewer flare-ups (OR 0.39, P=.034). Fifteen eyes (4.7%) needed corneal surgery (mostly DALK for visual rehabilitation; one amniotic membrane graft, two tectonic procedures for perforation). Strengths include the largest reported pediatric severe BKC cohort, long mean follow-up (3.1 years), detailed corneal phenotyping (central vs peripheral), clear treatment response/flare-up definitions, and survival analysis for flare-up risk. Limitations are retrospective design (potential referral bias to tertiary center, missing compliance data, no standardized mite evaluation), variable systemic antibiotic regimens/durations, small flare-up subgroup limiting power for antibiotic comparisons, and exclusion of milder cases (focus on severe BKC). These findings will impact clinical practice by emphasizing that severe pediatric BKC is underrecognized, often presents with chalazion history and asymmetric/severe corneal involvement (central scarring/neovascularization in >40%), and carries substantial vision risk (initial BCVA >0.3 logMAR in 29%, persistent in ~17%) due to amblyogenic astigmatism/scarring; early aggressive management (lid hygiene, topical antibiotics/steroids, systemic antibiotics in ~72%—weekly azithromycin preferred for compliance) achieves high complete response (91%) and visual improvement, but flare-ups occur in 23% (mostly first year post-cessation), necessitating close monitoring (especially <8 years/amblyogenic age) and counseling on potential surgical needs (5%). Central involvement and ≥1.5 D astigmatism warrant urgent intervention to prevent irreversible morbidity.

Cataract

Visual Outcomes and Complications Over 5 Years Following Lensectomy for Childhood Traumatic Cataract

Stahl ED, Sutherland DR, Repka MX, et al

JAMA Ophthalmol 2025;143(12):1035-1042

In this prospective cohort study, the long-term visual outcomes and complications after lensectomy for pediatric traumatic cataract were assessed over five years. Conducted across 32 sites in the US and Canada with 75 children aged under 13, the study focused on best-corrected visual acuity (VA) and the incidence of ocular complications. Results indicated that at the five-year mark, 49% of participants had available VA data, showing a median best-corrected VA of 20/63 for pseudophakic eyes (IOL placed) and 20/258 for aphakic eyes (no IOL). Only 21% of pseudophakic and 13% of aphakic eyes achieved age-normal VA. The

prevalence of glaucoma was low, at 9% for both groups, but surgery for visual axis opacification (VAO) was required in 47% of pseudophakic cases and 13% of aphakic cases. Notably, eyes without anterior vitrectomy showed a significantly higher risk for VAO. The findings underscore the importance of ongoing monitoring for pediatric patients post-surgery, due to the variable visual outcomes and complication rates associated with traumatic cataract surgery.

Standard Monofocal Intraocular Lenses Versus Enhanced Monofocal Intraocular Lenses for Children 6 to 13 Years Old With Pediatric Cataract
Elzawahry S, Elhilali H, Awadein A, Gawdat G, Maher S
J Pediatr Ophthalmol Strabismus 2026;63(1):54-64
This prospective randomized study compared a standard monofocal aspheric IOL (Tecnis ZCB00) with an enhanced monofocal IOL (Tecnis Eyhance ICB00) in children aged 6 to 13 years undergoing cataract extraction at a tertiary center. A total of 45 eyes from 32 children were included (23 eyes in the standard monofocal group and 22 eyes in the Eyhance group), with both unilateral and bilateral cases represented. The primary goal was to determine whether an enhanced monofocal IOL could provide improved functional range of vision without sacrificing distance acuity or contrast sensitivity. At 3 months postoperatively, conventional acuity measures were largely similar between groups. There were no statistically significant differences in uncorrected or corrected distance acuity, intermediate acuity at 66 cm, near acuity at 40 cm, or near add requirements. However, defocus curve testing revealed a meaningful difference: the Eyhance group demonstrated a smoother and more tolerant performance across simulated viewing distances (approximately 2 meters to 25 cm), suggesting increased depth of focus compared to the standard monofocal lens. Practically, this could translate to better visual performance at intermediate distances. In the subgroup of non-amblyopic eyes, mean acuity across the defocus range was significantly better in the Eyhance group. Contrast sensitivity outcomes were similar, although only about half of children were able to reliably complete contrast testing. The main strengths of this paper are its prospective randomized design and its focus on a pediatric population, rather than extrapolating from adult cataract outcomes. Limitations include the small sample size, short follow-up, and limited binocular data. Overall, the Eyhance lens appears to provide comparable distance and near vision while potentially offering improved intermediate distance vision experience; however, this did not translate into a significant improvement in intermediate BCVA. Further studies might benefit from focusing on the subjective experience of these patients to see if the improvement in “defocus curve testing” results in a meaningful clinical difference in the patient experience.

Primary suspect drugs of cataracts in pediatric patients: FDA adverse events reporting database analysis
Ali A, Dockery PW, Downes DG, VanderVeen DK, Elhusseiny AM
J Cataract Refract Surg 2025;51(12):1044-1050
Medication exposure can contribute to cataract formation in children, but comprehensive pharmacovigilance data identifying high-risk drugs are limited. This study used the FDA Adverse Event Reporting System (FAERS) to detect medications disproportionately associated with pediatric cataracts. This was a retrospective observational pharmacovigilance study analyzing FAERS reports from 2004–2024 in patients ≤18 years, using five signal-detection algorithms

(PRR, χ^2, ROR, EBGM, IC) to identify drugs with statistically significant associations with cataract events. The cohort had a mean age of 9.39 ± 4.59 years, and 91 drugs were reported as primary suspects. The most frequently reported medications were ivacaftor and prednisolone (29 reports each, 7%), followed by methotrexate and adalimumab (26 reports each, 6%). The strongest pharmacovigilance signal was for topotecan, followed by ivacaftor and prednisolone. Strengths include analysis of a large national database over two decades using multiple validated signal-detection methods. Limitations include passive reporting bias, missing clinical details, lack of exposure denominators, and inability to establish causality, which are inherent to FAERS studies.Children receiving drugs with strong safety signals—particularly topotecan, ivacaftor, and systemic corticosteroids—may benefit from heightened ophthalmic monitoring for cataract development.

In-bag vs out-of-bag intraocular lens implantation for ectopia lentis: prospective comparative study
Song L, Wen Y, Liu Y, et al
J Cataract Refract Surg 2026;52(1):18-24
Congenital ectopia lentis (CEL) often requires surgical lens removal with intraocular lens implantation, but the optimal placement strategy—in-bag vs out-of-bag—remains uncertain, particularly regarding long-term visual outcomes and ocular growth in children. Understanding how these approaches affect refractive development and recovery is important for pediatric surgical planning. This was a prospective comparative study at a tertiary center dividing CEL patients into four groups (children/adults × in-bag/out-of-bag surgery) with follow-up at 1 month, 3 months, and every 6 months, assessing corrected distance visual acuity (CDVA), axial length (AL) growth, and prediction error (PE). Within each age group, CDVA and refractive prediction error did not differ significantly between in-bag and out-of-bag implantation, indicating similar short- and long-term visual performance. Across all groups, CDVA improved progressively over follow-up, while prediction error gradually increased, reflecting ongoing refractive change; adults achieved better CDVA than children but showed greater myopic drift. Importantly, axial length growth was slower after in-bag surgery than after out-of-bag surgery, suggesting a potential advantage for controlling postoperative ocular elongation. Strengths include the prospective design with longitudinal follow-up and inclusion of both pediatric and adult CEL patients for comparison. Limitations include lack of detailed subgroup sizes/outcomes in the abstract and potential heterogeneity in disease severity or surgical technique, which may influence refractive and growth outcomes. Both techniques are effective for CEL, but in-bag IOL implantation may be preferable when feasible because it is associated with slower axial length growth, while emphasizing early postoperative amblyopia therapy—especially within the first 6 months—for optimal visual recovery in children.

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Cataract Surgery

Posterior capsule opacification in children: comparison of posterior continuous curvilinear capsulorhexis alone and pars plana posterior capsulectomy with anterior vitrectomy
Orazbekov L, Ruslanuly K, Kurakbay A, et al
J AAPOS 2025;29(6):104690
Posterior capsule opacification (PCO) following cataract surgery in the pediatric population can lead to irreversible amblyopia. The purpose of this study was to compare the incidence, timing, and visual outcomes of PCO following pediatric cataract surgery comprising either posterior continuous curvilinear capsulorhexis without anterior vitrectomy (PCCC-) or pars plana posterior capsulectomy with anterior vitrectomy (PPPC+). This was a retrospective chart review of 1271 pediatric patients (1-7 years old) undergoing surgery for congenital cataract at a single tertiary care facility from January 2013 to December 2022. All eyes underwent primary intraocular lens implantation at the time of cataract surgery. A total of 643 eyes underwent PCCC- and 628 underwent PPPC+. PCO incidence was significantly higher in the PCCC- group than in the PPPC+ group (22.4% vs 9.9%, $P < 0.001$). Patients who developed PCO underwent initial cataract surgery at an older age ($P = 0.02$), PCO was diagnosed at a younger age ($P = 0.001$), and time to PCO development was shorter ($P = 0.003$) in the PCCC- versus the PPPC+ group. While preoperative BCVA was similar between groups ($P = 0.865$), postoperative BCVA improved significantly within each group ($P < 0.001$), with no intergroup difference ($P = 0.612$). They concluded that combined capsulectomy and anterior vitrectomy markedly reduces and delays PCO compared to PCCC alone, with equivalent visual gains. Strength: large sample size, limitations: they did not have a group that consisted of PCCC with anterior vitrectomy, this was a single center study retrospective study with one surgeon. Impact on clinical practice: highlights the importance of performing an anterior vitrectomy when performing pediatric cataract surgery to reduce the incidence of/prevent PCO

Effects of Age at Surgery and Laterality of Cataract on Visual Acuity 5 Years after Surgery in Infants Left Aphakic
Repka MX, Sutherland DR, Hatt SR, et al
Ophthalmology 2025;132(11):1284-1293
This prospective cohort study used data from the Pediatric Eye Disease Investigator Group (PEDIG) cataract registry to evaluate the association between age at cataract surgery and visual outcomes 5 years postoperatively in infants operated on before 12 months of age and left aphakic, with a secondary analysis examining the development of nystagmus. The primary outcomes were monocular visual acuity (VA) at 5 years, proportions achieving VA better than 20/200 or age-normal VA, and prevalence of nystagmus, analyzed by age at surgery (<2 months, 2 to <6 months, 6 to <12 months) and laterality (bilateral vs unilateral). Among 149 infants (203 eyes) with completed 5-year VA testing, bilateral cataract cases demonstrated better overall VA than unilateral cases, but in bilateral cataracts there was no significant difference in 5-year VA by age at surgery, whereas in unilateral cataracts surgery before 2 months of age was associated with significantly better mean VA and a higher likelihood of achieving VA better than 20/200 compared with surgery at 2 to <6 months. No significant differences in age-normal VA or nystagmus prevalence at 5 years were observed by age at

surgery for either laterality. Strengths include the prospective, multicenter design and standardized follow-up, while limitations include exclusion of primary IOL cases, loss to follow-up for one-third of eligible infants, variability in postoperative management, and small sample sizes in some subgroups. These findings are clinically significant for pediatric ophthalmology because they refine the timing trade-off in infantile cataract surgery, suggesting that while unilateral cataracts benefit visually from surgery before 2 months of age, bilateral cataracts may allow for modest surgical delay—potentially reducing glaucoma risk—without compromising long-term visual acuity.

Accuracy of new-generation and traditional intraocular lens power calculation formulas in pediatric primary implantation
Jin J, Shen Y, Qu Y, et al
J Cataract Refract Surg 2026;52(1):44-51
Accurate IOL power selection in pediatric cataract surgery is difficult because ocular growth and short axial lengths increase the risk of refractive surprise. This study compared traditional and new-generation IOL formulas to determine which provide the most reliable predictions in pediatric primary implantation. This was a retrospective consecutive case series including 83 patients (108 eyes) undergoing pediatric primary IOL implantation, comparing prediction error across traditional formulas (Holladay 1, SRK/T, Hoffer Q, Haigis) and new-generation formulas (Barrett Universal II, Kane, EVO 2.0, Ladas Super Formula), with subgroup and multivariate analyses evaluating factors affecting refractive outcomes. Prediction accuracy differed significantly among formulas ($P < .001$). SRK/T and Kane formulas showed the lowest mean and median absolute prediction errors, while LSF and Haigis performed worse, demonstrating higher errors. Older age and longer axial length improved prediction accuracy, whereas younger age and shorter axial length independently predicted refractive surprise; surgical procedure type and IOL model did not significantly affect accuracy. Strengths include comparison of multiple modern and traditional formulas in a pediatric cohort with multivariate analysis of biometric factors. Limitations include the retrospective design and persistent suboptimal accuracy overall, reflecting ongoing challenges in predicting refraction in growing pediatric eyes. For pediatric primary IOL implantation, SRK/T and Kane formulas may offer relatively better refractive accuracy, but surgeons should anticipate greater prediction error in younger children and those with short axial length, emphasizing cautious target planning and counseling.

Multifocal Versus Monofocal Intraocular Lens Implantation in Children With Cataracts
Ding Y, Wan X, Kong L, et al
Am J Ophthalmol 2026;281:151-161
This prospective, nonrandomized comparative clinical study from a single Chinese center (Qingdao Eye Hospital, Shandong First Medical University) evaluated real-world outcomes of multifocal versus monofocal intraocular lens (IOL) implantation in 571 eyes of 402 pediatric cataract patients (219 children/311 eyes with multifocal IOL optic implantation in Berger space; 183 children/260 eyes with monofocal IOL implantation plus primary posterior capsulorhexis and anterior vitrectomy), with rigorous screening excluding severe comorbidities (e.g., retinopathy of prematurity, retinoblastoma). Mean age at surgery was ~5.8–6.5 years across groups (no significant differences). Multifocal IOLs (e.g., ZFR00V, AM4UH, Tecnis ZMB00, DiffaAy) targeted

mild postoperative hyperopia (age-adjusted: +0.5 to +3.0 D); monofocal IOLs (e.g., A1UL22, iSert 251) used standard formulas. Berger space implantation achieved optic capture in 93.25% of multifocal cases without vitrectomy. Efficacy outcomes favored multifocal IOLs: postoperative corrected distance visual acuity (CDVA), distance-corrected near visual acuity (DCNVA), and (in some analyses) intermediate acuity were significantly better in both bilateral and unilateral cases (all $P < .05$ where reported). More patients achieved Titmus stereopsis ≤100 arcseconds after multifocal implantation (bilateral: 70% vs 40%, P=.006; unilateral: 59% vs 38%, P=.003). Optical quality improved significantly postoperatively (higher modulation transfer function cutoff and Strehl ratio, lower ocular scatter index; all $P < .001$), with no differences between unilateral/bilateral or multifocal/monofocal groups. Spectacle independence was higher with multifocal IOLs (51.67% vs 37.31%; P=.033). Safety favored multifocal IOLs in Berger space: significantly lower rates of early corneal edema (2.28% vs 9.84%; P=.017), transient intraocular hypertension (2.28% vs 12.02%; P=.006), and visual axis opacification (VAO; 0% vs 6.56%; P=.014) during mean ~29–35 months follow-up. No retinal detachment or cystoid macular edema occurred. Mild IOL decentration was rare (0.45% multifocal). Strengths include the largest reported pediatric cohort comparing multifocal vs monofocal IOLs, real-world data with rigorous screening, comprehensive outcomes (visual acuity, stereopsis, optical quality via OQAS, complications), direct comparison of bilateral/unilateral cases, and high success of Berger space implantation avoiding vitrectomy/VAO. Limitations are nonrandomized design (potential selection bias; families/surgeons chose IOL type after discussion), single-center setting (limited generalizability), variable follow-up (mean ~2.5–3 years; insufficient for long-term myopia shift or late complications), incomplete baseline optical/stereopsis data in some young/opaque-lens cases, and lack of contrast sensitivity/glare/haloes quantification despite multifocal concerns. These findings will impact clinical practice by supporting multifocal IOL optic implantation in Berger space as a safe, effective option for rigorously screened pediatric cataract patients, offering superior distance/near vision, better stereopsis, higher spectacle independence, and markedly lower VAO risk without vitrectomy compared to monofocal IOL with PCCC/AV; surgeons should counsel families on potential selection factors, emphasize rigorous preoperative screening to exclude high-risk cases (e.g., severe nystagmus, maculopathy), and consider multifocal IOLs preferentially in cooperative children needing full-range vision, while awaiting longer-term multicenter randomized data on myopia progression and rare late complications.

Genetics

Clinical Nomogram for Determining Expected Choroidal Thickness in Children With Myopia
Flitcroft I, Lingham G, Kerin E, et al
Am J Ophthalmol 2025;278:346-355
A thin choroid is a recognized risk factor for myopia-associated complications and visual impairment in later life. This study aims to develop a clinical tool to identify individuals whose choroidal thickness varies from that expected for their age, sex, and refraction, and who might therefore be at higher or lower risk of future myopic complications. A clinical nomogram was generated to facilitate comparison of the observed choroidal thickness with that expected on the basis of spherical equivalent, axial eye length, and demographic factors. A large proportion of variance in choroidal thickness remains unexplained by spherical equivalent and axial length alone, indicating that it needs to be considered as an independent metric. Choroidal thickness may be a better predictor of myopic macular degeneration risk, but it has to be interpreted in the context of race, ethnicity, and genetics. Although the nomogram is currently an additional tool, it may be validated over time.

Joubert Syndrome in Children-A Comprehensive Analysis of Quality of Life, Functional Independence and Family Impact
Elmaoğlu E, Coşkun AB, Usgu S, Çiğdem Z, Alsaç SY
Am J Med Genet A 2025;197(12):e64213
This retrospective study examines quality of life, functional independence, and family impact among 49 children diagnosed with Joubert Syndrome. This is a Turkish cohort, and data might not be generalizable. More than 60% of families were consanguineous, and only 8% underwent prenatal genetic screening. Eyes were affected in 88% of patients, and 75% had involvement of more than one organ. Only 15% of the children were able to attend regular school. All children had some developmental delay. Most children diagnosed with Joubert Syndrome were observed to experience considerable difficulties with the independent performance of activities of daily living and communication. The delayed achievement of motor milestones, high prevalence of feeding difficulties, and limited functional independence highlight the need for early, structured rehabilitation programs to enhance developmental outcomes. The study also reveals the psychosocial and economic burdens experienced by caregivers, underscoring the need for family-centered support interventions.

Axenfeld-Rieger Syndrome: From Zebrafish Models to Clinical Outcomes Bohnsack
BL, Williams AL, Jacobson A, Drackley A, Bolton E, Rossen JL
Am J Ophthalmol 2026;282:225-252
Retrospective cohort study of 66 patients (31 males) with Axenfeld-Rieger Syndrome. Patients were classified into 4 ARS phenotypes: deep anterior chamber (n = 55), shallow anterior chamber (n = 4), corneal opacification (n = 3), and iridogoniodysgenesis (n = 4). Total 42 patients (64%) were diagnosed with glaucoma at a median 4.2 years [IQR 0.3, 13.3], and 58 eyes of 33 patients required IOP-lowering surgery. Patients with glaucoma had higher initial IOP ($P < .0001$) and worse final BCVA ($P < .01$) compared to patients without glaucoma. At final follow-up (median 6.1 years [IQR 1.6, 10.1]), patients with glaucoma showed decreased IOP (P

< .0001), but increased glaucoma medications (P < .001). Ten-year survival rates were highest for trabeculectomy with mitomycin C (76%; 95% CI [47, 91]) and Baerveldt devices (71%; 95% CI [47, 86]). Final BCVA was linearly associated with the number of glaucoma surgeries (ß=0.15, P < .01, R2 = 0.12).

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;39(16):2899-2911
Inherited retinal dystrophies are a genetically heterogeneous group of conditions, with approximately 40% of cases remaining unresolved after initial genetic testing. Key limitations of current next-generation sequencing approaches include the inability of gene panels to capture non-targeted regions and the limited sensitivity of whole-exome sequencing for deep intronic variants. Beyond sequencing, variant interpretation remains a challenge, with many variants classified as variants of uncertain significance complicating clinical decision-making. The authors propose reanalysis of whole-exome sequencing using an updated IRD gene panel for non-syndromic cases and a phenotype-driven approach guided by the Human Phenotype Ontology (HPO) for syndromic IRDs. The most common clinical diagnoses in the genetically resolved cohort (n = 376) were non-syndromic retinitis pigmentosa (40.4%, 152/376), Stargardt disease (11.4%, 43/376), and Usher syndrome (6.3%, 24/376). Pathogenic variants were identified in 70 genes across 24 IRD subtypes. 101 selected cases were further analyzed using a stepwise, case-by-case strategy. Variant re-evaluation and reclassification were conducted for 41 VUS cases that matched the clinical phenotype, resolving 18 cases by reclassifying them as likely pathogenic or pathogenic. WES reanalysis identified 16 additional diagnoses, whereas WGS and customized gene panels provided molecular diagnoses for 15 additional cases among a subset of 60 patients. This increased the overall diagnostic rate for probands to 67.6% (355/525).

Therapeutic antisense oligonucleotide mitigates retinal dysfunction in a pig model of CLN3 Batten disease
Stratton MP, Centa JL, Swier VJ, et al
Nucleic Acids Res 2025;53(20):gkaf1141
CLN3-related Batten disease is a lethal pediatric neurodegenerative disease. Typically, the disease manifests as vision loss in early childhood and progresses to neurological dysfunction and death in young adulthood. Most therapeutic developments have focused on treating the brain and may not protect against vision loss. A splice-switching antisense oligonucleotide delivered to the central nervous system was shown to reduce neurological disease burden in mouse models of CLN3 disease. This paper presents a similar ASO approach for treating retinal dysfunction in a pig model of CLN3 Batten disease. A single intravitreal injection of ASO induces robust exon skipping in the retina for up to 12 months. The ASO treatment resulted in higher amplitudes on electroretinograms, suggesting that retinal dysfunction was mitigated at early time points of disease. Treatment was well-tolerated and makes it a promising candidate for clinical translation.

Advances in the treatment of blinding retinal diseases
Li Z, Jin S, Xu W, Zhang M, Liu X
Int Ophthalmol 2025;46(1):21
Inherited and degenerative conditions are among the primary causes of permanent vision loss in young people worldwide. This review critically summarizes recent advances in therapeutic strategies and highlights the challenges that limit their clinical application. Currently, most clinical trials involve transplanting stem cell-derived RPE cells in suspension into the subretinal space. Despite optimized culture conditions and advancements in cell delivery techniques, long-term graft survival remains suboptimal. Furthermore, clinical outcomes in stem cell therapies have been limited, primarily due to the advanced disease stage and poor baseline visual function in treated patients. Ocular tissues, with their accessibility, immune privilege, and compartmentalization, are ideal targets for gene therapy. Advances in non-viral vectors, such as lipid-based nanoparticles, alongside refined injection methods tailored to specific retinal conditions, represent crucial considerations for future gene therapy development. Retinal prostheses offer an innovative approach for degenerative retinal conditions. Using novel electrode materials, such as graphene, and engineering high-resolution electric fields can significantly improve visual outcomes. Additionally, integrating prosthetic devices with complementary therapies holds promise for advancing personalized medicine in the management of retinal diseases.

Update on Gene Therapy Clinical Trials for Eye Diseases
Lonfat N, Moreno-Leon L, Punzo C, Khanna H
Hum Gene Ther 2025;36(19-20):1287-1300
The IRDs constitute a spectrum of disorders that vary by age of onset, location (peripheral or central retinal involvement), and severity (age of onset and rate of progression). Remarkable progress has been made in developing gene therapies for IRDs. This review article has been compiled to provide an update on the outcomes of clinical trials that have recently been completed and of the new clinical trials that have been initiated to tackle these blinding diseases. Gene therapy trials have yielded promising outcomes, although considerable variation exists across studies. Following the success of the first human gene therapy for RPE65-LCA, several programs have reached the clinical trial stage, but we have yet to see results confirming safety and/or improvements in visual acuity and function in larger studies. Most clinical studies have focused on monogenic forms of visual impairment. A major focus is on assessing the advantages and disadvantages of subretinal delivery, which is currently being used in most RP trials. New studies on ascertaining the advantages of IVT and suprachoroidal delivery over subretinal delivery are also being conducted.

Clinical and Molecular Findings in PROM1-Associated Inherited Retinal Dystrophies
D'Esposito F, Gagliano C, Vallone S, et al
Genes (Basel) 2025;16(11):1299
PROM1 gene is crucial for the development and maintenance of photoreceptors. Variants in PROM1 are linked to a wide phenotypic spectrum of IRDs. This study aims to examine genotype-phenotype associations in 10 Italian patients with PROM1-associated disease. All patients had pathogenic or likely pathogenic PROM1 mutations. Both autosomal dominant and

autosomal recessive inheritance patterns were identified. Dominant pathogenic variants were predominantly linked to late-onset cone-rod dystrophy or macular dystrophy, whereas biallelic variants frequently resulted in early-onset severe rod-cone dystrophy characterized by fast vision deterioration. The phenotype varied greatly. Generally, patients affected by the c.1117C>T-related dominant form displayed less severe phenotypes, mainly characterized by late-onset MD and nyctalopia. A more severe phenotype was associated with the presence of an additional pathogenic variant in compound heterozygosis

Ophthalmological manifestations in a cohort of Cowden syndrome patients in a large tertiary healthcare system
Baroutis KG, Hoyek S, Correa VSMC, Ntentakis DP, Patel NA, Vavvas DG
Eye (Lond) 2025;39(16):2926-2932
Cowden syndrome (CS) is a rare genetic disorder caused by mutations in the PTEN gene associated with multisystem hamartomas and predisposition to malignancies. This is a retrospective cohort study of 17 patients with CS included in the Mass General Brigham (MGB) Research Patient Data Registry. 5% exhibited CS-related ocular findings, including retinal hamartoma, eyelid hemangioma, trichilemmoma, and a peripapillary hamartoma-like lesion. Most patients maintained excellent vision over a median follow-up of 4.5 years. Genotype analysis revealed that truncating PTEN variants were more likely associated with central nervous system involvement. A literature review identified a broader spectrum of ocular anomalies in CS, including papillomatous eyelid lesions, angiomas, hamartomas, proliferative retinopathies, congenital retinal macro vessels, and CNVM, underscoring phenotypic variability. Additionally, alterations in the stroma and epithelium of the cornea and cases of infantile glaucoma and iris mammillations have been reported in more recent studies. Macrocephaly and autism spectrum disorders have been reported in 30% of patients in the literature.

Natural course of refractive errors in early onset inherited retinal diseases
Azmon R, Ezra Kahtan B, Hendler K, Yahalom C
Eye (Lond) 2025;39(16):2940-2944
Individuals with IRDs have an increased prevalence of high refractive errors (REs). This study aims to characterize the natural progression of REs in patients with early-onset IRDs and to identify associations with specific IRDs and genes. A total of 199 patients (384 refractive measurements) were included in this study. Retinitis Pigmentosa (RP) and Achromatopsia were associated with high hypermetropia in early visits, with a decreasing RE trend over time. CNGA3, CNGB3, and CRB1 were associated with high hypermetropia, which remained high over time in CRB1. In contrast, Congenital Stationary Night Blindness and Blue Cone Monochromacy showed high myopia, with myopia worsening over time and a corresponding increase in high myopia from 51.5% to 69.7% from first to last visit. High hypermetropia is common in CRB1-related cases. The paper highlights the importance of early screening and refractive correction.

The Undiagnosed Diseases Network (UDN) Solves Ocular Syndromic Diagnostic Dilemmas
Tinker RJ, Smith LM, Bastarache LA, et al
Am J Ophthalmol 2025;280:51-63

The multicenter, NIH-funded Undiagnosed Diseases Network (UDN) is designed to diagnose puzzling and newly identified conditions. This is a Retrospective Interventional Case Series of participants with ocular phenotypes who applied to and were accepted into the UDN, with detailed supporting letters from ophthalmologists or other clinicians when clinically indicated, and genetic and laboratory test results that were not diagnostic. Advanced genomic technologies (exome, genome, mitochondrial, and RNA sequencing; X-inactivation analysis; immunoblot analysis) are used for diagnosis. The diagnostic rate for subjects with an eye phenotype was 40.2% (452 of 1123); the diagnostic rate for the other subjects (without an eye phenotype) was 27.8% (276 of 992). In univariate analysis, having an eye phenotype was significantly associated with receiving a diagnosis (odds ratio [OR] = 1.75; CI = 1.45-2.10; P = 2.28e-09). Clinicians, including ophthalmologists, can collaborate with the UDN to solve challenging ocular mysteries using genomic technologies.

Advanced therapies for inherited optic neuropathies Wong DCS,
Makam R, Yu-Wai-Man P
Eye (Lond) 2026;40(2):177-184
Inherited optic neuropathies (IONs), typically lead to irreversible severe vision loss due to mitochondrial dysfunction causing retinal ganglion cell degeneration. Clinical trials in LHON have demonstrated the efficacy of idebenone, an oral neuroprotective agent, and of gene-replacement therapy using allotopic gene expression. Early-phase clinical trials are underway for ADOA caused by variants in the nuclear gene OPA1, using innovative techniques to modulate gene expression in a variant-agnostic manner. This review critically appraised a range of therapeutic strategies, including gene editing and stem cell-based optic nerve regeneration, and discussed the barriers to translation. Future studies focusing on understanding genetic heterogeneity, disease variability, and optimising patient selection for clinical trials are essential to improve patient management and fast-track transformative therapies for IONs.

Efficacy and safety of intravitreal rAAV2-ND4 therapy for Leber's hereditary optic neuropathy
Jiang L, Guo S, Li B, Xiao S, Wang F, Wei W
Eye (Lond) 2025;39(17):3099-3104
This study aimed to assess the safety and efficacy of a rAAV2 carrying normal ND4 (rAAV2-ND4) in individuals with visual loss due to LHON carrying the m.11778G>A mutation. Additionally, it aimed to determine a safe dose for intravitreal injection. A single-arm, open-label, dose-finding clinical trial. A total of 12 participants with the m.11778G>A mitochondrial DNA mutation and vision loss exceeding 6 months in both eyes were enrolled in this trial. The participants received NR082 by unilateral intravitreal injection. 6 participants received 1.5 × 109 vg, 0.05 mL (Group I), and 6 participants received 4.5 × 109 vg, 0.05 mL (Group II). They were followed for 52 weeks and underwent safety assessments, including visual structure and function examinations. No serious ocular or systemic adverse events or dose-limiting toxicity were reported. In Group I, the mean baseline BCVA in injected eyes improved from 1.86 ± 0.36 LogMAR at baseline to 1.59 ± 0.10 LogMAR at week 52 post-intravitreal rAAV2-ND4. In Group II, baseline BCVA was 2.15 ± 0.23 LogMAR, improving to 1.92 ± 0.32 LogMAR in week 52. Two eyes in Group I and four eyes in Group II showed significant improvement (at least 0.3 LogMAR

BCVA improvement) after 52 weeks. A dose of 4.5 × 109 vg, 0.05 mL was to be used in the future Phase 3 study.

The Phenotypic and Genotypic Features of ADAMTSL4-Related Ocular Disease
Williams KM, Berger W, Koller S, et al
Clin Genet Published online November 17, 2025
Pathogenic variants in ADAMTSL4 are an important cause of isolated ectopia lentis. This paper describes a retrospective, multicenter study examining the phenotypic and genotypic spectrum of ADAMTSL4-associated ocular disease in 41 individuals from 32 families with genetically confirmed ADAMTSL4-related disease, spanning six tertiary referral centers in Europe. Patients had highly myopic refractive error (mean SE -10.27 D), ectopia lentis et pupillae (30% of cases), with a younger age at diagnosis (median 0.5 years). Subluxation of the lens tended to be in the inferior direction (~33%). Zonules were absent in the majority of cases. Sixteen different pathogenic variants in ADAMTSL4 were reported. Early identification of typical phenotypic features alongside genetic testing can aid early, precise diagnosis and prevent unnecessary investigations.

Phenotypic characterisation of enhanced S Cone syndrome-a multicenter case series analysis
Parameswarappa DC, Hansraj S, Ramamurthy S, et al
Eye (Lond) 2025;39(18):3333-3337
A retrospective study of retinal phenotype in 34 subjects with enhanced S-cone syndrome from four centers in India. Twenty-one males (62%) and 13 females were included. The median age at presentation was 17.5 years [range:10, 25]. Nyctalopia was the most common presenting symptom seen in 76% (26/34) of subjects. The median best corrected visual acuity at presentation was 0.35 logMAR [0.17, 0.62]. The most common retinal phenotype was a ring of non-specific pigmentary changes along the arcades with or without atrophy (41%, 28/68 eyes) followed by yellow to white dot-like changes along the vascular arcades/mid-periphery (38%, 26/68). Hypo-autofluorescence with moderate diffuse or patchy changes along the major vascular arcades was seen in 37% (8/22) of eyes. OCT showed foveomacular schisis in 79% (35/44), of which 8 eyes (18%) had giant schisis(>1000 um). No correlation was observed between any of the retinal features and fundus autofluorescence sub-types, but lower visual acuity with increasing age was noted (R2;0.122, $p < 0.05$).

IT TAKES TWO TO TANGO: potential novel therapies for autosomal dominant optic atrophy
Sampige R, Seaborn LEA, Pluenneke M, et al
Front Ophthalmol (Lausanne)2025;5:1688232
DOA is a rare genetic disease, but it is one of the most common hereditary optic neuropathies and can drastically impact patient's quality of life. This paper reviews current and future investigational therapies for DOA, including intravitreal antisense oligonucleotide injections via Targeted Augmentation of Nuclear Gene Output (TANGO), CRISPR-based therapies, genetic editing, gene-replacement approaches, and idebenone, a small-molecule mitochondrial modulator.Clinical trials for DOA treatment are reviewed, and opportunities for future research on ADOA therapeutics, including the use of mitochondria-targeted peptides and antioxidants, NAD+ boosters/metabolic support, mitophagy and fission-fusion modulators, and cell-based

regenerative therapy, are discussed. The challenges associated with novel therapeutics for ADOA are multifaceted and encompass both disease biology and transitional barriers. The first challenge arises from the heterogeneity of OPA1 mutations. More than 400 pathogenic variants have been described, each producing variable effects on protein function and clinical severity. A second barrier is efficient delivery to retinal ganglion cells, which are the primary site of degeneration in DOA. RGCs are post-mitotic and are located deep within the inner retina, a compartment that is relatively difficult to access for therapeutic agents, making efficient delivery challenging. Each therapeutic modality has its own limitations. From the need for repeated treatment with ASO to limitation of viral packaging capacity, since the OPA1 gene (approximately 100 kb isoforms) exceeds the optimal size for standard AAV vectors.

Onset of Ocular Abnormalities in Children with Hearing Loss
Chen A, O'Neil E, Datz E, et al
Ophthalmology Published online February 9, 2026
This is a retrospective chart review of children with hearing loss seen for any indication by the pediatric ophthalmology practice at the Children's Hospital of Philadelphia over a 15-year period. The authors sought to determine the prevalence and onset of abnormal ocular findings in children with hearing loss. Of 11,437 children with hearing loss, 3,399 had sensorineural, 2,729 had conductive, 1,601 had mixed, and 3,708 had unspecified types. Ocular abnormalities were identified in 2,199 children (19.2%), including 1,339 (12.7%) with possible syndromic association (e.g., retinal degeneration or signs of a genetic syndrome). Among the latter, the cumulative sensitivity of continued screening was 48-72% by age 5, 71-87% by age 10, and 90-96% by age 15. We recommend that asymptomatic children have an ophthalmologic examination upon diagnosis of hearing loss, 2 years later, and again at ages 5, 10, and 15, or sooner if visual symptoms develop or a pediatrician's vision screening identifies a concern. When genetic testing is possible, an identified genetic cause may help tailor the timing of ophthalmologist exams.

Genome-Wide Association Study and Rare Variant Association Studies of Strabismus in the All of Us Research Program
Lee KAV, Tesdahl C, Aboobakar IF, et al
Ophthalmol Sci 2025;5(6):100873
This study aimed to explore the genetic contributions to strabismus in different ancestral groups. The All of Us Research Program includes genotypic and phenotypic data from a diverse population of adults (age ≥18 years at time of enrollment) across the United States. Among participants with whole-genome sequences available, strabismus cases were identified based on diagnosis codes from their electronic health records. The final cohort consisted of 1579 cases and 121 490 controls of European (EUR) ancestry, 235 cases and 40 602 controls of Admixed American (AMR) ancestry, and 365 cases and 53 577 controls of African American (AFR) ancestry. Genome-wide association study identified one locus with 3 significant SNPs (rs2247113, rs2667037, and rs2715926) in intron 1 of PLA2R1 in the AFR group, and 2 loci, one in RIMBP2 intron (rs184071225) and one intergenic (rs191788703), in the AMR group. Rare variant association study revealed 33 genes with a statistically significant (P value < 5 x 10-5) increased burden of variants: 9 in the EUR cohort: ZNF468, CMYA5, NSUN4, TEX45, ICAM3,

ADAMTS20, FANCI, HLA-DQB1, and GRIN3B; 14 in the AMR cohort: RIMBP1, UCKL1, EHBP1L1, CLTCL1, HELB, TULP2, APOB, SMPD3, OBSCN, NLRP8, PLOD1, NUP214, OR6J1, and NOP10; and 10 in the AFR cohort: C4orf54, PIGG, OR10D3, MKNK1, KNCN, MS4A14, CSN2, BDKRB1, IL1RL1, and ISM2. Genetic associations with strabismus differed between ancestry groups, although genes in similar pathways, such as synaptic signaling and structural muscle proteins, were found in multiple groups.

Outcomes of idebenone therapy for Leber hereditary optic neuropathy in a cohort of patients from Wales
Sanders FWB, Votruba M
Eye (Lond) 2025;39(16):2952-2957
Cohort report of Welsh patients with LHON treated with oral Idebenone From March 2021, all patients seen in a tertiary referral clinic who were diagnosed with LHON by targeted genetic testing were offered idebenone and initiated on idebenone as part of standard care. A total of 12 (67% male) individuals were treated with idebenone 300 mg TDS for LHON, with a mean duration of 30.2 (±9.9) months. Mean visual acuity at initiation of therapy was 2.22 (±0.32) LogMAR, improving to a peak of 1.12 (±0.77) LogMAR at 27 months. This time point coincided with the maximum CRR, with 86% demonstrating CRR. At 24 months, CRR was significantly higher when compared to a natural history cohort. The present cohort demonstrates evidence of CRR in a high proportion of patients reaching 27 months of treatment.

Gene therapy outcomes in young patients with RPE65-retinal degeneration
Stephenson KAJ, Alsalamah AK, Tumber A, et al
Can J Ophthalmol Published online February 9, 2026
Outcomes of young patients ≤21 years old with RPE65-related LCA who have received Luxturna in Canada. Single-centre, retrospective review of 18 patients ≤21 years old (mean age: 14.6 ± 3.4 years, 10 females) with biallelic RPE65-LCA treated with Luxturna. significant improvement in BCVA, GVF V4e, and III4e isopters were noted in 11%, 11%, and 39%, respectively, FSTw values improved significantly in 100%. (mean -2.8 ± 1 log, i.e., 256X). Chorioretinal atrophy (CRA) was observed at baseline in 38%, and at the last visit, CRA was present in all patients. The presence of nummular and/or perifoveal atrophy at baseline, correlated with poorer functional outcomes. Neither postoperative elevation of intraocular pressure nor recurrence of inflammation after steroid cessation affected functional outcomes; however, inflammation was associated with the development of nummular atrophy. Treatment is safe and effective in improving retinal sensitivity in patients under 21 years old with RPE65-LCA, despite the occurrence of CRA post-treatment.

Next generation sequencing in children with isolated congenital cataract
Amanova G, Er E, Isik E, et al
Eur J Ophthalmol 2025;35(6):2075-2082
This study evaluated the etiology of congenital cataracts without known etiology in 10 families using whole exome sequencing (WES). Of the 10 patients diagnosed with isolated CC, 9 (90%) had bilateral cataracts, and 1 (10%) had unilateral cataract. Nuclear cataracts were found in 8 patients, and polar cataracts were found in 2. All patients underwent comprehensive

ophthalmological, metabolic, and genetic assessments. DNA samples from the probands were analyzed using WES. Parental consanguinity was present in 7 out of the 10 families. An unidentified variant in the RAB3GAP1 gene (c.491C >G) associated with Martsolf syndrome was found in one patient. Two novel and one previously identified gene variants associated with congenital cataract were detected in 3 of the remaining 9 patients: a novel c.463C > T in CRYGD, a previously identified c.965dup in HSF4, and a novel c.3330C > A in FYCO1. This study shows that WES is a valuable tool in determining the genetic etiology of isolated congenital cataract, and identifies new pathogenic variants.

Genotype-Phenotype Correlations in ABCA4-Associated Retinopathy: Insights From a Spanish Cohort of 245 Patients
Cobos E, Català-Mora J, Aguilera C, et al
Invest Ophthalmol Vis Sci 2026;67(2):19
ABCA4- associated retinopathy includes a broad range of inherited retinal dystrophies (IRDs) with genotypic and phenotypic heterogeneity that complicates diagnosis and counseling. This study aims to evaluate genotype-phenotype correlations in these patients. This is a multicenter, retrospective, cross-sectional study inclusive of 245 patients with biallelic pathogenic ABCA4 variants from 7 Spanish reference centers. Variants were classified by predicted severity, and patients were stratified into five phenotypic categories based on fundus findings. Results show that earlier symptom onset and longer disease duration were significantly associated with more severe phenotypic features, genotype severity correlated with phenotype severity, and severe variants were linked to more pronounced phenotypes, whereas milder alleles showed weaker associations. The presence of a predicted null variant in allele 1 significantly correlated with more advanced fundus changes. This study confirms that the severity of ABCA4 variants correlate with the extent of retinal phenotype, emphasizing the importance of early molecular diagnosis. These findings also support refinement of variant classification, which can help with prognostication and patient counseling.

Axial Length Profiles in Inherited Retinal Diseases-A Genotypic and Phenotypic Analysis
Zhang L, Li H, Duan C, et al
Invest Ophthalmol Vis Sci 2025;66(13):32
This study evaluated the distribution patterns of axial length (AL) in patients with inherited retinal diseases (IRDs). This is a retrospective multicenter cohort study inclusive of 397 genetically and clinically confirmed with IRD patients from 349 families, as well as 605 healthy individuals in the control group. The authors found patterns in AL profiles associated with different IRD genotypes and phenotypes. Patients with pathogenic variants in COL11A1, RP1, and RPGR had longer AL, whereas patients with pathogenic variants in other genes such as BEST1 had shorter AL. Phenotypically, vitreoretinopathy, choroid/retinal pigment epithelial dystrophy, and cone-dominated dystrophy were significantly associated with long AL. Rod-dominated dystrophy showed a unique bidirectional pattern in that it was associated with both longer and shorter AL. Other macular-involved diseases were associated with short AL. There was AL interocular consistency across all genotype and phenotype subgroups. This patient quantifies AL patterns seen in different IRDs. The results suggest that the genes involved in IRDs may have a role in ocular emmetropization.

FGF10/IGSF3 Variants in Bony Congenital Nasolacrimal Duct Obstruction: A Genotype-Phenotype Study of Syndromic Versus Isolated Disease
Li Y, Feng ZX, Cui Y, et al
Invest Ophthalmol Vis Sci 2025;66(15):69
This study aims to identify pathogenic variants associated with congenital bony nasolacrimal duct obstruction (bony CNLDO) and to clarify genotype-phenotype correlations. This is a retrospective case study comprising of 32 participants from 6 families, and 7 sporadic cases. Children with clinically confirmed bony CNLDO and their relatives underwent detailed ophthalmic, systemic examinations, orbital computed tomography (CT), and maxillofacial magnetic resonance imaging (MRI). Whole-exome sequencing (WES) was performed. Bioinformatics tools were utilized to predict variant pathogenicity. Eight novel FGF10 variants were found, including 6 missense mutations, 1 intronic splicing mutation, and 1 heterozygous deletion at chromosome 5p12 encompassing the FGF10 gene. Two sporadic cases had no identifiable pathogenic variants. All patients with FGF10 variants exhibited syndromic aplasia of lacrimal and salivary glands (ALSGs) phenotype characterized by bony CNLDO, punctal anomalies, and hypoplasia of lacrimal, parotid, and submandibular glands. Three novel IGSF3 variants were also identified including 2 missense mutations and 1 nonsense mutation. In contrast, individuals carrying IGSF3 variants showed isolated bony CNLDO with normal glandular morphology. This article shows two subtypes of bony CNLDO that display different phenotypes based on the molecular etiology. These findings are helpful in establishing genetic diagnosis and counseling.

Detailed Comparison Between Two Main Phenotypes of CRB1-Related Retinal Dystrophy, Pan-retinopathy and Maculopathy
Zou X, Fang S, Liu Y, Li H, Han X, Sui R
Invest Ophthalmol Vis Sci 2025;66(15):27
This study analyzes manifestations of two primary phenotypes of CRB1-related retinal dystrophy, pan-retinopathy, and maculopathy. This is a retrospective study including 75 patients with biallelic pathogenic variants in CRB1. Genetic analysis identified 89 disease-causing CRB1 variants. Patients with biallelic loss-of-function variants were significantly more prevalent in the pan-retinopathy group (40.3%) than in the maculopathy group (7.1%). The proportion of patients harboring biallelic variants expressing wild-type CRB1-B was significantly higher in the maculopathy group (30.8%) than in the pan-retinopathy group (8.1%). In the pan-retinopathy group, visual function was significantly worse. The panretinopathy group also showed marked hyperopia, shorter axial lengths, severe visual field impairment, and severely attenuated ERG responses. Initial visual acuity was better in the maculopathy group, but a critical decline occurred after 18.94 years. OCT and fundus autofluorescence imaging revealed distinct patterns: pan-retinopathy predominantly showed outer retinal atrophy, parafoveal thickening, and diffuse hypofluorescence; maculopathy was characterized by macular edema/schisis and bilateral localized macular hypofluorescence. This study nicely illustrates the genotyope-phenotype correlation in CRB1-associated retinopathies, with different subgroups exhibiting clinically distinct phenotypes. It also provides important information that can help guide prognostication and patient counseling.

Enhancing Molecular Diagnostic Accuracy in Genetic Eye Disorders Through a Personalized Re-Evaluation Strategy
Martins PM, Figueiredo I, Cruz N, et al
Invest Ophthalmol Vis Sci 2026;67(1):62
A significant number of genetic eye disorders remain without molecular diagnosis after testing. This study aims to describe a tailored re-evaluation strategy, using up-to-date molecular testing, case-by-case review, in silico tools to increase diagnostic yield. This cross sectional study included 988 individuals from 800 families at a large genetic eye disorder referral center. All patients received an initial clinical diagnosis, followed by genetic testing. Cases that did not yield a molecular diagnosis were then re-evaluated in a multidisciplinary setting to determine whether additional genetic testing was warranted, using updated Next Generation Sequencing (NGS) panels and/or Exome Sequencing (ES). Results show that initial testing yielded a molecular diagnosis in 475 families (59.4%). Variant reclassification enabled 39 additional diagnoses. A personalized re-testing strategy resolved 43 more through updated NGS panels or ES. The solved rate increased from 59.4% to 70.1% through these strategies. This study illustrates the importance of re-evaluation of unsolved cases as molecular testing methodologies continue to improve and become more refined.

Genetic Landscape and Clinical Characterization of FRMD7-Related Infantile Nystagmus Based on Large In-House Datasets and Literature Review
Liu S, Li S, Wang Y, Sun W, Hejtmancik JF, Zhang Q
Invest Ophthalmol Vis Sci 2026;67(1):30
Variants in the FRMD7 gene on the X chromosome constitute one of the most common etiologies underlying idiopathic infantile nystagmus (IIN). This study aimed to clarify the pathogenicity of FRMD7 variants and their associated clinical features. A total of 56 pathogenic or likely pathogenic variants were identified in 75 families. Five in silico tools exhibited gene-specific sensitivity (>90%) and specificity (>85%) in determining pathogenicity for FRMD7 missense variants. The penetrance in males was 100% and in females 39.3%. Visual acuity in patients with heterozygous variants was significantly better than that of hemizygotes. This study characterized FRMD7 variants and identified useful in silico tools in assessing missense variants.

Predictive Utility of Genetic Risk for Myopic Maculopathy Presence and Progression in a Chinese High Myopia Cohort
Li Z, Zhao Z, Zhang K, Jiang F, Xie L, He M
Invest Ophthalmol Vis Sci 2025;66(14):38
This study aims to evaluate the predictive utility of genetic risk for predicting the presence and longitudinal progression of myopic maculopathy among Chinese pediatric and adult high myopia cohorts. This is a prospective longitudinal cohort study that included 623 participants with high myopia with a 2-year follow up. Multivariate logistic regression models were used to estimate the presence and progression of myopic maculopathy in cross-sectional analyses and follow-up visits. Conventional factors included age, gender, education level, SE, or axial length. Genetic risk factors included polygenic risk scores (PRSs) derived from genome-wide significant

single-nucleotide polymorphisms associated with myopia. Results showed that the PRS alone failed to predict myopic maculopathy among the study participants. This study's limitations include its relatively short follow up period, as well as using PRSs derived from GWASs predominantly conducted in European populations, which the study is in a Chinese population. Further studies should be conducted to determine the usefulness of PRS in predicting maculopathy in high myopia patients.

Preclinical Assessment of Mitochondrial-Targeted ND4 Gene Therapy for Leber Hereditary Optic Neuropathy
Dong Y, Hao Z, Liu Y, et al
Invest Ophthalmol Vis Sci 2025;66(14):58
This study aims to establish preclinical safety data to advance mitochondrial targeted AAV-delivered human ND4 (MTSAAV/hND4) for treatment of Leber Hereditary Optic Neuropathy (LHON). This is an animal study, where MTSAAV/hND4 was bilaterally injected into mouse eyes to evaluate potential adverse effects on visual function using serial pattern electroretinograms (PERGs) and spectral-domain optical coherence tomography (SD-OCT). In rats, MTSAAV/hND4 was administered unilaterally to assess toxicity, biodistribution, and neutralizing antibody levels. Control groups include PBS-injected and untreated naïve mice and rats. The results showed no significant adverse effects on visual function in treated mice. Retinal thickness remained largely stable, with only a transient, benign increase in RNFL-IPL thickness observed in the low-dose group at 1 month. Postmortem analysis showed no significant differences in RGC density among MTSAAV/hND4-injected mice, PBS-injected controls, and naïve controls, and axons morphology and distribution were preserved. In rats, viral DNA was primarily detected in the injected eyes, while viral DNA levels in non-ocular tissues were low. Histopathological analysis showed no vector-related toxicity. At 6 months post-injection, overall hematological parameters remained within normal limits. All MTSAAV/hND4-injected rats seroconverted by day 90, with neutralizing antibody titers reaching 1:1280. This study of intravitreal delivery of gene therapy agent in rodents showed favorable biodistribution, and good safety profile. These findings provide preclinical evidence supporting the advancement of MTSAAV-mediated ND4 gene therapy toward clinical trials for LHON.

Abnormal Splicing in the Final Intron of PRX Results in Dominant Congenital Cataract Without Neurological Phenotype
Reis LM, Bellingham J, Motta FL, et al
Invest Ophthalmol Vis Sci 2025;66(14):28
This study evaluated the role of abnormal splicing of PRX intron in isolated congenital cataract. In this series of 7 patients from 4 families, sequencing revealed heterozygous variants affecting splicing of the final intron of PRX. PRX encodes periaxin, a protein necessary for the maintenance of peripheral nerve myelin and the proper organization of the lens cortex adherens junction. PRX has two major isoforms, differing in their final exons. The dominant cataract alleles identified here occur within the splice region of intron 6 and are predicted to cause abnormal splicing of PRXb (L-PRX). RNA sequencing confirmed aberrant splicing for all identified variants, including retention of intron 6, which ultimately results in a switch to the S-PRX isoform, and/or utilization of alternate donor or acceptor sites yielding small in-frame

deletions in L-PRX. Based on these results, the authors propose that splicing defects in PRX lead to abnormal lens development and cataract formation. Further studies are needed to elucidate the exact mechanism. This study illustrates the importance of studying splicing defects in introns as pathogenic variants.

Hidden Splicing Variants in Inherited Retinal Degeneration: Discovery and Functional Insight
Huang YS, Lu WT, Chiu IH, et al
Invest Ophthalmol Vis Sci 2025;66(13):12
This study aims to identify pathogenic splicing variants that cause Inherited Retinal Disease (IRD) and characterizing their transcript-level consequences. A total of 738 IRD families were included in this study and underwent targeted gene panel sequencing. Splicing variants accounted for 14% of genetically diagnosed families. Of these, 4% were newly identified through combined computational and experimental platform. Notably, 28% of all splice-disrupting variants, located in noncanonical, exonic, or deep-intronic regions, would likely have been missed by conventional analysis pipelines that prioritize protein-coding changes. Five recurrent splice-disrupting variants were observed across multiple families. Functional assays confirmed aberrant splicing, and the associated phenotypes were consistent with known disease phenotypes. This study highlights the importance of splicing variant detection platforms in discovering hidden pathogenic variants and improving IRD diagnostic yield.

Genetic Correlates of Phenotypic Variability in c.5882G>A p.(Gly1961Glu)-Associated Stargardt Disease
Pas JAAH, Künzel SH, Ansari G, et al
Invest Ophthalmol Vis Sci 2026;67(2):32
This study aims to quantitatively investigate disease progression and genotype–phenotype correlations in Stargardt disease patients harboring the common ABCA4 variant c.5882G>A p.(Gly1961Glu), and evaluating the contribution of second ABCA4 variants to disease severity. This is a multicenter study that included 52 Stargardt disease patients all carrying the ABCA4 c.5882G>A variant. Disease severity was quantified by the age-at-criterion Ellipsoid Zone (EZ) loss, defined as the estimated age when EZ atrophy reached 6.25 mm2, allowing a comparison of the effects of different second alleles. The median age at criterion EZ loss across all patients was 43 years. Substantial variability in the progression of EZ loss was observed among patients despite the shared c.5882G>A genotype. Differences in specific second ABCA4 variants were strongly associated with variation in disease progression, with some variants linked to markedly earlier progression (e.g., c.1957C>T, -50.7 years) and others associated with delayed progression (e.g., c.1648G>A, +19.8 years). This is an interesting study looking at patients with a shared pathogenic variant in order to study the effect of the second ABCA4 pathogenic variant. This study highlights the importance of precise genotypic characterization in prognostic counseling, clinical trial stratification, and potentially impacting clinical trials of gene therapies.

Ubap1l Knockout Mice Model Recapitulates Retinal Degeneration Phenotype Observed in Patients and Exhibits Irregular Photoreceptor Morphology
Wang Y, Zhang S, Zheng Y, et al
Invest Ophthalmol Vis Sci 2025;66(15):35

UBAP1L is a newly discovered gene related to recessive inherited retinal degeneration (IRD) with an unknown pathogenic mechanism. This study found that biallelic novel pathogenic variants in UBAP1L were exclusively detected in two unrelated families with retinitis pigmentosa (RP). The authors went on to study the impact of the Ubap1l genetic defect in a mouse model. Quantitative RT-PCR showed that UBAP1L was highly expressed in human and mouse retina. Notably, in the human retina, UBAP1L was more highly expressed in cones, with low but detectable expression in the RPE, whereas this expression pattern was not observed in the mouse retina. Ubap1l knockout mice exhibited mottled retinal degeneration, impaired photoreceptor function, and deformation of the rod outer segments. These findings provide insights into the role of UBAP1L in maintaining photoreceptor function, as well as provide a potential therapeutic target.

Transgene-Induced Chromosomal Rearrangement With Aberrant Human Vascular Endothelial Growth Factor at the Optic Fissure Leads to Uveal Coloboma in Mice
Wang YA, Alur RP, Kalaskar V, et al
Invest Ophthalmol Vis Sci 2025;66(13):7
Uveal coloboma is a potentially blinding congenital ocular malformation. This study characterizes a novel mouse model of coloboma, Retinal and Iris Coloboma (RICO). Transgenic mice were created by insertion of a human vascular endothelial growth factor-165 (hVEGF) gene driven by a neuron-specific enolase promoter. RICO mice were examined clinically and histologically. Results show that RICO mice have optic nerves demonstrated a widening of the optic canal with excavation of the optic nerve head and premature termination of the RPE and retinal layers shown on OCT. Heterozygous mice exhibited a broader phenotypic continuum. RICO mice exhibit altered expression of genes in the vicinity of the insertion site, where deletions of the human homologous locus were found in coloboma patients. RNA sequencing demonstrates changes in multiple coloboma-associated genes. This new RICO mouse presents a useful animal model for studying the pathogenesis of coloboma.

Pedigree analysis of an unusual low penetrance retinoblastoma mutation resulting in multiple silent carriers and a discordant effect on monozygotic twins
McDermott JJ 4th, Nyalakonda RR, Schefler AC
J AAPOS Published online September 18, 2025
This study investigates low-penetrance heritable retinoblastoma (RB) mutations. The authors report a pair of monozygotic twins with molecularly proven discordant RB, as well as the largest pedigree published describing a low-penetrance RB1 mutation with multiple successive generations of silent carriers. The proband in the case report was found to have RB1 mutation, c.54_76dup in exon 1, coding for a premature translational stop signal secondary to frameshift. Monozygotic twins were later born in this family, only one twin developed a unilateral tumor, while the other twin remained disease free (at latest follow up at 42 months). This paper demonstrate that low penetrance germline RB variants can result in discordant disease in monozygotic twins, inviting further studies on the mechanisms of pathogenesis that may offer therapeutic targets.

EGFLAM Pathogenic Variants and Congenital Stationary Night Blindness

Boranijasevic S, Smirnov V, Navarro J, et al
JAMA Ophthalmol 2026;144(1):79-88
Congenital stationary night blindness (CSNB) is a clinically and genetically heterogeneous inherited retinal disorder (IRD). This study describes the phenotype and underlying gene defect in patients with cCSNB from 2 unrelated families. This is a retrospective case series that includes data from 3 patients from cohorts of genetically unsolved IRD cases. These patients showed phenotypes including high myopia, reduced visual acuity, and night blindness. Retinal imaging depicted myopic changes. ffERG revealed electronegative Schubert-Bornschein configuration in keeping with cCSNB with ON-bipolar cell dysfunction. These patients lacked pathogenic variants in other known genes implicated in IRDs, including CSNB. Two different homozygous pathogenic variants, c.1563_1566del, p.(Val522Glufs*18) and c.1795C>T, p.(Arg599*) in EGFLAM were identified by genome and exome sequencing in these patients. The corresponding protein is localized in the outer plexiform layer and important for ON-bipolar cell signaling in the retina. This study identifies pathogenic variants in EGFLAM leading to cCSNB. The authors advocate for EGFLAM to be included in diagnostic gene panels for IRDs. This may help provide molecular diagnosis for some previously unsolved cases.

Early-Onset Retinopathy in Patients With Variants in SLC6A6 Leading to Impaired Taurine Transport
Ullah M, Rehman AU, Shetty M, et al
JAMA Ophthalmol 2026;144(1):70-78
This study identifies pathogenic variants in the SLC6A6 (encoding TauT, the main transporter for taurine) and assess their role in the molecular pathogenesis of hereditary early-onset retinal dystrophy (EORD) in affected individuals from diverse ethnic backgrounds. This is a retrospective, multicenter observational study involving 7 affected and 10 unaffected individuals from 4 unrelated families. The 7 affected individuals exhibited LCA/EORD, with extraocular findings in some. Genetic analysis identified homozygous pathogenic SLC6A6 variants in all affected individuals, while unaffected relatives were heterozygous carriers. Functional studies demonstrated that both missense variants are associated with complete loss of taurine transport in HEK-293 cells and patient-derived fibroblasts. Plasma taurine levels in affected individuals were reduced compared with heterozygous carriers and healthy control individuals. These findings confirm the role of SLC6A6 in LCA/EORD due to impaired taurine transport. This study also invites futures studies looking at oral taurine supplementation as a treatment of SLC6A6 associated EORD.

Clinical Findings and Molecular Genetics of USH1C-Associated Usher Syndrome
Aychoua N, de Guimarães TAC, Ponnekanti MB, et al
JAMA Ophthalmol 2026;144(1):53-61
This study aims to characterize some genetic variants, clinical features, natural history, and social outcomes of USH1C-associated retinopathy. This is a retrospective case series including patients with molecularly confirmed UCH1C-associated retinopathy evaluated at a tertiary referral center. Main outcomes included best-corrected visual acuity (BCVA), retinal imaging features, genetic variants, and patient-reported social outcomes. Depression was documented by general practitioners using a patient questionnaire. Unemployment was self-reported at last

follow-up. Retinitis pigmentosa diagnosis (RP) was diagnosed based on characteristic retinal findings and visual field loss. A total of 28 patients were included in this analysis. Two novel pathogenic USH1C variants were identified; 18 patients were homozygous. Presenting symptoms included nyctalopia and peripheral vision difficulties. Baseline BCVA in the better-seeing eye was 0.22 logMAR (20/32). Among 15 patients with follow-up of 5 years or more, baseline BCVA was 0.30 logMAR (20/40), declining to 0.59 logMAR (20/80). Depression was reported by 5 of 13 patients (38.5%) and unemployment by 7 of 23 patients (30.4%). OCT revealed cystoid macular edema in 5 of 21 patients at baseline, persisting in 2 patients at follow-up. Patients with missense variants c.308G>A (p.Arg103His) and c.440A>G (p.His147Arg) showed retinitis pigmentosa sparing the superior retina. The results of this study show a slow decline of visual acuity over decades. Depression and unemployment were observed at high rates. This study provides helpful insights into the clinical course of patients with USH1C-associated retinopathy, and identify social challenges they may face, which are important for prognostication and counseling.

Natural history of autosomal recessive IMPG2-associated retinal dystrophy
Georgiou M, Fujinami K, Fujinami-Yokokawa Y, et al
Am J Ophthalmol 2025;278:73-80
Autosomal recessive IMPG2-associated retinal dystrophy is a rare inherited rod–cone dystrophy with structural and functional course that has been poorly characterized. This study addresses that gap to support prognosis and future therapeutic trial design.This is a multicenter, international, retrospective case series includes 60 patients (children and adults) with autosomal recessive IMPG2-associated retinal dystrophy from 14 tertiary eye centers in 11 countries. Clinical records, visual function, multimodal imaging (FAF, OCT), and molecular genetic testing results were analyzed.Disease onset was mostly early, with 77% having onset before 18 years versus 23% with adult-onset disease, but both groups exhibited relatively poor mean BCVA of 0.55 LogMAR by a mean age of 33 years. Frequent association with high myopic (88%) and most presented with either nyctalopia (48%) or reduced visual acuity (38%). OCT/FAF commonly showed foveal atrophy, indicating early macular involvement regardless of age of onset. Genetically, 53 IMPG2 variants were identified with 40% not previously clinically characterized, improving our genetic understanding of this disease.Strengths include large sample size for rare condition, international cohort, and standardized phenotyping with genetic confirmation. Limits include retrospective study, heterogeneity follow-up across centers, and limited longitudinal quantitative data.Having insight into the natural history of this disease will help with counseling patients regarding early macular involvement and moderate vision loss by early adulthood, and consider potential future treatments that will be most helpful in younger patients, likely before fourth decade of like.

The effect of metagenomic sequencing on patient clinical outcomes for intraocular infections: a multicenter randomized controlled trial
Shantha JG, Moussa K, Laovirojjanakul W, et al
Am J Ophthalmol 2025;279:100 109
Presumed infectious intraocular inflammation is sight threatening, and traditional culture/PCR testing may fail to identify a pathogen or guide targeted therapy. Metagenomic sequencing

offers pathogen detection from small intraocular samples, but its impact on patient outcomes had not been tested prospectively. This is a multicenter randomized controlled trial at six tertiary eye centers (five in the U.S., one in Thailand) enrolled 100 adults with intraocular inflammation suspicious for infection and vision better than no light perception. Groups randomized so that the treating physician either did or did not receive intraocular metagenomic sequencing results in addition to standard of care diagnostics, and outcomes were assessed at 4 weeks. Most patients improved or had a pathogen identified before randomization, leaving 21 patients for the randomized comparison. At 4 weeks, clinical improvement occurred in 88.9% of patients whose physicians had access to metagenomic results versus 63.6% without, which indicates a modest increase in improvement. However, the proportion judged by an expert panel to have received appropriate therapy was similar between groups (88.9% vs 100%), and only three non–study related adverse events were reported, suggesting that metagenomic data fine tuned outcomes more than treatment choices. Strengths include the randomized controlled design, multicenter enrollment, and use of both clinical and expert graded appropriateness outcomes, directly addressing whether metagenomic sequencing helps/changes patient results. Limitations include small, randomized subset, and limited follow up duration. This study supports using metagenomic sequencing in selected, diagnostically challenging intraocular infections in patients and may lead to modest benefit. Larger trails are needed before routine, broad implementation.

Trends and disparities in the incidence and prevalence of inherited retinal diseases in the United States
Abbass NJ, Yazji I, Allan KC, et al
Am J Ophthalmol 2025;279:165 173
Inherited retinal diseases (IRDs) are a diverse group of genetic disorders causing photoreceptor degeneration, with variable presentation and age of onset. Despite advances in genetic testing and therapies, there is limited data on IRD incidence, prevalence, and demographics. This is a trend study (2016–2023) using U.S. electronic health record database. IRD cases were identified via ICD 10 codes (pigmentary retinal dystrophy, choroideremia, achromatopsia, congenital night blindness, hereditary retinal dystrophy). From 2016 to 2023, the overall prevalence of IRDs increased 1.84 fold to 106 per 100,000 persons, while annual incidence rose from 12.5 to 15.5 per 100,000, indicating substantial growth in IRD condition over time. Males had a higher risk of choroideremia, achromatopsia, and congenital stationary night blindness compared with females. White patients had a higher rate of IRDs relative to Black and Hispanic populations. The overall prevalence of all IRDs increased with age. Strengths include large EHR dataset, recent time frame, and consistent application of ICD 10 codes to look for trends and demographic disparities in IRDs. Limitations are reliance on diagnosis codes without genetic confirmation, potential of errors in coding, and possible under representation of patients with limited healthcare access. The study highlights rising IRD burden and also sex and race-based disparities, showing a need to improve broaden equitable access to genetic testing, diagnosis and treatment of these disorders.

SNRNP200 associated retinopathy: in depth clinical phenotyping and genetic characterization
Romo Aguas JC, Laich Y, Kalitzeos A, et al

Am J Ophthalmol 2025;280:209 220
SNRNP200, a spliceosome gene accounting for a meaningful fraction of autosomal dominant retinitis pigmentosa cases, has been linked to rod predominant retinal degeneration, but prior series have been small and lacked detailed longitudinal data. This study was designed to better define the clinical spectrum, progression, and genotype–phenotype correlations of SNRNP200 associated retinopathy to inform prognosis and trial planning. This was a multicenter, retrospective, observational study of molecularly confirmed patients harboring at least one disease causing SNRNP200 variant. Collection from records included clinical data, multimodal retinal imaging, and electrophysiology and genetic testing results. 34 patients were identified from 4 countries, followed a median of 6 years, central visual acuity remained relatively well preserved with a slow estimated decline of about 0.021 LogMAR per year. In contrast, structural degeneration was more evident on OCT, while electrophysiology in a subset showed a rod–cone dystrophy pattern with largely preserved macular function in most cases. Genetic analysis identified 21 SNRNP200 variants, 11 of them novel, increasing the known mutational spectrum associated with this retinopathy. Strengths include the largest SNRNP200 cohort reported to date, long follow up, and detailed phenotyping. Limitations are the retrospective design, modest sample size and potential variability in imaging and testing protocols across centers. The study indicates that SNRNP200 associated retinopathy shows generally slow central vision decline with preserved macula into midlife, which is reassuring for patient counseling, but also indicates wide therapeutic window for potential treatments.

Genotype–phenotype correlations of COL2A1 and COL11A1 patients
Constant A, Daruich A, Bernabei F, et al
Am J Ophthalmol 2026;281:17 24
Stickler syndrome is a multisystem collagenopathy and the leading cause of syndromic rhegmatogenous retinal detachment in children, most often due to variants in COL2A1 or COL11A1. This was a retrospective cross sectional study of genetically confirmed Stickler patients followed at two Paris tertiary centers between 2016 and 2024. Records were reviewed for demographics, ophthalmic findings. Among 110 patients, 90 (82%) had COL2A1 variants and 20 (18%) COL11A1 variants, with 10.8 years of median follow up. Retinal detachment rates were similar in the groups (about half in each group), but the COL11A1 group showed a more aggressive ocular course. Patients with COL11A1 variants had significantly longer axial lengths, earlier onset of retinal detachment, and a shorter interval to fellow eye detachment compared with COL2A1 patients, and they also had substantially higher rates of deafness. This suggests that lifetime detachment risk is comparable, but that COL11A1 related Stickler syndrome manifests earlier and progresses faster. Strengths include a large Stickler cohort with long follow up. Limitations are the retrospective design, the smaller size of the COL11A1 subgroup, and restriction to two centers in one country. This study supports potentially more intensive, earlier retinal surveillance and systemic (especially hearing) monitoring in COL11A1 patients as these patients can have earlier retinal detachment and shorter time to fellow retinal detachment compared to COL2A1. This may impact patient management and prophylactic strategies.

Axenfeld Rieger syndrome: from zebrafish models to clinical outcomes
Bohnsack BL, Williams AL, Jacobson A, et al

Am J Ophthalmol 2026;282:225 252
Axenfeld Rieger syndrome (ARS) is a rare, clinically and genetically heterogeneous anterior segment dysgenesis characterized by distinctive ocular anomalies and systemic malformations, with a high lifetime risk of glaucoma. Although FOXC1 and other genes have been implicated, long term outcome data and functional confirmation of specific FOXC1 variants have been limited. This was a retrospective cohort study of ARS patients diagnosed between 1970 and 2023, in which ocular diagnoses, glaucoma surgeries, genetic data, and examination findings were collected. Glaucoma surgery success was defined by IOP 5–20 mmHg, no additional IOP lowering surgery, and absence of visually devastating complications. Complementary zebrafish live imaging and histologic experiments were used to assess FOXC1 variants. Included were 66 patients (median presentation age 4.1 years), 64% developed glaucoma and 58 eyes of 33 patients required IOP lowering surgery; patients with glaucoma had significantly higher initial IOP and worse final BCVA than those without glaucoma. Over a median 6.1 year follow up, glaucomatous patients achieved significantly lower IOP but required more glaucoma medications, while final BCVA worsened in association with increasing numbers of glaucoma surgeries. In the zebrafish model, foxc1a knockdown produced ocular and craniofacial abnormalities that were rescued by wild type human FOXC1 mRNA but not by patient derived mutant FOXC1, functionally validating the pathogenicity of clinically identified variants. Strengths include one of the largest ARS cohorts with glaucoma to date, long follow up, and integration of an in vivo zebrafish model that directly tests human FOXC1 variants. Limitations are the retrospective design over several decades with evolving surgical techniques and diagnostics, and incomplete/variable genetic testing in earlier patients. This study helps in the understanding, management and counseling in patients with ARS at it expands both anterior and posterior segment findings, our understanding of glaucoma surgery in these patients as well as new information regarding FOXC1 variants.

Central retinal sensitivity decline in RPGR-related retinal phenotypes
Josan AS, Taylor LJ, Raji S, Cehajic-Kapetanovic J, MacLaren RE
Am J Ophthalmol 2026;282:154–161
RPGR mutations cause X-linked retinitis pigmentosa with phenotypic variability from typical to more aggressive cone-rod dystrophy, but quantitative differences in central retinal function decline between phenotypes have been poorly delineated. This retrospective cohort study analyzed microperimetry assessments from 50 molecularly confirmed RPGR patients (36 rod-cone, 14 cone-rod dystrophy) using MAIA testing with advanced modeling and survival analysis. Cone-rod dystrophy patients showed faster central sensitivity loss than rod-cone patients, with annual MS16 decline rates of 10.8% versus 5.1% and MS4 decline rates of 14.9% versus 4.1%. Median survival to complete central sensitivity loss was ~8 years earlier in cone-rod dystrophy, with 7-8-fold higher hazard ratios for central vision loss. Strengths include the largest RPGR microperimetry dataset with longitudinal modeling, Limitations are retrospective design and smaller cone-rod subgroup. The use of microperimetry in this disease can be used as a sensitive outcome measure and help with patient counseling and management/ consideration of earlier treatment in this subgroup.

Inherited retinal disease pathway in the UK: a patient perspective and the potential of AI

Wong W, Sumodhee D, Morris T, et al
Br J Ophthalmol 2025;109(11):1266-1271
Inherited retinal diseases are a leading cause of blindness in young UK adults despite improvement in genomics, but ~40% remain genetically undiagnosed after extensive testing, this cross-sectional electronic survey collected 242 responses from UK IRD patients/relatives/caregivers using Likert-scale and open-ended questions about diagnostic experiences, genetic counseling, information needs, and attitudes toward AI tools like Eye2Gene. Diagnostic journeys showed wide variability with median 3 consultations, 1-year specialist wait, 25-mile travel, and 35.8% diagnosis changes, 22.4% never received genetic testing. Over 90% of patients were in favor of integration of AI into the IRD pathway to improve genetic diagnosis and care. Strengths include the large sample size for rare disease, co-designed with patient advisors capturing real-world disparities and AI enthusiasm, while limitations include distributed through UK-based charities, UK-only, and recall of pre-2020 testing. The findings suggest most patients are in favor of responsibly using AI tools like Eye2Gene to reduce diagnostic delays and variability. This may help with standardizing IRD pathways and help with management and care.

Safety and vision outcomes of subretinal gene supplementation therapy in PDE6A-associated retinitis pigmentosa: a non-randomised controlled trial
Reichel FF, Fischer MD, Stingl K, et al
Br J Ophthalmol 2026;110:173–179
PDE6A-associated retinitis pigmentosa is a rare autosomal recessive inherited retinal disease causing severe vision loss, with no approved treatments available. Preclinical studies in animal models showed promising results with AAV8.hPDE6A subretinal gene therapy, prompting this first-in-human phase I/IIa trial. This is an open-label, non-randomized, fellow-eye-controlled trial administered single unilateral subretinal injections of AAV8.hPDE6A to 9 adults with advanced biallelic PDE6A variants. Safety was the primary endpoint assessed via clinical exams, labs, and OCT, with secondary visual function outcomes (BCVA, contrast sensitivity, VF, etc.) compared between treated and untreated fellow eyes over 1 year. Most ocular events resolved spontaneously or with steroids, but persistent issues included central retinal thinning (5/9 patients), small peripheral atrophy (2/9), moderate BCVA loss (2/9), and color vision disturbance (3/9), contrasting with preclinical safety profiles. Visual function showed non-significant trends toward worsening in treated versus control eyes, with statistically significant central retinal thinning but no evidence of functional stabilization or improvement. These findings differ from animal models where equivalent/higher doses preserved retinal structure and function. Strengths include safety and efficacy assessment with fellow-eye controls in this rare disease and detailed documentation of procedure-related versus vector-related adverse events. Limitations include small sample size, open-label design, advanced disease stage at baseline limiting therapeutic window, and limited 1 year follow up in this slow-progressing disease. This trial demonstrates that subretinal gene therapy with AAV8.hPDE6A did not improve vision function and posed risks (central retinal thinning and vision decline) and warrants caution in use. Preclinical trials had better results and further study is needed to mitigate potential adverse effects.

Using artificial intelligence to assess macular edema treatments in retinitis pigmentosa Most JA, Walker EH, Le AD, et al
Retina 2026;46:146-155
Retinitis pigmentosa (RP) is a progressive rod-cone degeneration complicated by macular edema (ME) in 10-50% of cases, where carbonic anhydrase inhibitors like oral acetazolamide show short-term efficacy but long-term structural outcomes remain uncertain. This retrospective longitudinal study of 44 patients used software validation to compared automated and manual IRF segmentation. Treatment-naïve eyes showed slow spontaneous IRF reduction comparable to overall treated eyes, but oral acetazolamide achieved significant IRF resolution versus negligible topical CAI effect. Only acetazolamide yielded functional BCVA gains (+2 ETDRS letters/year) versus stable acuity elsewhere, with higher baseline IRF/worse BCVA predicting greater fluid response and IRF correlating moderately-strongly with CST Strengths include AI validation enabling precise, direct long-term IRF tracking, while limitations include retrospective design, modest per-treatment samples, genetic heterogeneity, and not enough non-CAI cases for separate analysis. This study highlights the use in genetic disease RP, AI-based analysis tool potential to help to examine natural history of macular edema in this condition as well as optimizing treatment. This showed oral acetazolamide as the superior therapy.

Low population penetrance of variants associated with inherited retinal degenerations
Zaslavsky K, Chen L, Park C, et al
Am J Hum Genet 2026;113(1):71-82
Inherited retinal degenerations (IRDs) have traditionally been considered monogenic Mendelian disorders with near-complete penetrance, but studying specialty clinic-based patients may inflate estimates by selecting severely affected cases, leaving population-level penetrance unknown. The study screened 317,964 All of Us biobank participants for 167 pathogenic/loss-of-function variants in 33 IRD genes, identifying 481 with definite IRD-compatible genotypes, then calculated disease annotation frequency (DAF) using ICD code sets and validated with Biobank retinal imaging. Population penetrance ranged 9.4%-28.1% across code sets, well below assumed ~100%, with gene-specific variability. Biobank imaging confirmed 16.1%-27.9% abnormality rates in 68 variant carriers. IRD-compatible genotypes may affect 0.7%-2.1% of populations—orders of magnitude above diagnosed IRD prevalence—indicating frequent incomplete penetrance requiring genetic/environmental modifiers for disease manifestation. Strengths include unbiased biobank approach overcoming bias from obtaining information of genomics/EHR/imaging across >300,000 individuals. Limitations include biobank recruitment biases, peripheral retina imaging gaps, and potential age-related macular degeneration confounding broader code sets. Low population penetrance in IRD-associated genes suggest widespread variable expressivity with permissive genetic or environmental factors may play a role. This knowledge may help with predicting IRD risk, counseling and treatment development.

Measuring historical variant reclassification in inherited retinal disease and its impact on clinical genetic testing
Kern K, Gordon A, Drackley A, et al
Ophthalmic Genet 2025;7:1-8

Inherited retinal diseases (IRDs) are disorders causing vision loss whose heterogeneity makes molecular diagnosis challenging. Next-generation sequencing improves diagnosis, but variant interpretation discordance hinders gene targeted therapy for IRD. Accurate variant classification using American College of Medical Genetics and Genomics (ACMG) and Association for Molecular Pathology (AMP) guidelines is important amid fast expanding IRD gene knowledge.In this study, 140 variants from a cohort of 28 pediatric IRD patients using blinded ACMG/AMP workflows and compared results to original labs, while analyzing RPE65 ClinVar submissions from different years for discordance trends. In the pediatric cohort, 77.8% of reclassifications were concordant, with 22.1% discordance seen more by downgrades from definitive to VUS than upgrades. Discordance peaked at 37.5% for 2016 reports but fell post-ACMG/AMP standardization. Strengths include blinded reanalysis by genetic specialists and ClinVar benchmarking. Limitations include single-center retrospective design and exclusion of non-ACMG-interpretable variants. Improvement in IRD reclassification is needed, in the setting of rapid increase in genetic testing, to enhance management including accurate eligibility for therapies.

Generalizable features of pegRNA design for prime editing of inherited retinal diseases
Patterson FM, Nguyen Tran MT, et al
Ophthalmic Genet 2025;7:1-12
Inherited retinal diseases (IRDs) have diverse mutations needing versatile prime editing. This study investigates the generalizable characteristics of non-engineered pegRNA design (PE2), A single-transgene oligopool approach used. Proposed is a cell line agnostic set of pegRNA design guidelines. The study found non-engineered pegRNA 3’ extensions should mediate substitution-type edits that should be placed within five necleotides upstream of nick site induced by Cas-endonuclease. Strengths include ocular cell validation and IRD contexts; limitations are low efficiencies, synthetic motifs, and no in vivo data. In providing these recommendations it will overall simplify pegRNA design which may improve management and treatment of IRD.

The timing of genetic testing and healthcare costs associated with the diagnostic journey of inherited retinal disease
Zhang Q, Lumb K, Cai Q, Wang W, et al
Ophthalmic Genet 2025;4:1-8
Inherited retinal diseases (IRDs) are a leading cause of vision loss, where timely genetic testing aids diagnosis, counseling, and life planning. Delays from low awareness and cost increase healthcare burdens. This retrospective study identified patients with IRD from Optum Clinformatics Data Mart Database (2017–2023) compared all-cause and ocular/retinal-related healthcare costs/resource utilization in 310 IRD patients stratified by early (≤12 months post diagnosis) vs. delayed (>12 months) genetic testing. Delayed testing patients (median 847 days) incurred 8.3-fold higher mean all-cause costs ($75,553 vs. $9,073) and 3.8-fold higher ocular costs ($10,947 vs. $2,899) than early testers, driven by 3.5x more eyecare visits despite genetic tests costing just $585 on average. Strengths include real-world quantification of testing delays' economic impact; limitations involve claims data lacking clinical details, unequal periods,

and commercial insurance bias. Early genetic testing significantly decreases IRD diagnostic costs , justifying expanded reimbursement to accelerate confirmation and therapy access.

Glaucoma

Visual Outcomes of Children With Primary Congenital Glaucoma Receiving Different Refractive Corrections: The CLEVR-PCG Randomized Clinical Trial
Jiang J, Hu Y, Zhu Y, et al
JAMA Ophthalmol 2025;143(12):1006-1013
In a randomized clinical trial (CLEVR-PCG), researchers evaluated the visual outcomes of children aged 4-15 years with primary congenital glaucoma (PCG) after surgery. The study compared the effectiveness of rigid gas-permeable contact lenses (RGPCLs) and spectacles in improving visual acuity (VA) and other visual functions. Conducted at the Zhongshan Ophthalmic Center in Guangzhou, China, 56 participants were randomized to receive either RGPCLs or spectacles for 12 months. Results showed that the RGPCL group had a greater improvement in best-corrected visual acuity (BCVA, mean change of 0.31 logMAR vs. 0.12 logMAR, P=0.03) and contrast sensitivity (0.40 vs. 0.13 log units, P=0.04). Additionally, near stereoacuity was achieved more frequently in the RGPCL group (50% vs. 25%, P=0.001). The findings suggest that RGPCLs offer superior visual rehabilitation compared to spectacles for children post-PCG surgery.

Surgical Outcomes and Risk Factors for Failure in Childhood Glaucoma: Analysis of the IRIS® Registry (Intelligent Research in Sight)
Fujita A, Vu DM, Rothman AL, et al
Ophthalmology 2025;132(11):1231-1240
This large retrospective cohort study analyzed 2,380 eyes of children under 18 years in the IRIS Registry who underwent glaucoma surgery between 2013 and 2019 to evaluate surgical failure rates and risk factors. Failure was broadly defined to include IOP control, very low IOP, need for additional IOP-lowering surgery, severe vision loss, or eye removal. Over an average follow-up of about 33 months, 45% of eyes failed, typically within the first year (mean 9 months), most commonly due to insufficient IOP reduction or need for another procedure; nearly 18% required at least one reoperation. Higher risk of failure was associated with younger age, higher preoperative IOP, worse visual acuity, uveitis, greater use of glaucoma medications (especially systemic therapy), and postoperative hyphema, while certain procedures—such as iris-based surgeries and trabecular/angle-based implants—had higher failure rates compared with ab interno angle surgery. In a subgroup analysis, 3-year failure rates after angle surgery were similar for primary congenital glaucoma (34.5%) and juvenile open-angle glaucoma (39.2%). Eyes with poor visual outcomes were more often aphakic, had more comorbidities, and required more medications, with unilateral cases showing particularly high rates of poor vision, likely related in part to amblyopia. Key limitations include reliance on registry data (with incomplete capture of surgeries performed outside the registry, especially at academic centers), missing diagnostic details for many patients, strict failure definitions that may not reflect clinical judgment, and lack of detailed information such as IOP measurement methods. Overall, this study provides one of the largest real-world assessments of childhood glaucoma surgery in the United States, highlighting that surgical failure remains common and underscoring the importance of early disease control, careful risk stratification, and close postoperative monitoring.

Virtual reality field testing in children with normal eyes and glaucoma: comparison of game-based versus Humphrey visual field-equivalent algorithms
Wang B, Naithani R, Alvarez S, et al
J AAPOS 2025;29(6):104691
Virtual reality-based field (VRF) perimetry presents an alternative to standard automated perimetry, offering both game-based and Humphrey-equivalent algorithms. The goal of this prospective study was to evaluate the performance of children with healthy eyes and those with known or suspected glaucoma to take VisuALL VRF (Olleyes) using a game-based test and a Humphrey-equivalent test; a subset of 49 eyes were also tested with table-top Humphrey visual field (HVF) perimetry prior to VRF testing. The 2 VRF algorithms were evaluated based on test duration, foveal sensitivity, mean deviation (MD), pattern standard deviation (PSD), and patient preference, assessed by means of a questionnaire. A total of 71 eyes of 36 participants (Mean patient age was 10.9 ± 2.6 years (range, 6-17)) were included: 42 healthy control eyes, 4 glaucoma suspects, and 25 with known childhood glaucoma. For game-based versus Humphrey-equivalent algorithms, average MD and foveal sensitivity were not statistically significantly different (P = 0.39 vs 0.79, respectively). Comparison using linear mixed-effects modeling showed a positive correlation between visual field parameters from the two VRF test types for both MD (P < 0.001) and PSD (P < 0.001). Test duration was longest for game-based VRF (5.7 min ± 1.8 min) compared with Humphrey-equivalent VRF perimetry (2.6 min ± 0.4 min) and HVF (4.2 ± 1.1 min), but most participants preferred it. Strength: prospective study; limitations: small numbers, single center study, and the reliability data for the game-based VRF is not directly comparable to the Humphrey-based VRF or table-top HVF data. Impact on clinical practice: While most children preferred the game-based VRF despite its longer duration and game-based and Humphrey-equivalent VRFs showed good correlation with respect to one another for visual field parameters for both healthy eyes and those with known or suspected glaucoma, it is important to keep in mind that there was significant variability in extent and severity of estimated field loss between different visual field devices.

Short stature in children with primary congenital glaucoma-a retrospective cross-sectional study
Babgi R, AlObaida I, Al Owaifeer AM, Malik R, AlQahtani DS, Al Noaim K
J AAPOS 2025;29(6):104692
Childhood stunting is a global health priority, because growth is an overall indicator of a child's well-being, and failure to grow is characterized by below-normal weight, height, or both which can be the result of genetic, prenatal, postnatal, and environmental factors. The purpose of this retrospective study was to investigate whether there is an association between primary congenital glaucoma (PCG) and short stature in children. They included 93 children with an established diagnosis of PCG (mean age, 41.1 months) and were < 5 years of age at the time of their height and weight measurements. Z scores for height and weight were calculated, and short stature and low weight were classified as moderate or severe. Forty-three children (46%) had evidence of moderate or severely short stature (Z score < -2), with a roughly equal distribution by sex. Twenty-seven children (29%) had evidence of severe short stature (Z score < -3). Despite short stature, children tended not to be underweight: only 6 children (6%) were moderately or severely underweight. This study suggests that children with PCG may be of

shorter stature, but of normal weight for age. limitations: did not control for potential confounders such as socioeconomic status, lacked a comparison group of children of similar socioeconomic and ethnic background but without PCG, reliance on multiple nurses for anthropometric measurements, modest sample size , retrospective design, absence of data on relevant laboratory parameters (e.g. hormonal and genetic markers). Impact on clinical practice: Early detection of growth failure could enable timely referral for investigation and possible early interventions to improve overall quality of life.

Axenfeld-Rieger Syndrome: From Zebrafish Models to Clinical Outcomes
Bohnsack BL, Williams AL, Jacobson A, Drackley A, Bolton E, Rossen JL
Am J Ophthalmol 2026;282:225-252
This retrospective cohort study examined 66 patients with Axenfeld-Rieger Syndrome (ARS) diagnosed between 1970-2023, investigating genetics, clinical outcomes, and surgical success rates. The study classified patients into four phenotypic categories based on anterior chamber depth and corneal findings, with 64% developing glaucoma at a median age of 4.2 years. Patients with glaucoma had significantly higher initial intraocular pressures and worse final best-corrected visual acuity compared to those without glaucoma. Among the 58 eyes requiring IOP-lowering surgery, trabeculectomy with mitomycin C and Baerveldt devices demonstrated the highest 10-year survival rates (76% and 71%, respectively), though final visual acuity declined linearly with increasing number of glaucoma surgeries. The study also employed zebrafish models to validate clinically identified FOXC1 genetic variants. Using morpholino oligonucleotide knockdown of Foxc1a in zebrafish, the authors successfully recapitulated the ocular and craniofacial developmental abnormalities seen in ARS. These abnormalities could be rescued by wild-type human FOXC1 mRNA but not by mutant FOXC1 mRNA containing clinically identified variants, providing functional validation of the pathogenicity of these mutations.

Surgical Outcomes in Axenfeld-Rieger Syndrome: A Multicenter Retrospective Analysis
Seresirikachorn K, Thiamthat W, Bitrian E, Chang TCP
Am J Ophthalmol 2026;282:120-127
This multicenter retrospective study examined surgical outcomes and risk factors for glaucoma development in 96 patients (189 eyes) with Axenfeld-Rieger syndrome (ARS) across three tertiary hospitals in Thailand and the United States from 2004-2023. Over a mean follow-up of 7.5 years, 57.3% of ARS patients developed glaucoma, with significant risk factors including diagnosis at birth (adjusted OR 6.45) and presence of cardiac anomalies (adjusted OR 10.73). Notably, all patients with a causative FOXC1 variant developed glaucoma, and genetic testing identified a causative gene variant in half of the cases tested. Among patients who developed glaucoma, 70% required surgical intervention at a median age of 6 months. Success was defined as achieving an IOP>5 and ≤21mmHg with an IOP reduction of 20% or more from baseline, without reoperation for glaucoma, and without experiencing loss of light perception. Complete success was defined as success criteria with no glaucoma medication use. Qualified success was defined as success but with use of glaucoma medication. The study found that complete surgical success rates remained low across all procedures (no procedure achieved >25% complete success at 3 years), but glaucoma drainage devices (GDD) demonstrated

significantly higher qualified success rates (72.9%) compared to goniotomy (37.8%) or trabeculotomy (27.8%). The authors concluded that GDD may be the preferred primary surgical procedure for ARS-associated glaucoma, though the overall prognosis for achieving medication-free IOP control remains challenging in this population.

Ologen-Augmentation of Ahmed Valves in Pediatric Glaucomas: 2- to 6-Year Follow-up
Jacobson A, Bohnsack BL
Ophthalmol Glaucoma 2025;8(6):609-615
Glaucoma drainage devices (GDDs) are often used in children with refractory glaucoma. Although they usually control IOP well in the first year, long-term success rates are significantly lower. Early aqueous flow through the tube can cause a hypertensive phase and plate encapsulation, leading to early failure. To address this, various adjuncts have been trialed to improve long-term outcomes with limited success. This retrospective cohort study extended follow up and expanded a previous cohort, reporting 2–6-year outcomes of Ahmed valves augmented with Ologen in 40 eyes of 28 patients under 18 years old. Slightly more than half were male. The cohort included primary congenital glaucoma and glaucoma secondary to ocular or systemic anomalies. Most eyes (28) had previous ocular surgery. Some also underwent concurrent procedures, including vitrectomy for posterior tube placement or lensectomy with sulcus tube placement. Although there was no control group, success rates at 3 and 5 years (complete: 75% and 57%; qualified: 87% and 67%) were higher than the group's previously reported 1- and 2-year outcomes for qualified success in conventional Ahmed valves (63% and 38%). At final follow-up, only 20% of eyes required glaucoma medications, with a median restart time of 8.9 months. The authors suggest their lower failure rate compared with another small cohort published in Egypt may relate to fewer prior surgeries and more secondary glaucoma cases rather than primary congenital glaucoma. Notably, failures in this cohort were not due to plate encapsulation. While Ologen adds cost (~$200 per disc), the authors argue it may be justified by improved tube longevity and delayed need for medication.

Identifying Barriers and Improving Adherence to Follow-up of Childhood Glaucoma in South India
Pillai MR, Puthuran GV, Friedman DS, et al
Ophthalmol Glaucoma 2025;8(6):616-626
While several studies have explored factors affecting adherence to medications and follow up in the adult glaucoma population in both the developed and developed world, fewer studies have focused on the pediatric glaucoma population. This cross-sectional study used a combination of home visit and hospital visit-based questionnaire administered to caregivers of children with glaucoma identified over a five-year period within a 200km radius from the base hospital to explore factors possibly associated with adherence to recommended care. Of 147 caregivers interviewed during home visits, 142 subsequently presented for the requested hospital-based follow up visit. Only 56% of these patients remained adherent to follow up (returning within 6 months of recommended follow-up). The factors most strongly associated with higher adherence included higher levels of parental education (68.3% vs 42.9% with at least high school education, p=0.018) as well as children with history of glaucoma surgery (3 times more likely to remain adherent). After multivariate analysis, these were each found to be

independently associated with adherence. Other factors associated with higher adherence included urban residence and higher socioeconomic status. Interestingly, travel distance to care was not found to be associated with adherence. While poor adherence to care is a known problem in glaucoma, this population had an exceedingly high rate of loss to follow up (47.5%) compared to other cohorts reported in the US (11.3%) and UK (2.9%). Families with lower socio-economic status were more likely to report financial barriers to care. This study helps to better understand barriers that might affect adherence for pediatric glaucoma patients, particularly in southern India where rate of poor adherence seems to be very high.

Visual Outcomes and Risk Factors for Progression in Juvenile Open-Angle Glaucoma
Seresirikachorn K, Vu DM, Narayana A, Annopawong K, Wanichwecharungruang B, Peter Chang TC
Ophthalmol Glaucoma 2025;8(6):627-633
Juvenile glaucoma is a particularly aggressive form of glaucoma known to have increased risk of blindness over time. Despite our knowledge of risks for vision loss in this population, the prognosis and long-term visual outcomes have limited study data due to the relative rarity of the disease. This retrospective cohort study of 203 eyes from 106 patients diagnosed with JOAG with a minimum of 1 year of follow up at two tertiary hospitals in Bangkok Thailand reported proportion of visual impairment and blindness (both VA and VF based) at the beginning and end of the study period as well as progression at 1, 3, and 5 years into the study. Over a 7.68±6.15 year follow up period, the proportion of eyes classified as blind rose significantly (Baseline: VA only 15%, VA+VF 31.5%; Final follow up: VA+VF 35.5%, $P<0.001$). At the patient level, the proportion of blindness in the better seeing eye (e.g bilateral blindness) also progressed with time (Baseline: VA only 4.7%, VA+VF 15.2%; Final follow up: VA+VF 19.8%, $p<0.001$). During follow up, 11.8% of eyes progressed to a more severe visual impairment category. There was no significant difference in rate of progression between those with mild, moderate, and severe VI at baseline, but higher rates of progression were associated with higher numbers of glaucoma surgical intervention (which acts as a surrogate for more aggressive disease). Given that progression was generally slow and the fact that worse final visual outcomes had worse VA and VF findings at presentation, this study highlights the importance of early detection and treatment. This study does not fully capture “glaucoma progression” given that the focus is on larger categories of visual impairment, and further study on quality of life for patients in this population may be beneficial.

Outcomes in Primary Congenital Glaucoma, 2011-2023: L V Prasad Eye Institute, Hyderabad
Mandal AK, Gothwal VK, Ali MH
Ophthalmol Glaucoma 2026;9(1):62-74
Primary congenital glaucoma has been reported at higher rates and with greater severity in India, other Asian and Middle Eastern countries compared to Western countries. While angle surgery remains the preferred primary surgery for PCG, primary combined trabeculotomy-trabeculectomy (CTT) has been reported to yield superior results compared to angle surgeries in several Asian and Middle Eastern countries. This large retrospective cohort study reported on the IOP and vision outcomes in 1150 eyes of 704 patients who underwent primary CTT without MMC by a single surgeon in a large tertiary referral center in India from

2011 to 2023. Mean age at first surgery was 23.1months (Range: 9days -233 months, median: 5 months) with mean follow up of 60.1 months. Complete success (IOP ≥6 and ≤16mmHg without any glaucoma medication) at post op years 1, 5, and 10 were 85.9%, 69.7%, and 37.8%, respectively. Qualified success plus complete success (same IOP criteria with allowance for addition of 1 glaucoma medication) was high at these same time points (98.2%, 93.3%, and 84.1%). Of the 60% of eyes with corneal edema at presentation, 90% had clear corneas at last follow up. Unfortunately, visual outcomes despite good IOP control were limited; only 23.1% had VA of ≥20/40 at last follow up. In unilateral cases, the most common cause for visual impairment was amblyopia, whereas bilateral cases had higher rates of visual impairment secondary to corneal decompensation/scar, amblyopia, PSC cataract, and glaucomatous optic atrophy. Children with infantile onset PCG had better success than neonatal and late onset groups. The authors did report that the retrospective nature of this study and high rate of loss to follow up limits data regarding possible need for glaucoma medications for patients at later stages after surgery. It is also difficult to generalize the results of this study for patients in Western countries due to the different phenotypes of glaucoma between these regions, but this study suggests that CTT is a reasonable primary surgery for PCG, particularly in this population where standard angle surgery has higher rates of failure as reported in previous studies.

Ahmed Glaucoma Valve Implantation Versus Trabeculotomy as Initial Intervention for Primary Congenital Glaucoma-Long-Term Follow-Up
Tal-Mushinski E, Imtirat A, Kerman T, et al
J Glaucoma 2025;34(10):783-788
While the worldwide incidence of PCG is between 1 in 10000 to 30000 live births, it is known to be significantly higher in the Middle East, particularly in the Arab Bedouin population in southern Israel. In this particular population, the typically first line angle surgeries have been shown to have lower efficacy and there is also concern for the burden of follow up for possible revision due to low socioeconomic status and high birth rate with families having multiple children. This retrospective study reported outcomes for 83 eyes of 55 patients (88% Bedouin Arab ethnicity) with PCG who underwent standard 180 degree trabeculotomy (n=49) or AGV (n=34) as primary surgery at a single academic center in Israel from 1998 to 2022. During 36 months of follow up, the primary success rate for AGV was 54% compared to 22% for trabeculotomy. Medication usage was similar between groups at all time points, but corneal clarity and improvement in CDR was significantly better after AGV compared to trabeculotomy. There were also higher rates of need for secondary surgery after trabeculotomy (51%) compared to AGV (6%). Late complications including strabismus were more common than in trabeculotomy. The study is limited by its retrospective nature, and limited generalizability given the distinct population with known severe phenotype of PCG. The three year follow up window may also not be long enough to capture late tube failures secondary to encapsulation, which is a known complication of GDD in pediatric patients. Despite this, in a population known to have severe disease and need more aggressive initial intervention, this study suggests that AGV is a feasible first-line option.

Influence of Retinopathy of Prematurity and Laser Therapy on Intraocular Pressure in Preterm Infants

Verma P, Katoch D, Singh SR, et al
J Glaucoma 2025;34(10):795-800
In an effort to understand how ROP in premature infants may affect IOP and glaucoma risk, this prospective non-randomized comparative study reported IOP in pre-term infants qualifying for ROP screening (<34 weeks, <2000g, other complicating medical factors) at a single eye center in India. The infants were separated into three groups: no ROP (Group1), ROP not requiring treatment (Group 2), and ROP requiring laser (Group 3); aggressive posterior ROP requiring Avastin injection were excluded. IOP measured with speculum and Perkins tonometry was recorded at baseline, 1 month, and 3 month interval as well as at 1 week post op if receiving laser. At baseline, Group 3 had significantly lower IOP than Groups 1 and 2. There was a transient post-laser spike in Group 3 which generally resolved without treatment. There was also a mild negative correlation with lower IOP over time in Groups 1 and 2. By 3 month follow up, there was no significant different between IOP across Groups 1, 2, or 3. While IOP measures using a lid speculum may have inherent limitations, it is helpful that the technique was consistent across this cohort and measured by the same provider each time. The impact of immature aqueous systems as well as active ROP becomes more important to understand as younger, more complex babies are kept alive when born prematurely.

Two-Year Results of Gonioscopy-Assisted Transluminal Trabeculotomy Versus Ab Externo Visco Circumferential Suture Trabeculotomy in Primary Congenital Glaucoma
Elwehidy AS, Elhofi AS, Abdelkader AME, GabAllah NM
J Glaucoma 2025;34(10):811-818
Various surgical approaches have been used in the treatment of primary congenital glaucoma, most recently with gonioscopy-assisted transluminal trabeculotomy (GATT) showing promising outcomes. Ab-externo 360-degree trabeculotomy (micro-catheter or polypropylene suture) can facilitate similar angle treatment for patients with hazy corneas, but the cost of the microcatheter may limit access to this technology. This study aimed to compare outcomes of GATT to ab externo visco circumferential suture trabeculotomy (AVCST) which uses viscoelastic to facilitate SC cannulation with polypropylene suture. Sixty-five eyes of 39 patients with PCG were selected to have either AVCST (n=34) or GATT (n=31); decision for which procedure was largely driven by corneal clarity, but also by surgeon preference. Other than corneal clarity, there were no statistically significant differences in demographics or baseline clinical characteristics between the two surgical groups. Post-op evaluations at 1, 3, 6, 9, 12, 18, and 24 months showed no statistically significant difference between the rates of success for GATT vs. AVCST. Even when cases in which SC could not be cannulated 360 degrees are counted as failures (7 AVCST, 1 GATT), the cumulative rate of success at 2 years post op remains high (82.4% AVCST and 93.5% GATT). This is the first known study to directly compare these two surgical techniques for PCG, and while the cohort is relatively small and retrospective in nature, the similarity in outcomes is encouraging for both as viable primary treatment options with the option to default to partial angle treatment if full cannulation is not possible.

Predictors of Long-Term Visual Acuity and Intraocular Pressure Outcomes in Childhood Glaucoma: A Multicenter Study By the Childhood Glaucoma Research Network
Sheheitli H, Brandt J, Grajewski A, et al

J Glaucoma 2025;34(11):979-984

While severity classification exists to help with prognostication in adult forms of glaucoma, our current classification models for pediatric glaucoma do provide stratification of severity in a similar way. This retrospective study aimed to identify predictive variables of visual acuity and IOP outcomes in childhood forms of glaucoma, possibly to use in consideration of expanded stratification recommendations for severity grading in this population. Three hundred ninety-six eyes of 243 children diagnosed with glaucoma ≤3yo with at least five years of follow up available were included. Of six clinical variables (significant aniso/isometropia, media opacities, nystagmus, anterior segment dysgenesis, strabismus, angle closure) as well as IOP and VA at 3 and 5 year visit, the two most significant predictors for VA at final follow up were VA at 5 years as presence of angle closure, and the two most significant predictors for final IOP were IOP at 5 year visit and presence of nystagmus. Worse VA outcomes were also correlated with media opacities, nystagmus, anterior segment dysgenesis, and bilateral glaucoma. This study was limited by significant variability in demographic data collection between study signs and possible confounding of temporal correlation of IOP and VA if five year and final data were collected near each other. The authors of this study advocate for the creation of a severity classification for childhood glaucoma, and while further study is needed, the prognostic value of IOP and VA at 3 and 5 year follow up as well as the clinical factors discussed here may help contribute to creating these guidelines.

Infections

Endogenous Endophthalmitis in Children: A 5-Year Retrospective Study in Vietnam
Nguyen NH, Nguyen MP, Nguyen HPT, et al
J Pediatr Ophthalmol Strabismus 2025;62(6):435-442

This 5-year retrospective study from the Vietnam National Eye Hospital describes one of the largest single-center cohorts of pediatric endogenous endophthalmitis to date, including 157 children (≤15 years) seen between 2016 and 2020. The average age was 6 years, and presentation was typically delayed but still within one week for most patients (mean ~5 days). A major clinical theme was how often the diagnosis was missed before referral: only 22.6% of children were correctly diagnosed at the outside hospitals, with uveitis and conjunctivitis being the most common incorrect labels. This highlights how easily endogenous endophthalmitis can masquerade in children. Microbiologically, Gram-positive cocci were the most common organisms identified on smear (45.2%), followed by Gram-negative bacilli (10.8%), with polymicrobial cases present in 7%. Notably, culture yield was extremely low (6.3% overall), reinforcing that smear results may be the most practical diagnostic tool in resource-limited settings. Vitreous specimens were more likely to be smear- and culture-positive than aqueous samples, and when both were obtained, over half (54.8%) showed discordant results, which supports the authors' recommendation to sample both chambers when feasible. Somewhat surprisingly, in 140 (89.2%) of the children with endogenous endophthalmitis, there was no systemic disease identified. Outcomes were poor overall: anatomical success occurred in 64.3%, but combined anatomic + functional success was only 38.2%, with particularly dismal outcomes in polymicrobial and fungal cases. Prognosis correlated strongly with severity at presentation. Children with vision better than light perception had significantly higher success (45.8% vs 16.7%), and those with milder ultrasound vitreous opacity (grades 1–2) had markedly better outcomes than those with dense grade 3 opacity (69.6% vs 38.1%). Earlier presentation (<7 days) improved anatomic success. Interestingly, early vitrectomy within 24 hours did not show a statistically significant benefit, likely reflecting selection bias and overall disease severity. Clinically, this paper underscores that pediatric endogenous endophthalmitis is frequently misdiagnosed, often microbiologically elusive by culture, and heavily outcome-dependent on baseline vision and vitreous density at presentation. Pediatric ophthalmologists should keep the possibility of endogenous endophthalmitis in mind when a patient with unusual, unilateral ocular inflammation presents, and should push for both a smear and a culture when a sample is obtained.

Evaluation of an Association between COVID-19 and Retinal Hemorrhage in Children
Zhao AT, Laub N, He J, Yu Y, Spiller A, Binenbaum G
Ophthalmology 2026;133(1):136-142

This retrospective cohort study evaluated whether COVID-19 infection is associated with retinal hemorrhage in children, a question with important implications for child abuse evaluations. The authors reviewed 6,952 children (ages 1 month to 18 years) at Children's Hospital of Philadelphia who underwent dilated fundus examination within 28 days of a COVID-19 test between 2020 and 2023, comparing rates of retinal hemorrhage among those with positive versus negative test results across 7-, 14-, 21-, and 28-day windows. Using generalized estimating equations adjusted for age and repeated testing, they found no significant

association in any time period and interestingly, retinal hemorrhage was slightly less common in COVID-positive children (about 1.4%–2.0%) than in COVID-negative children (about 2.6%–3.0%), with all odds ratios nonsignificant. Only four COVID-positive children had retinal hemorrhages, and each had a clear alternative cause (e.g., trauma, leukemia, raised intracranial pressure, or carbon monoxide poisoning) with hemorrhage patterns consistent with those diagnoses rather than viral retinitis or vasculitis. Strengths include the large, diverse cohort and detailed ophthalmologist-performed examinations, while limitations include the retrospective design, uncertainty about exact infection timing, and inclusion of children with other known causes of hemorrhage (though this is likely biased toward finding an association). Overall, the study provides strong evidence that COVID-19 is not a cause of retinal hemorrhage in children and should not be considered an explanation for such findings in clinical or legal settings, reinforcing the importance of careful differential diagnosis—particularly in cases of suspected abusive head trauma.

Incidence and characterization of retinal findings after SARS-CoV-2 infection in children
Zontag N, Perkins J, Wong BM, Levin AV
J AAPOS 2025;29(6):104660
Retinal hemorrhages have been reported in Adults with COVID-19. The purpose of this study was to determine whether SARS-CoV-2 infection is associated with retinal hemorrhage in young children. This was a retrospective chart review of 56 children <8 years of age treated in the University of Rochester healthcare system between July 1, 2020, and July 1, 2024, who underwent ophthalmologic examination, within 28 days of a COVID-19 diagnosis. Mean age was 24 months. All fundus examinations were normal except for 1 patient with optic nerve edema 22 days after testing positive for COVID-19 (this patient had a history of posterior fossa tumor with obstructive hydrocephalus and underwent a suboccipital craniotomy for near-total resection of the tumor 22 days prior to ocular examination). To calculate the potential risk of error in estimating the association of retinal hemorrhage and COVID-19 infection, a one-sided version of Hanley's rule of zero incidence was applied which suggested with 95% confidence, that the true incidence of retinal hemorrhage in children <8 years old following COVID-19 infection is likely to be <9.09% at 14 days, <7.69% at 21 days, and <5.35% at 28 days. Strengths: only included those with COVID-19 infection documented by any method, including PCR testing or antigen; limitations: small sample size and retrospective chart review. Impact on clinical practice: Little evidence that SARS-CoV-2 infection causes retinal hemorrhages in young children, so if children with a diagnosis of COVID-19 are found to have retinal hemorrhages, alternative etiologies should be considered.

Neuro-Ophthalmology

Impact of malnutrition on pupillary responses in pediatric population
Kocabas DÖ, Yavrum F, Şükün EY, Yavrum B
Eur J Ophthalmol 2026;36(1):67-74
Malnutrition adversely affects visual system development and autonomic nervous system regulation in children, yet the impact on pupillary responses as an autonomic function marker remains unexplored. This study investigated whether malnutrition compromises autonomic nervous system function through altered pupillary responses in pediatric patients. This cross-sectional study compared automated pupillometry measurements (static pupil diameters at scotopic, mesopic, and photopic illumination, plus dynamic pupil dilation speed) in 92 malnourished children (BMI z-score <-1) versus 80 age- and gender-matched healthy controls, with malnutrition subgroup analysis by severity. Malnourished children demonstrated significantly smaller pupil diameters across all three illumination levels and faster pupil dilation speed (0.27±0.05 vs 0.23±0.06 mm/s, $p<0.001$) compared to controls, with BMI z-score positively correlating with mesopic and photopic pupil diameter but negatively correlating with dilation speed ($r=-0.313$, $p=0.004$). Severe malnutrition showed significantly higher dilation speed than mild malnutrition ($p=0.007$), though pupil diameters remained similar across malnutrition subgroups. No significant correlations existed between pupillary responses and individual micronutrient levels (hemoglobin, ferritin, vitamin D, vitamin B12), despite all being significantly lower in malnourished children.The study's use of automated pupillometry in a relatively large pediatric sample provides objective autonomic assessment, though the cross-sectional design does not establish causal relationships and the small subgroup sizes limited the power to detect differences by malnutrition severity. Additional limitations include inability to measure micronutrients association with pupillary differences, reliance on single-point laboratory values, and the Sirius device's restriction to measuring only dilation speed in dynamic mode. Altered pupillary responses may serve as early markers of autonomic dysfunction in malnourished children, potentially identifying those at risk for malnutrition-related ocular pathologies before clinical symptoms develop.

The Rates of Retinal Nerve Fiber Layer Change in Children With Optic Disc Drusen
Estrela T, Jeon-Chapman J, Zhang JJ, et al
Ophthalmol Sci 2025;6(1):100943
The presence of Optic disc drusen, while often asymptomatic, are known to potentially cause RNFL loss and visual field changes over time. This retrospective cohort study aimed to identify risk factors that may contribute to higher rates of RNFL loss in children with optic disc drusen. The study included an age-matched “control” group of patients labelled as Glaucoma Suspects who would be expected to have regular OCT RNFL testing but presumably stable RNFL thickness to approximate the normal loss of RNFL with age. All 40 eyes of 22 patients (mean age 12.1yr) with ODD were evaluated by neuro-ophthalmology and had at least 3 OCT RNFL over the course of at least 18 months of follow up. Compared to the control group which had minimal change through the follow up period (-0.07um/year), those with ODD had average RNFL thinning of -2.01um/year, greatest in the superior, inferior, and nasal quadrants. There was also a moderate correlation of RNFL loss corresponding to GCL volume at the final follow

up in those with ODD. Multivariable analysis only correlated higher baseline RNFL with higher rates of loss. While this study cannot elucidate the mechanism for change in RNFL and does not have long enough follow up to explain why the same rate of change does not seem to be continued into adulthood, it does help provide important longitudinal data to understand the impact of ODD on the optic nerve health. Based on this data, the authors advocate for possibly including pediatric ODD patients in future studies regarding neuroprotection and further study to understand long-term risk.

Evaluating the Role of Virtual Reality Visual Fields (VRF) in the Diagnosis and Management of Pediatric Neuro-Ophthalmic Conditions
Saleem Z, Wang B, Naithani R, Alvarez S, Freedman SF, El-Dairi M
Am J Ophthalmol 2026;281:326-332
This prospective reliability and validity comparison study from Duke Eye Center (July 2022–March 2023) assessed the feasibility of game-based virtual reality perimetry (VRF; VisuALL 24-2 AVA Standard) versus standard Humphrey visual field (HVF; 24-2 SITA Fast or equivalent with size III/V stimulus) in 129 children (253 eyes; mean age 11.0 ± 3.3 years) with known or suspected neuro-ophthalmic conditions (e.g., anterior/posterior visual pathway compression, papilledema/hydrocephalus, optic neuritis, mitochondrial optic neuropathy, intrinsic optic nerve issues). Key findings on feasibility and performance: Significantly more eyes successfully completed VRF (240/253, 94.9%) than HVF (191/253, 75.5%; P < .0001), with younger age as the main factor for HVF failure (mean 8.9 vs 11.6 years for completers; P < .001). Both tests were completed in 178 eyes (70.3%). Among eyes completing both, mean deviation (MD) was similar (HVF -5.0 ± 6.3 dB vs VRF -5.3 ± 6.2 dB; P = .782), but pattern standard deviation (PSD) was lower for HVF (4.53 ± 3.9 vs 5.24 ± 3.7 dB; P < .01), foveal sensitivity higher for HVF (34.4 ± 6.5 vs 29.8 ± 8.1 dB; P < .0001), and test duration shorter for HVF (4.6 ± 1.8 vs 6.5 ± 2.0 min; P < .0001). Moderate correlation existed for MD (R = 0.36, P < .0001) and strong for PSD (R = 0.60, P < .0001) between HVF and VRF; weak for foveal sensitivity (R = 0.10, P = .01); none for duration. Against clinician-predicted defects (based on history, exam, MRI, OCT; masked grading by second ophthalmologist), sensitivity was comparable (HVF 86.5% vs VRF 88.6%; P = .861) and specificity low but similar (30.8% vs 33.5%; P = .725). Concordance for presence/absence of any predicted defect was ~52–53% (P = .849); quadrant/central defect concordance showed no major differences except slightly better HVF in some temporal quadrants. Discordant results (vs predicted) occurred more in healthier eyes (better RNFL, visual acuity, younger age), suggesting test difficulty rather than true negatives. Strengths include a sizable pediatric neuro-ophthalmic cohort with diverse diagnoses, head-to-head comparison of VRF vs HVF in the same eyes, masked clinical prediction and grading, use of both global indices and defect localization, and statistical rigor (linear mixed models, Bland-Altman, correlations). Limitations are single-center setting (potential referral bias), non-random test order (HVF first may cause fatigue/learning effects), lack of reliability indices comparability between platforms, no HVF-equivalent VRF algorithm (game-based may differ), limited long-term data, and reliance on clinician prediction as reference (imperfect structure-function correlation). These results will impact clinical practice by demonstrating that game-based VRF is more feasible than HVF in children with neuro-ophthalmic disease—achieving higher completion rates (especially in younger patients)

with comparable global indices (MD), sensitivity for predicted defects, and overall concordance—making it a valuable alternative or adjunct when HVF is unreliable or incomplete. Clinicians should consider VRF for pediatric patients with attention/postural challenges, suspected central/quadrant defects, or poor HVF cooperation, while noting its longer duration and potential for slightly different PSD/foveal sensitivity; further validation with HVF-equivalent VRF protocols and longitudinal studies is needed to confirm diagnostic equivalence in this challenging population.

Nystagmus

The Human Fovea Is Relatively Horizontally Elongated in Infantile Nystagmus
Thomas N, Acton JH, Erichsen JT, et al
Invest Ophthalmol Vis Sci 2025;66(14):56
The study investigates the foveal structure in adults with idiopathic infantile nystagmus (IN), characterized by horizontal eye movements occurring shortly after birth. Researchers hypothesized that the foveal pit would be horizontally elongated due to the nature of IN. Twelve adults with idiopathic IN and twelve matched controls were analyzed using optical coherence tomography to measure the horizontal and vertical diameters of the foveal pit. Results showed a significantly lower ratio (0.89) in the IN group compared to the controls (0.96, P=0.006), indicating a relative horizontal elongation of the fovea in those with IN. This finding suggests a direct relationship between early nystagmus and foveal development. Future research is needed to explore the impact at the photoreceptor level.

Correction of abnormal head position in pediatric nystagmus using yoked low-value prism glasses: a retrospective study
Nsour G, Misawa MAM, Adamuccio J, et al
Invest Ophthalmol Vis Sci 2026;67(2):3
Nystagmus affects approximately 24 per 10,000 individuals and frequently leads to abnormal head positions (AHP) as patients align their eyes with the "null zone" to minimize oscillations and optimize visual acuity. While surgery remains the standard treatment for AHP, yoked prisms represent an underutilized non-surgical alternative. This retrospective study reviewed 31 pediatric patients (mean age 10.3 ± 3.6 years) with nystagmus and AHP who were prescribed low-value yoked prisms tailored to their head turn direction. Outcomes assessed were binocular best-corrected visual acuity (BBCVA) and AHP measurements at distance and near vision with and without prisms, using goniometer measurements by two ophthalmologists. The mean prism prescription was 3.9 ± 1.25 prism diopters, with each prism diopter correcting approximately 3.67° of AHP at distance and 3.34° at near—approximately seven times more effective than traditional optical formulas predicted. AHP improved dramatically from 16.9° ± 9.9° to 4.6° ± 5.8° at distance ($P < 0.0001$, large effect size) and from 12.7° ± 12.9° to 3.8° ± 6.2° at near ($P < 0.0001$, large effect size), while BBCVA showed modest improvement from 0.44 ± 0.22 to 0.41 ± 0.23 logMAR ($P = 0.001$, small effect size). The study provides the first quantitative assessment of minimal prism values needed for AHP correction and demonstrates immediate, well-tolerated benefits. Limitations include the retrospective design, absence of objective eye-tracking to

quantify nystagmus changes, small sample size for subgroup analyses, lack of sham controls, and inability to assess long-term neural plasticity effects. Low-value yoked prisms represent a safe, non-invasive adjunctive or primary treatment option that can reduce the physical and psychosocial burden of AHP in pediatric nystagmus while allowing use of primary gaze position.

Deficits in Motion and Form Perception in Infantile Nystagmus Syndrome Joshi MR, Subedi A, Basnet GB, Zahidi AAA, Adhikari HB
Invest Ophthalmol Vis Sci 2025;66(13):44
Visual deficits in infantile nystagmus syndrome (INS) may result from retinal blur caused by eye movements and/or cortical changes from early visual deprivation. This study compared motion and form perception in individuals with INS to determine the roles of internal noise and sampling efficiency. Thirty participants with INS and 30 age-matched controls completed motion direction and orientation discrimination tasks. Stimuli included random dot kinematograms for motion and Glass patterns for form, each presented for one second. Researchers measured performance using coherence thresholds and equivalent noise paradigms. Motion coherence thresholds were significantly higher in INS than controls at both tested speeds. Orientation coherence thresholds were also significantly higher in the INS group. In equivalent noise testing, INS participants showed worse thresholds at zero and low noise levels but performed similarly to controls at the highest noise level. Statistical analysis indicated that increased internal noise best explained the performance differences between groups. Overall, INS reduces sensitivity to both motion and form perception, likely due to elevated internal noise arising from early visual processing abnormalities linked to eye movements or early deprivation. Limitation of this study is the highly specialized test methods that are not easily performed in the clinical setting but findings may be applicable to providers to understand the sequelae of INS.

Oculoplastics

One-stage versus two-stage surgical correction of blepharophimosis-ptosis-epicanthus inversus syndrome: a retrospective comparative study
Swaify IY, El Essawy RA, Abdelfattah RA, Abdelbaky SH
J AAPOS 2025 Dec;29(6):104688
Blepharophimosis-ptosis-epicanthus inversus syndrome (BPES) can significantly interfere with visual development with a risk of amblyopia up to 56.4% and often imposes a psychological burden on affected children and their parents, underscoring the importance of early surgical correction to promote normal visual and psychological development, improve cosmesis, and alleviate the associated abnormal chin-up posture. The optimal surgical approach and the timing of intervention remain matters of debate where traditionally, BPES repair is performed in two stages: medial canthoplasty for epicanthus and telecanthus correction at 3-5 years of age followed by ptosis repair after 6 months. The purpose of this study was to compare the surgical outcomes of one-stage (ptosis surgery and epicanthus and telecanthus repair performed in the same operative session) and two-stage (ptosis surgery performed first followed by epicanthus and telecanthus repair at least 6 months later) correction of BPES in children <3 years of age. This retrospective comparative study included 24 children <3 years with BPES who underwent surgical correction at Cairo University (11 in the one-stage group and 13 in the two-stage group) from Jan 2017 to Dec 2024. Surgical outcomes were assessed based on horizontal palpebral fissure length (HPFL), interpalpebral fissure height (IPFH), inner intercanthal distance (IICD) and IICD/HPFL ratio. Both groups showed significant postoperative improvements in HPFL, IPFH, IICD and IICD/HPFL ($P < 0.005$), with no statistically significant difference between them. The two-stage group had a higher proportion of patients with good blepharophimosis outcome (46% vs 27%), whereas the one-stage group showed a higher proportion of good ptosis outcomes (64% vs 46%); however, these differences were not statistically significant. Complications were minimal and comparable between both groups. They found that outcomes of one- and two-stage approaches were comparable, where one-stage correction may be preferable in patients with severe ptosis, although two-stage repair may better address severe blepharophimosis. Limitations: retrospective study, small sample size, short follow up period, did not assess amblyopia, psychological impact and educational performance. Impact on clinical practice: Authors recommend one-stagerepair in patients with severe ptosis for a better ptosis outcome and earlier visual rehabilitation and staged procedures (treating ptosis first) for cases with severe blepharophimosis to optimize surgical results with regard to blepharophimosis.

Endoscopic and surgical evaluation of epiphora in children with Down syndrome
Nakamura J, Asano M, Ohno T, et al
J AAPOS 2025;29(6):104687
The incidence of congenital nasolacrimal duct obstruction (CNLDO) in children with Down syndrome (DS) is estimated to be 20%-30% and spontaneous resolution is less frequent than in the general pediatric population. While probing remains the first-line surgical treatment for CNLDO in the general population, probing is much less effective in patients with DS and previous studies have shown that adjunctive use of stent intubation with probing during primary intervention improves success rates. The purpose of this study was to examine the clinical characteristics and surgical outcomes of patients with DS presenting with primary epiphora. This

retrospective chart review looked at the charts of 63 children with DS and primary epiphora referred to a tertiary academic children's hospital between Jan 2013 and August 2023. Forty-two patients (67%) had epiphora since birth, and 12 patients (19%) developed symptoms after the first year of life. Of the 40 patients who underwent lacrimal syringing, 28 (70%) showed passage, and 12 showed obstruction. Surgical intervention was performed in 18 patients: office-based probing under local anesthesia (n=9) or endoluminal lacrimal duct recanalization (ELDR) with stent intubation under general anesthesia (n=9) with the following surgical outcomes: overall complete resolution of symptoms in 7 of 19 (37%) eyes, partial resolution in 11 of 19 (58%) eyes and failure in 1 (5%) eye. Dacryoendoscopy revealed not only stenotic lacrimal passages due to developmental anomalies of the lacrimal drainage system but also fibrous dense white tissue obstructing the mucosal surface of the nasolacrimal duct in several cases, indicating chronic inflammatory changes. limitations: retrospective study, small sample size, single surgeon, did not include nasal endoscopic evaluation. Impact on clinical practice: Be aware that many children with DS may exhibit delayed-onset epiphora due to a distinct pathophysiology compared with that in the general pediatric population, characterized by developmental anomalies of the lacrimal drainage system in combination with chronic inflammation.

Effect of inferior turbinate infracture on outcomes of probing for congenital nasolacrimal duct obstruction
Kim BM, Ashby GB, Mohney BG
J AAPOS Published online September 18, 2025
Conflicting information exists based on previous small studies regarding the benefits of concurrent turbinate infracture with probing of congenital nasolacrimal duct obstruction. Authors retrospectively evaluated outcomes of 987 probing procedures that occurred between 2002 and 2018 on patients <6 years of age carrying a diagnosis of congenital nasolacrimbal duct obstruction at a single medical center. 184 of these procedures included inferior turbinate infracture. Patients with craniofacial abnormalities or other nasolacrimal pathology were excluded. Outcomes were categorized as "complete resolution," "partial resolution," "unresolved," or "lost to follow-up." Potential adverse events were also noted, specifically development of sleep apnea, chronic rhinitis, or chronic sinusitis. With no significant difference in demographics between the two groups, rates of "complete resolution" were comparable (80.4% in the probing + infracture group, 80.6% in the control group). There was no difference in rates of chronic nasopharyngeal disorders. Probing with infracture was slightly more successful in older patients (>24 months) than probing alone, though not significantly so (P=0.16). Limitations of the study include predominantly white population, retrospective nature (decision to perform infracture was made by a clinician and not randomly assigned), and difficulty to determine success rates in patients lost to follow up. Findings suggest that inferior turbinate infracture does not significantly impact outcome of probing procedure, but also does not cause significant adverse effects.

Dacryocystorhinostomy outcomes for congenital nasolacrimal duct obstruction associated with craniofacial abnormalities
Ashby GB, Sinha K, Kuchhangi AD, Odorico SK, Oatts JT, Wagner LH

J AAPOS Published online September 18, 2025

Children with craniofacial abnormalities are often excluded from dacryocystorhinostomy (DCR) outcome studies because they have known risk factors for failed surgery. This study aimed to compare clinical characteristics of patients with and without craniofacial abnormalities who underwent DCR for intractable congenital nasolacrimal duct obstruction (CNLDO). Authors performed a retrospective, multi-center study of patients less than 17 years old who underwent either endoscopic or external DCR between 2003 and 2023. They captured data points on demographics, presence of craniofacial abnormality, persistent symptoms, and need for further surgery and compared continuous variables using two-sample t-tests and categorical variables using X^2 tests. Data included 55 eyes of 40 patients. There was no difference in the demographics between the two groups. While there was no difference to surgical approach to DCR between the two groups, children with craniofacial anomalies were more likely to require multidisciplinary surgical care (primarily ENT). Children with craniofacial anomalies were also significantly more likely to have proximal nasolacrimal pathology such as punctal or canalicular agenesis. This group had a higher rate of persistent symptoms following surgery than the group without craniofacial anomalies. In the craniofacial group, patients who underwent multidisciplinary surgery were more likely to experience resolutions of symptoms. Limitations include retrospective nature and possibility of incomplete data in patients lost to follow-up. Further, patients with craniofacial abnormalities may have other factors contributing to persistent epiphora. Results suggest that in children with craniofacial anomalies, surgeons should be prepared to address proximal nasolacrimal pathology and should have low threshold to involve other surgical specialties if needed.

Long-term Cardiovascular, Renal, and Safety Outcomes of Teprotumumab versus Systemic Glucocorticoids in Thyroid Eye Disease: A Target Trial Emulation

Lo JE, Freitag SK, Liu CY, Barbesino G, Ma KS

Ophthalmology 2025;132(10):1142-1151

There is limited data on the long-term safety of teprotumumbab compared to systemic glucocorticoids in patients with TED. The study aimed to investigate the long-term cardiovascular, renal, infectious, and safety outcomes of teprotumumab vs GCs for the management of TED. This is a population based cohort study that included patients >18yo with TED who initiated tepro, GCs, or conservative treatment from 80 health care organizations in the US. 685 tepro initiators were compared to 685 propensity-score matched IV GC initiators. 741 tepro initiators were compared to 741 oral GC initiators. Teprotumumab was associated with markedly lower all-cause mortality and reduced risks of acute myocardial infarction, acute kidney failure, emergency department visits , hospitalizations, urinary tract infection pneumonia and severe sepsis compared to IV and oral GCs. There was no difference in the risks of diabetes, chronic kidney disease, or inflammatory bowel disease, or complications requiring a hearing device, whereas there was a higher risk of hearing loss after starting teprotumumab compared with GCs. All-cause mortality was also markedly reduced in teprotumumab-treated patients when compared with patients receiving conservative treatment. The strengths of this study include its large sample size and long-term follow-up. Weaknesses include the use of billing codes to identify diagnosis – this could have skewed the data if primary care for medical conditions was being received at a system outside the organizations included in this study. In

any case, this study does help demonstrate that tepro has an overall good safety profile and lower risk of resulting in systemic disease compared to GCs.

Periocular Management of Pediatric Facial Nerve Palsy
Lim CS, Neville C, Nduka C, Kannan R, Malhotra R
Am J Ophthalmol 2025;278:292-304
This retrospective case series examined 26 pediatric patients (29 eyes) with facial nerve palsy (FNP) over 9 years, focusing on periocular management without tarsorrhaphy. The study found that corneal involvement was common, with 3 children developing neurotrophic keratopathy, and upper eyelid skin contracture was a frequent feature. Fourteen children underwent periocular surgery including levator recession, platinum segment insertion, correction of meibomian gland inversion, full-thickness skin grafts, and lower eyelid elevation—notably avoiding tarsorrhaphy in all cases.The surgical outcomes were favorable, with significant improvements in CADS Grading Scale scores for Cornea (degree of exposure and corneal sensation), Asymmetry (resting position of involved brow and eyelids), Dynamic function (degree of lagophthalmos), and Synkinesis (presence of synkinetic eye closure or gustatory epiphora) ($P < .05$). Vision was maintained in 21% of patients and improved in 58%, with only 21% experiencing deterioration. Two children with neurotrophic keratopathy improved without requiring corneal neurotization, and the avoidance of tarsorrhaphy prevented vision field loss while still achieving good ocular surface protection. The authors concluded that this surgical approach effectively addressed lagophthalmos and improved both ocular surface health and corneal sensation in pediatric FNP patients.

Levator Muscle Complex Exploration During Surgery for Simple Severe Congenital Ptosis
Alahmadawy YA, Ahmed RA, Allen RC, Diab MM
Ophthalmic Plast Reconstr Surg 2026;42(1):90-96 This study aimed to describe the gross morphology of the levator palpebrae superioris (LPS) muscle complex in children with severe congenital ptosis and poor levator function (≤4 mm) and to evaluate surgical outcomes when levator surgery was guided by intraoperative findings. It was a retrospective, interventional case series including 109 eyelids where levator surgery was performed instead of preplanned frontalis suspension based on intraoperative LPS evaluation. Data collected included demographics, ptosis measurements, LPS and levator aponeurosis morphology, surgical technique, and outcomes. Fatty infiltration of the LPS muscle belly was graded as minimal, mild, moderate, or severe based on its proportion relative to normal muscle width. The levator aponeurosis was thin in 56.9% of eyelids and thick with fibrotic changes in 43.1%. The distal LPS zone consistently showed fatty infiltration and abnormal vessels, while the proximal zone appeared fleshy red with minimal to moderate fatty changes in about 72% of eyelids. Securing this proximal zone to the tarsal plate significantly improved margin reflex distance 1 and levator function, with median gains of 4.0 mm and 7.0 mm, respectively, over a median follow-up of 8 months. The applicability to practice is that intraoperative assessment of the LPS muscle can allow for levator-based surgery, resulting in successful outcomes even in cases initially considered for frontalis suspension.

Metagenomic Profile of the Lacrimal Sac Microbial Communities in Congenital Nasolacrimal Duct Obstruction: The Lacriome Paper 7
Ali MJ Ophthalmic Plast Reconstr Surg 2025;41(5):584-588
This prospective study investigated the metagenomic microbial profile of lacrimal sac samples from patients with congenital nasolacrimal duct obstruction (CNLDO). Ten consecutive samples were collected during endoscopic dacryocystorhinostomy after marsupialization and analyzed using whole shotgun metagenome sequencing on the Illumina platform. Bioinformatic processing was conducted through the SqueezeMeta pipeline, with functional annotation performed using MetaCerberus. The results showed that bacteria were the most abundant organisms, followed by fungi and viruses. The dominant bacterial phyla included proteobacteria, firmicutes, actinobacteria, and bacteroidetes. Common bacterial species identified were Haemophilus influenzae, Streptococcus pneumoniae, Stenotrophomonas maltophilia, Achromobacter xylosoxidans, Staphylococcus aureus, and Ochrobactrum anthropi. Predominant fungi included Botrytis cinerea, Aspergillus oryzae, and Fusarium fujikuroi, while several pandoravirus species were the most frequent viruses detected. Overall, the study demonstrated that lacrimal sacs in CNLDO harbor diverse polymicrobial communities, highlighting the need for further research into microbial interactions and their role in disease.

Outcomes of Frontalis Advancement With or Without External Levator Advancement for Congenital Ptosis: A Retrospective Comparative Study
Shoji MK, Legala AR, Bansal R, et al Am J Ophthalmol 2026;281:172-180
This retrospective comparative clinical cohort study from the University of California San Diego (Shiley Eye Institute) evaluated long-term outcomes of frontalis flap advancement alone versus a novel bilayer technique combining frontalis flap advancement with external levator advancement (ELA) in 92 eyelids of 76 patients (mean age 6.9 ± 9.2 years) with severe congenital ptosis and poor levator function (mean baseline levator function 4.4 ± 2.0 mm, MRD1 0.7 ± 1.3 mm), including cases with concurrent strabismus repair. Frontalis flap alone was performed in 65 eyelids (often in older patients or those with prior surgeries), while frontalis flap + ELA was used in 27 eyelids (more common in younger patients as a primary procedure after 2022). Both techniques significantly improved postoperative marginal reflex distance-1 (MRD1) from baseline ($P < .001$ each), but the bilayer frontalis + ELA group achieved significantly greater final MRD1 (3.9 ± 0.8 mm vs 3.2 ± 1.2 mm; $P = .004$) and change in MRD1 (3.4 ± 1.2 mm vs 2.5 ± 1.6 mm; $P = .002$). Lagophthalmos remained stable from baseline in both groups (postoperative ~0.5 mm; no significant difference vs baseline or between groups). Eyelid symmetry improved significantly in both (inter-eye MRD1 difference reduced to ~0.5 mm), with a nonsignificant trend favoring the bilayer group. All eyelids achieved visual axis clearance at last follow-up (mean 12.0 ± 13.1 months), with preexisting amblyopia stable/improved/resolved in most cases and no new/worsening amblyopia. Multivariate regression confirmed frontalis + ELA as an independent predictor of greater MRD1 improvement ($B = 0.518$, $P = .048$), alongside lower baseline MRD1. Preoperative BCVA ≥20/40 strongly predicted motor success (≤10° residual AHP; 95% vs 58% for BCVA <20/40; $P = .007$). Revisions were required in 7.6% (all frontalis-alone group; 6 for undercorrection, 1 for retraction/hematoma); no revisions occurred in the bilayer group. Mild dryness (5 cases) and one corneal abrasion resolved conservatively; no major complications (e.g., infection, extrusion) occurred. Strengths include a comparative cohort

design directly contrasting two techniques in a challenging population (severe congenital ptosis, poor levator function), inclusion of concurrent strabismus repair cases, multivariate adjustment for confounders (age, prior surgeries), clear primary (MRD1 change) and secondary (symmetry, lagophthalmos, amblyopia, adverse events) outcomes, and demonstration of the bilayer technique's superior elevation without increased lagophthalmos or complications. Limitations are retrospective nature (potential selection bias; bilayer technique adopted later, leading to younger/primary-surgery bias in that group), relatively small bilayer sample (n=27 eyelids), variable follow-up (mean ~1 year; longer-term durability unclear), incomplete visual/amblyopia data due to external pediatric ophthalmology follow-up, lack of standardized intraoperative titration protocol, and no direct comparison to traditional sling suspension or single-layer frontalis-ELA techniques. These findings will impact clinical practice by supporting frontalis advancement flap—particularly the bilayer frontalis + ELA technique—as a safe, effective alternative to traditional sling suspension for severe congenital ptosis with poor levator function, offering greater eyelid elevation (mean +3.4 mm MRD1), excellent visual axis clearance, stable lagophthalmos, and low revision rates without synthetic/autologous materials; surgeons should consider this approach preferentially in younger/primary cases, counsel families on markedly higher success likelihood with preoperative BCVA ≥20/40, and discuss potential mild duction deficits while reassuring on amblyopia stability and low complication risk, reserving revisions for undercorrection or retraction.

Orbit

Marked Enlargement of a Single Extraocular Muscle: Clinical and Imaging Patterns in the Prediction of Malignancy
Vahdani K, Kampik K, Uddin JM, Verity DH, Rose GE
Ophthalmic Plast Reconstr Surg 2026;42(1):58-64
This study evaluated clinical features, imaging patterns, histopathology, and malignancy predictors in patients with enlargement of a single extraocular muscle. A retrospective review categorized imaging into single-muscle only (SMO), single excessively-enlarged muscle, and single-muscle with lacrimal gland enlargement (SMLG). Among 142 patients, 43% had SMO, 37% had a single excessively-enlarged muscle, and 20% had SMLG. The most common diagnoses were myositis (43%), atypical thyroid eye disease (27%), and malignancy (27%). Malignancy—mostly lymphoma or metastases—was most frequent in SMO (43%), atypical thyroid eye disease predominated in single excessively-enlarged muscle (49%), and myositis was most common in SMLG (69%). Univariate predictors of malignancy included age ≥60, prior malignancy, visual impairment, exophthalmos ≥3 mm, SMO pattern, lateral rectus involvement, the “amphora sign,” and maximum muscle diameter ≥10 mm; multivariate analysis confirmed prior malignancy and muscle diameter ≥10 mm as independent predictors. Pain, diplopia, and symptom duration did not differ between myositis and malignancy groups. The applicability to practice are that single-muscle enlargement can mimic both inflammatory and neoplastic conditions, warranting early biopsy, especially in SMO, large muscle diameter, or prior cancer history.

Pediatrics / Infantile Disease / Syndromes

Longitudinal clinical characteristics of patients with neurofibromatosis type 1
Wassermann L, Rezar-Dreindl S, Reiter GS, et al
Can J Ophthalmol 2025;60(5):e689-e694
NF-1 can be associated with significant visual morbidity. As there is a variety of information on demographics and follow-up duration, this study aims to provide information on longitudinal characteristics to add to the existing literature. This was a retrospective study looking at patients with genetically proven NF-1 (168 eyes, 85 children). Mean age at baseline was 3.1±2.6 years (range 2–19). 32.9% of patients had café-au-lait stains, and 37.1% had Lisch nodules. 16.5% of patients had optic nerve abnormalities and 18.8% received therapy. Optic pathway gliomas were most sensitively picked by MRI (81%) compared to fundus exam (14%) or OCT (5%). By logMAR, mean BCVA was 0.19±0.20 at baseline. There was deterioration of BCVA at baseline when severe optic nerve abnormalities were noted (0.21±0.14) compared to those without (0.14±0.14). A significant difference in BCVA over follow-up was noted if therapy was given (–0.17±0.16) compared to not (–0.04±0.16). 19% of patients developed strabismus, and 20% had amblyopia, consistent with other studies. Limitations include being a retrospective, single-center study although there is a relatively high sample size. It also did not take into account newer findings associated with NF-1 that may be helpful in further following/predicting issues in these patients (e.g., choroidal abnormalities, hyperpigmented spots, retinal vascular abnormalities). This is not a generalizable study but does provided added information on NF-1 patients.

Global Prevalence of Congenital Color Vision Deficiency among Children and Adolescents, 1932-2022
Jeong YD, Cho J, Son Y, et al
Ophthalmology 2025;132(12):1431-1444
This is a systemic review and meta-analysis aiming to assess the global prevalence of congenital color vision deficiency. This study aimed to present exclusively the prevalence of congenital CVD, stratified by geographic region, ethnicity, type, and severity. There were >2000 articles screened for inclusion, but ultimately 56 were included in the final analysis. The selected studies focused on inherited forms of CVD, included participants ranging in age from 30 months to younger than 19 years, were based on general population data, provided sufficient information, were not RCTs or self-reported surveys, and were not duplicate entries. A total of 1,703, 619 participants, including 31,493 patients, from 21 countries (Australia, China, Denmark [including Greenland], Ethiopia, India, Iran, Iraq, Ireland, Israel, Italy, Malaysia, Nepal, Nigeria, Saudi Arabia, Singapore, South Korea, Spain, Taiwan, the United Kingdom, the United States, and the Republic of South Africa) across 5 continents were included in this study. In the 56 studies meeting the inclusion criteria, the global pooled prevalence of CVD was found to be 2.59%. Specific regional rates by country can be found in the original article. The highest prevalence, exceeding 5% was in the Arabian Peninsula, particularly Iraq. Ireland and Australia also showed higher prevalence. The global prevalence of CVD showed clear regional differences, with Oceania having the highest rate, followed by Africa, Europe, and Asia. North America had the lowest prevalence. Regarding ethnicity, individuals of European ancestry

showed the highest prevalence followed by those of African ancestry, Asian ancestry, and Hispanic ancestry. This suggests that individuals from Western populations may be more predisposed to inheriting CVD. Male patients had a higher prevalence across all types and severities, with deutan being the most common type in both sexes, followed by protan and tritan. In terms of severity, male patients showed the highest rates of dichromacy whereas female patients had the highest prevalence of anomalous trichromacy. The study provides a comprehensive estimation of the global prevalence of CVD, but other than given us more knowledge on this it doesn't really have a significant clinical impact. Also, there was limited data from many regions of the world, notably South America, making it very likely that they are underestimating the prevalence in these regions.

Practice management / Health care systems / Education

Wait times in pediatric ophthalmology clinics: Insights from a tertiary university hospital Nemet A, Israeli A, Yona T, et al
Eur J Ophthalmol 2025;35(6):2298-2304
The authors conducted a large retrospective observational study of wait times (WTs) in pediatric ophthalmology and strabismus clinics at a single tertiary university-affiliated hospital in Israel, analyzing real-world electronic health record data from April 2016 through June 2023 for a final cohort of 11,320 patients (49.51% female). Median age was 6 (IQR: 7) years, median WT was 34.14 (IQR: 16.5–60.3) minutes, and the most common WT was 10 min. The authors found that the median WTs remained broadly stable over the study period, though they decreased during the COVID-19 pandemic. WTs varied by clinic type, time of day, and month of the year, with late morning peaks and shorter waits later in the day, and patients who arrived late being seen sooner than those who arrived early; demographic factors such as gender, ethnicity, and age showed minimal association with WTs. The study highlights that scheduling factors, including the need for combined orthoptist and ophthalmologist assessments, contribute to longer waits and that personalized clinic schedules and patient arrival guidance could help reduce WTs and potentially improve clinic flow and overall patient satisfaction. The study had several limitations such as its single institution model and retrospective design which limit its generalizability and applicability to other healthcare settings with different workflows or patient populations. Additionally, a high proportion of no-show and incomplete visits were excluded, potentially biasing WT estimates, and the study lacked patient-reported outcomes such as perceived satisfaction or the clinical impact of waiting, focusing solely on time metrics.

Factors associated with resident pursuit of pediatric ophthalmology fellowship
Kumar A, Morse JR, Wong RK, Oatts JT
J AAPOS Published online August 11, 2025
It is well-documented that there is a shortage of pediatric ophthalmologists. Only 5% of graduated ophthalmology residents pursue a fellowship in pediatrics, and about half of pediatric ophthalmology fellowships go unmatched. This article evaluates responses of 66 US ophthalmology program directors (54% response rate in 121 eligible programs) to a 9-item questionnaire inquiring about program characteristics, exposure to pediatric ophthalmology, and resident pursuit of fellowship between 2018 and 2023. Statistical analysis was performed to characterize programs that graduated at least one resident who pursued a pediatric ophthalmology fellowship versus those that did not. Of responding programs, 40 reported at least one resident pursuing pediatrics fellowship. Larger residency size (4.47 +/- 1.46 residents), higher number of pediatric ophthalmologists on faculty (3.26 +/- 2.6 pediatric ophthalmologists), and presence of a home pediatric ophthalmology fellowship program were associated with resident pursuit of pediatrics fellowship. Specialty of the program director, PG-year of first exposure to pediatrics, number of days of exposure, geographic region, and percentage of residents pursuing any fellowship were not. The major limitation of this study is the method of data collection; response rate was low among program directors, and responding program directors may have more investment in residents pursuing pediatric fellowship. Results suggest a correlation between availability of pediatric faculty mentors and presence of pediatrics fellows

at the home institution and pursuit of pediatric fellowship. Increased exposure to pediatrics may not be sufficient to garner interest.

Progress toward gender equity in leadership and representation in academic pediatric ophthalmology
Bicknell BT, Rudd Zhong Manis J, Chishom H, et al
J AAPOS Published online August 20, 2025
Historically, gender disparities have existed in academic medicine and leaderships roles. This study explores female representation in pediatric ophthalmology, specifically when evaluating academic rank, leadership roles, and research productivity. This is a cross-sectional study of publicly available data from the Fellowship and Residency Electronic Interactive Database in August of 2024. Data was collected on 451 academic pediatric ophthalmologists, including gender, graduation year, academic rank, possession of a leadership role, number of publications, number of citations, and h-index. Women account for 55.9% of academic pediatric ophthalmologists and 65.3% of post-2000 graduates. Males make up 69.7% of pre-2000 graduates. Males are statistically more likely to be department chairs and full professors, whereas women are more likely to be program directors and assistant professors. There was no statistically significant difference in academic rank and research productivity by gender among post-2000 graduates. Limitations of this study include cross-sectional nature, questionable accuracy of publicly available data, extrapolation of number of years in practice based on graduation year, and inclusion of academic providers only. The average age of the population of female pediatric ophthalmologists compared to male pediatric ophthalmologists likely acts as a significant confounder when comparing academic rank and leadership roles by gender. In summary, female representation in pediatric ophthalmology has increased since 2019. However, there may be persistent disparities in leadership and senior ranks.

The Pocket Strabismus Surgical Skills Trainer: design and validation
Baldwin G, Dennis E, Heidary G, et al
J AAPOS Published online September 17, 2025
Surgical skills simulators allow trainees to perform the critical steps of strabismus surgery without using biologic material. Authors developed the 3D-printed silicone "Pocket Strabismus Surgical Skills Trainer," and physicians (30 trainees and 6 faculty) among three ophthalmology programs participated in 2 workshops using the model. Data was collected through a post-program Likert scale survey, querying appearance of the model, ease of use, and similarity to true surgical movements. 100% of participants reported easy use; most participants felt the sclera was appropriately reproduced in appearance (86%) and feel (77%), while 81% felt the rectus muscles were appropriately life-like in both appearance and feel. 92% felt the sclera modeled true surgical practice, and 100% felt the muscles modeled true surgical practice. A strength of the study is physician participation across all levels of training, including faculty. Limitations include faculty-trainee relationship between the investigators and resident participants, likely impacting responses. Further, study was non-comparative. More information could be gained by comparing this model to other commercially available synthetic models or to biologic tissue. However, this model represents an easy to use, inexpensive to produce,

reusable model that can increase practice hours in trainees without a wet lab or readily available biologic tissue and increase exposure to pediatric surgical training.

Quality and Readability of Patient Educational Materials Generated by ChatGPT-4o for Pediatric Ophthalmologic Surgeries
Yang A, Reid M, Nguyen AM, et al
J Pediatr Ophthalmol Strabismus 2025;62(6):421-427
This study evaluated whether ChatGPT-4o can generate high-quality, readable patient education materials (PEMs) for common pediatric ophthalmic surgeries, and how those materials compare to AAPOS website handouts. The authors prompted ChatGPT-4o to create approximately 1,000-word PEMs at a 6th-grade level in both English and Spanish for four procedures: strabismus surgery (with and without adjustable sutures), pediatric cataract surgery, and nasolacrimal duct probing. They generated three outputs per procedure per language (24 total) to account for variability, and compared English ChatGPT responses to AAPOS PEMs using a validated quality tool (QGLOP: accuracy, bias, currency, and tone). Readability was assessed using standard grade-level formulas. Overall, AAPOS materials outperformed ChatGPT-4o on key quality domains. AAPOS handouts scored significantly higher on accuracy, currency, and tone, with perfect scores in several categories, whereas ChatGPT outputs had lower and more variable accuracy. Bias scores were not significantly different, suggesting that ChatGPT's recommendations were not grossly misaligned with clinical standards, even when the details were sometimes incomplete or misleading. Importantly, despite being explicitly prompted for a 6th-grade reading level, ChatGPT outputs averaged around an 8th-grade level (similar to AAPOS materials), so readability was not a clear advantage. English and Spanish ChatGPT responses were generally comparable in quality and readability, although one readability metric suggested Spanish outputs may be easier to read. Most importantly, though, the authors highlight multiple relevant examples of misleading content, including inappropriate emphasis on "vision therapy" as a non-surgical alternative for strabismus and overly optimistic language about outcomes after pediatric cataract surgery while omitting core elements like refractive correction and amblyopia therapy. The key takeaway is that ChatGPT-4o PEMs, as generated here, are not yet an equivalent substitute for society-endorsed patient education materials, and any AI-generated handouts require careful clinician review prior to use.

Out-of-Pocket Expense for Surgical Chalazion Removal
Siddiqui T, Jaber J, Sorensen R, et al
J Pediatr Ophthalmol Strabismus 2025;62(6):396-400
This retrospective cost-analysis study examined out-of-pocket expenses for pediatric surgical chalazion incision and drainage (I&D) at a tertiary academic children's hospital from 2011–2020, with the goal of giving families a more realistic estimate of what chalazion surgery may ultimately cost. Using CPT codes for chalazion excision under general anesthesia in patients <18 years, the authors modeled total out-of-pocket expense as the sum of three components: the surgeon/procedure fee, facility fees, and anesthesia. Costs were derived from CMS physician fee schedule data and the hospital's online cost estimator, with historical facility fees extrapolated using CMS year-to-year facility fee rate changes. All costs were also inflation-adjusted to 2020 dollars, and a "cumulative" cost estimate was calculated by

incorporating published recurrence rates requiring repeat surgery. Unadjusted (nominal) costs rose over the decade, from $513.89 in 2011 to $563.48 in 2020 (+9.7%), with modest increases across all three components. However, once adjusted for inflation, the direction reversed: the estimated cost of a single chalazion I&D decreased from $591.27 (2011) to $563.48 (2020), a 4.9% decline. To better reflect real-world burden, the authors then incorporated recurrence requiring repeat surgery, using two published estimates: 10.7% from retrospective cohorts and 24.3% from randomized trials. With the higher recurrence assumption, the cumulative inflation-adjusted expected cost in 2020 increased from $563.48 to $700.41, still representing a small decline compared to 2011 ($734.95). The authors contextualized this as roughly 1.15% of median Houston family income in 2020. Clinically, the main takeaway is less about year-to-year cost trends and more about counseling: even if the “single-procedure” price is stable or slightly improving in real dollars, recurrence meaningfully increases expected family expense. The study is limited by being a modeled estimate (not true patient billing), extrapolated facility fees, and high dependence on geography and insurance structure, but it provides a practical framework for discussing the likely total cost of chalazion surgery over time rather than treating it as a one-time event.

Post-pandemic changes in demographics and outcomes of children at an inner-city vision outreach program: Give Kids Sight Day
Williamson JE 3rd, Lam L, Spitofsky NR, et al
J AAPOS Published online September 18, 2025
The COVID-19 pandemic reduced access to in-school vision screenings. Since that time, the rate of childhood vision impairment has been increasing, according US Department of Health and Human Services. Authors retrospectively compared records from the attendees of Wills Eye Hospital's free vision screening event, Give Kids Sight Day (GKSD) in the year 2023, as well as from the years 2009-2020. They additionally analyzed prospective demographic survey results from 189 responders out of 293 attendees in 2023. Compared to pre-COVID events, 2023 participants were more likely to be medically uninsured. Those with medical insurance were more likely to lack vision insurance, and 47% of attendees requiring a glasses prescription had never failed a previous vision screen. More children in 2023 required refractive correction and follow-up (76%) than in prior years (28-61%). In summary, access to vision insurance has declined among this patient population, and a large percentage of children with refractive needs are falling through the cracks with school screening programs. Major limitations of this study include small sample size with 78% of attendees in 2023 coming from Philadelphia. Additionally, demographic survey responses were limited to only 64%. If trends are reproducible among other US populations, this study suggests significant lapses in current school-based vision screening programs, as well as decreasing access to vision insurance. There is a need for increased funding for in-school and community-based screening programs, as well as more resources for families to obtain subsidized insurance plans.

Predictors of missed pediatric ophthalmology appointments in a New Zealand cohort: the impact of gender, ethnicity, and socioeconomic deprivation
Mpe D, Niederer RL, Low J, Danesh-Meyer HV
J AAPOS Published online September 18, 2025

Authors performed a retrospective review of all un-attended pediatric ophthalmology appointments, defined as those that failed to be preemptively rescheduled or canceled, at Auckland District Health Board, which provides publicly funded health care in New Zealand, over a two-year period. They documented patient age, gender, ethnicity, and address; address was then used to extrapolate a rating on the New Zealand Deprivation Index, a measure of socioeconomic status based on region. 13% (2965/22818) of pediatric ophthalmology appointments were missed, with higher rates for new patient appointments than follow-ups. Multivariable logistic regression showed increased likelihood of missed appointments in patients of male gender, Maori or Pacific people ethnicity, and with higher Deprivation Index score. This indicates that ethnic minorities and patients of lower socioeconomic status may have decreased access to care than other populations. Limitations of the study include use of data from a single institution. The study does not provide any information on what the barriers to appointment attendance may be in these populations. Further, some patient's determination of socioeconomic status may be inaccurate if based on address alone. Providers need to be aware of disparities in access to ophthalmologic care among minorities and impoverished patients. More research needs to be done to illuminate specifically what barriers exist and how to combat them.

Predictors of access to pediatric eye care appointments
Diehl TH, Malek DA, Cavuoto KM
J AAPOS Published online September 18, 2025
Limited access to pediatric ophthalmologists has been well-documented, particularly in areas with lower median household income. Authors were interested in disparities in access to pediatric eye due to Medicaid acceptance, appointment wait-time, and practice location. They acquired a list of pediatric ophthalmologists and pediatric optometrists and contacted them by telephone with a script attempting to make an appointment for a hypothetical 8-year old patient, including questions about private insurance and Medicaid acceptance and appointment availability. 947 ophthalmologists and 581 optometrists were included. The rate of successful appointments made was significantly higher for optometrists (65%) than ophthalmologists (37%), and successfully higher for patients with private insurance than with medicaid. Wait-times were longer to see ophthalmologists than optometrists. Patients in majority white counties were more likely to book appointments than in primarily minority counties. They concluded that disparities exist in accessing eyecare by insurance type, demographics, and provider type. However, the study is limited by the use of a hypothetical patient. A significant proportion of appointments were declined because of insufficient patient information, such as inability to verify insurance policies, and lack of physician referral; this study likely reflects lower rates of appointment scheduling than in a real-world scenario.

Examining key factors on the road to leadership positions among pediatric ophthalmology faculty
Rudd Zhong Manis J, Bicknell BT, Chishom H, et al
J AAPOS 2025;29(6):104689
The purpose of this study was to identify key factors associated with attaining leadership positions among US academic pediatric ophthalmologists, with a focus on gender, fellowship

training, years of practice, research productivity (eg, H-index, number of publications), and variables related to their academic institutions. This cross-sectional study reviewed publicly available data accessed through institutional websites. Institutional variables included public/private designation and location within US census regions. Of 125 US-based ophthalmology programs, 517 pediatric ophthalmology faculty were characterized (54.6% women). In multivariable analysis, academic rank and H-index were strongly associated with leadership positions (P < 0.001 and P = 0.008, resp.), whereas years since fellowship completion, gender, number of fellowships, and advanced degrees were not. Women full professors had fewer years since fellowship than men (24 vs 36 years [P < 0.001]). Female leadership distribution mirrored faculty averages by region. The authors felt that underrepresentation of women in full professor and senior leadership roles may reflect a lag in promotions corresponding to the increasing presence of women in pediatric ophthalmology in recent decades. limitations: relied on publicly available institutional directories, which may contain inaccuracies; gender identification was not self-reported, leadership roles outside academia were not included, cross-sectional study; Impact on clinical practice: This study sought to provide insights into how to promote equitable career development within academic pediatric ophthalmology.

Enhancing patient and parent education in pediatric ophthalmology using artificial intelligence: a report by the AAPOS Public Information Committee
Dihan QA, Brown AD, Alzein AF, et al
J AAPOS 2025;29(6):104693
Parental health literacy significantly affects pediatric ophthalmology follow-up care and adherence to treatment regimens, yet patient education materials (PEMs) often exceed the American Medical Association's recommended 6th-grade reading level. This study evaluated the baseline readability, quality, and accuracy of PEMs by the American Association for Pediatric Ophthalmology and Strabismus (AAPOS) and assessed how LLMs may improve these PEMs. This cross-sectional study analyzed 111 PEMs from the AAPOS website. Readability was assessed using the Flesch-Kincaid Grade Level (FKGL) and Simple Measure of Gobbledygook (SMOG) which found Baseline PEMs were written on average at a 9th-grade reading level (SMOG, 9.0 ± 1.6; FKGL, 9.6 ± 2.1), with only 3.6% meeting the 6th-grade recommendation. Quality and understandability were evaluated using the DISCERN and the Patient Education Materials Assessment Tool (PEMAT), respectively. Accuracy was assessed using the Likert misinformation scale. Each PEM was separately rewritten by ChatGPT-4 and Gemini Advanced after initial analysis and it was noted that ChatGPT-4 rewrites improved readability to a 7th-grade level without compromising quality, while Gemini Advanced rewrites met the 6th-grade threshold but showed modestly reduced quality (DISCERN: 3; P < 0.001). Both models enhanced understandability (ChatGPT-4, 90.9%; Gemini Advanced, 91.3%; [P < 0.001]), and their rewrites contained no misinformation (Likert = 1). limitations: focus only on textual PEMs, did not include any direct patient assessments, only included English -language PEMs, Impact on clinical practice: AAPOS PEMs were high in quality and accurate at baseline, but written at a 9th-grade reading level. As supplemental tools, LLMs can improve PEMs' readability and understandability, but should be thoroughly reviewed by physicians to ensure optimal safety and education.

Minority representation in the 2024 American Association for Pediatric Ophthalmology and Strabismus (AAPOS) annual meeting program
Josef JD, Bradfield YS, Greninger DA, Chang TC; Diversity, Equity Inclusion Task Force members; Annual Program Committee members of the American Association of Pediatric Ophthalmology and Strabismus
J AAPOS Published online February 12, 2026
This cross-sectional study examined differences in acceptance rates of research and workshop abstracts submitted to the 2024 American Association for Pediatric Ophthalmology and Strabismus (AAPOS) annual meeting between underrepresented in medicine (URiM) and non-URiM authors. URiM status was defined as individuals identifying as Black or African American, Hispanic or Latino, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or LGBTQ+. For all abstract submissions, authors were asked to complete a questionnaire self-reporting gender, URiM status, whether the submission addressed diversity, equity, and inclusion (DEI)-related topics, and trainee status when applicable. A total of 443 abstracts were submitted, of which 89.1% were research abstracts and 10.8% were workshop abstracts. Overall, 75.7% of research abstracts and 54.2% of workshop abstracts were accepted. There were no statistically significant differences in acceptance rates for either research or workshop abstracts based on URiM status, nor were there differences between acceptance of DEI-related versus non-DEI-related topics. Female-presenting authors had significantly higher acceptance rates compared to male-presenting authors ($p = 0.0015$). Additionally, no significant differences in acceptance were observed when “decline to answer” responses were recategorized as all URiM, all non-URiM, or split evenly between the two groups. Strengths of this study include the comparison of masked and unmasked review processes and attempts to account for “decline to answer” responses. Limitations include the unknown overall distribution of URiM and gender status within the AAPOS membership, which limits generalizability to the entire medical society, as well as the possibility that higher acceptance rates among female authors reflect their greater representation within AAPOS. The cross-sectional design, inability to assess trends over time, and reliance on self-reported data also represent limitations. Overall, this study demonstrated that the current AAPOS annual meeting abstract review process resulted in no differences in abstract acceptance rates based on URiM status.

Strabismus surgery charges at ambulatory facilities across the United States
Wu ZZ, Oatts JT, Hunter DG, Oke I
J AAPOS Published online January 31, 2026
This cross-sectional study investigated factors contributing to variation in charges for strabismus surgery and the potential impact on reimbursement for pediatric ophthalmology and strabismus surgeons. The authors analyzed data from the National Ambulatory Surgery Sample (NASS) using strabismus-related Common Procedural Terminology (CPT) codes from January 2016 through December 2020. The primary outcome was the total hospital facility charge per encounter in U.S. dollars. Patient demographics analyzed included age, sex, ZIP-code–level median household income, and insurance type, while facility characteristics included census region, population, urban versus rural location, and teaching status. A total of 154,005 patient

encounters were analyzed, of which 69.9% involved pediatric patients and 91.8% occurred in teaching facilities. Overall, inflation-adjusted charges increased by 35.4% during the study period. Higher charges were associated with facilities located in the Northeast, non-teaching facilities, and urban settings. Patient demographics with higher charges were seen among individuals residing in ZIP codes within the lowest income quartile and those with non-private insurance, including Medicare, Medicaid, self-pay, and other non-private plans. Strengths of the study include use of a large, nationally representative database encompassing approximately 83% of the U.S. resident population and 76% of ambulatory surgery encounters. Limitations include changes to NASS surgical coding in 2018, inability to track repeat surgeries for individual patients, and inclusion of only hospital-owned facilities. Overall, the findings highlight significant geographic and demographic variability in strabismus surgery charges, underscoring the need to address disparities and highlighting opportunities to improve access to strabismus care.

Advanced clinical practice in paediatric ophthalmology: a service evaluation of clinic implementation and the first three years of practice
Alexander K
Strabismus Published online December 4, 2025
This service evaluation examined the early impact of an Advanced Clinical Practice provider (ACP) clinic in the United Kingdom using retrospective data from patients seen over a 3 year period. A total of 278 appointments were analyzed. ACPs managed 66% of cases independently, while ophthalmologist-consultants were needed in 34%. The most common reason for consultant involvement was prescribing requirements, accounting for 53% of those cases. Diagnoses spanned anterior, posterior, and eyelid conditions, with chalazia representing 23% of visits. Management performed by ACP involved reassurance (33%), medications (26%), monitoring (22%), advice (16%), and referral for surgery (3%). Overall, the clinic handled diverse cases and reduced physician workload, though prescribing restrictions limited ACP autonomy and highlighted opportunities for role expansion. A limitation of the study is that the assessment of the accuracy of diagnosis and quality of management were not compared to a “gold standard” such as an ophthalmologist. Despite this, the study is a very good step toward understanding the potential roles that ACP providers may perform as part of an integrated pediatric eye care service.

Prematurity

PREVALENCE AND DEGREE OF RETINAL VASCULATURE ALTERATIONS IN ADULTS BORN PRETERM WITH VERY LOW BIRTH WEIGHT: A Birth Cohort Study
Kulmala MK, Kajantie E, Morken TS, Majander A
Retina 2025;45(12):2383-2392
The vascularization of the retina is complete a birth in term neonates, but those born premature have incomplete vascularization and are at risk of retinopathy of prematurity. While there are many studies exploring incomplete peripheral vascularization in neonates after treatment for ROP, the natural history of retinal vascularization in preterm neonates without ROP treatment is less certain. This cohort study included 175 adults aged 34 to 42 and were stratified into very low birth weight (<1500g) and controls. No infants had been treated for ROP, but there were also no strict screening guidelines. Very low birth weight eyes had altered foveal thickness and mild foveal ectopia. The foveal avascular zone was also smaller in very low birth weight eyes. Almost a quarter (23%) of the very low birth weight eyes had persistent avascular retina, although none had any lattice degeneration or retinal holes. These anatomic changes did not affect visual acuity and no patients had retinal complications. This study has the advantage of looking at retinal changes many years after birth, although given there was no standardized ROP screening, the prior stage or zone of ROP in these participants is unknown. The study does not address optimal management and follow-up of persistent avascular retina in infants who do not require ROP treatment, although suggests that persistent avascular retina is very common in very low birth weight infants, with few complications in this cohort, although there may be selection bias.

Optic Disc Characteristics in Children Born Preterm With and Without ROP: Results From the Gutenberg Prematurity Eye Study Young (GPESY)
Fieß A, Gißler S, Grabitz S, et al
Invest Ophthalmol Vis Sci 2025;66(13):21
The aim of this prospective cohort study was to identify variations in optic nerve head architecture among former premature infants with and without ROP. Included were 793 children aged 4–17 years born preterm or full term, peripapillary retinal nerve fiber layer (pRNFL) thickness, minimal rim width (MRW), Bruch's membrane opening (BMO), and vertical cup-to-disc ratio (vCDR) in relation to perinatal factors. Children born extremely preterm had significantly thinner pRNFL overall except temporally. Those who received treatment for ROP showed thicker temporal and inferotemporal pRNFL but thinner superonasal sectors. Perinatal adverse events and maternal smoking were both associated with thinner pRNFL. Breastfeeding, in contrast, was linked to slightly thicker pRNFL measurements. MRW was reduced in extremely preterm children, especially in inferior sectors. Both moderate and extremely preterm groups demonstrated larger vertical cup-to-disc ratios. Overall, prematurity correlated with thinner nerve fiber and rim measurements and larger cups, while ROP treatment showed sector-specific thickening effects. The application to practice is better understanding of typical optic nerve head features in former premature infants to better differentiate from other congenital or acquired optic nerve abnormalities.

Refractive Error

Atropine or Cyclopentolate to Diagnose Premyopia in Preschool Children
Wu H, Wang Y, Lu Q, et al
JAMA Ophthalmol 2025;143(11):904-913
This study evaluates the effects of atropine versus cyclopentolate on objective refraction outcomes in preschool children after cycloplegia. The analysis combines data from the 2024 Preschool Children Refractive Development Pattern and Influencing Factors Study (PRDP-IFS) and the 2013-2014 Elaborative Shanghai Childhood Ocular Refractive Development Study (E-SCORDS), including 1761 children and their 3048 eyes. Results indicate that the mean cycloplegic spherical equivalent (DSE) was significantly higher in the atropine group (1.56 D) compared to the cyclopentolate group (0.97 D), suggesting less myopic refractive outcomes with atropine. The frequency of refractive states also showed significant differences, with more prevalence of moderate to high hyperopia and low hyperopia in the atropine group, while premyopia was more common in the cyclopentolate group. The study highlights the potential benefits of atropine in improving diagnostic outcomes for premyopia but acknowledges that the two agents were not tested within the same cohort.

Effect of Defocus Incorporated Multiple Segments (Fog Vision +0.50 D) Combined With 0.01% Atropine on the Preclinical and Early Stages of Myopia in Children
Zhao Q, Zhao Z, Zhao G, et al
J Pediatr Ophthalmol Strabismus 2026;63(1):11-22
This retrospective case series evaluated a three-part myopia prevention/control regimen – DIMS (defocus incorporated multiple segments) spectacles, intentional “fogging” with an additional +0.50 D over cycloplegic correction to (per the authors) fully relax accommodation, and nightly 0.01% atropine – in children with preclinical or very early myopia. Ninety-six children (192 eyes), ages 6–14, were included, with baseline cycloplegic SE between +1.00 and −1.00 D and generally “borderline” axial lengths clustered near the age-matched 50th percentile. A key practical feature was that children were instructed to wear the DIMS spectacles only at home, not at school, aiming to improve adherence in children reluctant to wear glasses publicly. Outcomes were assessed over 12 months using cycloplegic refraction and IOLMaster axial length (AL). Rather than using an untreated control group, the authors compared each eye’s annual AL growth to sex- and age-matched physiological AL growth curves from epidemiologic data. Treatment “success” for AL was defined as growth within 25% of the expected physiologic rate (the “green zone”), while refractive success was defined as myopia progression ≤ −0.50 D/year. After one year, AL increased significantly in both sexes, as expected, but 87% of eyes met the physiologic-growth success criterion. Similarly, 93% of eyes showed low/no refractive progression by the −0.50 D/year threshold. Subgroup analyses by baseline AL (above vs below the 50th percentile) and age (<10 vs ≥10 years) showed no statistically significant differences in success rates, suggesting broadly similar efficacy across these risk strata. The authors argue the combination may be synergistic: DIMS provides peripheral myopic defocus, atropine reduces progression via non-accommodative mechanisms, and +0.50 D fogging is intended to relax accommodation during near work. Major limitations include the retrospective design, lack of randomized controls, reliance on external normative AL curves, and inability to isolate which

component drove the observed effect. Still, the study suggests that early, multi-modal intervention may be effective. Certainly, further study regarding multimodal therapy is needed to better define synergistic effects, redundancies, and tolerance in the search for the most effective combination.

Association of secondhand smoke exposure with child astigmatism in the Hong Kong children eye study
Shing E, Kam KW, Zhang Y, et al
Br J Ophthalmol 2025;110(1):94-100
Secondhand smoke (SHS) has a variety of health hazards with prior studies indicating alterations in the posterior segment (retinal vasculature, RNFL, choroidal thickness), earlier myopic onset, and greater axial myopia. Prior studies have also indicated an association between childhood astigmatism and maternal smoking during pregnancy. This was a population-based cross-sectional study of 11,545 children (6–8 years old) from the Hong Kong Children Eye Study. Astigmatism was measured through retinoscopy and keratometry, while smoking exposure was quantified through parental survey. Regression analysis was used to assess the level of risk association. About a quarter of patients (26.47%) had SHS exposure with the number of cigarettes/day smoked by parents being on average 16.90±10.10. Adjusting for age, sex, spherical value, parental astigmatism, and family income, SHS exposure was found to have a OR=1.64 with two smoking parents, but having one smoking parent was not associated with refractive or corneal astigmatism. The risk increased to 2.18-fold with increased smoking consumption (≥10 cig/day to ≥20). Limitations include this being a cross-sectional snapshot as opposed to prospective study with more of a statistical association being noted. Smoking use was also based on parental survey input, which can be confounded by biases and accuracy issues. That being said, this adds another aspect of (eye) health that further stresses the importance of avoiding SHS exposure in children.

Reference values of spherical equivalent for predicting the onset and progression of myopia among children and adolescents in China
Qin R, Liu Y, Li H, et al
Br J Ophthalmol 2025;109(11):1221-1225
Myopia is an emergent global public health issue, particularly in Asian countries. The aim of this study was to establish reference values of cycloplegic spherical equivalent (SE). This study was based on vision screenings among 67,260 Chinese children (grade 0–12), obtaining cycloplegic SE via auto-refraction (desktop TopCon KR800) with spot-checking of 5% of randomly selected samples to ensure precision. Of the cohort, 48.36% were boys and 4178% were from schools in more economically-developed areas. The majority (23.17% and 65.56%) were in younger grades (senior kindergarten and elementary school, respectively). The prevalence of myopia ≤ -0.50 D SE was 1.2% (boys) and 1.0% (girls) in grade 0 (senior kindergarten) and increased to 82.4% (boys) and 87.7% (girls) by grade 12 (3rd year of high school). High myopia (≤-6.00 D SE) in boys was found to be 11.6% in grade 12. Statistical modeling was performed to provide a trajectory of SE progression—with mention of needing to remove extreme outliers (3.0% of observations). Modeling predicted a kindergarten boy of SE > 1.54 D would be non-myopic by grade 12, whereas one with SE > 0.19 D would become myopic but not reach high myopic

levels by grade 12. This study provides helpful reference values for predictive modeling of myopia within children in China. Limitations are that this is not a prospective study of myopia progression but based on modeling, albeit from a large cohort of data. Also, it is not necessarily widely applicable to global health given the homogeneity of the population observed.

Dietary omega-3 polyunsaturated fatty acids as a protective factor of myopia: the Hong Kong Children Eye Study
Zhang XJ, Zhang Y, Zhang YJ, et al
Br J Ophthalmol 2025;110(1):101-106
Myopia is a growing global concern with interest in multifactorial ways to curb progression. Prior animal studies have suggested that ω-3 polyunsaturated fatty acids (PUFAs) may suppress myopic progression by affecting choroidal blood flow and scleral hypoxia, which leads to axial elongation. This study was part of the population-based Hong Kong Children Eye study looking at 1005 Chinese children (ages 6–8 years old) looking at a validated food-frequency questionnaire, questionnaire on children's outdoor time and near-work time, cycloplegic spherical equivalent (SE) refraction with autorefractor, and axial length (AL) via IOL Master. In the cohort, mean age was 7.64 years, SE was 0.00 D, and AL was 23.22 mm. The rate of myopia was 27.5%. Adjusting for age, sex, BMI, near-work time, and parental myopia history, AL was found to be longest in the lowest quartile of ω-3 PUFAs intake (mean 23.29 mm; 95% CI = 23.17–23.40 mm) compared to highest quartile of ω-3 PUFAs intake (mean 23.08; 95% CI = 22.96–23.19 mm) (p=0.01). SE was also found to be most myopic in lower quartile group of ω-3 PUFAs intake (mean -0.13 D; -0.32–0.07) vs highest quartile (mean 0.23 D; 0.03–0.42) (p = 0.01). Conversely, a diet higher in saturated fatty acids (SFAs) was associated with a higher axial length (23.30 mm; 23.17–23.42) compared to lower SFAs intake (23.13 mm; 23.01–23.24). This study is limited by its cross-sectional nature, which makes it difficult to more definitely put a causal/temporal relationship on diet and myopic progression, Secondly, dietary intake was based on a snapshot survey, which has recall bias and can be affected by timing of study. Furthermore, blood levels of FAs were not used to verify. Dietary supplementation was also not taken into account. However, this raises an interesting question of a possible nutritional component that can be looked at in a more longitudinal, rigorous way to see if another aspect of lifestyle modification can affect myopic progression.

Efficacy comparison of atropine, orthokeratology and repeated low-level red-light therapy for myopia control in children: a systematic review and network meta-analysis
Zheng Z, Jiang X, Chen R, Dong L
Br J Ophthalmol 2025;109(11):1215-1220
Myopia is a growing global concern with interest in multifactorial ways to curb progression. This was a review and meta-analysis of 41 RCTs (6434 eyes) involving atropine 0.01% drops (AP), orthokeratology (Ortho-k), and repeated low-level red-light therapy (RLRL)—including combination therapies—with primary outcomes of mean changes in cycloplegic spherical equivalent (SE) and axial length (AL) at 1-year follow-up. All interventions showed efficacy in slowing myopic progression compared to control groups. For AL progression slowing, cumulative probability rankings showed RLRL (93.4%) > AP+Ortho-k (80.9%) > Ortho-K (42.8%) > AP (32.8%) at 12-month timepoint. SE progression showed rankings of RLRL

(80.8%) > AP (28.3%) and AP+Ortho-k (80.0%) > Ortho-k (60.4%) at 12 months with separation of these two groups due to smaller sample sizes and temporary SE-reducing effect of Ortho-k. All interventions showed efficacy with RLRL showing the highest rank in AL and SE progression, which is in contrast to prior reported studies showing AP+Ortho-k showing higher efficacy. The theory is that RLRL leads to higher choroidal thickening and thus reduction in AL growth. Combination therapy was also shown to have better effect than monotherapy in more established practices (AP, Ortho-k). Limitations of this meta-analysis include having smaller study sizes for certain cohorts and non-myopic children were not included. However, this raises the interest in further RLRL evaluation as an effective tool in myopia management.

Advanced maternal reproductive age elevates myopia risk in offspring
Qi J, Lin J, Zhang K, et al
Br J Ophthalmol 2025;109(12):1425-1432
Myopia is a growing global concern with interest in better understanding risk factors that might allow for prediction of progression in certain patients over others. There have been previous studies identifying several prenatal factors linked to postnatal myopic progression but large-scale evidence is lacking. This was a cross-sectional study looking at 14,044 participants in the UK Biobank, an extensive health-related information collection across the UK. Myopic was defined as spherical equivalent (SE) ≤ -0.50 D and high myopia as ≤ -6.00 D. Parental age was categorized as <25, 25–29, 30–34, and ≥ 35 years. Logistical regression models were used with adjusting for age, sex, race, time spent outdoors, income, education, BMI, smoking, and drinking. The prevalence of myopia and high myopia increased with higher maternal and paternal ages. At maternal age <25 years, the prevalence was 36.2% and 4.0% while at ≥ 35 years, it rose to 50.9% and 7.8%, respectively. Similarly, at paternal age <25 years, the prevalence was 34.7% and 3.0% while at ≥ 35 years, it rose to 45.4% and 6.3%, respectively. Both parents showed a negative Pearson correlation (r=-0.08, p<0.001). When adjusting for confounding factors, risk association was found to be highest in maternal age ≥ 35 years for myopia (OR 1.42, p<0.001) and high myopia (OR 1.56, p=0.029); however, no significant effect was noted with paternal age. With interaction analysis looking at parental age and time spent outdoors, spending < 2 hrs outdoors attenuated higher maternal age effect on myopic progression (p=0.042). Limitations of this study include its cross-section design, insufficient data on prenatal conditions (e.g., medication use, pregnancy complications), information on outdoor time being only during summers and in adulthood, and absence of noting near work, which is a known risk for myopic progression. This raises the possible concern of advanced parental age, particularly maternal age, on myopic progression; however, there are too many factors that could not be taken into account from this data bank, making it hard to make a helpful comment on increased risk.

IMI: The Role of Light in Refractive Development and Myopia: Evidence from Animal and Human Studies
Ashby R, Harb EN, Ostrin LA, et al
Invest Ophthalmol Vis Sci 2025;66(15):5
Myopia is a growing global concern with time spent outdoors and sunlight exposure being a beneficial lifestyle factor. This is a review evaluating the background and evidence regarding

this association looking at available animal and human studies. Animal studies have shown characteristics of intensity, spectral composition, and photoperiod can influence refractive development that is felt to be through modulation of the retinal dopaminergic system. However, other pathways have been potentially proposed that work with or are independent of dopamine. These findings have not had strong translational findings in human studies with evidence lacking definitive evidence on the role of sun exposure in retarding myopic progression in humans. Despite that, clinicians often recommend regular time spent outdoors, typically ≥ 2 hours. This worked as a review with suggestions of recommendations on future directions, including look at effects of light on human opsins, specific levels of opsin activation in various types of "white light," incorporating wearable technology in assessing the lighting environment for more accurate ways of evaluating exposure when children are in specific settings, looking at these issues in natural but also artificial lighting, and gaining a better understanding of how myopia relates. Overall, this is a review of current evidence that shows promising avenues of understanding in animal studies but opens prospects and need for further understanding in humans to validate the current recommendations on spending time outdoors.

Refractive Error Centile Curves for Asian and Western Children and Adolescents: An Individual Level Meta-Analysis
Flitcroft DI, Lingham G, Ying GS, et al
Invest Ophthalmol Vis Sci 2025;66(15):30
Myopia is a growing global concern with efficacy depending on longitudinal follow-up of refractive error and axial length. Much of clinical comparison in pediatric settings are based on standardized/normative data charts; however, this is not an established comparison for pediatric refractive changes. This study was a large population-based look at 70,022 eyes (38,898 participants) from 9 studies in East Asian (46.9%), European, North American, and Australian children (6–20 years) with information on cycloplegic spherical equivalent (cSER) and non-cycloplegic (nSER) refractions extracted, and a new method to adjust for the distribution between these data was developed and validated. Overall, males and females had similar centiles in Western and East Asian regions at 8 years, but there was more variation (girls > boys with myopia) in older ages (by 20 years in Western and 15 years in East Asian). After 8 years, there was more myopic found in East Asian > Western region at corresponding ages, increasing in magnitude with increasing age until stabilizing around 16–18 years in females but not as much in males. Limitations include having more inclusion of urban (where people tend to be more myopic) than rural participants, especially in East Asian region. There were also more participants in the cSER group with regression analysis used to compare nSER participants; however, this would be made more accurate with more equal numbers. Furthermore, this being a meta-analysis of studies, there is the limitation that arises from individual studies that could be included and their own limitations or heterogeneity in which populations were looked at compared to other studies. The benefit of this study is in providing population-based data on myopic "growth" over time based on sex and region, which can then potentially be used in comparison when clinically following a patient's course on or off therapy.

Does Past Myopia Progression Predict Future Progression?
Beaulieu WT, Repka MX, Pineles SL, et al

Invest Ophthalmol Vis Sci 2026;67(1):38
This post hoc analysis of a randomized controlled trial (MTS1) evaluated whether a child's past myopia progression—measured by Spherical Equivalent Refractive error (SER) and Axial Length (AL)—can accurately predict how much their vision will worsen in the following year. Researchers analyzed 136 children (ages 5–12) and compared their progression in the first 12 months to their progression in the second 12 months. The study found that prior changes were poor predictors of future behavior. Specifically, if a child's myopia increased by 0.50 D in the first year, there was only a 42% chance they would progress at that same rate the next year. Statistically, the "prior change" variable accounted for a mere 3% to 6% of the variation in future progression meaning factors like age and measurement noise are far more influential than a child's recent history of "fast progression." This study challenges some common clinical assumptions such as waiting to see if a child is a fast progressor before starting myopia control therapy because past progression cannot reliably predict future change so early intervention may be indicated regardless. Pediatric ophthalmologists may also need to consider other factors such as family history and outdoor time in assessing risk.

Inhibition of Retinal AdoRA2a Activity Attenuates Myopia Progression
Liu S, Guan Z, Yang X, et al
Invest Ophthalmol Vis Sci 2026;67(1):15
This research investigates the molecular signaling pathways of myopia (nearsightedness), specifically focusing on the role of the adenosine A2a receptor (AdoRA2a) in the retina. By utilizing retina-specific knockout mice and pharmacological interventions, the study demonstrates that myopia development—triggered by form deprivation (FD)—is associated with a significant rise in retinal adenosine levels and an upregulation of the enzymes responsible for its production (CD39 and CD73). The researchers discovered that while deleting the AdoRA2a gene in the retina significantly inhibits myopia progression and axial elongation, it has no adverse effect on normal eye development under unobstructed vision. Crucially, the study suggests that AdoRA2a acts as a "pro-myopia" signal that likely interacts with Dopamine D2 receptors (Drd2). The findings propose that targeting retinal AdoRA2a with antagonists could serve as a novel and effective therapeutic strategy for slowing myopia. progression in children. In addition, this treatment seems to have a high safety profile and does not disrupt normal refractive development and the natural growth of the eye and also may allow better prediction of which patients are susceptible to myopic progression

Establishment of Myopia Occurrence Prediction Model in Children without Myopia Using Cycloplegic Refraction and Prior Axial Length Change
Xu S, Ruan Z, Wang Y, et al
Ophthalmology 2025;132(11):1260-1272
This was a 5-year prospective school-based study where the authorsfollowed 1,907 Chinese children aged 6–9 years without myopia to develop and validate a model predicting who would become myopic. Children underwent yearly exams with cycloplegic refraction and axial length (AL) measurements, and the main outcome was new-onset myopia (spherical equivalent ≤ −0.50 D) over 1-, 2-, and 4-year periods. The researchers found that a child's baseline refractive error was the strongest predictor overall, while faster eye growth (greater 1-year AL elongation)

added important additional risk information; including changes over 2 years did not meaningfully improve prediction. The final model, which also included sex and parental myopia, showed high accuracy in both the development and external validation groups (AUCs ~0.88–0.94), good agreement between predicted and observed outcomes, and clear clinical usefulness; models that did not use cycloplegic refraction performed worse. Using this tool, the authors proposed more individualized refractive cutoffs to define “premyopia” based on eye growth and family history and created a free online risk calculator. Limitations include the need for prior axial length data, restriction to urban Han Chinese children, lack of data about behavioral factors (e.g., outdoor time), and possible effects of the COVID-19 pandemic on myopia rates due to increased indoor and screen time, which may limit generalizability. Overall, this study provides a practical approach to identifying children at highest risk for myopia to help create more targeted prevention strategies for myopia.

Spatio-Temporal Optical Phase Kit for Myopia Control: Stage 1 Results from a Randomized Controlled Clinical Trial in Chinese Children
Fedtke C, Chen Z, Tilia D, et al
Ophthalmology 2025;132(12):1344-1356
This is a prospective, multi-sight, double masked randomized controlled trial investigating the efficacy of the Spatio-Temporal Optical Phase (S.T.O.P.) kit in reducing myopia progression vs. single vision spectacles (control group). The STOP technology has been developed to produce a dynamic, or a spatially and temporally varying, optical signal that is hypothesized to mitigate myopia progression while maintaining efficacy over time – it is a film that goes over single-vision spectacles and is much more economical than peripheral defocus lenses. Please refer to paper for a more detailed description of the technology behind the films. The study includes health children between ages 6-14yo with myopia between -0.75 to -5.00D, astigmatism of 1.50D or less, and anisometropia of less than 1.00D or less spherical equivalent who had not previously used dilute atropine. 160 eligible participants were randomly assigned to STOP kit 1 group (53), STOP kit 2 group (54), or single vision spectacles (53). The different STOP kits had different optical elements in the films. The primary outcomes measured were change in axial length and change in spherical equivalent from time dispensed to 6 months. Both the S.T.O.P. kit 1 and S.T.O.P. kit 2 groups showed significantly less change in AL compared with the control kit group at the 1-month, 4-month, and 6-month visits. All 3 groups showed a significant increase in AL at the 6-month visit compared with the dispensing. Both the S.T.O.P. kit 1 and S.T.O.P. kit 2 groups showed significantly less change in autorefraction (i.e., less refractive change, specifically less negative autorefraction or less change in autorefraction magnitude) compared with the control kit group at the 6-month visit. All 3 groups showed a significant change in autorefraction (more negative autorefraction) at the 6-month visit compared with baseline. This 6-month randomized controlled clinical trial demonstrated that both S.T.O.P. kits reduce myopia progression in children 6 to 14 years of age compared with single-vision control lenses. Of note, the investigators also looked at vision and satisfaction with the kits, and they did maintain acceptable visual performance and high wearer satisfaction. This study is valuable because it offers a more cost-effect method for myopia management as compared to current options for spectacles. This is stage 1 of an ongoing project, which will be investigating the efficacy of these kits compared to other film designs and compared to static peripheral defocus spectacles.

Myopia and astigmatism in adolescents with autism spectrum disorder
Nitzan I, Khanchin G, Safir M, Wajnsztajn D
J AAPOS Published online September 5, 2025
Myopia and astigmatism, especially when severe, can contribute to visual impairment and poor quality of life. In a nationwide cross-sectional study of nearly 900,000 Israeli adolescents 16-20 years of age undergoing mandatory standardized medical exams from 2011-2022, 2,622 carried a diagnosis of autism spectrum disorder. When adjusted for demographic and socioeconomic confounders, patients with ASD had higher odds of having myopia and astigmatism than those without. They also classified severity of refractive error and found that ASD was associated with increased odds of severe myopia and astigmatism. Study is limited by cross-sectional design with limited information available to determine causality or longitudinal changes in refractive error. Therefore, it can not be definitively concluded from this data that high refractive error in adolescents with autism correlates with amblyogenic refractive errors in younger children. However, data does suggest that regular vision screenings in young patients with autism is likely beneficial.

Factors Affecting the Lifetime Cost of Myopia and the Impact of Active Myopia Treatments in Europe
Lee L, De Angelis L, Barclay E, et al
Am J Ophthalmol 2025;278:212-221
This study examined the lifetime economic impact of myopia control interventions compared to traditional single vision correction in France and the United Kingdom. Using a modeled scenario approach, the authors compared five management scenarios: traditional care, low-dose atropine, anti-myopia spectacles, anti-myopia soft contact lenses, and orthokeratology. The model tracked progression through adulthood and incorporated both direct and indirect societal costs, including the risk of myopia-related complications and vision loss.The results demonstrated that myopia control interventions during childhood likely reduce total lifetime costs compared to traditional care, with cost ratios ranging from 0.50 to 0.81 for children at risk for faster progression and 0.73 to 1.10 for those at risk for slower progression. Children predicted to experience faster myopia progression derived the greatest economic benefit from active myopia control. The estimated lifetime cost of traditional myopia management was approximately $32,492 (faster progression) to $22,606 (slower progression) in France, and $48,170 to $29,664 in the UK. The cost savings from myopia control resulted from reduced refractive progression, decreased need for complex lenses, and lower risk of pathologic complications and vision loss. Notably, female individuals incurred higher lifetime costs due to higher contact lens wear rates, greater prevalence of vision impairment, and longer life expectancy.

A Novel MRI-Based Approach to Peripheral Refraction and Prediction of Myopia Progression
Kneepkens SCM, Van Vught L, Polling JR, et al
Am J Ophthalmol 2025;278:239-249
This study from the Generation R cohort (a population-based birth cohort study in the Netherlands) examined 1635 children using MRI-based ray tracing to investigate the association between relative peripheral refraction (RPR) and myopia progression. Myopic children have

more hyperopic RPR compared to their peers; therefore, myopic defocus lenses use RPR to induce myopic defocus on the peripheral retina while preserving central vision. In this cohort, at age 9 myopic children demonstrated significantly more hyperopic relative peripheral refraction (RPR) compared to emmetropic children at both horizontal (-1.8D vs. 0.2D) and vertical eccentricities (-1.0D vs. 0.8D). Higher RPR was associated with faster axial length progression, with each diopter increase in horizontal RPR conferring a 23% increased risk of incident myopia and vertical RPR conferring a 10% increased risk. The predictive model achieved an AUC of 0.77 for identifying fast progressors.The MRI analysis also revealed substantial interindividual variation in retinal curvature, corresponding to peripheral refractive differences >8D among children with similar axial length and central refraction. The authors posited that this anatomical variability suggested that standard myopia control strategies using peripheral myopic defocus may require individualization to optimize efficacy.

Clinical Nomogram for Determining Expected Choroidal Thickness in Children With Myopia
Flitcroft I, Lingham G, Kerin E, et al
Am J Ophthalmol 2025;278:346-355
This study developed a clinical nomogram to identify children with myopia whose choroidal thickness deviates from expected values, potentially indicating higher or lower risk for future myopic complications. The researchers conducted a post-hoc patient-level meta-analysis of four clinical studies involving participants aged 6-30 years, measuring spherical equivalent refraction, axial length, and choroidal thickness using OCT imaging. Using ordinary least squares regression with restricted cubic splines and linear mixed models, they created prediction models that explained over 44% of the variance in choroidal thickness based on age, sex, spherical equivalent refraction, and axial length.The analysis revealed that approximately 44% of participants had choroidal thickness measurements that were more than 50 μm thicker or thinner than expected, with about half of the remaining variance attributed to inter-individual differences likely reflecting genetic, environmental, or lifestyle factors. The resulting clinical nomogram offered a simple, visual tool that clinicians can use to compare a myopic child's measured choroidal thickness against expected values, potentially helping to identify those at higher risk for myopia-related complications such as myopic maculopathy and enabling more personalized risk stratification and monitoring.

A Novel Comparative Study of Inflammatory Cytokines Through Noninvasive Tear Analysis in Children With Myopia Versus Emmetropia
Nishanth S, Bauer NJC, Shetty R, et al
Am J Ophthalmol 2025;278:413-420
This prospective cross-sectional study investigated inflammatory cytokine profiles in the tear film of children aged 8-15 years with varying refractive errors. The study compared 30 emmetropic eyes (spherical equivalent of ±0.5 D), 39 moderate myopic eyes (-0.50 to -6.00 D), and 25 high myopic eyes (≤-6.00 D) using noninvasive tear analysis collected via Schirmer's strips. Eight inflammatory markers were measured: IL-1β, IL-10, IL-6, MMP-9, ICAM-1, IL-17A, TNF-α, and VEGF-A. The results demonstrated that most inflammatory cytokines showed a positive associative trend in moderate and high myopes compared to emmetropes, with the exception of IL-17 and VEGF-A. After adjusting for age, TNF-α and ICAM-1 were significantly elevated in

myopic children. Additionally, dry eye disease was significantly associated with raised IL-1β, IL-6, and IL-10 levels. The authors concluded that inflammatory processes may play a role in childhood myopia, similar to what has been observed in other inflammatory ocular conditions like keratoconus and uveitis.

Variations in Physiological and Myopic Eye Growth Among Children From Different Populations
Wong YL, Yuan Y, Ye Y, Drobe B, Chen H, Bao J
Am J Ophthalmol 2025;280:20-27
This prospective cohort study from the Wenzhou Medical University-Essilor Progression and Onset of Myopia (WEPrOM) study examined physiological and myopic eye growth patterns in Chinese children and compared them to other populations. The study followed 700 nonmyopic and 297 myopic schoolchildren aged 7-9 years at baseline for 4.5 years, using axial length measurements to quantify eye growth. In WEPrOM children aged 7-12 years, predicted physiological eye growth ranged from 0.22 to 0.12 mm/year, while myopic eye growth ranged from 0.52 to 0.27 mm/year. The key finding was that both physiological and myopic eye growth rates differed significantly across populations. Children in the WEPrOM study demonstrated physiological eye growth (0.22-0.12 mm/year for ages 8-12) comparable to other Chinese cohorts but greater than Singapore (SCORM: 0.12-0.04 mm/year) and the US (OLSM: 0.15-0.06 mm/year). Similarly, myopic eye growth in WEPrOM children (0.5-0.27 mm/year) was comparable to other Chinese studies but exceeded rates in SCORM and OLSM cohorts. The authors concluded that these population-specific differences in eye growth rates have implications for interpreting myopia control efficacy, emphasizing the need to use physiological eye growth rates from similar source populations when evaluating axial elongation outcomes.

Refractive changes following congenital ptosis surgery
Watad M, Masalha M, Wygnanski-Jaffe T, et al
Strabismus Published online December 17, 2025
The authors of this retrospective interventional case series aim to evaluate refractive change associated with ptosis surgery performed on patients under 14 years of age. A total of 24 patients were included and had mean age of 1.8 years at the time of surgery. Sixteen patients underwent bilateral ptosis surgery and 8 unilateral surgery. Eighteen underwent frontalis sling surgery the others had either levator resection, levator advancement or Muller's muscle-conjunctival resection. Most of the patients in this study had a greater than 0.5 diopter change in sphere and cylinder power in the operative eye. Children of ages 1-3 years were affected the most often. Interesting, the unoperated contralateral eyes in unilateral ptosis patients also commonly developed post-operative refractive changes. The authors suggest that correction of unilateral ptosis results in alteration of levator tone and, by way of Herring's law, alteration of the lid position of the contralateral eye. Limitations of the study are significant in that the sample size is small, data are presented as changes in refractive error without information about whether eyes became more or less ametropic and whether patients became more or less anisometropic. Timing of post-operative refraction was not standardized. Applicability to practice is to perform serial cycloplegic refractions post-operatively and give pre-operative education about potential refractive changes with surgery.

Acceleration of Myopic Shifts in Refraction and Axial Elongation Begins in the Premyopia Stage
Cai W, Hu Y, Chen X, Morgan IG, He M, Ding X
Invest Ophthalmol Vis Sci 2025;66(13):33
This prospective study examined how children's yearly changes in refraction and axial eye length depend on their starting refractive error. Researchers analyzed 2,259 participants aged 7–15 from a long-term twin study with up to 12 annual follow-ups and validated findings in a separate cohort. Children were grouped as myopic, premyopic, or hyperopic based on initial spherical equivalent. In hyperopic children, yearly refractive change was similar across ages. In premyopic children, refractive worsening increased as starting refraction decreased, especially before age 12. Already-myopic children showed the largest annual shifts, reaching about −1.0 diopter in those under 10, though changes were stable within age groups. Modeling showed acceleration toward myopia began when starting refraction was around +1.00 D, and axial length trends mirrored refractive patterns. The authors conclude that preventing children's refraction from dropping below +1.00 D may help delay progression into premyopia and myopia. The large number of is a particular strength. A potential weakness is whether results can be generalized to people of all races. The study is applicable to practice by offering a quantitative refractive threshold for myopia control therapies.

One-Year Myopia Control Efficacy of a New Defocus Spectacle Lens: A Randomized Clinical Trial
Han X, Zhang Y, Jin L, Wang D, He M, Zeng Y
Ophthalmol Sci 2025;6(1):100940
In recent years, DIMS lenses have been studied as a potential treatment to slow myopia progression in children. This randomized open-label clinical trial tested the efficacy of a novel defocus spectacle lens (MYOGEN) which was developed to suppress hyperopic defocus across all directions in comparison with standard SVL lens. Patients had to be between 6-14 years of age with SE -1.0D to -3.5D, astigmatism ≥-1.0D, anisometropia ≤1.0D, and normal IOP. Of 174 patients randomized (85 MYOGEN, 89 control), there was significantly less myopic progression of SE and AL in the treatment group compared to the SVL control group (SE -0.8±0.44D vs -1.06±0.51D; AL 0.25±0.15mm vs. 0.37±0.18mm; $p<0.001$). There was no significant difference in glasses compliance or spectacle-related adverse events between the groups. Relative to previous studies using other defocus spectacles, this cohort had a higher rate of myopia progression but also had a lower baseline level of myopia. Previous meta-analysis of similar treatments have also suggested greater efficacy if patients with higher baseline myopia, so it is difficult to generalize the results of this study to know if this lens is more effective than others in the same category. While the theoretical benefit of the lens design to minimize visual discomfort that could be caused by split or disrupted visual field in other lens designs, further head to head study would be needed to understand if there is a clinically significant difference in the visual experience vs the effectiveness of the treatment.

Efficacy and Safety of Low-Concentration Atropine in Slowing Myopia Progression in Children in Japan: The Randomized, Double-Blind Phase II/III ORANGE Study
Ohno-Matsui K, Igarashi-Yokoi T, Migita Y, Yamakawa Y; ORANGE study investigators
Ophthalmol Sci 2025;6(1):100960

While several studies on low-dose atropine for the slowing of myopia progression have been completed to date, it is not yet an approved treatment in Japan, thus compounding and acquisition of dilute atropine in Japan is limited and unreliable in concentration. The ORANGE study was a Phase II placebo-controlled, double-masked study which showed the efficacy of even low-low concentrations of dilute atropine (0.0025%) compared to placebo. This publication now aims to determine the optimal clinical concentration of atropine for myopia progression and assess potential rebound phenomenon with discontinuation. A total of 347 patients, mean age 9.4 years, were randomized 1:1:1 to atropine 0.01%, 0.025%, and placebo and followed for 2 years. At the 2 year mark, each group was again split and randomized to continue or discontinue treatment if initially on atropine vs possibly start atropine or continue placebo if started initially on placebo. Ultimately, there was slowing of progression of myopia SE and AL seen both in the 0.01% and 0.025% concentrations, but to a greater degree with 0.025%. There was a slight rebound effect after washout for patients who were switched to placebo after 2 years. The drop was overall well-tolerated with the most common side effect being photophobia, similar to that reported in previous studies. This study largely reinforces findings previously reported in LAMP and other low-dose atropine studies published in recent years.

MyopiaX-1 Safety and Efficacy of a Novel Approach to Slow Juvenile Myopia Progression: A Multicenter, Randomized, Controlled Trial
Loughman J, Lingham G, Kaymak H, et al
Ophthalmol Sci 2025;6(1):100973
MyopiaX-1 is a cellphone app-based therapy aimed at providing blue light stimulation to the optic nerve head/blind spot to trigger a dopamine-mediated approach to slow myopia progression. This study was a multicenter, randomized, active-controlled, examiner-masked, proof-of-concept clinical trial to assess safety, tolerability, and signals of effect of MyopiaX on myopia progression in European children. 101 treatment naïve children 6-12 years of age with myopia -0.75D to ≤-5.00D were randomized 2:1 to intervention (MyopiaX BID for 12 months+6 months of DIMS lenses) or active control (DIMS lenses for 12 months). MyopiaX treatment sessions lasted a total of 10 minutes with the treatment administered through VR-based mini-games each using commercially available hardware including phone and VR headset. While this proof-of-concept study was not powered for statistical comparison between groups, there was similar rate of progression of spherical equivalent refraction between groups at 6 and 12 months, although higher AL increase at 6 months for the MyopiaX group. There were some concerns about treatment being too long or not engaging from participants using MyopiaX, and the rate of adherence fell from 57% to 25% from 6 to 12 months. There were no safety concerns. This study opens yet another possible avenue to explore for myopia control going forward but will require larger cohorts with longer periods of follow up to determine efficacy of this particular model.

Impact of Myopia Control Interventions on Choroidal Thickness in Children: A Systematic Review and Meta-Analysis of Randomized Controlled Trials
Martinez-Perez C, Oliveira AP
Ophthalmol Sci 2025;6(2):101039

Interventions for myopia control have been a major focus in recent years due to rapidly increasing rates of myopia, and compelling experimental and clinical evidence has identified choroidal thickness (ChT) as a biomarker and possible mediator in myopia progression (thinning linked to progression, thickening observed after effective treatment). Despite this, there are gaps in our understanding of how myopia control interventions influence choroidal structure in children. This systematic review and meta-analysis aimed to synthesize RCTs reporting ChT outcomes across pharmacological, optical, and light-based myopia treatments. Of 316 records initially retrieved, 11 studies met inclusion criteria. ChT was consistently measured using OCT platforms, typically performed under cycloplegia and most studies reported standardized procedures for subfoveal and parafoveal regions. All of the interventions showed evidence of rapid, early ChT thickening with treatment, and the greatest change seen in pharmacological (atropine) or combined treatments. Despite hypotheses brought forward in previous studies regarding mechanism for choroidal modulation and its impact on myopia, this particular analysis cannot further elucidate the mechanism, particularly given the focus on ChT without correlating clinical outcomes such as axial length. Given the continued importance of myopia control, designing future studies to assess roles of choroidal remodeling along with clinical outcomes such as axial length may be helpful in further understanding the mechanisms behind slowing myopic shifts.

Refractive Surgery

None during this period.

Retina

Oral fluorescein angiography allows for more precise detection of sickle cell retinopathy in pediatric patients
Lindquist M, Stafie ST, Ward C, et al
J AAPOS 2025;29(6):104683
Current screening protocols for sickle cell retinopathy (SCR) based on expert consensus recommend dilated fundus examination starting at age 10 and every 1-2 years thereafter, regardless of genotype, based on low-quality evidence. This retrospective study compared oral ultrawide-field fluorescein angiography (UWF-FA) to fundus photography in the detection of SCR. They included patients with known sickle cell disease (SCD) who were referred to the ophthalmology clinic at Seattle Children's Hospital for SCR screening who underwent both modes of imaging (October 2022 – January 2025). Four retina specialists masked to clinical information assessed SCR severity using the Goldberg classification system; their findings were compared to grades by an unmasked pediatric vitreoretinal specialist. They included 32 patients, 7-21 years of age (24 were diagnosed with HbSS (75%), 6 with HbSC (18.75%), and 2 HbSb-thal (6.25%)). Sixteen patients (50%) were diagnosed with SCR by the unmasked grader. In evaluating the UWF-FA images, the masked graders identified SCR in all 16 cases, as did the unmasked grader, but using fundus photographs they indicated the presence of SCR in only 75% of the same cases. SCR was more prevalent among HbSC (83%) and Hb-beta thalassemia trait (100%) patients compared with HbSS (38%). In this cohort, angiographic evidence of disease was found as early as age 7. Limitations: small sample size, retrospective study. Impact on clinical practice: Findings suggest screening should be considered before age 10 years and oral UWF-FA may be more effective compared to fundus photography in the detection of SCR.

Retinal Detachment After Primary Congenital Glaucoma Surgery
Bayoumi NHL, Khalifa NAE, Moustafa M, et al
J Pediatr Ophthalmol Strabismus 2026;63(1):23-27
This retrospective case-control study reports the incidence, characteristics, and outcomes of retinal detachment (RD) in children who previously underwent surgery for primary congenital glaucoma (PCG). Reviewing 363 children (507 eyes) over a long follow-up period, the authors identified 13 children (17 eyes) who developed RD, yielding an incidence of 3.35% of eyes and 3.58% of children. Most detachments were rhegmatogenous (88%), and bilaterality occurred in nearly a third of affected children (31%), underscoring the severity of this complication. At the time of initial glaucoma presentation, case eyes were not obviously "worse" than controls: there were no significant differences in baseline IOP, corneal diameter, axial length, or cup-to-disc ratio. This is clinically important because it suggests RD risk is not easily predictable at the outset. However, case eyes ultimately underwent approximately twice as many glaucoma surgeries as controls (mean 2.2 vs 1.1 procedures per eye), raising the possibility that repeat surgical decompressions and/or persistently uncontrolled disease contribute to later vitreoretinal pathology. RD was often detected late and carried a poor prognosis. At diagnosis, 47% of eyes were considered inoperable, and only 29% had controlled glaucoma. Management varied (scleral buckle vs PPV with silicone oil), with recurrent RD noted in half of the buckle cases. Even after anatomical repair, functional and structural outcomes remained guarded: at final

follow-up, 41% of eyes progressed to atrophia bulbi, and among eyes with available IOP data after RD repair, most still had uncontrolled glaucoma. The authors emphasize that RD after PCG surgery is an uncommon but devastating long-term complication, and they advocate for meticulous, lifelong follow-up, including attempts at peripheral retinal evaluation.

The Influence of Myopia Progression in Children on the Risk of Retinal Detachment: A Comprehensive Outcomes Analysis
Shmushkevich S, Berzack S, Bajrami S, et al
J Pediatr Ophthalmol Strabismus 2026;63(1):7-10
This large retrospective cohort study used the TriNetX electronic medical record platform to evaluate whether childhood myopia is associated with an increased risk of retinal detachment over a 10-year follow-up period. The authors identified 151,499 children with a diagnosis of myopia (ICD-10 H52.1) across 66 U.S. health care organizations and compared them with more than 5 million children without myopia who had routine health examinations. To reduce confounding, a 1:1 propensity score match was performed for age, sex, and race, yielding two balanced cohorts of 145,814 children each (mean age ~11 years, ~52% female, similar racial/ethnic composition). Over the study window (2004–2024), retinal detachment (ICD-10 H33) occurred in 657 myopic children (0.5%) compared with 63 non-myopic children (0.04%). This corresponded to an absolute risk difference of 0.004 and a markedly elevated relative risk, with risk ratio of 10.43 and odds ratio of 10.47 (both highly statistically significant). Although the authors also examined the average number of retinal detachment diagnoses per affected child, this difference was not statistically significant between groups, suggesting the primary signal was driven by the increased incidence of detachment rather than recurrent events once detachment occurred. The study's key contribution is scale: it provides large, U.S.-based data supporting a strong association between pediatric myopia and subsequent retinal detachment within a decade. However, several limitations temper interpretation. The analysis relies entirely on ICD coding, which introduces misclassification risk for both myopia and retinal detachment, and it does not stratify myopia severity (low vs high), axial length, or progression rate. In addition, propensity matching was limited to demographics and did not account for important confounders such as trauma, prematurity/ROP, connective tissue disorders, prior ocular surgery, or socioeconomic access to care. Even with these caveats, the findings reinforce the clinical and public health rationale for early myopia detection, counseling, and progression-slowing strategies, with particular attention to long-term retinal risk in children who become myopic early.

Influence of Strabismus Surgery on Fundus Hemodynamics Based on Swept-Source Optical Coherence Tomography Angiography Blood Flow Parameters
Huang L, Zhong H, Zheng W
J Pediatr Ophthalmol Strabismus 2025;62(6):408-420
This prospective, contemporaneous controlled trial used wide-field swept-source OCT angiography (SS-OCTA) to ask a question that strabismus surgeons rarely get to explore in detail: does routine horizontal rectus surgery measurably alter posterior segment perfusion, and if so, where and for how long? The authors enrolled 124 patients (June 2023–January 2024) undergoing either unilateral recession (UR; one horizontal rectus) or recession–resection (RR; two horizontal rectus muscles). SS-OCTA metrics were collected preoperatively and at 1 day, 1

week, and 1 month postoperatively using a 12×12 mm macula-centered scan, with analysis extending well beyond the traditional 6×6 mm zone into the peripheral 6–12 mm ring. Overall, horizontal rectus surgery produced transient, region-specific microvascular changes that peaked around 1 week and largely normalized by 1 month, with consistent foveal sparing. Retinal findings were subtle: superficial capillary plexus (SCP) vessel density was mostly stable, while the deep capillary plexus (DCP) showed the most consistent postoperative signal, particularly in the peripheral retina. In the UR group, DCP increased in the 6–12 mm ring beginning at day 1 and remained elevated through 1 month. In the RR group, DCP rose at 1 week in the 3–12 mm region and returned to baseline by 1 month, while SCP showed only a brief peripheral increase at day 1. Choroidal parameters were more reactive than retinal ones. Both groups demonstrated increased choroidal thickness (CT) and choroidal vascular volume (CVV), with a simultaneous drop in choroidal vascular index (CVI), consistent with postoperative inflammation and stromal expansion. These choroidal changes were larger in the RR group and most prominent outside the central fovea. Choriocapillaris perfusion (CCP) showed minimal change after UR but increased broadly after RR, beginning as early as day 1. A clinically interesting secondary finding was that lateral rectus surgery produced greater posterior hemodynamic shifts than medial rectus surgery, despite involving fewer anterior ciliary arteries—supporting the idea that local anatomic relationships (short posterior ciliary arteries/vortex veins) and collateral capacity may matter more than simple artery counts. Taken together, the study suggests that routine horizontal rectus surgery causes a short-lived, mostly peripheral posterior segment vascular response, more choroidal than retinal, while central macular perfusion remains relatively protected.

Profound effect of light on cysts in X-linked retinoschisis
Hassan S, Stanley ST, Brandauer E, et al
Invest Ophthalmol Vis Sci 2026;67(2):1
X-linked retinoschisis (XLRS) is a hereditary retinal disorder caused by RS1 gene mutations that leads to macular cysts and progressive vision loss, with previous reports suggesting diurnal variations in cyst severity. This study investigated whether these variations in Rs1-knockout mice are driven by time of day or environmental light exposure. Rs1-KO mice aged 2.5-4 months underwent electroretinogram (ERG), optical coherence tomography (OCT), and intraocular pressure measurements at 5 AM and 5 PM under various experimental conditions: standard 12-hour light/dark cycles, reversed cycles, continuous light, and continuous darkness. Eyes were collected for immunohistochemistry and Western blot analysis to assess synaptic changes. Light exposure—not time of day—was the primary driver of retinal changes, with extended light exposure (≥11.5 hours) completely resolving cysts and improving ERG b-wave amplitudes, while prolonged darkness (≥12 hours) worsened both structural and functional outcomes. Cyst size strongly correlated with ERG b-wave amplitudes ($R^2 = 0.71$, $P < 0.0001$), with immunohistochemistry revealing disrupted photoreceptor-bipolar connections in dark-exposed retinas that reorganized after light exposure. Ketamine/xylazine anesthesia also contributed to cyst reduction (0.025 ± 0.006 mm² decrease, $P < 0.0001$), though this effect was independent of light exposure. The study's major strength lies in the experimental design that isolated the effects of light exposure from circadian rhythm and anesthesia confounders through multiple experimental paradigms. Limitations include the use of a mouse model which may not

fully replicate human disease, particularly regarding cone-mediated central vision that is most affected in human patients, and the need for anesthesia which itself influenced outcomes. These findings suggest that OCT and ERG measurements in XLRS clinical trials should be time- and lighting-stamped to ensure valid comparisons, and controlled light exposure may represent a novel, non-invasive therapeutic strategy for patients with XLRS.

The Developmental Landscape of Children With Uveal Coloboma and Its Relationship With Clinical Phenotype and Genetics
Brooks BP, Hehn AT, Blain D, et al
Am J Ophthalmol 2026;282:345-357
This study examined the developmental landscape of 70 children with uveal coloboma to determine the relationship between developmental delay, syndromic presentation, and genetic findings. Patients underwent comprehensive systemic testing, molecular genetic testing, and cognitive/adaptive behavioral assessments between 2009 and 2023. Those with two or more abnormal systemic findings (excluding ocular or developmental issues) were classified as syndromic, which occurred in 23 patients. Causative genetic variants were identified in only 13 cases (19%), suggesting many undiscovered genetic or environmental factors remain. The key findings demonstrated that children with syndromic coloboma had significantly greater odds of developmental delay compared to those with nonsyndromic presentations (OR 4.81, P = .004). Additionally, a syndromic diagnosis increased the likelihood of obtaining a molecular genetic diagnosis (OR 6.91, P = .004). The authors concluded that systemic findings are common even in patients presenting with apparently isolated coloboma, emphasizing the importance of comprehensive phenotyping in this population.

Evaluation of retinal microvascular changes and laboratory characteristics in children with Wilson disease: an optical coherence tomography angiography study
Eker S, Gumus M, Karakucuk Y, Duyan SA, Gumustekin RK, Emiroglu HH
J AAPOS Published online February 2, 2026
Wilson’s disease (WD) leads to abnormal copper accumulation that affects multiple organs, including the liver, brain, cornea, and kidneys, and prior research has also suggested the presence of small vessel disease. This study aimed to evaluate retinal microvascular changes in pediatric patients with WD using optical coherence tomography angiography (OCTA), examining macular perfusion in relation to laboratory findings. In a prospective, cross sectional comparative design, newly diagnosed and untreated WD patients were compared with age and sex matched controls. Participants underwent laboratory testing—including liver function tests, serum copper, urinary copper excretion, and serum ceruloplasmin—and OCTA imaging to measure superficial, deep, and choriocapillaris vascular density, as well as foveal avascular zone (FAZ) dimensions, subfoveal choroidal thickness, and central macular thickness. A total of 26 WD patients and 35 controls, both groups averaging 14 years of age, were included. Children with WD demonstrated significantly increased values in superficial and deep FAZ areas and increased vascular density in the inferior sector, while male patients showed lower vascular density in the superior sector compared with female patients. Only two WD patients exhibited Kayser–Fleischer rings, and none displayed sunflower cataracts, optic disc abnormalities, or neurological involvement. Significant correlations emerged between urinary copper excretion,

serum ceruloplasmin, and nasal sector vascular metrics, as well as between subfoveal choroidal thickness and hepatic dry copper. Although the study was limited by its small sample size, its findings suggest that OCTA may be a useful noninvasive tool for detecting microvascular retinal alterations in pediatric WD.

Association between retinal findings and risk of mortality in pediatric abusive head trauma
Elhusseiny AM, Azhari JO, Ercanbrack CW, Chauhan MZ, Phillips PH, Grigorian F
J AAPOS Published online January 27, 2026
Abusive head trauma (AHT) is strongly associated with multilayered retinal hemorrhages, which have been linked to an increased risk of mortality. This study evaluates how specific retinal hemorrhage characteristics, comorbid systemic conditions, and socioeconomic factors relate to in hospital mortality among children diagnosed with AHT. Conducted as a single institution retrospective review over ten years, the study included hospitalized children with confirmed AHT and retinal hemorrhages documented with RetCam imaging. Two fellowship trained pediatric ophthalmologists independently graded the hemorrhages using a three part system assessing extent, spread, and morphology, with analysis based on the more severely affected eye. Neighborhood context was assessed using the Child Opportunity Index. Among 91 patients, the mean age at injury was approximately eight months, and all had retinal hemorrhages. Mortality was 20%. Higher mortality was associated with greater hemorrhage grade, wider spread, and the presence of retinoschisis, while optic disc edema, vitreous hemorrhage, hemorrhage morphology, and patient age were not associated with increased risk. Younger infants trended toward more severe hemorrhages, and age statistically correlated with hemorrhage spread. Hypoxic ischemic injury was the only comorbidity significantly linked to mortality, whereas skeletal fractures, demographic factors, and socioeconomic measures were not. This study fills an important knowledge gap regarding how hemorrhage severity relates to outcomes in AHT, though its retrospective design and modest sample size limit generalizability. Clinically, the results highlight that higher grade and more extensive retinal hemorrhages are strong predictors of mortality in children with AHT.

Real-Time Adverse Events in Pediatric Fluorescein Angiography: IV versus Oral
Sorour O, Ikram N, Shuldiner S, et al
Ophthalmol Retina 2025;9(10):1027-1029
Fluorescein angiography is generally considered relatively safe, with most complications being immediate and minor, although limited data exists in children. This retrospective consecutive observational study included all 258 fluorescein angiography (FA) visits of 207 pediatric patients. Around one third of visits were associated with adverse events (36%). The most common adverse events related to fluorescein were nausea, emesis, and itching. Pain, difficult cannulation, and failed cannulation were seen in the intravenous group. Adverse events were more common in the intravenous group (39%) vs the oral group (7.2%). There was no significant association with patient sex, ethnicity, or allergies. The rate of complications in this study is higher than reported previously, but this may be due to meticulous record-keeping of any event that occurred. Oral fluorescein angiography may be a viable alternative if sufficient clinical information can be obtained and has a lower rate of adverse events.

ARTIFICIAL INTELLIGENCE FOR THE DETECTION OF MACULOPATHY IN PEDIATRIC PATIENTS WITH SICKLE CELL DISEASE
Hoyek S, Chaaya C, Abidi M, et al
Retina 2026;46(1):179-186
Children with sickle cell disease are at risk of a variety of ocular complications including sickle cell retinopathy and maculopathy. This study included 348 OCT scans from 174 eyes of 87 patients with sickle cell disease at a single center. All scans were evaluated by experienced clinicians to identify temporal retinal thinning or disorganization in comparison to the nasal macula. Several artificial intelligence models were developed to analyze the OCT images. Accuracy of models was a challenge, but with duplicating values and using specific models they created an algorithm with an accuracy of 96%, using one OCT scan. This early data illustrates the promise of artificial intelligence in interpretation of OCT images and detection of early sickle cell maculopathy, but additional work is needed prior to using this on a widespread level.

SOCIODEMOGRAPHIC FACTORS AFFECTING PRESENTATION IN PEDIATRIC RHEGMATOGENOUS RETINAL DETACHMENT
Zafar S, Zhao AT, Soares RR, et al
Retina 2026;46(1):62-69
Rhegmatogenous retinal detachments (RRDs) are relatively rare in children (estimated 3 per 100,000) but are an important cause of vision loss. Due to the rarity and shortage of pediatric ophthalmologists and retina specialists treating children, many families travel to academic centers to receive care. This study included 229 pediatric patients who presented with RRD at a single center between 2015 to 2024. Details including surgical success as well as area deprivation index, insurance status, rurality of residence, and travel time were recorded. At presentation, only older age was associated with macula-on status at initial visit. Female gender was associated with a better visual acuity at initial presentation. Patients with insurance were less likely to be lost to follow-up. Area deprivation index and travel time did not influence presentation or postoperative outcomes. Overall, this study showed that age and gender were the largest factors affecting presentation in pediatric RRDs. Insurance status was important in patient's ability to attend follow-ups, and connecting patients to insurance resources is important to consider when treating these complex children.

EXCISION OF EXTENSIVE SUBRETINAL FIBROSIS ASSOCIATED WITH RHEGMATOGENOUS RETINAL DETACHMENTS IN PATIENTS WITH FAMILIAL EXUDATIVE VITREORETINOPATHY
Kondo H, Matsushita I, Tsurusaki M
Retina 2026;46(2):281-290
Familial exudative vitreoretinopathy (FEVR) is a hereditary disease characterized by abnormal development of the retinal vasculature leading to retinal detachments. Tractional retinal detachments are the most common, but rhegmatogenous retinal detachments can develop as well. This retrospective case series included 10 eyes with a rhegmatogenous retinal detachment in the setting of FEVR with extensive subretinal fibrosis, without evidence of a tractional retinal detachment. All patients underwent a 25G PPV and a large peripheral retinectomy of greater than 180 deg was completed to excise the extensive subretinal fibrosis in 9 of 10 patients.

Those that underwent complete excision of the fibrosis had retinal reattachment under silicone oil which was subsequently removed without RD recurrence. There were complications including pupillary block glaucoma in one patient and cataract in 2 patients. The authors note that the presentation of a rhegmatogenous retinal detachment in FEVR with extensive subretinal fibrosis is typical in Asian populations, but may not be generalizable. Excision of subretinal fibrosis may be a helpful surgical technique for patients matching the specific profile included in this paper, although further study is needed.

SIMPLE OBSERVATION AS A MANAGEMENT OPTION FOR EARLY-STAGE COATS DISEASE
Lachiver L, Bremond-Gignac D, de Vergnes N, Daruich A
Retina 2025;45(10):1862-1867
Coats disease is a rare congenital condition characterized by unilateral retinal telangiectasia with associated exudation. Early-stage Coats disease is often treated with laser photocoagulation. This study reviewed 52 consecutive patients with Coats disease, and the 8 patients with stage 2A disease (extrafoveal exudation) were included. Seven of these patients were managed with observation, and the mean area of exudation decreased and distance from the fovea increased. One patient had complete spontaneous regression. Although this study shows that observation in early (<2A) Coats disease may be a promising option, the short follow-up (6 months) and limited sample size affects generalizability. Observation requires very close follow-up, and the ability of the patient to present for repeat exams should factor into the ophthalmologist's decision for treatment.

Measuring Rod- and Cone-Photoreceptor-Specific Vision in Inherited Retinal Diseases Using a Commercial Perimeter
Wu V, Roman AJ, Galsterer EL, et al
Invest Ophthalmol Vis Sci 2025;66(13):31
This study developed a clinical perimetry protocol to measure photoreceptor-specific function in inherited retinal diseases. Standard automated perimetry can assess disease severity but cannot distinguish rod, L/M-cone, and S-cone contributions. Researchers created a protocol using an unmodified commercial perimeter with five chromatic testing conditions along the vertical meridian. These included two-color dark-adapted testing, red-on-blue, blue-on-yellow, and standard white-on-white testing. Control data established prediction intervals and defined physiologic ranges for rod- and cone-specific responses. Testing in conditions such as achromatopsia and retinitis pigmentosa produced expected photoreceptor-specific patterns. The method also detected partial cone preservation in incomplete achromatopsia and helped differentiate disease subtypes and stages. Overall, the protocol provides a practical, under-30-minute clinical tool for assessing photoreceptor-specific function across a wide dynamic range. The applicability of practice is the potential to give patients more objective feedback about the stability or deterioration of their vision as well as a standardized assessment of vision across multiple sites.

OCT Angiography of Chorioretinal Microvasculature in Children with Type 1 and Type 2 Diabetes without Retinopathy

Aman S, Asebot M, Patel D, et al
Ophthalmol Sci 2025;6(1):100917
Diabetic retinopathy occurs at high rates (>50%) in youths with both TIDM and T2DM within 12 years of diagnosis. Previously, evaluation of underlying choroidal changes was limited due to available imaging modalities, but with the advent of SS-OCTA, we have an opportunity to better understand vascular changes that may be present prior to the development of clinically significant retinopathy. This cross-sectional observational study aimed to use SS-OCTA to evaluate retinal choroidal vascular metrics in children with T1 and T2DM without DR compared to non-DM controls. Thirty-two patients (age 14±4 years, TIDM 31%, T2DM 22%, Control 47%) had choroidal and retinal OCT-A images showing increased choroidal vascularity index, choroidal vascular volume, and choriocapillaris thickness in T1DM patients, but not T2DM patients relative to control. There was no significant difference between retinal thickness, mean choroidal thickness, vessel skeleton density, vessel diameter index, or flux between groups. It is important to note that the duration of disease in the T1DM portion of this cohort was significantly longer than those with T2DM (8 years vs. 2 years), so further study would be beneficial to understand if these choroidal changes are specific to T1DM or to duration of disease. The power of this study is also limited by small sample size. The opportunity to use OCT-A as a non-invasive screening tool to identify early changes that may pre-date clinical retinopathy could be very helpful in preventing DM associated vision complications for these young patients with high risk for DR, but more standardized values for age will be needed to generalize the application of this variable.

Choroidal Characteristics in 3- to 16-Year-Old Chinese Patients, Measured by Swept-Source OCT/OCT Angiography
Wu J, Wang N
Ophthalmol Sci 2025;5(6):100869
With improving ability to evaluate choroidal structures with advances in OCT-A technology, studies have begun to investigate the possible impact of choroidal structures on ocular growth regulation. This cross-sectional observational study aimed to characterize age-dependent changes in choroidal structures and vascularity in Chinese children age 3-16 years and investigate any relationship with ocular metrics. Choroidal vascular index was positively correlated with axial length elongation whereas choroidal thickness and choroidal vessel volume were negatively correlated with axial length. There was also noted to be a stepwise linear regression with inverse association between choroidal perfusion and BCVA. Further understanding these choroidal parameters may have predictive and prognostic value for refractive error in children going forward.

Macular Thinning and Microvasculature Abnormalities in Children with Sickle Cell Disease: A Longitudinal Analysis
Ong SS, Nampomba A, Rahman S, et al
Ophthalmol Sci 2025;5(6):100862
Patients with sickle cell disease are at risk for a number of retinal complications including macular thinning which has been associated with age, genotype, and stage of proliferative SCR, but this prospective cohort study aimed to evaluate longitudinal changes in retinal thickness and

vascular density on OCT and OCT-A which may also provide further understanding of vascular risks in these patients prior to the onset of macular thinning. Over the course of at least 2 years of follow up, patients with SCD underwent OCT and OCT-A . In the 56 eyes from 28 patients (14 HbSS, 9 HbSC, 3 HbS alpha thal, 3 HbS beta plus thal), there was no significant difference in ocular characteristics between the groups, but hemoglobin levels were noted by to lower in HbSS bs HbS variant groups while hydroxyurea was higher in HbSS at final follow up. Some clinical complications including CVA, need for chronic transfusion were higher at final follow up in HbSS as well. Regarding the OCT and OCT-A findings, there was progressive retinal thinning, primarily of the inner retinal layers, particularly in children with HbSS disease while vascular density failed to increase in HbSS while it did in HbS variants. These findings point to microvascular level changes that begin in childhood, particularly in HbSS disease that likely contribute to higher rates of retinal complications seen in that population into adulthood. This study had a relatively small population, but the correlation with known clinical patterns warrants further understanding for potential use in screening of SCD patients.

Retinoblastoma

Diffuse infiltrating retinoblastoma: a multicentre, international, data-sharing study
Tomar AS, Finger PT, Gallie B, et al
Br J Ophthalmol 2025;109(12):1409-1416
Diffuse infiltrative RB (DIR) is a rare variant characterized by widespread retinal infiltration and can masquerade as uveitis with pseudohypopyon, anterior chamber flare, iris heterochromia, vitritis, and intraocular hemorrhage. This was a multicenter registry-based retrospective case series looking at 132 eyes from 132 patients with DIR) out of a total of 2854 eyes with RB (Jan 2001–Dec 2013. The median age at diagnosis was 24 months with note of this variant often having delayed diagnosis due to masquerading presentation. The vast majority were staged as cT3 with clinically high-risk features and higher risk of metastases. There were high associations with glaucoma (67%), vitreous hemorrhage (50%), RD (38%), diffuse vitreous seeds (37%), anterior segment involvement (24%), and hyphema (6%). The mainstay of treatment was primary enucleation (81%) with initial systemic chemotherapy (19%) that resulted in secondary enucleation (6%) in lesser amounts. The 5-year survival rate for cT3-DIR was 82% while CT3 non-DIR was better at 94%. There was also a higher risk of metastatic death in comparable staging of DIR (HR 3.3 compared to 1.8). The study reports prior literature being limited and some describing DIR as slow-growing and with a more favorable prognosis. With larger data-gathering for this rarer presentation, the current study showed higher mortality and high-risk features given the high rate of enucleation as treatment. The limitations of this study including being retrospective and did not have standardized data collection time points. Also, the timing of the data did not include newer modalities like intra-arterial chemotherapy. Further study can shed light into how this variant has presented and changed in the current era of treatment; however, this study does provide wider data on the difficulty in diagnosis and risk of under-treating with this RB type.

At What Age Could Screening for Familial Retinoblastoma Be Stopped?: Revised Dutch Retrospective Population-Based Cohort Study 1991-2019
Badalova NA, van Hoefen Wijsard M, Dommering CJ, et al
Ophthalmology 2025;132(10):1152-1160
There is currently no universally accepted protocol for screening children at risk for familial retinoblastoma. Recommendations vary on timing and duration of screening. A consensus report from the American Association of Ophthalmic Oncologists and Pathologist recommends screening all children at risk of familial retinoblastoma until 7 years of age. This prompted them to investigate the latest age of familial retinoblastoma diagnosis to assess whether this extended screening is justified at their center. A recent systematic review conducted by the same group identified 4 years as the latest age of detection of a primary retinoblastoma tumor in systematically screened at-risk children from birth from 1945-1998. For various reasons, the investigators felt the reported age may be an overestimate with the detection of tumor possibly being earlier. In the current study, they reexamine the age at diagnosis of familial retinoblastoma using data from their nationwide retinoblastoma registry covering the past 28 years, during which at-risk children in The Netherlands were screened in a single center by a team of dedicated retinoblastoma ophthalmologists. This study primarily relied on the age at diagnosis

of familial retinoblastoma in high-risk patients. In The Netherlands, all at-risk children are screened soon after birth and continue screening until 4 years of age. A diagram of their screening protocol can be found in the article. 28 patients were considered “completely screened” meaning initial screening occurred before 4 weeks of age and followed the recommended frequency in their protocol. All 28 completely screened children received a diagnosis before 1 year of age, with a median age at diagnosis of 18 days. Sixteen children (57.1%) received a diagnosis at the first examination within the first month after birth, and 82.1% received a diagnosis within the first 6 months. A primary motivation for this study was to refine screening protocols for low-risk children (3% risk), aiming to minimize the burdens of prolonged screening. The results showed that stopping screening after 1 year of age may be safe for low-risk children because no tumors were diagnosed beyond this age in completely screened patients. They revised their screening protocol in 2024 and screening is discontinued for unaffected children at low risk (< 3%) of familial retinoblastoma developing at 2 years, to ensure a safety margin. They emphasize screening children with low risk early and under general anesthesia from 6 months to 2 years of age before discontinuing screening. In children with higher risk, ophthalmic examination will continue until 4 years of age, even when no retinoblastoma tumor has developed, adhering to the same screening protocol as during the study period.

The role of enucleation in the development of nystagmus in children with retinoblastoma
Olechowski A, Reed E, Naeem Z, Sagoo MS, Reddy MA
J AAPOS Published online January 31, 2026
This retrospective study investigated characteristics and risk factors associated with developing nystagmus in children with retinoblastoma who underwent unilateral enucleation between 2009 and 2021, incorporating demographic data, ocular findings, treatment details, and follow up information. Among 139 analyzed patients, 8.7% developed nystagmus during follow up, with no significant differences in demographics or presenting symptoms between those with and without nystagmus. Children who developed nystagmus were diagnosed with retinoblastoma at a younger age, underwent earlier enucleation, and more often had bilateral disease. They also had poorer vision in the remaining eye and required more aggressive treatment compared with peers who did not develop nystagmus, and all carried germline mutations, in contrast to 24% of those without nystagmus. The study found that enucleation did not precede nystagmus development in most cases, suggesting the surgery itself is unlikely to be the cause. Strengths of the study include its large cohort and long follow up period, though limitations include its single center, retrospective design. Clinically, the findings indicate that enucleation for treatment of retinoblastoma is unlikely to lead to nystagmus, providing reassurance for clinicians counseling families.

LACK OF COMPLICATIONS OF HIGH-DOSE INTRAVITREAL TOPOTECAN FOR RECURRENT RETINOBLASTOMA IN 81 CONSECUTIVE INJECTIONS
Shields CL, Medina RJ, Attaseth T, Lally SE
Retina 2026;46(2):264-271
Management of retinoblastoma involves systemic or intraarterial chemotherapy, often in conjunction with intravitreal chemotherapy, particularly for vitreous seeds, which are not

well-addressed with other methods. Melphalan was the initial agent, but topotecan has gained popularity given its effectiveness and minimal toxicity. This retrospective study included 81 consecutive injections of high-dose topotecan for recurrent retinoblastoma in 25 eyes. There were a mix of recurrent tumor types, including intraretinal tumor, vitreous seeds, subretinal seeds, or multiple tumor types. Around half of injections were given without concurrent intravenous or intraarterial chemotherapy. At mean follow of 10 months from the first injection, tumor control was achieved in all cases. There were no local or systemic complications. Children in the study had received a variety of prior treatments, but this study does add to the safety of intravitreal topotecan, which may be a useful therapy for children with recurrent retinoblastoma.

Enucleation of an Eye With Potential High-Risk Retinoblastoma Is Currently Important for Patient Survival
Shields CL, Lally SE, Shah AC
Retina 2026;46(1):1-3
Retinoblastoma is a serious intraocular malignancy with well-established high-risk histopathologic features that predict metastatic disease. Tumor invasion into the optic nerve deep to the lamina cribosa, uveal invasion at least 3mm, and scleral or orbital invasion are established as high-risk features and mandate the use of systemic chemotherapy. This editorial discuss the continued role for enucleation for as the gold standard for diagnosing high-risk retinoblastoma, although the features may be suggested on imaging modalities. Eyes with neovascular glaucoma, buphthalmos, massive retinoblastoma with obvious extension, and any high-risk imaging features should be enucleated. If enucleation confirms high-risk retinoblastoma, then a systemic chemotherapy regimen with vincristine, etoposide, and carboplatin is recommended. Some families may resist enucleation and prefer to attempt to globe salvage with intraarterial chemotherapy, which would not provide the systemic chemotherapy that is performed with confirmed high-risk retinoblastoma. While it does not provide any new evidence, this editorial summaries the continued role of enucleation in retinoblastoma.

HIGH-DOSE INTRAVITREAL TOPOTECAN (100 μ G/0.1 CC) AS MONOTHERAPY FOR RECURRENT/REFRACTORY INTRAOCULAR RETINOBLASTOMA IN SEVEN EYES
Vempuluru VS, Raval V, Kaliki S
Retina 2025;45(11):2142-2149
Intravitreal chemotherapy for retinoblastoma has quickly become an effective option for treatment of vitreous seeds that often minimally respond to intravenous chemotherapy, intraarterial chemotherapy, or radiation. Melphalan is the traditional agent, with topotecan as a newer agent with less toxicity that was shown to be noninferior to melphalan. This retrospective study included 7 eyes treated with high-dose intravitreal topotecan for refractory or recurrent disease with some combination of vitreous seeds, epiretinal seeds, intraretinal tumor, or subretinal seeds. 6 eyes were group D and one eye was group C. Tumor control was achieved for all vitreous seeds, epiretinal seeds, and subretinal seeds, but only 60% (3/5 eyes) with intraretinal tumor. Overall, tumor control was 71% (5/7 eyes) treated with high-dose topotecan. The ERG did not demonstrate any significant changes. This study is limited in number of eyes

and inclusion criteria but does illustrate high-dose topotecan as a safe option for recurrent of refractory retinoblastoma, particularly with vitreous or subretinal seeds.

Lack of Long-Term Benefit from Anti-VEGF Combined Therapy in cT2b Retinoblastoma
Shi H, Zhu Y, Yang J, et al
Ophthalmol Retina 2026;10(2):217-219
Advanced retinoblastoma is a therapeutic challenge with high stakes. Prior retrospective studies have suggested that intravitreal anti-VEGF increased the overall eye preservation rate, but no prospective studies have been conducted. A prospective, open-label, dual centered, single-arm trial was designed to answer the question of whether intravitreal anti-VEGF added to the classic IV vincristine-etoposide-carboplatin backbone could shift the therapeutic ceiling for cT2b unilateral disease. Seven consecutive patients were enrolled and received intravitreal anti-VEGF along with conventional chemotherapy. The study was terminated after all patients completed their 12-month follow-up. All 7 patients exhibited disease progression after a short and non-sustained partial response, indicating that there is no long-term clinical benefit from anti-VEGF combined with IV chemotherapy for this subset of retinoblastoma. Although the study showed no long-term benefit, there was a reduction in tumor size after the first and second treatment period. While there may be a role for intravitreal anti-VEGF with IV chemotherapy to reduce tumor burden, additional study is needed as there was no long-term benefit and the study was terminated prematurely.

Late-Onset Retinoblastoma: Clinical and Genetic Features in Children Presenting Over 5 Years Old
Evans WI, Thompson BN, King BA, et al
Ophthalmol Retina 2026;10(1):95-101
Retinoblastoma is the most common intraocular malignancy in children, and at least 90% of children present by age 5 of age. There is limited data on those children that present later, and many may have atypical features that lead to the delayed diagnosis. This retrospective chart review included 25 patients who were diagnosed with retinoblastoma at age 5 of later (4.7% of all children with retinoblastoma at this institution). The majority of patients (22/25) had symptoms that prompted referral, while a few (3/25) were discovered on routine examination. Around a third of patients (9/25) were misdiagnosed prior to referral. Most of the patients (24/25) had unilateral disease. The growth pattern was variable between in patients. Of the children that underwent genetic testing, 25% had a germline mutation identified. The study includes a large period of time (1999-2022) but is retrospective. It highlights that retinoblastoma can and does occur in older children (oldest age in this study was 13), and should remain on the differential, including atypical presentations of retinoblastoma. A high level of suspicion is needed, as delay in diagnosis can result in metastatic disease (2/3 patients in this study with metastatic disease had PPV followed by enucleation for a presumed blind, painful eye).

Spatial Proteomic Analysis Highlights Molecular Reprogramming in Optic Nerve Invasive Retinoblastoma
Zhu T, Yang J, Xu M, et al
Invest Ophthalmol Vis Sci 2025;66(13):37

This study investigated how molecular changes at the interface between malignant and nonmalignant tissue contribute to heterogeneity and metastasis in retinoblastoma with optic nerve invasion. Researchers performed spatial proteomic analysis on three tumor samples, comparing optic nerve–invasive regions with intraretinal regions and tumor boundaries with centers. They found significant alterations in cholesterol metabolism in invasive lesions compared with intraretinal tumor areas. The invasive tumor boundary showed increased anaplerotic metabolism, oxidative respiration, and keratin-related cytoskeletal remodeling. These boundary regions also demonstrated epigenetic remodeling associated with decreased KMT5C, a regulator of epithelial–mesenchymal transition. Immunofluorescence validation confirmed distinct expression patterns of PC, KRT17, and KMT5C between tumor boundary and center tissues. The findings indicate that invasive fronts of tumors have unique metabolic and structural adaptations linked to metastatic potential. Overall, the study provides an initial spatial proteomic map revealing molecular reprogramming underlying optic nerve invasion in retinoblastoma. Atlhough the study has a very small sample size, the clinical implications of the study are a more comprehensive understanding of RB optic nerve invasion and metastatic potential.

Suprachoroidal Injection of Topotecan for Retinoblastoma: A Preclinical Study
Singh AD, Raval V, Kumar S, Daniels A
Ophthalmol Sci 2025;5(6):100875
While there has been significant progress made on the efficacy and safety of chemotherapeutic treatment for retinoblastoma, access to IAC remains limited due to cost, and even when IAC can be used, there are risks of ocular toxicity and sometimes limited feasibility in younger patients. Effectiveness of intravitreal chemotherapeutics is limited by its poor penetration to retinal structures. Pharmacodynamic studies have shown uniform and rapid retinal and choroidal distribution of fluorescein administered in a suprachoroidal route, thus, this study aimed to further explore suprachoroidal administration of chemotherapy as a possible treatment for retinoblastoma. This study evaluated the pharmacokinetics (n=18) and toxicity/dose escalation (n=8) of Toptecan administered suprachoroidally in rabbit subjects. Pharmacokinetics were evaluated based on tissue collection after euthanasia (N=3/time point) at 15 minutes, 30 minutes, 1 hour, 2 hours, 4 hours, and 6 hours post-dose. Retinal and choroidal levels of topotecan peaked by 15 minutes with subsequent rapid decline over the following time periods and maintenance of low concentrations in plasma, aqueous, and vitreous. In separate subjects, ERG was performed to monitor for toxicity at two different concentrations compared to saline injection for the fellow eye. There was no reduction in retinal function on ERG at 28 days compared to baseline prior to injections and no evidence of toxicity on clinical examination following sacrifice. Going forward, there may be limitations to SCI administration if there is choroidal extension of tumor, but the possibility of injection in a non-involved quadrant may help facilitate treatment and maintenance of safety. This animal-based study offers encouraging data regarding the possibility of localized treatment with achievement of therapeutic levels with no significant toxicity which may be clinically beneficial in the future.

Retinopathy of Prematurity

Treating Retinopathy of Prematurity with Dexamethasone Eye Drops: A Difference-in-Differences Study in Sweden Using Register Data
Gränse LAKC, Öhnell HMV, Holmström G, et al
Ophthalmology 2026;133(2):248-256
This is a retrospective cohort study based in Sweden from a center that started giving infants diagnosed with type 2 ROP dexamethasone drops (1 drop/day) in 2020. They compare their rates of traditional (laser/injection) ROP treatment during 2015-2018 vs 2020-2021 with rates from 3 other sites in Sweden that did not introduce dexamethasone in 2020. The study aimed to evaluate whether low-dose dexamethasone eye drops (1 mg/ml, typically 1 drop/day per eye) could prevent progression from type 2 ROP to type 1 ROP. Data was obtained from the Swedish National Quality Register for ROP (SWEDROP). They included 2,017 preterm infants born before 30 weeks' gestation. Babies born 2015–2018 (no dexamethasone drops) were in the control group. Those born 2020–2021 were in the intervention group (dexamethasone introduced at the intervention site for type 2 ROP; not used at control sites). At the intervention site traditional treatments fell from 72% (23/32) in control years to 13% (4/32) in intervention years ($P < 0.001$) amongst infants with severe ROP. Among all infants at the site, treatment fell from 5.6% (23/409) to 1.8% (4/217) ($P = 0.03$). Of 32 infants with type 2 ROP in intervention years, 28 received drops; 24 (86%) regressed without needing further treatment (median duration: 4 weeks). No reactivations, cataracts, or glaucoma was reported up to 3 years post-screening. At the control sites, in infants with severe ROP, traditional treatment increased slightly from 47% (82/175) to 56% (32/57) ($P = 0.22$). In all screened infants, there was a minor decrease in treatment from 8.6% (82/950) to 7.3% (32/441) ($P = 0.38$). The authors concluded that he introduction of dexamethasone eye drops at type 2 ROP diagnosis was associated with a marked reduction in the need for invasive treatments, potentially offering a simple, noninvasive, cost-effective alternative. Additional randomized trials are needed to confirm these findings.

Validation of the DIGIROP algorithm in identifying preterm infants at risk for developing retinopathy of prematurity in a Belgian NICU
Vanhaesebrouck S, Zecic A, Goossens L, et al
Eur J Ophthalmol 2026;36(1):89-96
Retinopathy of prematurity (ROP) is a leading cause of preventable childhood blindness, yet current screening guidelines result in many unnecessary examinations as only a small percentage of screened infants develop treatment-requiring ROP. The DIGIROP decision support tool uses birth characteristics (gestational age, birth weight, gender) to identify high-risk infants and reduce screening burden, but requires external validation before widespread clinical implementation. This retrospective cohort study analyzed 292 preterm infants screened for ROP at a Belgian quaternary NICU from 2020-2022, validating DIGIROP-birth and DIGIROP-screen algorithms against routine screening protocols and comparing clinical characteristics between ROP-positive and ROP-negative groups. DIGIROP demonstrated 100% sensitivity and 62.4% specificity, identifying all 23 infants who developed ROP while eliminating screening in 112 low-risk infants (52.8% reduction). The algorithm improved detection efficiency from 1 in 12 screened infants developing any ROP to 1 in 4, and reduced median screening examinations

from 7 to 5 per infant (p<0.001). Gestational age and birth weight were the strongest independent predictors of ROP, with ROC analysis showing acceptable predictive accuracy (AUC >0.75 for both). The study's strength lies in comprehensive validation with 100% sensitivity preservation, though limitations include small sample size (only 23 ROP cases, 13 treated), retrospective single-center design, and restriction to infants 24-30 weeks gestational age limiting generalizability. DIGIROP implementation could substantially reduce stressful screening examinations in low-risk preterm infants while maintaining perfect sensitivity for detecting treatment-requiring ROP, though multicenter prospective studies are needed before widespread adoption in Western NICUs.

Computational vascular development model explaining incidence of notch in retinopathy of prematurity with ultra-widefield optical coherence tomography
Sutter DA, Igelman A, Coyner AS, et al
Invest Ophthalmol Vis Sci 2026;67(2):10
Retinopathy of prematurity (ROP) commonly features a temporal "notch"—a posterior incursion of the retinal vascular border—that can affect zone classification and treatment decisions, yet no specific mechanisms have explained why this occurs. Human retinal vasculature develops from 16 to 40 weeks gestation, originating at the optic disc and progressing centrifugally, a process interrupted by premature birth. This study analyzed 85 eyes from 52 infants screened for ROP with investigational ultra-widefield optical coherence tomography (UWF-OCT) between June 2023 and October 2024, calculating minimum retinal arc-length (min-RAL) to the vascular border. A computational model using modified diffusion-limited aggregation (DLA) with an inferred foveal repulsive force operating by inverse square law was developed, simulating vascular development on a circular grid terminated 50 times each in zone I and zone II. Among 85 eyes, temporal notches appeared in 54 eyes (63.5%) from 36 infants who had significantly lower gestational age (25.0 ± 2.0 vs. 27.4 ± 2.1 weeks), lower birthweight (533.6 ± 112g vs. 914 ± 359g), and shorter min-RAL (10.5 ± 2.6 vs. 12.9 ± 1.8 mm, all P < 0.001). The modified DLA computational model closely predicted notch incidence: 86% in zone I simulations versus 83% in real eyes, and 48% in zone II simulations versus 51% in real eyes. Temporal notches (56.5%) occurred significantly more frequently than nasal (13.0%) or non-horizontal notches (21.7%, P < 0.02). The study provides the first computational model explaining ROP notch physiology with empiric validation using advanced UWF-OCT imaging and quantitative measurements. Limitations include that the model is hypothesis-generating rather than proof of mechanism, significant simplifications (excluding three-dimensional diffusion, eye growth, astrocyte migration, and other angiogenic factors), inability to identify the specific cause of the foveal repulsive effect (though PEDF is speculated), and use of qualitative notch grading rather than mathematical thresholds. This computational model may serve as the foundation for future predictive models of retinal vascular development and explains how notch formation in ROP arises naturally from an anti-angiogenic foveal effect during vasculogenesis, informing zone classification and treatment decisions.

Temporal trends and risk factors for retinopathy of prematurity: insights from a population-based study (1995-2021)
Shemesh R, Reichman B, Strauss T, et al

Can J Ophthalmol 2025;60(6):e844-e850
ROP is a significant cause of early blindness with initial declines noted in developed countries; however, this decline may have slowed or even increased in recent years—possibly from improved survival of extreme premies and associated increased complication rates. This was a population-based observational cohort study from the Israel national very-low birthweight infant database compromising 16,527 born 23–29 weeks with 3684 having ROP stages 2–4. Multivariable logistic regression was used to assess for the independent effect of factors association with ROP. They found a decrease in the ROP rate from 32.9% in 1995–2000 to 16.0% in 2017–2021 ($p<0.0001$). The adjusted OR was lower in subcategorized time periods compared to that initial epoch at 0.68 (2001–2006), 0.36 (2007–2011), 0.31 (2012–2016), and 0.32 (2017–2021). From the initial to latter epochs, there was an increase in survival to discharge home for ages, notably 25.7% to 46.0% in the 23–25 week EGA group. Further, the patients with ROP were of significantly lower EGA (26.2±1.5 vs 27.7±1.7 weeks) and BW (839±195 vs 1059±219 g) ($p<0.0001$). ROP was significantly higher in the 23–25 week EGA cohort (57.4%) with background of intubation/CPR (32.9%), SGA (33.3%), respiratory co-morbidities (42.9–43.1%), sepsis (36.6%), surgically treated NEC (47.5%) and surgically treated PDA (55.3%). When looking at temporal trends, the rate of ROP declined in the 5 aforementioned epochs in all variables except for higher OR in surgically treated NEC (1.86), surgically treated PDA (1.88), and sepsis (1.67). Overall, there was 2/3 decrease in ROP from 1995 to 2021, but this was attenuated in the last decade with increasing ROP rates found based on variables of NEC, PDA, and sepsis. Limitations include the observational nature of the study, lack of particular ROP information (age at time of diagnosis, ROP progression), a relatively homogenous population, and unaccounted other variables (e.g., blood transfusions, growth rates, breast milk feeding, nutritional supplementation). However, this does raise the prospect of certain cohorts that may need closer evaluation for ROP risk in the current age of earlier survival and associated co-morbidities.

Effect of intravitreal injection on optic nerve in infants with retinopathy of prematurity: a long-term follow-up study
Mao J, Deng X, Chen Y, et al
Br J Ophthalmol 2025;109(11):1226-1231
With the evolution of ROP treatment including more anti-VEGF therapy via intravitreal injection (IVI). Given the background of IVI potentially leading to elevated IOP and that infants tend to be born with increased cup:disc ratio (C/D) with further optic nerve development, there is a concern for what IVI may do to the optic nerve head in infants treated for ROP given that there is some concern in the adult literature for a possible assoc with IVI and optic nerve damage. Vertical C/D was measured and compared in fundus photography at 36 weeks to 6 months PMA in each group. A total of 381 eyes from preterm infants in Zhejiang, China were included with mean GA 28.8±2.5 weeks (range 24–36 weeks). The mean BW was 1158.49±337.53 g (range 500–2170 g). The patients were divided into control, untreated, and treated groups with further subdivision in the treatment group to those with and without Plus disease. As expected, GA and BW were lower in the ROP groups and the amount of oxygen used was higher in the significantly higher in the ROP groups. The baseline C/D did not correlate with GA or BW. All groups showed longitudinal growth of C/D. C/D was significantly higher in treated than untreated and control

groups at all time points except at baseline PMA 36 weeks. The increase in C/D amount was reported on average as 0.357±0.041, 0.351±0.046, and 0.348±0.046 to 0.470±0.037, 0.421±+0.040, and 0.420±0.048 in the treated, untreated, and control groups, respectively. The C/D was significantly lower in those with Plus (42 eyes) than without Plus (37 eyes) although masking of the C/D was mentioned as a possibility given the anomalous vascular appearance in Plus. This study suggests correlation between IVI and increased C/D that may imply a causative relationship; however, limitations are that the C/D are based on fundus photography evaluation, which is subjective. Also, neurologic context was not taken into account, and this may impact C/D as well. This study raises questions for further study; however, it is difficult to provide a particular note of effect from IVI on C/D based on these data.

Predictors of persistent avascular retina in retinopathy of prematurity treated with intravitreal ranibizumab
Chen JG, Mo KX, Huang QQ, Ruan GY
J AAPOS 2025;29(6):104697
The etiology and prevalence of persistent avascular retina (PAR) in retinopathy of prematurity (ROP) is unclear. The purpose of this study was to identify predictive factors for PAR following primary intravitreal ranibizumab (IVR) monotherapy in ROP. This was a retrospective chart review of 69 infants (128 eyes, mean gestational age (GA) was 28.4 weeks and mean birth weight (BW) was 1129.6 g, mean postmenstrual age (PMA) at IVR was 38.3 weeks, mean postnatal age (PNA) at IVR was 70.2 days) with type 1 or aggressive ROP treated with IVR at a single center between July 2019 and March 2021. The mean retinal vascular outgrowth speed (RVOS) temporal quantitatively assessed from fundus photographs 2 months after IVR was 0.9 ± 0.6 disk diameters (DD)/month, with significantly faster vascular outgrowth in treated eyes compared to untreated fellow eyes ($P < 0.05$). Complete retinal vascularization was achieved in 69 eyes (53.9%) by 64 weeks PMA (±2 week), whereas PAR persisted in 59 eyes (46.1%). Multivariable analysis revealed four independent PAR predictors: slower temporal RVOS (OR = 0.024 for faster RVOS), larger cumulative clock hours of ROP (OR = 2.263), later PNA at IVR (OR = 1.041), and advanced ROP severity (OR = 31.67). Significant predictors from univariate analysis were incorporated into a multivariable logistic regression model presented as a nomogram which showed excellent discrimination (AUC = 0.948) and calibration ($P = 0.055$) for predicting PAR risk in ROP following primary IVR. limitations: retrospective study, single surgeon performing injections, internal validation limits generalizability, only looked at temporal (not nasal) RVOS. Impact on clinical practice: Slower RVOS, advanced ROP severity, larger ROP CCH, and later PNA at IVR were independent PAR predictors following primary treatment with IVR for ROP.

Factors influencing the timing of complete retinal vascularization in infants screened for retinopathy of prematurity
Kuziel J, Strampe M, VandeLune J, Zirbes C, Larson S, Dumitrescu A
J AAPOS 2025;29(6):104659
Premature infants screened for retinopathy of prematurity (ROP) reach complete retinal vascularization at various postmenstrual ages (PMAs). The purpose of this study was to evaluate the factors that affect the age at which the infant eyes reach retinal vascular maturity.

This retrospective chart review looked at 1,971 patients (mean GA was 28 weeks and mean BW was 1,096 g) screened for ROP at their institution between December 13, 2007, and December 30, 2020 (i.e. 13 years). Mean PMA for retinal maturity was 44.9 weeks (n=1462), which was higher for infants born at an earlier GA ($P < 0.0001$) or who underwent non-ocular surgery ($P < 0.0001$). Chronological age at retinal maturity was higher for those with higher ROP stages or with positive blood cultures or who received ≥5 units red blood cell (RBC) transfusions (all $P < 0.0001$). limitations: retrospective study, multiple examiners, subjective clinical exam, excluded those with peripheral avascular retina, and if the infant received laser treatment, retinal maturity was defined as resolution of ROP with retinal vascularization to the area of laser which is not the same as retinal maturity. Impact on clinical practice: Later retinal maturity may be expected in those infants with lower GA, those who underwent non-ocular surgery, developed higher ROP stages, had positive blood cultures, or who received ≥5 units of RBC transfusions.

Evaluating the G-ROP criteria sensitivity for type 1 ROP in a North American cohort
Pang O, Habib N, Conley J, Fletcher-Morehouse L, Geddie B
J AAPOS 2025;29(6):104694
Current screening criteria for retinopathy of prematurity (ROP) follow the American Academy of Pediatrics (AAP) guidelines. However, the Postnatal Growth and Retinopathy (G-ROP) study has proposed newer criteria, showing 100% sensitivity for detecting type 1 ROP while reducing the number of infants requiring dilated retinal examinations by 30%. The purpose of this retrospective cohort study was to validate the G-ROP criteria in a midsized Midwestern children's hospital including 687 infants screened for ROP between January 2018 and December 2022 under AAP guidelines (average gestational age 28 weeks; the average birthweight, 1022.5 g). Applying the G-ROP criteria to the same cohort, 448 (65.2%) met G-ROP criteria. Using SOC criteria, 34 infants (4.9%) developed type 1 ROP necessitating treatment, while using G-ROP screening criteria, 33 of 448 (7.4%) with type 1 ROP were identified; thus the sensitivity of G-ROP for detecting type 1 ROP was 97.1%, but 1 infant who required treatment was missed, who had a medical history of twin-to-twin transfusion syndrome. limitations: retrospective study, one center. Impact on clinical practice: G-ROP criteria demonstrated high, but not 100% sensitivity compare to current AAP screening guidelines.

External validation of an artificial intelligence-based model for retinopathy of prematurity screening using Phoenix ICON retinal images
Derks LA, Tekin YS, Loudon SE, et al
J AAPOS 2025;29(6):104696
The Imaging & Informatics in retinopathy of prematurity (ROP) (i-ROP) research consortium’s deep learning (i-ROP DL) algorithm generates a quantitative vascular severity score (VSS) that has been shown to detect cases of type 1 ROP and more-than-mild ROP (MTM-ROP)—defined as type 1 ROP, type 2 ROP, or any ROP with pre-plus disease—with 100% and 80% sensitivity, respectively. The purpose of this study was to assess the performance of a RetCam-trained artificial intelligence (AI) algorithm for the autonomous detection of severe ROP using retinal images acquired with the smaller field-of-view Phoenix ICON retinal camera. Retrospective external validation was performed using Phoenix ICON retinal images captured during ROP screening examinations in a Dutch cohort of infants born in 2021. A total of 4,411 images from

66 infants were captured during 419 individual eye examinations, averaging 67 ± 65 images per infant and 10 ± 6 images per eye examination. Images of insufficient quality were excluded via automated quality assessment (n=60 examinations (14.3%)) and 51 of 213 (23.9%) infant-level examinations had no quality images of at least one eye or only one eye was screened. When using the best performance between both eyes to assess infant-level performance, area under the precision-recall curve (AUPRC) was 0.911, sensitivity 82.0%, and specificity 77.0% for MTM-ROP; AUPRC was 0.983, sensitivity 100.0%, and specificity 72.4% for type 1 ROP alone. They found that the algorithm's performance with Phoenix ICON is similar to its performance with RetCam. limitations: small number of infants included; one site; Impact on clinical practice: When considering using an AI algorithm for the autonomous detection of severe ROP using retinal images acquired with a smaller field-of-view, there is a need for imaging protocols to increase the percentage of images with sufficient quality.

Retinopathy of Prematurity in the Extremely Premature: Disease Burden, Treatment Approaches, and Visual Outcomes in Micro- and Nano-Premature Infants
Yuan M, Chaaya C, Altamirano F, et al
Am J Ophthalmol 2025;280:40-50
This retrospective cohort study from 2013-2023 examined retinopathy of prematurity (ROP) in 702 extremely premature infants, categorized as micro-premature (24-26 weeks gestational age and/or 600-799g birth weight) or nano-premature (<24 weeks GA and/or <600g birth weight). Among the 525 infants analyzed after excluding those lost to follow-up, 84.9% developed ROP and 21.4% required treatment with laser and/or anti-VEGF therapy for type 1 disease. Notably, 12.6% required re-treatment. Lower gestational age, lower birth weight, and central nervous system hemorrhagic injury emerged as significant risk factors for treatment-warranted ROP on multivariate regression. The nano-premature infants demonstrated substantially worse outcomes compared to micro-premature infants, including more severe and posterior ROP, earlier treatment requirements, higher rates of treatment across all modalities, increased amblyopia incidence, worse final visual acuity, and more frequent developmental delay. The authors emphasized that while treatment can stabilize the disease, these high-risk infants face ongoing visual and developmental challenges, highlighting the critical importance of comprehensive screening and long-term follow-up.

Comparing Rhegmatogenous and Tractional Retinal Detachment in Regressed Retinopathy of Prematurity: An International, Multicenter Study
Hsu HT, Kang EY, Blair MP, et al
Am J Ophthalmol 2026;282:1-10
This international, multicenter retrospective study examined late-onset retinal detachment (RD) occurring at least 2 years after resolution of acute retinopathy of prematurity (ROP) in 177 eyes from 156 patients. The study found that the vast majority of these late-onset RDs were rhegmatogenous (95%) rather than tractional (5%), with patients presenting at an average age of approximately 20 years. Rhegmatogenous RD showed favorable outcomes with significant visual improvement after surgery, though poor anatomic outcomes were associated with retinal breaks larger than 1.5 mm and prior acute-stage ROP surgery. In contrast, tractional RD presented earlier, required multiple surgeries in 77.8% of cases, and had significantly poorer

final reattachment rates (66.7% versus higher rates in rhegmatogenous RD). The authors concluded that patients with regressed ROP remain at elevated risk for RD, particularly before age 30, and recommend regular ocular examinations for early detection and timely intervention to optimize outcomes.

Preappointment dilation drops for retinopathy of prematurity examination visits: an equitable intervention to reduce clinic time regardless of insurance status
Rocks MC, Heath D, Moyer L, et al
J AAPOS Published online January 30, 2026
Retinopathy of prematurity (ROP) is a major cause of permanent visual impairment in children and requires repeated screening examinations with pharmacologic dilation, which can be time consuming for families and clinics. This quality improvement initiative aimed to reduce clinic time for neonates undergoing ROP screening by preordering dilation drops and educating caregivers to administer the drops 90 minutes prior to the appointment. Using a Plan Do Study Act (PDSA) framework, the primary outcome measured was total clinic time from check in to check out, as recorded in the electronic health record. The goal was to reduce median clinic time from 81 minutes to 51 minutes, or to achieve a center line shift to 63 minutes, without differences based on insurance status. Data were collected for three months prior to the intervention and for one year afterward, with targeted strategies implemented to increase predilation rates, including a $40 drop discount for uninsured or underinsured families, shifting drop ordering responsibilities from nurses to technicians, notification calls confirming drop orders, and reminder text messages to caregivers. A total of 918 ROP appointments were analyzed, including 154 pre intervention and 764 post intervention visits. Median clinic time decreased from 81.7 minutes to 61.9 minutes, representing a 19.8 minute reduction per visit, with no differences observed across insurance types. Predilation rates increased from 0% to 52%, and predilated infants spent a median of 29 minutes less in clinic compared to babies who were not predilated. Compliant families to the predilation protocol experienced a median reduction of 35.7 minutes. No adverse events were reported. Strengths of the initiative include a clearly defined aim and multiple PDSA cycles, while limitations include its single institution design and inability to account for all factors influencing caregiver compliance. Overall, preordering dilation drops significantly and safely reduced clinic time for ROP screening across all insurance groups.

Clinical, demographic, and socioeconomic factors associated with outpatient retinopathy of prematurity follow-up
Liu EJ, Freedman SF, Stinnett SS, Prakalapakorn SG
J AAPOS Published online February 16, 2026
Barriers to timely outpatient follow up for retinopathy of prematurity (ROP) screening are increasingly understood to be influenced by social determinants of health, and this retrospective study evaluates how clinical, demographic, and socioeconomic factors affect adherence to recommended follow up visits. Over a 10 year period, charts of infants requiring outpatient ROP follow up were reviewed to assess whether they returned within three days of the advised interval (“on-time”). Collected data included demographics, birth weight, gestational age, language preference, interpreter use, inpatient ROP treatment, recommended follow up timing, insurance type, and home to clinic distance. Of the 1,424 infants evaluated, 582 (37.4%)

required outpatient follow up; among these, 98.7% returned, and 81.2% did so on-time. Univariate analyses showed higher odds of delayed follow up among infants with higher birth weight or gestational age, those who had not received treatment before discharge, those with public insurance, those living 60 miles or more from the clinic, and those residing in more disadvantaged neighborhoods (higher area deprivation index, ADI) or rural counties, as well as those given longer recommended follow up intervals. In multivariate analyses, factors independently associated with untimely follow up included recommended intervals greater than 14 days, English language preference, lack of inpatient treatment, public insurance, and higher ADI. The study's strengths include its large patient sample, while limitations stem from the retrospective nature of the data and its single center design. Overall, the findings underscore that social determinants of health significantly influence the timeliness of outpatient ROP follow up and highlight opportunities for healthcare systems and providers to develop targeted support strategies and educational interventions to improve adherence.

The relationship between maternal cannabis use disorder diagnosis and the development of retinopathy of prematurity
Tran MD, Baer RJ, Bandoli G, et al
J AAPOS Published online February 2, 2026
Cannabis is the most commonly used drug after alcohol and tobacco, and its use during pregnancy is associated with an increased risk of preterm birth. This retrospective study evaluated whether in utero cannabis exposure increases the risk of retinopathy of prematurity (ROP) among preterm infants. The study included singleton infants delivered between 22 and <31 weeks' gestation and/or weighing <1500 g at birth from the UC San Diego Study of Outcomes in Mothers and Infants (SOMI) database between 2011 and 2020. Infants born to mothers with cannabis use disorder (CUD) and those diagnosed with ROP were identified using ICD-9 and ICD-10 codes. Among 31,110 infants who survived to ROP screening, 997 (3.2%) had documented prenatal cannabis exposure. Mothers with CUD were more likely to be younger than 18 years, identify as Black or "other" race/ethnicity, use public insurance or WIC, and have comorbid tobacco or alcohol use, anxiety, depression, hypertension, and low BMI; CUD was also associated with lower gestational age. However, rates of ROP were similar between exposed and unexposed infants (32.1% vs. 33.3%), and adjusted analyses showed no statistically significant increased risk. Strengths include the large sample size, while limitations involve reliance on administrative coding, potential misclassification of CUD, and lack of data on timing of exposure. Although maternal CUD does not appear to independently increase ROP risk, it remains associated with preterm birth and low birth weight, both established risk factors for ROP.

Risk Factors for Reoperation in Vitrectomy for Stage 4A Retinopathy of Prematurity
Fukushima M, Iwahashi C, Kurihara T, et al
Ophthalmol Retina 2025;9(11):1062-1070
Retinopathy of prematurity (ROP) results in abnormal development of retinal vessels, causing a tractional retinal detachment in the advanced stages. Despite advances in treatment of ROP with anti-VEGF, some infants still develop tractional retinal detachments, and some go on to require multiple surgeries. This retrospective study included 90 patients who underwent

vitrectomy for stage 4A ROP at a single center. Final anatomic success was achieved in the vast majority of patients (97%), although a significant number required multiple surgeries. Vitreous hemorrhage was the most common reason for re-operation (23%), with re-detachment being much lower (9%). The presence of plus disease and a greater extent of fibrovascular membrane increased the changes of another surgical procedure. The authors suggest that preoperative anti-VEGF may help reduce the rates of postoperative vitreous hemorrhage. This study provides interesting insights into outcomes of vitrectomy for stage 4A ROP but are limited by a single center and may not be generalizable to all populations.

Timing of Retinopathy of Prematurity Diagnosis and Treatment in Micro-Premature and Nano-Premature Infants during Inpatient Screening
Yuan M, Altamirano F, Hu D, et al
Ophthalmol Retina 2025;9(12):1219-1224
Retinopathy of prematurity (ROP) remains a significant cause of vision in children, particularly in extremely premature infants. Current screening guidelines recommend the first screening at 31 weeks postmenstrual age, or 4 weeks of life, whichever is later. The natural history of ROP in extremely premature infants, however, is more uncertain, and some have suggested modification of these screening guidelines in very high-risk neonates. This study included all infants screened for ROP a three tertiary care NICUs born at <26 weeks gestation or <800g. A total of 650 infants met the inclusion criteria, and most (80%) developed ROP. The average PMA of initial ROP diagnosis was 33.7 weeks. Around one third of patients had ROP at their initial screening exam. Around 20% of infants developed type I ROP and required treatment, at an average PMA of 37 weeks. Only 9 patients (1.4%) had type I ROP diagnosed at their first or second screening exam, and they generally did well with treatment. This large, multicenter study supports the current ROP screening guidelines for these high-risk infants and provides interesting insights on the natural history of ROP in extremely premature infants.

Topographic Features in Retinopathy of Prematurity With en Face Ultra-Widefield OCT
Sutter DA, Woodward MK, Jackson J, et al
Ophthalmol Retina 2026;10(1):88-94
Retinopathy of prematurity (ROP) results in extraretinal neovascularization and tractional retinal detachment in severe cases. These pathologies have a 3D configuration, but traditional fundus photography is only able to capture the 2D nature. This study explores the use of ultra-widefield OCT to capture topographic information on ROP without direct visualization. Images were acquired during routine ROP screening with ultra-widefield OCT. Two separate techniques were used to determine topographic information and visualize the changes in increasing ROP stages. Interestingly, they found that there can be subclinical changes even in “stage 0” ROP, with a subtle increase in retinal thickness at the vascular-avascular junction. They found cystoid macular thickening and foveal contour changes as part of the ROP morphology as well, which are not well-appreciated on standard fundus photography. The topographic maps provide interesting information on the ROP stages well capture the 3D nature of the disease. This technology is not commercially available and unable to be implemented in all settings, but does show promise in the future of ROP screening and may allow detection of more subtle pathology than with fundus photography and clinical examination alone.

Caffeine Therapy Reduces Severe Retinopathy of Prematurity in Neonates with Gestational Age between 23 and 28 Weeks
Otsuka Y, Taketani F, Hirose M, Oh H
Ophthalmol Sci 2025;6(1):100903
Many pharmacological interventions have been investigated as possible modalities to prevent severe ROP (caffeine, antioxidants, COX inhibitors, human milk, Vitamins A and E). The purpose of this retrospective observational cohort study was to evaluate the effect of caffeine therapy, which was being utilized for systemic reasons to prevent extubation failure and apnea episodes, on the onset and exacerbation of ROP. Of 202 neonates included in the study, 66.8% received caffeine therapy 11.8±15.9 days after birth for a period of 23.9±18.6 days. While many other infant factors including GA, BW, initial Zone, RDS, sepsis, blood transfusion, duration of O2 and tracheal intubation were correlated with onset of any ROP, caffeine use was not. In addition, these same factors were also positively correlated with development of severe ROP while caffeine use had a negative correlation/apparent protective factor (87% or patients with no severe ROP had caffeine, 56.5% with severe ROP had caffeine, P<0.01).This protective association disappeared for infants <23GA, all of whom still developed severe ROP. The authors postulate that infants 23-28 weeks GA are most likely to benefit from caffeine exposure to limit progression of ROP. Importantly, this study was observational, and the caffeine was not being administered specifically for ROP treatment, thus further study would be beneficial to understand the impact that caffeine could have on ROP stabilization, but this could be a potentially low-risk intervention to prevent higher levels of ROP which could complicate vision development.

OCT-Derived Quantitative Measurement of Extent of Vascularization ("Zone") in Retinopathy of Prematurity
Sutter DA, Woodward MK, Jackson J, et al
Ophthalmol Sci 2025;6(1):100912
ROP assessment and study is plagued by significant inter-expert variability in the diagnosis of zone on imaging and ophthalmoscopy which can significantly impact treatment decision making. This diagnostic study aimed to use ultra-widefield OCT to quantitatively measure the area of vascularized retina (AVR) as an anatomic corollary for zone. Using an investigational 140 degree swept source OCT, images were obtained of all infants eligible for ROP screening over a 16-month period. Axial length was calculated from UWF-OCT axial distance to the fovea and multiple measures of retinal arc length from the optic nerve to the vascular-avascular border allowed approximation of the AVR. Focusing on the temporal portion of the retina, the mean retinal arclength as well as AVR was correlated with zone I, PII, and II. The addition of objective data points to our understanding of Zone and ROP severity could significantly change how ROP is followed in the future. Challenges that remain include the fact that eyes are continuously growing in this cohort and thus by nature, Zone II disease happens in older/larger eyes than Zone I. As technology advances, particularly the opportunity for AI to play a role in interpreting images such as this, this could help improve our treatment strategies for ROP

Early Antibiotic Use and Retinopathy of Prematurity: A Single-Center Retrospective Cohort Study
Zhang JY, Bondi DS, Hyman MJ, et al
Ophthalmol Sci 2025;6(1):100919
Over the last several decades, there has been an increase in empirical use of antibiotics in an effort to avoid delayed diagnosis and treatment of neonatal sepsis, but the increased exposure to antibiotics in this population has not been without trade-offs. Prolonged antibiotic exposure has been associated with complications such as BPD, NEC, antibiotic resistance, and more recently, a Canadian study reported increased odds of stage 3 or higher ROP with increased antibiotic use in the absence of culture-proven sepsis. This retrospective cohort study reviewed antibiotic exposure in 720 preterm infants screened for ROP at a single US institution over the course of 12 years. The 6.9% of infants requiring treatment for type 1 ROP had younger GA, lower BW, and higher rates of BPD and bacterial infection compared to those not requiring ROP treatment. After controlling for these variables, the odds of ROP treatment were found to be significantly increased for infants receiving “other beta-lactam antibacterials” (9.9% higher); no association was found with the other drug glasses. This association with other beta-lactam, other antibacterial drugs, and antifungals remained in a refined analysis of BW<750g or GA <27 weeks and appeared to show a dose response with higher risk of treatment with longer antibiotic exposure. While the retrospective nature of this study precludes complete control for confounding of increased baseline risk for ROP in babies who are generally sicker, the dose dependence at least points to a possible association between ROP and broad-spectrum antibiotics that may impact gut microbiome warranting further study. This also highlights the importance of antibiotic stewardship programs to minimize adverse effects of antibiotics which may not be fully elucidated.

Association of Childhood Neighborhood Opportunity With Retinopathy of Prematurity
Altamirano F, Hoyek S, Carlson K, et al
Am J Ophthalmol 2025;279:86-90
This cross-sectional study investigated the association between neighborhood conditions—measured by the Child Opportunity Index (COI), a composite score of 44 indicators across education, health/environment, and socioeconomic domains—and the development of retinopathy of prematurity (ROP) in preterm infants. ROP remains a leading preventable cause of childhood blindness in the US, influenced by both clinical factors like prematurity and social determinants of health (SDOH) such as access to care and environmental exposures. The study included 2468 infants screened for ROP at three neonatal intensive care units (Boston Children’s Hospital, Beth Israel Deaconess Medical Center, and Brigham and Women’s Hospital) from 2012 to 2021, with US residential addresses linked to COI scores by birth year (using COI 3.0). The primary analysis examined overall COI scores in multivariable logistic regression models adjusting for demographics (sex, race/ethnicity, insurance) and then further for gestational age (GA) and birth weight (BW); secondary analyses assessed COI subdomains. Outcomes were any ROP diagnosis and treatment-warranted ROP (TW-ROP, per Early Treatment for ROP Type 1 criteria). Infants in very low opportunity neighborhoods had significantly lower BW (1026 ± 337 g vs. 1130 ± 320 g) and GA (27.8 ± 2.9 weeks vs. 28.5 ± 2.5 weeks) than those in very high opportunity areas, along with higher unadjusted prevalence of

ROP (44.6% vs. 33.3%) and TW-ROP (10.3% vs. 5.5%). A 20-point decrease in overall COI was associated with increased odds of ROP (OR 1.10, 95% CI 1.04-1.16) and TW-ROP (OR 1.16, 95% CI 1.05-1.30) in unadjusted and demographics-adjusted models, but these associations attenuated and lost significance after further adjustment for GA and BW. In subdomain analysis, only lower health and environment scores remained significantly linked to TW-ROP after full adjustment (OR 1.29, 95% CI 1.08-1.53). Strengths include the large multicenter sample, standardized ROP screening across sites, use of a validated neighborhood-level metric (COI) designed for child well-being, and adjustment for key confounders; limitations encompass potential selection bias from excluding missing/foreign addresses (possibly affecting those with housing instability), a cohort skewed toward higher-opportunity neighborhoods (limiting generalizability), incomplete race/ethnicity data in some cases, and the cross-sectional design preventing causal inference or exploration of mechanisms beyond prematurity mediation. This study may impact clinical practice by encouraging the use of neighborhood opportunity indices like the COI to identify at-risk populations for ROP and TW-ROP—particularly in low-opportunity areas where prematurity rates are higher—and to guide targeted interventions addressing SDOH barriers (e.g., improved access to prenatal care, follow-up support, or environmental risk mitigation) to enhance early detection, surveillance, and long-term visual outcomes in vulnerable infants.

Long-Term Retinopathy of Prematurity Outcomes with Mandated Screening Interval and Grader Continuity at a High-Volume Quaternary Center
Zhao CS, Brant AR, Shah SV, et al
Am J Ophthalmol 2025;279:147-155
Retrospective cohort study describes long-term screening patterns, treatment rates, and outcomes for retinopathy of prematurity (ROP) at Stanford Children's Hospital, a high-volume quaternary teaching hospital and regional referral center, over 12 years (2013–2024). ROP screening used a unique model emphasizing grader continuity (continuous exams by the same assigned screener without routine handoffs) and mandated screening intervals (weekly or more often) with binocular indirect ophthalmoscopy (BIO), differing from typical feature-based intervals or rotating screeners. The study reviewed 15,798 examinations for 1,860 infants from 34 hospitals, with 88.8% of patients seen exclusively by one of four screeners and 18.0% outborn (transferred referrals). Nearly all intervals (98.1%–99.3% per screener) were weekly or shorter. Outborn infants had significantly lower mean gestational age (27.8 ± 3.0 weeks vs. 29.0 ± 3.0 weeks) and birth weight (1066.9 ± 408 g vs. 1181.4 ± 416 g) than inborn infants (both $P < .005$). Treatment was required in 100 infants (5.4% overall), more frequently among outborn (9.0% vs. 4.6% inborn, $P = .002$) and higher-risk (nano- or micro-premature) cases, with one screener handling most high-risk infants and treatments (10.2% rate overall, 19.4% for high-risk). Volume increased over time without seasonal trends ($P = .51–.55$). No infant developed retinal detachment or ROP-related blindness during acute screening or subsequent follow-up. Strengths include the large sample size over a long period, standardized high-frequency BIO screening with exceptional grader continuity (minimizing inter-observer variability), detailed tracking of inborn/outborn differences and referral patterns at a quaternary center, and excellent outcomes despite managing complex, high-risk cases; limitations are its retrospective, single-center design (potentially limiting generalizability to other settings or

models), reliance on resource-intensive continuity (challenging for some institutions), lack of direct comparison to alternative screening approaches (e.g., wide-field imaging or rotating screeners), and incomplete capture of some confounders like specific oxygen exposure or comorbidities. This study may impact clinical practice by supporting the feasibility and potential benefits of grader continuity combined with mandated frequent (weekly) BIO screening intervals—particularly for high-risk premature infants—to achieve zero retinal detachments and low treatment rates, encouraging centers to prioritize consistency and reduced handoffs to minimize subjectivity and improve outcomes in ROP management.

Placental Transcriptomic Analysis in Retinopathy of Prematurity Reactivation After Anti-VEGF Treatment

Kang J, Kim S, Bae JG, Jang JH

Am J Ophthalmol 2025;279:242-252

This retrospective case series aimed to identify fetal factors in the maternal placenta associated with reactivation of retinopathy of prematurity (ROP) after anti-VEGF treatment by analyzing placental transcriptome differences. ROP reactivation (also called recurrence) is a key concern after intravitreal anti-VEGF therapy (e.g., ranibizumab), as it can involve rebound VEGF activity and return of plus disease or new lesions, unlike more permanent suppression with laser; intrauterine/placental factors may influence fetal vascular development and treatment response, but had been underexplored. The study included 12 preterm infants (gestational age <32 weeks) treated with 0.2 mg intravitreal ranibizumab for ROP between March 2022 and December 2023, with stored maternal placentas; 4 had reactivation and 8 served as controls (followed to ~70 weeks postmenstrual age). Placental fetal villous tissue was snap-frozen, RNA extracted, and sequenced (Illumina NovaSeq); differentially expressed genes (DEGs) were identified (|log2FC| >0, P < .05), adjusted for confounders (e.g., maternal diabetes, birth weight, ROP type, postmenstrual age at injection). Analyses included GO/KEGG enrichment, protein-protein interaction (PPI) networks (STRING/Cytoscape), hub gene identification (MCODE), and ROC curve assessment for predictive potential (AUC ≥0.7). A total of 329 DEGs were found (207 upregulated, 122 downregulated) in the reactivated group. Upregulated DEGs enriched in VEGFA-VEGFR2 signaling (P = .016), glioblastoma/endothelin pathways, and cellular/organelle terms; downregulated DEGs linked to protein binding, lysosome, cell migration, and SARS-CoV-2-related pathways. PPI network revealed 4 clusters, with the top (enrichment score 10.7) centered on VEGFA-VEGFR2 signaling and TROP2 regulatory signaling. Fifteen upregulated hub genes were identified; 9 showed strong predictive potential for reactivation (AUC >0.7): ACTG1 (0.938), BSG (0.781), ETS1 (0.75), FN1 (0.719), FOXO4 (1), IGFBP3 (0.75), NUMB (0.781), MDM2 (0.844), and SMARCA2 (0.906). Seven of these (except FOXO4/SMARCA2) were tied to angiogenesis, including VEGF pathway/endothelial activity (e.g., cytoskeletal/ECM remodeling, VEGF expression regulation). Strengths include novel use of placental RNA-seq to probe intrauterine origins of ROP reactivation variability, rigorous bioinformatics (enrichment, PPI, hub/ROC analyses), covariate adjustment for baseline differences, and identification of potential predictive biomarkers from a high-risk pathway; limitations encompass small sample size (n=12, only 4 reactivated cases) at a single center (limiting generalizability/power), lack of functional validation (e.g., qPCR, in vitro assays), reliance on stored placentas, and demographic imbalances (e.g., lower birth weight/aggressive

ROP in reactivated group) despite adjustments. This study may impact clinical practice by highlighting placental VEGFA-VEGFR2 signaling upregulation as a fetal contributor to ROP reactivation risk after anti-VEGF therapy, suggesting that assessing expression of these 9 hub genes (particularly angiogenesis-related ones) in placental tissue could help predict reactivation susceptibility, guide personalized treatment/follow-up strategies (e.g., closer monitoring or adjunct therapies), and prompt further research into intrauterine angiogenic influences on ROP outcomes.

Retinal Blood Flow Decreases after Treatment with Bevacizumab for Retinopathy of Prematurity
Wang J, Mansoor S, Wu JY, et al
Ophthalmol Sci 2025;5(6):100857
In addition to the standard markers used for evaluation of ROP (zone, stage, p-score/plus disease), various devices including laser speckle contrast imaging (LSCI) have been used in an attempt to quantify vascular changes associated with retinal pathology. Previous literature suggests a significant decline in blood flow after intravitreal anti-VEGF injection, thus this prospective cohort study aimed to use LSCI to assess total retinal blood flow before and after ROP treatment with intravitreal anti-VEGF bevacizumab. A total of 14 babies (BW 664±193g, GA 24.4±1.2 weeks) undergoing screening/treatment for ROP had LSCI imaging obtained at multiple time points ranging from 2 weeks prior to 32 weeks after bevacizumab. In correlation with increased zone, decreased stage, and decreased p-score, the peak, mean, and dip total retinal blood flow (TRBF) optic nerve head and vessel decreased significantly after treatment. All patients received secondary treatment (1 bevacizumab, 13 laser) between 13.7 to 43 weeks of life. Infants requiring retreatment <10 weeks after initial treatment had a higher initial post-treatment peak TRBF compared to those who had their secondary treatment at later time points (9.0±1.5au vs. 7.3±2.2 au). From a baseline pre-treatment peak TRBF of 11.1±2.9au, there was noted to be a decrease of β=-0.1au/week (p=0.004). This study is limited in further sub-analysis due to its small sample size, but the current data suggests that TBRF may be a useful data point in understanding response to treatment after anti-VEGF for ROP. Implementation of this measure in the future may be limited by the need for specialized equipment (LSCI) for measures which is not currently a standard tool.

Strabismus

Is Hirschberg enough? - A comparative study of corneal light reflex test and alternate prism cover test in measuring comitant horizontal strabismus
Tirmizi IE, Sadiq SMAA
Eur J Ophthalmol 2025;35(6):2290-2297
This cross-sectional comparative study evaluated whether the Hirschberg corneal light reflex test is sufficient for measuring comitant horizontal strabismus when compared with the alternate prism cover test (APCT), which is considered the clinical gold standard. 69 adult patients with comitant horizontal deviations, predominantly exotropia (70%), were assessed using both methods. The authors found statistically significant discrepancies between the two tests, particularly in moderate to severe deviations (greater than 30 prism diopters). The mean difference between the angle of deviation as measured by the Hirschberg test, compared to that by the alternate prism cover test was found to be 14.90 ± 11.98 PD. The authors found that the Hirschberg test tended to overestimate small angles less than 30 prism diopters and underestimate larger deviations greater than 50 prism diopters, with accuracy varying according to the severity and type of strabismus. The study concluded that Hirschberg testing alone is not reliable for precise quantification of comitant horizontal strabismus and should not replace APCT in clinical decision-making. The study has several limitations, including its single-center, cross-sectional design, relatively small sample size with a heavy skew toward exotropia, and restriction to adult patients with comitant horizontal deviations, limiting generalizability to other strabismus types and pediatric populations. Additionally, both tests are examiner-dependent, and the absence of masking or inter-observer variability analysis may introduce measurement bias. Despite these limitations, the study reinforces the role of APCT as the preferred method for accurate strabismus measurement while highlighting the limited precision of the Hirschberg test beyond screening purposes.

Ocular Translation Due to Gravitational Acceleration
Demer JL, Clark RA
Invest Ophthalmol Vis Sci 2025;66(14):21
This study investigates the influence of gravitational head orientation on eye position in the orbit. Using magnetic resonance imaging (MRI), researchers assessed the globe centroid positions in 11 adult volunteers under various postures, including supine and lateral decubitus. Results showed significant anterior and medial shifts of the upper eye, and anterior, lateral, and superior translations for the lower eye when transitioning from supine to lateral positions. These translations were quantified, revealing a notable elongation of the optic nerve due to gravitational effects during posture changes. This research highlights the role of gravity in eye movement dynamics and its implications for understanding eye rotations and optic nerve mechanics in both terrestrial and microgravity environments.

Saccade-Related Activity in Superior Colliculus Predicts Eye Choice for Goal-Directed Saccades in Monkeys With Strabismus
Fleuriet J, Belloir T, Walton MMG
Invest Ophthalmol Vis Sci 2025;66(14):46

This study investigates saccade-related neuronal activity in the superior colliculus of monkeys with infantile strabismus, a condition characterized by misaligned eyes leading to significant visual and oculomotor deficits. Using single-unit recordings, researchers found that saccade-related neurons exhibited stronger bursts when directing a particular eye at a visual target, indicating that distinct populations of neurons are activated depending on which eye is aimed at the target. The findings suggest the brain processes information about eye choice to effectively control saccades despite the disconjugacy often present in strabismus.

Smooth Pursuit Velocity After a Season of Repetitive Head Impacts in American Football Players
Murray NG, Fenner M, Szekely B, et al
JAMA Ophthalmol 2025;143(10):866-873
Smooth Pursuit Velocity After a Season of Repetitive Head Impacts in American Football Players examines the effects of repetitive head impacts (RHI) on oculomotor control in 25 Division I football players during a single season. The study identified two groups based on head impact exposure: high-dose and low-dose, assessed using instrumented mouthguards. Participants completed an eye-tracking task at preseason, midseason, and postseason to measure smooth pursuit eye movement velocity. Results indicated that high-dose players had slower velocities than controls at preseason and midseason, suggesting pre-existing deficits rather than significant changes due to the season. The study underscores that current clinical assessments may not detect RHI-related deficits, emphasizing the need for improved monitoring of athletes' brain health despite the small sample size and exploratory nature of the research.

Clinical features and refractive profile of surgical patients with dissociated vertical deviation
Akbari MR, Khorrami-Nejad M, Mohammed AA, et al
Eur J Ophthalmol 2026;36(1):97-104
Dissociated vertical deviation (DVD) is a form of vertical strabismus characterized by upward drifting of one eye when the other fixates, often associated with early-onset strabismus and amblyopia. Despite being recognized for over a century, clinical characteristics and surgical outcomes remain incompletely understood, particularly in Middle Eastern populations. This cross-sectional retrospective study analyzed 180 Iranian patients with DVD who underwent strabismus surgery (38 unilateral, 142 bilateral) at Farabi Eye Hospital between 2012-2023, examining refractive error, visual acuity, deviation angles, and surgical outcomes. Patients requiring unilateral surgery had significantly worse visual acuity in surgical eyes (0.54 vs 0.05 logMAR, $P<0.001$), greater astigmatism ($P=0.031$), and much higher amblyopia rates (52% vs 5.6%) compared to bilateral surgery patients. The most common presentation in both groups was DVD combined with horizontal deviation (47.4% unilateral, 64.1% bilateral), and over 42% of all patients required multiple surgeries for adequate correction. The study's large sample size and comprehensive comparison between unilateral and bilateral cases provide valuable insights, though the retrospective single-center design, potential documentation variability, and inclusion of young children with possible measurement inaccuracies limit generalizability. It shows us the difference between unilateral and bilateral DVD. These findings emphasize the importance of thorough preoperative assessment for amblyopia and coexisting horizontal

deviations when planning DVD surgery, as these factors significantly influence surgical approach and the likelihood of requiring multiple interventions.

Stereopsis Outcome in Refractive Accommodative Esotropia Successfully Treated With an Age of Onset Within 6 Months of Life
Yagasaki T, Yokoyama Y, Yagasaki A, Hozumi K
J Pediatr Ophthalmol Strabismus 2026;63(1):28-34
This retrospective study focuses on a clinically unusual subgroup: children with fully refractive accommodative esotropia (RAET) that began within the first 6 months of life and who were successfully aligned with full cycloplegic hyperopic correction (final deviation within 10 PD). The authors' goal was to identify which factors predict whether these children develop measurable stereopsis despite such early-onset misalignment. They reviewed 29 patients seen over a long period (1998–2023) and divided them into two outcome groups: those with measurable stereopsis (fine or coarse; n=11) and those with no stereopsis (n=18). Standard clinical variables were analyzed, including age at onset, age at initial visit, age at first glasses, duration of misalignment, refractive error, angle of deviation, and treatment duration. Overall, stereopsis outcomes were poor: only 2 patients (7%) achieved fine stereopsis (≤60 arcsec), 9 (31%) achieved coarse stereopsis, and 18 (62%) had no stereopsis. Interestingly, when comparing the measurable vs nil groups, none of the usual predictors reached significance, including age at onset, degree of hyperopia, initial deviation size, anisometropia, or duration of misalignment. Even the commonly cited "4-month misalignment" threshold (from prior literature) did not significantly stratify outcomes in this cohort. The one factor that did stand out was timing of optical alignment: children who first wore full cycloplegic correction at 8 months of age or younger were significantly more likely to achieve measurable stereopsis (67% vs 25%, P=.048). This echoes infantile esotropia data suggesting an 8-month "sensitive period" threshold for binocular development. The authors conclude that in early-onset RAET, the practical priority is getting full hyperopic correction on the child as early as possible (ideally by 8 months) to maximize the chance of any stereopsis.

Adult-Onset Comitant Esotropia: Patient Characteristics and Medical Evaluation
Adhan IK, Lam L, Wallingford M, et al
J Pediatr Ophthalmol Strabismus 2025;62(6):387-395
This large retrospective series from Wills Eye Hospital characterized the demographics, clinical features, and diagnostic yield of medical work-up in adults with acute-onset comitant esotropia (AOCET) without a history of childhood strabismus, trauma, concussion, duction deficits, sixth nerve palsy, or neurologic symptoms other than diplopia. The authors identified 268 patients seen between 2020 and 2023, with a mean age of onset of 53.7 years and a female predominance (62.7%) across every age decade. The cohort showed a bimodal distribution of onset, peaking in the third and seventh decades. Among those with race recorded, most were White, though over half of the cohort had unreported race data. Refractive status was notable for a predominantly myopic phakic population (mean spherical equivalent −3.22 D), with nearly two-thirds of phakic patients being myopic and most falling into the moderate myopia range. Younger onset cohorts were more likely to be myopic, whereas hyperopia became progressively more common with increasing age. Mean distance esotropia at presentation was 17.2 PD, and

the magnitude of esotropia decreased as age of onset increased. Divergence insufficiency–type esotropia accounted for 19% of cases and was most common in older decades. Work-up was performed in 44% of patients, more frequently in younger individuals. Despite this, the diagnostic yield was low. Thyroid testing, neuroimaging, and myasthenia labs were abnormal in a minority, and truly new explanatory diagnoses were rare: 4 cases of thyroid eye disease, 1 myasthenia gravis, and 1 multiple sclerosis. No intracranial tumors were detected. The authors conclude that AOCET in adults most often presents in myopic women and that extensive medical testing infrequently identifies a new underlying cause when classic neurologic symptoms and motility deficits are absent. Clinically, this supports a more selective approach to work-up while still recognizing that a small number of serious systemic diagnoses can present with isolated comitant esotropia and diplopia.

Motor skill deficits and associated factors in childhood intermittent exotropia: a cross-sectional study
Tan S, Yang D, Yang Y, et al
Invest Ophthalmol Vis Sci 2026;67(2):14
Intermittent exotropia (IXT) affects approximately 1-4.7% of children and disrupts binocular fusion during critical periods of neural development, leading to documented deficits in stereoacuity and suppression. While intact binocularity is essential for motor proficiency, the specific motor impairments associated with IXT independent of amblyopia remain unclear, as previous studies often confounded strabismus with reduced visual acuity. This cross-sectional study enrolled 73 children with basic-type IXT (ages 4-10 years) and 36 age-matched controls, all with normal best-corrected visual acuity, to evaluate motor proficiency using the Movement Assessment Battery for Children, Second Edition (MABC-2). Within the IXT cohort, relationships between clinical visual parameters (deviation control, stereoacuity, suppression) and MABC-2 scores were assessed using Spearman's correlation and multivariable regression models with sensitivity analyses. Children with IXT demonstrated significantly lower Total Motor Scores than controls (median 6.00 vs. 8.50, $P < 0.001$), with 65.75% classified as at-risk or having significant motor difficulty compared to 27.78% of controls ($P < 0.001$). Specific deficits emerged in manual dexterity (9.00 vs. 12.00, $P < 0.001$, Cliff's $\delta = -0.56$) and balance (5.00 vs. 6.00, $P < 0.001$, $\delta = -0.47$), while aiming and catching scores were comparable between groups ($P = 0.332$). Within the IXT cohort, poorer manual dexterity correlated modestly with reduced near stereoacuity ($r = -0.28$, $P = 0.019$), and aiming and catching performance was associated with presence of distance suppression ($r = -0.32$, $P = 0.008$), though these correlations did not remain significant after false-discovery-rate adjustment. The study's major strength is its strict exclusion of amblyopia, isolating the effects of binocular disruption from reduced visual acuity using standardized motor assessment tools. Limitations include the cross-sectional design precluding causal inference, smaller control group (approximately 2:1 imbalance), unmasked assessors introducing potential expectancy bias, lack of real-time ocular alignment monitoring during motor tasks, absence of data on confounding socioeconomic and environmental factors, and modest explained variance in multivariable models suggesting motor performance reflects multifactorial influences beyond measured clinical parameters. These findings underscore the necessity of monitoring motor development in children with IXT even in the absence of amblyopia, as motor

deficits relate to underlying sensory adaptations and may warrant consideration in treatment planning and rehabilitation strategies.

Perceptual Learning Based on Adaptive Contrast Detection Training for Intermittent Exotropia: A Pilot Double-Masked Randomized Controlled Study
Han M, Shen T, Chang S, et al
Invest Ophthalmol Vis Sci 2025;66(15):6
IXT is a common form of strabismus and affect binocularity, contrast sensitivity, and psychosocial development in children. Prior studies have shown patients with IXT exhibiting deficits in contrast sensitivity function (CSF) at high and low spatial frequencies and abnormal binocular contrast summation. These may affect the ability to maintain proper binocular alignment and visual contrast depth perception. Perceptual learning through adaptive training of spatial frequency and contrast has been shown to improve CS, VA, and stereoacuity in amblyopia. This was a double-masked RCT looking at 56 randomized children (ages 5–14 years) with basic-type IXT who had not received any other treatment other than refractive correction. They were equally randomized between the adaptive (cutoff spatial) frequency and (fixed frequency) placebo groups, which had similar demographics. Patients were assessed for fusion control via office control score; CS was checked through CSV-1000 equipment, binocular summation (BiS) was calculated as ration of binocular CS : higher monocular CS; suppression was checked via the PEDIG in-office method; and stereoacuity and motor alignment were assessed. There was initial training on site with the remainder done at home over 30 days. Both groups showed improvement in IXT control scores. Stereopsis and motor alignment at distance and near were significantly improved in the experimental group. There was also significantly less interocular suppression in the experimental group. After 14 days of treatment cessation, there was still significant retention of effects in the experimental group compared to placebo, who regressed back to baseline. Limitations of this study include lack of a true control (observation group) that might assess rate of spontaneous improvement in IXT, only including basic-type IXT, and the 30-day period was arbitrarily chosen. However, this provides an interesting piece of information on further management options in addressing IXT and its visuomotor effects, potentially with the option of an in-home based therapy.

Socioeconomic trends of adult strabismus in the United States: an analysis of the All of Us database
Lieu AC, Walker EH, Robbins SL, Granet DB, Rudell JC
J AAPOS Published online September 29, 2025
Authors aimed to identify whether socioeconomic status negatively impacts timely diagnosis of adult strabismus and whether low SES is a risk factor for adult strabismus, as it is in many other ophthalmologic conditions. Data was collected from the NIH All of US data base, which includes 413,360 adults representative of the diverse US population. They performed an X^2 test to determine significant differences between the 3,734 participants with strabismus, as compared to the entire database, in income, zip code, highest level of education, percent under poverty level, and Mean Deprivation Index (score 0-1 based on housing quality, neighborhood quality, economic stability, health, education, standard of living). Strabismus types evaluated were heterotropias, intermittent tropias, phorias, paralytic strabismus, dissociated gaze palsies,

mechanical strabismus, and strabismus in neuromuscular disorders. Results showed that people living in more affluent zip codes, with higher levels of education, and with lower poverty levels, were more likely to be diagnosed with strabismus. While a limitation of the study design is an inability to rule out higher prevalence of strabismus among people of higher SES, data suggests that barriers exist to diagnosis and treatment of adult strabismus in patients of lower SES.

Epidemiology of strabismus among adults in the United States: insights from the All of Us database
Lieu AC, Walker EH, Robbins SL, Granet DB, Rudell JC
J AAPOS Published online September 29, 2025
Authors aimed to determine the incidence of adult strabismus in the US and association with sex, age, and race. They used information from the NIH All of Us database which includes health information from 413,457 diverse US adults. Of all participants, 3734 carried a diagnosis of strabismus. They used an X^2 test to determine if there are significant differences in age, sex, and race between adults with strabismus and the general population. Results show that, despite a 1.6 female to male ratio for participation in the database, a significantly higher proportion of males was affected by strabismus. Incidence of strabismus is highest in adults greater than 65 years and increases with age. There is a lower incidence of strabismus in Asian and Black populations, and a higher incidence in White individuals. Limitations of the study include retrospective review from a database acquired through voluntary participation; it may not reflect the US population as a whole. Further, the data characterizes demographics of patients diagnosed with strabismus and does not necessarily account for the true prevalence. This may indicate barriers to diagnosis and treatment of strabismus in certain groups.

Telemedicine for initial postoperative appointments following strabismus surgery
Gaffar M, Mullane E
J AAPOS Published online September 18, 2025
Telemedicine has increased in popularity since the COVID pandemic. This study compared results of telemedicine post-operative appointments for strabismus surgery to in-person appointments in regard to length of visit and potential for missed complications. A retrospective review was performed of all pediatric patients who underwent strabismus surgery and had a telehealth post-operative appointment at a single institution from June 2020 to December 2022 and all patients who underwent an in-person post-operative visit from January 2018 to March 2020 at the same institution. Data points collected included percent of appointments successfully completed, no-show rates, duration of visits, technical difficulties, and post-operative complications. Vision was checked subjectively by occluding each eye separately and asking if any blurred vision was noted. If concerns arose, visits were converted to in-person.Of the 276 patients <18 years old, 109 visits were in-person, while 167 were via Zoom. Telemedicine visits were significantly shorter than in-person visits. There was no statistically significant difference in attendance rates or complication rates. It must be noted that 26 of 167 telehealth visits were converted to in-person, 20 of those at parent request, even during the pandemic. Parents who initially declined telemedicine visits in favor of in-person post-operative appointment were not included, and this number is not available in the data.

Patients with complicated surgeries were not offered telemedicine visits. Wait-time in the "virtual waiting room" is not included in the over-all visit time, and the number of phone calls or messages to the physician in the post-operative period was not documented for either group. The study has several limitations but telemedicine post-operative appointments may save time and resources in certain situations.

Predictors of nonsurgical consecutive exotropia following accommodative esotropia
ElHilali H, Awadein A, Radwan R, Gouda J, Fouad HM
J AAPOS 2025;29(6):104695
Nonsurgical consecutive exotropia refers to an accommodative esotropia that spontaneously converts to exotropia, with a reported incidence of 5-18%. The purpose of this retrospective chart review was to identify the incidence of and risk factors for development of spontaneous consecutive exotropia during management of fully accommodative esotropia with optical correction. They included 178 patients who presented with an initial diagnosis of fully accommodative esotropia with a minimum of 3 years' follow-up (mean age of esotropia onset was 2.3 ±1.4 years; of initial glasses prescription, 2.9 ± 1.5 years; mean spherical equivalent of both eyes was +4.3 ± 1.8 D; and mean follow-up was 6.9 ± 3.7 years). Consecutive exotropia developed in 31 children (17.4%) at a mean of 3.5 ± 3.6 years after prescription of spectacles. On multivariable analysis, children who developed consecutive exotropia had a higher initial spherical error (5D vs < 5D; P = 0.02), higher initial cylindrical error (1.5 D vs < 1.5 D; P = 0.01), and higher prevalence of neurological problems (P = 0.01). There was no statistically significant difference between spontaneous exotropia following accommodative esotropia and accommodative esotropia without spontaneous exotropia groups in terms of age of onset, the age of initiation of spectacles, angles of deviation, stereoacuity, or the time of initiation of reduction of hyperopic prescription. Of those in the spontaneous exotropia group, 45% reverted to esotropia or orthotropia with a reduction of the hyperopic correction, while 55% remained exotropic despite reduction of the hyperopic correction, who were noted to be older (p=0,04). limitations: retrospective review, single center, lack of evaluation of sensory status due to age, and variable follow-up period. Impact on clinical practice: Be more mindful of which children may convert from a fully accommodative esotropia to spontaneous exotropia and consider reducing hyperopic correction when able.

A pilot, randomized clinical trial of dichoptic 3D movies versus dichoptic 2D movies for treatment of childhood intermittent exotropia
Jost RM, Kumar K, Dao LM, et al
J AAPOS 2025;29(6):104698
Surgical and nonsurgical treatments of childhood intermittent exotropia (IXT) often have unsatisfactory results due to poor sensory status. Dichoptic 3D movies may offer a novel treatment designed to reduce suppression, encourage fusion, and engage stereoacuity. The aim of this masked, pilot randomized clinical trial was to assess whether 3D movies are superior to 2D sham movies treatment in treating children with IXT. They included and randomized 1:1 a total of 41 children aged 3-13 years with spontaneously manifested IXT to watch dichoptic 3D animated movies or 2D sham movies (3 movies/week, ~5 hours) for 4 weeks. After 4 weeks of treatment, the 3D movie group showed a significant improvement in mean distance control

score (P = 0.0002; n = 14); the 2D sham movie group did not (P = 0.11; n = 14). The 3D movie group had significantly more improvement in distance control than the sham group (P = 0.049), but near control, ocular alignment, and stereoacuity did not change for either group. The authors concluded that at-home dichoptic 3D animated movie treatment significantly improved IXT office distance control scores after 4 weeks and may provide an alternative nonsurgical treatment for childhood intermittent exotropia. Strengths: double-masked, randomized clinical trial, limitations: small pilot study, did not make their final sample size of 20/group, short follow-up duration, short duration of treatment, high rate of loss to follow up, non-uniform follow-up period for the outcome visit, and lack of objective monitoring of adherence. Impact on clinical practice: Dichoptic 3D movies may offer a novel treatment for IXT – but larger randomized clinical trials with longer follow up are needed

The Natural History of Exophoria Progression Among Young Healthy Adults
Armarnik S, Kinori M, Yahalomi T, et al
Am J Ophthalmol 2026;282:113-119
This study examined the natural progression of near exophoria in 369 healthy young adults (mean age 27.4 years, 93% male) evaluated at the Israeli Air Force Aeromedical Center between 2018 and 2023. Participants had at least 6 prism diopters (PD) of exophoria at near during their initial assessment and underwent at least two ophthalmologic evaluations separated by a minimum of one year. At baseline, mean near exophoria was 7.49 ± 2.06 PD, and at final follow-up it was 7.56 ± 3.08 PD, representing no statistically significant change over time (P = .680). Myopia was the only factor significantly associated with increased exophoria progression. The study concluded that near exophoria remained stable over time in this healthy, young, mostly male cohort, with no clinically significant progression observed. Despite variations in exophoria magnitude, stereoacuity (depth perception) remained consistently high throughout the study period across all participants, including those with marked exophoria. Those with myopia may warrant closer monitoring for potential progression.

Assessment of a score including control and quality of life in intermittent exotropia
Deboutte I, Alby A, Bonifas C, Lequeux L, Molinari N, Thouvenin D
Strabismus Published online December 9, 2025
The authors aim to test interobserver reliability of the International Exotropia Global Score (IXTGS) tool for the assessment of intermittent exotropia (IXT) control as well as the impact of exotropia on quality of life. Ninety-eight patients aged 3 to 80 years with IXT were included, with exodeviation up to 50 prism diopters (PD). Using Intraclass Correlation Coefficient (ICC) the inter-observer correlation of the IXTGS. The exotropia control scale scores did not correlate with quality-of-life scores. The author suggest that these two scores assess different facets of clinical exotropia making both important steps in devising a treatment recommendation. The questionnaire requires only 2-3 minutes to complete. Limitation of the IXTGS are that some individual elements of the control scale had reduce inter-observer reliability and may need modifications. Applicability to practice is that this appears to be an efficient and easy-to-use tool for providers and/or ancillary staff to screen patients with intermittent exotropia.

Incidence of Strabismus in Childhood Glaucoma

Rickels KL, Chauhan MZ, Dagi LR, et al
Ophthalmol Sci 2025;5(6):100892

This large retrospective database clinical cohort study was aimed at assessing the cumulative incidence of strabismus in patients with childhood glaucoma compared to healthy controls. Using the TriNetX US Collaborative Network database, patients with childhood glaucoma <18years at time of diagnosis were identified and propensity score matching was utilized to identify a control group matched by age, sex, race, ethnicity, and systemic comorbidities. ICD-9 and 10 codes were used to identify glaucoma diagnosis as well as subsequent strabismus diagnoses. Of 12637 patients with mean age of 3.81±4.44 years at diagnosis of primary glaucoma (PCG n=62, JOAG n=1894) and 5.18±4.40 years for secondary glaucoma (Glaucoma after cataract surgery n=6314, Other n=4267), the cumulative incidence of strabismus in primary glaucoma was 9.19% at 1 year, and 18.89% at 5 years after glaucoma diagnosis, while for secondary glaucoma it was higher (20.40% at 1 year, 31.39% at 5 years). Exodeviations were more common than esodeviations, and vertical deviations were the least common. The cumulative incidence of strabismus was significantly higher in both primary and secondary glaucoma cohorts compared to the controls (0.81% at 1 year, 1.49% at 5 years). The adjusted hazard ratio for developing strabismus was 7.03 and 7.95 for primary and 13.07 and 14.51 for secondary glaucoma at 1 and 5 years respectively compared to controls. The rate of strabismus was also two times higher in glaucoma patients who underwent incisional glaucoma surgery compared to those who did not undergo surgery. While limited by the retrospective nature and reliance of correct ICD and CPT coding in database review, this large cohort study provides important epidemiological insight into the incidence of strabismus in the setting of pediatric glaucoma and highlights the multifactorial nature of glaucoma’s impact on ocular/vision development.

Strabismus Surgery

The Polymorphism and Surgical Considerations of the Anterior Ciliary Vessels
Pan M, Xie R, Yang MJ Pediatr Ophthalmol
Strabismus 2026;63(1):45-53
This paper is a clinically practical, intraoperative “anatomy reality check” on anterior ciliary vessels (ACVs) and how their morphology affects the feasibility of vessel-sparing strabismus surgery. The authors prospectively collected high-quality surgical images of ACVs during rectus muscle surgery and used these recordings to qualitatively assess vessel number, caliber, branching, and symmetry between eyes.They included 212 patients undergoing horizontal strabismus surgery (bilateral LR recession in 111 and bilateral MR recession in 79), along with a smaller subset undergoing vertical rectus surgery. A key observation was that ACVs were highly polymorphous, not only between patients but also between the two eyes of the same patient. Traditional “rules” (eg, LR has one ACV, MR has two) frequently did not match what was seen under the microscope. When comparing symmetry between eyes, only 35% of patients had similar ACV morphology bilaterally on the LR, and even fewer (19%) had similar bilateral ACVs on the MR, reinforcing that surgeons should not expect predictable anatomy. The most actionable surgical finding was that LR ACVs were typically superficial and consistently embedded within a fascial layer on the muscle surface. This allowed the surgeon to peel the fascia containing all LR ACVs off the muscle “as a unit,” preserving the entire vascular complex. In contrast, MR and vertical rectus ACVs were often partially intramuscular with minimal connecting fascia, meaning preservation generally required meticulous, vessel-by-vessel dissection. The authors conclude that ACV preservation is likely underutilized partly because surgeons underestimate variability and overestimate difficulty. They argue LR vessel-sparing is the simplest entry point for adopting ACV preservation techniques and may reduce subclinical vascular and barrier changes even in routine horizontal surgery. Perhaps most helpful, though, is the inclusion of two videos demonstrating vessel preservation on the LR and MR; for a surgeon seeking to learn vessel-sparing surgery, these videos provide an excellent introduction.

True muscle transplantation for the management of third nerve palsy
Awadein A, Farag CS, Maher S
Can J Ophthalmol 2025;60(6):e836-e843
Surgical management of third nerve palsy is challenging with under-correction of exotropia being a common risk despite “supramaximal” recession-resection procedures in those that have partial adduction ability. Furthermore, these augmented procedures may result in restricted lateral ocular movements. Roger Hiatt first described EOM transplantation in 1973 in lieu of a 3-muscle surgery. In this study, the resected segment of the MR is used to lengthen the LR before recession with a free-graft or modified continuous graft technique. A retrospective review of 7 patients (mean age 32±17 years) who underwent this procedure included a pre-operative mean exotropia of 53±13 PD with a mean adduction deficit noted as –4. In this cohort, 5 cases had not undergone strabismus surgery before, while the remaining two had a prior recess-resect. The median amount of LR recession was 8 mm, and MR resection ranged from 6–8 mm. Mean post-op follow-up was 6.0±4.2 months. 5 patients had residual exotropia < 10 PD while the remaining two had 15 PD. Adduction limitation showed a mean improvement to –2.3±0.5 with it being ≤ –1 in 6 patients. The technique mentioned improvement in duction due

to the extra slack from the transplant and seemed superior than using synthetic material or autogenous fascia lata grafts in terms of inflammation and morbidity. The difficulty in moving the resected MR portion to the LR when first cut (free-graft) given muscle retraction was seemingly ameliorated with having the portion still attached to the MR when re-affixing to the LR (continuous graft). Limitations include a small sample size, lack of randomized control comparison, and short follow-up. However, this does add a possible technique to the toolbox of addressing third-nerve palsy related exotropia.

Physician reimbursement for strabismus surgery across provinces and territories in Canada
O'Hara K, Costanzo N, Bhambhwani V
Can J Ophthalmol 2025;60(5):e744-e747
There is a known decline in trainee interest in pediatric ophthalmology & strabismus due to inadequate financial reimbursement—leading to workforce concerns. This study reviewed the manuals for physician renumeration in Canada in 2023 and 2024 for strabismus surgery and routine cataract surgery codes. The two times periods were selected due to a change in billing codes in some provinces. A high variability was noted with 1-muscle surgery reimbursing $369 (Newfoundland, Labrador) to $835-891 (Yukon). 5-muscle surgery showed $502–512 (Prince Edward Island) to $1723–2626 (Manitoba, Ontario). A lack of added reimbursement was found in certain provinces for adjustable sutures (17%), re-operations (33%), complex strabismus (58%). Comparing 1-muscle surgery to cataract surgery, mean reimbursement was $529—551 and $489–496.4, respectively; however, certain provinces paid more for cataract surgery compared to 1-muscle surgery (25–33%) in the two time periods. Overall there was high variability across the Canada with some provinces/territories not providing extra compensation for adjunctive considerations. Additionally, most strabismus surgery is performed under general anesthesia, which precludes the number and turnover of cases unlike cataract surgery which is often under topical anesthesia and require less operating time and monitoring needs. Lower financial reimbursements have been cited as a reason for decreased interest in PO&S fellowships, leading to concerns for a declining workforce. The study is limited by basing numbers on publicly available manuals, and thus, other factors may be overlooked with specific payments. Secondly, not all Canadian physicians work on a fee-for-service model. This does provided added information on discrepancies in reimbursement for a common pediatric ophthalmology procedure, which is helpful when considering workforce issues.

Anomalies of lateral rectus muscle and inferior oblique muscle in exotropia
Pur DR, Cote SL, Makar I
Can J Ophthalmol 2025;60(5):e748-e751
In V-pattern XT (VXT), the common surgical approach is to weaken the IO if overaction is noted (IOOA) or transposition of the recti if not. This was a retrospective study (2013–2023) of patients who underwent BLR recession(BLRrec) for intermittent XT (IXT) or BLRrec with IO myectomy ± upwards LR transposition for VXT. 211 patients were reviewed with 65% (138) undergoing BLRrec, of which 61% (86/138) had nonpattern IXT and 39% (52/138) had VXT. 30% (42/138) had inferiorly displaced LR insertions with a greater proportion in the VXT group (58%, 30/52) compared to nonpattern (14%, 12/86). A smaller percentage (12%) had this finding unilaterally. In the VXT group, 44% (23/52) had abnormal IO (posteriorly displaced, tightness), especially in

patients with inferiorly displaced LR (18/30) compared to those with normal LR (5/22) (p=0.008). Post-operative follow-up ≥ 3 months with the mean duration being 19.46±23.9 months (range 3–142 months). Generally, more patients showed orthophoria when inferiorly displaced LR and/or abnormal IO was noted compared to normal anatomy although statistical analysis could not be run due to the small sample sizes. Limitations of this study included the retrospective nature, small number of patients, wide range of follow-up (especially since motor success in XT can be variable with time). The observations on the abnormal positioning of the muscles was also qualitative in nature. Overall, a takeaway could be that there is a higher chance of having inferiorly displaced LR in VXT, but the surgical management used does not have enough information/comparison to say which is the best approach.

Strabismus and Strabismus Surgery Reoperation Rates at 1, 3, and 5 Years: Analyses from the IRIS® Registry (Intelligent Research in Sight)
Repka MX, Lum F, Li C, Saseendrakumar BR
Ophthalmology 2026;133(2):203-213
This is a retrospective cohort analysis of data from the American Academy of Ophthalmology IRIS® Registry (Intelligent Research in Sight). In 2018, this group previously reported the first 4 years of data (2013—2016) on strabismus and strabismus surgery in approximately 30 million patients. At that time, they found that surgery was performed in 0.13% of patients, most often for horizontal strabismus. There was an overall mean 1-year reoperation rate of 6.72%. The reoperation rate increased with increasing age at the first surgery. This is an update to the 2018 report on the demographic and clinical characteristics of strabismus and strabismus surgery with an additional 6 years of data, now including 70 million patients of all ages. They also reported reoperation rates at 1, 3, and 5 years and evaluated risk factors associated with the performance of a strabismus reoperation. The results showed a total of 1,951,001 patients (2.46%) had strabismus. Diagnoses included esotropia (17.8%), exotropia (21.8%), hypertropia (13.5%), and paralytic strabismus (16.1%). At least 1 surgery was performed in 125,984 patients; 79% of reported codes were for horizontal surgery; 58% of cases were performed in patients aged less than 20 years. Reoperation rates were 5.61% (95% CI, 5.43—5.81), 8.53% (8.30—8.76), and 10.13% (9.88—10.38) within 1, 3, and 5 years, respectively. When compared with Medicare Part B, the odds ratios for a reoperation were lower for patients with commercial insurance (0.72) and Medicaid (0.82). The odds ratios of a reoperation when compared with the Northeastern United States were significantly lower in the Midwest (0.75), South (0.88), and the West (0.73). The strength of this study is its vast sample size and inclusion of data over a 10-year period. This information can be useful for developing patient information and counseling as well as for physician benchmarking.

Comparison of Two Different Extraocular Muscle Suturing Techniques for Strabismus Surgery
Zhou T, Guo W, Zhu X, et al
Am J Ophthalmol 2025;278:131-139
This prospective cohort study compared two extraocular muscle suturing techniques—3-point fixation (3PF; central locking stitch) versus 2-point fixation (2PF; no central locking stitch)—in 248 patients undergoing bilateral medial or lateral rectus recession for strabismus. The primary finding was that the 3PF technique significantly reduced the risk of overcorrection compared to

2PF, with cumulative overcorrection incidence of 13.09% versus 33.72%, respectively (a 62% risk reduction). Overcorrection was defined as postoperative deviation greater than 10 prism diopters in the opposite direction of the original deviation. The study found no significant difference between techniques in rates of undercorrection or recurrence, which occurred in approximately 8% of patients overall. Both groups showed similar cumulative incidence of undercorrection/recurrence (around 47%) over the follow-up period. The authors concluded that the 3PF suturing technique represents a superior alternative to the traditional 2PF approach for bilateral horizontal rectus muscle recession surgery, primarily due to its ability to reduce overcorrection while maintaining comparable efficacy in preventing undercorrection.

Surgical Dosing for V-Pattern Exotropia
Yehezkeli V, Parunakian E, Suh SY, Meng Q, Demer JL
Am J Ophthalmol 2025;280:64-70 This was a retrospective case series examining surgical strategies for correcting V-pattern exotropia (VXT). 55 patients (36 children, 19 adults) who underwent various surgical approaches between 2014 and 2025 were included: inferior oblique (IO) recession alone, superior transposition of lateral rectus muscles, their combination, or horizontal rectus surgery without pattern-specific modifications. All surgical approaches successfully reduced primary gaze exotropia from an average of 29Δ to 8Δ ($P < .001$), though patients experienced a mean exodrift of 6Δ over 2.1 years of follow-up. The study found that while all approaches reduced the V-pattern, the combination of IO recession and lateral rectus transposition yielded the greatest pattern reduction (from 30Δ to 5Δ). Notably, horizontal rectus recession alone also reduced the pattern (from 16Δ to 6Δ), suggesting that pattern-specific modifications may not always be necessary. The surgical effect of lateral rectus recession on exotropia was smaller than predicted by traditional Parks tables, accounting for only 40% of variance. The authors recommend that horizontal rectus recession dosing need not be adjusted for anticipated pattern collapse and suggest early overcorrection given the tendency for postoperative drift.

Surgical Dosing for Correction of Consecutive Exotropia
Meng Q, Parunakian E, Yehezkeli V, Demer JL
Am J Ophthalmol 2025;280:176-181
This retrospective case series examined surgical dosing for consecutive exotropia. The study included 44 patients (average age 35 years) with mean preoperative exotropia of 29Δ at distance and 33Δ at near. Patients were excluded if they had previous medial rectus (MR) advancement surgery or paralytic/restrictive exotropia. Thirty patients underwent bilateral MR advancement, 4 underwent unilateral MR advancement, 2 patients had bilateral MR advancement with unilateral lateral rectus (LR) recession, 6 patients had unilateral MR advancement with unilateral LR recession, and 2 patients had unilateral MR advancement with bilateral LR recessions. 11 patients had concurrent vertical muscle surgeries. At final follow-up, distance exotropia was reduced from 26Δ to 7Δ in the MR advancement group and from 39Δ to 9Δ in the MR advancement + LR recession group, though exoshift of 6.6-7.5Δ occurred between initial and final follow-up. 10 patients required additional surgery due to undercorrection. Regression analysis of surgical dose-response suggested each MR advancement should be augmented by 2 mm more than Parks' general surgical recommendations for treating exotropia

by MR resection. The authors concluded that this augmentation strategy may improve correction of consecutive exotropia while providing the opportunity to explore the MR muscle during surgery.

Convergence Insufficiency After Bilateral Medial Rectus Recession for Age-Related Distance Esotropia?
Meng Q, Yehezkeli V, Parunakian E, Demer JL
Am J Ophthalmol 2026;282:20-25
This retrospective case series examined 110 patients (mean age 74 years) with age-related distance esotropia (ARDE) who underwent bilateral medial rectus recession between 2014 and 2024. 28 patients underwent concomitant vertical rectus surgeries. Preoperatively, patients had esotropia averaging 13Δ at distance and 4Δ at near. After a mean post-operative follow-up of 14 months, 7% of patients developed exophoria at distance, while 44% had exophoria at near (including 8 patients with >10Δ). Twenty-three patients required additional strabismus surgery – 18 for recurrent ARDE and 5 for hypertropia. ARDE recurred in 20% of patients at final follow-up, with survival analysis showing approximately 15% recurrence at 2.5 years and 40% at 5 years postoperatively. Patients without recurrence had significantly more exophoria at final follow-up compared to those with recurrence (-2.5Δ vs -0.1Δ, P = .02), suggesting that postoperative exophoria may protect against late recurrence of ARDE. The authors concluded that bilateral medial rectus recession for ARDE is unlikely to cause symptomatic convergence insufficiency, and the development of mild exophoria may be a favorable prognostic indicator for long-term surgical success.

Scleral adjustment method: a novel and easy adjustable suture technique in strabismus surgery
Hamasaki I, Shibata K
J AAPOS Published online January 27, 2026
This retrospective single-institution study describes the authors' experience with a novel scleral adjustment (SA) method for adjustable sutures in strabismus surgery, focusing on surgical technique, postoperative outcomes, and practical advantages. Over a 6 month period with 3 months of postoperative follow up, the SA method involved securing the muscle with double armed 8 0 polyglactin 910 sutures using a locking bite at each pole, followed by two scleral passes anterior to the original insertion parallel to the muscle. There were no knots tied after the scleral passes in the operating room. Postoperative binocular adjustment was performed in the recovery area, targeting slight overcorrection for horizontal deviations and slight under-correction for vertical deviations at distance fixation, with suspension sutures tied using a 2 1 1 knot. Fourteen patients with a mean age of 60 years and a range of strabismus diagnoses (superior oblique palsy, esotropia, exotropia, hypotropia, sagging eye syndrome) were included, and all achieved postoperative alignment within 10 prism diopters without complications such as scleral perforation, severe inflammation, or granuloma. The authors highlight the technique's simplicity, reduced suture manipulation, and potential to decrease inflammation while preserving tensile strength. Limitations to the technique include increased risk of scleral perforation or intraocular inflammation due to the additional scleral pass. Limitations of the study include lack of quantitative operative data, such as time required in operating room and for adjustment, and

short-term follow up. This study presents an alternative technique to adjustable sutures in strabismus surgery.

Medial transposition of the split lateral rectus muscle used as a primary procedure for treatment of complete third nerve palsy
Farid MF
Strabismus Published online December 29, 2025
This retrospective case series aims to describe the outcomes and complications of medial transposition of the split lateral rectus (MTSLR) surgery for the management of complete 3rd nerve palsies in previously unoperated eyes. Twelve patients (ages 2-65 years) with mean pre-op exotropia of 96 prism diopters underwent primary MTSLR and had an improvement in exotropia to a mean of 2 prism diopters post-operatively. All patients achieved post-operative alignment within 10 prism diopters of orthophoria. The authors contrast their cohort with other studies which combine results of MRSLR when used for either primary or secondary surgery. Although the sample size in this study is small, the authors suggest that the results may be more successful and the procedure easier to perform when MRSLR is used as primary surgery. A limitation of this study is that limited data was provided regarding pre- and post-operative assessment of binocular vision. The authors state that only one patient had post-operative diplopia and this was transient. Given the guarded results of other surgeries for complete 3rd nerve palsy described in other studies, this study provides additional confidence in the use of MTSLR for primary treatment of 3rd nerve palsy.

Long-term outcomes of inferior rectus recession with conjunctival recession in congenital monocular elevation deficiency: a case series
Singh A, Mishra S, Verma S, Kumar B
Strabismus Published online November 25, 2025
The aim of this study is to report the long term (>2 years) results of treatment of monocular elevation deficiency with a standardized dose recession of the inferior rectus regardless of degree of restriction on forced duction test. Ten patients with mean age of 18 years underwent inferior rectus recession of 6 mm and recession of overlying conjunctiva for any degree of pre-operative hypertropia (20-55 prism diopters) and any degree of pre-operative inferior rectus restriction. Seven patients achieved orthophoria in primary position. The remaining 3 patients underwent another surgery, either vertical Knapp procedure or contralateral superior rectus recession. The study is limited by lack of control group and small sample size but the applicability to practice is that a simplified approach of a standardized inferior rectus recession may correct most cases of moderate to severe monocular elevation deficiency.

Long-term outcomes of botulinum toxin A for acute acquired comitant esotropia in children: a retrospective case series
Koçkar A, Çetinkaya Yaprak A, Doğan SN, Özgül O
Strabismus Published online November 24, 2025
The purpose of this retrospective case series is to describe long-term results of botulinum toxin A treatment of acute acquired comitant esotropia (AACE). Twenty patients with mean age of 5 years received botulinum toxin at an average of 4 weeks after the onset of AACE symptoms.

Seven patients underwent a second injection. At final follow-up (at least 12 months post treatment) mean deviation was 10 prism diopters at distance and 8 prism diopters at near. Five patients ultimately required strabismus surgery. The limitations of the study are small sample size and lack of standardized timing of injections and follow-up. One may apply these results to clinic practice in offering this procedure to patients for AACE with careful consideration of potential need to re-inject and the significant risk of needing incisional surgery despite injections.

Abbreviated prism adaptation protocol integrated with alternate prism cover testing for preoperative measurement in acute acquired comitant esotropia
Chen D, Cheng T, Du L, et al
Strabismus Published online February 9, 2026
The aim of this retrospective interventional case series was to evaluate an abbreviated prism adaptation cover testing protocol (APCT) for pre-operative measurements of acute acquired comitant esotropia (AACE). The APCT method was to place the patient in the correcting prism determined on standard prism alternate cover test (PACT). After 5 minutes of adaptation while in the clinic, the PACT was repeated and if additional esotropia was elicited, then additional correcting prism was added and the patient allowed to adapt for another 5 minutes. These steps were repeated until no additional esotropia was found. Eye muscle surgery was performed based on the results of the APCT. The surgical results of 89 patients with a mean age 34 years were analyzed. The APCT yielded measured esotropia a mean of 11 prism diopters greater than the standard PACT. Using the APCT measurements for eye muscle surgical planning, all subjects achieved successful surgical outcomes with alignment within 5 PD and absence of symptomatic diplopia in daily activities at the 3-month follow-up interval. The limitations of this study are the retrospective design, lack of control group and limited duration of follow-up. The mean age of patients seems significantly higher than other publications. Applicability to practice is to consider APCT planning surgery for AACE.

Surgical outcome of Modified Nishida's procedure in monocular elevation deficiency
Sultan T, Tomar V, Dadeya S, Saini A, Khurana M, Pandey K
Strabismus Published online December 1, 2025
The purpose of this prospective interventional study was to evaluate the effectiveness of the Modified Nishida procedure in patients with Monocular Elevation Deficiency (MED). Fifteen patients with Type 2 congenital MED, significant hypotropia, no horizontal deviation and no previous extraocular musce surgery underwent transposition of the superior borders of the medial and lateral recti to the medial and lateral boarders of the superior rectus muscle. Mean age of patients we 23 years. Results showed a statistically significant reduction in mean hypotropia from 28.67 PD preoperatively to 7.60 PD at three months ($p < 0.001$). Most patients (10 of 15) achieved success at 3 months as defined as < 5 prism diopters of post-operative vertical strabismus. Elevation deficit also improved significantly from a mean of -3.47 to -2.73 ($p < 0.01$). Overall, the study concluded that the Modified Nishida’s procedure is effective in improving both vertical deviation and elevation deficit in patients with MED.

A prospective randomized pilot study comparing fibrin glue, buried suture knot and exposed suture knot techniques for conjunctival closure in bilateral symmetrical fornix approach squint surgery
Agarwal NB, Sheth JN, Nanavati H, Sharma SS, Naik M, Gupta R
Strabismus Published online January 5, 2026
This study compared fibrin glue (FG), buried suture knot (BSK), and exposed suture knot (ESK) for conjunctival closure in bilateral symmetric strabismus surgery using a fornix incision. Thirty eyes from patients over 10 years old were randomized to one of the three closure methods. Conjunctival closure time was significantly faster with FG (37.2 ± 29.0 s) compared to BSK (171.6 ± 53.1 s) and ESK (148.7 ± 51.0 s). Patient-reported symptoms, including pain, foreign body sensation, itching, and watering, were similar across all groups, though FG showed greater comfort than BSK at two weeks. FG eyes exhibited significantly less postoperative inflammation than ESK at one week and BSK at two weeks. Both BSK and ESK eyes, but not FG eyes, showed a significant increase in conjunctival thickness at six weeks compared to preoperative measurements. Complications were minor, including wound gaping and infection in FG and a Tenon cyst in ESK. Overall, FG reduced surgical time and early inflammation, while long-term patient comfort was comparable across all closure methods. Based on favorable closure time and patient comfort, surgeons may wish to try fibrin glue for closure.

Outcomes of Nishida Muscle Transposition Procedure for Abducens Nerve Palsy Maher S, Awadein A, Farag C, Gouda J, Arfeen S
Am J Ophthalmol 2025;279:274-282
This retrospective case series evaluated motor outcomes of the Nishida procedure (a minimally invasive vertical rectus muscle transposition technique without muscle disinsertion or splitting) combined with medial rectus recession (Mrc) for unresolving sixth nerve palsy (SNP), a common cranial nerve palsy with limited spontaneous recovery after 6 months that often requires surgery to restore binocular vision when lateral rectus function is poor. The study reviewed 34 patients (mean age 24.4 ± 19.2 years, 70.5% trauma-related) with nonresolving SNP who underwent Nishida procedure (sutures placed 12 mm from the limbus in all cases) plus simultaneous Mrc in 33 cases (mean 4.6 ± 1.2 mm) or prior Mrc in one, with >3 months follow-up (mean 10.3 ± 9.1 months). Preoperative esotropia averaged 44.7 ± 7 PD in unilateral cases (n=32) and 90 PD in bilateral cases (n=2), with severe abduction deficits (−4 to −5). Success was defined as alignment within 8 PD of orthophoria without diplopia or significant vertical deviation. Initial overcorrection >8 PD occurred in 8 cases (23.5%), resolving spontaneously in 6 within 2–3 weeks; persistent exotropia remained in 2. Residual esotropia >8 PD occurred in 4 cases (11.7%), all with sutures placed farther from lateral rectus borders (5–7 mm vs. ≤5 mm in successful cases); no correlation existed with Mrc amount. Final success rate was 82.3%, with mean postoperative deviation 1 ± 6.5 PD (range XT 15 to ET 20). Abduction improved (mean deficit −2.7 ± 0.8), though 44% developed mild adduction limitation (−0.5 to −1); induced vertical deviation occurred in 2 but resolved in 1. No anterior segment ischemia or other major complications occurred. Strengths include the largest reported series of Nishida procedures for SNP, single-surgeon consistency, detailed operative measurements (e.g., suture positioning linked to undercorrection), and demonstration of a relatively simple, low-risk transposition with good alignment stability and self-adjusting overcorrections; limitations are its retrospective

design, variable follow-up durations (some as short as 3 months), exclusion of binocular field of vision or torsional measurements, potential selection bias, and lack of direct comparison to other transposition techniques. This study may impact clinical practice by supporting the Nishida procedure as an effective, safer alternative to traditional transpositions for unresolving SNP—particularly when combined with appropriate Mrc—due to its technical simplicity, reduced ischemia risk, and high success with careful suture placement close to lateral rectus borders to minimize undercorrection, potentially improving outcomes in trauma-related or other chronic cases while avoiding more invasive procedures.

Long-Term Sensory and Motor Outcomes for the Treatment of Abnormal Head Posture Secondary to Nystagmus
Morgado A, Gaier ED, Heidary G, Gise R, Staffa SJ, Dagi L
Am J Ophthalmol 2026;281:91-98
This retrospective interventional case series from Boston Children's Hospital (2014–2023) evaluated long-term motor and sensory outcomes after extraocular muscle surgery to reduce abnormal head posture (AHP) in 40 pediatric patients (median age 7 years at surgery; 63% male) with nystagmus-associated AHP (75% horizontal, 25% vertical), including those with concurrent strabismus repair. Median preoperative AHP was 30° (IQR 20°–40°), decreasing significantly to 5° (IQR 0°–10°) at last follow-up (median 38 months, IQR 12–56; P < .001), with 77.5% achieving motor success (residual AHP ≤10°; median 81% reduction). Success rates remained stable over time: 73% at 3 months, 71% at 2 years, and 79% long-term (P = .663). Concurrent strabismus repair (in 30% of cases) did not compromise AHP reduction (83% success vs 75% without; P = .697), though strabismus success was modest (58% ≤10 PD residual). Preoperative best-corrected visual acuity (BCVA) ≥20/40 (in better eye or OU) strongly predicted motor success (95% vs 58% for BCVA <20/40; P = .007), with median preoperative logMAR 0.3 (20/40) in successes vs 0.54 in failures (P = .01). Stereoacuity (available in 73%) remained stable in 93% and improved ≥2 octaves in 7% (no deterioration). No significant postoperative BCVA change occurred at 1 year (P = .125). No major complications or reoperations were reported, though 43% had mild duction deficits (median –1). Strengths include a well-characterized cohort with extended follow-up, clear motor success definition (≤10° residual AHP), stability assessment over multiple time points, inclusion of concurrent strabismus repair cases, and novel identification of preoperative BCVA as a strong predictor of motor outcome. Limitations are retrospective design (potential selection bias toward operated cases, variable AHP measurement including photo estimation in 9%, incomplete baseline testing), single-center setting (limited generalizability), exclusion of waveform oculography (preventing detailed nystagmus subtype analysis), and lack of consistent FMNS/LN documentation or vertical strabismus repair cases. These findings will impact clinical practice by supporting extraocular muscle surgery (e.g., Kestenbaum/modified Kestenbaum for horizontal, vertical rectus/oblique procedures for vertical AHP) as an effective, durable option for reducing nystagmus-associated AHP (stable success ~75–80% over ≥3 years), with concurrent horizontal strabismus repair feasible without compromising AHP outcomes; preoperative counseling should emphasize markedly lower success likelihood (only ~58%) in patients with BCVA <20/40, while reassuring families about preserved/stable stereoacuity and rare severe complications, guiding patient selection and expectations in this challenging population.

Measuring the Costs of Strabismus Surgery: A Time-Driven Activity-Based Costing Analysis
Portney DS, Skanchy DF, Shapiro JN, Valentine AD, Gappy C, Williams PE
Am J Ophthalmol 2026;281:449-455

This retrospective economic analysis from the University of Michigan (2022 calendar year) used time-driven activity-based costing (TDABC) to quantify day-of-surgery costs and identify cost drivers in 690 consecutive strabismus surgeries (47% pediatric, 53% adult) performed by 7 surgeons across four sites (hospital OR 47%, ophthalmology-specific HOPD 42%, ambulatory surgery center [ASC] 11%). Average day-of-surgery cost was $4420 (SD $1357), with no significant differences between pediatric vs adult cases (P=.339) or unilateral vs bilateral surgery (P=.547), despite shorter surgery time in pediatric cases (50.7 vs 56.9 min; P<.001). Key process times included preoperative 87.8 min, anesthesia 102.3 min, OR 89.9 min, surgery 53.9 min, and postoperative 113.2 min. Most cases involved horizontal muscles only (66%), bilateral surgery (68%), fellow as second surgeon (67%), no adjustable sutures (89%), and no reoperation (86%). Multivariate regression identified independent cost and time drivers: Lower costs/time: ASC location (-$813, P<.0001; -7.4 min) and fellow second surgeon (-$512, P<.0001; -7.3 min). Higher costs/time: adjustable sutures (+$1023, P<.0001; +20.6 min), reoperations (+$823, P<.0001; +15.5 min). Per-muscle increments: horizontal +$768, inferior oblique +$498, vertical +$976 (all P<.0001). Strengths include the largest reported TDABC analysis of strabismus surgery, comprehensive process mapping, inclusion of diverse surgical characteristics (pediatric/adult, unilateral/bilateral, adjustable sutures, reoperations, muscle types), multivariate adjustment for confounders, and direct comparison of incremental costs vs Medicare reimbursement (showing undervaluation of additional muscles, adjustable sutures, and reoperations). Limitations are single-institution academic setting (limited generalizability; costs vary by facility/payer), focus on day-of-surgery costs only (excludes preoperative evaluation, postoperative visits, anesthesia professional fees beyond capacity rates), retrospective design (potential unmeasured confounders), reliance on EHR timestamps (possible inaccuracies), and no adjustment for case complexity beyond recorded variables. These findings will impact clinical practice and policy by providing transparent, granular cost data for strabismus surgery, highlighting that ASCs and fellow involvement reduce costs/time while additional muscles (especially vertical), adjustable sutures, and reoperations substantially increase them—often exceeding Medicare incremental reimbursement (e.g., +$768–$976 per muscle vs ~$200–$250 modifier payment)—underscoring the need for advocacy to align payments with true resource use, particularly for complex/pediatric cases reliant on Medicaid; surgeons and administrators can use these insights for operational efficiency (e.g., ASC preference when feasible), resource allocation, and discussions on workforce shortages in pediatric ophthalmology/adult strabismus due to unfavorable economics.

Trauma

Incidence and clinical characteristics of pediatric traumatic hyphema from 2000 to 2009 in a population-based cohort
Ashby GB, Claxton MR, Mohney BG
J AAPOS Published online September 18, 2025
The authors aimed to report on the incidence, clinical characteristics, and outcomes of hyphema in the pediatric population. They performed retrospective chart review of patients less than 19 years old diagnosed with closed-globe traumatic hyphema at multiple medical centers in a single Minnesota county from 2000-2009. Data collected included initial and final vision, intraocular pressure, exam findings, details of injury, and hyphema severity. Of 70 patients who met inclusion criteria, 74% were males. The average age was 13, and most common mechanisms of injury were sports-related or from projectiles. 44% had microhyphema only. Final mean logMAR visual acuity was 0.03, but 41% had angle abnormalities or other sequela on exam. The authors concluded that visual outcomes are good, but findings that could contribute to long-term prognosis are common. They also note that none of the patients were hospitalized for management, yet rebleed rates were lower in this study than in previous studies where patients were managed in-patient, concluding that outpatient management is acceptable. Limitations include retrospective nature of the study and limited population diversity. This study is encouraging for continued outpatient management of traumatic hyphema, but encourages regular follow up for long-term sequela.
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Uveitis

Tocilizumab effectiveness in paediatric non-infectious uveitis: data from the International AIDA Network Registries on ocular inflammatory disorders
Sota J, Breda L, Paroli MP, et al
Br J Ophthalmol 2025;109(10):1151-1154
Although childhood non-infectious uveitis (NIU) is infrequent, there can be significant ramifications on vision, eye health, development, and quality of life. Utilizing an international uveitis and Behçet disease registry (Internal AIDA Network), children with NIU onset < 16 years old treated with tocilizumab (TCZ) (an IL-6 inhibitor) were assessed primarily for number of relapses before and after treatment and secondarily for steroid-sparing effect, changes in visual acuity, and improvement in macular edema and retinal vasculitis. 15 patients were enrolled with a majority having bilateral, anterior uveitis among a cohort of JIA (n=7), Behçet (n=3), mixed CTD (n=1), and idiopathic (n=4). A significant relapse reduction from 314 106 per 100 eyes before and after TCZ treatment (p=0.016) was noted. Steroid usage also reduced from a mean of 10.93 m g before to 1.7 mg after TCZ. Vision was similar between baseline and post-treatment. In the 4 patients with macular edema/retinal vasculitis, all resolved with treatment. As opposed to the APTITUDE trial that suggested TCZ didn't have success in TNF-refractory NIU, this study appeared to show ~three-fold improvement in relapses and reduction in steroid need. This study is limited with the lower number of enrolled patients; however, this is in the setting of a rare disease and treatment regiment, which was pulled from a multi-center international registry. The study provided added support for the use of TCZ in the treatment of NIU

Prevalence, Treatment Patterns, and Outcomes of Pediatric Noninfectious Uveitis in the United States: An IRIS Registry Analysis
Uner OE, Lin P, Kopplin LJ, et al
Ophthalmol Retina 2025;9(11):1106-1113
Uveitis is a significant cause of vision loss in the United States, including in pediatric patients. This large study using IRIS data explores noninfectious uveitis in pediatric patients across the United States, including 5722 pediatric patients. The average age at diagnosis was 12.5 years, and around half were female. The majority (69%) had anterior uveitis. Around 10% of patients had severe vision loss at final follow-up. Complications relating to uveitis occurred in a significant number, including cataract (10%) and macular edema (5%) and glaucoma (4%). Around 5% of patients required surgery, and most of these patients had posterior uveitis or panuveitis. This large study provides interesting information of pediatric uveitis in the United States and underscores that it remains an important cause of vision loss. Given the use if IRIS data, some finer details of patient presentation may be missed, but nevertheless shows the complications that can occur in pediatric uveitis.

Vision Screening

Effectiveness of the KidsVisionCheck mobile application in screening for amblyopia risk factors and visually significant refractive error
Ganeshan M, Chung A, Silverstein E
J AAPOS 2025;29(6):104681
KidsVisionCheck (KVC), a free photoscreening mobile application for iOS and Android released in 2022, aims to detect amblyopia risk factors (ARFs) in children, but is not FDA approved. The purpose of this study was to assess the app's sensitivity and specificity in detecting ARFs and visually significant refractive errors in a pediatric ophthalmology clinic with a high prevalence of pathology. This study evaluated KVC's performance in a convenience sample of 120 pediatric ophthalmology clinic patients 12 months to 12 years of age (average age SD, 6.8 3.3 years). Screening was followed by a dilated fundus examination with cycloplegic refraction. A successful screen was performed for 65.8% of children and the number of inconclusive results was higher in patients with darker iridis and inability to stay still. The 2021 AAPOS Vision Screening guidelines were used to assess for ARFs and visually significant refractive errors. This enriched population had a 44.2% prevalence of ARFs and visually significant refractive errors. The sensitivity of the application was 69.7%; the specificity, 58.7%; the positive predictive value was 54.8%, and the negative predictive value was 73.0%. KidsVisionCheck performed worse on these metrics than FDA-approved commercial instrument-based vision screeners. limitations: high rate of inconclusive results, performed off one phone model. Impact on clinical practice: KVC does not meet desirable standards for ARF and visually significant refractive error detection.

Agreement between the Spot Vision Screener and cycloplegic retinoscopy for toddlers with astigmatism
Twelker JD, Arthur AW, Bhakta R, et al
J AAPOS Published online September 30, 2025
AAPOS currently recommends that children aged 12 months to 3 years undergo instrument-based vision screening at annual well-child exams with their pediatrician. Authors were interested in the concordance between Welch Allyn spot vision screeners and cycloplegic retinoscopy in infants and toddlers. They looked at 410 children between 12 and 35 months (average 20.24 months) who underwent spot screening and, subsequently, cycloplegic refraction as part of the Spectacle Prescribing in Early Childhood Study (SPECS). Participants were referred to pediatric eye care provider from February 2021 to March 2024 after failing a spot screening by a pediatrician. Exam included repeating the spot screening, assessing pupils, alignment, and anterior segment, cyclopleging with 1 drop of proparacained followed by 2 drops of cyclogyl 1% 5 minutes apart, waiting 30 minutes, and performing retinoscopy and fundus exam. They compared right eye spot vision values for sphere, cylinder, and spherical equivalent to those of retinoscopic values using t-test and Bland-Altman analysis, finding that mean spherical equivalent values for spot screening was significantly less than for cycloplegic retinoscopy. Cylinder values, on the other hand, were significantly higher on spot screenings than on retinoscopy. Authors also note that AAPOS referral guidelines for children less than 4 years changed from threshold greater than 2.00D of astigmatism in 2013 to greater than 3.00D

in 2021. In addition to the above, they also looked at the sensitivity, specificity, positive predictive value, and negative predictive value of spot screenings using the 2013 and 2021 criteria as compared to findings on retinoscopy. The change to 2021 referral criteria resulted in spot screening having higher specificity, sensitivity, and NPV, overall better clinical accuracy. Limitation of this study includes relatively small sample size including patients only from Southern Arizona. Authors conclude that reliance on spot vision screeners could result in under-referral for moderate and high hyperopia. This can be combatted by performing visual acuity testing in 3-5 year olds at well-visits so that amblyopia from bilateral high hyperopia without esotropia may be detected.

Instrument-Based Screening for the Detection of Amblyopia and Amblyopia Risk Factors: A Report by the American Academy of Ophthalmology
Oatts JT, Collins ME, Cavuoto KM, et al
Ophthalmology 2025;132(11):1294-1303
This Ophthalmic Technology Assessment reviewed the evidence on the diagnostic accuracy of instrument-based vision screening devices for detecting amblyopia and amblyopia risk factors (ARFs). The authors performed a systematic PubMed search through January 2025 and included 33 prospective studies (28,072 children, mostly ≤6 years old), all rated level III evidence due to risk of bias or incomplete reporting. The primary outcomes were sensitivity, specificity, and referral rates for detecting amblyopia or ARFs compared with a comprehensive eye examination by an ophthalmologist or optometrist. Nine devices were evaluated, most commonly Plusoptix, Spot, and Retinomax, with wide ranges of sensitivity (e.g., 32%–100% for Plusoptix, 60%–94% for Spot, 70%–95% for Retinomax) and specificity (roughly 39%–100%), and referral rates ranging from 2% to 63%, often higher in ophthalmology clinic settings. Most studies used referral thresholds based on guidelines from AAPOS though criteria varied and influenced test performance. Overall, most devices showed higher sensitivity than specificity, meaning they detected many at-risk children but sometimes over-referred. Key limitations included variability in study design and setting, inconsistent reporting (many lacked confidence intervals or referral rates), reliance on ARFs rather than true amblyopia as the reference standard, and limited direct device comparisons. The panel concluded that instrument-based screening is a useful, rapid, and practical tool for early detection, especially in young or pre-verbal children, but emphasized the need for standardized reporting and clearer referral criteria to optimize screening programs. This study highlights the importance of ophthalmologist involvement in selecting devices, setting referral thresholds, and designing effective community screening strategies to prevent irreversible vision loss.

Phased multimodal consent in a Baltimore school-based vision program: a novel approach
Kuo JCL, Guo X, Collins ME
J AAPOS 2025;29(5):104654
Authors implemented a phased and multimodal consent process for school based vision screenings in Baltimore in the year 2022-2023 in hopes of improving participation in the program. Parental consent is required to provide an in-school exam to students who fail screening. In the universal phase, an email was sent to all parents, offering an eye exam to students who failed the screening. In the targeted phase, parents of students who failed (who

had not already provided consent) received another email, a paper form, and a telephone call attempting to obtain consent. Of 46 schools who participated, mean consent response rate was 86%. Targeted consent response rate was much higher than universal; among the targeted consent responses, most were obtained via phone call. They concluded that multimodal approach to consent increases outreach and response rates.

Vision and developmental delay in toddlers
Sanchez J, Gerhart K, Arthur AW, et al
J AAPOS Published online September 20, 2025
Authors were interested in the association of vision impairment and developmental delay in toddlers. They performed a retrospective medical record review of children aged 11 to 37 months from 3 clinics in Arizona looking for an association between clinical diagnosis of developmental delay and failed spot vision screening. Patients with neurologic conditions were excluded. In comparing rates of failed spot screening in children with and without developmental delay, they found that a larger portion of children who had failed a vision screening had a developmental delay, but that children with developmental delay underwent significantly more vision screening tests. Thus, they repeated logistical regression evaluating only the first vision screening of 805 eligible children. They found that males were significantly more likely than females to have a diagnosis of development delay, and that white children were more likely than hispanic children to have diagnosis of developmental delay. When race and sex were accounted for, failed vision screen was not associated with diagnosis of developmental delay. Sample size is a strength of the study, while limited information on severity of vision problems and inaccuracies in automated vision screens are weaknesses. More research is needed to determine if certain types or severity of vision impairment is associated with developmental delay.

Socioeconomic Determinants of Unmet Vision Care Needs and Gaps in Eye Examinations in Pediatric Populations From 2016 to 2022
Khan S, Bowers KE, Cavuoto KM
Am J Ophthalmol 2025;278:99-107
This cross-sectional study analyzed data from the National Survey of Children's Health (2016-2022) to examine socioeconomic determinants of unmet vision care needs in children ages 0-17. Among children unable to obtain necessary vision services, caregivers most frequently cited cost (59.9%), difficulty securing appointments (47.7%), and insurance eligibility concerns (32.4%) as primary barriers. Multivariable analysis revealed that children without health insurance (OR: 5.11) or with coverage gaps (OR: 4.73) were significantly more likely to forgo needed vision care, as were those from lower-income families (0-99% FPL: OR 2.56) and Black non-Hispanic children compared to White non-Hispanic children (OR: 2.97). A temporal analysis demonstrated declining rates of pediatric eye examinations from 2016 to 2022, with the lowest point occurring in 2020 during the COVID-19 pandemic, followed by partial recovery in 2022. The findings underscore substantial disparities in pediatric vision care access based on insurance status, income level, and race/ethnicity, highlighting the need for targeted interventions to address these inequities and prevent long-term visual impairment in vulnerable pediatric populations.

Sociodemographic factors and pediatric eye examinations: a population-based analysis
Mihalache A, Huang RS, Zajner C, et al
J AAPOS Published online January 31, 2026

Children ages 3–5 years are recommended by the US Preventive Services Task Force to undergo at least one vision screening, and AAPOS advises that infants with concerning findings such as abnormal red reflex, strabismus, chronic tearing, discharge, or reading difficulties receive a comprehensive eye exam. This retrospective study used data from the 2022 National Health Interview Survey to assess how sociodemographic factors influence the likelihood of children receiving eye examinations. The dataset included children ages 0–17 years who had undergone an eye exam within the previous year. Among 7,365 children with available information, only 39.5% had an eye exam in the prior 12 months. Univariate analysis showed lower odds of examination among younger children (0–4 years), those living in the West, children in rented or alternative housing, those with married or cohabitating parents, children with public or no insurance, and those whose household adults had less than a high school education. However, these associations were not significant in multivariable analysis. The study's strengths include a large, nationally representative cohort, while limitations include its retrospective, survey-based design and potential for recall, voluntary, and nonresponse bias. Clinically, the findings identify vulnerable populations who may benefit from targeted efforts to improve vision screening rates.

Visual Impairment

Association of Vision Impairment With Food Insecurity in US Children
Talaparthy T, Zumlot Y, Al-Zubi A, Ghazali R, Oke I, Elhusseiny AM
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This cross-sectional study using 2021-2023 National Survey of Children's Health data examined the association between vision impairment (VI) in children and household food insecurity (FI) in a nationally representative U.S. sample of over 153,000 children. The study found that households with a child with caregiver-reported vision impairment had 71% higher odds of being food insecure (adjusted OR 1.71, 95% CI 1.37-2.14) and 77% higher odds of experiencing more severe food insecurity (proportional aOR 1.77, 95% CI 1.44-2.19) compared to households with children without VI, even after adjusting for socioeconomic factors including household income, parental education, and family size.The findings identify families of children with vision impairment as a high-risk population for food insecurity, independent of traditional socioeconomic determinants. The authors conclude that these results underscore the need for routine food insecurity screening in pediatric and ophthalmology clinics, as well as policies that better integrate social and medical support for these vulnerable families. The presence of childhood VI may impose additional financial and logistical burdens on families that contribute to food insecurity beyond what would be expected from socioeconomic status alone.

Ocular conditions associated with parental concerns regarding childhood development and worse quality of life among multiethnic preschool children
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This study evaluates parental concerns regarding eye health in preschool children using data from the Multiethnic Pediatric Eye Disease Study (MEPEDS), a large population-based study conducted in Los Angeles that intentionally recruited Hispanic, Black or African American, and Asian American children to ensure diverse representation. Using a cross sectional design, researchers analyzed data collected between 2003 and 2011, which included standardized comprehensive eye examinations performed by ophthalmologists or optometrists, along with parental questionnaires assessing developmental concerns using the PEDS screening tool. Children were categorized as low or high risk for developmental concerns. Among 8,265 children included, 16% were classified as high risk, with notable variation across racial and ethnic groups: 7.1% of non-Hispanic White children, 20.9% of Hispanic children, 19.4% of African American children, and 5.0% of Asian American children were identified as high risk. High risk children tended to be older, male, born to younger mothers, from lower income households, or exposed prenatally to alcohol or tobacco. Multivariate analyses revealed that strabismus was consistently associated with higher parental concern across all ages, and astigmatism was associated with increased concern in older children. Both strabismus and astigmatism correlated with physician diagnosed developmental delays and worse quality of life, whereas anisometropia and amblyopia did not show such associations. The study’s limitations include a relatively small number of children with ocular conditions and the inability to infer causation due to its cross-sectional design, as parental concerns could not be directly correlated with clinical developmental assessments. Clinically, the authors suggest that comprehensive eye examinations may be valuable for children diagnosed with developmental delays.