What's New in Pediatric Ophthalmology Literature?

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

Last updated: March 2025

Table of Contents

What's New in Pediatric Ophthalmology Literature? 1
- Table of Contents 1
  - All-Star Nominees 3
    - Amblyopia, Refractive Error, and Vision Screening 3
    - Strabismus and Strabismus Surgery 6
    - Prematurity, ROP, Systemic Diseases / Practice Systems, and Education 7
    - Anterior Segment, Cataract, Glaucoma / Uveitis / Infectious Disease 8
    - Retina, Retinoblastoma, Intraocular Tumors, and Trauma 10
    - Neuro-ophthalmology, Nystagmus, Visual Impairment / Plastics and Orbit 12
    - Genetics 15
  - Amblyopia 17
  - Anterior Segment 23
  - Cataract 28
  - Cataract Surgery 30
  - Genetics 33
  - Glaucoma 47
  - Infections 55
  - Neuro-Ophthalmology 56
  - Nystagmus 60
  - Oculoplastics 61
  - Orbit 65
  - Pediatrics / Infantile Disease / Syndromes 68
  - Practice management / Health care systems / Education 69
  - Prematurity 74
  - Refractive Error 76
  - Refractive Surgery 86
  - Retina 87
  - Retinoblastoma 94
  - Retinopathy of Prematurity 102
  - Strabismus 112
  - Strabismus Surgery 121

Trauma.....131
Uveitis.....132
Vision Screening.....133
Visual Impairment.....137

All-Star Nominees

Amblyopia, Refractive Error, and Vision Screening

Fluoxetine as a possible treatment for adult amblyopia: results of a double-blind, randomized, placebo-controlled trial
Mirmohammadsadeghi A, Mousavi A, Akbari MR, et al
J AAPOS 2024;28(5):104009
Amblyopia is one of the most common causes of monocular vision impairment in adults, but the standard treatments have diminishing effectiveness with age. Recent research suggests that pharmacological treatments may enhance neuroplasticity and improve vision in adult amblyopia patients; however, prior studies on fluoxetine for this purpose have yielded contradictory results. This study aimed to determine whether fluoxetine, combined with standard treatments, could improve vision in adults with amblyopia. This was a double-blinded, randomized clinical trial that included 55 adult patients with anisometropic or strabismic amblyopia. Patients were randomized into two groups: oral fluoxetine + patching/refractive correction vs just patching/refractive correction. The fluoxetine group showed a significantly greater improvement in visual acuity compared to the placebo group. Improvement in the fluoxetine group remained stable for 18 months after treatment discontinuation. No participants reported adverse effects. The strengths of this study were its design (double-blinded and randomized) and long follow-up. Weaknesses were the small sample size and lack of formalized adverse event monitoring. This is an important study as it presents a promising therapy for adults with amblyopia.

Spectacle Lenses With Highly Aspherical Lenslets for Slowing Axial Elongation and Refractive Change in Low-Hyperopic Chinese Children: A Randomized Controlled Trial
Zhang Z, Zeng L, Gu D, et al
Am J Ophthalmol 2025;269:60-68
This study investigated the effectiveness of highly aspherical lenslets (HAL) spectacle lenses in slowing axial length (AL) elongation and delaying myopia onset in pre-myopic children. This single-center, randomized controlled trial, conducted at Fudan University Eye and ENT Hospital in Shanghai, China, included 108 Chinese children aged 6.0–9.9 years with a spherical equivalent refractive error (SERE) of 0.00 to +2.00 D. Participants were randomized to wear either HAL spectacle lenses or standard single-vision lenses (SVL) for 1 year. Cycloplegic refraction, AL, and uncorrected visual acuity (UCVA) were assessed at baseline, 6 months, and 12 months, with lens-wearing duration tracked using a Clouclip device and questionnaire logs. The primary outcomes were changes in AL and SERE over 1 year. Results showed that the 1-year AL elongation was 0.24 mm in the SVL group and 0.19 mm in the HAL group (P =.057), while the SERE change was −0.19 D and −0.23 D, respectively (P =.883). Changes in AL and SERE correlated significantly with lens-wearing time. In the subgroup wearing lenses >30 hours/week, the HAL group had significantly slower AL elongation (0.11 mm) than the SVL group (0.27 mm) (P <.001). No significant differences were found in the ≤30 hours/week subgroup or across different age and baseline SERE subgroups. This study, as the first to assess HAL lenses in pre-myopic children, demonstrates a potential dose-dependent effect of HAL lenses in slowing AL elongation and delaying myopia onset. Despite limitations such as the short follow-up period and homogeneous population, the findings suggest that HAL lenses,

particularly with consistent and prolonged wear, offer a promising non-invasive alternative to pharmaceutical interventions for myopia prevention. This highlights the importance of early intervention and suggests that optical strategies can be effective even before myopia develops.

Five-Year Clinical Trial of the Low-Concentration Atropine for Myopia Progression (LAMP) Study: Phase 4 Report
Zhang XJ, Zhang Y, Yip BHK, et al
Ophthalmology 2024;131(9):1011-1020
This fourth phase of the study aimed to evaluate the long-term efficacy of low concentration atropine over 5 years, the proportion of children requiring restart of treatment after cessation of atropine, and the efficacy of re-treatment using 0.05% atropine for children with myopic progression after cessation. All children in the atropine continued treatment groups at any concentration were switched to 0.05% atropine and any in the cessation group at any concentration were restarted on 0.05% atropine if either eye progressed to 0.50D/year or less during years 4 and 5. The parameters collected in this phase were the same as all prior phases. Primary outcomes included myopia progression, proportion of children needing retreatment, and the difference in myopia progression between continued treatment and prn retreatment groups from years 3 to 5. Over 5 years the cumulative mean SE progression were -1.34 ± 1.40 D, -1.97 ± 1.03 D, and -2.34 ± 1.71 D for the continued treatment groups with initial 0.05%, 0.025%, and 0.01% atropine, respectively (P = 0.02). Similar trends were observed in AL elongation (P = 0.01). Among the PRN re-treatment group, 87.9% of children (94/107) needed re-treatment. The proportion of re-treatment across all studied concentrations was similar (P = 0.76). The SE progressions for continued treatment and PRN re-treatment groups from years 3 to 5 were -0.97 ± 0.82 D and -1.00 ± 0.74 D (P = 0.55) and the AL elongations were 0.51 ± 0.34 mm and 0.49 ± 0.32 mm (P = 0.84), respectively. The authors discuss that results appeared to be based on concentration dependency, the higher the concentration the greater the effectiveness. Similar myopia progression in years 4 & 5 were noted across the different initial treatment concentrations, concluding that the initial treatment concentration does not influence the treatment effect when switched to 0.05%. The use of 0.05% over 4 years was more efficacious than either the prn or switchover groups. Good tolerability and low occurrence of adverse events were noted as well. A high percentage of children required restart of treatment after cessation at year 3. Overall the study demonstrated that 0.05% atropine was effective and well tolerated over 5 years and that retreatment can also be efficacious after cessation.

Myopia Control Effect of Repeated Low-Level Red-Light Therapy Combined with Orthokeratology: A Multicenter Randomized Controlled Trial
Xiong R, Wang W, Tang X, et al
Ophthalmology 2024;131(11):1304-1313
The authors conducted a 12 month multicenter, parallel group, single blinded RCT examining the combination of RLRL and orthokeratology. The groups consisted of patients given orthokeratology lenses along with RLRL or orthokeratology alone. The primary outcome was to study AL change at 12 months compared to baseline. Secondary outcomes included changes in other biometric parameters (CCT, AD, lens thickness, VA and IOP). The goal was to look for

change in macular choroidal thickness at 12 months relative to baseline. Results showed that the orthokeratology+ RLRL group suggested an efficacy of combining the two that became increasingly apparent over time relative to orthokeratology alone. The secondary outcomes were similar in both groups. With respect to choroidal thickening, the orthoK + RLRL group showed increasing macular thickness. The results overall showed a slowing of axial elongation by 0.29mm in the combined group vs orthoK alone and suggest that RLRL could augment the efficacy of orthoK However the sample size was small. The authors suggest that for patients who have axial elongation of greater than 0.50mm over 1 year with orthoK alone, RLRL might be a useful adjunct therapy.

Social and Quality-of-Life Impact of Refractive Surgery in Children With Developmental Disorders and Spectacle Nonadherence
Strelnikov J, Zdonczyk A, Pruett JR Jr, et al
Am J Ophthalmol 2025;269:20-29
This study evaluated whether refractive surgery could improve social functioning and vision-specific quality-of-life (VSQOL) in children with autism spectrum disorder (ASD) and/or intellectual disability (ID) who struggle to tolerate traditional vision correction. In this prospective, before-and-after case series at a single academic tertiary care center, 18 children (ages 3–18) with ASD and/or ID, significant ametropia, and spectacle nonadherence underwent refractive surgery, including photorefractive keratectomy (PRK), phakic intraocular lens (PIOL) implantation, or clear lens exchange (CLE). Social functioning was assessed using the Social Responsiveness Scale, 2nd Edition (SRS-2), and VSQOL was measured with the Pediatric Eye Questionnaire (PedEyeQ), both at baseline and at 1, 6, and 12 months post-surgery. Results showed statistically significant improvements in social awareness and motivation (+8 points and +7 points, respectively, P =.03) on the SRS-2, with clinically meaningful improvements in total SRS-2 scores for 56% of participants. The PedEyeQ revealed significant improvements in functional vision (+40 points, P =.02), bothered by eyes/vision (+23 points, P =.02), and parental worry (+28 points, P =.04). Refractively, 72% of treated eyes achieved the surgical goal, and 44% showed visual acuity improvement of two or more Snellen lines. This study, as the first to prospectively measure the social impact of refractive surgery in this population, demonstrates potential developmental benefits beyond visual correction. Despite limitations such as the small sample size and lack of a control group, it highlights refractive surgery as a viable option for children with ASD/ID and spectacle intolerance. The observed improvements in social awareness and motivation suggest that better vision may enhance social interactions in this population, emphasizing the importance of tailored ophthalmologic care in neurodevelopmental disorders. Future research with larger, controlled trials is needed to confirm these benefits and justify broader clinical application.

The effect of inconsistent guidelines on variability in pediatric vision screening referral outcomes
Sechrist SJ, de Alba Campomanes AG
J AAPOS 2024;28(6):104057
Yearly vision screenings, often conducted in primary care settings, are crucial for detecting ocular disorders in children. However, discrepancies exist in referral guidelines, particularly for children aged 5-6. This study compared different pediatric vision screening (PVS) referral

guidelines to evaluate the impact of these discrepancies on referral rates. Researchers retrospectively applied various PVS referral guideline thresholds to a cohort of 5- to 6-year-olds who underwent visual acuity screening during well-child visits. These results were then compared to actual referral rates. Analysis revealed a 2.7-fold difference in the proportion of children failing vision screening and an 18% difference in referral rates depending on the guideline applied. This highlights the uncertainty among primary care providers caused by conflicting PVS guidelines. Limited by its retrospective, cross-sectional design at a single academic center, this study emphasizes the need for consistent, evidence-based PVS referral guidelines, particularly for 5- to 6-year-olds. Harmonizing discordant criteria and improving alignment between professional organizations involved in pediatric vision screening are essential to ensure appropriate referrals and timely management of vision problems in children.

One-year efficacy of myopia control by the defocus distributed multipoint lens: a multicentric randomised controlled trial
Chen X, Li M, Li J, et al
Br J Ophthalmol 2024;108(11):1583-1589
This study is a multicenter clinical trial of a newly designed spectacle lens called defocus distributed multipoint (DDM) which is based on peripheral myopic defocus. 168 children age 6-13 years with SER between –1.00 and –5.00 (mean –2.74D) and no previous myopia control therapy were randomly assigned to wear a DDM lens or SVL in 3 different centers in China. Linear mixed model analysis compared between-group SER and AL changes, and logistic regression analysis was used to analyze the between-group difference in rapid myopia progression (SER increase >/+ 0.75D per year or AL growth >/= 0.40mm per year). Compared with the SVL group, the DDM lenses significantly delayed AL growth by 38% (mean difference 0.13 mm). In the linear mixed model analysis, no covariates were significantly associated with AL growth. The DDM group showed significantly delayed SER progression according to a mean difference of 0.24 D (34%) at 1 year. In the linear mixed model analysis, baseline age was significantly associated with SER progression. The proportions of participants with rapid myopia progression were 56.7% (38/67) in the SVL group and 27.2% (22/81) in the DDM group, which was significant and had an OR=3.51. Daily wearing time (> or < 12 hours) was positively correlated with SER increase and negatively correlated with AL growth in the DDM group, but this correlation was not significant in the SVL group. At 1 year, the DDM lens significantly reduced the risk of rapid myopia progression compared with the SV lens, especially for younger (6–9 years) children and boys. Additionally, longer daily wearing times improved its efficacy in myopia control. Further research is needed to understand longevity of treatment effects and all of the other questions we currently have related to all forms of myopia control, but is nice to have a spectacle option for those who are unable to wear contact lenses or use atropine eye drops.

Strabismus and Strabismus Surgery

Evaluation of a Novel Virtual Reality Simulated Alternate Cover Test to Assess Strabismus: A Prospective, Masked Study

Mori DM, Kuchhangi A, Tame J, et al
Am J Ophthalmol 2025;269:266-272
This study evaluated a virtual reality (VR)-based eye-tracking system for strabismus measurement in children, comparing it to the gold standard sensorimotor examination. This prospective, masked diagnostic test study included 85 children (ages 5-18) with visual acuity of 20/80 or better. Participants underwent a VR-simulated alternate cover test using the Olleyes VisuALL ETS headset, followed by a gold-standard alternate cover test performed by a masked pediatric ophthalmologist or orthoptist. Strabismus measurements from both methods were compared, and the sensitivity and specificity of the VR system were assessed. Of the participants, 40% (34/85) had strabismus, with esotropia, exotropia, and vertical strabismus present in 17.7%, 22.4%, and 5.9%, respectively. The VR system showed moderate overall correlation with the gold standard ($r = 0.42$, $p < 0.001$), with the strongest correlation for esotropia ($r = 0.74$, $p = 0.001$) and constant deviations. However, it demonstrated weak or no correlation for exotropia and vertical strabismus. Bland–Altman analysis revealed larger mean differences for exotropia and vertical strabismus, indicating underestimation by the VR system. The VR system had low sensitivity (27.6%) but high specificity (87.5%). This study, as the first to evaluate a VR-based alternate cover test, highlights the potential of VR technology for strabismus assessment, particularly for esotropia and constant deviations. Despite limitations such as poor sensitivity and underestimation of exotropia, VR offers advantages in accessibility, telemedicine integration, and postoperative monitoring. Future refinements should focus on improving accuracy, particularly for exotropia and intermittent deviations, and enhancing sensitivity for reliable strabismus detection. VR holds promise for expanding strabismus detection and monitoring, especially in telemedicine and remote screening applications, but requires further development before widespread clinical adoption.

Multiple Factors Causing Variability of Alignment in Childhood Concomitant Strabismus
Guo Y, Guan Y, Li LI, Jiang J
Am J Ophthalmol 2025;270:77-82
This study investigated factors contributing to variability in strabismus measurements to improve accuracy in clinical assessments and surgical planning. In this prospective interexaminer reliability analysis, 197 children with concomitant strabismus (57 with esotropia and 140 with exotropia) underwent repeat prism and alternate cover tests (PACT) by two independent orthoptists. Sensory tests were performed once, and measurements were classified as stable (difference within 10 prism diopters [PD]) or unstable (difference ≥10 PD). Variables analyzed included sensory results (suppression, stereopsis), patient age, and angle of deviation. Results showed that suppression significantly increased variability at distance ($p=0.004$) and near ($p=0.046$), while anisometropia was associated with increased variability at distance ($p=0.035$). Larger angles of deviation also increased variability, especially at distance. Age was not a significant factor, and while not statistically significant, better stereopsis tended towards more stable measurements. This study, with its strengths in prospective design and large sample size, highlights key factors influencing alignment variability in strabismus: suppression, anisometropia, and large angles of misalignment. Clinicians should consider these factors when determining surgical dosing, and improved assessment techniques or repeated testing may be necessary to reduce measurement errors. Future studies should evaluate longitudinal stability of

alignment to further refine surgical planning. This research emphasizes the importance of considering sensory status and deviation magnitude when evaluating strabismus alignment, ultimately contributing to better surgical outcomes.

Surgical Timing for Patients with Thyroid Eye Disease Treated with Teprotumumab: A Collaborative Multicenter Study
Walsh HL, Clauss KD, Meyer BI, et al
Ophthalmic Plast Reconstr Surg Published online December 10, 2024
Thyroid eye disease (TED) is a difficult to treat autoimmune inflammatory condition with a range of ocular symptoms. TED is primarily caused by the overexpression of the insulin-like growth factor 1 receptor (IGF-1R) on orbital fibroblasts, immune cell infiltration, and cytokine production, leading to inflammation and tissue expansion. Recent advancements in treatment, particularly the approval of teprotumumab (an IGF-1R-targeting monoclonal antibody), have shown significant improvements in managing active TED; however, surgical interventions are still necessary for certain symptoms. A challenge now is determining the optimal timing for surgery after teprotumumab treatment, as the drug's half-life is about 20 days, with its effects lasting up to 100 days. Surgeons traditionally wait 6 months after treatment for immune quiescence before performing surgery, though recent data suggest that surgery might be performed within a shorter window post-treatment without increased risk of disease regression. The study examined TED patients who underwent surgery either within 180 days or after 180 days of their last teprotumumab infusion to compare disease regression rates. The results revealed no significant difference in regression rates between the two groups. The study also found that regression characteristics, such as increased proptosis and higher Clinical Activity Score (CAS), were more pronounced in patients who underwent surgery later. Strengths of this study were its multicenter design and its attempt to answer an important clinical question. Weaknesses were its small sample size, retrospective design, and inability to come up with an definitive recommendation for optimal surgical timing. Overall, the study provides valuable insights into the optimal timing for surgical intervention in TED patients treated with teprotumumab. This is an important discussion and will hopefully prompt future studies looking for a more definitive answer.

Augmented-dose surgery based on the single Maddox rod test for acute acquired comitant esotropia
Zheng J, Wang Y, Shen T, et al.
J AAPOS 2024;28(6):104037
Previous studies indicate that postoperative undercorrection is common in patients with acute acquired comitant esotropia (AACE), leading to recommendations for increased surgical doses. This retrospective study compared the outcomes of augmented-dose surgery for AACE based on either the single Maddox rod test (SMRT) or the prism and alternate cover test (PACT) when a clinically significant difference existed between the two tests. The study reviewed the records of AACE patients who underwent augmented-dose surgery with a difference of ≥5Δ in preoperative deviations measured by PACT and SMRT. Augmented-dose surgery was determined by either the SMRT or PACT. Success was defined as the elimination of diplopia and deviations ≤10Δ, assessed with both PACT (PACT success) and SMRT (SMRT success) at near and distance. The study included 18 patients in the SMRT group and 15 in the PACT

group. In the SMRT group, the PACT success rate was 94%, and the SMRT success rate was 78%. Postoperative distance esodeviation was 0.72Δ ± 1.64Δ by PACT and 5.94Δ ± 4.73Δ by SMRT. In the PACT group, the PACT success rate was 80%, and the SMRT success rate was 33%. Postoperative distance esodeviation was 4.07Δ ± 5.15Δ by PACT and 13.73Δ ± 7.96Δ by SMRT. The SMRT success rate was significantly higher in the SMRT group than in the PACT group ($P = 0.010$), and the postoperative distance deviation was smaller in the SMRT group ($P < 0.05$), though there was no statistically significant difference in sensory outcomes between the groups. Limitations of the study include its retrospective design, small sample size, short follow-up duration, the variety of surgical procedures performed, and the use of adjustable sutures in some cases. Despite these limitations, the findings suggest that among patients with a difference of ≥5Δ in preoperative deviations assessed by SMRT and PACT, augmented-dose surgery based on the SMRT should be considered.

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

Patient satisfaction with synchronous telehealth care after strabismus surgery
Pereira CZ, Soares JQ, Saccon BP, Rossetto JD, Höpker LM
J AAPOS 2024;28(6):104045
To measure patient satisfaction with synchronous telehealth care after strabismus surgery, the authors used the Telemedicine Satisfaction Questionnaire (TSQ) to assess the quality of care, its similarity to in-person visits, and patients' perceptions of the interaction. The Portuguese version of the TSQ was administered in 2022 to patients in Curitiba, Brazil, who received postoperative synchronous telehealth care between 2020 and 2022. The time between the questionnaire and the telehealth consultation ranged from 2 to 22 months. All patients received synchronous telehealth care from the same surgeon between postoperative days 7 and 10 and had in-person consultations on days 1 and 30, at 6 months, and yearly thereafter. The study included 53 patients, with 26 (49%) male and 28 (53%) under 18 years old. Synchronous telehealth care was rated highly, with an average TSQ score of 4.3 out of 5. The mean score for quality of care was 4.1; for similarity to face-to-face visits, 4.5; and for interaction perception, 4.5. Distance between patients' homes and the hospital did not affect satisfaction. While limited by the small sample size, the study indicates positive patient perceptions of telehealth care quality, suggesting its acceptability for postoperative strabismus care.

Term infant brain MRI after ROP treatment by anti-VEGF injection versus laser therapy
Manrique M, Pham M, Basu S, Murnick J, Rana MS, Chang T, Chan C, Vieta-Ferrer E, Sano C, Limperopoulos C, Miller M
J AAPOS 2024;28(6):104038
Intravitreal injection of anti-vascular endothelial growth factor (anti-VEGF) agents is used to treat posterior type 1 retinopathy of prematurity (ROP). Recent reports indicate that anti-VEGF therapy may be associated with white matter brain injury, according to animal studies, and neurodevelopmental impairments in children born preterm. The purpose of this study was to investigate whether type 1 ROP treated with bevacizumab is associated with structural brain injury on term infant magnetic resonance images (MRIs) in very low birth weight (VLBW) infants compared with those treated with laser ablation. This was a retrospective review of the medical

records of VLBW infants from 2006 to 2021 with type 1 ROP who had been treated with laser or anti-VEGF. A pediatric neuroradiologist reviewed brain MRIs at term equivalent age (36-46 weeks' postmenstrual age) and classified infants for severity (no/mild vs. moderate/severe) of overall brain and white matter injury using the validated Kidokoro scoring system. Fifty-two infants met inclusion criteria, with 35 (67%) treated with laser and 17 (33%) with bevacizumab. Moderate-to-severe brain injury scores were not statistically different between bevacizumab and laser treatment groups in either continuous or binary adjusted analyses, for either the overall score or the white matter subscore. Strengths of the study included the use of a single, experienced neuroradiologist blinded to ROP treatment groups, while limitations included its retrospective design, single-institution setting, small sample size, and lack of functional neurodevelopmental data (i.e., structure versus function). These findings suggest that clinicians can counsel families when choosing treatment for type 1 ROP, as the severity of structural brain injury on term MRI (total and white matter) did not differ statistically between infants treated with bevacizumab and those treated with laser ablation.

P Score: A Reference Image-Based Clinical Grading Scale for Vascular Change in Retinopathy of Prematurity

Binenbaum G, Stahl A, Coyner AS, et al

Ophthalmology 2024;131(11):1297-1303

The authors discuss the various methods of grading plus disease over time and this study attempts to standardize ROP classification. A 34 group panel of experts were given a series of images to classify into 9 standard photographs of plus disease (P1-9). A second set of 30 ophthalmologists were given the 9 images as a reference and 180 images (30 were duplicates to allow for intragrader reliability assessment) to assess P score of the images. Primary outcome was integrated agreement across 30 graders for the gradings of all 150 images calculated separately for no plus, preplus, or plus disease grading and for P score grading. Secondary outcomes included integrated agreement for no plus, preplus, and plus disease grading and for P score grading measured between each pair of graders.The study found that intergrader agreement was higher using P score reference images rather than no plus, preplus, or plus disease parameters. The purpose of the P score was to provide a way to represent a continuous spectrum of ROP related vascular changes. The authors discuss the advantages of such a classification in that it facilitates more detailed comparison between examinations to assess for progression and regression, makes communication more effective between examiners and in handoffs, and allows more detailed documentation of the degree of vascular change. It can also be beneficial for ROP research. However at this time it shouldl not replace plus disease as defined by ICROP to guide treatment. The authors discuss that they now incorporate P score as a new element of the international classification to use alongside zone, stage and plus disease classification in ROP diagnoses as plus disease is essential for treatment decisions.

Anterior Segment, Cataract, Glaucoma / Uveitis / Infectious Disease

Complications, Visual Acuity, and Refractive Error 3 Years after Secondary Intraocular Lens Implantation for Pediatric Aphakia

Wang S, Repka MX, Sutherland DR, et al Ophthalmology 2024;131(10):1196-1206 This is a prospective study reporting the complications, refractive error, and visual acuity in infants and young children participating in a prospective PEDIG cataract surgery registry of pediatric cases who underwent secondary IOL implantation after previous unilateral or bilateral lens extraction for nontraumatic cataract. Participants included 80 (108 eyes) who subsequently underwent secondary IOL placement: 32 children had bilateral secondary IOLs (60 included eyes) and 48 had unilateral secondary IOLs. Th median age of lensectomy was 1.6 months for bilateral and 2.7 months for unilateral cases. The median age for secondary IOL placement was 2.7 years for bilateral and 2.1 years for unilateral cases. Glaucoma related adverse events (either development of glaucoma or glaucoma suspect) were the most common incident complications – 17% in bilateral cases and 12% in unilateral cases at 3 years post-lensectomy. At 5 years post-lensectomy, incidence of GRAEs was 29% in bilateral cases and 15% unilateral cases in the secondary IOL cohort, and 34% in bilateral cases and 22% in unilateral cases in the cohort who remained aphakic during the study period. No significant difference in risk for GRAEs by 5 years was found between eyes with secondary IOL versus eyes left aphakic. The 3-year incidence of surgery for visual axis opacification was 2% for bilateral and 4% for unilateral cases. Incidence of iris abnormalities was within 3 years of secondary IOL was 10% for bilateral and 4% for unilateral cases. 90 days post-operatively, the median refractive prediction error was less hyperopic by 0.88D for 21 bilateral cases and 1.50D for 19 unilateral cases. At 5 years, the median refractive error for 70 eyes with available data was +0.50 spherical equivalent for bilateral cases and +0.06 for unilateral. Median corrected visual acuity for 75 eyes at 5 years was 20/63 for bilateral and 20/400 for unilateral cases. This study provides important data that can help pediatric cataract surgeons assess and monitor patients with secondary IOLs, including glaucoma risk and knowledge of expected myopic shift when IOLs are placed at a younger age. The study is limited by the sample size and biases related to case selection for secondary IOL placement, as this decision was up to the treating provider.

Intracameral Anaesthetic Mydriatic Versus Topical Mydriasis in Pediatric Cataract Surgery: A Randomized Control Study
Sukhija J, Kaur S, Kumari K, Gupta K, Sen I
Am J Ophthalmol 2024;268:360-367
This study compared the efficacy and stability of intracameral atropine, methylcellulose, and adrenaline (ICAM) (phenylephrine 0.31%, tropicamide 0.02%, and lidocaine 1%) versus topical mydriatic (TM) drops (tropicamide 0.8%, phenylephrine 5%, and cyclopentolate 0.5%) in pediatric cataract surgery. This randomized, masked, fellow eye-controlled trial, conducted at a tertiary eye care facility, included children (≤12 years) with bilateral cataracts undergoing planned surgery. One eye randomly received ICAM at the start of surgery, while the other (control) received TM drops three times, starting an hour before surgery. Pupillary dynamics were measured at different surgical time points by a masked observer. 63 children (126 eyes) with a mean age of 15.7 months participated. ICAM achieved adequate mydriasis in 93.5% of cases, increasing pupil size from 1.78 mm to 5.1 mm after injection, while TM drops achieved adequate mydriasis in 88.8%, increasing pupil size from 1.75 mm to 6.06 mm ($p < .0001$). Maximum pupillary dilation was 6.06 ± 1.17 mm with ICAM and 6.75 ± 1.07 mm with TM drops

(p =.004). ICAM maintained stable or slightly increased pupil size throughout surgery, whereas TM drops showed a decrease toward the end (-0.33 ± 2.57 mm). ICAM required additional dilation in 3.17% of cases, compared to 11.1% with TM drops. No significant systemic side effects or unexpected complications were observed. This rigorous study, with its strengths in design and comprehensive outcome measures, supports ICAM as an effective alternative to TM drops in pediatric cataract surgery. While TM drops provided greater initial dilation, ICAM offered more stable mydriasis and reduced the need for intraoperative augmentation. ICAM also streamlined the surgical process, improving efficiency and reducing systemic exposure risks. Despite limitations such as the single-center design and lack of ethnic variation, these findings suggest that ICAM could become a preferred mydriatic approach in pediatric cataract procedures, particularly for infants and young children prone to intraoperative miosis.

Myopic shift after primary intraocular lens implantation in unilateral cataract children and its association with preoperative ocular parameters
Li Y, Jin G, Tan Y, et al
J Cataract Refract Surg 2025;51(1):53-59
This study investigates the myopic shift in children who have undergone unilateral cataract surgery with intraocular lens (IOL) implantation. 126 patients were evaluated at the time of surgery and followed 3 years post-operatively. The children were separated into 4 age groups: ages 1-2, 2-4, 4-6 and > 6 years old. The results found a mean myopic shift of 3.53 diopters in the youngest age group and 1.99 diopters in those older than 6. Interestingly, a greater interocular axial length difference pre-surgery was associated with a decreased myopic shift. The authors submit a table with target recommendations for IOL power in unilateral cataract patients that takes into account the refractive error of the normal eye.

Two-Year Results of Gonioscopy-Assisted Transluminal Trabeculotomy in Primary Congenital Glaucoma
El Sayed YM, Aboulhassan RM, Gawdat GI, Feisal AE, Elhilali HM
J Glaucoma 2024;33(11):862-866
While angle surgery has long been the standard primary procedure in most cases of primary congenital glaucoma, recent studies have suggested higher rates of successful outcomes with circumferential surgery compared to standard goniotomy or trabeculotomy. This prospective study aimed to evaluate the outcomes and relative risk factor/correlates of gonioscopy-assisted transluminal trabeculotomy (GATT) in the treatment of a large cohort of PCG eyes. A total of 60 eyes from 50 patients were treated with GATT, achieving an average incision extent of 353±21 degrees of Schlemm's canal, with complete 360 degree treatment achieved in 85% of cases. There was a statistically significant reduction in IOP at all post-operative time points (1, 3, 6, 9, 12, and 24 months post-op) with mean reduction of approximately 45% from pre-op IOP mean of 24mmHg to post op of 12.6mmHg at final follow up. Success rate at 1 and 2 years were 90 and 81%, with 76.7% and 72% of these being without need of anti-glaucoma medications. Ten percent of eyes required further surgery within the first year, and 3.3% failed to achieve IOP reduction >20% by year 2. Higher IOP reduction was found to be positively correlated with greater extent of SC incision (p=0.001), and failure rate was higher in the setting of greater

pre-op CDR (p=0.03). The most frequent complication was post-op hyphema (33.3%), but this was noted to resolve spontaneously within a month and was not found to correlate with final success rate or IOP. The cohort size and prospective nature of this study are strengths, especially given the rare nature of PCG, although limitations include the lack of a control arm and possibility of missed IOP spike recording in the first post-op month. This study points to the importance of continued exploration of circumferential treatments in the setting of PCG.

Retina, Retinoblastoma, Intraocular Tumors, and Trauma

Risk Factors for Retinal Detachment in Marfan Syndrome After Pediatric Lens Removal
Abdelmassih Y, Lecoge R, El Hassani M, et al
Am J Ophthalmol 2024;266:190-195
This study aimed to identify risk factors associated with retinal detachment (RD) after lens removal surgery in children with Marfan syndrome (MS). This retrospective, case-control study utilized an institutional case series from the Rothschild Foundation Hospital (Paris), encompassing surgeries performed between 2010 and 2020, with data on 85 children (<18 years) diagnosed with MS who underwent lens removal surgery. Variables assessed included age, axial length (AL), intraocular lens (IOL) implantation, capsular residue, follow-up duration, number of surgeries, and final best-corrected visual acuity (BCVA), with the primary outcome being the occurrence of RD. Statistical methods included univariate and multivariate analyses, Kaplan–Meier survival analysis, and logistic regression. Results showed an RD incidence of 22.2% (35 eyes), with bilateral RD occurring in 45.8% of these cases. The median time to RD was 7.2 years post-surgery, with 82.6% of cases developing RD more than 6 months post-operatively. Significant risk factors for RD included longer AL (OR = 1.3, P =.03) and capsular residue, which was the strongest predictor (OR = 16.8, P =.01). While IOL implantation was associated with RD in univariate analysis, this association was not significant in the multivariate analysis. Survival analysis showed an increased risk of RD from 8% at 5 years to 15% at 10 years. Despite limitations such as its retrospective design and potential biases, this study, with its strengths in cohort size, long follow-up duration, and rigorous statistical analysis, provides crucial insights into RD risk factors in pediatric MS patients after lens removal surgery. It emphasizes complete capsular removal during surgery and heightened surveillance for patients with increased AL, bilateral RD risk, and the necessity of lifelong follow-up for early detection and management of RD.

Intravitreal Topotecan for Vitreous Seeds in Retinoblastoma: A Long-term Review of 91 Eyes
Sen M, Rao R, Mulay K, Reddy VAP, Honavar SG
Ophthalmology 2024;131(10):1215-1224
This is a retrospective study of 91 eyes with retinoblastoma treated between January 2013 and April 2019. Patients with recurrent or refractory vitreous seeds after completion of intravenous or intra-arterial chemotherapy were treated with intra-vitreal topotecan (30microgram/0.15mL). Injection was repeated every 4 weeks until regression of seeds and had a minimum 12-month follow-up. Details of treatment prior to intravitreal topotecan are delineated in the methods section of the report. Vitreous seeds regressed in 82 eyes (90%) with a median of 3 injections and a median duration of 2 months. The 9 eyes (10%) with refractory seeds regressed with

additional tandem IVT and melphalan. Vitreous seeds recurred in 17 eyes (19%). The median time for recurrence was 7 months and in 13 eyes (77%), vitreous seeds recurrence was associated with recurrence of the main tumor. Tandem IVT and melphalan was administered in 15 eyes, 13 of which had refractory seeds and 2 of which had recurrent seeds Vitreous seeds regressed in all eyes (100%). Risk of vitreous seed recurrence after treatment with IVT was associated with increasing age and recurrence of retinal tumor. Cataract was the most common complication seen in 17 eyes (9%), followed by retinal detachment (n=4), sterile inflammation (n=3), phthisis (n=3), and pigmentary retinopathy (n=2). The data from this study shows that IVT by the safety-enhanced technique at a dose of 30 mg/0.15 ml at an every 3- to 4-week regimen is effective against both refractory and recurrent vitreous seeds, with regression of seeds in 97% eyes and eye salvage in 85% of eyes. Topotecan also seems to be less toxic to the retina, with pigmentary retinopathy noted in only 2 patients.

Apparent Diffusion Coefficient (ADC) Differentiates Retinoblastoma from Coats Disease on MRI
Zhang WX, Shimony JS, Lueder GT, Reynolds MM
Am J Ophthalmol 2024;267:8-12
This study explored the potential of the apparent diffusion coefficient (ADC), a measure of water molecule diffusion within tissue obtained from diffusion-weighted MRI (DW-MRI), as a biomarker to differentiate Coats disease from retinoblastoma in children. This retrospective cross-sectional study analyzed MRI scans of children diagnosed with either Coats disease (5 eyes from 5 patients) or retinoblastoma (29 eyes from 23 patients) between January 1, 2018, and January 8, 2022, with all MRIs performed before treatment. ADC values were obtained by sampling five to eight points from each lesion using MRI software, and internal reliability was assessed through blinded re-measurement. A t-test compared ADC values between the two diseases. Results showed that the mean ADC for retinoblastoma was significantly lower (442 ± 210 mm^2/s) than for Coats disease (1364 ± 309 mm^2/s) ($P < 0.001$), with consistent re-measurements confirming reliability. An ADC threshold of 900 mm^2/s effectively differentiated retinoblastoma from Coats disease with high accuracy. Factors such as age and sex were not significantly associated with ADC values, and interobserver agreement was 100% when classifying cases using ADC. This study suggests that ADC, as an objective and reliable metric, can be a valuable diagnostic tool for differentiating these conditions. Despite limitations such as the small sample size and retrospective design, the findings have potential clinical applications, as identifying an ADC threshold could reduce unnecessary invasive treatments, such as enucleation, in misdiagnosed cases. Future research should focus on refining ADC measurement protocols, increasing sample size, and validating findings across multiple institutions. This study highlights the potential of ADC measurements from DW-MRI as a valuable diagnostic adjunct for distinguishing retinoblastoma from Coats disease, with the potential to reduce misdiagnosis, unnecessary enucleations, and inappropriate treatment strategies if validated in larger cohorts.

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

Special Commentary: Cerebral/Cortical Visual Impairment Working Definition: A Report from the National Institutes of Health CVI Workshop
Chang MY, Merabet LB;

CVI Working Group
Ophthalmology 2024;131(12):1359-1365
This is a special report released by the NIH CVI workshop. It is a set of criteria established by medical experts to define and diagnose CVI, which is a visual impairment arising from damage to the brain's visual processing areas, causing functional vision deficits beyond what would be expected based solely on an eye exam alone. The established working definition is as follows:(1) CVI encompasses a spectrum of visual impairments caused by an underlying brain abnormality that affects the development of visual processing pathways and is characterized by deficits in visual function and functional vision (2) The visual dysfunction in CVI is greater than expected by any comorbid ocular conditions alone. (3) The visual dysfunction in CVI may manifest as lower-order or higher order afferent visual deficits, or both, leading to characteristic behaviors in affected individuals. (4) Although CVI may be comorbid with other neurodevelopmental disorders, CVI is not primarily a disorder of language, learning, or social communication. (5) The underlying neurologic insult of the developing brain may go unrecognized or undiagnosed until later in life. Rationale for this working definition is further discussed in the report. The authors hope that this definition will help guidance of future research in the area. The NIH is also developing a CVI registry to collect relevant data prospectively and longitudinally to help inform future research questions on CVI. Future work is needed to achieve consensus on nomenclature, diagnostic criteria, and strategies for early identification and intervention.

Diagnosis and Care of Children With Cerebral/Cortical Visual Impairment: Clinical Report
Lehman SS, Yin L, Chang MY;
Section On Ophthalmology ; Council On Children With Disabilities; American Association For Pediatric Ophthalmology And Strabismus, American Academy Of Ophthalmology; American Association Of Certified Orthoptists
Pediatrics 2024;154(6):e2024068465
Cerebral/cortical visual impairment (CVI) is a leading cause of pediatric visual impairment in developed economies and is increasing in developing economies. Because vision is crucial for learning, delayed CVI diagnosis can negatively impact education, making early detection and management essential. Routine vision screening may not accurately identify CVI, and co-occurring neurocognitive impairments and medical conditions can further complicate diagnosis. CVI is defined as "a verifiable visual dysfunction which cannot be attributed to disorders of the anterior visual pathways or any potentially co-occurring ocular impairment." This emphasizes that either there is no ocular abnormality, or visual function is worse than expected based on the degree of ocular pathology. Common etiologies of CVI include central nervous system malformations, head trauma, hydrocephalus, hypoxic-ischemic encephalopathy, infections, seizures, toxins and drugs, and intraventricular hemorrhage/periventricular leukomalacia in prematurity. Cerebral palsy is a frequent comorbidity, especially in children born preterm. Characteristics of CVI include challenges with visual focus, latency in response to visual stimuli, light sensitivity or affinity, enhanced object detection with movement, unusual visual behaviors, difficulty interpreting complex visual scenes, challenges with object/face recognition, and variable visual responses depending on the environment. To improve outcomes for children with CVI, recommendations include early identification, improved communication

among healthcare providers, addressing disparities in medical care, optimizing transition of care planning for young adults with CVI, supporting CVI research, and improving educational resources regarding CVI.

Adaptive functioning and relationship to visual behavior in children with cerebral/cortical visual impairment
Nguyen R, O'Neil SH, Borchert MS, Chang MY
J AAPOS Published online January 21, 2025
Cerebral/cortical visual impairment (CVI) affects visual function as well as difficulty with visual search, visually crowded environments, recognition of faces or objects, depth perception, motion perception, and/or visuospatial orientation. How this effects adaptive behavior (communication, socialization, and daily living skills) is unknown. This study investigates the relationship between adaptive behavior and CVI. This is a prospective study that recruited children aged 12 months-12 years diagnosed with CVI by a pediatric neuro-ophthalmologist. The Visual Behavior Scale (VBS) was used to assess visual acuity, and the Vineland Adaptive Behavior Scale, 3rd edition (VABS-III) was used to evaluate adaptive behavior. Adaptive behavior was and function was measured in the domains of communication, daily living skills, and socialization. 49 children with CVI were recruited and the mean visual acuity was equivalent to fixation on small objects (2 inch toy at 1 foot). The mean VABS-III score was below the 1% in all domains and all subdomains. There was a significant relationship between the visual acuity and VABS-III even when accounting for neurological comorbidities. Limitations of this study involve the complex nature of children with CVI with both ocular and neurologic comorbidities contributing to both visual function and adaptive behavior. There is a correlation between reduced visual acuity and reduced adaptive behavior in children with CVI which impacts socialization and daily living skills.

The Neutrophil-Lymphocyte Ratio in Pediatric Preseptal and Orbital Infectious Cellulitis
Law JJ, Orgul S, Tomlinson LA, Wladis EJ
Ophthalmic Plast Reconstr Surg Published online December 9, 2024
Orbital cellulitis (OC) and preseptal cellulitis (PC) can present similarly but need to be distinguished from one another as OC can have potentially vision and life-threatening consequences. This study investigates the neutrophil-lymphocyte ratio (NLR) as a potential biomarker to help differentiate between these conditions in pediatric patients, aiming to reduce reliance on imaging and improve clinical decision-making. This was a retrospective review including 66 patients (43 with OC and 23 with PC). The median NLR for OC patients was 4.18, which was significantly greater than the 1.96 observed in PC patients ($p < 0.001$). Among OC patients, those who required surgical intervention had a higher median NLR (6.53) compared to those managed medically (3.09, $p = 0.003$). The NLR did not show a significant difference in patients with OC who did or did not have a subperiosteal abscess ($p = 0.401$). Strengths of this study were its potential impact on clinical management of patients and its robust statistical analysis. Unfortunately, the study's retrospective nature and small sample size limited the ability to establish a definitive NLR cutoff for safe observation. This is an important study as it brings up the potential impact that NLR can have on the management of patients with OC/PC. By evaluating the NLR alongside clinical examination, we may be able to reduce the need for CT

scans and may avoid unnecessary surgical interventions. Larger prospective studies are needed to refine the NLR as a tool for distinguishing OC from PC.

Orbital Myositis and Strabismus: Clinical Profile, Management, and Predictive Factors for Recurrence

Lasrado AS, Chattannavar G, Jakati S, Mohamed A, Kekunnaya R

J Pediatr Ophthalmol Strabismus 2025;62(1):57- 66

This study examined the clinical profile, management, and recurrence factors in patients with orbital myositis. Researchers reviewed records of 52 patients (55 eyes) diagnosed with orbital myositis between 2010 and 2022. Patient demographics, presenting complaints, visual function, primary gaze deviation, and extraocular muscle involvement were analyzed. Radiological modalities, management, recovery status, and need for surgical intervention were also documented. The study found that 69% of patients were women, with a mean age of 36 years. Common presenting complaints were periocular pain (55%) and diplopia (49%). The disease was unilateral in 94% of cases, with 60% exhibiting ocular misalignment. The medial rectus muscle was most commonly involved (58%), and abduction limitation was present in 73%. Computed tomography and magnetic resonance imaging were equally used for diagnosis (42% each), and muscle biopsy was performed in 38% of patients. Systemic immunomodulators were required in 16% of cases, and strabismus surgery was performed in 11%. Recurrence was noted in 43% of patients, with abrupt cessation of steroids being a significant risk factor. The study concluded that systemic steroids with a slow taper are effective for most patients, while refractory cases may require biopsy and steroid-sparing agents. Surgical intervention can address residual disease after remission. Limitations include the retrospective design, high follow-up attrition rate, and challenges in differentiating idiopathic orbital myositis from thyroid eye disease.

Genetics

Nystagmus in infancy: causes, characteristics and main tools for diagnosis

Goldman E, Hendler K, Yahalom C

Eye (Lond) Published online December 5, 2024

The authors evaluated a cohort of 147 infants (0-1 year) presenting with nystagmus. The ocular pathology causing nystagmus was albinism (59.2%) followed by inherited retinal diseases (19.5%), cataracts, and other ocular pathology (9%). Only 8% of cases had idiopathic nystagmus, and only 5% of cases had neurologic causes of nystagmus. The main tests that helped reach diagnosis included clinical examination, genetic testing, and electroretinogram (ERG). Vertical nystagmus was seen in 8/147 infants; 4 had an IRD as a final diagnosis. The most common associated clinical characteristics were high hypermetropia and strabismus. This paper adds to the literature, suggesting a complete workup for nystagmus and the low yield of MRI.

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

Viola Lee KA, Aboobakar IF, Jain A, Tesdahl CD, Jin K, Oke I, Whitman MC
Ophthalmology 2025:S0161-6420(25)00067-3

This is an interesting study trying to evaluate the role of genetics in development and treatment of amblyopia. This study utilized data from the All of Us Research Program, a large-scale, publicly available biomedical database maintained by the National Institutes of Health (NIH). The All of Us database includes genotypic and phenotypic data from a diverse population of participants across the United States. The authors conducted genome-wide association study (GWAS) to identify single nucleotide polymorphisms (SNPs) associated with amblyopia. 764 subjects with amblyopia and 122,305 controls were included in the analysis. The GWAS revealed 4 loci that approached statistical significance defined as p = 5e-8: rs56105618, rs1349660, rs7958343, and rs138693522. Each of the variants is an expression quantitative trait locus (eQTL) for a gene expressed in the brain or related to neural development. RVAS revealed 15 genes with a statistically significant (p-value = 5e-05) different burden of variants: DCP1B, OR12D2, PCDHA4, ALKBH8, NMUR2, OR52P1P, NEU1, CACNB2, PSMA7, LRR1, ZNF831, FSIP2, ZNF654, CES5A, and MPV17, several of which have known roles in neurodevelopment. The identification of genes linked to amblyopia with roles in neurodevelopment suggests that the neurodevelopmental changes in amblyopia are not only secondary to abnormal visual experience but may result from the interaction of primary neurodevelopmental deficits with abnormal experience. This potentially explains why some children develop amblyopia and others do not with the same ocular risk factors, may explain differences in treatment outcomes, and suggests new avenues for amblyopia treatment.

Amblyopia

Fluoxetine as a possible treatment for adult amblyopia: results of a double-blind, randomized, placebo-controlled trial
Mirmohammadsadeghi A, Mousavi A, Akbari MR, et al
J AAPOS 2024;28(5):104009
Amblyopia is one of the most common causes of monocular vision impairment in adults, but the standard treatments have diminishing effectiveness with age. Recent research suggests that pharmacological treatments may enhance neuroplasticity and improve vision in adult amblyopia patients; however, prior studies on fluoxetine for this purpose have yielded contradictory results. This study aimed to determine whether fluoxetine, combined with standard treatments, could improve vision in adults with amblyopia. This was a double-blinded, randomized clinical trial that included 55 adult patients with anisometropic or strabismic amblyopia. Patients were randomized into two groups: oral fluoxetine + patching/refractive correction vs just patching/refractive correction. The fluoxetine group showed a significantly greater improvement in visual acuity compared to the placebo group. Improvement in the fluoxetine group remained stable for 18 months after treatment discontinuation. No participants reported adverse effects. The strengths of this study were its design (double-blinded and randomized) and long follow-up. Weaknesses were the small sample size and lack of formalized adverse event monitoring. This is an important study as it presents a promising therapy for adults with amblyopia.

Inter-Ocular Fixation Instability of Amblyopia: Relationship to Visual Acuity, Strabismus, Nystagmus, Stereopsis, Vergence, and Age
Ghasia F, Tychsen L
Am J Ophthalmol 2024;267:230-248
This study examined the relationship between fixation instability (FI) and factors such as amblyopia severity, strabismus angle, nystagmus, stereopsis, vergence instability, and age in 104 amblyopic subjects (13.3 ± 11.2 years old) and 47 controls (15.3 ± 12.2 years old). Amblyopia types included anisometropic (n = 33), strabismic (n = 35), and mixed (n = 36). FI was measured using infrared video-oculography, tracking horizontal and vertical eye positions during binocular and monocular viewing, and quantified using the bivariate contour ellipse area (BCEA). Vergence instability and inter-ocular FI ratios were also calculated. Multiple regression analysis examined relationships between FI and clinical factors. Results showed that FI was least severe in anisometropic amblyopia and most severe in mixed amblyopia, with strabismus angle positively correlating with FI ($P < .01$). Monocular viewing worsened FI, especially in severe amblyopia and large-angle strabismus ($P < .01$). Over 65% of strabismic/mixed amblyopes had nystagmus, compared to 27% of anisometropic amblyopes, with fusion maldevelopment nystagmus found only in strabismic/mixed cases. Younger children had greater FI and vergence instability ($P < .05$), but age did not affect inter-ocular FI ratios. Vergence instability was more pronounced in strabismic and mixed amblyopia, increasing significantly during monocular viewing, particularly in the fellow eye. This study, with its strengths in dataset size and quantitative eye-tracking analysis, confirms FI as a core deficit in amblyopia, influenced by severity, strabismus angle, and nystagmus. The inter-ocular FI ratio offers a robust marker

for amblyopia assessment, with potential for automated screening and treatment monitoring. Despite limitations such as exclusion of individuals with idiopathic infantile nystagmus and a cross-sectional design, the findings reinforce the importance of early detection and intervention, as younger children exhibited more instability. Objective FI measurements using video-oculography may serve as biomarkers for amblyopia and strabismus, with the inter-ocular FI ratio providing a new diagnostic metric. Future machine-learning tools leveraging eye-tracking technology could enhance amblyopia diagnosis and monitoring.

Virtual Reality With Eye Tracking for Pediatric Ophthalmology: A Systematic Review
Nikolaidou A, Sandali A, Chatzidimitriou E, Pantelaki D, Gianni T, Lamprogiannis L
J Pediatr Ophthalmol Strabismus 2024;61(6):381-390
New technology is changing medicine. In recent years, virtual reality glasses, often with eye tracking technology, have been utilized in ophthalmology for examination, diagnosis, and treatment of certain eye conditions. Pediatric ophthalmology, with its sometimes less-than-compliant patients, seems to be an ideal field in which to utilize these new technologies; therefore, the authors here seek to examine the existing literature and applications of virtual reality in pediatric ophthalmology. In all, the authors found 20 studies involving virtual reality in pediatric ophthalmology. Of these, 55% focused on diagnosis/examination, while 45% focused on treatment and rehabilitation. The most common pathology for which virtual reality is being used (at present) is amblyopia, with strabismus and visual field defects being the two other most common pathologies. For amblyopia, virtual reality is primarily being used as a vehicle for dichoptic therapy, including in FDA-approved devices like Luminopia and CureSight. For strabismus, the focus is more on diagnosis, with multiple devices seeking to measure misalignment; however, there were two studies that looked at using virtual reality to help improve control of intermittent and/or post-operative deviations. For visual field defects, virtual reality has been used to better engage pediatric patients during visual field testing. In all, this paper suggests that virtual reality with eye tracking shows promise in certain domains of diagnosis and treatment in the pediatric ophthalmology office.

High-Adherence Dichoptic Treatment Versus Patching in Anisometropic and Small Angle Strabismus Amblyopia: A Randomized Controlled Trial
Wygnanski-Jaffe T, Kushner BJ, Moshkovitz A, Belkin M, Yehezkel O;
CureSight Pivotal Trial Group
Am J Ophthalmol 2025;269:293-302
This study compared the effectiveness and safety of a novel binocular eye-tracking-based home treatment (CureSight) with traditional patching for amblyopia in children. In this prospective, evaluator-masked, multicenter, randomized controlled trial (RCT), 149 children aged 4 to <9 years with anisometropic, small-angle strabismic, or mixed-mechanism amblyopia were randomized to either the CureSight group (90 minutes/day, 5 days/week for 16 weeks) or the patching group (2 hours/day, 7 days/week for 16 weeks). The primary endpoint was the mean improvement in amblyopic eye visual acuity (VA) from baseline to 16 weeks. Results showed that CureSight was noninferior to patching in the modified intent-to-treat (mITT) analysis and superior in the per-protocol (PP) analysis ($p=0.02$). No significant differences were found in stereoacuity improvements. The CureSight group had significantly higher adherence (94%) than

the patching group (83.9%, p=0.0038), with 93% of parents reporting satisfaction with CureSight. No serious adverse events were reported. This high-quality RCT demonstrates that CureSight is a viable alternative to patching, with equal or superior effectiveness, higher adherence, and greater parental satisfaction. Despite limitations such as the restricted age range and self-reported patching compliance, this study supports binocular therapy as an effective and child-friendly alternative for amblyopia treatment. The findings suggest that CureSight could be considered a first-line treatment option, particularly for children with adherence difficulties, pending further research on long-term outcomes. This study highlights the potential for wider adoption of binocular therapy in amblyopia management.

Patch-free streaming contrast-rebalanced dichoptic cartoons versus patching for treatment of amblyopia in children aged 3 to 5 years: a pilot, randomized clinical trial
Jost RM, Birch EE, Wang YZ, et al
J AAPOS 2024;28(5):103991
Previous research has shown dichoptic treatments to be effective, but many existing methods are challenging for younger children due to complex games or difficulty using anaglyph glasses/head-mounted displays. This study aimed to evaluate a novel dichoptic amblyopia treatment designed for preschool children. This is a randomized clinical trial comparing dichoptic cartoon treatment to standard patching in children aged 3-5 years. The trial enrolled 34 children, with 17 assigned to each treatment. The dichoptic group watched cartoons modified for binocular imbalance using a handheld Nintendo 3DS XL, and the patching group covered their stronger eye for two hours daily. At two weeks, the dichoptic group showed greater visual acuity improvement compared to the patching group. Stereoacuity improvements were observed but did not significantly differ between groups. Adherence was high (98%-99%) in both groups. Strengths of this study were the randomized control trial design with direct comparison to patching and the younger age group that was studied. Limitations were the short duration and small sample sizes. This is an important study as it presents a possibility for dichoptic treatment that can be used in a younger age group.

Amblyopia and physical activity in adolescents
Lee KE, Torjani A, Thuma TBT, et al
Strabismus 2024;32(4):223-229
Recent studies have shown that individuals with amblyopia may have difficulties with coordinating balance and may be at greater risk of developing fine motor impairments. The purpose of this study was to determine if there is an association between the presence of amblyopia and physical activity (PA) in adolescents. Adolescent patients aged 12–18 years with a history of childhood amblyopia were age- and gender-matched to control patients with no other ocular pathology aside from refractive error. Each participant's best corrected visual acuity and refractive error were recorded in addition to their height and weight to calculate body mass index (BMI). A 32-question electronic survey was used to calculate self-reported physical activity level (PAL) score and type of physical activity over the previous seven days. The Ainsworth Compendium of Physical Activities was taken as a reference to calculate Metabolic Equivalent of Task (MET) minutes for the most frequently performed activity. A total of 26 adolescents with amblyopia (10 strabismic, 16 anisometropic) and 26 healthy controls were recruited. The MET

minute values were 2404.3 ± 2313.9 in the control group and 905.6 ± 1196.0 in the amblyopia group (p = .008). The PAL scores were similar between amblyopia and control groups; however, BMI was significantly higher in amblyopia participants (25.2 ± 6.3 versus 21.1 ± 5.4, p = .003). When compared with controls, amblyopes perceived physical activity to be of significantly lower importance in their lives compared to controls. Amblyopic adolescents may represent a population with increased vulnerability to significantly lower energy expenditure and higher BMI. Future studies with a larger number of participants and further investigation into the impact of refractive error on physical activity may be useful in identifying these patient at risk of obesity in the future. The study has some limitations. Self-reporting physical activity over the past 7 days may reduce recall bias but may not reflect the average PAL over the year due to seasonal sports, weather, school, or other time-consuming activities. Other factors that also influence BMI such as maternal smoking and television viewing time should have been mitigated by the case/control nature of the study. A consensus method to accurately assess physical activity in children and adolescents has not been clearly standardized.

Baseline and outcome stereoacuity of children with anisometropic amblyopia undergoing dichoptic amblyopia treatment
Birch EE, Jost RM, Kelly KR
J AAPOS Published online January 24, 2025
Dichoptic therapy with optic correction for amblyopia treatment is an alternative to standard-of-care optical correction and patching to improve visual acuity in children with anisometropic amblyopia. However, there is a paucity of data regarding stereopsis and binocular function in children with anisometropic amblyopia treated with dichoptic therapy. This study aims to investigate binocular function outcomes in children treated with dichoptic therapy in those that achieve normal visual acuity compared to those with residual amblyopia. Data from 8 previous prospective clinical trials of contrast-rebalanced dichoptic amblyopia treatment in children with anisometropic amblyopia conducted between 2014-2023 was analyzed for best corrected visual acuity, baseline and outcome stereoacuity and binocular function. Participants were subdivided into 3 groups: spherical anisometropia, astigmatic anisometropia, and combined anisometropia. The study included 185 children, aged 3-12 years. Better baseline visual acuity, less suppression, and less anisometropia were associated with better outcome stereoacuity and binocular function. Children aged 3-6 years with normal visual acuity after dichoptic treatment had better stereoacuity and binocular function outcomes than those children with residual amblyopia. In children aged 7-12 years, there were fewer participants with successful treatment, and stereoacuity and binocular function outcomes were similar between those successfully treated and those with residual amblyopia. The strength of this study is the data was collected in a prospective manner with a relatively large sample size; however, the studies were conducted at a single site. Dichoptic therapy for anisometropic amblyopia has similar stereopsis and binocular function outcomes as patching and Bangerter filters as reported previously.

Effectiveness of Dichoptic Therapy for Treating Mild to Moderate Amblyopia in a Tertiary Eye Care Center in South India
Ganesh S, Lusobya RC, Balasubramanian J, et al

J Pediatr Ophthalmol Strabismus 2024;61(6):416-424
Dichoptic therapy has become more studied and more prominent in recent years in pediatric ophthalmology as a potential intervention for amblyopia. Here, the authors evaluate the use of dichoptic therapy (specifically, the Bynocs AmblyGo platform) as a treatment for mild to moderate amblyopia (6/60 or better BCVA in the amblyopic eye(s)) in India. This platform uses red-blue goggles to dissociate the two eyes, and the patient plays games on a personal computer with “active graphic components” that are only visible to the amblyopic eye. On their retrospective chart review, 74 eyes of 59 patients, with most patients being 7-19 years old, met inclusion criteria. Although the majority of these patients had previously undergone occlusion therapy, and were on the older side of treatment, there was an improvement in visual acuity in 82% of amblyopic eyes. Perhaps more importantly, of the 21 patients without single binocular vision, 20 achieved single binocular vision by completion of therapy. Additionally, many experienced an improvement in distance and/or near stereopsis. Although it is difficult to ascertain the true effects of this therapy, especially in comparison to occlusion or penalization, given its retrospective nature, this paper adds to the literature suggesting that dichoptic therapy is a viable and useful alternative treatment for amblyopia, and one that still may have some efficacy after previous treatments. Moreover, it hints that, as a binocular amblyopia treatment, it may have binocular benefits, such as improvement in stereopsis. This should be further investigated in randomized, controlled trials.

Fixation stability deficits in anisometropic amblyopia
Zhou Y, Yu W, Ye Q, et al
Invest Ophthalmol Vis Sci 2025;66(1):14
This study investigated the relationship between fixation stability deficits in anisometropic amblyopia and various visual functions, as well as retinal structure. Researchers measured the contrast sensitivity function (CSF) using the qCSF method and assessed fixation stability and the preferred retinal locus using the MP-3 microperimeter. Bivariate contour ellipse area (BCEA) of both eyes was used to quantify fixation stability. The study found that fixation stability in the amblyopic eye was significantly associated with age, CSF, the interocular difference in CSF, eccentricity of the preferred retinal locus in the amblyopic eye, and fixation stability in the fellow eye. Fixation stability in the fellow eye was significantly associated with its own eccentricity and the fixation stability of the amblyopic eye. Both eyes exhibited eccentric fixation and fixation instability, with fixation stability in both eyes correlating with the eccentricity of the preferred retinal locus. These findings suggest that clinical management of amblyopia should consider fixation stability and characteristics of both eyes. However, as a cross-sectional study, it could not establish causal relationships or observe changes in fixation stability over time. Further longitudinal studies are needed to address these limitations.

Evaluating Eye Tracking During Dichoptic Video Viewing With Varied Fellow Eye Contrasts in Amblyopia
Quagraine IM, Murray J, Cakir GB, et al
Invest Ophthalmol Vis Sci 2024;65(14):11
Amblyopia is a neurodevelopmental disorder from discordant visual input from the two eyes during the critical period of visual development. There is recent interest in newer dichoptic

amblyopia therapies which target interocular suppression such as by reducing the contrast in the fellow eye (FE) while maintaining 100% contrast in the amblyopic eye (AE) or dichoptic masking where complementary parts of images are presented to each eye separately. Studies of dichoptic treatments have shown mixed results. This study used eye-tracking technology to measure the fixation duration of the AE and FE in participants with amblyopia or previously treated amblyopia to determine how viewing durations change at various FE contrasts. 27 individuals with amblyopia (8 anisometropia, 9 strabismus <5 PD, 10 strabismus >5 PD) and 8 healthy controls were recorded during dichoptic viewing of stationary dots and videos with varying FE contrasts (100%, 50%, 25%, and 10%). Those with significant suppression, visual acuity, and stereoacuity deficits had reduced AE fixation in the AE region at 100% FE contrast and lowering FE contrast increased AE duration in stimuli presented within the AE region, particularly in anisometropic and treated strabismic participants and strabismus participants that showed fixation switches while viewing dichoptic stationary dots. At lower FE contrasts, those with worse stereoacuity and visual acuity continued to show diminished AE fixation in the AE region. Increased eye deviation was noted in strabismic participants with decreasing FE contrasts which can influence the effectiveness of dichoptic treatments. Limitations include the small sample size and passive viewing of dichoptic stimuli. The results of this study suggest that dichoptic contrast modulation shows promise for reducing suppression; however, responses vary by amblyopia type and visual function deficits and individualized treatments may be beneficial.

Anterior Segment

Comparative analysis of biometry and anterior chamber metrics in the eyes of extreme hyperopic and emmetropic children
Stern B, Ben-Eli H, Karshai I, Mechoulam H, et al.
J AAPOS 2024;28(6):104032
This prospective case-control study investigated the clinical and biometric features of pediatric eyes with extreme hyperopia (at least +8 diopters). Researchers compared biometric parameters in children with extreme hyperopia to those of an age-matched emmetropic cohort. All participants underwent comprehensive eye examinations, anterior OCT, and ocular biometry imaging. Nineteen children (mean age, 12.3 ± 2.3 years) with extreme hyperopia (+8.84 ± 0.77 D) were compared with 17 emmetropic children (+0.53 ± 0.43 D; mean age, 12.4 ± 2.2 years). No significant difference in age was found between groups (P = 0.864). Eyes with extreme hyperopia had significantly shorter axial length, normal spherical equivalent corneal keratometry, higher astigmatism, lower anterior chamber area and volume, and narrower iridotrabecular angle OCT parameters. Lens thickness and curvature were similar between groups, but the lens was positioned slightly more anteriorly and tilted in the extreme hyperopia group. While limited by the small sample size, this prospective study demonstrates that extreme hyperopia is associated with shorter axial length, reduced anterior chamber size, a well-formed and regular-sized lens positioned anteriorly, and a narrower iridotrabecular angle. These findings suggest the importance of screening for angle closure risk using anterior segment OCT in children with extreme hyperopia.

Topographic corneal changes in children with moderate to severe blepharokeratoconjunctivitis
Plasencia Salini R, Boghosian T, Khalili S, Mireskandari K, Ali A, Fung SSM
J AAPOS Published online January 23, 2025
Blepharokeratoconjunctivitis (BKC) in children is a common disease and varies widely from visually insignificant minimal corneal findings to visually significant corneal opacities and dangerous corneal thinning. Corneal topography has been studied in other pediatric ocular surface diseases, such as vernal keratoconjunctivitis, to evaluate progression of disease, and this study aims to evaluate corneal changes in children with moderate to severe BKC using corneal topography. This retrospective study included children diagnosed with moderate to severe BKC based on a grading scale previously published by Hamada et al between March 2008 and June 2019 at the Hospital for Sick Children, Toronto who had corneal topography performed using the Pentacam system (Oculus Inc, Wetzlar, Germany). Parameters included keratometric measurements of mean keratometry, flat keratometry, steep keratometry, maximum keratometry, and topographic astigmatism, and were compared to normative values in healthy children. 36 eyes of 21 children with mean age of 8.5 years and best-corrected visual acuity of 0.33 logMar (20/43) were included in the analysis and compared to previously published normative values. Steep keratometry, maximum keratometry, and topographic astigmatism were significantly higher in the BKC group. When Rabinowitz criteria for corneal ectasia was applied, 15 children (71%) would be classified as abnormal. While mean central corneal thickness was similar in the BKC and normative groups, the thinnest point in BKC patients, most often inferotemporally, was less than 500µm in 47% of eyes, which was a statistically significant

reduction compared to the normative group. Strengths of this study include quality topography scans, robust analysis of parameters, and comparison to published normative values. Limitations include its retrospective design, small sample size, and possible demographic variables between normative data and the study cohort which can affect the precision of comparisons. This study provides objective data demonstrating corneal irregularity and thinning that can occur in moderate to severe BKC and may be an important tool in evaluating corneal involvement and changing refractions that influence visual function and development in the pediatric population.

Corneal Collagen Cross-linking for Keratoconus in Pediatric and Developmentally Delayed Patients
Conner E, Gagrani M, Lalgudi VG, et al
Cornea 2025;44(1):7-14
Corneal cross-linking (CXL) is the standard of care for keratoconus but is uniquely challenging in the pediatric and developmentally delayed population. This study reports a standardized approach and outcomes for doing such surgery in this group. Forty-eight eyes of 34 patients who fall into these categories underwent standard CXL where general anesthesia was used in all but 3 patients. A temporal tarsorrhaphy was used in almost all patients. A trend towards improved visual acuity was noted but not found to be statistically significant. The limitations include the retrospective nature. But this study provides an important report on management approach to caring for the oft-neglected developmentally delayed population. It also gives meaningful outcome data that is reassuringly safe.

Clinical Classification and Management Outcomes of Anterior Segment-Dominated Persistent Fetal Vasculature: The CCPMOH Report
Chen H, Chen W, Zhou F, et al
Am J Ophthalmol Published online December 7, 2024
This study aimed to characterize the clinical features, management, and outcomes of anterior segment-dominated persistent fetal vasculature (aPFV). PFV is a congenital ocular defect that can cause vision impairment, and this research focused specifically on aPFV subtypes. The study was a secondary analysis of a longitudinal cohort study from the Childhood Cataract Program of the Chinese Ministry of Health (CCPMOH), including 470 pediatric patients (619 eyes) diagnosed with aPFV. Patients were classified into three types based on the location of vascular abnormalities, with each type further classified as mild (a) or severe (b). Data collected included age at presentation, gender, visual acuity, biomicroscopic assessments, biometric parameters, surgical techniques, and postoperative complications. The mean age at presentation was 36.7 months, with 67.9% of cases being unilateral. Type IIa was the most common subtype. Cataracts were found in 81.6% of eyes, and Type III had the shallowest anterior chamber depth and largest corneal astigmatism. Surgical outcomes showed that 96.9% of eyes underwent surgery, with 19.2% developing ocular hypertension and 9.4% experiencing visual axis obscuration. Visual acuity improved in 73.7% of eyes at the last follow-up, with the worst outcomes associated with severe Type IIb and IIIb cases. This study, as the largest cohort study focusing on aPFV, provides a novel classification system and management algorithm to guide surgical interventions. Despite limitations such as its single-center design, it offers

valuable insights into the clinical features, management, and long-term outcomes of aPFV. This research advances the understanding of aPFV, offering a systematic approach to diagnosis and treatment that can improve patient outcomes and guide future research.

A Comparative Study of Ocular Surface Disease in Childhood Glaucoma
Elhusseiny AM, Haseeb A, Eleiwa TK, et al
Cornea 2025;44(1):73-79
This comparative study explored the ocular surface disease (OSD) in patients with childhood glaucoma (CG). This was a multi-center, comparative study of 41 eyes in 2 patients with CG and compared them to age and sex matched controls. OSD was assessed with a combination of objective (TBUT, anterior segment exam) and subjective (questionnaire) measures. In all metrics, the patients with CG fared worse and the differences were statistically significant. The TBUT was mildly shorter in CG, but the punctate epithelial erosions were nearly quadrupled in the CG group. The prevalence of dryness, grittiness, scratchiness, irritation, soreness and burning per the questionnaire were present at approximately double the rate compared to the control group. The strengths of the paper include both objective and subjective measures and the use of a control group. The limitations include a relatively small sample size and the heterogenic nature of childhood glaucoma that they lumped together. In summary, the article does provide convincing data that patients with CG have increased rates of OSD from their surgical and topical medication history that warrants consideration with their management (i.e. using preservative-free glaucoma drops, etc.).

Incidence and presenting clinical features of pediatric keratoconus in a US population
Farazdaghi MK, Bothun ED, Tran M, Hodge DO, Mohney BG
J AAPOS 2024;28(5):104003
Pediatric keratoconus (PKC) is a progressive ocular disorder that leads to corneal ectasia and thinning. Early diagnosis of PKC is important due to the availability of vision-preserving treatments like corneal collagen crosslinking (CXL) and lamellar keratoplasty, yet data on the incidence and clinical characteristics of PKC in the U.S. remain limited. This study aimed to fill this gap in knowledge. This was a retrospective chart review of 36 patients with PKC. It found an annual incidence of 2.48 cases per 100,000 children, with a predominance of male patients (80%) with most diagnosed around age 15. The study also highlighted that nearly 50% of patients required some form of surgical intervention, including corneal collagen crosslinking and keratoplasty. The clinical features of PKC were consistent with previous reports, with refractive error and corneal thinning noted, although no significant differences in severity were observed based on the age of diagnosis. Strengths of this study were its large cohort size and thorough analysis of PKC incidence. Weaknesses were its retrospective nature and limits racial/ethnic diversity of the cohort. Overall, the study presents important insights into the epidemiology and management of pediatric keratoconus.

Burden of Vernal Keratoconjunctivitis in the United States: A Retrospective Claims Database Analysis
Koo EB, Yu TM, Layton AJ, Babineaux S, Fung S
Ophthalmology 2024;131(10):1243-1245

This is a retrospective analysis evaluating the clinical and economic burden of vernal keratoconjunctivitis in the United States. Data was extracted from the IBM MarketScan Commercial Claims & Encounters database, containing deidentified, patient-specific data from more than 250 medium and large employers and health plans. The VKC group included patients <18 yo with >1 claim for an ICD-10 code for VKC with limbal or corneal involvement of vernal conjunctivitis in 2018. Only patients that also had a filed pharmacy claim for corticosteroid or immunomodulator were included. This resulted in 422 patients that filled the inclusion criteria. The control group included 1266 patients without a claim for VKC – 3 controls were matched to each VKC patient. A significantly higher frequency of glaucoma or ocular hypertension (OHT) was noted in patients with VKC versus controls. However, none were prescribed medication to lower intraocular pressure, possibly due to CS discontinuation or treatment in clinic without a prescription. Topical CS fills were required by 60.7% of patients with VKC versus 0.9% of controls. Respective values for those requiring > 3 fills were 7.6% and 0.0%. Systemic CS fills were required by 29.4% of patients with VKC versus 12.7% of controls. Respective values for those requiring > 3 fills were 1.0% and 0.5%. The frequency of refills in the VKC groups shows there may be an unmet need for more efficacious and long-term treatments for children with VKC. Mean pharmacy costs per patient and the proportion of patients with >1 ophthalmologic-related physician office visit was significantly higher in the VKC group versus controls. Patients with VKC receiving CS or IM treatment had an elevated prevalence of clinical complications, such as corneal scars, ulcers, and keratitis, suggesting that these treatments were insufficient to prevent poor disease outcomes. This highlights the need for effective CS-sparing agents to reduce the risks of long-term complications and improve long-term management of VKC.

Complications After Pediatric Penetrating Keratoplasty: An IRIS Registry Study
Zhang LJ, Dana R, Lorch AC, et al
Cornea 2024;43(12):1555-1559
The authors used the Intelligent Research in Sight (IRIS) Registry to explore the associated complications reported in the registry in association with pediatric keratoplasty. The registry was searched for patients ages 0-18 undergoing penetrating keratoplasty between 2013 to 2020. Of the 544 children identified, 47.6% experienced complications, of which the majority were anterior segment related (versus posterior). Infectious keratitis was the single most common complication (30%) with a median time of 275 days (IQR 50-550). Anterior segment complications were less common in older patients and more common in those with traumatic acquired indications for transplantation. The most common posterior segment complications included vitreous hemorrhage (9.6%), retinal detachment (8.8%) and endophthalmitis (5%). The biggest limitation of this study is the reliance on ICD coding to find complications, rather than actual chart review. This study provides semi-reliable data from a registry on complication rates and types after PK surgery in the pediatric population.

Ocular manifestations of juvenile Sjogren's disease
Nguyen R, Gomez-Castillo L, Gonzales JA
Curr Opin Ophthalmol 2024;35(6):513-520

This is a literature review of juvenile Sjögren's disease. Unlike in adults, juvenile Sjögren's disease rarely presents with dry eyes and dry mouth, occurring in less than 10% of cases. Instead, children typically present with rash, recurrent parotiditis, and other systemic symptoms. The authors report that the ocular staining score demonstrates high sensitivity and specificity, making it the most effective method for detecting keratoconjunctivitis sicca in pediatric patients. Additionally, tear biomarkers may offer diagnostic potential, with several studies reporting elevated levels of cytokines, such as TNF, in juvenile cases. Most children (90%) are ANA-positive, while Anti-SSA and Anti-SSB antibodies are slightly less sensitive compared to ANA. The diagnostic criteria for salivary gland biopsy in children differ from those in adults, as juvenile cases often show lower focus scores than the adult threshold of >1 focus per 4 mm^2. While parotid gland biopsy may offer greater sensitivity, it is associated with higher procedural risks. As in adults, the primary approach to treatment focuses on symptomatic relief. Autologous serum tears can be considered for ocular surface management. In cases of active ocular surface inflammation, the first line of treatment involves topical steroid drops, followed by the introduction of immunomodulators for long-term control.

Cataract

Myopic shift after primary intraocular lens implantation in unilateral cataract children and its association with preoperative ocular parameters
Li Y, Jin G, Tan Y, et al
J Cataract Refract Surg 2025;51(1):53-59
This study investigates the myopic shift in children who have undergone unilateral cataract surgery with intraocular lens (IOL) implantation. 126 patients were evaluated at the time of surgery and followed 3 years post-operatively. The children were separated into 4 age groups: ages 1-2, 2-4, 4-6 and > 6 years old. The results found a mean myopic shift of 3.53 diopters in the youngest age group and 1.99 diopters in those older than 6. Interestingly, a greater interocular axial length difference pre-surgery was associated with a decreased myopic shift. The authors submit a table with target recommendations for IOL power in unilateral cataract patients that takes into account the refractive error of the normal eye.

Association of neighborhood Child Opportunity Index with visual outcomes in children with unilateral pediatric cataract
Elhusseiny AM, Chau J, Altamirano-Lamarque F, et al
J AAPOS Published online January 21, 2025
Visual outcomes in children with unilateral pediatric cataract is dependent on managing amblyopia which requires parental and patients' understanding of the disease, its prognosis, and adherence to management strategies. This study aims to investigate association of neighborhood environmental quality and visual outcomes of unilateral pediatric cataract surgery using the Child Opportunity Index (COI), which evaluates resources based on social and economic opportunity, health and environmental opportunity, and education opportunity. This is a retrospective study that included pediatric (≤18 years) patients who underwent unilateral cataract surgery at Boston Children's Hospital between January 2000 and July 2022. Cataract morphology was classified as anterior, posterior, nuclear, total lenticular opacity, and other. COI scores were stratified into very low, low, moderate, high, and very high. The primary outcome was association between COI and last recorded visual acuity. 80 eyes of 80 patients were included with posterior cataract being the most common morphology. The mean COI was 76.1 (high-opportunity neighborhood). There was no association between age of presentation and COI or other variables, including age, sex, race/ethnicity, cataract type, and insurance status, and visual outcomes. However, the authors found a lower overall COI was associated with lower visual acuity as well as in the subdomains of lower education and health and environment. There was not an association with lower visual acuity and mean social and economic index. This study uses an established index to increase understanding of factors that may influence visual outcome in a challenging disease. Limitations of the study include its retrospective nature, small sample size that limits statistical analysis of subgroups, and not accounting for other structural abnormalities that contribute to poor vision other than amblyopia. Considering parental and patient environment is important to the success of managing amblyopia in the setting of pediatric unilateral cataract, and this study provides a way to determine those at risk for worse visual outcomes due to neighborhood opportunity.

Lens Thickness in Infants and Children with Cataracts
Wei L, Kolosky T, Byun S, et al
Ophthalmol Sci 2024;5(1):100588
While significant phenotypic variance exists in the presentation of infantile/childhood cataracts, previous studies have suggested certain lens changes may be associated with anterior segment dysgenesis and linked as risk factors for glaucoma and certain cataract changes. This prospective, multi-center, case control study was carried out to evaluate lens thickness differences in cataractous versus non-cataractous lenses in patients 0-60 months of age. Measurements were obtained using caliper distance from the black/white junction delineating the anterior and posterior lens capsule on two subsequent UBM measurements obtained under general anesthesia, either at the time of surgery for cataract, or at the time of other non-cataract procedure (i.e. NLDO probing, trauma, etc) for control eyes. The 171-eye cohort was divided into age groups as follows: 0-7mo, 7-24 mo, 24-60mo; this was meant to reflect previously used age cohorts from IATS and IOLunder2 study. Bivariate analysis reported a significantly lower mean lens thickness in cataract compared to controls (3.16mm, 3.60mm, $p<0.0001$). Within age subgroups, the difference in lens thickness was only significant in patients 0-7 months and 24-60 months. There were trends showing bilateral cataract lenses to be thinner than unilateral lenses (3.13mm, 3.18mm), and the non-cataract control eyes of patients with unilateral cataract tended to be thinner than bilateral control eyes (3.57mm, 3.62mm), although neither of these were statistically significant ($p=0.74$, $p=0.24$). Authors postulated that knowledge of thinner lens structure in infantile cataracts may help in future understanding of cataract development, pre-natal identification, and prognostication for possible post-surgical risk factors, although they recognize that clinical exam ultimately is more relevant in diagnosis and difficulty in obtaining these measurements without general anesthesia may limit application in pre-surgical management/diagnosis. They advocate for the use of UBM measurements over A-scan for better reliability of measurements in this study compared to previous.

.

Cataract Surgery

Complications, Visual Acuity, and Refractive Error 3 Years after Secondary Intraocular Lens Implantation for Pediatric Aphakia
Wang S, Repka MX, Sutherland DR, et al Ophthalmology
2024;131(10):1196-1206 This is a prospective study reporting the complications, refractive error, and visual acuity in infants and young children participating in a prospective PEDIG cataract surgery registry of pediatric cases who underwent secondary IOL implantation after previous unilateral or bilateral lens extraction for nontraumatic cataract. Participants included 80 (108 eyes) who subsequently underwent secondary IOL placement: 32 children had bilateral secondary IOLs (60 included eyes) and 48 had unilateral secondary IOLs. Th median age of lensectomy was 1.6 months for bilateral and 2.7 months for unilateral cases. The median age for secondary IOL placement was 2.7 years for bilateral and 2.1 years for unilateral cases. Glaucoma related adverse events (either development of glaucoma or glaucoma suspect) were the most common incident complications – 17% in bilateral cases and 12% in unilateral cases at 3 years post-lensectomy. At 5 years post-lensectomy, incidence of GRAEs was 29% in bilateral cases and 15% unilateral cases in the secondary IOL cohort, and 34% in bilateral cases and 22% in unilateral cases in the cohort who remained aphakic during the study period. No significant difference in risk for GRAEs by 5 years was found between eyes with secondary IOL versus eyes left aphakic. The 3-year incidence of surgery for visual axis opacification was 2% for bilateral and 4% for unilateral cases. Incidence of iris abnormalities was within 3 years of secondary IOL was 10% for bilateral and 4% for unilateral cases. 90 days post-operatively, the median refractive prediction error was less hyperopic by 0.88D for 21 bilateral cases and 1.50D for 19 unilateral cases. At 5 years, the median refractive error for 70 eyes with available data was +0.50 spherical equivalent for bilateral cases and +0.06 for unilateral. Median corrected visual acuity for 75 eyes at 5 years was 20/63 for bilateral and 20/400 for unilateral cases. This study provides important data that can help pediatric cataract surgeons assess and monitor patients with secondary IOLs, including glaucoma risk and knowledge of expected myopic shift when IOLs are placed at a younger age. The study is limited by the sample size and biases related to case selection for secondary IOL placement, as this decision was up to the treating provider.

Scleral-fixated vs Iris-fixated intraocular lens in pediatric ectopia lentis: A systematic review
Soraya Alamsjah SHZ, Yulia DE, Tan S
European Journal of Ophthalmology 2024;34(6):1642-1654
Numerous intraocular lens (IOLs) options are available for treating pediatric ectopia lentis, and this paper reviews recent literature on pediatric ectopia lentis treatment with iris-fixated and scleral-fixated IOLs. A comprehensive search was undertaken on PubMed, Embase, ProQuest, Cochrane, Wiley, SCOPUS, and EBSCO. Studies published in the last ten years that met the inclusion criteria were included in this review. Seventeen studies exhibiting low to moderate risk of bias were included in this review, with eight on iris-fixated IOL (IFIOL), six on scleral-fixated IOL (SFIOL), and three on both IOLs. The number of patients included across the studies ranged from 8 to 60 patients. The mean age range at surgery varied from 3.5 years to 18 years of age. The follow-up period also varied across studies, with a minimum duration of three

months and a maximum of 9.56 years. Among all possible causes, Marfan Syndrome was the most common etiology of lens ectopia, reported in 10 out of 17 studies. From the included studies, data including best-corrected visual acuity, endothelial cell density, postoperative complications, IOL stability, and intraocular pressure were collected. Pupillary ovalization was the most common reported post-operative complication in the IFIOL group, and lens decentration/tilting were seen more commonly in the SFIOL group. Endothelial cell loss was seen in both groups, but was lower in the SFIOL group, despite the longer surgical times given the complexity of the surgical procedure. IFIOL and SFIOL show comparable lens stability, offer good visual rehabilitation, and demonstrate equivalent safety profiles. This systematic review is limited by the inclusion of studies with small sample sizes and relatively short post-operative duration (most only up to 2 years). More robust studies with longer follow-up periods and larger sample sizes are necessary to make more reliable conclusions comparing IFIOL and SFIOL outcomes in children.

Intracameral Anaesthetic Mydriatic Versus Topical Mydriasis in Pediatric Cataract Surgery: A Randomized Control Study
Sukhija J, Kaur S, Kumari K, Gupta K, Sen I
Am J Ophthalmol 2024;268:360-367
This study compared the efficacy and stability of intracameral atropine, methylcellulose, and adrenaline (ICAM) (phenylephrine 0.31%, tropicamide 0.02%, and lidocaine 1%) versus topical mydriatic (TM) drops (tropicamide 0.8%, phenylephrine 5%, and cyclopentolate 0.5%) in pediatric cataract surgery. This randomized, masked, fellow eye-controlled trial, conducted at a tertiary eye care facility, included children (≤12 years) with bilateral cataracts undergoing planned surgery. One eye randomly received ICAM at the start of surgery, while the other (control) received TM drops three times, starting an hour before surgery. Pupillary dynamics were measured at different surgical time points by a masked observer. 63 children (126 eyes) with a mean age of 15.7 months participated. ICAM achieved adequate mydriasis in 93.5% of cases, increasing pupil size from 1.78 mm to 5.1 mm after injection, while TM drops achieved adequate mydriasis in 88.8%, increasing pupil size from 1.75 mm to 6.06 mm ($p < .0001$). Maximum pupillary dilation was 6.06 ± 1.17 mm with ICAM and 6.75 ± 1.07 mm with TM drops ($p = .004$). ICAM maintained stable or slightly increased pupil size throughout surgery, whereas TM drops showed a decrease toward the end (-0.33 ± 2.57 mm). ICAM required additional dilation in 3.17% of cases, compared to 11.1% with TM drops. No significant systemic side effects or unexpected complications were observed. This rigorous study, with its strengths in design and comprehensive outcome measures, supports ICAM as an effective alternative to TM drops in pediatric cataract surgery. While TM drops provided greater initial dilation, ICAM offered more stable mydriasis and reduced the need for intraoperative augmentation. ICAM also streamlined the surgical process, improving efficiency and reducing systemic exposure risks. Despite limitations such as the single-center design and lack of ethnic variation, these findings suggest that ICAM could become a preferred mydriatic approach in pediatric cataract procedures, particularly for infants and young children prone to intraoperative miosis.

Postoperative guidelines following pediatric cataract and glaucoma surgeries: a survey of preferred surgeon instructions

Ngo AM, Kraus CL
J AAPOS Published online January 23, 2025
Children are at increased risk for ocular trauma, and guidelines for activity after pediatric cataract or glaucoma have not been well studied or published. This study aims to survey ophthalmologists to determine their recommendations for long-term postoperative restrictions on activity in children following intraocular surgery for cataracts and/or glaucoma. Using Pediatric Ophthalmology and American Glaucoma Society listservs and social media special interest groups, a survey to elicit surgeon's recommendations for long-term, greater than 1 month post-operative, restrictions of water-based activities, sports, and other "high-risk" activities after cataract surgery and/or glaucoma surgery was distributed between June and August 2023. Survey respondents included 39 pediatric ophthalmologists and 10 adult specialists who practiced mainly in North America (76%). The most common response was no restrictions regardless of surgery type or activity (water-based, sports, or high-risk activities such as climbing gyms, inflatable bounce houses, and trampolines) except for sports restrictions following primary cataract surgery with IOL in which only 47% reported no restrictions. Clinical nuance did not change restrictions except in the case of intraocular lens implant with iris claw design, in which 21% changed restrictions, and in trauma with zonular loss, 35% changed restrictions recommendations. Limitations include limited number of responses and response bias inherent in self-reported surveys. This study allows the comparison of long-term postoperative restrictions to other clinicians' practice patterns to help determine course of action to balance childhood quality of life and safety following pediatric cataract and glaucoma surgeries.

Genetics

Nystagmus in infancy: causes, characteristics and main tools for diagnosis
Goldman E, Hendler K, Yahalom C
Eye (Lond) Published online December 5, 2024
The authors evaluated a cohort of 147 infants (0-1 year) presenting with nystagmus. The ocular pathology causing nystagmus was albinism (59.2%) followed by inherited retinal diseases (19.5%), cataracts, and other ocular pathology (9%). Only 8% of cases had idiopathic nystagmus, and only 5% of cases had neurologic causes of nystagmus. The main tests that helped reach diagnosis included clinical examination, genetic testing, and electroretinogram (ERG). Vertical nystagmus was seen in 8/147 infants; 4 had an IRD as a final diagnosis. The most common associated clinical characteristics were high hypermetropia and strabismus. This paper adds to the literature, suggesting a complete workup for nystagmus and the low yield of MRI.

Genome Wide and Rare Variant Association Studies of Amblyopia in the All of Us Research Program
Viola Lee KA, Aboobakar IF, Jain A, et al.
Ophthalmology 2025:S0161-6420(25)00067-3
This is an interesting study trying to evaluate the role of genetics in development and treatment of amblyopia. This study utilized data from the All of Us Research Program, a large-scale, publicly available biomedical database maintained by the National Institutes of Health (NIH). The All of Us database includes genotypic and phenotypic data from a diverse population of participants across the United States. The authors conducted genome-wide association study (GWAS) to identify single nucleotide polymorphisms (SNPs) associated with amblyopia. 764 subjects with amblyopia and 122,305 controls were included in the analysis. The GWAS revealed 4 loci that approached statistical significance defined as p = 5e-8: rs56105618, rs1349660, rs7958343, and rs138693522. Each of the variants is an expression quantitative trait locus (eQTL) for a gene expressed in the brain or related to neural development. RVAS revealed 15 genes with a statistically significant (p-value = 5e-05) different burden of variants: DCP1B, OR12D2, PCDHA4, ALKBH8, NMUR2, OR52P1P, NEU1, CACNB2, PSMA7, LRR1, ZNF831, FSIP2, ZNF654, CES5A, and MPV17, several of which have known roles in neurodevelopment. The identification of genes linked to amblyopia with roles in neurodevelopment suggests that the neurodevelopmental changes in amblyopia are not only secondary to abnormal visual experience but may result from the interaction of primary neurodevelopmental deficits with abnormal experience. This potentially explains why some children develop amblyopia and others do not with the same ocular risk factors, may explain differences in treatment outcomes, and suggests new avenues for amblyopia treatment.

The burden of X-linked retinitis pigmentosa (XLRP) on patient experience and patient-reported outcomes (PROs): findings from the EXPLORE XLRP-2 study
Parmeggiani F, Weber M, Bremond-Gignac D, et al.
Eye (Lond) 2025;39(3):578-585

EXPLORE XLRP-2 was an exploratory, multicentre, non-interventional study. A retrospective chart review was conducted to collect clinical/demographic data, including XLRP clinical stage (mild, moderate or severe). This paper presents 169 patients from Europe and Israel with XLRP caused by retinitis pigmentosa GTPase regulator (RPGR) gene mutation. 81% of patients were male, mean (SD) age was 39.3 (17.61) years, and 20 adolescents were included. The mean age (SD) at genetic confirmation was 33.4 years (17.98), and the mean duration (SD) from initial symptoms to genetic diagnosis was 16.4 (15.66) years. The analysis used clinical data and patient surveys. Compared with patients with mild disease, patients with severe XLRP are more likely to experience difficulties with functioning in low luminance, depression, unemployment, productivity issues, mobility, and daily activities. 28% of patients reported any level of depression, and 44.6% reported any level of anxiety. The authors concluded that patients with XLRP face emotional and societal burdens, many of which significantly correlate with the disease stage. These results provide areas of focus for research into disease management, improving clinical practice, and updating public policies that support patients with XLRP.

Hardy-Rand-Rittler colour vision testing in cone and cone-rod dystrophies: correlation with structural and functional outcome measures
Tharmarajah B, Cornish EE, Nguyen J, et al.
Eye (Lond) 2025;39(3):527-532
The authors analyzed a cohort of 109 patients diagnosed with cone and cone-rod dystrophy by electroretinography (ERG). Each patient's HRR color vision test scores were compared with cone and rod system function markers, including visual acuity (VA), ERG responses, changes on Spectral Domain Optical Coherence Tomography (OCT), and Fundus Autofluorescence. The number of plates identified on HRR testing correlated with logMAR best-corrected distance VA; $r(101) = -0.49$, $p < 0.0001$. HRR scores correlated with markers of cone and macula function, including OCT Ellipsoid Zone Gap Width, Central Macular and Outer Nuclear Layer Thickness, Full Field ERG 30 Hz flicker amplitudes, light-adapted 3.0 b-wave amplitudes, and Pattern ERG 15- and 30-degree p50 amplitudes. HRR color vision testing correlates with structural and functional measures in Cone and Cone-Rod Dystrophy. HRR color vision testing provides a simple clinic-based option to monitor disease changes in Cone and Cone-Rod Dystrophy patients, especially when ERG testing is not available.

Attitudes, knowledge, and risk perceptions of patients who received elective genomic testing as a clinical service
Zoltick ES, Bell M, Hickingbotham MR, et al.
Genet Med 2024;26(10):101200
This paper surveyed almost 6000 patients that completed elective genomic testing at a rural nonprofit healthcare system. Before the test patients receive way broad-based education and then they were surveyed on their understanding and expectations from the test. Patients most often expected results to guide medication management (74.0%), prevent future disease (70.4%), and provide information about risks to offspring (65.4%). Patients were "very concerned" most frequently about the privacy of genetic information (19.8%) and how well testing predicted disease risks (18.0%). On average, patients answered 6.7 of 11 knowledge items correctly (61.3%). They more often rated their risks for colon and breast cancers as lower

rather than higher than the average person but more often rated their risk for a heart attack as higher rather than lower than the average person (all P < .001). The authors concluded that patients pursued the test because of the utility expectations but often misunderstood the test's capabilities.

Insights on the Genetic and Phenotypic Complexities of Optic Neuropathies
D'Esposito F, Zeppieri M, Cordeiro MF, et al.
Genes (Basel) 2024;15(12):1559
Dysfunctions of the optic nerve potentially result in severe vision loss and blindness and can be related to very different causes, from developmental factors to infectious, toxic, and traumatic causes, related to myelinic degeneration, compressive, and finally genetic factors. Genetic optic nerve disorders are rare and often underdiagnosed or misdiagnosed, as the onset might be insidious and potentially confounded by different causes. A systematic literature search was performed for this narrative review in October 2024. DOA was the most common disease with 16 different OPA genes involved. LHON is the most prevalent optic neuropathy; it is caused by primary mutations in mitochondrial DNA. It is maternally inherited and predominantly affects males, accounting for 80–90% of cases, with symptom onset usually beginning in the second or third decades of life. Primary congenital glaucoma (PCG) is a non-syndromic form of glaucoma that occurs in the first three years of life and is a major cause of childhood blindness: it can have a neonatal onset (0–1 month), infantile onset (1–24 months), or late onset (>2 years); it is named juvenile glaucoma when the onset is from 3 years to puberty. Other conditions associated with optic neuropathy are syndromic - developmental defects (Axenfeld–Rieger syndrome, PAX6 related disease, Wolfram syndrome, Friedreich ataxia). Genetic and molecular investigations have markedly enhanced our comprehension of ocular neuropathies.

Rhegmatogenous Retinal Detachment Secondary to Type I Stickler Syndrome: Diagnosis, Treatment and Long-Term Outcomes
Chen X, Ju Y, Gao F, et al.
Genes (Basel) 2024;15(11):1455
This is a retrospective study on 11 patients with retinal detachment secondary to type I Stickler syndrome. All patients required vitrectomy with the mean age for developing retinal detachment of 11.5 years old. 90% of the eyes were macula- off at presentation. On average patients required 2 surgeries with the most common complications being increased IOP (82%), development of cataract (73%), recurrent RD (18%). The authors achieved 90.9% anatomical reattachment after a mean of two surgical procedures, and 81.8% of eyes showed improved BCVA after surgery, with a middle logMAR BCVA of 0.52 (0.15–0.82). This information is useful for counseling patients of the risk, complications and prognosis.

Characterizing the Genetic Basis for Inherited Retinal Disease: Lessons Learned From the Foundation Fighting Blindness Clinical Consortium's Gene Poll
Branham K, Samarakoon L, Audo I, et al
Invest Ophthalmol Vis Sci 2025;66(2):12
The Foundation Fighting Blindness (FFB) Consortium is a collaboration of 41 international clinical centers that manage patients affected with inherited retinal diseases (IRDs). The annual

Consortium gene poll was initiated in 2020 to capture the genetic cause of disease in patients with IRD and associated clinical practices of Consortium sites. This study reports data from the 2022 gene poll. Academic, private practice, and government ophthalmology clinics that are members of the Consortium centers were polled to identify per-case IRD genetic causality from a list of 387 syndromic and nonsyndromic IRD genes. The survey also assessed how genetic testing was obtained and clinical practices of the sites. Thirty centers responded and reported genetic data from 33,834 patients (27,561 families). Disease-causing variants were reported in 293 of 387 genes. The most common genetic etiologies were ABCA4 (17%), USH2A (9%), RPGR (6%), PRPH2 (5%), and RHO (4%). The top 100 genes accounted for the genetic cause of disease in 94.4% of patients. Two-thirds of the centers had at least one genetic counselor. In the 21 US sites, genetic testing was commonly obtained through sponsored programs. In the 9 non-US sites, genetic testing was commonly obtained using either patient- or public health system-funded testing pipelines. Clinical work-up of patients with IRD most commonly included updating history, eye examination, and optical coherence tomography. This report provides an updated picture of genetic causality in the IRD population, and highlights the importance of molecular diagnosis, which has become the standard of care in IRD.

Increase in blood derived mitochondrial DNA copy number in strabismus patients
Zehra Z, Zia MA, Siddiqui SN, et al.
J AAPOS 2024;28(6):104042 Abnormalities in mitochondrial energy homeostasis can lead to various disorders, including ocular motility aberrations. Previous studies have suggested the involvement of mitochondrial aberrations in strabismus etiology. In this study, the authors aimed to determine whether there is a detectable difference in mtDNA copy number between tissues obtained from people with horizontal comitant strabismus and samples from control subjects. Blood samples from 93 strabismic (39 esotropic, 54 exotropic) and 93 control subjects were analyzed for mtDNA copy number through quantitative polymerase chain reaction. Expression of 6 genes involved in mitochondrial biogenesis in cDNA was also examined from extraocular muscles of a separate group of 26 strabismus patients and 4 healthy controls. Results show that mtDNA content was significantly higher in strabismus patients as compared to the control group. No significant difference was observed in the expression of the examined biogenesis genes between strabismus and control groups. The results suggest a possible association between mtDNA copy number and strabismus, further supporting the possible role of mitochondria in strabismus pathogenesis.

Survival and Health Care Burden of Children With Retinoblastoma in Europe
Virgili G, Capocaccia R, Botta L, et al
JAMA Ophthalmol Published online October 10, 2024
This study aims to estimate the incidence and survival of retinoblastoma (RB) in European children and the occurrence of second primary tumors (other than RB) in these patients. This is a cohort study that used population-based data from 81 cancer registries in 31 European countries adhering to the European Cancer Registries (EUROCARE-6) project. The authors examined annual incidence, 5-year survival, and the standardized incidence ratio (SIR) of subsequent malignant neoplasms. Over 3000 patients were included in the analysis. The estimated overall European incidence rate was 4.0 per million children. Rates among countries

varied from less than 2 to greater than 6 per million. While the overall European 5-year survival was 97.8%, it was lower in Estonia and Bulgaria (<80%), and 100% in several countries. Twenty-five subsequent malignant neoplasms were recorded during follow-up (up to 14 years), with an SIR of 8.2 and with cases occurring at mean ages between 1.3 and 8.9 years. An increased risk was found for hematological tumors, as well as bone and soft tissue sarcomas. This study provides important data that can help monitor RB management and occurrences of second tumors. These data can also help with ways to examine disparities among different countries.

Biallelic Loss-of-Function Variants in UBAP1L and Nonsyndromic Retinal Dystrophies
Ullah E, Lin S, Lu J, et al
JAMA Ophthalmol 2024;142(11):1081-1086
Inherited retinal dystrophies (IRDs) present a challenge in clinical diagnostics due to genetic heterogeneity. This study aims to provide a clinical and molecular characterization of 6 patients with IRDs with biallelic disease-causing variants in a novel candidate IRD disease gene. This is a multicenter case series that examines biallelic disease-causing variants in the novel candidate IRD disease gene, UBAP1L. Exome and genome sequencing revealed candidate variants in the UBAP1L gene in all participants. Four homozygous UBAP1L variants were identified in the affected individuals from 6 families, including 2 frameshift variants, 1 canonical splice variant, and 1 noncanonical splice variant that caused aberrant splicing and frameshift in a minigene assay. Clinical evaluation of the participants showed retinal dystrophy including maculopathy, cone dystrophy, and cone-rod dystrophy. RNA sequencing of the retina showed that human UBAP1L is highly expressed in both cones and retinal pigment epithelium, whereas mouse Ubap1l is highly expressed in cone cells only. Knock out mouse model with truncation of the C-terminal SOUBA domain did not manifest retinal degeneration up to 15 months of age. This study showed strong clinical and genetic evidence of loss of function in UBAP1L being associated with inherited retinopathy in humans. The data suggest that UBAP1L should be included in the genetic evaluation of patients with IRD.

Exome-wide genetic risk score (ExGRS) to predict high myopia across multi-ancestry populations
Yuan J, Qiu R, Wang Y, et al.
Commun Med (Lond) 2024;4(1):280
This study proposes using a genetic risk score (GRS) to capture genetic susceptibility to HM. High myopia (HM) was defined as a spherical equivalent (SE) of -6.00 diopters (D). The study enrolled two independent cohorts: 12,600 unrelated individuals of Han Chinese ancestry from Myopia Associated Genetics and Intervention Consortium (MAGIC) and 8682 individuals of European ancestry from UK Biobank (UKB). All patients had trio exome sequencing analysis. The study found that besides Mendelian genetics, high myopia could be attributable to polygenic inheritance and suggested creating a genetic risk score that combines rare variants. This approach is more valuable as a prediction than as a diagnostic tool.

Retinopathy in Mucopolysaccharidoses
Noor M, Mehana O, de la Mata G, et al.

Ophthalmology 2024:S0161-6420(24)00720-6
This study presents a cohort of 75 patients with various mucopolysaccharidoses page 3 to 58 evaluated by ophthalmology clinically, imagistic and electrophysiology. Retinopathy was confirmed in 32 (43%) of patients, including 25 MPS I, 4 MPS II, 1 MPS IVA, and 2 MPS VI. Five participants were first diagnosed with retinopathy with clinical examination, while 31 participants were identified on UWF colour fundus photography supported by FAF and OCT. 21 (28%) patients exhibited ERG abnormalities consistent with retinopathy. Fifteen of the total 32 participants described symptoms of nyctalopia. The onset of retinopathy varied substantially, with initial detection between 2 and 53 years of age. Emerging treatments, including gene therapy, may prevent or stabilise retinopathy. Phenotypic data and natural history of MPS-related retinopathy are thus of paramount importance.

Genotype-Phenotype Correlations of Nance-Horan Syndrome in Male and Female Carriers of a Novel Variant
Zin OA, Neves LM, Motta FL, et al.
Genes (Basel) 2025;16(1):91 This paper presents three affected members of the same family with Nance-Horan syndrome. Thia is a X-linked disease and in males, it causes bilateral dense pediatric cataracts, dental anomalies, and facial dysmorphisms. Females traditionally have a more subtle phenotype with discrete lens opacities as an isolated feature. The paper highlights the importance of pursuing genetic testing in patients with congenital cataract since systemic features such as dental anomalies and intellectual disability may take years before they develop.

Clinical and Molecular Findings in Patients with Knobloch Syndrome 1: Case Series Report
Vasilyeva T, Kadyshev V, Khalanskaya O, et al.
Genes (Basel) 2024;15(10):1295
This is a case series of 3 patients presenting with early-onset high myopia, decreased best corrected visual acuity, chorioretinal atrophy, and occipital skin/skull defects and were molecularly diagnosed with Knobloch syndrome 1.Age of diagnosis very from 3 to 14 years old despite all symptoms being present at presentation. Patients had some override ability in the phenotype but the same genetic variants. This paper is another level of evidence for genetic testing for early onset high myopia.

Comprehensive Evaluation of the Genetic Basis of Keratoconus: New Perspectives for Clinical Translation
Cerván-Martín M, Higueras-Serrano I, González-Muñoz S, et al
Invest Ophthalmol Vis Sci 2024;65(12):32
Keratoconus (KC) is a corneal disorder with complex etiology involving both genetic and environmental factors. This study aims to identify novel genetic regions associated with KC. Through a genome-wide association study (GWAS) that integrated previously published data with newly generated genotyping data from an independent European cohort, two novel genetic loci associated with KC were identified. Additionally, the authors identified 315 candidate genes influenced by confirmed KC-associated variants. Among these, MINK1 was found to play a pivotal role in KC pathogenesis through the WNT signaling pathway. The authors developed a

Polygenic Risk Score model that successfully differentiated KC patients from controls. This can potentially help identify individuals at high risk for developing KC. This study identifies potential genetic basis for KC. More studies are needed to further elucidate the exact mechanisms of the involvement of these candidate genes in the pathogenesis of KC, and may produce future therapeutic targets.

Safety of Human USH1C Transgene Expression Following Subretinal Injection in Wild-Type Pigs
Kiraly P, Klein J, Seitz IP, et al
Invest Ophthalmol Vis Sci 2025;66(1):48
Usher syndrome (USH) is genetically heterogeneous with 11 causative genes confirmed. Mutations in USH1C are responsible for one third of all USH patients and represent its most severe clinical subtype. This study aimed to evaluate early-phase safety of subretinal application of AAVanc80.CAG.USH1Ca1 (OT_USH_101) in wild-type (WT) pigs, examining the effects of a vehicle control, low dose, and high dose. Twelve WT pigs (24 eyes) were divided into three groups, each pig received bilateral subretinal injections of either vehicle, low dose, or high dose. Retinal morphology and function were assessed by OCT and ERT at baseline and two months post-surgery. After necropsy, retinal changes were examined through histopathology, and human USH1C_a1/harmonin expression was assessed by quantitative PCR (qPCR) and Western blotting. The results showed high levels of expression without significant total retinal thickness changes two months after subretinal injection. The full field ERG showed no significant changes in rod or cone responses. Histopathology indicated no severe retinal adverse effects in the vehicle and low dose groups; though some eyes in the high dose group showed inflammatory and atrophic changes. The results showed that low dose subretinal administration of OT_USH_101 was well tolerated while achieving high expression levels. This is important for future considerations of gene therapy for Usher syndrome in humans.

Family of juvenile X-linked retinoschisis with varied presentation: a case series with RS1 genetic analysis
Panirsheeluam B, Abd Ghani S, Mohamad Isa MI, et al
J AAPOS 2024;28(5):104006
Retinoschisis is a rare congenital eye condition characterized by splitting of the layers within the retina, leading to vision loss. Juvenile X-linked retinoschisis (JXLRS) is an inherited form of retinoschisis that occurs in males and is caused by mutations in the RS1 gene, which encodes the retinoschisin protein. Clinical diagnosis of X-linked retinoschisis can be challenging because of its variable ocular fundus presentation. This case series describe a group of 3 siblings with the same RS1 mutation who present with different phenotypes. One patient, diagnosed at age 7, presented with bilateral Coats disease with extensive exudative retinal detachment prior to genetic testing. Patient 2, diagnosed at age 3 months, presented with retinal break and bullous retinal detachment in one eye, and peripheral retinoschisis of the other eye. Patient 3, diagnosed at age 15, presented with bilateral foveal schisis. This paper highlights the wide spectrum of phenotypic presentations that can occur even with the same genetic mutation in RS1 among siblings.

Clinical and Molecular Characterization of AIPL1-Associated Leber Congenital Amaurosis/Early-Onset Severe Retinal Dystrophy
Zhang Q, Sun J, Liu Z, et al
Am J Ophthalmol 2024;266:235-247
Leber congenital amaurosis (LCA) represents a group of retinal disorders with early infancy vision loss, nystagmus, and an extinguished electroretinogram. With widely overlapping clinical and genetic features, early-onset severe retinal dystrophy (EOSRD) is considered a milder form of the same disease presenting in early childhood, usually before the age of 5 years. This study aimed to characterize the clinical features, genetic findings, and genotype-phenotype correlations of patients with LCA or EOSRD harboring biallelic AIPL1 pathogenic variants. This is a retrospective study inclusive of 51 patients from 47 families with a clinical diagnosis of LCA/EOSRD caused by pathogenic variants in the AIPL1 gene. The authors identified 28 disease-causing AIPL1 variants, with 18 being novel. In EOSRD patients, mean visual acuity was 1.3 logMAR. For LCA patients, visual acuity ranged from light perception to counting fingers. OCT findings showed preservation of foveal ellipsoid zone in the 5 youngest EOSRD patients and 9 LCA children. ERG showed severe cone-rod patterns in 78.6% of patients with EOSRD, while the extinguished pattern was documented in all LCA patients who underwent ERG. Genetic evaluation showed that the most common mutation was the nonsense variants of c.421C > T, with an allele frequency of 53.9%. All patients with EOSRD carried at least one missense mutation. More than half of LCA patients harbored two null AIPL1 variants, while the rest were either homozygous for c.421C > T and 6 or heterozygous for c.421C > T with another loss-of-function variant. This study reveals distinct clinical features and variation spectrum between AIPL1-associated LCA and EOSRD. Patients harboring at least one nonnull mutation were significantly more likely to have a milder EOSRD phenotype than those with two null mutations. This genotype-phenotype correlation provides useful information on prognostication. Additionally, the preserved foveal ellipsoid zone in the youngest EOSRD patients suggests a potential window for therapy.

Prevalence Estimates and Genetic Diversity for Autosomal Dominant Retinitis Pigmentosa Due to RHO, c.68C>A (p.P23H) Variant
Leenders M, Gaastra M, Jayagopal A, Malone KE
Am J Ophthalmol 2024;268:340-347
Autosomal dominant retinitis pigmentosa (adRP) is primarily associated with pathogenic variants in the rhodopsin gene (RHO). Globally RHO is in the top 5 genes driving IRDs. Over 150 gain-of-function variants have been found in this gene. Clinical presentations of adRP-RHO have a wide range of phenotypes. This study aims to provide the most up-to-date clinical prevalence estimate for adRP patients due to RHO c.68C > A, (p.P23H) by both literature based meta-analysis and population genetics modeling. The estimated clinical prevalence of adRP due to RHO P23H based on literature review was approximately 2000-3000 patients. In comparison the genetics modeling calculated prevalence in the US was an estimated 6176 and only half of them are expected to cluster with European genetic ancestry. This variant was found enriched in subgroups of African American or other non-European biogeographic ancestries. Of the estimated 6200 persons carrying this variant in the US, ~3500 are expected to show clinical signs of visual impairment as modeled by average age of onset previously reported for patients

with this variant. This study showed an interesting comparison of two approaches to estimate the prevalence of adRP patients due to RHO c.68C > A, (p.P23H) in the US. While both approaches yielded overlapping estimates, the difference potentially indicates a diagnosis gap. As genetic evaluation becomes standard of care, it would be interesting to see if similar future studies will show the diagnostic gap closing.

Retinal detachment in Type IX collagen recessive Stickler syndrome
Maghsoudi D, Nixon TR, Martin H, et al.
Eye (Lond) 2025;39(1):133-138
Authors reviewed a cohort of 13 patient Type-IX recessive Stickler Syndrome to evaluate their risk of retinal detachments and systemic association. 2 of 13 patients (15.4%) had experienced retinal detachment requiring surgical repair. These were both due to horseshoe tears, secondary to posterior vitreous detachment, occurring at the ages of 24 and 36 respectively. No patients had cleft palate, and 30.8% had midfacial hypoplasia. Hearing loss was more prevalent (91.7%) than in dominant SS. The main limitation of this study is the lack of long-term follow-up of this cohort.

Heterozygosity for loss-of-function variants in LZTR1 is associated with isolated multiple café-au-lait macules
Mastromoro G, Santoro C, Motta M, et al.
Genet Med 2024;26(11):101241 This study evaluates association between heterozygous loss-of-function LZTR1 alleles and isolated multiple café-au-lait macules (CaLMs). The authors found that café au lait spots associated with heterozygous LZTR1 variants Are isolated but occasionally can be associated with Siobhan, ptosis or features of autosomal recessive Noonan syndrome.

Investigating Microperimetric Features in Bietti Crystalline Dystrophy Patients: A Cross-Sectional Longitudinal Study in a Large Cohort
Xu Y, Liu X, Wu N, et al
Invest Ophthalmol Vis Sci 2024;65(13):27
Bietti crystalline dystrophy (BCD) is an autosomal recessive inherited retinal disease characterized by yellow-white crystalline deposits dispersed throughout the retina, combined with thinning of retinal pigment epithelium (RPE) and choroid. BCD is responsible for 10% of non-syndromic retinitis pigmentosa (RP). This study aims to characterize BCD patients, with a focus on the utility of microperimetry in macular monitoring. This retrospective study included 208 genetically-confirmed BCD patients. The patients were categorized into subgroups based on their fundus characteristics, optical coherence tomography (OCT) findings, and genetic profiles. Fixation patterns were analyzed, and macular sensitivity (MS) parameters were compared among different groups. The results showed that patients with well-preserved RPE or ellipsoid zone at the foveal/parafoveal region exhibited higher MS. An age-adjusted comparison of sensitivity among genotypic groups and cumulative incidence analyses showed no association between genotypic groups and vision loss. This paper shows that microperimetry can be a useful tool for detecting macular functional changes in BCD patients. BCD patients with different genotypes may have similar disease progression.

Genotype-Phenotype Spectrum of eyeGENE Patients With Familial Exudative Vitreoretinopathy: Novel Variants in Norrin/β-Catenin Signaling Pathway Genes
Yaylacioglu Tuncay F, Reeves MJ, Yousaf S, et al
Invest Ophthalmol Vis Sci 2025;66(2):9
The Norrin/β-catenin signaling pathway has a fundamental role in retinal vascular development. Some hereditary retinal vasculopaties, including familial exudative vitreoretinopathy (FEVR), are due to defective proteins in the Norrin/β-catenin signaling pathway. This is a retrospective study that characterizes the genotypes and phenotypes of a cohort of 122 eyeGENE patients from 114 families with FEVR. Genetics test reports of 50 probands revealed 52 variants in the four genes of the Norrin/β-catenin signaling pathway: LRP5, FZD4, TSPAN12, and NDP. Following variant reclassification, 35 of the reported variants were interpreted as pathogenic or likely pathogenic, providing a conclusive test result for nearly one-third (32%) of the probands. Retinal detachment was reported less in patients with variants in TSPAN12. One-third of the patients (33.3%) with an FZD4 variant had asymmetric findings. This large cohort study expands the variant spectrum in FEVR with further understanding of the phenotypic differences among the different pathogenic variants.

Congenital retinal folds
Zhong L, Dhallan A, Lueder GT, Reynolds MM
J AAPOS Published online January 28, 2025
Congenital retinal folds (CRFs) are a rare entity that present as a fold of retinal tissue that extends from the optic nerve toward the retinal periphery. CRFs are often associated with ocular conditions such as familial exudative vitreoretinopathy (FEVR). This case series presents 5 patients with CRFs. Genetic testing revealed mutation in 4 patients: FZD4 and TSPAN12, both associated with FEVR, and IMPDH1 and PEX1, whose roles in CRF are unclear. Four patients presented with strabismus, all of whom underwent surgical intervention. Two patients developed tractional retinal detachments that necessitated vitrectomy. Visual outcomes were generally poor, with final visual acuity ranging from 20/600 to no light perception. This series underscores the importance of genetic testing in CRF cases, particularly for assessing familial risk, although the genetic basis remains inconclusive. The clinical characterization suggests that patients should be closely monitored for complications such as retinal detachment.

Characteristics, associations, and outcomes of children with posterior segment coloboma
Altamirano F, Hoyek S, Savant SV, et al
J AAPOS 2024;28(5):104005
Ocular coloboma can be sporadic, hereditary, or associated with multiple chromosomal abnormalities. This study characterizes the clinical characteristics and outcomes of children with posterior segment coloboma (PSC), and evaluated the association with CHARGE syndrome. This is a retrospective chart review that included 501 eyes of 343 patients. Coloboma type according to the Ida Mann (IM) classification, and best-corrected visual acuity. Logistic regression was used to evaluate the association of CHARGE syndrome with coloboma classification and laterality. Results showed differences in the mean best-corrected visual acuity of eyes with large vs moderate-to-small PSC both at initial and final examination. RD rate was

5% per eye and 7.3% per patient. Children with CHARGE syndrome were at increased odds of having larger and more severe colobomas and bilateral fundus colobomas. This study provides helpful information for prognosis in coloboma, and highlights that colobomas tend to be more severe in CHARGE syndrome.

Clinical Characterization, Natural History, and Detailed Phenotyping of NMNAT1-Associated Leber Congenital Amaurosis
Lee YJ, Jeong HC, Kim JH, Jo DH
Am J Ophthalmol Published online December 20, 2024
Biallelic variants in the nicotinamide nucleotide adeny- lyltransferase 1 (NMNAT1) gene have been reported to cause Leber Congenital Amaurosis (LCA). NMNAT1 variants account for 4.9% to 18% of LCA cases, with a higher prevalence in East Asian and Australian populations. In this retrospective case series, the authors characterized the clinical phenotype and disease progression in patients with NMNAT1-associated LCA within the Korean population. A total of 14 patients were included in this study. Results show that all patients exhibited early-onset, rapidly progressive bilateral retinal degeneration with pronounced central involvement. The condition was characterized by multiple atrophic lesions that coalesced into a large central retinal scar by age 2, and stabilized around age 4. Fluorescein angiography demonstrated central hypofluorescence with visible choroidal vasculature. OCT findings include significant retinal thinning, outer retinal layer disruption, and retinal pigment epithelial atrophy. Most patients maintained light perception vision or better, with minimal deterioration of visual acuity after age 2. All patients were hyperopic and exhibited undetectable ERG and VEP responses. This study provides important clinical descriptions of NMNAT1 -associated LCA. The temporal pattern of disease progression suggests a possible window of treatment in early childhood before age 2.

Heritability and Genetic Factors of Astigmatism and Corneal Curvature: A Systematic Review and Meta-analysis
Shing E, Kam KW, Zaabaar E, et al
Am J Ophthalmol 2025;269:161-171
Astigmatism is the most common refractive error in children and adults. Unlike myopia, astigmatism lacks a defined onset and varies with age. This study is designed to systematically review and meta-analyze all reported heritability studies of refractive astigmatism (RA), corneal astigmatism (CA) and corneal curvature (CC), and evaluate the existing genetic associations of RA, CA and CC. Meta-analyses of heritability were conducted using random-effects model for mean difference. Results show that pooled heritability was moderate for RA, CA, and CC. Subgroup analyses revealed significant differences between analysis methods and populations in both CA and CC, and between age groups in CA. A total 50 single-nucleotide polymorphisms (SNPs) in 10 genes were reported with overlapping associations with RA, CA, and/or CC. This study confirms moderate heritability for RA, CA, and CC, and identified many SNPs as candidate variants. These findings highlight the complex genetics of astigmatism, and provides potential candidate genes for future studies.

Molecular Subtype Identification and Potential Drug Prediction Based on Anoikis-Related Genes Expression in Keratoconus

Jiang Z, Zhang B, Jia S, Yuan X
Invest Ophthalmol Vis Sci 2025;66(2):3
Keratoconus is the most common corneal ectatic disease, characterized by progressive thinning and steepening of the cornea. The pathophysiology of KC is largely unknown, and nonsurgical treatments are lacking. Anoikis is a particular apoptotic death program induced by the loss of cell adhesion to matrix. The decomposition of extracellular matrix is an important process in the occurrence of keratoconus (KC). This study aims to describe the expression profile of anoikis-related genes (ARGs) in KC samples, identify differentially expressed genes, characterize the biological functions and immune characteristics of different molecular subtypes of KC. By comparing the expression profile between disease and normal samples, the authors identified two definite clusters on the basis of ARGs expression difference. Expression levels were then studied in an animal model of KC. The analyses suggest that ARGs could serve as potential biomarkers for KC subtypes, progress, or prognosis. These preliminary results suggest the possibility of ARGs involvement in keratoconus disease process, and can be a future target for further studies to identify genetic biomarkers.

Preventable vision loss in children with Coats disease
Altamirano F, Gonzalez E, Shah AS, Oke I
J AAPOS 2024;28(5):104000
Coats disease is a rare retinal vascular disorder that can lead to retinal detachment and severe visual impairment. Coats disease is generally idiopathic; however, genetic associations have been described, including a mutation in the NDP gene on chromosome Xp11. This paper aims to describe the prevalence and risk factors associated with amblyogenic refractive error in children with Coats disease. This is a retrospective chart review of 50 children with unilateral Coats disease treated at a single tertiary care center. Results showed that median age at presentation was 5 years. The Coats disease classification was stage 1 in 2%, stage 2 in 58%, and stage 3 or greater in 40%. 76% of children had at least one visit with a pediatric specialist; the rest were only seen by a retina specialist. 74% of patients had refractive data; among them, amblyogenic refractive error was identified in 46%. Glasses were prescribed to 50% of children. Children diagnosed at an earlier age had increased odds of amblyogenic refractive error. This paper shows that amblyogenic refractive error is prevalent among children with Coats disease, and highlights the importance to coordinate care between pediatric and retina specialists caring for children with Coats disease to ensure timely diagnosis of amblyogenic refractive error and minimize preventable vision loss.

Mutations in the ciliary transport gene IFT140 cause syndromic congenital retinal dystrophy
Danish E, Alhashem A, Naaman N, et al
J AAPOS 2024;28(5):104007
Ciliopathies result from rare gene mutations that encode proteins involved in the function of cilia. Early-onset, severe retinal dystrophy can be isolated or syndromic, presenting as part of an underlying systemic disease. Mainzer-Saldino syndrome, a rare systemic ciliopathy characterized by skeletal and renal disease, is caused by recessive mutations in the IFT140 gene. This paper is a case series of 13 cases of early-onset retinal dysfunction with confirmed IFT140 mutations from 8 unrelated Saudi families belonging to 3 well-known tribes. All except

for a single family of 4 affected subjects (3 were aborted fetuses) carried the same homozygous missense IFT140. Severe retinal dystrophy was present in all living subjects, phenotypically apparent as hyperopia, nystagmus, nyctalopia, poor vision and nonrecordable full-field electroretinography. All affected individuals had skeletal abnormalities, and neurological abnormalities were common, but there was no evidence of chronic renal failure. As retinopathies are an early presentation in ciliopathies, ophthalmologists encountering a child with retinal dystrophy with associated skeletal dysplasia should consider genetic work up for ciliopathies.

Long-term follow-up of ocular involvement in hereditary mucoepithelial dysplasia
Feizi S, Tahavvori M, Hosseini SB, et al.
J AAPOS 2024;28(5):103997
Hereditary mucoepithelial dysplasia (HMD) is a rare, autosomal dominant multisystem disease that presents with nonscarring diffuse alopecia, well-demarcated oral erythema, and erythematous intertriginous plaques. This is a case report of a boy diagnosed with HMD with heterozygous mutation in the SREBF1 gene in infancy, who underwent long term ophthalmic follow up due to having photophobia. Ocular examination revealed meibomian gland dysfunction and superficial corneal vascularization and opacity. Impression cytology of the sclerocorneal limbus revealed atypical epithelial cells. The patient received treatment for meibomian gland dysfunction, dry eye, and ocular surface inflammation. Over time, corneal opacity improved greatly. This case report highlights the importance of close ophthalmologic follow ups for exam and treatment to preserve vision in patients with HMD.

Ophthalmic Findings in the KIF1A-Associated Neurologic Disorder (KAND)
Abdelhakim AH, Brodie SE, Chung WK
Am J Ophthalmol 2024;268:247-257
KIF1A-associated neurologic disorder (KAND) is a recently identified genetic disorder caused by pathogenic variants in the KIF1A gene. KIF1A encodes protein whose function is important in the anterograde transport of cargo along microtubules in an ATP-dependent fashion. The phenotypic spectrum in KAND patients is variable and can include spasticity, neurodevelopmental delay and regression, intellectual disability, autism, microcephaly, progressive spastic paraplegia, seizures, cerebellar atrophy, and peripheral neuropathy. This study characterized the ophthalmic findings in KAND. This cross-sectional study includes 24 patient from the K IF1A Outcome measures, Assessments, Longitudinal And endpoints (KOALA) Study. Results showed the average central visual acuity in pediatric participants was 20/43 and 20/119 in adults. Ninety-five percent of participants had some degree of optic nerve atrophy detected by clinical examination and/or (OCT). Nearly 40% had strabismus. Color vision, visual fields, and stereopsis were impaired in most participants. VEP showed varying degrees of signal slowing and diffuseness. This study provides comprehensive description of ophthalmic findings in KAND patients, with optic nerve atrophy as the primary finding at a high prevalence rate. On average, adults had worse vision than children, suggesting a possible progressive vision loss. These results suggest that ophthalmology evaluation and follow up is an important part of follow up for KAND patients.

Genotype Associated With Visual Prognosis in Patients With Congenital Ectopia Lentis Following Lens Surgery: A Prospective Cohort Study
Jia WN, Chen ZX, Wang YL, et al
Am J Ophthalmol 2024;268:285-295

Congenital ectopia lentis (EL) is characterized by structural and functional anomalies of the lens zonule, resulting in the displacement of the lens from its anatomical position. It can lead to serious ophthalmic complications and is surgically complex to manage. In this prospective clinical cohort study, the authors sought to investigate the relationship between visual prognosis and genotype in patients undergoing lens surgery for congenital EL. This study included a total of 329 probands who underwent lens extraction and intraocular lens implantation, who also received panel-based next-generation sequencing. Patients were grouped into children and adolescents/adults based on the age at surgery. Visual prognosis, including best-corrected visual acuity (BCVA) and amblyopia, was stratified into short-term and medium to long-term. Genotype was categorized as the FBN1 and non-FBN1 mutations. Results showed that children with the non-FBN1 mutation exhibited inferior medium to long-term postoperative BCVA and a higher prevalence of amblyopia compared to those with FBN1 mutation. Further classification of FBN1 variants did not yield significant correlations with visual prognosis. No significant correlation was observed between genotype and short-term visual prognosis in the children. This study shows a genotype-phenotype correlation in congenital EL, where molecular diagnosis can potentially help prognosticate medium to long-term visual outcome.

Glaucoma

Two-Year Results of Gonioscopy-Assisted Transluminal Trabeculotomy in Primary Congenital Glaucoma
El Sayed YM, Aboulhassan RM, Gawdat GI, Feisal AE, Elhilali HM
J Glaucoma 2024;33(11):862-866
While angle surgery has long been the standard primary procedure in most cases of primary congenital glaucoma, recent studies have suggested higher rates of successful outcomes with circumferential surgery compared to standard goniotomy or trabeculotomy. This prospective study aimed to evaluate the outcomes and relative risk factor/correlates of gonioscopy-assisted transluminal trabeculotomy (GATT) in the treatment of a large cohort of PCG eyes. A total of 60 eyes from 50 patients were treated with GATT, achieving an average incision extent of 353±21 degrees of Schlemm's canal, with complete 360 degree treatment achieved in 85% of cases. There was a statistically significant reduction in IOP at all post-operative time points (1, 3, 6, 9, 12, and 24 months post-op) with mean reduction of approximately 45% from pre-op IOP mean of 24mmHg to post op of 12.6mmHg at final follow up. Success rate at 1 and 2 years were 90 and 81%, with 76.7% and 72% of these being without need of anti-glaucoma medications. Ten percent of eyes required further surgery within the first year, and 3.3% failed to achieve IOP reduction >20% by year 2. Higher IOP reduction was found to be positively correlated with greater extent of SC incision (p=0.001), and failure rate was higher in the setting of greater pre-op CDR (p=0.03). The most frequent complication was post-op hyphema (33.3%), but this was noted to resolve spontaneously within a month and was not found to correlate with final success rate or IOP. The cohort size and prospective nature of this study are strengths, especially given the rare nature of PCG, although limitations include the lack of a control arm and possibility of missed IOP spike recording in the first post-op month. This study points to the importance of continued exploration of circumferential treatments in the setting of PCG.

Outcomes of Circumferential Versus Hemi-gonioscopy-Assisted Transluminal Trabeculotomy for Congenital Glaucoma
Gupta S, Panigrahi A, R A, et al
Am J Ophthalmol Published online November 7, 2024
This study compared the efficacy of 360-degree gonioscopy-assisted transluminal trabeculotomy (360-GATT) versus 180-degree hemi-GATT (180-GATT) in treating primary congenital glaucoma (PCG) in children. This prospective, randomized controlled trial, conducted at the All India Institute of Medical Sciences (AIIMS) in New Delhi, included 52 eyes from 37 children with PCG and corneal diameters <14 mm. Patients were randomly assigned to undergo either 360-GATT or 180-GATT. Outcomes measured included intraocular pressure (IOP) reduction, postoperative medication needs, need for additional surgery, complications, and structural improvements in cup-to-disc ratio, corneal diameter, and axial length. With a median follow-up of 22.5 months, 360-GATT achieved significantly greater IOP reduction (49%) and lower final IOP (10 mmHg) compared to 180-GATT (20.5% reduction, 12 mmHg final IOP, P=.0003). 360-GATT also demonstrated significantly higher absolute success rates (IOP ≤18 mmHg or ≤15 mmHg without medications) at 1 year (P=.009 and P=.002, respectively). Structural improvements were significant in the 360-GATT group but not in the 180-GATT group.

The most common complication was transient hyphema, and one case of localized iridodialysis occurred with 360-GATT. The need for additional intervention (medications or surgery) was lower in the 360-GATT group. This study, with its randomized controlled design and comprehensive outcome assessment, demonstrates the superiority of 360-GATT over 180-GATT in PCG, with better IOP control, structural improvements, and lower need for additional intervention. Despite limitations such as the small sample size and short follow-up duration, the findings suggest that 360-GATT should be the preferred surgical approach for PCG, particularly in early intervention, as it may help preserve functional outflow channels. Future large-scale, long-term studies are needed to confirm these findings and evaluate the long-term effects of GATT.

Long-term outcomes of Ahmed glaucoma drainage device capsulectomies in pediatric glaucoma patients
Segar S, Ismail A, Shah R, Kim C, Kappagantu A, Roarty J
J AAPOS 2024;28(5):104002
Pediatric glaucoma is a difficult to treat condition, and glaucoma drainage devices (GDD) can be used to manage refractory cases. In pediatric populations, implantation of glaucoma drainage devices (GDD) is more likely to result in significant scarring leading to bleb encapsulation with subsequent device failure and increased IOP. Although this is a recognized complication, there are limited studies about surgical removal of these capsules. This study's aimed to evaluate the effectiveness of capsulectomy in treating this complication and its long-term outcomes. This was a retrospective review of 18 patients (22 eyes) who underwent Ahmed GDD placement followed by capsulectomy. The surgical technique involved careful dissection to remove the fibrovascular capsule over the GDD, with some cases using mitomycin C to reduce scarring. After capsulectomy, IOP decreased from an average of 29.5 mm Hg to an average of 15.2 mm Hg. Surgical success was defined as maintaining an IOP under 21 mm Hg without additional procedures, which was achieved in 5 eyes (23%). The remaining 77% of eyes required further surgical interventions, with a median time to failure of 80.1 months. Visual acuity remained relatively stable postoperatively, with no significant changes observed before and after capsulectomy. Strengths of this study are the review of the capsulectomy procedure and the significant follow-up period. Weaknesses include its retrospective design and small sample size. This is an important study that highlights the short-term benefits of Ahmed GDD capsulectomy as well as its limited long-term success. It is good for pediatric glaucoma doctors to be familiar with this procedure as it can serve as a temporizing measure to delay more invasive interventions.

Long-term Visual Acuity Outcomes of Deep Sclerectomy in Pediatric Glaucoma
Alkhalifah MI, Mousa A, Al Obeidan SA
J Glaucoma 2025;34(2):84-88
Nonpenetrating deep sclerectomy (NPDS) was first described in the 1980s as a less invasive alternative to trabeculectomy, aiming to create a filtering membrane through which aqueous can drain to the subconjunctival space with the possibility of lower risk of surgical complications. This retrospective chart review study included patients who had undergone deep sclerectomy (penetrating or non-penetrating) <14 years of age at a single institution in Saudi Arabia from

2002-2016 and were still being followed at the institution. All surgeries were initially planned for NPDS, but if conversion to PDS was done intraoperatively due to poor filtration or unintentionally, this served as the PDS cohort for the study. Of 83 eyes in 68 patients with mean age at time of study of 11.1 years (range 5-25), 59 underwent NPDS, and 24 underwent PDS with mean follow up of 10.75 years. “Good” VA (≤20/40) was found in 57%, about 20% had fair vision (<20/40-20/200), and about 25% had poor vision (≤20/200). There was no significant difference in visual acuity outcomes between NPDS and PDS. The most common causes for poor visual outcomes included amblyopia and advanced optic nerve cupping. Need for additional surgery within 1 year, initial IOP >40mmHg, and need for antiglaucoma medications for IOP control post-op were associated with poor visual acuity outcomes. Higher rate of poor visual acuity outcomes was found in patients who had surgery after 6 months of age (7/16, 43.8%) compared to those with surgery prior to 6 months (14/67, 20.9%), p=0.059. Importantly, there was no statistically significant difference in IOP control, rates of success, or number of complications in NPDS compared to PDS. One strength of this study is the long-term follow up of these patients. A limitation was the retrospective nature of this study. As the first English literature study to report on this technique in pediatric glaucoma, this study reports similar visual acuity outcomes with deep sclerectomy compared to other glaucoma procedures, and possibly similar success rates to trabeculectomy, further study will be needed to understand safety profile and role of this compared to other more-common procedures currently utilized in PCG.

Outcomes of a Second Ahmed Glaucoma Implant With Mitomycin-C in Pediatric Glaucoma After Initial Valve Failure
Promelle V, Lyons CJ
J Glaucoma 2024;33(10):763-768
In the surgical management of glaucoma, GDDs are often employed after the failure of angle surgery to provide adequate IOP control, however the efficacy of GDD is limited in time, particularly in the pediatric population due to propensity to conjunctival scarring/GDD encapsulation. Previous studies have reported 10 year success of GDD+Mitomycin C to be <60%, which necessitates continued understanding of how to best proceed after failure of first GDD. This retrospective chart review reported outcomes of second Ahmed glaucoma valve (AGV) with MMC after failure of first GDD in children. Of 115 eyes receiving AGV (either S2 of FP7 model) from 2000-2019 at a single institution, 22 were identified to be eyes with previous GDD surgery. The cumulative rate of complete success (IOP 5-21mmHg with no medication) was 82% at 6 months post-op, but fell to 47%, 34%, and 27% at 2 years, 4 years, and final follow up. Qualified success with IOP 5-21mmHg through the use of glaucoma medications was somewhat better (74% at 2 years, 54% at 5 years). Ten eyes experienced failure at a mean time of 4.3 years, due to either severe complication or vision loss (5), final IOP >21 (4), and decision for further surgery (1). There was no significant difference in success rate between primary and secondary forms of glaucoma or silicone and polypropylene models of AGV. Interestingly, probability of qualified success was higher is eyes with MMC use at the time of previous GDD, even though second tube was needed for IOP control (70% cumulative probability of success compared to 21% in eyes without previous MMC, p=0.02). While this study is limited by small sample size and single GDD-type use which limits comparison of valved versus non-valved GDD at the time of secondary surgery, this does help further understand the benefit and role of

secondary GDD after failure of a first GDD. Results point to possible long-term benefit of MMC to help prevent posterior scarring that may benefit even future surgeries. Importantly, high risk of vision loss is important to discuss with families in these patients with advanced glaucoma as risk appears to increase with subsequent tube placement.

Intraocular Pressure Response to Perceived Stress in Juvenile-Onset Open Angle Glaucoma
Abokyi S, Mordi P, Ntodie M, Ayobi B, Kwasi Abu E
J Glaucoma 2024;33(11):874-879
Given that IOP remains the only known modifiable risk factor for glaucoma, there has been recent interest in possible impact of external stress on IOP levels and how this may play a role in glaucoma management. This examiner blinded pretest-postest study evaluated IOP and associated Perceived Stress Scale (PSS) scores in university students with and without Juvenile Glaucoma for 3-week periods at the beginning and end of an academic semester. Patients were restricted from caffeine use or strenuous physical activity in the 24 hours before IOP measurements which were all taken between 9am and noon by applanation. All glaucoma patients were maintained on PF Timolol 0.5% only. The study and control populations included 24 participants each, and within the glaucoma group 19 patients were categorized as having mild glaucoma, 5 with moderate glaucoma. Before academic stress, PSS scores were similar in both groups ($p=0.342$) and rose significantly post-stress in both groups ($P<0.001$) with no notable difference between groups ($p=0.185$). There was a statistically significant increase in IOP in both groups from pre- to post-stress (Glaucoma 22.01±5.87 to 25.08±5.84mmHg, Control 11.36±2.03 to 13.65±2.11mmHg). Presence of glaucoma also had a significant interaction with greater IOP response compared to controls (+3.10 vs +2.23mmHg, $P<0.001$). This study is limited by inability to control for confounding causes of stress outside of academic pressure on the participants contributing to their PSS score at the time of measurements, but the interaction between stress of any kind and increased IOP suggests possible utility to addressing stress-management as part of glaucoma therapy going forward.

The incidence, clinical features, microbiology, and visual outcomes of endophthalmitis associated with glaucoma surgery in children
Al Zahrani AT, AlZendi NA, Alsulaiman SM, AlShahwan S, Khan MA, Malik R
J AAPOS Published online January 23, 2025
Endophthalmitis associated with surgically treated pediatric glaucoma is rare but results in poor outcomes. This study investigates the incidence, clinical findings, microbiology, and visual outcomes of endophthalmitis associated with glaucoma drainage device implant surgery (GDD) and glaucoma filtering surgery (GFS) in the pediatric population. A retrospective chart review was conducted on pediatric patients (<18 years) who underwent glaucoma surgery, including glaucoma drainage devices (Ahmed valve or Baerveldt implant), trabeculectomy with or without MMC, and deep sclerectomy, between January 2008-October 2018 at King Khaled Eye Specialist Hospital in Riyadh, Saudi Arabia. Patients who developed endophthalmitis subsequent to glaucoma surgery were divided into two subgroups, GFS and GDD, and data collected to include demographics, type of glaucoma, type of glaucoma surgery, clinical presentation, culture results, treatment, and visual outcome. A total of 853 eyes of patients <18 years of age were included, 422 in the GDD group and 428 in the GFS group. Of these, 20

eyes (19 with primary congenital glaucoma, 1 with glaucoma after cataract removal) developed endophthalmitis status post glaucoma surgery, 15 (3.3%) in the GDD group and 5 (0.9%) in the GFS group. Delayed endophthalmitis (>6 weeks post-surgery) accounted for 65% of the cases with the most common causative organism of streptococcal pneumoniae (45%). Ocular pain and eyelid swelling were the most common symptoms with conjunctival injection, absent red reflex, eyelid swelling, and hypopyon the most common signs. Treatment consisted of evisceration for 2 eyes, intravitreal tap and injection of antibiotics with immediate pars plana vitrectomy in 7 eyes, and intravitreal tap and injection of antibiotics alone in 11 eyes. Visual outcome was no light perception in 50% of the eyes. The retrospective nature of the study leads to limitations such as selection bias from a single institution and possible loss of follow-up to other institutions which would affect the incidence. Although the small sample size of eyes with endophthalmitis precluded comparisons of the subgroups, the overall cohort of patients was large. This study can help to inform clinicians and patients on incidence, clinical features, and visual outcomes of endophthalmitis in pediatric patients undergoing glaucoma surgery.

Slow Coagulation Versus Micropulse Transscleral Cyclophotocoagulation For Refractory Childhood Glaucoma
Seixas RCS, Russ HHA, Maestrini HA, et al
European Journal of Ophthalmology 2024;34(6):1932-1940
This study compared the safety and efficacy of micropulse laser (MP-TSCP) and slow coagulation transscleral cyclophotocoagulation (TSCP) with a diode laser for reducing intraocular pressure (IOP) in patients with refractory childhood glaucoma (CG). Patients with CG and at least 12 months of medical chart data were included. Data on preoperative and postoperative outcomes were analyzed. The primary outcomes were an IOP of 6-21 mmHg and/or ≥ 20% reduction in the baseline value. A total of 17 eyes were included. The preoperative mean IOP was 28 mmHg in the MP-TSCP and 29.9 mmHg in the TSCP. The mean IOP decreased significantly to 17.26 ± 3.27 mmHg in the MP-TSCP and 14.68 ± 5.79 mmHg TSCP at the last medical record. Three anti-glaucoma meds were administered to the eyes preoperatively in both groups. A mean of 1.02 eye drops was administered to the MP-TSCP and 2.06 to the TSCP. The number of medications decreased by 2.38 ± 1.55 in the MP-TSCP and 0.82 ± 1.68 in the TSCP. The median preoperative visual acuity (logMAR) was 1.51 ± 1.06 in the MP-TSCP and 1.87 ± 0.74 in the TSCP. The variation in mean visual acuity (logMAR) was -0.027 ± 0.05 in the MP-TSCP and -0.40 ± 0.58 in the TSCP. The most frequent complication was corneal decompensation (one patient in MP-TSCP group and two patients in TSCP group). Both techniques were effective and relatively safe for reducing IOP. These techniques appear to extend the indications of cyclophotocoagulation in CG eyes and improve the functional prognosis. This study is limited by its small sample size but does offer a potential treatment for difficult cases of refractory childhood glaucoma.

In Vivo Assessment of the Pediatric Trabecular Meshwork, Schlemm Canal, and Iridocorneal Angle Using Overhead-Mounted Optical Coherence Tomography
Wang B, Naithani R, Alvarez S, Glaser T, Freedman SF
Am J Ophthalmol 2025;269:402-408

This study aimed to describe the morphology of outflow structures in normal pediatric eyes, eyes with glaucoma, and eyes with cataracts using optical coherence tomography (OCT). In this prospective cohort study, 41 children (70 eyes) were categorized into normal (28 eyes), glaucoma (19 eyes), and cataract (26 eyes, 15 pre- and 11 post-lensectomy) groups. While undergoing clinically indicated anesthesia, pediatric patients underwent overhead-mounted OCT imaging to analyze trabecular meshwork (TM) thickness, Schlemm canal (SC) patency, iridocorneal angle abnormalities, and episcleral vessel patency. No normal eyes had thickened TM, while it was found in 47.4% of glaucomatous eyes and 53.8% of cataractous eyes. SC patency was present in all normal eyes, significantly reduced in glaucomatous eyes (32%), and moderately reduced in cataractous eyes (65.4%). Iridocorneal angle abnormalities were present in 94.7% of glaucomatous eyes and 69.2% of cataractous eyes, with similar prevalence before and after lensectomy. All normal and most glaucomatous eyes had patent episcleral vessels. Eyes with a patent SC had significantly lower intraocular pressure (IOP) than those without ($P < .001$), and eyes with a normal iridocorneal angle also had lower IOP than those with angle malformations ($P < .001$). TM thickness did not significantly affect IOP. This study provides the first in vivo OCT evaluation of TM, SC, and iridocorneal angle abnormalities in pediatric eyes, demonstrating significant structural differences between normal, glaucomatous, and cataractous eyes. Limitations include limited imaging angles, small sample size, and cross-sectional design. However, the findings reinforce the importance of thorough anterior segment evaluation in pediatric glaucoma and cataract patients, suggesting that some children with cataracts may be predisposed to glaucoma. OCT could aid in pre-surgical planning and glaucoma risk assessment, though further research is needed. This study emphasizes the need for better pediatric glaucoma management strategies, including surgical approaches targeting TM and SC abnormalities.

Initial Results of the Paul Ahmed Comparison (PAC) Study in Refractory Childhood Glaucoma
Elhusseiny AM, Khaled OM, Chauhan MZ, Sayed MS, Shaarawy T
Am J Ophthalmol Published online November 5, 2024
This study compared the efficacy and safety of newer pressure-guided implants (PGI) with traditional Ahmed glaucoma valves (AGV) in treating refractory childhood glaucoma. In this randomized controlled trial conducted at two clinical centers, 44 patients (44 eyes) aged ≤ 18 years with refractory childhood glaucoma were randomly assigned to receive either a PGI (25 patients) or AGV (19 patients). Patients were followed for one year postoperatively, with the primary outcome being reduction in intraocular pressure (IOP) and secondary outcomes including reduction in glaucoma medications, success rate, and complication rate. Both groups had comparable mean age and similar preoperative IOP levels. At one year, the mean IOP was similar between the PGI (14.9 mmHg) and AGV (15.5 mmHg) groups ($p = 0.6$). However, the AGV group had significantly lower IOP at one month ($p = 0.003$), likely due to the ripcord design in the PGI. Both groups showed significant reductions in glaucoma medications, with no significant difference at one year. Success rates were also comparable, with 80% for PGI and 73.6% for AGV at one year ($p = 0.2$). Complication rates were similar between the two groups. This study, as the first randomized controlled trial comparing PGI and AGV in children, suggests that both implants are effective and safe for managing refractory childhood glaucoma, with comparable outcomes at one year. While AGV may offer an initial advantage in early

postoperative IOP reduction, PGI may provide more stable long-term IOP control. Future studies with longer follow-up are needed to assess long-term efficacy and safety.

Treatment Patterns of Childhood Glaucoma in the United States: Analysis of IRIS® Registry (Intelligent Research in Sight)
Fujita A, Vu DM, Aziz K, et al
Am J Ophthalmol Published online November 30, 2024
This study examined treatment patterns for childhood glaucoma in the U.S. using the IRIS® Registry (Intelligent Research in Sight). This retrospective cohort study included 3,069 patients under 18 years old diagnosed with glaucoma between 2013 and 2020, comprising 5,017 affected eyes. Analysis included patient demographics, clinical characteristics, and treatment patterns, with Cox regression modeling used to determine predictors of incisional glaucoma surgery. Of the patients, 4.1% had primary congenital glaucoma (PCG), 38.1% had juvenile open-angle glaucoma (JOAG), 19.9% had glaucoma following cataract surgery (GFCS), and 32.8% had secondary glaucoma. Treatment modalities included IOP-lowering medications in 93.6% of eyes (beta-blockers most common), and 16.1% underwent glaucoma-related procedures, with angle surgery most common for PCG, tube shunts for GFCS and secondary glaucoma, and laser trabeculoplasty mainly used for JOAG by non-glaucoma specialists. Predictors of incisional surgery included PCG diagnosis, increased baseline IOP, and diagnosis at <1 year of age, while being treated by a non-glaucoma subspecialist decreased the likelihood. This study, utilizing a large, nationally representative dataset, provides valuable insights into real-world treatment patterns for childhood glaucoma in the U.S. Despite limitations such as its retrospective design and potential underrepresentation of certain cases, it highlights the need for standardized guidelines and identifies disparities in treatment approaches between subspecialists and general ophthalmologists. The findings suggest potential overuse of laser trabeculoplasty in JOAG and provide data to support future research on treatment efficacy and long-term outcomes. This research underscores the importance of refining management strategies for childhood glaucoma and ensuring that all ophthalmologists have access to best-practice recommendations.

Comparison of Bent Ab-Interno Needle Goniectomy and Goniotomy in Primary Congenital Glaucoma: A Randomized Controlled Trial
Kaushik S, Gupta K, Hunashyal S, Sardana M, Thattaruthody F, Pandav SS
Ophthalmol Glaucoma 2025;8(1):46-52
This prospective, parallel-group, randomized controlled trial aimed to compare post-operative outcomes of Best-Ab-Interno Needle Goniectomy (BANG) and Goniotomy in patients with primary congenital glaucoma to determine if the trabecular mesh stripping nature of BANG provided any additional pressure control benefits compared to simple tissue incision done with standard goniotomy. Infants with bilateral, symmetrical PCG between 1 month and 1 year of age at a single institution underwent surgery with a single surgeon. One eye was randomized to goniotomy vs BANG and the fellow eye received the other procedure; surgery for both eyes was performed on the same day. Goniotomy was performed with a microvitreoretinal knife (Alcon V-Lance) while BANG was performed using a 25-guage needle bend to 90 degrees toward the bevel to create a cutting edge with the tip of the needle. Eight babies (mean age 7.6±3.6

months) were included and followed for 1 year post op. Mean 1-year post-op IOP was not significantly different between goniotomy and BANG groups (15.3mmHg ±2.4mmHg vs. 17.1±3.0mmHG, p=0.15), nor was the number of anti-glaucoma medications needed for adequate IOP control (1.14±0.89 medications vs. 1.28±0.75 medications, p=0.37). Mean axial length progressed similarly in both eyes and there were no serious complications in either group. Authors postulate that this outcome may be able to be extrapolated to the effect of Kahook Dual Blade (KDB) compared to goniotomy given similar structural nature of KDB to BANG in removing the TM tissue, although this was not directly tested in this study. The main limitation of this study was the small size, but the similarity between comparison groups as a parallel-designed study was a strength. At this time, the added complexity of BANG does not appear to provide significant additional benefit in PCG control compared to standard goniotomy.

Trabecular Meshwork Abnormalities in a Model of Congenital Glaucoma Due to LTBP2 Mutation
Torné O, Oikawa K, Teixeira LBC, Kiland JA, McLellan GJ
Invest Ophthalmol Vis Sci 2024;65(12):28
The authors focused on characterizing early trabecular meshwork (TM) morphologic abnormalities in a feline model of human primary congenital glaucoma (PCG) caused by mutation in LTBP2. Eyes from 41 cats, including 19 normal and 22 homozygous for LTBP2 mutation, across various postnatal stages (birth, 2 weeks, 5 weeks, and 12 weeks) were paraformaldehyde fixed, anterior segments dissected, post-fixed in glutaraldehyde and processed and sectioned for transmission electron microscopy. Cell morphology, nuclear shape, and intertrabecular space (ITS) were quantitatively assessed, and the structure of the fibrillar extracellular matrix in the TM was systematically evaluated. The earliest differences in TM morphology between PCG and normal cats were identified at 2 weeks postnatally. Elastic fibers in the TM were discontinuous and disorganized ($P = 0.0122$), and by 5 weeks of age PCG cats presented significantly less ITS ($P = 0.0076$) and morphologically rounder TM cells than normal cats ($P = 0.0293$). By 12 weeks of age, the ITS was further collapsed ($P < 0.0001$), and the TM cells were morphologically elongated and attenuated in PCG compared to controls ($P = 0.0028$). In this feline model of PCG due to LTBP2 mutation, development of ultrastructural TM extracellular matrix abnormalities are first observed by 2 weeks and cellular abnormalities by 5 weeks of age. By 12 weeks of age, when intraocular pressure becomes significantly elevated, the TM morphologic abnormalities are already well established. These findings suggest that the postnatal period between 0 and 5 weeks of age is critical for TM and PCG development and progression in cats. Clinical correlation with human patients, however, cannot be extrapolated based on these findings alone.

Infections

Pediatric bacterial keratitis: clinical features causative organisms, and outcome during a 13-year study period
Alsarhani WK, Almulhim A, Alkhalifah MI, et al
Can J Ophthalmol 2024;59(6):394-398
This retrospective chart review examined pediatric patients with bacterial keratitis treated between 2007 and 2019 at King Saud University in Saudi Arabia. The authors included patients under 18 years of age with culture-proven keratitis or presumed bacterial keratitis. Patients were categorized into two groups: culture-positive and culture-negative bacterial keratitis. A poor outcome was defined as a decrease in final best-corrected visual acuity (BCVA) by one or more lines, corneal perforation, endophthalmitis, or graft failure. Female patients comprised 60% of the cohort, and 43 patients met the inclusion criteria. The mean age was 9.3 years. All patients presented with unilateral keratitis, and the culture positivity rate was 60.5%. The majority of patients presented within 48 hours of symptom onset. Visual acuity (VA) at presentation was worse than 20/60 in 65% of cases. Contact lens-related ulcers were more common in older patients, with a mean age of 14.4 years, while trauma-related ulcers were observed in younger patients, with a mean age of 6.8 years. Gram-positive bacteria were identified as the causative organisms in 15 patients. The use of contact lenses was associated with Pseudomonas infections. The only factor significantly associated with a poor outcome was poor visual acuity at presentation. Positive cultures were correlated with larger corneal infiltrates. The findings of this study are consistent with previous literature, as patients presenting with poor visual acuity often have more severe disease, leading to denser corneal scarring. While this study contributes to the epidemiological understanding of pediatric bacterial keratitis, it does not provide specific recommendations or future directions for the treatment of this condition.

Neuro-Ophthalmology

Peripapillary hyperreflective ovoid mass-like structure (PHOMS): prevalence, risk factors, and development over time in Danish myopic children
Hansen NC, Behrens CM, Hvid-Hansen A, Hamann S, Kessel L
J AAPOS 2024;28(6):104034
On optical coherence tomography (OCT) scans of the optic nerve head, peripapillary hyperreflective ovoid mass-like structures (PHOMS) are sometimes observed, potentially indicating axonal distension. PHOMS has been reported more frequently in myopic individuals. This study investigated the prevalence of PHOMS in a myopic pediatric cohort, associated risk factors, and PHOMS development over 18 months of low-dose atropine treatment. This post hoc analysis of a randomized clinical trial included 97 myopic participants aged 6 to 12 years, randomized to: (1) 0.1% atropine for 6 months, then 0.01% for 18 months (N = 33); (2) 0.01% atropine for 24 months (N = 32); or (3) placebo for 24 months (N = 32). The primary outcome was the presence of PHOMS, and the secondary outcome was mean nasal PHOMS diameter on OCT B-scan, both assessed at baseline, 6, and 18 months. PHOMS were present in 26% of participants (n = 25), with 52% (n = 13) showing bilateral presentation. Optic disk tilt (OR = 10.81; 95% CI, 3.58-32.58 [P < 0.001]) and longer axial length (AL) (OR = 2.06; 95% CI, 1.02-4.17 [P = 0.04]) increased the risk of PHOMS. A greater increase in nasal peripapillary choroidal thickness was associated with a smaller PHOMS diameter at 18 months (P = 0.05). The study's strengths include masked participants and examiners. Limitations include its post hoc nature, small sample size, and short follow-up. The findings suggest that PHOMS may not be uncommon in children with myopia. Although longer AL and optic disk tilt appear to increase PHOMS risk, they do not affect PHOMS size.

Accommodative and Vergence Responses to a Moving Stimulus in Concussion
Haensel JX, Marusic S, Slinger KE, et al
Invest Ophthalmol Vis Sci 2024;65(12):45
Since adolescents often report visual symptoms amplified by moving targets after concussion, the authors aimed to measure accommodative and vergence responses to a moving target in concussed adolescents versus controls. Thirty-two symptomatic concussed participants (mean age, 14.4 ± 2.6 years; mean days since concussion, 107 days; range, 36-273 days) and 32 healthy controls (mean age, 12.7 ± 2.1 years) viewed a movie binocularly (closed-loop) and monocularly (vergence open-loop), as well as a Difference of Gaussians (DoG) target binocularly (accommodation open-loop). The movie or DoG target sinusoidally moved toward and away from participants at a 0.1-hertz (Hz) frequency at four separate stimulus amplitudes (1.50 diopters [D], 1.00 D, 0.50 D, 0.25 D) around a 2.50-D midpoint. Accommodation and vergence were continuously measured at 50 Hz using the PowerRef 3. Fourier analysis was used to assess the response amplitudes at the 0.1-Hz frequency. A 2 × 3 analysis of variance with the factors group (concussed, control) and viewing condition (binocular, monocular, DoG) was conducted on response amplitudes. Across groups, accommodative and vergence responses were significantly higher in binocular than monocular conditions (P < 0.001), but not DoG conditions. Compared to controls, concussed participants had significantly reduced monocular accommodative responses (P < 0.012; e.g., at 1.50 D, controls = 1.09 ± 0.47 D and

concussed = 0.80 ± 0.36 D, P = 0.011). No group differences were observed for vergence responses in any viewing condition. Accommodative and vergence responses to a moving target seem largely driven by disparity cues for both groups, with only minimal improvements in the presence of additional blur cues. Concussed participants showed reduced accommodative responses to a 0.1-Hz stimulus in monocular conditions, indicating mild accommodative deficits in the absence of disparity cues. Among its study limitations, concussed individuals were recruited from vision examinations after being referred due to persistent symptoms, resulting in a sample of visually symptomatic participants who may not be representative of all patients with PCS. The study participants in the concussion group may have also been frequently questioned about their vision symptoms, giving rise to potential voluntary or practice factors that could have affected accommodative responses, introducing bias to the results. Nevertheless, the study findings could provide a valid explanation for why accommodative training and exercises in post-concussion patients can improve their symptomatic complaints.

Optic Nerve Head Morphological Variation in Craniosynostosis: A Cohort Study
Rufai SR, Thomas MG, Marmoy OR, et al
Am J Ophthalmol 2025;269:136-146
This study investigated optic nerve head (ONH) morphology in children with craniosynostosis and normal intracranial pressure, as these patients require ophthalmological monitoring but ONH characteristics in this population are not well-defined. This single-center, prospective cohort study at Great Ormond Street Hospital in London used handheld optical coherence tomography (OCT) to assess ONH morphology in 58 children (110 eyes) with craniosynostosis (aged 0-13 years) who had either normal or stable intracranial pressure, compared to 218 healthy controls from a published normative dataset. Main outcome measures included disc width, cup width, rim width, and retinal nerve fiber layer (RNFL) thickness. A three-way linear mixed model regression compared FGFR1/2-associated craniosynostosis, non-FGFR1/2-associated craniosynostosis, and controls. Compared to controls, children with craniosynostosis had larger disc width (6%, p =.001), smaller temporal cup width (13%, p =.027), larger rim width (16%, p <.001), and smaller temporal RNFL thickness (11%, p =.027). FGFR1/2-associated craniosynostosis (Crouzon, Apert, Pfeiffer syndromes) showed smaller disc width (10%, p =.014) and smaller temporal cup width (38%, p =.044) compared to non-FGFR1/2 craniosynostosis. These findings suggest distinct ONH morphology in FGFR1/2-associated craniosynostosis, which may be misinterpreted as signs of intracranial hypertension (IH). This study, as the first to characterize ONH morphology in craniosynostosis with normal intracranial pressure, provides valuable insights for clinical practice. Despite limitations such as the small sample size for FGFR1/2-associated craniosynostosis and lack of longitudinal data, it highlights the potential for misinterpreting ONH differences in these patients. The findings suggest that temporal RNFL thickness and rim width may be useful markers for detecting true IH, and handheld OCT can be a valuable tool for routine ophthalmological monitoring. This research emphasizes the need for tailored interpretations of ONH morphology based on genetic subtypes in craniosynostosis and encourages further longitudinal studies to assess ONH changes over time and their clinical significance.

Adaptive functioning and relationship to visual behavior in children with cerebral/cortical visual impairment
Nguyen R, O'Neil SH, Borchert MS, Chang MY
J AAPOS Published online January 21, 2025
Cerebral/cortical visual impairment (CVI) affects visual function as well as difficulty with visual search, visually crowded environments, recognition of faces or objects, depth perception, motion perception, and/or visuospatial orientation. How this effects adaptive behavior (communication, socialization, and daily living skills) is unknown. This study investigates the relationship between adaptive behavior and CVI. This is a prospective study that recruited children aged 12 months-12 years diagnosed with CVI by a pediatric neuro-ophthalmologist. The Visual Behavior Scale (VBS) was used to assess visual acuity, and the Vineland Adaptive Behavior Scale, 3rd edition (VABS-III) was used to evaluate adaptive behavior. Adaptive behavior was and function was measured in the domains of communication, daily living skills, and socialization. 49 children with CVI were recruited and the mean visual acuity was equivalent to fixation on small objects (2 inch toy at 1 foot). The mean VABS-III score was below the 1% in all domains and all subdomains. There was a significant relationship between the visual acuity and VABS-III even when accounting for neurological comorbidities. Limitations of this study involve the complex nature of children with CVI with both ocular and neurologic comorbidities contributing to both visual function and adaptive behavior. There is a correlation between reduced visual acuity and reduced adaptive behavior in children with CVI which impacts socialization and daily living skills.

Ganglion Cell Complex Thickness and Visual Function in Chronic Leber Hereditary Optic Neuropathy
Hedström J, Nilsson M, Engvall M, Williams PA, Venkataraman AP
Invest Ophthalmol Vis Sci 2024;65(12):4
This study evaluated the correlation between the macular ganglion cell complex (GCC) thickness measured with manually corrected segmentation and visual function in individuals with chronic Leber hereditary optic neuropathy (LHON). Twenty-six chronic LHON subjects (60% treated with idebenone or Q10) from the Swedish LHON registry were enrolled. Best-corrected visual acuity (BCVA), visual field tests, and optical coherence tomography (OCT) were performed. GCC thickness was obtained after the segmentation was corrected manually in nine macular sectors. The GCC thickness was overestimated by 16 to 30 μm in different macular sectors with the automated segmentation compared with the corrected ($P < 0.001$). GCC thickness in all sectors showed significant correlation with all functional parameters. The strongest correlation was seen for the external temporal sector (BCVA: $r = 0.604$, $P < 0.001$; mean defect: $r = 0.457$, $P = 0.001$; Esterman score: $r = 0.421$, $P = 0.003$). No differences were seen between treated and untreated subjects with regard to GCC and visual field scores ($P > 0.05$), but BCVA was better among treated subjects ($P = 0.017$). The corrected GCC thickness showed correlation with visual function in chronic LHON subjects. The frequently occurring segmentation errors in OCT measurements related to chronic LHON can potentially be misleading in monitoring of disease progression and in evaluating the treatment effects. The authors suggest that precise measurements of GCC could serve as a sensitive tool to monitor structural changes in LHON. This is the first study on the Swedish LHON population to include

45% of consented LHON subjects from the Swedish LHON registry and is limited by its relatively small sample size and lack of generalizability to all populations across the globe.

Rapid Amplification of Cerebrospinal Fluid Pressure as a Possible Mechanism for Optic Nerve Sheath Bleeding in Infants With Nonaccidental Head Injury
Stewart PS, Brook BS, Jensen OE, Spelman TA, Whittaker RJ, Zouache MA
Invest Ophthalmol Vis Sci 2024;65(12):9
The authors sought to determine if subdural hemorrhage along the optic nerve (ON) as a histopathological indicator of abusive head trauma (AHT) in infants could be caused by an abrupt increase in intracranial pressure transmitted to cerebrospinal fluid (CSF) at the optic foramen (OF). A theoretical model was developed to simulate the effect of a pressure perturbation of maximal amplitude P applied at the optic foramen for a short duration T on the CSF-filled ON subarachnoid space (ONSAS). The ONSAS was modelled as a fluid-filled channel with an elastic wall representing the flexible ONSAS-arachnoid/dura interface. Based on this mode, the authors determined that a sudden increase in CSF pressure in the cranial cavity could cause a rapid expansion of the ONSAS, which may lead to rupture of the bridging blood vessels. The model has some limitations, particularly neglecting viscous effects in the CSF and modelling the elasticity of the dura mater/arachnoid membrane in a relatively simple manner. The elastic stiffness of this interface was inferred from data collected in adults and therefore neglects the additional pliability of intracranial structures when fontanelles have not yet fused in infants. However, the authors propose that their model provides a valuable tool to test clinical hypotheses in a system where experimental data are difficult to generate.

Nystagmus

No entries for this period.

Oculoplastics

Performance of orbital rapid magnetic resonance imaging (rMRI) as a primary tool for evaluation of suspected pediatric orbital cellulitis
Yasin A, Mathew S, Maes J, et al
J AAPOS 2024;28(5):103998
The standard imaging modality for orbital infections has traditionally been contrast-enhanced computed tomography (CT). While this is a quick and readily available imaging modality, it comes with the drawbacks of radiation exposure and the need for IV contrast. In response to these limitations, the authors started offering noncontrast rapid orbit magnetic resonance imaging (rMRI) as an alternative to CT. The current study aims to evaluate the effectiveness of rMRI as a primary imaging tool for diagnosing pediatric orbital cellulitis in a clinical setting. The study reviewed 31 rMRI scans in patients with symptoms of orbital or severe preseptal cellulitis and no previous ophthalmic surgery or significant medical conditions. Results showed that rMRI was effective in diagnosing orbital infections, with 97% of scans providing diagnostic information. Out of the 31 cases, 19 (63%) were diagnosed with orbital cellulitis, while 11 (37%) had preseptal cellulitis. The rMRI results were concordant with clinical diagnoses in 93% of cases. While rMRI was successful in most cases, five additional CT scans were performed after rMRI, for either suboptimal rMRI images or for surgical planning. Strengths of this study were highlighting a novel technique for imaging with less risk factors for patients. Limitations include its small sample size and single center design. Overall, the study suggests that rMRI is a promising alternative to contrast-enhanced CT for diagnosing pediatric preseptal and orbital cellulitis. It provides quick, accurate results without the risks associated with radiation and contrast use. This is an important imaging tool to be aware of for potential use in diagnosing pediatric orbital infections.

Longitudinal Study of Epibulbar Dermolipomas Over Five-Year Follow-Up: Growth Analysis, Refractive Errors, and Surgical Outcomes
Anklesaria V, Basu S, Singh S
Ophthalmic Plast Reconstr Surg Published online December 27, 2024
Dermolipomas are benign ocular tumors resulting from ectodermal sequestration. They can occur alone or in association with systemic conditions like Goldenhar syndrome. These tumors are usually located in epibulbar or orbital tissues and commonly present as yellowish masses in the temporal peribulbar area. While typically asymptomatic, they can cause irritation, conjunctivitis, astigmatism, or visual impairment. This study aimed to analyze longitudinal changes in dermolipoma size, refractive errors, and surgical outcomes over a 5-year follow-up period. A retrospective review was conducted on 53 patients (61 eyes). Surgical interventions were performed based on visual impairment or cosmetic concerns. Cosmetic concerns were the primary complaint of patient. Surgical intervention was performed in 32 eyes, showing significant improvement in refractive error ($p = 0.003$) and BCVA ($p = 0.05$). Unoperated eyes showed minimal growth in lesion size and no significant change in refractive errors. Postoperative outcomes showed a 90.6% improvement in cosmetic appearance, with few complications requiring re-surgery. Strengths of this study were it's longitudinal nature, large sample size, and comprehensive analysis (including refractive error changes). Weaknesses are

its retrospective design and single center nature. Overall, I think this is an important study as it shows that there can be significant visual benefits to removal of dermolipomas in certain patients. At the same time, it gives good data about the mostly stable nature of lesions that do not require surgery.

Pediatric nasolacrimal duct intubation using deep sedation outside the operating room-comparison of three types of stents
Henry WA, Dalabih A, Grigorian AP
J AAPOS 2024;28(6):104039
Congenital nasolacrimal duct obstructions persisting beyond 9 months of age often require surgical intervention, typically involving probing and stenting under general anesthesia in an operating room. This study presents a novel approach using intravenous sedation outside of the operating room. Researchers reviewed medical records of patients treated for nasolacrimal duct obstruction at a tertiary pediatric hospital from 2018 to 2023, using monocanalicular Monoka, Masterka, and LacriJet nasolacrimal stents. All procedures were performed outside the operating room under intravenous sedation administered by a specialized sedation team. The study analyzed symptom resolution, sedation duration, and complications for each stent type. A total of 64 patients (mean age 23.9 ± 19.7 months; 81 stents) were included: 32 Monoka, 15 Masterka, and 34 LacriJet. Symptoms resolved in 86% of eyes. Sedation side effects were minor and infrequent, occasionally including brief apnea, hypoxia, hypotension, or laryngospasm. No patients experienced harm or required hospitalization. The Monoka group showed a higher risk of side effects. The study's strengths include the inclusion of patients with craniofacial abnormalities. Limitations include its retrospective design, lack of stent type randomization, and a predominantly white patient population, limiting generalizability. These findings suggest that nasolacrimal duct stenting procedures could be considered under deep sedation outside the operating room.

Evaluation of primary acquired nasolacrimal duct obstruction: Comparison of CT-DCG and dacryoendoscopy in accurately localizing the lacrimal drainage obstructions
Zhang W, Li L, Zhang L, et al
European Journal of Ophthalmology 2024;34(6):1781-1787
The authors conducted this study to evaluate the power and limitations of computed tomography-dacryocystography (CT-DCG) in determining the level and type of lacrimal duct obstruction in comparison to dacryoendoscopy in patients clinically suspected to be having partial or complete primary acquired nasolacrimal duct obstruction (PANDO). A retrospective chart review was performed for 957 patients (1232 lacrimal drainage systems) with PANDO at Shanghai Ninth People's Hospital. Patients were examined with CT-DCG, which were then correlated with dacryoendoscopy and the findings of clinical examination. Of the studied patients, 173 were men and 784 were women with an age range of 18-93 years. Of the 1232 lacrimal pathways, good CT-DCG images could be obtained in 980 cases and dacryoendoscopy in 957 cases. Of these, complete obstructions were noted in 81% (794/980), and partial obstructions were identified in 19% (186/980) with CT-DCG. CT-DCG and dacryoendoscopy showed 68.4% agreement for the type of the obstruction and 63% for the level of the obstruction. The majority of the obstructions occurred at the sac-duct junction (62.5%) followed

by the upper half of the nasolacrimal duct (27.5%). There was a significant difference in the correlation of the obstruction type with age group and with the duration of symptoms. As the duration of symptoms increased, the proportion of complete lacrimal duct obstructions as shown on CT-DCG images increased and the proportion of incomplete obstruction decreased ($p = 0.015$). The study was limited by its retrospective design and inconsistent quality of dacryoendoscopy images. Based on the findings from the study, the authors suggest that a combination of CT-DCG and dacryoendoscopy could together identify the location of obstruction more accurately and target treatments more effectively.

Management of Pediatric Traumatic Nasolacrimal Duct Obstruction and Predictors for Surgical Outcomes
Li L, Zhang L, Li Y, Shi W, Ali MJ, Xiao C
Ophthalmic Plast Reconstr Surg Published online December 19, 2024
Traumatic nasolacrimal duct obstruction (NLDO) is a common consequence of midface trauma that typically results in epiphora, nasal deformity, dacryocystitis, and medial canthus deformities. While pediatric NLDO is widely studied, research specifically on traumatic NLDO in children is limited. Managing traumatic NLDO presents challenges due to anatomical distortions, variable presentations, and uncertain long-term outcomes. The objective of this study was to evaluate the demographics, causes, clinical and radiological characteristics, surgical approaches, and outcomes of pediatric traumatic NLDO patients. A retrospective review of 80 pediatric patients (83 eyes) diagnosed with traumatic NLDO was performed. Treatment primarily involved external or endoscopic dacryocystorhinostomy (DCR) with silicone intubation, and in some cases, medial canthus repair. Results showed that motor vehicle accidents were the most common cause of traumatic NLDO (42.5%), with epiphora as the predominant symptom. NOE fractures were present in 60.2% of cases, and lacrimal sac displacement was observed in most patients. The most common site of obstruction was the sac-duct junction (74.6%). Surgical success was achieved in 83.1% of cases, with failures attributed to factors such as orbital rim fractures, skin scarring, lacrimal sac displacement, and fracture fragments. The study highlights the importance of CT-DCG imaging for preoperative planning and suggests that early fracture repair may improve surgical outcomes. It concludes that surgical intervention should be individualized based on clinical and radiological findings, with specific attention to osteotomy location and medial canthopexy in patients with medial canthus deformities. Strengths of the study were it comprehensive data collection and long follow-up period. Weaknesses were its retrospective design and limited sample size. It is an important study as it evaluates factors that can lead to surgical success in a difficult to treat condition.

The effect of age on congenital nasolacrimal duct obstruction probing and stent intubation outcomes in pediatric Down syndrome patients
Haraguchi Y, Salem Z, Ghali N, Zeng A, Örge FH
J AAPOS 2024;28(5):104010
Congenital nasolacrimal duct obstruction (CNLDO) occurs in about 6% of newborns and often resolves spontaneously by 9-12 months, but it is more prevalent and harder to treat in children with Down syndrome (DS), who may have additional anatomical abnormalities. Due to this, outcomes in DS patients tend to be less favorable. This study investigated the success rates of

probing/irrigation and silicone intubation for CNLDO in children with DS. It is a retrospective chart review of data from 49 patients with DS at a single institution, comparing outcomes based on age at the time of surgery. The results show no significant difference in symptom resolution, stent duration, or the number of stent placements between those who underwent surgery before or after age 3. There was also not difference seen between stent duration of <1 year vs >1 year with regard to epiphora resolution. The strengths of this study were its focus on an important clinical question. Weaknesses include its retrospective nature and small sample size. The study suggests that delayed intervention might be just as effective as early intervention, despite the higher failure rates in DS patients compared to the general population. The findings highlight the need for tailored approaches in managing CNLDO in DS children, especially considering the anatomical challenges specific to this condition.

Triamcinolone injection in the treatment of lid retraction for thyroid-associated ophthalmopathy: A systematic review
Badjrai RA, Eldinia LR, Anandi L, et al
Eur J Ophthalmol 2025;35(1):69-76
Lid retraction is a common sign of thyroid-associated ophthalmopathy (TAO). Systemic corticosteroids are a standard immunosuppressive therapy for TAO but can cause mild to severe systemic complications. Some physicians use local triamcinolone injections for patients who cannot tolerate systemic steroids. This systematic review, following Preferred Reporting Items for Systemic Reviews and Meta-Analysis (PRISMA) guidelines, aimed to evaluate the response and safety of local triamcinolone injections for lid retraction in TAO. Six reviewers independently screened articles from PubMed, Proquest, and ScienceDirect, ultimately including six studies with a total of 392 patients. The review showed statistically significant improvement in lid retraction with triamcinolone injection. All studies used a 20mg (0.5mL) injection into the affected eyelid, suggesting this as a safe and effective dose. Studies indicated better outcomes when injections were administered during the early congestion phase compared to the fibrotic phase, with noticeable benefits at 3 and 6 months. Limitations include limited information on potential side effects of triamcinolone injections and variations in outcome measurements between studies. Despite these limitations, the meta-analysis demonstrates good efficacy and stability of local triamcinolone injections in reducing lid retraction, suggesting it as an effective alternative to systemic steroids.

Orbit

Subperiosteal Abscess of the Orbit: Long-term Trends in Bacteriology and Clinical Outcomes and Current Management Recommendations
Boal NS, Ataei Y, Hong SH, et al
Ophthalmic Plast Reconstr Surg Published online November 26, 2024
Orbital cellulitis often results from bacterial sinusitis that extends into the orbit, leading to subperiosteal abscesses (SPAs). The pathogens responsible for these infections have evolved over time, which has had an effect on management strategies. This study analyzes current organisms and clinical courses in pediatric sinusitis-related SPA, with comparison to prior time frames, and re-examination of the management protocol in light of those findings. It is a comprehensive retrospective analysis of 91 pediatric patients with sinusitis-related SPAs. It spans data from 2012 to 2022 and compares it to data from previous time frames (1977–1992 and 2002–2012). In the study, about half of the patients recovered with medical therapy alone and the other half underwent surgical drainage of their abscess. The study showed a significant increase in the recovery of Streptococcus anginosus group (SAG). Methicillin-resistant Staphylococcus aureus (MRSA) was also found in a significant proportion of cases, indicating a shift in microbial profiles and emphasizing the importance of targeted antibiotics. There was also a trend towards increased prevalence of anaerobic bacteria; however, it is unclear if this is a true increase or just related to advances in specimen collection and microbial identification. In regards to medical vs surgical management, it was determined that frontal sinusitis did not independently predict need for surgery. The study also showed that recurrent SPA within 6 months should be an indication for urgent surgical drainage. The strengths of this study are its longitudinal data with comparison to previous generations of data and conclusions with a clear protocol to follow. There are weaknesses including its retrospective nature and the single center design decreasing its generalizability. This is an important study as it updates Harris's criteria for SPA drainage to better reflect current bacteriology.

The Neutrophil-Lymphocyte Ratio in Pediatric Preseptal and Orbital Infectious Cellulitis
Law JJ, Orgul S, Tomlinson LA, Wladis EJ
Ophthalmic Plast Reconstr Surg Published online December 9, 2024
Orbital cellulitis (OC) and preseptal cellulitis (PC) can present similarly but need to be distinguished from one another as OC can have potentially vision and life-threatening consequences. This study investigates the neutrophil-lymphocyte ratio (NLR) as a potential biomarker to help differentiate between these conditions in pediatric patients, aiming to reduce reliance on imaging and improve clinical decision-making. This was a retrospective review including 66 patients (43 with OC and 23 with PC). The median NLR for OC patients was 4.18, which was significantly greater than the 1.96 observed in PC patients ($p < 0.001$). Among OC patients, those who required surgical intervention had a higher median NLR (6.53) compared to those managed medically (3.09, $p = 0.003$). The NLR did not show a significant difference in patients with OC who did or did not have a subperiosteal abscess ($p = 0.401$). Strengths of this study were its potential impact on clinical management of patients and its robust statistical analysis. Unfortunately, the study's retrospective nature and small sample size limited the ability to establish a definitive NLR cutoff for safe observation. This is an important study as it brings

up the potential impact that NLR can have on the management of patients with OC/PC. By evaluating the NLR alongside clinical examination, we may be able to reduce the need for CT scans and may avoid unnecessary surgical interventions. Larger prospective studies are needed to refine the NLR as a tool for distinguishing OC from PC.

Simvastatin-induced ferroptosis in orbital fibroblasts in graves' ophthalmopathy
Wang L, Li Y, Niu T, et al
Invest Ophthalmol Vis Sci 2025;66(1):56
Recent studies have shown that statins have a protective effect on individuals with Graves Ophthalmopathy (GO). Statins were reported to trigger ferroptosis in some disorders, but little is known about whether statins protect against GO via ferroptosis. The aim of this study was to explore whether ferroptosis is involved in the protective effect of simvastatin on GO. CCK-8 assays, flow cytometric analysis, and transmission electron microscopy (TEM) were used to compare the sensitivity of GO-OFs(orbital fibroblasts) and control-OFs (orbital fibroblasts) to erastin-induced ferroptosis. The ferroptosis levels in the GO-OFs were evaluated by measuring cell viability, reactive oxygen species (ROS) levels, and lipid peroxidation levels and performing TEM analysis after treatment with simvastatin and Fer-1. The study indicated that ferroptosis plays an important role in the pathogenesis of GO and that simvastatin may induce ferroptosis, suggesting that this drug could serve as a novel therapeutic agent for GO. This study has several limitations. The tissues included in this study were sourced from individuals whose clinical activity score was less than 3, and thus, these samples may not fully capture the inflammatory condition because orbital surgery is rarely advised for individuals with active GO except for those with an urgent need. Furthermore, similar to other in vitro investigations, our study focused solely on OFs without considering the interplay between immuneactive cells and OFs or the potential impact of the microenvironment. In addition, the bioavailability of simvastatin is low, and it is mainly bound to plasma proteins. The actual exposure of cells in the body to free simvastatin may be much lower than the total plasma concentration.

Orbital Myositis and Strabismus: Clinical Profile, Management, and Predictive Factors for Recurrence
Lasrado AS, Chattannavar G, Jakati S, Mohamed A, Kekunnaya R
J Pediatr Ophthalmol Strabismus 2025;62(1):57- 66
This study examined the clinical profile, management, and recurrence factors in patients with orbital myositis. Researchers reviewed records of 52 patients (55 eyes) diagnosed with orbital myositis between 2010 and 2022. Patient demographics, presenting complaints, visual function, primary gaze deviation, and extraocular muscle involvement were analyzed. Radiological modalities, management, recovery status, and need for surgical intervention were also documented. The study found that 69% of patients were women, with a mean age of 36 years. Common presenting complaints were periocular pain (55%) and diplopia (49%). The disease was unilateral in 94% of cases, with 60% exhibiting ocular misalignment. The medial rectus muscle was most commonly involved (58%), and abduction limitation was present in 73%. Computed tomography and magnetic resonance imaging were equally used for diagnosis (42% each), and muscle biopsy was performed in 38% of patients. Systemic immunomodulators were required in 16% of cases, and strabismus surgery was performed in 11%. Recurrence was

noted in 43% of patients, with abrupt cessation of steroids being a significant risk factor. The study concluded that systemic steroids with a slow taper are effective for most patients, while refractory cases may require biopsy and steroid-sparing agents. Surgical intervention can address residual disease after remission. Limitations include the retrospective design, high follow-up attrition rate, and challenges in differentiating idiopathic orbital myositis from thyroid eye disease.

Pediatrics / Infantile Disease / Syndromes

No entries for this period.

Practice management / Health care systems / Education

Patient satisfaction with synchronous telehealth care after strabismus surgery
Pereira CZ, Soares JQ, Saccon BP, Rossetto JD, Höpker LM
J AAPOS 2024;28(6):104045
To measure patient satisfaction with synchronous telehealth care after strabismus surgery, the authors used the Telemedicine Satisfaction Questionnaire (TSQ) to assess the quality of care, its similarity to in-person visits, and patients' perceptions of the interaction. The Portuguese version of the TSQ was administered in 2022 to patients in Curitiba, Brazil, who received postoperative synchronous telehealth care between 2020 and 2022. The time between the questionnaire and the telehealth consultation ranged from 2 to 22 months. All patients received synchronous telehealth care from the same surgeon between postoperative days 7 and 10 and had in-person consultations on days 1 and 30, at 6 months, and yearly thereafter. The study included 53 patients, with 26 (49%) male and 28 (53%) under 18 years old. Synchronous telehealth care was rated highly, with an average TSQ score of 4.3 out of 5. The mean score for quality of care was 4.1; for similarity to face-to-face visits, 4.5; and for interaction perception, 4.5. Distance between patients' homes and the hospital did not affect satisfaction. While limited by the small sample size, the study indicates positive patient perceptions of telehealth care quality, suggesting its acceptability for postoperative strabismus care.

Reversal of Pharmacologically Induced Mydriasis with Phentolamine Ophthalmic Solution
Pepose JS, Wirta D, Evans D, et al
Ophthalmology 2025;132(1):79-91
This paper discussed 2 phase 3 multicenter, placebo controlled, randomized double masked clinical trials of phentolamine ophthalmic solution(POS) for reversal of pharmacological dilation. The authors discuss that patients who are dilated can have glare, photophobia, and blurred vision after dilation that can last up to 24 hours and that it can cause increased collisions with obstacles when driving. They designed this study (MIRA 2 and MIRA 3) to look at POS 0.75% with the primary endpoint assessing the percentage of participants whose eyes returned to 0.2mm or less from baseline PD at 90 minutes after instillation vs placebo. Secondary endpoints included measurement of PD, time to recovery of baseline PD, recovery of pupillary light response, patient questionnaire and safety. Patients were randomized in a 3:1:1 ratio of 2.5% phenylephrine, 1% tropicamide, and Paramyd. The results of the study showed that a statistically significant percent of the patients treated with POS showed reversal of mydriasis compared to placebo at 90 minutes. This finding held true at all timepoints measured in the study. As far as the secondary measures, POS treatment demonstrated durability of PD reduction across all mydriatic agents and iris colors with phenylephrine demonstrating the most rapid effect, faster recovery of baseline PD in the treatment group as well as pupillary light reactivity in patients with dark irides. As far as safety, treatment was well tolerated with some adverse events such as conjunctival hyperemia and some irritation upon instillation of drops. The study was limited by the inclusion of only patients with healthy ocular history and no systemic issues, as well as the minimum age being 12. This may be an area for further study to be used in the pediatric population and those with systemic or ocular disease. The authors

conclude that POS consistently reduces pupil diameter rapidly with minimal side effects and patients reporting improvement in visual acuity symptoms.

Female Leadership in Pediatric Ophthalmology: A Descriptive Analysis
Lam L, Nelson LB, Bayraktutar BN, Lee KE
J Pediatr Ophthalmol Strabismus 2024;61(6):391-396
The past decades have seen an upward trend in female physicians across most all specialties, but there are still gender disparities present. This study looked at female leadership in pediatric ophthalmology in order to better understand gender disparities in our subspecialty, collecting data from late 2023 into 2024 using publicly available sources. They found that 38.3% (64/167) of dedicated pediatric ophthalmology services are led by a female chief, with representation greater at children's hospitals (40.0%, 36/90) than at academic medical centers (36.4%, 28/77). Of the 46 pediatric ophthalmology fellowship programs, 45.7% (21/46) were led by a female fellowship program director. The authors note that, despite some advancements, there remains a gender gap, even in pediatric ophthalmology. Further efforts may be necessary to improve equity in leadership opportunities in our field.

Predictors of No-Show Status: An Analysis of Pediatric Ophthalmology Patients at an Academic Ophthalmology Department in the United States
Borkhetaria RK, Hussain ZS, Giang V, Ely AL
J Pediatr Ophthalmol Strabismus 2024;61(6):442-451
Clinic appointment no-shows are a notorious challenge for any pediatric ophthalmology practice, hurting practice finances, clinic efficiency, and patient access. In this analysis, the authors attempted to analyze what factors may predict no-shows. To do this, they performed a retrospective chart review of all scheduled pediatric ophthalmology appointments at a single academic center over a one year span. Of over 8,000 scheduled visits, 17.9% were no-shows. Univariate analysis revealed that younger patients (less than 5 years old, p=0.002 and 6-11 years old, p=0.006) had higher no-show rates that 12-17 year old patients. There was no difference between male and female patients (p=0.870). The odds of a no-show appointment were greater among patients who identified as Black (P < .001) and other (P < .001), or Unavailable (P < .001) compared to White patients, while there was no difference in the odds of no-show between Asian and White patients (P = .749). Patients speaking languages other than English also had higher rates of nonattendance than patients speaking English. Patients with medical assistance (P<0.001) and no insurance coverage (p<0.001) were both more likely to no-show compared to those with private insurance. Both income and distance were associated with no-show rate, with households farther away and having income lower than median income for the state being more likely to no-show. Lastly, new patient appointments were more likely to be no-shows than return patient appointments. While none of the results themselves are exactly surprising, this study reinforces the notion that we need to continue to improve access to care among families with higher socioeconomic burden, families of racial minorities, and families who do not speak English as a first language. Compared to those with private insurance, the no-show odds for patients with medical assistance (P < .001) and no insurance coverage (P < .001) were nearly 3.5 times and 6.5 times greater, respectively.

Using machine learning to identify pediatric ophthalmologists
Oke I, Elze T, Miller JW, et al
J AAPOS Published online November 19, 2024
Due to projected decline in pediatric ophthalmologists, there is concern about meeting the vision needs of the pediatric population. This study aims to use coding data from the American Academy of Ophthalmology (AAO) IRIS (Intelligent Research in Sight) Registry and machine learning to identify pediatric ophthalmologists. This cross-sectional study collected data between January 1, 2019 and December 31, 2019 and included ophthalmologists with subspecialty classification participating in the IRIS registry who used billing codes. A logistic regression model and a random forest algorithm in machine learning were compared for the classification of pediatric ophthalmologist using procedure codes. Only strabismus procedure codes were used for the logistic regression model and all CPTs were used for the random forest model. Out of 10,723 ophthalmologists whose data was included, the cohort included 334 (3.1%) pediatric ophthalmologists. Comparing the models, they had similar sensitivity (0.97 for logistic model and 0.98 for the random forest algorithm), but the random forest algorithm had better specificity. Codes that were influential in the random forest algorithm in addition to strabismus codes were sensorimotor (CPT 92060), refraction (CPT 92015), and procedures performed under anesthesia (CPT 92018, 68811, 68815, 68816, 67808). Some limitations of the study include lack of validation for generalizability and data was collected only from the IRIS Registry which may lead to underrepresentation and self-reporting of subspecialities. While this study was not designed to determine an optimal algorithm, it provides information regarding the usefulness of machine learning. This study presents a new machine learning method to identify specialists, which may aid in recognizing emerging trends and distribution of pediatric ophthalmologists.

A Systematic Review of Ophthalmology Education in Medical Schools: The Global Decline
Spencer SKR, Ireland PA, Braden J, et al
Ophthalmology 2024;131(7):855-863
The authors aimed to review the current state of undergraduate ophthalmic education around the world. The secondary objective was to determine if there were geographical or temporal trends of these outcomes and whether there is a correlation between the length of the course and outcomes. The authors used the Meta-analysis of Observational Studies in Epidemiology guidelines to identify articles investigating ophthalmology course delivery and outcomes. 52 studies were identified and of those 11 were from English speaking countries. The longest exposures were in Africa, while North America and Australasia had the shortest course. Overall the authors found that the amount of ophthalmology teaching in medical schools has declined over the past 2 decades. In terms of scoring, students did not score highly for either knowledge or skill. They also discuss that the correct diagnosis rate by ED doctors was only 40% of the time which is also a decline from prior decades. The conclusion of the authors is that course length has declined over the past 2 decades and that there are mediocre student self ratings regarding knowledge, skills and confidence.

Large language models: a new frontier in paediatric cataract patient education
Dihan Q, Chauhan MZ, Eleiwa TK, et al
Br J Ophthalmol 2024;108(10):1470-1476

Current guidelines for patient education materials are that they should be written at or below 6th grade reading level; however, much of the existing online information specifically for pediatric cataracts falls short of meeting this recommendation. This comparative study conducted between November and December 2023 evaluated the ability of different large language models (LLMs – ChatGPT-3.5, ChatGPT-4 and Google Bard) to improve the readability of existing online patient education materials (PEMs) on pediatric cataract. The ability to generate novel PEMs on pediatric cataract was also tested, and they analyzed the readability, quality, understandability and accuracy of these responses. They assessed the readability of all PEMs in this study using well-established readability formulas: the Simple Measure of Gobbledygook (SMOG) and the Flesch-Kincaid Grade Level (FKGL) and calculated the texts' readability metrics using online scoring tools. All generated responses from each of the three LLMs surpassed the 70% 'understandable' threshold and did not produce any misinformation according to the Likert misinformation scale. To generate the novel PEMs, the authors formulated 2 prompts based on principles outlined in OpenAI's guide to prompt engineering and then evaluated the quality and reliability of the resulting texts using the validated DISCERN instrument. These generated PEMs were generally of 'high quality,' with responses by each LLM demonstrating a median DISCERN score of ≥4. The authors concluded that all tested LLMs were able to generate understandable and accurate PEMs on the specific topic pediatric cataract, with ChatGPT-4 performing the best. Using this new technology may be useful in producing parent education materials in the future.

Association of smartphones use, ocular symptoms and binocular dysfunctions in adolescents: a hospital-based cross-sectional study
Sharma S, Singh A, Agrawal A, Kumari R, Kumar B
Strabismus 2024;32(4):279-286
This study aims to evaluate the proportion of ocular symptoms and binocular dysfunction and their association with smartphone use in adolescents through a hospital-based cross-sectional study. The participants were asked to fill out questionnaires related to smartphone use and symptoms of eyestrain experienced. They were asked about the following seven symptoms: blurring of vision, redness, visual disturbance, secretion, inflammation, lacrimation, and dryness. Each symptom out of the 7, was scored on a scale of 0–1 and was used to calculate an Ocular Symptom Score (OSS) by summing the scores of each symptom. Depending upon the duration of smartphone usage, the participants were classified into four groups: <2 hours/day, 2–4 hours/day, 4–6 hours/day, and >6 hours/day. Binocular functions were assessed using near point of convergence (NPC), near point of accommodation (NPA), Accommodative convergence/Accommodation (AC/A) ratio, dissociated heterophoria, and binocular accommodative facility (BAF). A total of 123 smartphone user adolescents, aged 10–19 years were included in this study. The mean age of the study population was 16.58 + 2.8 years, out of which 52.03% were males. Prevalence of ocular symptoms was higher in groups with greater duration of smartphone use (2 to 4, 4 to 6, and >6 hours/day as compared to <2 hours/day: 90.48%, 94.74%, 100% vs. 75% respectively). The mean of NPC was 8.51, it was highest in subjects using smartphones for >6 hours. The mean AC/A ratio was 2.83 + 1.03: 1. A low AC/A ratio was associated with a longer duration of smartphone usage. The mean of BAF was lowest in the group with >6 hours/day of smartphone use. No significant change was found in NPA and

dissociated heterophoria with the duration of smartphone usage. Higher duration of smartphone use (>2 hours/day) is associated with various ocular symptoms and binocular dysfunction. The cross-sectional study design in a hospital setting and the absence of a control group were the major limitations of the study. Also, the participants were divided according to the symptoms and duration of smartphone usage only, irrespective of their refractive status.

Prematurity

The Effect of Perinatal High-Dose Erythropoietin on Retinal Structural and Vascular Characteristics in Children Born Preterm
Jeltsch BM, Hanson JVM, Füglistaler J, et al
Am J Ophthalmol 2024;266:264-273
This study examined the long-term effects of perinatal high-dose recombinant human erythropoietin (rhEPO) on macular structural and vascular characteristics in preterm children. Conducted at University Hospital Zurich, Switzerland, this randomized, double-blind clinical trial follow-up included an intervention group of extremely (<28 weeks) or very preterm children (28-32 weeks GA) (7-15 years old) from the EpoKids study, who were randomized at birth to receive either high-dose rhEPO or placebo, and a healthy control (HC) group of term-born children of similar age. Examiners were blinded to intervention status. Spectral-domain Optical Coherence Tomography (OCT) and Optical Coherence Tomography Angiography (OCTA) imaging, along with ophthalmologic and orthoptic examinations, were performed. Main outcome measures included macular thickness and volume (CRT, TMV), foveal avascular zone (FAZ), vessel density (VD), vessel length density (VLD), and presence of foveal hypoplasia. Results showed a significant reduction in VD and VLD in the EPO group compared to the placebo group ($p=0.015$), but no significant differences in other macular structural parameters. Both preterm groups showed increased CRT and reduced FAZ compared to the HC group ($p<0.005$), with the HC group having significantly lower rates of foveal hypoplasia. The EPO group had more pronounced reductions in VD and VLD compared to both the placebo and HC groups. This well-controlled study, with its strengths in design, population size, and comprehensive assessment, provides valuable insights into the effects of rhEPO on retinal development, particularly highlighting the complexity of macular vascular maturation in preterm infants. Despite limitations such as unequal intervention group sizes and potential biases, the study suggests a need for further research to clarify the clinical significance of reduced vessel density and explore long-term visual implications. Clinicians should continue monitoring macular development in preterm children receiving EPO therapy to assess potential visual outcomes.

The Effect of High-Dose Erythropoietin Perinatally on Retinal Function in School-Aged Children Born Extremely or Very Preterm
Sisera L, Hanson JVM, Füglistaler J, et al
Am J Ophthalmol 2024;266:300-312
This study aimed to assess the long-term effects of perinatal high-dose recombinant human erythropoietin (rhEPO) on retinal and visual function in children born extremely or very preterm. Conducted at the Department of Ophthalmology, University Hospital Zurich, Switzerland, this randomized, double-blind clinical trial follow-up included children aged 7 to 15 years who were previously randomized at birth to receive either high-dose rhEPO or placebo, along with a control group of term-born, healthy children. Inclusion criteria were participation in the EpoKids study and informed consent, while exclusion criteria included history of ocular trauma or surgery, retinal or developmental diseases unrelated to prematurity. Electroretinogram (ERG) assessed retinal function, with ophthalmological and orthoptic examinations ruling out comorbidities, and visual acuity and color discrimination tests serving as secondary outcomes. Examiners and subjects remained blinded to intervention status until all analyses were completed. Results

showed no significant differences in ERG parameters between the rhEPO (n = 52) and placebo (n = 35) groups. Compared to the healthy control (HC) group (n = 52), two cone system-mediated peak times were slightly slower in the placebo group, and a rod system-mediated peak time was slightly faster in the rhEPO group. Visual acuity and color discrimination were similar across all subgroups. This robust study, with its blinded assessment and inclusion of a control group, confirms the safety of high-dose rhEPO in the perinatal period, showing no negative impact on long-term retinal function. Despite limitations such as unequal group sizes and the small number of ROP cases, the findings suggest that rhEPO may offer slight mitigation of prematurity effects on retinal function. Clinically, this indicates that while rhEPO may not significantly alter visual outcomes, it poses no risk to retinal function, allowing for continued investigation of its neurodevelopmental benefits without ocular concerns. This study provides valuable evidence supporting the safety profile of rhEPO in preterm infants, encouraging further research into its broader neurological effects.

Macular Changes In Adults With History Of Premature Birth
Cox JT, Knapp AN, Chen C, et al
Retina 2025;45(2):171-177
With advances in technology, premature babies are surviving at younger ages and smaller weights. The lasting implications of premature birth are unknown, and this study explored vascular changes on OCT. A total of 34 eyes were included, 17 eyes from premature birth adults not requiring ROP treatment and 17 eyes from healthy controls. Prematurity was associated with vascular changes on ocular coherence tomography-angiography including decreased foveal avascular zone area, decreased foveal avascular zone circularity index, decreased superficial capillary plexus vessel density, and decreased deep capillary plexus vessel density. Prematurity was also associated with structural changes including a shallower foveal pit depth, decreased cube average thickness, and increased central subfield thickness-to-cube average thickness ratio. Even without ROP requiring treatment, there are lasting changes of prematurity evident in adults by OCT, although the clinical significance of these changes is unknown.

Refractive Error

Five-Year Clinical Trial of the Low-Concentration Atropine for Myopia Progression (LAMP) Study: Phase 4 Report
Zhang XJ, Zhang Y, Yip BHK, et al
Ophthalmology 2024;131(9):1011-1020
This fourth phase of the study aimed to evaluate the long-term efficacy of low concentration atropine over 5 years, the proportion of children requiring restart of treatment after cessation of atropine, and the efficacy of re-treatment using 0.05% atropine for children with myopic progression after cessation. All children in the atropine continued treatment groups at any concentration were switched to 0.05% atropine and any in the cessation group at any concentration were restarted on 0.05% atropine if either eye progressed to 0.50D/year or less during years 4 and 5. The parameters collected in this phase were the same as all prior phases. Primary outcomes included myopia progression, proportion of children needing retreatment, and the difference in myopia progression between continued treatment and prn retreatment groups from years 3 to 5. Over 5 years the cumulative mean SE progression were -1.34 ± 1.40 D, -1.97 ± 1.03 D, and -2.34 ± 1.71 D for the continued treatment groups with initial 0.05%, 0.025%, and 0.01% atropine, respectively (P = 0.02). Similar trends were observed in AL elongation (P = 0.01). Among the PRN re-treatment group, 87.9% of children (94/107) needed re-treatment. The proportion of re-treatment across all studied concentrations was similar (P = 0.76). The SE progressions for continued treatment and PRN re-treatment groups from years 3 to 5 were -0.97 ± 0.82 D and -1.00 ± 0.74 D (P = 0.55) and the AL elongations were 0.51 ± 0.34 mm and 0.49 ± 0.32 mm (P = 0.84), respectively. The authors discuss that results appeared to be based on concentration dependency, the higher the concentration the greater the effectiveness. Similar myopia progression in years 4 & 5 were noted across the different initial treatment concentrations, concluding that the initial treatment concentration does not influence the treatment effect when switched to 0.05%. The use of 0.05% over 4 years was more efficacious than either the prn or switchover groups. Good tolerability and low occurrence of adverse events were noted as well. A high percentage of children required restart of treatment after cessation at year 3. Overall the study demonstrated that 0.05% atropine was effective and well tolerated over 5 years and that retreatment can also be efficacious after cessation.

Spectacle Lenses With Highly Aspherical Lenslets for Slowing Axial Elongation and Refractive Change in Low-Hyperopic Chinese Children: A Randomized Controlled Trial
Zhang Z, Zeng L, Gu D, et al
Am J Ophthalmol 2025;269:60-68
This study investigated the effectiveness of highly aspherical lenslets (HAL) spectacle lenses in slowing axial length (AL) elongation and delaying myopia onset in pre-myopic children. This single-center, randomized controlled trial, conducted at Fudan University Eye and ENT Hospital in Shanghai, China, included 108 Chinese children aged 6.0–9.9 years with a spherical equivalent refractive error (SERE) of 0.00 to +2.00 D. Participants were randomized to wear either HAL spectacle lenses or standard single-vision lenses (SVL) for 1 year. Cycloplegic refraction, AL, and uncorrected visual acuity (UCVA) were assessed at baseline, 6 months, and

12 months, with lens-wearing duration tracked using a Clouclip device and questionnaire logs. The primary outcomes were changes in AL and SERE over 1 year. Results showed that the 1-year AL elongation was 0.24 mm in the SVL group and 0.19 mm in the HAL group (P =.057), while the SERE change was −0.19 D and −0.23 D, respectively (P =.883). Changes in AL and SERE correlated significantly with lens-wearing time. In the subgroup wearing lenses >30 hours/week, the HAL group had significantly slower AL elongation (0.11 mm) than the SVL group (0.27 mm) (P <.001). No significant differences were found in the ≤30 hours/week subgroup or across different age and baseline SERE subgroups. This study, as the first to assess HAL lenses in pre-myopic children, demonstrates a potential dose-dependent effect of HAL lenses in slowing AL elongation and delaying myopia onset. Despite limitations such as the short follow-up period and homogeneous population, the findings suggest that HAL lenses, particularly with consistent and prolonged wear, offer a promising non-invasive alternative to pharmaceutical interventions for myopia prevention. This highlights the importance of early intervention and suggests that optical strategies can be effective even before myopia develops.

Axial Shortening Effects of Repeated Low-level Red-light Therapy in Children With High Myopia: A Multicenter Randomized Controlled Trial
Liu G, Liu L, Rong H, et al
Am J Ophthalmol 2025;270:203-215
This study investigated the efficacy and safety of repeated low-level red-light (RLRL) therapy for myopia control in children with high myopia (≤ –6.00 D). In this multicenter, randomized, single-blind clinical trial, 202 high-myopic children aged 7-12 years were assigned to either the RLRL + single vision spectacle group or the single vision spectacle-only control group. RLRL therapy was administered for 3 minutes twice daily for 12 months. The primary outcome was the change in axial length (AL), with secondary outcomes including changes in spherical equivalent (SE), choroidal thickness (ChT), and retinal thickness (RT). After 12 months, the RLRL group showed a significant reduction in AL elongation (–0.11 ± 0.25 mm) compared to the control group (+0.32 ± 0.09 mm, P < 0.001), with 59% of the RLRL group experiencing axial shortening. The RLRL group also had less myopic shift in SE (+0.18 ± 0.63 D vs. –0.80 ± 0.42 D, P < 0.001), increased ChT in all macular regions, and significant RT thickening in the parafoveal and perifoveal areas, while the control group showed progressive thinning. No adverse effects were reported. This study, as the first to investigate RLRL in high myopia, demonstrates its potential for myopia control by reducing axial elongation and promoting choroidal and retinal thickening. Despite limitations such as the short follow-up duration and lack of a sham control group, the findings suggest that RLRL is a safe and potentially highly effective non-invasive treatment option for high myopic children. Future research should focus on long-term effects and optimal treatment duration to refine clinical recommendations. This study highlights the potential of RLRL therapy in mitigating the risks associated with high myopia.

One-year efficacy of myopia control by the defocus distributed multipoint lens: a multicentric randomised controlled trial
Chen X, Li M, Li J, et al
Br J Ophthalmol 2024;108(11):1583-1589

This study is a multicenter clinical trial of a newly designed spectacle lens called defocus distributed multipoint (DDM) which is based on peripheral myopic defocus. 168 children age 6-13 years with SER between –1.00 and –5.00 (mean –2.74D) and no previous myopia control therapy were randomly assigned to wear a DDM lens or SVL in 3 different centers in China. Linear mixed model analysis compared between-group SER and AL changes, and logistic regression analysis was used to analyze the between-group difference in rapid myopia progression (SER increase >/+ 0.75D per year or AL growth >/= 0.40mm per year). Compared with the SVL group, the DDM lenses significantly delayed AL growth by 38% (mean difference 0.13 mm). In the linear mixed model analysis, no covariates were significantly associated with AL growth. The DDM group showed significantly delayed SER progression according to a mean difference of 0.24 D (34%) at 1 year. In the linear mixed model analysis, baseline age was significantly associated with SER progression. The proportions of participants with rapid myopia progression were 56.7% (38/67) in the SVL group and 27.2% (22/81) in the DDM group, which was significant and had an OR=3.51. Daily wearing time (> or < 12 hours) was positively correlated with SER increase and negatively correlated with AL growth in the DDM group, but this correlation was not significant in the SVL group. At 1 year, the DDM lens significantly reduced the risk of rapid myopia progression compared with the SV lens, especially for younger (6–9 years) children and boys. Additionally, longer daily wearing times improved its efficacy in myopia control. Further research is needed to understand longevity of treatment effects and all of the other questions we currently have related to all forms of myopia control, but is nice to have a spectacle option for those who are unable to wear contact lenses or use atropine eye drops.

Association of sleep timings, duration, consistency, and chronotype with premyopia and myopia among Indian children
Hussain A, Mohammad A, Tharsis A, Badakere A, Agarkar S
European Journal of Ophthalmology 2024;34(6):1770-1780
This study aimed to explore the association between sleep disorders and myopia among Indian children and was designed as a hospital-based cross-sectional study including 453 children between the ages of 5-12 years. All children underwent cycloplegic autorefraction and ocular biometric tests. The Children's Sleep Habits Questionnaire (CSHQ) and parental information on behavioral habits were used to assess the association of sleep parameters with myopia (SE ≤ −0.50 D) and pre-myopia (SE ≤ + 0.75 D to > −0.50 D) using logistic regression models. Both myopia and pre-myopia exhibited significant late bedtime, short sleep duration, early wakeup time on only weekdays, and longer weekend catch-up sleep than emmetropic children ($p < 0.05$). In a multivariate analysis, late bedtime (past midnight) on weekdays (Odds ratio, OR = 3.63, 95% CI [0.74, 8.68]) as well as on free days (OR = 1.04, 95% CI [0.02, 8.08]); and early wake-up time only on weekdays (5:00-6:00 a.m., OR = 2.16, 95% CI [0.24, 6.76] and 06:00-07:00 a.m., OR = 2.42, 95% CI [0.51, 8.44]) were associated with increased risk of myopia (all $p < 0.05$) but not pre-myopia. After adjusting the confounding factors, when each of the CSHQ subscale components was analyzed, only bedtime resistance, night waking, and daytime sleepiness scores were significantly associated with a higher risk for pre-myopia and myopia ($p < 0.05$). The study’s limitations include introduction of selection bias by its cross-sectional design and of recall bias in using questionnaire data. However, its findings could

provide useful evidence in the counseling of patients and their families regarding behavioral patterns that could be adjusted for prevention of myopic progression.

Progression Patterns and Risk Factors of Axial Elongation in Young Adults With Nonpathologic High Myopia: Three-Year Large Longitudinal Cohort Follow-Up
Kong K, Jiang J, Wang P, et al
Am J Ophthalmol 2024;267:293-303
This study aimed to assess the patterns and risk factors of axial elongation in young adults with nonpathologic high myopia and explore the potential protective effects of antiglaucoma medications. In this prospective, clinical observational cohort study with a 2- to 4-year follow-up, 563 young adults (ages 18-50) with nonpathologic high myopia (≥ 26mm axial length) were included, totaling 1,043 eyes. Annual axial elongation was measured using linear mixed-effect models, risk factors were identified through ordinal logistic regression analysis, generalized estimate equations eliminated interocular correlation bias, and antiglaucoma medication use was analyzed for potential protective effects. The mean axial elongation was 0.03 mm/year over a mean follow-up of 30.23 months, with 11.7% of eyes showing severe elongation (>0.1 mm/year). Risk factors for axial elongation included baseline axial length ≥ 28 mm, younger age (<40 years), axial asymmetry (IOD ≥ 1 mm between eyes), and female sex. Use of prostaglandin analogues and fixed combination therapy slowed axial elongation by 75% (P <.001). This study, with its strengths in its large nonpathologic myopia cohort and longitudinal follow-up, provides valuable insights into axial elongation patterns and risk factors. Despite limitations such as the relatively short follow-up and small sample of antiglaucoma medication users, it highlights the importance of regular monitoring in young adults with high myopia, especially those with risk factors. The findings suggest that antiglaucoma medications, particularly prostaglandin analogues, may offer a promising intervention for slowing axial elongation and mitigating myopia progression, warranting further investigation. This study advocates for a paradigm shift toward early intervention in nonpathologic high myopia to prevent future visual impairment.

Omega-3 Polyunsaturated Fatty Acids as a Protective Factor for Myopia
Xue CC, Li H, Dong XX, et al
Am J Ophthalmol 2024;268:368-377
This study aimed to determine the causal relationship between omega-3 polyunsaturated fatty acids (PUFAs) and myopia using Mendelian randomization (MR) analysis, a genetic approach that mimics randomized controlled trials, to strengthen causal inference. The two-sample MR analysis utilized genome-wide association study (GWAS) summary data from the UK Biobank, the Genetic Epidemiology Research on Adult Health and Aging (GERA) cohort, and the Consortium for Refractive Error and Myopia (CREAM) Study. Genetically predicted plasma levels of 18 fatty acid (FA)-related traits were used as exposure variables, with spherical equivalent refraction (SER), axial length (AL), and choroidal thickness as outcome measures. Five MR models evaluated causality, with statistical significance determined using Bonferroni correction. Results showed that higher levels of omega-3 PUFAs, docosahexaenoic acid (DHA), the DHA–total FA ratio, the PUFA–total FA ratio, and degree of unsaturation were significantly associated with more positive SER (lower myopia risk) and shorter AL. Higher omega-3 and

DHA levels were also nominally associated with thicker choroidal thickness, supporting the hypothesis of a protective effect through improved choroidal blood perfusion. Conversely, higher omega-6/omega-3 ratio and monounsaturated FA (MUFA)–total FA ratio were associated with a higher risk of myopia. This study, with its strengths in objective measurement of fatty acid levels, multiple myopia measurements, and robust statistical approach, provides strong genetic evidence for the protective role of omega-3 PUFAs, particularly DHA, in myopia prevention. Despite limitations such as sample overlap and limited generalizability, the findings support nutritional interventions as a potential strategy to slow myopia progression. Further randomized controlled trials are needed to determine the optimal dose and effectiveness of omega-3 supplementation in human populations. This research highlights the potential of dietary strategies for myopia management and encourages further clinical trials to explore their efficacy.

Myopia Control Effect of Repeated Low-Level Red-Light Therapy Combined with Orthokeratology: A Multicenter Randomized Controlled Trial
Xiong R, Wang W, Tang X, et al
Ophthalmology 2024;131(11):1304-1313
The authors conducted a 12 month multicenter, parallel group, single blinded RCT examining the combination of RLRL and orthokeratology. The groups consisted of patients given orthokeratology lenses along with RLRL or orthokeratology alone. The primary outcome was to study AL change at 12 months compared to baseline. Secondary outcomes included changes in other biometric parameters (CCT, AD, lens thickness, VA and IOP). The goal was to look for change in macular choroidal thickness at 12 months relative to baseline. Results showed that the orthokeratology+ RLRL group suggested an efficacy of combining the two that became increasingly apparent over time relative to orthokeratology alone. The secondary outcomes were similar in both groups. With respect to choroidal thickening, the orthoK + RLRL group showed increasing macular thickness. The results overall showed a slowing of axial elongation by 0.29mm in the combined group vs orthoK alone and suggest that RLRL could augment the efficacy of orthoK However the sample size was small. The authors suggest that for patients who have axial elongation of greater than 0.50mm over 1 year with orthoK alone, RLRL might be a useful adjunct therapy.

Repeated Low-Level Red Light Therapy for Myopia Control in High Myopia Children and Adolescents: A Randomized Clinical Trial
Xu Y, Cui L, Kong M, et al
Ophthalmology 2024;131(11):1314-1323
This was a prospective, single-blinded, parallel-group, multicenter, randomized clinical trial assessing the use of RLRL in patients with high myopia. The authors cite prior studies looking at myopia in children with -1 to -5 diopters. The current study criteria looked at patients between the ages of 6-16 with myopia of greater than or equal to -4 in at least 1 eye, astigmatism of less than 2D, anisometropia less than 3 D and BCVA of log >0.2. The primary outcome was the change in axial length measured at baseline and 12 month follow up. Secondary outcomes looked at change in cycloplegic SER. The study also assessed CCT, ACD and lens thickness. The device was given to patients and they logged in with a unique username and password used to monitor compliance and were exposed to 3 minutes of RLRL

twice a day separated by at least 4 hours. After 12 months the mean change in axial length was -0.06mm in the treatment group vs 0.34mm in the control group. The mean SER change was 0.11 D and -0.75 D in the two groups respectively. The authors concluded that RLRL demonstrates strong efficacy in patients with high myopia and that 53.3% experienced axial shortening. This is important as the LAMP and ATOM studies did not look at patients with high myopia. The study has some limitations including that it was only a 1 year study and long term effects have not yet been conducted to validate the results.

Role of lens in early refractive development: evidence from a large cohort of Chinese children
Han X, Xiong R, Jin L, et al
Br J Ophthalmol 2024;108(12):1627-1633
The process of emmetropization from neonatal hyperopia to emmetropia during childhood involves a complex interaction between different components of the eye, and researchers are investigating this process more in depth in the setting of the myopia pandemic. There is speculation that the lens may act as a balance weight to compensate for the myopic shifts associated with axial elongation, resembling an active control underlying emmetropization. And myopia, from this perspective, represents a failure of the lens to compensate for axial elongation. Therefore, this study aimed to assess the longitudinal changes in refraction and related biometric factors in a large cohort of Chinese children aged 3-13 years using the Zengcheng School myopia study (ZOOM). 5826 children were included in the setting of multiple exclusion criteria. As expected, the oldest age group showed significantly more myopic SER, longer AL, cylinder power (CP) and lens power (LP). The 3-year-old and 4-year-old age groups demonstrated an inflection point in longitudinal SER changes at a mild hyperopic baseline SER (+1 - +2 D), with children with more myopic SER showing hyperopic refractive shifts while those with more hyperopic SER showing myopic shifts. The hyperopic shift in SER was mainly attributed to rapid LP loss and was rarely seen in the older age groups. Axial elongation accelerated in the premyopia stage, accompanied by a partially counter-balancing acceleration of LP loss. For children aged 3–7 years, those with annual SER changes <0.25 D were all mildly hyperopic at baseline. These data supported the theory of of a pushback process in which increased in the rate of LP occur in parallel with increases in axial elongation. The authors propose that the crucial time for myopia prevention is from a hyperopic reserve to premyopia, rather than from emmetropia to myopia.

Axial Growth and Myopia Progression After Discontinuing Soft Multifocal Contact Lens Wear
Berntsen DA, Ticak A, Orr DJ, et al
JAMA Ophthalmol Published online January 16, 2025
Myopia is projected to affect 54% of the population by 2050. The Bifocal Lenses in Nearsighted Kids (BLINK) Study was a 3-year multicenter, randomized, double-masked clinical trial that found that center-distance soft multifocal contact lenses with a high add (+2.50 D) slowed axial elongation by -0.23 mm and myopia progression by 0.46 D compared to single-vision contact lenses. The purpose of this study was to determine whether there was loss of treatment effect and greater than age-expected eye growth or myopia progression (rebound) after discontinuing multifocal soft contact lens wear. In the BLINK2 study, participants from the original BLINK study wore +2.50 D-add center-distance multifocal contact lenses for 2 years and then daily

disposable single-vision contact lenses for the final year. 235 children with myopia (median age 15 years) completed the BLINK2 study after a mean follow-up of 2.9 years. After switching from multifocal to single-vision contact lenses, axial elongation increased by 0.03 mm per year and the rate of myopia progression increased by -0.17 D/y. Axial elongation (P<0.001) and myopia progression (P<0.001) both depended on participant age at the BLINK2 study baseline visit. The overall rate of axial elongation and myopia progression after switching to single-vision lenses returned to age-expected rates for nontreated myopic eyes. Though there was no rebound effect noted, children in the study were a mean of 17 years old at the time of multifocal discontinuation, and we don't know if this result would remain the same if discontinuing multifocal wear at a younger age. This study was also limited in that there was not a single-vision control group. Overall, this study showed that discontinuing multifocal contact lenses in the late teenage years did not lead to a loss of treatment effect.

Novel Lenslet-ARray-Integrated Spectacle Lenses for Myopia Control: A 1-Year Randomized, Double-Masked, Controlled Trial
Su B, Cho P, Vincent SJ, et al
Ophthalmology 2024;131(12):1389-1397
This is a randomized, controlled clinical trial investigating the myopia control efficacy of novel Lenslet-ARray-Integrated (LARI) spectacle lenses with positive power lenslets (PLARI) and negative power lenslets (NLARI) worn for 1 year in myopic children. Participants included a total of 236 children 6 to 12 years of age with spherical equivalent refraction (SER) between -4.00 and -1.00 diopters (D), astigmatism of 1.50 D, and anisometropia of 1.00 D. They were assigned randomly in a 1:1:1 ratio to PLARI, NLARI, and control (single-vision [SV]) groups. Cycloplegic autorefraction and axial length were measured at baseline and 6-month intervals after lens wear. Lenslet-ARray-Integrated (LARI) spectacle lenses included 2 designs: LARI lens with lenslets of +3.00 D additional power (PLARI) and LARI lens with lenslets of -3.00 D additional power (NLARI). Both designs provide the wearer with a clear central visual field and produce similar image blur on the retina corresponding to the lenslet array zone. No significant differences were observed in the changes in spherical equivalent between PLARI and NLARI groups at the 6-month and 12-month follow-up. Compared with the SV group, participants wearing PLARI and NLARI lenses showed significantly less myopia progression by 55% and 68%, respectively, over 1 year based on the change in spherical equivalent. The axial length elongation for the PLARI and NLARI groups were both significantly less than the SV group at 12-months. Compared with SV lenses, the PLARI and NLARI design lenses slowed AE by 44% and 50%, respectively, in 1 year. Participants wearing PLARI lenses showed a slower increase by 0.36 D (55%) and 0.15 mm (44%), respectively, and those wearing NLARI lenses showing a slower increase by 0.45 D (68%) and 0.17 mm (50%), respectively. No significant differences were found in the annual average SER increase or AE between the PLARI and the NLARI groups. Limitations of this study include the short follow-up time, and longer-term data are needed to show an if these lenses are effective throughout childhood. Also, this study was only conducted on Chinese children, so the results may not be generalizable. Although this study provides data on another option for myopia control, it's difficult to say if widespread use of these very specialized lenses is a practical option for the future.

Efficacy and Safety of Different Atropine Regimens for the Treatment of Myopia in Children: Three-Year Results of the MOSAIC Randomized Clinical Trial
Loughman J, Lingham G, Nkansah EK, Kobia-Acquah E, Flitcroft DI
JAMA Ophthalmol Published online January 9, 2025
The prevalence and severity of myopia is increasing. Atropine drops have been sown in some clinical trials to slow myopia progression in a dose-dependent manner; however, use of higher concentrations may cause side effects. This study (MOSAIC2) was a secondary analysis of the 3-year results of the MOSAIC (Myopia Outcome Study of Atropine in Children) study, a double-masked randomized clinical trial of different atropine concentrations and regimens. The purpose of MOSAIC2 was to explore the change in myopia progression after ceasing 0.01% atropine drops or reducing its frequency in a tapering regimen and evaluate the safety and efficacy of 0.05% atropine eye drops in a European population. In the original MOSAIC trial, 250 children ages 6 to 16 with myopia were randomly assigned to either 0.01% atropine drops nightly or placebo drops nightly for 24 months. In MOSAIC 2 (3rd year of the trial), children were assigned to 2 groups: 1. Placebo nightly for 2 years followed by 0.05% atropine eye drops for 1 year (placebo then 0.05% atropine group) 2. 0.01% atropine nightly for 2 years and then randomly assigned to placebo nightly for 1 year (atropine then nightly placebo group), taper placebo (atropine then tapering placebo), or tapering 0.01% atropine eye drops (0.01% atropine then tapering 0.01% atropine) for 1 year. For analysis the atropine then nightly placebo group and atropine then tapering placebo group were combined. 199 children with myopia (average age 13.9 years, 60.8% female, 83.4% White) were included in the analysis. From the 24 month to 36 month visit, the atropine then placebo group had more spherical equivalent (adjusted difference -0.13D, P=0.01) and axial length progression (adjusted difference 0.06 mm, P=0.008) compared to the placebo then 0.05% atropine group. The atropine then tapering 0.01% atropine group had more axial eye growth compared with the placebo then 0.05% atropine group (adjusted difference 0.04 mm, P= 0.04). Pupil diameter increased in the placebo then 0.05% atropine group. In the placebo then 0.05% atropine group, 15% reported blurred near vision and 8% reported photophobia during year 3 compared with 3% and 0% respectively in the group taking atropine and then tapering 0.01% atropine and no reports in both placebo groups. Despite adverse events, no one stopped treatment. 5% of children in the 0.05% atropine group required varifocal lenses. Myopia progression in the atropine then placebo group did not increase and was consistent with an age-related slowing (no rebound effect). This study is limited due to the older age of participants, smaller sample sizes across treatment arms in year 3, and lack of an untreated control group.

Natural Course of Refractive Error in Congenital Stationary Night Blindness: Implications for Myopia Treatment
Poels MMF, de Wit GC, Bijveld MMC, van Genderen MM
Invest Ophthalmol Vis Sci 2024;65(14):9
The Schubert-Bornschein type of congenital stational night blindness (CSNB) is an IRD caused by defective signal transmission between photoreceptors and bipolar cells. Most patients with CSNB1 (“complete” CSNB) and CSNB2 (“incomplete" CSNB) are myopic, with patients with CSNB1 typically having more severe myopia than those with CSNB2. The purpose of this retrospective study was to investigate the natural course of refractive error throughout childhood

in patients with CSNB. Participants had no history of any myopia control treatment. 295 refraction measurements were obtained in 127 patients with CSNB (48 CSNB1 and 79 CSNB2) at various ages between 0 and 21 years. This study found that most of the myopization in patients with CSNB occurs in the first years of life and after the age of 4 years myopization is relatively minor. After the age of 4 years, there was minimal progression of only -0.12 D per year up to 15 years after which the refraction remained stable. This study is limited in that it relied on retrospective data and other risk factors for myopia were not included. Most refraction data were also obtained from prescriptions of current glasses (65%) which might not accurately represent a patient's current refractive state. While moderate to high myopia without an underlying IRD typically presents between the ages of 6 and 12 years and tend to progress until the late teenage years, this study showed that the natural course of myopia progression in children with CSNB is significantly different with minimal progression after the age of 4 years.

Association between hyperglycemia during pregnancy and offspring's refractive error: A focused review
Guo Y, Lu J, Zhu L, Hao X, Huang K
Eur J Ophthalmol 2025;35(1):60-68
This study aimed to evaluate the relationship between maternal hyperglycemia during pregnancy and visual development in offspring. Researchers searched PubMed, EMBASE, Wanfang, and CNKI for relevant studies, ultimately identifying and reviewing nine articles that met their criteria. The review suggests a correlation between maternal hyperglycemia and refractive error in offspring, but it does not specify whether the refractive error was visually significant. Additionally, the study misidentifies peripapillary atrophy as optic nerve hypoplasia, invalidating their description of a cited article. The study fails to demonstrate a clear correlation between gestational hyperglycemia and visual maldevelopment in offspring. The authors do not appear to differentiate refractive errors from poor visual development and lack a clear definition of high refractive error. Despite these limitations, the study raises questions about the potential link between gestational diabetes and refractive error in offspring. It suggests that physicians should inquire about maternal gestational diabetes when encountering patients with high refractive error.

Choriocapillaris flow features in children with myopic anisometropia
Jiang Z, Bo W, Yang Z, Luo X, Ni Y, Zeng J
Br J Ophthalmol 2024;108(11):1578-1582
It is known that myopia development is closely related to the choroid. Therefore the authors sought to investigate differences in choriocapillaris blood flow parameters in patients with myopic anisometropia by conducting pairing studies between the two eyes. 46 children with myopic anisometropia underwent complete eye exams and OCTA imaging with mean age 10.5 years and anisometropic mean difference of –1.23D. There were no significant differences in the percentage of flow voids and the average flow void area of the choriocapillaris layer in all detected regions between pair eyes of the same patient. The choroidal thickness in the central fovea was significantly less in the more myopic eyes than in the less myopic eyes; however, macular retinal thickness was not significantly different between the eyes of the same patient. No significant correlation was found between changes in SER and AL and other flow voids

except for the total number of flow voids in the choriocapillaris layer at the nasal side of the macular region. One limitation is the relatively small amount of anisometropia in the subjects. The authors postulate that the decrease in flow voids in the nasal macula may be an early event during myopia development, but at this point more research is needed to determine if this is clinically relevant.

Shaping school for childhood myopia: the association between floor area ratio of school environment and myopia in China
Zeng D, Yang Y, Tang Y, et al
Br J Ophthalmol 2024;109(1):146-151
Previous studies have reported that the prevalence of myopia in schoolchildren is increasing with urban environment. Floor area ratio (FAR) serves as a comprehensive indicator for urban morphology. This longitudinal cohort study has investigated the association between FAR and myopia incidence in children from 108 primary schools in Shenzhen, China, offering innovative population-scale myopia prevention from a perspective of school planning and reconstruction. 136,753 children grades 1-4 were recruited to participate and followed for 2 years. About a quarter (26%) of the initially non-myopic children developed myopia in the 2 year study period. Adjusting for demographic, socioeconomic, and greenness factors, and increase in FAR was associated with a decreased risk of 2year myopia incidence (OR=0.9) and similar findings were noted in the analysis adjusted for genetic and behavioral factors. An increase in FAR at the school level was found to be associated with a 2% reduction in myopia incidence. While the clinical relevance of this is unclear, it does provide another component to addressing myopia control in urban environments.

Refractive Surgery

Social and Quality-of-Life Impact of Refractive Surgery in Children With Developmental Disorders and Spectacle Nonadherence
Strelnikov J, Zdonczyk A, Pruett JR Jr, et al
Am J Ophthalmol 2025;269:20-29

This study evaluated whether refractive surgery could improve social functioning and vision-specific quality-of-life (VSQOL) in children with autism spectrum disorder (ASD) and/or intellectual disability (ID) who struggle to tolerate traditional vision correction. In this prospective, before-and-after case series at a single academic tertiary care center, 18 children (ages 3–18) with ASD and/or ID, significant ametropia, and spectacle nonadherence underwent refractive surgery, including photorefractive keratectomy (PRK), phakic intraocular lens (PIOL) implantation, or clear lens exchange (CLE). Social functioning was assessed using the Social Responsiveness Scale, 2nd Edition (SRS-2), and VSQOL was measured with the Pediatric Eye Questionnaire (PedEyeQ), both at baseline and at 1, 6, and 12 months post-surgery. Results showed statistically significant improvements in social awareness and motivation (+8 points and +7 points, respectively, P =.03) on the SRS-2, with clinically meaningful improvements in total SRS-2 scores for 56% of participants. The PedEyeQ revealed significant improvements in functional vision (+40 points, P =.02), bothered by eyes/vision (+23 points, P =.02), and parental worry (+28 points, P =.04). Refractively, 72% of treated eyes achieved the surgical goal, and 44% showed visual acuity improvement of two or more Snellen lines. This study, as the first to prospectively measure the social impact of refractive surgery in this population, demonstrates potential developmental benefits beyond visual correction. Despite limitations such as the small sample size and lack of a control group, it highlights refractive surgery as a viable option for children with ASD/ID and spectacle intolerance. The observed improvements in social awareness and motivation suggest that better vision may enhance social interactions in this population, emphasizing the importance of tailored ophthalmologic care in neurodevelopmental disorders. Future research with larger, controlled trials is needed to confirm these benefits and justify broader clinical application.

Retina

Ocular Effects of Prenatal Carotenoid Supplementation in the Mother and Her Child: The Lutein and Zeaxanthin in Pregnancy (L-ZIP) Randomized Trial - Report Number 2
Addo EK, Gorka JE, Allman SJ, et al
Ophthalmol Sci 2024;4(5):100537
Xanthophyl carotenoids including lutein, zeazanthin (Z), and meso-Z, referred to as macular pigment (MP) are known to play a protective role in the macula and begin to accumulate in a developing baby's retina and neural tissues even before birth, but the possible role of supplementation of these nutrients during pregnancy to mitigate possible maternal depletion has not been well-studied to date. This prospective randomized trial with 47 subjects evaluated the role of carotenoid supplementation (Lutein and Zeaxanthin) during pregnancy. Levels of maternal macular, skin, and serum carotenoid were measured using autofluorescence, resonance Raman spectroscopy, and liquid chromatography in a maternal Carotenoid supplementation group who received AREDS2 level L and Z supplementation compared to a placebo control group. Infantile ocular carotenoids and retinal architecture were measured by blue light reflectance and SD-OCT. Changes in MP were evaluated at four time points throughout the study: enrollment, trimester 2, trimester 3, and within 2 weeks post-partum. At all time-points, there was found to be a statistically significant increase in maternal MP in the carotenoid supplementation group compared to placebo. There was also a statistically significant increase in levels of skin and serum carotenoid levels in the treatment group infants who also showed trends toward higher levels of MP optical density (20% increase, p=0.242) and more mature foveal parameters, although these two endpoints did not reach statistical significance. The main limitation of this trial was that the population was primarily White and at baseline had good dietary supplementation with appropriate carotenoids, so there was no deficiency in the carotenoid levels of the Control group. As a Phase 2 trial, L-ZIP showed safe use of AREDS2 dosing in this population and was shown to improve maternal ocular status as well as maternal and infant carotenoid levels throughout pregnancy and provides groundwork for future multicenter studies in populations at higher risk for carotenoid depletion and subsequent side-effects.

Risk Factors for Retinal Detachment in Marfan Syndrome After Pediatric Lens Removal
Abdelmassih Y, Lecoge R, El Hassani M, et al
Am J Ophthalmol 2024;266:190-195
This study aimed to identify risk factors associated with retinal detachment (RD) after lens removal surgery in children with Marfan syndrome (MS). This retrospective, case-control study utilized an institutional case series from the Rothschild Foundation Hospital (Paris), encompassing surgeries performed between 2010 and 2020, with data on 85 children (<18 years) diagnosed with MS who underwent lens removal surgery. Variables assessed included age, axial length (AL), intraocular lens (IOL) implantation, capsular residue, follow-up duration, number of surgeries, and final best-corrected visual acuity (BCVA), with the primary outcome being the occurrence of RD. Statistical methods included univariate and multivariate analyses, Kaplan–Meier survival analysis, and logistic regression. Results showed an RD incidence of 22.2% (35 eyes), with bilateral RD occurring in 45.8% of these cases. The median time to RD was 7.2 years post-surgery, with 82.6% of cases developing RD more than 6 months

post-operatively. Significant risk factors for RD included longer AL (OR = 1.3, P =.03) and capsular residue, which was the strongest predictor (OR = 16.8, P =.01). While IOL implantation was associated with RD in univariate analysis, this association was not significant in the multivariate analysis. Survival analysis showed an increased risk of RD from 8% at 5 years to 15% at 10 years. Despite limitations such as its retrospective design and potential biases, this study, with its strengths in cohort size, long follow-up duration, and rigorous statistical analysis, provides crucial insights into RD risk factors in pediatric MS patients after lens removal surgery. It emphasizes complete capsular removal during surgery and heightened surveillance for patients with increased AL, bilateral RD risk, and the necessity of lifelong follow-up for early detection and management of RD.

Paediatric staphyloma classification: new perspectives via ultrawide field three-dimensional swept-source optical coherence tomographic angiography
Sun L, Hou A, Zheng S, Zhang L, Qin L, Ding X
Br J Ophthalmol 2024;109(1):133-138
The authors sought to characterize the population, morphology, presence and disease correlation of pediatric staphyloma (PS) in pediatric patients and to propose a novel classification for this condition using innovative mulitmodal imaging: ultrawidefield 3D swept-source OCTA (UWF 3D SS-OCTA). 69 children with PS (106 eyes, 32 unilateral and 37 bilateral staphylomas), mean age 8 years were evaluated. They report 2 previously unreported types of staphylomas identified in this study: temporal staphyloma (24% of cases) and inferior temporal staphyloma.93% of those with temporal staphylomas were diagnosed with FEVR. Over half of the patients fit into previously recognized categories, but this new method of imaging allows for further study of the various types, some of which can be linked to peripheral vascular diseases. Because of this, they proposed 5 unique classifications.

Preventable vision loss in children with Coats disease
Altamirano F, Gonzalez E, Shah AS, Oke I
J AAPOS 2024;28(5):104000
Vision loss in Coats disease is often attributed to structural damage, but refractive amblyopia—if undiagnosed and untreated—may contribute to irreversible vision loss. This study aims to determine the prevalence of amblyogenic refractive error and its associated factors in children with Coats disease. This was a retrospective chart review of that included 50 children with unilateral Coats disease, the majority of whom had macular abnormalities. Amblyogenic refractive error was present in 46% of the evaluated patients. Only 14% of patients with suspected refractive amblyopia received treatment with glasses and patching; 40% of treated cases showed visual improvement. Younger age at diagnosis was significantly associated with amblyogenic refractive error. Strengths of this study were the relatively large cohort studied and the focus on an understudied aspect of Coats disease. The study's limitations include its retrospective design, potential selection bias, and difficulty distinguishing the impact of amblyopia from structural retinal damage. This study highlights the importance of routine refractive error assessment in children with Coats disease and emphasizes the key role that pediatric ophthalmologists play in managing patients with Coats disease in conjunction with the retina team.

Characteristics, associations, and outcomes of children with posterior segment coloboma
Altamirano F, Hoyek S, Savant SV, et al
J AAPOS 2024;28(5):104005
Ocular colobomas are embryonic defects caused by incomplete closure of the ectodermal optic vesicle that can affect the choroid, retina, and/or optic nerve. Posterior segment colobomas (PSC) can cause significant visual impairment and retinal detachment (RD), with affected retinal tissue being thin and prone to breaks. Surgical treatment is challenging and often results in suboptimal visual outcomes. This study aimed to describe the characteristics and factors influencing the outcomes of pediatric PSC cases. This is a retrospective of 343 patients (501 eyes) with PSC. The study identified that large PSCs (types 1-3, according to the Ida Mann classification) had worse visual outcomes compared to smaller PSCs (types 4-7). RD occurred in 5% of eyes, with a higher prevalence in children with CHARGE syndrome and myopia. The study found that CHARGE syndrome was a significant predictor for large or bilateral colobomas, with affected children at higher risk of RD and worse visual outcomes. Strengths of the study include the large sample size and long follow-up period. Limitations include the retrospective design, incomplete records, and challenges in assessing visual acuity in children with developmental delays. The study highlights the importance of early intervention and close follow-up, particularly for children with large or bilateral PSC, to minimize visual impairment. It also emphasizes the need for systemic evaluations, as 60% of children had systemic abnormalities.

Optical Coherence Tomography Angiography Evaluation of Retinal and Choroidal Microvascular Morphological Changes Following Strabismus Surgery
Gül C, Erşan HBA, Karapapak M, Güven D
J Pediatr Ophthalmol Strabismus 2024;61(6):397-403
During strabismus surgery, the anterior ciliary vessels, which supply much of the blood flow to the anterior segment of the eye, are often cut or ablated. As such, strabismus surgery can alter the vascular supply to the eye, and knowing exactly how, and how much, it affects this is important in planning successful surgeries. In this article, the authors use OCT-A to evaluate changes to posterior segment vasculature – retina and choroid – following strabismus surgery to assess its impact on this area of the eye. The study examined 44 eyes of 44 patients undergoing horizontal one-muscle surgery, horizontal two-muscle surgery, or inferior oblique muscle anteriorization surgery. OCT-A of the posterior pole was performed pre-operatively, then at 1 day, 1 week, 1 month, and 3 months postoperatively in each surgical eye. Compared to pre-operative measurements, there was no change in the size of the foveal avascular zone following surgery. Interestingly, in horizontal two-muscle and inferior oblique muscle anteriorization surgeries, outer retinal blood flow values were higher at 1 day postoperatively than at all other time points; in all surgery types, choriocapillaris blood flow values were higher at 1 day and 1 month postoperatively compared to the preoperative period. Vessel density in both the deep and superficial capillary plexuses was lower at 1 day post-operatively compared to 1 month post-operatively. The authors suggest that the transient increases in outer retinal and choriocapillaris blood flow in the early postoperative period is most likely secondary to inflammation, while the changes in vessel density may be attributable to temporary changes in

local vascular hemodynamics. Regardless of the explanation, it seems likely that there are vascular changes in the posterior pole follow strabismus surgery; however, they appear to be largely transient. As imaging modalities continue to improve, more light will be shed on the structural effects and consequences of these operations.

Gunn Dots In Children Aged 11-12 Years From The General Community Sample Copenhagen Child Cohort 2000 Study
Boberg-Ans LC, Munch IC, Olsen EM, Skovgaard AM, Larsen M
Retina 2024;44(11):1961-1965
Healthy children and young adults often have visible small white dots on the retinal surface, especially where the RNFL is thickest along the superotemporal and inferotemporal rim of the optic disc. Gunn dots have an oval or polygonal shape and appear in a somewhat regular pattern. This study used red free images obtained from 761 healthy children as a part of the Copenhagen Child Cohort Study. Gunn dots were found in 716 of the 761 participants (94%). The majority of dots were located both inferior and superior to the optic disk, situated within a distance of 3 mm from its center. The median number of Gunn dots was 64 in right eyes and 68 in left eyes. Having more than the median number of Gunn dots in the right eye was associated with older age, within the limited age range of one year, and was less common among the children with a thinner retinal nerve fiber layer. The clinical significance of Gunn dots is uncertain but their location at the vitreoretinal interface makes them a parameter of interest to study in the future, although there are currently no clinical applications.

Inherited retinal dystrophies and orphan designations in the European Union
Moseley J, Leest T, Larsson K, Magrelli A, Stoyanova-Beninska V
European Journal of Ophthalmology 2024;34(6):1631-1641
Based on a review of IRD (Inherited Retinal Dystrophy) Orphan Designations (OD) experience of in the European Union (EU), a review of scientific literature and clinical practice on IRD groupings, and input from patients and clinical experts, EU regulators made recommendations to guide the choice of grouping for IRD conditions in the context of an EU OD. The authors assert that the new designations provide a robust yet flexible framework for orphan designations in the complex field of the genetic spectrum underlying inherited retinal dystrophies. By discarding the more rigid and somewhat outdated phenotypically derived classification scheme traditionally used for IRD conditions, the newly suggested classification system allows for orphan designations adapted to the clinical state-of-the-art of the treatment under discussion. Hence, this newly adopted ontology will make it easier for future innovative treatments, such as gene-therapies, to be awarded the status of orphan drug and hence receive the accordant benefits meant to facilitate medicine development and future commercialization.

Optical coherence tomography (OCT) and OCT-angiography in syndromic versus non-syndromic USH2A-associated retinopathy
Antropoli A, Arrigo A, Caprara C, et al
Eur J Ophthalmol 2025;35(1):106-111
Retinitis pigmentosa (RP) encompasses a group of genetic diseases causing rod and cone degeneration. Usher Syndrome type 2, a syndromic form of RP, involves a mutation affecting

ciliary function. While previous studies have identified vascular defects and reduced subfoveal choroidal thickness in RP, there is limited research comparing OCT and OCTA findings between syndromic and non-syndromic RP. This cross-sectional, multi-center study compared OCT and OCTA scans in patients with RP and Usher Syndrome type 2 associated with USH2A mutations to determine if the phenotype influences the severity of anatomical and microvascular changes. The study compared 13 patients with Usher Syndrome type 2 to 5 patients with non-syndromic RP. Syndromic patients were younger and had worse visual acuity than those with exclusively retinal phenotypes. Although not statistically significant, Usher Syndrome type 2 patients showed a higher prevalence of cystoid macular edema (CME) and thicker choroids compared to non-syndromic RP patients. No other significant differences were found in OCT and OCTA parameters between the groups. This study provides novel information about OCT and OCTA findings in patients with USH2A-associated retinopathy. However, it is limited by its cross-sectional design and small sample size. Despite these limitations, this study offers valuable insights into the structural and vascular changes in patients with USH2A-associated retinopathy, which can inform future clinical practice and research.

Short-term effects of sunlight exposure on fundus blood flow perfusion in children: a randomised controlled trial
Zhao L, Zhang B, Wang J, et al
Br J Ophthalmol 2024;109(1):139-145
This was a parallel RCT aimed to evaluate the short term effect of different sunlight exposure on fundus blood flow perfusion (BFP) after near work. 81 students aged 7-15 with spherical equivalent refraction between -2.00 and +3.00D were randomly assigned to either a low-illuminance (4k lux) group (N=40) or high-illuminance group (10k lux) (N=41). Following 1 hour of indoor reading, participants had sunlight exposure matching their group's intensity for 15 minutes. BFPs in the superficial retina, deep retina and choroid were measured at four time points: pre-reading, post-reading, 5th-minute and 15th-minute sunlight exposure. Within the initial 5 minutes of sunlight exposure, the 10k lux group showed a tendency for decreased BFP, particularly in the choroid, while the 4k lux group exhibited an increase. From 5 to 15 minutes, BFP decreased in both groups. No significant difference was observed after 15 minutes of exposure. Using these results, the authors suggest that to prevent myopia, continuous sunlight exposure for over 15 minutes is recommended to aid in reinstating the fundus BFP increased by near work.

Effects of Physical Activity and Inactivity on Microvasculature in Children: The Hong Kong Children Eye Study
Zhang XJ, Yuen VL, Zhang Y, et al
Invest Ophthalmol Vis Sci 2024;65(14):7
Physical activity and inactivity and other cardiovascular risk factors have been shown to affect the microvasculature in the retina. Therefore, the retinal vasculature has been suggested as a biomarker of cardiovascular health for predicting the risk of cardiovascular diseases. Previous studies in adults have shown that increased physical activity is associated with narrower retinal venular caliber, but there are few studies in children. The purpose of this study was to investigate the effects of physical activity and inactivity on the retinal vasculature in children.

11,959 children aged 6 to 8 years (mean 7.55 years, 52.22% boys) from the Hong Kong Children Eye Study, a population-based cross-sectional study, were included. Fundus photographs were obtained, and a newly developed and validated artificial intelligence Deep Learning System was used to measure retinal arteriolar and venular caliber. The mean central retinal vein equivalent (CRVE), a summary index reflecting the average width of retinal venules, was 215.7 m. The mean central retinal artery equivalent (CRAE), a summary index reflecting the average width of retinal arterioles, was 151.6 m. Children with increased ratio of physical activity to inactivity had wider CRAE (P= 0.007) and narrower CRVE (P<0.001). In the subgroup analysis of boys, increased ratio of physical activity to inactivity was associated with wider CRAE and narrower CRVE but in girls only narrower CRVE. This study was limited in that it was a cross-sectional design, relied on questionnaires, and didn't account for changes in physical activity and inactivity over time or other confounding factors. Overall, this study showed that increased activity in children was associated with a healthier microvasculature in the retina.

Peripapillary Hyperreflective Ovoid Mass-Like Structures in Stickler Syndrome
Khatib TZ, Safi A, Nixon TRW, et al
Ophthalmol Retina 2024;8(10):1013-1020
Peripapillary hyperreflective ovoid mass-like structures (PHOMS) are a non-specific OCT finding seen in a variety of optic nerve disorders. They result in nerve fiber displacement and herniation in the peripapillary region, resulting in hyperreflective oval structures above Bruch's membrane on OCT. Stickler syndrome is a genetic condition resulting from collagen mutations. In this observational study, 22 eyes with anomalous discs from 11 individuals with genetically confirmed Stickler syndrome type 1 and type 2 were included. Enhanced depth-imaging OCT and fundus examination were used to identify PHOMS. PHOMS were identified in 20 of 22 eyes. It is unclear the exact pathogenesis and impact of PHOMS, but the combination of congenital myopia and oblique insertion of the optic nerve may cause axoplasmic stasis and formation of PHOMS. The prognostic or therapeutic implications of PHOMS are uncertain.

Ultrawidefield Fluorescein Angiography and OCT Findings in Children and Young Adults with Autosomal Dominant Neovascular Inflammatory Vitreoretinopathy
Ebert JJ, Maccora I, Sapp CC, et al
Ophthalmol Retina 2024;8(11):1107-1112
Autosomal dominant neovascular inflammatory vitreoretinopathy (ADNIV) is a rare hereditary vitreoretinopathy characterized by inflammation, neovascularization, and retinal degeneration, often leading to severe vision loss and blindness. The study reviewed a series of children and young adults with ADNIV from a single family. The mean age at presentation was 14 years. Average visual acuity at presentation was 20/33. OCT demonstrated macular edema in 8 of 20 eyes and symptomatic vitreoretinal interface disease in 2 of 20 eyes. Ultrawidefield FA demonstrated retinal vascular leakage (20/20 eyes, 100%), peripheral nonperfusion (13/20 eyes, 65%), and retinal neovascularization (6/20 eyes, 30%). Retinal vascular leakage improved with local corticosteroids, and neovascularization regressed with anti-VEGF therapy. Ultrawidefield FA may be helpful in monitoring response to treatment in this rare disease, although given the homogenous group from a single family may lack generalizability.

Assessment of the effects of two commonly used mydriatics on the macular and peripapillary microvascular systems of healthy children: An Optical Coherence Tomography Angiography Study
Seyyar SA, Soysal GG, Balyemez B
Retina Published online August 5, 2024
Tropicamide and phenylephrine are the most commonly used agents for pupil dilation, which is crucial in a comprehensive eye exam. The aim of this study was to evaluate possible changes in vascular parameters measured by OCTA in the eyes of healthy children after application of mydriatic agents. This prospective study enrolled the right eye of healthy children with no known systemic or ocular disease. Baseline OCTA was obtained prior to dilation. The children were randomized into either the tropicamide or phenylephrine groups, which were given three times at 5-minute intervals. Thirty minutes after the final application of mydriatic agent, a second OCTA was obtained on the right eye of all subjects. A total of 62 children with ages between 5 and 16 were included. 33 received tropicamide and 29 received phenylephrine. The two mydriatics caused a decrease in mean radial peripapillary capillary density and superior radial peripapillary density. Interestingly, this was deemed to be secondary to the pupillary dilation rather than the effect of either of the medications. There were no statistically significant differences in any of the measured parameters between phenylephrine and tropicamide. Overall, this study highlights that agents for pupillary dilation may have an effect on OCTA parameters, but there are no current clinical applications.

Incidence Of Steroid-Related Ocular Hypertension And Cataract Formation After Sub-Tenon Triamcinolone In Nonuveitic Pediatric Patients
Patel NA, Hoyek S, López-Font FJ, et al
Retina 2025;45(1):141-146
Triamcinolone is an injectable steroid used for a variety of ocular conditions. Like all corticosteroids, it carries the risk of IOP elevation, although there is no consensus on safety of sub-tenon triamcinolone, especially in pediatric patients. This is a retrospective multicenter case series of pediatric patients (<18 years) who received sub-tenon triamcinolone. Patients with elevated IOP at baseline, glaucoma, uveitis, retinal detachment, ruptured globe, vitrectomy, scleral buckle, or lensectomy were excluded. 59 eyes of 41 patients met the inclusion criteria. The most common diagnosis was ROP, followed by Coats and FEVR. Triamcinolone was injected following laser treatment in the majority of cases. Two eyes (3.4%) of two patients (4.9%) were mild steroid responders. One eye (1.7%) of 1 patient (2.4%) was a moderate responder. There were no high steroid responders, and all eyes with steroid response showed a return of intraocular pressure to normal range at next visit without needing any intraocular pressure-lowering medications. No patients were diagnosed with glaucoma or required glaucoma surgery. Only 1 eye (1.7%) developed trace posterior subcapsular cataract. No optic disk cupping or inflammation were noted. This study reveals that sub-tenon triamcinolone overall has a favorable safety profile for prevention of inflammation at the time of retinal photocoagulation, but this may not be generalizable to other situations or disease states.

Retinoblastoma

Intravitreal Topotecan for Vitreous Seeds in Retinoblastoma: A Long-term Review of 91 Eyes
Sen M, Rao R, Mulay K, Reddy VAP, Honavar SG
Ophthalmology 2024;131(10):1215-1224
This is a retrospective study of 91 eyes with retinoblastoma treated between January 2013 and April 2019. Patients with recurrent or refractory vitreous seeds after completion of intravenous or intra-arterial chemotherapy were treated with intra-vitreal topotecan (30microgram/0.15mL). Injection was repeated every 4 weeks until regression of seeds and had a minimum 12-month follow-up. Details of treatment prior to intravitreal topotecan are delineated in the methods section of the report. Vitreous seeds regressed in 82 eyes (90%) with a median of 3 injections and a median duration of 2 months. The 9 eyes (10%) with refractory seeds regressed with additional tandem IVT and melphalan. Vitreous seeds recurred in 17 eyes (19%). The median time for recurrence was 7 months and in 13 eyes (77%), vitreous seeds recurrence was associated with recurrence of the main tumor. Tandem IVT and melphalan was administered in 15 eyes, 13 of which had refractory seeds and 2 of which had recurrent seeds Vitreous seeds regressed in all eyes (100%). Risk of vitreous seed recurrence after treatment with IVT was associated with increasing age and recurrence of retinal tumor. Cataract was the most common complication seen in 17 eyes (9%), followed by retinal detachment (n=4), sterile inflammation (n=3), phthisis (n=3), and pigmentary retinopathy (n=2). The data from this study shows that IVT by the safety-enhanced technique at a dose of 30 mg/0.15 ml at an every 3- to 4-week regimen is effective against both refractory and recurrent vitreous seeds, with regression of seeds in 97% eyes and eye salvage in 85% of eyes. Topotecan also seems to be less toxic to the retina, with pigmentary retinopathy noted in only 2 patients.

Apparent Diffusion Coefficient (ADC) Differentiates Retinoblastoma from Coats Disease on MRI
Zhang WX, Shimony JS, Lueder GT, Reynolds MM
Am J Ophthalmol 2024;267:8-12
This study explored the potential of the apparent diffusion coefficient (ADC), a measure of water molecule diffusion within tissue obtained from diffusion-weighted MRI (DW-MRI), as a biomarker to differentiate Coats disease from retinoblastoma in children. This retrospective cross-sectional study analyzed MRI scans of children diagnosed with either Coats disease (5 eyes from 5 patients) or retinoblastoma (29 eyes from 23 patients) between January 1, 2018, and January 8, 2022, with all MRIs performed before treatment. ADC values were obtained by sampling five to eight points from each lesion using MRI software, and internal reliability was assessed through blinded re-measurement. A t-test compared ADC values between the two diseases. Results showed that the mean ADC for retinoblastoma was significantly lower (442 ± 210 mm^2/s) than for Coats disease (1364 ± 309 mm^2/s) ($P < 0.001$), with consistent re-measurements confirming reliability. An ADC threshold of 900 mm^2/s effectively differentiated retinoblastoma from Coats disease with high accuracy. Factors such as age and sex were not significantly associated with ADC values, and interobserver agreement was 100% when classifying cases using ADC. This study suggests that ADC, as an objective and reliable metric, can be a valuable diagnostic tool for differentiating these conditions. Despite limitations such as the small sample size and retrospective design, the findings have potential clinical applications, as identifying an ADC

threshold could reduce unnecessary invasive treatments, such as enucleation, in misdiagnosed cases. Future research should focus on refining ADC measurement protocols, increasing sample size, and validating findings across multiple institutions. This study highlights the potential of ADC measurements from DW-MRI as a valuable diagnostic adjunct for distinguishing retinoblastoma from Coats disease, with the potential to reduce misdiagnosis, unnecessary enucleations, and inappropriate treatment strategies if validated in larger cohorts.

Follow-up of Cystic Pineal Glands in Retinoblastoma Patients Does Not Increase Detection of Pineal Trilateral Retinoblastoma
de Bloeme CM, Jansen RW, de Haan J, et al
Am J Ophthalmol 2024;268:199-211
This study aimed to evaluate the effectiveness of magnetic resonance imaging (MRI) screening for detecting trilateral retinoblastoma (TRb), a rare but aggressive condition involving retinoblastoma with intracranial involvement. In this prospective multicenter cohort study, 607 retinoblastoma patients from three European medical centers were followed from 2012 to 2022, with follow-up until September 1, 2023. All patients underwent baseline MRI screening at diagnosis, with pineal glands classified as normal, cystic, suspicious, or TRb detected. Patients with cystic or suspicious glands underwent follow-up MRI at 3 months. The primary outcome was the effectiveness of MRI screening for TRb detection (sensitivity and specificity), and the secondary outcome was TRb incidence. Results showed a 1.59% overall risk of TRb in retinoblastoma patients, with higher risks in heritable (3.78%) and bilateral (3.21%) cases. Only 1 of 4 pineal TRb cases was detected via follow-up MRI (sensitivity: 25%), requiring 494 follow-up scans per detection. Restricting follow-up to suspicious glands reduced this to 22 scans per detection. Nonpineal TRb was detected in 4 of 5 cases on baseline MRI (sensitivity: 80%). Survival rates were significantly lower in TRb patients (22.2% at 5 years) compared to those without TRb (97.7%). This large, multicenter study with a standardized MRI classification system demonstrates the effectiveness of baseline MRI for detecting nonpineal TRb but highlights the low sensitivity for pineal TRb and the high number of scans needed for detection. Despite limitations such as variability in pineal gland appearance and follow-up adherence, the study provides valuable clinical recommendations. Baseline MRI remains crucial, especially for nonpineal TRb, while follow-up MRI should be restricted to suspicious pineal glands. Further research is needed to optimize screening intervals and explore alternative methods to improve early detection of pineal TRb.

Treatment Outcomes and Definition Inconsistencies in High-Risk Unilateral Retinoblastoma
Arazi M, Baum A, Casavilca-Zambrano S, et al
Am J Ophthalmol 2024;268:399-408
This study aimed to evaluate the impact of adjuvant chemotherapy in children with high-risk retinoblastoma (Rb) and to analyze the variability in defining high-risk histopathological features (HRHF) after enucleation. This retrospective, multinational clinical cohort study included 600 children with unilateral Rb who underwent upfront enucleation between 2011-2020 across 21 centers in 12 countries. The study compared outcomes between children who received adjuvant chemotherapy (n=505, 84.2%) and those who did not (n=95, 15.8%), and evaluated cases initially classified as non-HRHF but later reclassified using a standardized HRHF definition.

Results showed that 36 children (6.0%) experienced orbital tumor recurrence, 49 (8.2%) developed metastasis, and 72 (12.0%) died. Adjuvant chemotherapy significantly reduced recurrence, metastasis, and mortality (P ≤.002), with 5-year metastasis-free survival of 93.7% and overall survival of 89.7% in the adjuvant-treated group, compared to 82.1% and 78.9%, respectively, in the enucleation-only group. Of the 600 children, 63 (10.5%) were initially classified as non-HRHF but were reclassified as HRHF using standardized criteria. Among these, 9.5% experienced recurrence, 7.9% had metastasis, and 9.5% died. Notably, minor choroidal invasion with prelaminar/laminar optic nerve invasion, not universally classified as high-risk, was associated with metastasis and death in 5.3% of cases in this study. This large, diverse, multinational study demonstrates the survival benefits of adjuvant chemotherapy in children with HRHF and highlights the risks associated with inconsistent HRHF definitions. Despite limitations such as its retrospective design and treatment variability, it advocates for global standardization of HRHF criteria to ensure uniform treatment and improve outcomes. The study also underscores the need to consider economic factors and explore cost-effective strategies for Rb management, especially in lower-income regions. This research emphasizes the importance of early intervention, standardized diagnostic criteria, and tailored adjuvant therapy in optimizing survival outcomes for children with high-risk unilateral retinoblastoma.

Assessment of Retinal Microvasculature and Choroidal Vascularity After Intra-arterial Chemotherapy for Retinoblastoma
Yi X, Lin X, Fang C, et al
Am J Ophthalmol 2024;266:10-16
While previous studies have evaluated systemic chemotherapy effects on retinal vasculature, research on the impact of intra-arterial chemotherapy (IAC) on retinal microvascular and choroidal vascular parameters remains limited. This retrospective clinical cohort study aimed to assess these effects using optical coherence tomography angiography (OCTA) and spectral-domain optical coherence tomography (SD-OCT) in 12 eyes with unilateral retinoblastoma (RB) treated with IAC (RB tumor group), 12 contralateral normal eyes (RB fellow group), and 12 age- and sex-matched healthy controls (Control group). Retinal parameters measured included foveal avascular zone (FAZ), superficial vessel density (SVD), and deep vessel density (DVD). Choroidal parameters included choroidal thickness (ChT), total choroidal area (TCA), luminal area (LA), stromal area (SA), and choroidal vascularity index (CVI). Data analysis was conducted using SPSS with statistical significance set at P <.05. The RB tumor group exhibited significantly lower retinal and choroidal vascular parameters compared to both the RB fellow and control groups (P <.01 for all comparisons), while no significant differences were found between the RB fellow eyes and control eyes. Key findings included lower foveal thickness, SVD, DVD, ChT, TCA, LA, SA, and CVI in RB tumor eyes; a negative correlation between total melphalan dose and vascular parameters; and no measurable changes in contralateral eyes. This comprehensive analysis, utilizing both SD-OCT and OCTA, contributes to understanding chemotherapy-induced ocular toxicity in pediatric patients, particularly highlighting IAC-related vascular damage and the localized nature of its effects. Despite limitations such as the small sample size, patient cooperation challenges, single time point analysis, and potential selection bias, this study identifies potential long-term visual function decline in RB survivors and suggests that higher melphalan doses may exacerbate ocular

vascular toxicity. The findings confirm the absence of systemic vascular side effects from IAC and reinforce the importance of OCTA and SD-OCT as monitoring tools for early detection of microvascular toxicity, potentially guiding treatment modifications to minimize visual impairment. This study emphasizes the need for long-term monitoring of IAC-treated patients to prevent or mitigate visual complications.

Single- Versus Triple-Agent Intra-Arterial Chemotherapy for Retinoblastoma
Alshahrani NO, Aldhawi A, Feng ZX, et al
Am J Ophthalmol 2025;269:488-496
This study compared the efficacy and safety of single-agent versus triple-agent intra-arterial chemotherapy (IAC) for treating retinoblastoma (RB) in children. Conducted at the Hospital for Sick Children in Toronto, Canada, this retrospective, single-institutional clinical cohort study included children (<18 years old) with RB who underwent IAC between 2016 and 2024, with at least a 6-month follow-up. 35 children (36 eyes) were included in the analysis, comparing single-agent (melphalan) versus triple-agent (melphalan, topotecan, carboplatin) IAC. The primary outcomes were ocular and systemic complications, intraocular recurrence, extraocular extension, metastasis, and death, while secondary outcomes included tumor response, ocular survival, and recurrence-free ocular survival. The triple-agent group showed a higher likelihood of very good partial response (VGPR) or complete response (CR) (91% vs. 62%, P =.030), but no significant difference in recurrence-free ocular survival. Two-year ocular survival was 72.2%, with a trend towards better survival in the triple-agent group (82.6% vs. 53.8%, P =.059). The globe salvage rate was 72%. Ocular complications occurred in 31% of the single-agent group and 52% of the triple-agent group (P =.215), while systemic complications were higher in the triple-agent group (74% vs. 38%, P =.036). No extraocular extension, metastasis, or death occurred during a median follow-up of 34.2 months. This study, as the first to compare single- and triple-agent IAC, provides valuable insights into their efficacy and safety profiles. Despite limitations such as its retrospective design and small sample size, it highlights the potential benefits of triple-agent IAC for tumor control and ocular survival, while also emphasizing the increased risk of systemic complications. The findings support the use of triple-agent IAC for enhanced eye salvage but underscore the need for careful consideration of the risk-benefit profile when making treatment decisions.

High-Risk Histopathological Features of Retinoblastoma following Primary Enucleation: A Global Study of 1426 Patients from 5 Continents
Kaliki S, Vempuluru VS, Bakal KR, et al
Retina Published online August 14, 2024
There are certain criteria, including massive choroidal infiltration, postlaminar optic nerve infiltration, optic nerve transection involvement and extrascleral tissue infiltration that are generally regarded as high-risk histopathological feature for retinoblastoma following enucleation. These factors, which are very important in prognostication, have not been extensively studied. This retrospective, collaborative study across Asia, Africa, Australia, Europe, North America, and South America focused on high risk histopathological features in patients who underwent primary enucleation from 2011 and 2020. A total of 1426 eyes were Included. The mean age at time of diagnosis was 30 months. The majority of enucleated eyes

belonged to ICRB Group E in Asia, Australia, Europe, and North America. In South America, a sizable portion of eyes (41%) belonged to Group D. Only two group C eyes were enucleated in 2 patients with unilateral retinoblastoma in Asia. The endophytic growth pattern was the most common in Asia, Europe, and South America. The exophytic growth pattern was most common in North America and Australia. Degree of tumor differentiation also differed between continents. Orbital tumor recurrence was seen in 4%, systemic metastases in 7%, and tumor-related death in 6%. All three of these factors were highest in South America and lowest (all 0%) in Australia. High-risk histopathological features were seen in 50% of patients. Patients in Asia and South America had a higher percentage of high-risk histopathological features. This is a large study looking at trends in retinoblastoma histopathologic features across the globe.

RB1 circulating-tumor DNA in the blood of Retinoblastoma patients increases in untreated patients
Silverman RF, Francis JH, Robbins MA, Dunkel IJ, Abramson DH
Retina Published online August 1, 2024
Circulating tumor DNA in plasma has been used in a variety of cancers for both diagnosis and monitoring. In retinoblastoma, where direct tumor sampling risks spreading the disease, liquid biopsies to evaluate circulating tumor DNA may be particularly helpful. This study included patients from a single academic center with RB1 ctDNA at two time points before treatment. A total of four patients were included with five RB1 gene alterations. Clinical status of each patient was evaluated under anesthesia with imaging, ultrasound, and OCT. All eyes were class E and each patient underwent enucleation. Variant allele frequency increased on reevaluation of the same RB1 mutations on ctDNA compared to the initial sample. This suggests that growing tumors demonstrate increasing plasma ctDNA. While additional research is needed to validate ctDNA, it offers a promising method to monitor retinoblastoma and identify growing tumors.

Choroidal Nevi in Children: Size, Growth, and Topographic Distribution
Yeşiltaş YS, Singh N, Oakey Z, Wrenn J, Singh AD
Am J Ophthalmol 2024;266:102-109
This study explores the size, growth patterns, and topographic distribution of choroidal nevi in children, providing insights into choroidal nevogenesis. This retrospective consecutive case series included both clinical and population-based data, with clinical data from 20 children (<20 years old) diagnosed with choroidal nevi at the Cole Eye Institute (CEI) from 2005-2023 and population data from 48 children from the Sydney Pediatric Eye Disease Study (SPEDS), Sydney Myopia Study (SMS), Sydney Childhood Eye Study (SCES), and Sydney Adolescent Vascular and Eye Disease Study (SAVES). A comparison group of 100 consecutive adults with choroidal nevi from the CEI database was also included. Key measures were size (largest basal diameter), growth rate, topographic distribution, and presence of secondary changes (e.g., drusen, orange pigment, subretinal fluid). Results showed that the median largest basal diameter (LBD) of choroidal nevi was significantly smaller in children (1.6 mm) than adults (4.8 mm; $p < 0.001$). In children, 75% of nevi remained stable, while 16% showed growth at a mean rate of 0.12 mm/year (range: 0.10-0.15 mm/year).1 New-onset nevi were observed in some children, and while malignant transformation was not seen in childhood, one case transformed at age 26.5. Compared to adults, children had fewer secondary changes in their nevi, with

drusen found in 6% of children vs. 78% of adults ($p < 0.05$). Nevi in children were located significantly more posteriorly, with a median distance to the fovea of 2.1 mm vs. 5.1 mm in adults ($p < 0.0001$). This suggests ongoing nevogenesis in childhood that slows in adulthood. This study, as the largest case series on choroidal nevi in children, provides valuable insights into nevus development and growth patterns, highlighting differences between children and adults. Despite limitations like its retrospective nature and small sample size, it emphasizes the importance of clinical follow-up and routine fundus imaging in children to monitor nevi and detect potential malignant changes later in life.

High-Dose Intravitreal Topotecan For Recurrent Retinoblastoma, Subretinal Seeds, And Vitreous Seeds
Shields CL, Medina R, Evans H, et al Retina 2025;45(1):1-6
Intravitreal chemotherapy has been used as therapy for active retinoblastoma vitreous seeds, and most reports have focused on the use of melphalan. Topotecan has also been found effective in intravenous, periocular, and intravitreal routes in both animals and humans. It carries the advantage of high tolerability with low incidence of complications. This study details a single center experience with high dose intravitreal topotecan for recurrent retinoblastoma. 13 patients with recurrent solid tumor, subretinal seeds, and/or vitreous seeds were treated with high-dose topotecan. All patients were injected in the operating room under general anesthesia. At date of first seen, the median patient age was 9 months, and the recurrence on average was 10 months following the initial treatment. After injection with topotecan, regression of solid tumor, subretinal seeds, and vitreous seeds was achieved in all cases, along with globe salvage. In one case with massive vitreous seeding, there was late recurrence that resolved with 4 monthly injections of topotecan and cryotherapy. Although a small sample size, this study illustrates the potential role for topotecan, which carries an advantage over melphalan with a lower risk of retinal toxicity.

Retinoblastoma survival and enucleation outcomes in 41 countries from the African continent
Nishath T, Stacey AW, Steinberg D, et al
Br J Ophthalmol 2024;109(1):64-69
This was a 3-year prospective observational study to investigate survival and globe salvage outcomes and identify their risk factors across a large cohort of patients from the African continent. A total of 958 patients from 41 African countries and 66 participating centers were enrolled in the study. Average age at diagnosis was 31 months, unilateral involvement in 73%, 2.6% with family history and 6.5% with hereditary disease. 70% underwent enucleation and nearly 10% of the cohort faced treatment abandonment. Death outcomes were at 8%–9% for stages 0–1, increased to near 24% for stage 2 and then increased substantially to almost 50% for stages 3 and 4. Kaplan Meier curves were used to estimate survival rate of children over time: 78.2% at 1 year and 66.2% at 3 years after diagnosis. Cox regression models were used to evaluate variables associated with survival: advanced clinical stage (cT4) have higher risk of death compared to cT2, and survival is nearly equal for cT2 and cT3 patients. In terms of globe salvage, the risk of enucleation exceeds 50% after about 4 months and levels off close to 70% for the remaining 3 years and was significantly associated with disease stage as expected. Compared with global values, African children with retinoblastoma have the highest mean age

at diagnosis, the latest clinical stage of disease at time of diagnosis, the highest enucleation rates and lowest survival rates—66% by 3 years. We can do better for these patients!

Survival and Health Care Burden of Children With Retinoblastoma in Europe
Virgili G, Capocaccia R, Botta L, et al
JAMA Ophthalmol Published online October 10, 2024
Retinoblastoma (RB) is a rare cancer of infancy and childhood that is aggressive and life-threatening if left untreated. A risk of subsequent malignant neoplasms (SMNs) has been reported following a diagnosis of RB. Those with heritable retinoblastoma (from a germline mutation in RB1 gene) have an increased risk of SNMs such as bone and soft tissue sarcomas, uterine leiomyosarcoma, melanoma, and radiotherapy-related CNS tumors. The purpose of this study was to study the incidence, survival, and SMN occurrence in children with RB diagnosed between 2000 and 2013 using population- based data from European cancer registries. Data between January 2000 and December 2013 was obtained from 3,262 patients aged 0 to 14 years (mean age 1.27 years, 52% male) who were diagnosed with RB from 81 cancer registries in 31 European countries. Of 2,712 cases with information on laterality, 28.4% had bilateral lesions. Most cases were diagnosed within 5 years of age (96%) and 42% were diagnosed in the first year of life. The overall European incidence rate of RB during this period was estimated to be 4.0 per 1,000,000 with no time trend of incidence. The overall 5-year survival was estimated to be 97.8% with disparities across countries. The standardized incidence ratio for SMNs was 8.2. There was an increased risk for hematologic tumors (standardized incidence ratio 5) and bone and soft tissue sarcomas (standardized incidence ratio 29). This study is limited due to incomplete RB information for stage and results may be influenced by or associated with genetic predispositions among ethnic groups. In conclusion, in this study, there was a stable incidence of RB from 2000 to 2013, high survival for children with RB in Europe, and a higher risk of SMNs in RB survivors.

Transcorneal Vitrectomy in Eyes with Regressed Retinoblastoma
Bao YK, Sanchez GM, Lee TC, Berry JL, Nagiel A
Retina Published online June 11, 2024
Current treatments for retinoblastoma focus on globe salvage when possible, with intra-arterial chemotherapy, intravitreal chemotherapy, brachytherapy, and laser therapy. With more children with retinoblastoma avoiding enucleation, there is an increase in the number of patients with regressed retinoblastoma and ocular pathology that may benefit from vitrectomy. Surgery in eyes with retinoblastoma is controversial, as it carries the theoretical risk of seeding. This paper reports a series of five patients with regressed retinoblastoma for greater than one year who underwent a novel transcorneal vitrectomy surgical approach that avoids the need for cryotherapy or chemotherapy. 23G or 25G incisions were made at the limbus and lensectomy was performed for phakic patients. Wounds were sutured at the conclusion of surgery and the surface irrigated with sterile water to lyse tumor cells. No cryotherapy or chemotherapy was given. There was no retinoblastoma recurrence and no visual improvement with vitrectomy in any patient. This may be a useful technique when posterior segment surgery is necessary in eyes with regressed retinoblastoma after assessing the risks and benefits.

Retinopathy of Prematurity

Term infant brain MRI after ROP treatment by anti-VEGF injection versus laser therapy
Manrique M, Pham M, Basu S, Murnick J, Rana MS, Chang T, Chan C, Vieta-Ferrer E, Sano C, Limperopoulos C, Miller M
J AAPOS 2024;28(6):104038
Intravitreal injection of anti-vascular endothelial growth factor (anti-VEGF) agents is used to treat posterior type 1 retinopathy of prematurity (ROP). Recent reports indicate that anti-VEGF therapy may be associated with white matter brain injury, according to animal studies, and neurodevelopmental impairments in children born preterm. The purpose of this study was to investigate whether type 1 ROP treated with bevacizumab is associated with structural brain injury on term infant magnetic resonance images (MRIs) in very low birth weight (VLBW) infants compared with those treated with laser ablation. This was a retrospective review of the medical records of VLBW infants from 2006 to 2021 with type 1 ROP who had been treated with laser or anti-VEGF. A pediatric neuroradiologist reviewed brain MRIs at term equivalent age (36-46 weeks' postmenstrual age) and classified infants for severity (no/mild vs. moderate/severe) of overall brain and white matter injury using the validated Kidokoro scoring system. Fifty-two infants met inclusion criteria, with 35 (67%) treated with laser and 17 (33%) with bevacizumab. Moderate-to-severe brain injury scores were not statistically different between bevacizumab and laser treatment groups in either continuous or binary adjusted analyses, for either the overall score or the white matter subscore. Strengths of the study included the use of a single, experienced neuroradiologist blinded to ROP treatment groups, while limitations included its retrospective design, single-institution setting, small sample size, and lack of functional neurodevelopmental data (i.e., structure versus function). These findings suggest that clinicians can counsel families when choosing treatment for type 1 ROP, as the severity of structural brain injury on term MRI (total and white matter) did not differ statistically between infants treated with bevacizumab and those treated with laser ablation.

P Score: A Reference Image-Based Clinical Grading Scale for Vascular Change in Retinopathy of Prematurity
Binenbaum G, Stahl A, Coyner AS, et al
Ophthalmology 2024;131(11):1297-1303
The authors discuss the various methods of grading plus disease over time and this study attempts to standardize ROP classification. A 34 group panel of experts were given a series of images to classify into 9 standard photographs of plus disease (P1-9). A second set of 30 ophthalmologists were given the 9 images as a reference and 180 images (30 were duplicates to allow for intragrader reliability assessment) to assess P score of the images. Primary outcome was integrated agreement across 30 graders for the gradings of all 150 images calculated separately for no plus, preplus, or plus disease grading and for P score grading. Secondary outcomes included integrated agreement for no plus, preplus, and plus disease grading and for P score grading measured between each pair of graders.The study found that intergrader agreement was higher using P score reference images rather than no plus, preplus, or plus disease parameters. The purpose of the P score was to provide a way to represent a continuous spectrum of ROP related vascular changes. The authors discuss the advantages of

such a classification in that it facilitates more detailed comparison between examinations to assess for progression and regression, makes communication more effective between examiners and in handoffs, and allows more detailed documentation of the degree of vascular change. It can also be beneficial for ROP research. However at this time it shouldl not replace plus disease as defined by ICROP to guide treatment. The authors discuss that they now incorporate P score as a new element of the international classification to use alongside zone, stage and plus disease classification in ROP diagnoses as plus disease is essential for treatment decisions.

Risk factors for severe retinopathy of prematurity stratified by birth weight and gestational age in privately insured infants
Moir JT, Hyman MJ, Skondra D, Rodriguez SH
J AAPOS 2024;28(6):104049
This study aimed to evaluate risk factors associated with the need for treatment in infants with retinopathy of prematurity (ROP) across two distinct cohorts. It was a retrospective analysis of the Merative MarketScan Commercial Database from 2003 to 2022. Infants with ROP were stratified into two groups: group A, which included infants with both birth weight (BW) <1000 g and gestational age (GA) <29 weeks, and group B, which included infants with either BW ≥1000 g or GA ≥29 weeks. Multivariable logistic regression was used to calculate odds ratios (ORs) and 95% confidence intervals (CIs) for ROP requiring treatment, with respect to various comorbidities identified using International Classification of Diseases and Current Procedural Terminology codes from outpatient and inpatient claims. A total of 425 (4.8%) of 8,789 infants with ROP required treatment, including 387 (14.2%) of 2,726 infants in group A and 38 (0.6%) of 6,063 in group B. On multivariable analysis, in group A, intraventricular hemorrhage (OR = 1.38; 95% CI, 1.09-1.74) and patent ductus arteriosus ligation (OR = 1.65; 95% CI, 1.25-2.16) significantly increased the odds of requiring treatment, while in group B, infection (OR = 1.96; 95% CI, 1.01-3.80) significantly increased the adjusted odds of needing treatment. Strengths of the study included the use of a large database, while limitations included its retrospective nature, potential inaccuracies, misclassification, or missing claims data, and restriction to privately insured patients. These findings suggest that risk factors for treatment-requiring ROP may differ between smaller and larger infants.

Exposure to unblended oxygen may require earlier first retinopathy of prematurity screening examination and modification of existing screening guidelines in Sub-Saharan Africa
Namakula L, Nakibuuka V, Ells AL, et al.
J AAPOS 2024;28(6):104053
This case series examines whether preterm infants with a gestational age (GA) of ≥32 weeks and birth weight (BW) of ≥1500 g exposed to unblended oxygen should undergo earlier retinopathy of prematurity (ROP) screening than current guidelines, which are adopted from Kenyan guidelines for the third ROP epidemic.1 Researchers reviewed cases of infants with severe, treatment-requiring ROP at St. Francis Hospital Nsambya in Kampala, Uganda, focusing on those requiring treatment before 30 days of life. Since 2022, three infants required treatment before 30 days old. All were exposed to unblended oxygen for 5-10 days after birth and were on room air at the time of treatment. GA ranged from 32 to 34 weeks, and all infants

had a BW >1500 g. Treatment occurred at 2 weeks of age for all infants. Acknowledging the limitation of being a case series, this study suggests that clinicians should be aware of the potential for earlier development of severe ROP in preterm infants born at ≥32 weeks GA and exposed to unblended oxygen, potentially warranting earlier screening than guidelines adopted from other countries.

Longitudinal Assessment of Retinopathy of Prematurity (LONGROP) Study: Impacts of Viewing Time and Ability to Compare on Detection of Change
Rosenblatt TR, Ghoraba HH, Ji MH, et al
Am J Ophthalmol Published online October 24, 2024
This study compared the accuracy of two retinopathy of prematurity (ROP) screening methods: simulated bedside indirect ophthalmoscopy (sBIO) and telemedicine (TELE) with longitudinal image comparison. In this prospective reliability analysis, 12 pediatric retina specialists graded retinal images from 40 infants over 12 weeks. Graders were divided into two cohorts, each evaluating two different patient sets for six weeks using either sBIO (time-limited, simulating in-person examination) or TELE (time-unlimited with access to prior images), then switching techniques. Accuracy was measured against a previously graded Gold Standard (GS) reference set. Results showed no significant difference in accuracy between sBIO (51.7%) and TELE (51.9%) for detecting disease trajectory (Tempo). Agreement was highest for stable exams and lowest for worsening disease. Graders performed worse in the second half of the study, suggesting fatigue. Tempo assessment did not correlate well with granular image data, indicating that graders did not consistently integrate lower-level features into their overall assessments. Accuracy was higher in stable and treatment-warranted cases but lower in progressive disease. TELE graders had slightly higher reliability for progressive cases. This study, with its rigorous methodology and large dataset, demonstrates that telemedicine may not significantly outperform bedside ophthalmoscopy for ROP disease trajectory detection by expert graders. However, it highlights telemedicine's potential for higher reliability in progressive cases, supporting its role in large-scale screening where expert availability is limited. The findings also emphasize the impact of grader fatigue and the complexity of ROP progression assessment. Future research should explore automated analysis and AI-assisted grading to improve accuracy and reduce human variability. This study underscores the importance of refining telemedicine screening protocols and improving ROP disease progression assessment.

Use of an Artificial Intelligence-Generated Vascular Severity Score Improved Plus Disease Diagnosis in Retinopathy of Prematurity
Coyner AS, Young BK, Ostmo SR, et al
Ophthalmology 2024;131(11):1290-1296
The study was designed to evaluate whether AI based vascular severity score (VSS) output could assist clinicians in consistent and accurate diagnosis of plus disease compared with the reference to reduce variability of clinical diagnosis in practice. The authors used data from the iROP cohort study. The five image views from each examination in the subset included in iROP were uploaded to the grading platform and a group of ROP clinicians then classified them to normal, preplus, or plus and assigned a vascular severity score. One month later they were asked to repeat the same task but also were given the AI derived VSS. The effect of the

intervention was evaluated by comparing overall agreement of plus disease classification. Additionally, a comparison was made between the clinician assigned VSS label with the reference standard diagnosis (RSD) and compared the percent agreement of individual VSS labels with the majority VSS for the group with and without AI. The study found that there was an improvement in agreement with the plus disease RSD from substantial to near perfect, however there was more variability in the diagnosis of preplus disease. Two key findings were identified: 1) when provided with an AI based VSS, plus disease classification among ROP clinicians improved, and 2)clinicians were able to learn to assign a 1 through 9 label directly with high diagnostic accuracy for both preplus and plus disease. The authors posit that adoption of a VSS may lay the groundwork for re-evalution of treatment criteria. GIven that much of the data comes from studies 20 years ago the method of classification has changed and may be difficult to extrapolate as premature infants are younger with more posterior disease and primary treatment has shifted from laser to anti-VEGF therapy. This may have implications on timing of treatment. The study was limited by the small number of clinicians and images used and thus did not have the power to assess whether there were different benefits to different clinicians based on their experience. The results here may also not be able to be generalized to other areas of the world and there are two practical barriers to implementation: 1)most ROP exams around the world are done without digital imaging which was the basis for this study, and 2) no AI algorithms are approved for ROP. The article is significant in that it may pave the way for improved clinical outcomes and preventable blindness in ROP and may also indicate the start of a trend in adoption of assistive AI technologies in ophthalmology.

Validation of the "TWO-ROP" Algorithm at a Multi-Neonatal Intensive Care Unit Tertiary Referral Center
Patel NA, Altamirano F, Hoyek S, et al
Ophthalmol Retina 2025;9(1):63-68
Retinopathy of prematurity (ROP) is the leading cause of childhood blindness in the United States. With the growing number of premature infants surviving at younger ages and smaller size, the number of neonates requiring screening has increased. A previously reported “TWO-ROP” algorithm, suggesting that for infants meeting 0 or 1 of the screening criteria (birth weight, gestational age), a single screening at 36 or 40 weeks postconception age could decrease screenings while preserving safety. This study was a retrospective review of patients screened for ROP at several large academic centers. The babies meeting 0 or 1 criteria were grouped into three categories: 1) those meeting screening criteria by birth weight alone <1500g, 2) those meeting criteria by gestational age <30 weeks alone, and 3) those meeting neither birth weight or gestational age criteria. Of the total 3289 patients screened at multiple centers, 1095 met the inclusion criteria and were grouped into one of the three groups above. The majority of included patients (76.4%) were in group 1, meeting screening criteria by birth weight alone. Retinopathy of prematurity was detected in 11.0% of patients. Stage 3 was found in 9 eyes of 5 patients (0.5%, all zone II). Three eyes of two patients (0.2%) had plus disease. Two patients had bilateral laser treatment at 44 and 39.4 weeks postconceptional age; 3 out of 4 of these eyes met type 1 treatment criteria. The ROP screening burden was lessened by 9.0% for the TWO-ROP 36-week system and 16.7% for the 40-week system. The sensitivity for the TWO-ROP screening system was 100% for the TWO-ROP 36-week system and 99.4% for the

TWO-ROP 40-week system. Overall, this analysis adds validation to the TWO-ROP algorithm. To ensure timely management, the authors suggest that the screening examination occur at 38 to 39 weeks postconception age, although these results may not be generalizable to all populations and health systems.

Outcomes after unilateral bevacizumab treatment for infants with asymmetric retinopathy of prematurity
Nelson DG, Hubbard GB, Hutchinson AK
J AAPOS Published online December 27, 2024
Treatment for retinopathy of prematurity (ROP) includes injection of intravitreal bevacizumab (IVB) when appropriate. While ROP is usually a bilateral disease, the severity or progression of ROP may be asymmetric. This study aims to describe a group of patients with asymmetric ROP who received initial IVB treatment in only one eye, and to determine whether and when the other eye required treatment. This is a retrospective study that included consecutive patients who received unilateral or sequential (6 days or more) IVB for ROP between January 2011 and September 1, 2021 at Emory University. Data collection included gestational age, birth weight, indication for treatment, dosage of IVB, interval between treatment of first or second eyes, and additional treatments. Unilateral treatment for asymmetric ROP was performed in 22 patients out of a total of 103 patients that received IVB during the study period. Of these patients, 11 (50%) did not require IVB in the contralateral eye, and 7 did not require additional treatment. Of the 11 patients that did require IVB in the contralateral eye, 7 did not require additional treatment. Limitations include bias inherent in cohort retrospective studies and small sample size which limits statistical analysis. This study investigates an important question of the necessity of bilateral intravitreal injections in asymmetric disease. Limiting IVB injections may reduce the risk of endophthalmitis and exposure to systemic absorption of anti-VEGF agents.

Trends in Retinopathy of Prematurity Among Preterm Infants in California, 2012 to 2021
Quinn MK, Lee HC, Profit J, Chu A
JAMA Ophthalmol 2024;142(11):1055-1061
Retinopathy of prematurity (ROP) is a leading cause of childhood blindness. The purpose of this study was to assess the screening and prevalence of ROP in California from January 1, 2012 to December 31, 2020 and investigate for racial disparities in ROP prevalence. Data was collected using the California Perinatal Quality Care Collaborative data from NICUs across 60 hospitals in California. To evaluate screening rates, the population was restricted to infants with gestational age (GA) <30 weeks. To evaluate for ROP prevalence, the age range was expanded to include all very preterm and extremely preterm infants (<32 weeks GA) to capture infants who may have qualified for screening due to birth weight or severity of clinical course. Severe ROP was defined as stage 3, 4, or 5 or any infant who required surgery, laser, or anti-VEGF intravitreal injections. 36,113 infants out of 39,269 very preterm infants (mean GA 28.6 weeks, mean birth weight 1075 grams, 48.6% female) potentially eligible for screening were screened. Rates of ROP screening were unchanged from 2012 to 2021 and stayed within the range of 95 to 98%. There were no differences or temporal trends in ROP screening rates by race and ethnicity. From 2012 to 2021 the prevalence of ROP decreased from 31% to 29%. Of very preterm infants (<32 weeks GA or <1500 g birth weight) with any ROP, there was a higher representation of

infants born to Hispanic (RR of ROP 1.24) and Native American/Alaskan (RR of ROP 1.41) parents compared to infants with White parents despite adjusting for GA. Compared to White infants, Asian (RR 1.49) and Hispanic (RR 1.46) infants were more likely to be diagnosed with severe ROP. Over time there was a decrease in the rates of ROP among infants with Asian and Hispanic parents and little change in the prevalence among infants with Black and White parents. The trends of racial and ethnic disparities in ROP decreasing over time in this California cohort are contrary to those in the broader US in a different study that reported increasing ROP rates along with racial and ethnic disparities. This study is limited in that it did not take socioeconomic status into account which has been shown to be a predictor of ROP, and the analysis was limited to very preterm infants. In conclusion, in this cohort study of infants in California, ROP incidence and racial and ethnic disparities in ROP incidence improved from January 2012 to December 2021.

Isolated Retinal Neovascularization in Retinopathy of Prematurity: Clinical Associations and Prognostic Implications
Burt SS, Woodward M, Ni S, et al
Ophthalmol Retina 2024;8(10):1021-1028
Retinopathy of prematurity (ROP) is a potentially blinding disease of premature neonates, with gestational age, birth weight, and exposure to high levels of oxygen recognized as risk factors. The ICROP3 guidelines for assessing disease severity do not take into account isolated retinal neovascularization or “popcorn” lesions. The study was conducted at a single academic center and included 136 babies examined in the NICU from December 2020 through August 2023. All included babies had ultrawidefield OCT (>140deg) images obtained en face. A total of 422 imaging sessions with 5927 images were reviewed. Images were reviewed according to ICROP3 criteria for zone and stage of disease, in addition to the presence of isolated retinal neovascularization at any time during their disease course. Of the 136 patients, a total of 22 developed isolated retinal neovascularization at some point in their disease course, all of whom had stage 2 or worse ROP. On average, infants with isolated retinal neovascularization had lower birth weights, were more likely to have disease in zone 1, more likely to progress to stage 3, and more likely to require treatment. In all 22 eyes with isolated retinal neovascularization, the isolated neovascularization was found temporally, and it was also found nasally in 5 patients. A vascular severity score (VSS) was assigned by the clinician at each examination. Eyes with isolated retinal neovascularization had a higher VSS leading up to and including the week of the patient’s worst ROP. This study reveals that isolated neovascularization may be helpful in risk-assessment of babies with ROP and illustrates that OCT may be a viable screening tool.

Validation of the Postnatal Growth and Retinopathy of Prematurity (G-ROP) criteria in a Slovene cohort
Zupan M, Binenbaum G, Pompe MT
J AAPOS Published online January 23, 2025
G-ROP screening criteria is a growth-based model used to identify premature infants at increased risk for retinopathy of prematurity (ROP). It has been validated in several countries with a high sensitivity for predicting type 1 ROP and significantly reducing the number of infants

requiring screening. This study aims to validate the G-ROP screening tool in Slovenia. This is a retrospective observational cohort study in which the G-ROP criteria were applied to infants who underwent ROP screening during the study period. 102 infants were included in the study, of whom 11 (10.7%) developed type 1 ROP and required laser photocoagulation, anti-VEGF therapy, or a combination. When the original G-ROP criteria was applied, 72 children required screening (29.4% reduction) with 100% sensitivity for type 1 ROP. Simplified criteria were also assessed in which 100% sensitivity for type 1 ROP remained throughout while reducing the number of infants requiring screening. Limitations of the study include small sample size due to relatively small size of Slovenia. In summary, the G-ROP criteria achieved 100% sensitivity in identifying type 1 ROP disease while reducing the number of infants requiring screening in a Slovenia cohort.

Impact of a ROP mentoring program in rural regions of Colombia
Zuluaga-Botero C, Solano JM, Serrano-Calderon C, et al
J AAPOS 2024;28(5):104013
Retinopathy of prematurity (ROP) has been a major cause of childhood blindness in Latin America for over 30 years. In response, the Colombian government launched a national ROP program in 2003, which improved ROP services in urban areas but faced challenges in rural regions, prompting a mentoring intervention from 2012 to 2019 to address these disparities. This paper discusses the impact of this mentoring program. The intervention involved mentoring hospitals in four rural regions, aimed at increasing neonatal intensive care unit (NICU) coverage for ROP screening. The program included training neonatal staff and ophthalmologists, improving communication, and enhancing data collection. Over the six years, there was a significant increase in the number of NICUs providing ROP services, and the proportion of preterm infants screened also increased. The overall proportion of infants treated for ROP declined during the mentoring period, which could be due to improvements in neonatal care or changes in the characteristics of the screened population. The mentoring program successfully raised awareness and improved ROP management. The strengths of this study were its national scope and its focus on a mentoring intervention. Its limitation were its lack of a control group and limited long-term follow-up. It is an important study as it highlights how a mentoring intervention can help to improve ROP care in underserved communities.

Survival and characteristics of retinopathy of prematurity in micro-premature infants
Eng KT, Grewal PS, Hostovsky A, et al
Can J Ophthalmol 2024;59(6):e803-e807
This retrospective analysis examined infants born at or transferred to the Sunnybrook Health Sciences Centre NICU between 2014 and 2018. The authors included infants born between 22 and 26 weeks of gestation, aiming to describe the risk and characteristics of retinopathy of prematurity (ROP) in the most premature infants. The infants were divided into two groups: Group A (22–23 weeks) and Group B (24–26 weeks). A total of 503 infants were identified, of whom 414 survived to discharge. Complete ROP records were available for 294 infants. The average age at the first ophthalmologic examination was 31.1 weeks. The overall survival rate was 82.5%. Among the cohort, 60% of infants developed ROP, 8.5% developed Type 1 ROP, and 7.8% required treatment. Group A infants were more likely to develop ROP and Type 1

ROP compared to Group B infants. Plus disease was observed in 17.5% of infants born at 22–23 weeks, 16.7% of those born at 24 weeks, 12% of those born at 25 weeks, and 2% of those born at 26 weeks. Aggressive posterior ROP (AP-ROP) was more common in Group A infants. Notably, no infants exhibited plus disease at the initial examination. Group A infants developed ROP at an earlier postmenstrual age and required treatment earlier compared to Group B infants.The authors concluded that the current screening guidelines were effective in their cohort, as no infants required treatment at the time of the first examination. This study offers valuable epidemiological insight into micropremature infants, particularly as survival rates have improved within this cohort.However, the study has several limitations. The presence of missing data could potentially skew the results. Furthermore, it is unclear whether the analysis included only infants who survived to discharge, which may introduce bias, as infants who died were excluded from the dataset.

Long-term surgical outcomes and prognostic factors for advanced-stage retinopathy of prematurity after vitrectomy
Chang YH, Kang EY, Chen KJ, et al
Br J Ophthalmol 2024;109(1):126-132
This was a retrospective cohort study of patients with ROP who underwent vitrectomy 2005-2016 and had at least 5 years of follow-up. The aim was to evaluate the anatomic factors, associated prognostic factors, and visual outcomes in patients with advanced (stage 4b, 4b, or 5) ROP following vitrectomy. The cohort contained 81 eyes of 51 patients with stage 4 or 5 ROP treated at a single hospital and mean age at last follow up was 10.2 years (range 5-14 years). Over 80% of eyes had preoperative treatments including laser and/or anti-VEGF prior to vitrectomy. Over 90% of the eyes with stage 4A and 4B ROP maintained posterior pole attachment until the last follow-up. Stage 4 eyes without plus disease showed a 100% attachment rate. The mean BCVA of all the eyes at the most recent follow-up visit was 20/1002. The eyes with stage 4A ROP had the highest average BCVA. Of the eyes with stage 5 ROP, 89% presented with NLP, LP or HM; 65.4% of the eyes with stage 4A ROP and 23.8% of the eyes with stage 4B ROP had BCVAs better than 20/200. Over half of the eyes underwent cataract surgery before the age of 10 years, and corneal opacity and phthisis were the 2nd and 3rd most common complications. Stage of the disease was a poor prognostic factor in all vitrectomized eyes, and vitrectomy combined lensectomy was a significant predictor for poor anatomic outcomes for stage 4 eyes.

Short-Term Reactivation Of Retinopathy Of Prematurity After Primary Ranibizumab Treatment
Strawbridge J, Cheng JY, Gundlach BS, et al
Retina 2024;44(11):1945-1951
Retinopathy of prematurity (ROP) remains a leading cause of preventable blindness in children. Anti-VEGF has emerged as a preferable treatment for aggressive and posterior ROP. This study sought to explore the risk factors for short-term reactivation of ROP, as well as safety and efficacy of repeat injections. A total of 1078 eyes of 539 infants were screened for ROP between January 2013 and April 2023. 141 eyes had type 1 ROP, and a total of 82 eyes of 43 infants received ranibizumab and were included in the study. The mean gestation age for this cohort was 24.7 weeks and a mean birth weight of 672.6g. Thirteen patients (22 eyes) developed

short-term reactivation an average of 7.2 weeks after treatment. Increased reactivation risk was associated with zone I disease, lower postmenstrual age at first injection, and lower gestational age at birth. Of the 13 patients that received repeat injections, five required laser treatment for a second reactivation. Compared to bevacizumab, ranibizumab may require more injections, theoretically due to its decreased half-life in the vitreous. This study illustrates that repeat ranibizumab anti-VEGF injections can be used for reactivation of ROP after initial injection, although repeat reactivation remains a risk, and eyes need to be monitored closely.

Administering Intravitreal Bevacizumab For Retinopathy Of Prematurity: 8-Year Cognitive Outcomes In A Prospective Cohort
Wu PL, Shih CP, Huang YS, et al
Retina 2024;44(11):1952-1960
The use of anti-VEGF for retinopathy of prematurity (ROP) has gained popularity, especially in treatment of posterior ROP. VEGF is important in neurodevelopment and neuroprotection. Limited data exists on the potential systemic effects of bevacizumab injection in premature infants. This study explored the cognitive function of patients treated with bevacizumab in infancy for ROP. A total of 277 children were enrolled in the study. The patients were grouped into full-term, preterm without ROP, ROP without treatment, and ROP with treatment. Cognitive outcomes were assessed with a full-scale intelligence quotient every year for 2 years. At a mean age of 7.8 years, ROP with and without treatment groups had lower intelligence scores compared with full-term and preterm without ROP groups. Intelligence quotients did not differ between those who received different ROP treatments. Best-corrected visual acuity was negatively associated with intelligence quotient. Overall, this study illustrates that there were no worsening cognitive outcomes in infants receiving bevacizumab compared to laser for treatment of ROP. Gestational age and best-corrected visual acuity were correlated with cognitive development in children. This supports that bevacizumab is a safe treatment for ROP and does not carry the risk of worsening cognitive development, although the sample size is low and patients were screened at the age of 8 years, which may miss some earlier neurodevelopmental effects.

Characteristics Of 'notch' In Retinopathy Of Prematurity Following Intravitreal Ranibizumab Monotherapy
Zhang F, Zou Q, Liu Q, You Z
Retina Published online August 23, 2024
Anti-VEGF treatment has grown in popularity for treatment of retinopathy of prematurity (ROP). The “notch” in ROP is defined as the area where the ROP lesions extend more posteriorly within 1 to 2 clock hour points above and below the horizontal meridian. The notch is observed in various eyes following ranibizumab treatment. This single center retrospective study analyzed the clinical features of notch among infants with ROP who received intravitreal ranibizumab. 173 eyes of 96 infants who received ranibizumab for Type I ROP or A-ROP were included. In Type I ROP, the notch was detected in 35.7% of patients and primarily appeared in Stage 2 ROP at the junction of zones I and II on the temporal side. Notch was present in the Type 1 ROP group before the first ranibizumab injection but posttreatment in the A-ROP group. A significantly higher reactivation rate, longer follow-up duration, and postmenstrual age at the last follow-up

were seen in the notch (+) versus the notch (-) group. In the notch (+) ROP group, the mean gestational age was significantly lower in reactivated versus regressed eyes. The reactivation rate after intravitreal ranibizumab was increased in patients in ROP with notches and may be a useful biomarker and help with risk stratification.

Mydriasis for retinopathy of prematurity screening in Europe: A cross-sectional online survey
Seliniotaki AK, Bougioukas KI, Lithoxopoulou M, et al
European Journal of Ophthalmology 2024;34(6):1803-1809
This study compiled real-time data on the preferred mydriasis practice patterns for retinopathy of prematurity (ROP) screening in Europe. A cross-sectional online survey was conducted from December 2022 to January 2023, using a self-report online questionnaire which was distributed via email to the members of the European Pediatric Ophthalmological Society and the Greek National ROP Task Force. A six-week period of recruitment was designated, and a reminder email was sent after two weeks. Sixty-six responses were recorded (response rate: 29.5%), representing practices in 55 Neonatal Intensive Care Units from 21 European countries. In 94.5%, the applied mydriatic regimen consists of phenylephrine with at least one muscarinic antagonist, either tropicamide or cyclopentolate. The concentration of phenylephrine ranges from 0.5% to 5%, of tropicamide from 0.25% to 1%, and of cyclopentolate from 0.2% to 1%. The most commonly used regimen (43.6%) contains phenylephrine 2.5% and tropicamide 0.5%, administered either combined or separately. About 54.5% of the reported mydriatic solutions are non-commercial, in-house preparations. Systemic adverse events, including oxygen desaturation, bradycardia and cardiopulmonary arrest were reported in 14.5% of cases. The findings from this study suggest that there is considerable heterogeneity in the applied mydriatic regimens for ROP screening in Europe, reflecting the absence of universal guidelines. The wide use of in-house preparations underlines the gap in the pharmaceutical industry. Given the relatively high percentage of cases with systemic complications after mydriatic drops in this fragile patient population, more attention should be given to efforts in developing general guidelines and protocols across hospital systems in Europe.

Strabismus

Increase in blood derived mitochondrial DNA copy number in strabismus patients
Zehra Z, Zia MA, Siddiqui SN, et al.
J AAPOS 2024;28(6):104042
Abnormalities in mitochondrial energy homeostasis can lead to various disorders, including ocular motility aberrations such as strabismus. In this study, the authors compared blood-derived mitochondrial DNA (mtDNA) copy number from comitant strabismus patients with that from age-matched controls and also examined the expression of mitochondrial biogenesis genes in a separate set of extraocular muscle samples from strabismic and control subjects. Blood samples from 93 strabismic patients (39 esotropic, 54 exotropic) and 93 control subjects were analyzed for mtDNA copy number using quantitative polymerase chain reaction, while the expression of six genes involved in mitochondrial biogenesis was examined in cDNA obtained from extraocular muscles of a separate group of 26 strabismus patients and four healthy controls. The results showed that mtDNA content was significantly higher in strabismus patients compared to the control group, both overall ($P < 0.00001$) and within the strabismus subgroups (esotropia: $P < 0.00001$; exotropia: $P < 0.00001$). However, no significant difference was observed in the expression of the examined biogenesis genes between the strabismus and control groups. Limitations of the study include the use of blood samples instead of extraocular muscle tissue and the inability to determine whether the correlation between strabismus and increased mtDNA copy number reflects a causal relationship or a common underlying factor. These findings suggest an association between mtDNA copy number and strabismus, but further research is needed to elucidate the significance of altered mtDNA in strabismus and its potential role in the condition's etiology.

Incidence of strabismus surgery after vitreoretinal surgery
Johnson WJ, Bitner DP, Bacig C
J AAPOS 2024;28(6):104047
While strabismus can occur after various intraocular surgeries, vitreoretinal procedures, often involving retrobulbar anesthesia and exoplants, carry a higher risk. This study investigated the prevalence of strabismus surgery following vitreoretinal surgery within a large, multispecialty practice with the region's sole adult strabismus surgeon. The study included a large cohort of vitreoretinal surgery cases performed within this practice. Researchers identified patients who underwent subsequent strabismus surgery and collected data on the type and number of prior retinal surgeries, history of strabismus surgery, pre- and postoperative strabismus measurements, and surgical outcomes. Out of 4,176 retinal surgeries, 7 cases (0.17%) resulted in strabismus surgery, with only one patient having a prior history of strabismus surgery. Among the remaining 6 patients, 2 had undergone scleral buckle placement, and 2 had a clinical course consistent with typical block infiltration strabismus. Strabismus surgery occurred on average 22 months (range, 7-40 months) after the initial retinal surgery. No patient required more than one strabismus surgery, and all but one achieved microtropia or better postoperatively. Despite the limitations of a retrospective design, this study, with its unique strength of having a single adult strabismus surgeon in the region, demonstrates a low risk of needing strabismus surgery after

retinal surgery. This may be attributed to the trend toward less invasive retinal procedures, with smaller instrumentation and reduced exoplant use.

Evaluation of a Novel Virtual Reality Simulated Alternate Cover Test to Assess Strabismus: A Prospective, Masked Study
Mori DM, Kuchhangi A, Tame J, et al
Am J Ophthalmol 2025;269:266-272
This study evaluated a virtual reality (VR)-based eye-tracking system for strabismus measurement in children, comparing it to the gold standard sensorimotor examination. This prospective, masked diagnostic test study included 85 children (ages 5-18) with visual acuity of 20/80 or better. Participants underwent a VR-simulated alternate cover test using the Olleyes VisuALL ETS headset, followed by a gold-standard alternate cover test performed by a masked pediatric ophthalmologist or orthoptist. Strabismus measurements from both methods were compared, and the sensitivity and specificity of the VR system were assessed. Of the participants, 40% (34/85) had strabismus, with esotropia, exotropia, and vertical strabismus present in 17.7%, 22.4%, and 5.9%, respectively. The VR system showed moderate overall correlation with the gold standard ($r = 0.42$, $p < 0.001$), with the strongest correlation for esotropia ($r = 0.74$, $p = 0.001$) and constant deviations. However, it demonstrated weak or no correlation for exotropia and vertical strabismus. Bland–Altman analysis revealed larger mean differences for exotropia and vertical strabismus, indicating underestimation by the VR system. The VR system had low sensitivity (27.6%) but high specificity (87.5%). This study, as the first to evaluate a VR-based alternate cover test, highlights the potential of VR technology for strabismus assessment, particularly for esotropia and constant deviations. Despite limitations such as poor sensitivity and underestimation of exotropia, VR offers advantages in accessibility, telemedicine integration, and postoperative monitoring. Future refinements should focus on improving accuracy, particularly for exotropia and intermittent deviations, and enhancing sensitivity for reliable strabismus detection. VR holds promise for expanding strabismus detection and monitoring, especially in telemedicine and remote screening applications, but requires further development before widespread clinical adoption.

Multiple Factors Causing Variability of Alignment in Childhood Concomitant Strabismus
Guo Y, Guan Y, Li LI, Jiang J
Am J Ophthalmol 2025;270:77-82
This study investigated factors contributing to variability in strabismus measurements to improve accuracy in clinical assessments and surgical planning. In this prospective interexaminer reliability analysis, 197 children with concomitant strabismus (57 with esotropia and 140 with exotropia) underwent repeat prism and alternate cover tests (PACT) by two independent orthoptists. Sensory tests were performed once, and measurements were classified as stable (difference within 10 prism diopters [PD]) or unstable (difference ≥10 PD). Variables analyzed included sensory results (suppression, stereopsis), patient age, and angle of deviation. Results showed that suppression significantly increased variability at distance ($p=0.004$) and near ($p=0.046$), while anisometropia was associated with increased variability at distance ($p=0.035$). Larger angles of deviation also increased variability, especially at distance. Age was not a significant factor, and while not statistically significant, better stereopsis tended towards more

stable measurements. This study, with its strengths in prospective design and large sample size, highlights key factors influencing alignment variability in strabismus: suppression, anisometropia, and large angles of misalignment. Clinicians should consider these factors when determining surgical dosing, and improved assessment techniques or repeated testing may be necessary to reduce measurement errors. Future studies should evaluate longitudinal stability of alignment to further refine surgical planning. This research emphasizes the importance of considering sensory status and deviation magnitude when evaluating strabismus alignment, ultimately contributing to better surgical outcomes.

Horizontal extraocular muscle insertion locations in children undergoing extraocular muscle surgery
Lin RZ, Reynolds MM, Lee AR
J AAPOS Published online January 22, 2025
Extraocular muscle (EOM) insertion sites are estimated using the spiral of Tillaux, which was developed by surgeon Paul Jules Tillaux with data collected from adult cadaveric eyes in the nineteenth century. There is some more recent evidence that suggests extraocular muscle insertions may be variable depending on age of the patient and/or presence of strabismus. This study aims to determine location of EOM insertions in children undergoing eye muscle surgery. This is a retrospective study that included children aged 0-17 years who had horizontal EOM surgery by one of two pediatric ophthalmologists between October 2022 and December 2023. Patients with prior strabismus surgery or glaucoma were excluded. Measurements of EOM insertion locations were obtained intraoperatively with either a Scott curved ruler or a caliper and were taken from the anterior limbus to the midpoint of the EOM to the nearest 0.5mm. Demographics, sensorimotor exam, cycloplegic refraction, and axial length were also collected for each patient. 292 patients were included in the analysis, in which 143 (49.0%) had esotropia, 144 (49.3%) had exotropia, and 5 had eye muscle surgery due to nystagmus or anomalous head position. Measurements were recorded for 528 horizontal muscles. In this cohort, the mean insertions for the medial rectus (MR) and lateral rectus (LR) were significantly closer to the limbus than the spiral of Tillaux. MR insertions were significantly farther from the limbus in males, older children, and in children with exotropia. LR insertions were closer to the limbus in children with esotropia and children aged 0-4 compared with exotropia and children aged 13-17, respectively. When bilateral surgery was performed, the MR insertions were symmetric; however, the LR insertions were asymmetric between eyes, although this did not reach statistical significance. Limitations include retrospective design with strabismic patients; therefore, data may not be generalized to children without strabismus. However, there is little data on EOM insertion location in children, and this study adds to the body of knowledge on this subject. Additional investigation may determine effect of EOM insertion location on surgical planning or outcomes.

The effect of low hypermetropia correction and office-based orthoptic training on binocular vision parameters in children with convergence insufficiency
Rosa A, Rosa P, Kochana M, Ordon AJ, Loba P
J AAPOS Published online January 24, 2025

Summary of background (1-2 sentences). Convergence insufficiency (CI) may be treated with pencil push-ups, office-based orthoptic training, passive treatment with base-in prism reading glasses, or observation to improve binocular function. Low hyperopia spectacles are not generally given; however, this study aims to investigate the effect of low hyperopia correction only or with orthoptic exercises on binocular function and symptom control in children with CI. This is a prospective, randomized intervention trial with a 3-month follow-up period. Patients who met the inclusion criteria were randomized into one of three groups based on treatment: Group 1, spectacle correction and office-based orthoptic training; Group 2, spectacle correction alone; Group 3, office-based orthoptic training alone. 55 patients aged 6-12 years were included in the study. Decreased symptoms were achieved in all groups. Groups 1 and 2 demonstrated statistically significant reduction in near point convergence and groups 1 and 3 had improvement in fusional convergence for distance. Group 1 had the largest improvement in mean accommodative facility. Strengths of this study are its prospective, randomized design and use of the functional symptoms intensity scale to document symptoms. Limitations include unmasked examiner and unmasked randomization. In children with CI, low hyperopic spectacles may improve symptoms, near point convergence, and accommodative facility without compromising visual acuity or phoria angle.

Transient eye closure and ocular preference in patients with intermittent exotropia
Rostami M, Kiarudi MY, Hassanzadeh S, et al.
J AAPOS 2024;28(6):104015
Transient eye closure (TEC) under bright light is a clinical sign often observed in patients with intermittent exotropia. This study aimed to assess the relationship between sensory and motor ocular dominance and TEC under bright light conditions in these patients. It was a prospective, cross-sectional, observational study involving 40 patients (ages 7-40 years) with intermittent exotropia. Motor and sensory ocular dominance were evaluated using the hole-in-the-card and Worth 4-Dot tests, respectively, while the presence of outward eye deviation or TEC was recorded under bright light conditions. Patients were categorized into good, fair, and poor fusion control groups based on their exodeviation control grade, and the results were compared. TEC under bright light was observed in 23 patients (58%): 18 (45%) in the good control group, 14 (35%) in the fair control group, and 8 (20%) in the poor control group. Among those with good and fair control, 18 patients (56%) exhibited TEC in the dominant eye, while 5 patients (63%) with poor control closed their nondominant eyes, all of whom displayed outward eye deviation before TEC. The angle of deviation at far and near and the degree of near stereopsis were not significantly related to the presence of TEC ($P = 0.70$, $P = 0.06$, and $P = 0.34$, respectively). Limitations of the study included a small sample size, lack of binocular photophobia threshold assessment, subjectively measured photosensitivity, and the absence of comparisons between ocular dominance and fixation preference during strabismus testing or assessments using binocular rivalry tests. Additionally, conducting similar experiments in outdoor conditions under sunlight at longer distances would better simulate real-life scenarios. While the study provides interesting insights, it does not have a significant impact on clinical practice.

Characteristics of horizontal saccades in children with intermittent exotropia
Mihara M, Kakeue K, Tamura R, Hayashi A

J AAPOS 2024;28(6):104036
Previous studies in adults have shown that eye movements in patients with intermittent exotropia (IXT) differ from those without IXT, but it remains unclear whether the characteristics of saccades in IXT are innate or develop later due to chronic exotropia. This study aimed to analyze the peak velocity and gain of horizontal saccades in children with IXT and compare these measurements to those of children without strabismus. The study included children ≤12 years old with IXT and no history of strabismus surgery, as well as children without strabismus, and utilized an eye tracker to record and analyze the peak velocity and gain of horizontal saccades. A total of 48 children, including 38 with IXT, were included in the final analysis. No significant differences were found between the two groups in terms of saccade velocity or gain when comparing horizontal saccades in all directions. Both groups exhibited a tendency toward higher saccade gain and peak velocity for adduction, except in the nondominant eye of children without strabismus. A strength of this study was the use of the EyeTracker system, which increased the objectivity of the testing; however, limitations included the exclusion of children with <2 seconds for re-fusion after the cover-uncover test, the fact that only 48 out of 74 children had usable data, and the inability of children under four years old to complete the saccade task. Understanding the characteristics of saccades in children with IXT may provide a dynamic index of eye movements that could impact eye-hand coordination, reading, and ball sports from a different perspective compared with traditional measures such as deviation angle and stereopsis. Additionally, a diminishing dominance of the adduction saccade may be a sign of changing IXT control over time and could influence reading performance, contributing to issues such as re-reading the same line and slow reading speed.

Risk of serious intracranial pathology in children presenting with acute acquired comitant esotropia
Cote E, Reginald YA, Wan MJ
Can J Ophthalmol 2024;59(6):e819-e823
This is a retrospective observational cohort study of all children who presented with acute acquired comitant exotropia and underwent neuroimaging at the Hospital for Sick Children between 2000 and 2020. The authors excluded patients with incomitance, an accommodative component, hyperopia greater than +4.00 diopters, paralytic esotropia, a known history of strabismus or strabismus surgery, a known neurological disorder, or age less than 6 months or greater than 18 years. A total of 107 patients met the inclusion criteria. The mean age at presentation was 5.6 years, and 58% of the patients were male. The most common presenting symptom was diplopia, followed by headache. The mean distance deviation was 31.4 prism diopters (pd), while the mean near deviation was 35.6 pd. Neuroimaging findings were categorized into four groups: normal imaging, incidental finding, findings of uncertain contribution to exotropia, and likely causative lesions The majority of patients (76%) had normal neuroimaging. A total of five patients had imaging findings of uncertain contribution to exotropia, three of whom were diagnosed with Type 1 Chiari malformation. One child was found to have a serious intracranial pathology, specifically a medulloblastoma. Overall, 94.4% of patients had normal imaging or incidental findings that were not contributory to their exotropia. The authors highlight that this study provides valuable epidemiological insights into acute acquired comitant exotropia and addresses the diagnostic challenges faced by clinicians. The finding that the

overwhelming majority of patients had non-contributory MRI results is reassuring and may help guide future decision-making regarding the necessity of neuroimaging in similar cases.

Body Mass Index Is Associated With Orbital Pulley Degeneration Syndrome, Including Sagging Eye Syndrome
Iida K, Goseki T, Onouchi H, Sano K, Nakano T
Am J Ophthalmol 2024;268:312-318
This study investigated whether body mass index (BMI) is associated with orbital pulley degeneration syndrome (OPDS), particularly sagging eye syndrome (SES). OPDS encompasses conditions like SES, esotropia with high myopia, and age-related esotropia (ARE), all involving strabismus due to lateral rectus-superior rectus (LR-SR) band degeneration. This retrospective cohort study, conducted at a single center in Shizuoka, Japan, from July 2020 to March 2023, included 204 patients aged ≥50 years who underwent strabismus surgery. Patients were classified into OPDS (78) and non-OPDS (126) groups, as well as SES (49) and non-SES (119) groups, with BMI categorized into four groups: <18.5, 18.5–21.9, 22–24.9, and ≥25 kg/m². The SES group excluded patients with high myopia and ARE to isolate pure SES cases. Results showed that patients with OPDS had significantly lower BMI (21.2 ± 3.3 kg/m²) than non-OPDS patients (23.2 ± 3.0 kg/m², P <.001). Similarly, SES patients had significantly lower BMI (21.2 ± 3.3 kg/m²) than non-SES patients (23.1 ± 3.0 kg/m², P=.003). OPDS and SES were more prevalent in the lowest BMI group (<18.5) (P <.001 and P =.006, respectively). Logistic regression confirmed the association between lower BMI and higher OPDS/SES prevalence, independent of age and sex. This study provides new insights into BMI as a potential risk factor for OPDS/SES, suggesting that decreased orbital fat, more common in individuals with low BMI, may contribute to LR-SR band weakening and SES. Despite limitations such as its retrospective, single-center design and potential confounding factors, this study highlights the clinical relevance of BMI in assessing older patients with strabismus, particularly those with SES. Future research should further investigate the relationship between BMI, orbital fat, and OPDS/SES, exploring potential interventions like increasing BMI or orbital fat restoration to mitigate SES-related strabismus.

Validity and Reliability of 2 Cirrus Optical Coherence Tomography Procedures for Measuring Objective Ocular Torsion
Piedrahita-Alonso E, López-Redondo E, Valverde-Megías A, et al.
Am J Ophthalmol 2025;269:273-281
This study evaluated the validity and reliability of two new Cirrus HD-OCT methods (HD 1 line and macular cube) for measuring ocular torsion, compared to the gold standard fundus photography and Spectralis SD-OCT (FoDi software). Ocular torsion, measured via the disc-fovea angle (DFA), is crucial for diagnosing vertical strabismus and assessing extraocular muscle disorders. In this prospective study, 59 healthy individuals with normal binocular vision underwent DFA measurements three times using each method. Measurements were repeated after repositioning to assess reliability, and two independent observers quantified results for manual methods. All three OCT methods showed excellent agreement with fundus photography (ICC: 0.83–0.84), with excellent reliability across all methods (ICC: 0.91–0.92). The minimal detectable change was less than 3°, and repeated measurements had an absolute difference of

around 1°. Interrater reliability was high (ICC: 0.98 for the cube method, 0.94 for fundus photography). The Cirrus HD-OCT line method proved to be a fast and easy alternative, allowing real-time verification of foveal fixation. This study supports the clinical use of Cirrus HD-OCT for DFA measurement, offering a quicker and simpler alternative to fundus photography while maintaining accuracy and reliability. The HD 1 line method is particularly valuable due to its ease of use and real-time verification, making objective ocular torsion assessment more accessible in routine ophthalmologic practice. While limited by its focus on normal individuals and potential head positioning issues, this study highlights the efficiency improvements with the Cirrus HD-OCT, particularly the line method, which eliminates the need for exporting images for measurement. This objective assessment method improves the accessibility and efficiency of ocular torsion measurement in clinical practice.

Numerical Aberrations of the Extraocular Muscles and the Levator Palpebrae Superioris: An Anatomical and Clinical Insight
Tawfik HA, El Houssieny OA, Dutton JJ
Ophthalmic Plast Reconstr Surg 2025 Jan-Feb 01;41(1):8-21
The extraocular muscles (EOMs) include the four rectus muscles, the two oblique muscles (superior, inferior), and the levator palpebrae superioris (LPS) muscle. While the human orbit generally follows a standard anatomical structure, there are documented variations, including accessory muscle bands, muscle duplication, and even complete absence of muscles in some cases. This article aims to bring clarity to the diverse and often rare anatomical variations of EOMs, which can have implications in both normal and pathologic eye conditions. The authors reviewed all the relevant literature and then summarized the possible causes of aberrations of the EOMs and organized these lesions into several broad categories. Anatomical classifications of these variations are often confusing, with different terms used to describe similar abnormalities. The article proposes a more organized classification system, including categories for absent muscles, duplicate muscles, accessory muscle bands, bifid muscles (muscles with two heads), and unclassified anomalies. This article is interesting in that it focuses on rarely studied anatomic variations. It does have significant weaknesses as it is a literature review and does not include experimental evidence on the etiology of these anomalies. Despite this, I believe this is an important article for strabismologists as it emphasizes the importance of considering numerical variations of EOMs to prevent misdiagnosis and improve surgical outcomes.

Prevalence of strabismus and risk factors in adults born preterm with and without retinopathy of prematurity: results from the Gutenberg Prematurity Eye study
Fieß A, Dautzenberg K, Gißler S, et al
Br J Ophthalmol 2024;108(11):1590-1597
The Gutenberg Prematurity Eye Study is a retrospective cohort study with a prospective ophthalmological examination of participants born preterm and full-term (aged 18–52 years). Participants were grouped into full-term controls (gestational age (GA) at birth ≥37 weeks), preterm participants without retinopathy of prematurity (ROP) and GA 33–36 weeks (group 2), GA 29–32 weeks (group 3), GA ≤28 weeks (group 4), non-treated ROP (group 5) and treated ROP (group 6). 450 individuals with mean age 28.6 years were included. In the multivariable

regression model, strabismus was associated with gestational age, anisometropia ≥1.5D, hypermetropia ≥2D and astigmatism ≥1.5D. Esotropia was more frequent than exotropia or vertical deviations. Most strabismus cases occurred within the first 10 years of life. The strongest predictor associated with nystagmus was perinatal adverse events (OR=15.8). This study is one of the few longitudinal studies involving premature patients into adulthood, and confirms previous knowledge of the main determinants of strabismus including prematurity.

Disconjugacies of saccade duration and trajectories in strabismus
Walton MMG
Strabismus 2024;32(4):252-270
Previous studies have shown the amplitudes and directions of saccades often differ for the two eyes in strabismus, but it is unknown whether a similar disconjugacy exists for duration. This study was designed to determine whether or not saccade duration differs for the two eyes in strabismus, and whether there are abnormalities involving the trajectories of these movements. Dynamic analyses of saccade trajectories and durations were performed for two normal monkeys, two with esotropia and two with exotropia. The amount of curvature was compared for the two eyes. For each monkey with strabismus, the amount of curvature was compared to normal controls. Saccades were placed into 12 bins, based on direction; for each bin, the mean saccade duration was compared for the two eyes (duration disconjugacy). The duration disconjugacy for each bin was then compared for monkeys with strabismus, versus normal control animals. The amount of curvature was not consistently greater in subjects with pattern strabismus. However, saccade curvature differed for the two eyes by a significantly greater amount for all monkeys with strabismus, compared to normal controls. In addition, for a subset of saccades in subjects with strabismus, saccade duration differed for the two eyes by more than 10 ms, even when the animal was fully alert. A potential limitation of the above analysis is the fact that the measure of the amount of curvature does not provide information about the direction of the curvature. In the monkeys with strabismus it was common for one eye's saccade to be directed along one of the cardinal axes, while the fellow eye's saccade was oblique. Also, it was common for the smaller component of oblique saccades to be in opposite directions for the two eyes in the animals with strabismus.

Analysis of the effect of congenital unilateral trochlear nerve paresis on retinal vascular density: a retrospective study
Karapapak M, Kaldırım H, Özal E, Arabacı İÇ, Ermiş S
J AAPOS Published online January 23, 2025
Congenital unilateral trochlear nerve paresis, a common cause of vertical strabismus, often results in compensatory head tilt. There is a paucity of information that investigates the impact of abnormal head position on ocular hemodynamic variations. This study aims to evaluate alterations in retinal vascular density (VD) using swept-source optic coherence tomography angiography (SS-OCTA), a non-invasive imaging technique. Medical records of patients with congenital unilateral trochlear nerve palsy without prior strabismus surgery diagnosed between May 2020 and April 2024 at a single institution were reviewed and compared to a healthy control group. Comprehensive ocular exams with sensorimotor exams and SS-OCTA were performed. Patients were excluded if there was other ocular pathology, vasculopathy, or risk

factors for vasculopathy. 34 patients with congenital unilateral trochlear nerve palsy and 39 healthy controls were included. Statistically significant differences in central VD of the superficial capillary plexus (SCP) and deep capillary plexus (DCP) were observed with a lower central VD found in the fellow eye than the paretic or healthy control eyes. Inverse correlations between the distant deviation angle and mean VD of the SCP and DCP of the paretic eye were also statistically significant. This study implores a novel use of SS-OCTA to investigate effects of head tilt in trochlear nerve palsy on retinal vasculature. Limitations include retrospective design that may introduce selection bias and uncontrolled variability, small sample size that limits generalizability, and lack of longitudinal data. The impact of long-standing head position due to strabismus on retinal vasculature and ocular hemodynamics requires further study, and the SS-OCTA may provide a non-invasive technique to gather data.

Longitidunal changes in accommodation amplitude after strabismus surgery
Koca S, Güven S, Köksal Ş
J AAPOS Published online January 24, 2025
Strabismus surgery has been shown to disrupt the perfusion of the eye from disinsertion of the anterior ciliary arteries (ACA) with the rectus muscles. This study aims to investigate whether accommodation amplitudes are altered with disruption of the ACA to the ciliary muscle in strabismus surgery. This is a retrospective, comparative study that included patients ages 6-40 years with strabismus that underwent strabismus surgery with disinsertion of at least one rectus muscle. Patients with high accommodative convergence to accommodative ratio were excluded. 67 eyes of 36 patients were included in the analysis. During the first post-operative week, the accommodative amplitudes were significantly reduced compared to baseline values. This improved over the study period, increasing back to baseline by 3 months post-operative. Limitations include retrospective design, lack of control group, unclear impact of number of rectus muscles tenotomized. This study demonstrated a decrease in accommodative amplitudes early in the post-operative period that returned to normal; however, further investigation is needed to elucidate cause and clinical significance.

Strabismus Surgery

Agreement between intraoperative and anterior segment optical coherence tomography measurements of the extraocular muscle insertion distance in patients with previous strabismus surgery
Rodríguez M, Plata MC, Mejía ME, Lozano M
J AAPOS 2024;28(5):104011
Strabismus surgery in patients who have undergone previous surgeries is challenging, especially when you do not have records. Traditional imaging techniques such as ultrasound and ultrasonic biomicroscopy (UBM) have been employed for muscle visualization, but these have limitations, particularly regarding resolution or patient comfort. AS-OCT has emerged as a promising alternative, providing higher resolution images without contact. This study addresses the question of whether AS-OCT can reliably measure muscle insertion distances in patients who have had prior strabismus surgeries. The study involved 55 horizontal rectus muscles from 25 patients who had previously undergone strabismus surgery and were scheduled for reoperation. The AS-OCT measurements were taken before surgery and compared with intraoperative measurements using a Castroviejo caliper. The study found strong positive correlations between AS-OCT and intraoperative measurements for both medial rectus (MR) and lateral rectus (LR) muscles. The measurements were more accurate for muscles closer to the limbus (≤10 mm) than for muscles more than 10 mm from the limbus. The main strength of this study is the direct comparison of the AS-OCT measurements to the intraoperative measurements. Weakness include the limited sample size and inclusion of only horizontal muscles. This is an important study as it highlights AS-OCT role as a promising non-invasive imaging modality for strabismus surgery planning in patients undergoing re-operation.

Strabismus surgery for patients with acquired nonaccommodative esotropia based on monocular occlusion test
Masoomian B, Othman N, Mirmohammadsadeghi A, Akbari MR, Khorrami-Nejad M, Sadeghi M
J AAPOS 2024;28(6):104031
In approximately 22% of patients with acquired nonaccommodative esotropia (ANAET), preoperative angles of deviation are unstable. This study prospectively enrolled ANAET patients whose angle of esodeviation increased by at least 10Δ after 1 hour of monocular patching to evaluate the outcome of surgery based on this test. A monocular occlusion test was performed on 32 patients, with 14 (44%) showing a significant change in the angle of esotropia. The mean age was 21.4 (range, 5-50) years, and 8 (57%) were female. All patients underwent bimedial rectus muscle recession based on near esotropia after 1 hour of monocular occlusion. After a 12-month follow-up, the final mean angle of esodeviation was 1.0Δ ± 2.2Δ (range, 0Δ-6Δ) for distance and 3.6Δ ± 3.2Δ (range, 0Δ-10Δ) for near. No diplopia or other postoperative complications were reported, and all but one patient achieved alignment <8Δ of esodeviation postoperatively. A limitation of the study is the small sample size and the lack of comparison with a group of patients who did not respond to occlusion and underwent surgery based on the Prism adaptation test (PAT). Despite these limitations, the findings suggest incorporating monocular occlusion into the preoperative assessment to determine the surgical target in

ANAET patients. While less definitive than PAT, patch testing offers advantages in time efficiency and accessibility in certain clinical settings.

Augmented-dose surgery based on the single Maddox rod test for acute acquired comitant esotropia
Zheng J, Wang Y, Shen T, et al.
J AAPOS 2024;28(6):104037
Previous studies indicate that postoperative undercorrection is common in patients with acute acquired comitant esotropia (AACE), leading to recommendations for increased surgical doses. This retrospective study compared the outcomes of augmented-dose surgery for AACE based on either the single Maddox rod test (SMRT) or the prism and alternate cover test (PACT) when a clinically significant difference existed between the two tests. The study reviewed the records of AACE patients who underwent augmented-dose surgery with a difference of ≥5Δ in preoperative deviations measured by PACT and SMRT. Augmented-dose surgery was determined by either the SMRT or PACT. Success was defined as the elimination of diplopia and deviations ≤10Δ, assessed with both PACT (PACT success) and SMRT (SMRT success) at near and distance. The study included 18 patients in the SMRT group and 15 in the PACT group. In the SMRT group, the PACT success rate was 94%, and the SMRT success rate was 78%. Postoperative distance esodeviation was 0.72Δ ± 1.64Δ by PACT and 5.94Δ ± 4.73Δ by SMRT. In the PACT group, the PACT success rate was 80%, and the SMRT success rate was 33%. Postoperative distance esodeviation was 4.07Δ ± 5.15Δ by PACT and 13.73Δ ± 7.96Δ by SMRT. The SMRT success rate was significantly higher in the SMRT group than in the PACT group ($P = 0.010$), and the postoperative distance deviation was smaller in the SMRT group ($P < 0.05$), though there was no statistically significant difference in sensory outcomes between the groups. Limitations of the study include its retrospective design, small sample size, short follow-up duration, the variety of surgical procedures performed, and the use of adjustable sutures in some cases. Despite these limitations, the findings suggest that among patients with a difference of ≥5Δ in preoperative deviations assessed by SMRT and PACT, augmented-dose surgery based on the SMRT should be considered.

Characteristics and Surgical Outcomes of Comitant Esotropia in an Adult Population Between 18 and 60 Years Old
Cavuoto KM, Tibi C, Rosa PR, Capo H
Am J Ophthalmol 2024;267:13-18
This study aimed to describe the clinical characteristics and surgical outcomes of adults (ages 18–60) with comitant nonaccommodative esotropia. In this retrospective case series, adults with comitant esotropia who underwent strabismus surgery at a tertiary eye care center between 2014-2023 were categorized based on their near-distance deviation pattern: Basic Esotropia (ETBA), Divergence Insufficiency (ETDI), and Convergence Excess (ETCE). Surgical procedures included bilateral medial rectus recession (BMR) and unilateral recess-resect (R&R). Outcome measures were motor success (postoperative deviation ≤10 prism diopters [PD]) and sensory success (resolution of diplopia without prism correction). The study included 219 patients (64% female, mean age 36.7 years), with most having myopia (72%) and diplopia (80.3%). ETCE had the largest mean deviations (45.5 PD at distance, 64 PD at near), while

ETBA had the widest range of deviations. Motor success was higher with R&R (87.8%) than BMR (73.2%, p = 0.0375), but sensory success rates were not significantly different (R&R: 93.3%, BMR: 85.5%). Overall, 88.1% achieved single binocular vision. ETDI had a slightly higher dose response for BMR, suggesting a different underlying mechanism. This study, with its strengths in sample size, comprehensive classification, and long-term follow-up, demonstrates high success rates for both motor and sensory outcomes in strabismus surgery for adults with comitant nonaccommodative esotropia. Despite limitations such as its retrospective design and surgeon variability, it highlights the importance of classifying esotropia subtypes for surgical planning and suggests R&R may be preferable to BMR for motor outcomes. The findings also emphasize the role of near work and myopia in esotropia development. This research reinforces the effectiveness of surgical correction in adult esotropia and provides insights into optimizing surgical techniques for different esotropia patterns.

Surgical Timing for Patients with Thyroid Eye Disease Treated with Teprotumumab: A Collaborative Multicenter Study
Walsh HL, Clauss KD, Meyer BI, et al
Ophthalmic Plast Reconstr Surg Published online December 10, 2024
Thyroid eye disease (TED) is a difficult to treat autoimmune inflammatory condition with a range of ocular symptoms. TED is primarily caused by the overexpression of the insulin-like growth factor 1 receptor (IGF-1R) on orbital fibroblasts, immune cell infiltration, and cytokine production, leading to inflammation and tissue expansion. Recent advancements in treatment, particularly the approval of teprotumumab (an IGF-1R-targeting monoclonal antibody), have shown significant improvements in managing active TED; however, surgical interventions are still necessary for certain symptoms. A challenge now is determining the optimal timing for surgery after teprotumumab treatment, as the drug's half-life is about 20 days, with its effects lasting up to 100 days. Surgeons traditionally wait 6 months after treatment for immune quiescence before performing surgery, though recent data suggest that surgery might be performed within a shorter window post-treatment without increased risk of disease regression. The study examined TED patients who underwent surgery either within 180 days or after 180 days of their last teprotumumab infusion to compare disease regression rates. The results revealed no significant difference in regression rates between the two groups. The study also found that regression characteristics, such as increased proptosis and higher Clinical Activity Score (CAS), were more pronounced in patients who underwent surgery later. Strengths of this study were its multicenter design and its attempt to answer an important clinical question. Weaknesses were its small sample size, retrospective design, and inability to come up with an definitive recommendation for optimal surgical timing. Overall, the study provides valuable insights into the optimal timing for surgical intervention in TED patients treated with teprotumumab. This is an important discussion and will hopefully prompt future studies looking for a more definitive answer.

Novel Fixable Instruments Used in Strabismus Surgery
Yang M, Pan M, Xie R
J Pediatr Ophthalmol Strabismus 2024;61(6):425-433
Effective strabismus surgery typically requires at least one skilled assistant; however, a skilled assistant may not always be available. Here, the authors describe the utility of novel “fixable”

instruments in strabismus surgery that may allow a surgeon to complete an operation without an assistant. The first instrument introduced is a fixable forceps, which is essentially a dual-head locking forceps that can be used to grasp both the eye and the surgical drape simultaneously, thereby achieving stable eye positioning. The second instrument is a fixable muscle hook; this hook resembles a muscle hook on one side and a locking forceps on the other, allowing the muscle to be hooked and the instrument to be "fixed" on the surgical drape in a certain direction to maintain traction. The last instrument is a fixable retractor; it has a C-shaped retractor on one side and a locking forceps on the other, again allowing it to be positioned and locked into place while retracting. The authors report that the use of these instruments was relatively simple and allowed completion of surgery without an assistant without a significant increase in operative time.

Reliability of the Mendonça Strabismus Forceps in Locating the Insertion of Extraocular Rectus Muscles in Patients Undergoing Strabismus Surgery
Borges Corrêa A, Rossetto JD, Mendonça TS
J Pediatr Ophthalmol Strabismus 2024;61(6):404-409
The Mendoca forceps, a pair of almost circular, toothed forceps, are designed specifically for grasping the extraocular muscles and inserting a needle into the muscle, primarily for injection of botulinum toxin. However, there is not much evidence in the literature that these forceps are more efficient or effective at locating and isolating the extraocular muscles than comparable, more readily available forceps. To investigate this, the authors sought to locate, pre-operatively, the muscle insertion of any muscle undergoing operation in 41 patients with the Mendoca forceps. They then compared the estimated location of the insertion (determined by grasping with the Mendoca forceps) to the actual location of the insertion, as measured with a caliper after exposure of the muscle. In virgin muscles, the Mendoca forceps identified the location of the muscle insertion (within 1 mm) 100% of the time. In muscles undergoing re-operation, the forceps identified the insertion (within 1 mm) 89% of the time; only one muscle, a multiple re-operation, was unable to be successfully grasped. Overall, this shows the Mendoca forceps are quite effective at isolating and identifying the location of a given muscle insertion, even when that muscle has undergone previous surgery. Utilizing this tool may cut down on surgical time and exploration, especially on re-operations, in addition to its use in botulinum toxin injection. That said, it is possible that a more readily available toothed forceps may work just as well, although the wide circular design of the Mendoca does lend a nice "pinching" nature to grasping the extraocular muscles.

Clinical significance of medial rectus tendon width in unilateral medial rectus resection for patients with previously recessed lateral rectus muscle for exotropia
Kang E, Ha SG
J AAPOS 2024;28(6):104050
In cases of recurrent exotropia, medial rectus resection after bilateral lateral rectus recession is often considered for reoperations. While the amount of medial rectus resection is typically determined using standard surgical tables, postoperative variability in outcomes has been observed. This study explored the surgical dose-response, defined as the ratio between the amount of correction and the resected medial rectus. This retrospective study included 133

patients. The medial rectus tendon width (MRTW) was measured intraoperatively, and the surgical dose-response was calculated. The mean surgical dose-response was 3.66 ± 0.52 PD/mm. MRTW positively correlated with both age at surgery and surgical dose-response. Limitations of the study include its retrospective design, exclusion of children younger than 6 years, inclusion of only unilateral medial rectus resections, and lack of assessment of postoperative muscle width, central sagging, and extent of resection. Despite these limitations, the findings suggest that MRTW could be a potential intraoperative predictor of surgical dose-response when considering medial rectus resection for recurrent exotropia, warranting further investigation.

The role of lateral rectus muscle resection for severe esotropia after medial rectus muscle myectomy in Graves' ophthalmopathy
Chiu TY, Cheng MC, Wei YH, Liao SL
Eur J Ophthalmol 2025;35(1):239-244
Graves' ophthalmopathy can cause large-angle esotropia due to extraocular muscle infiltration by lymphocytes and fibroblasts. Some patients with large-angle esotropia undergo strabismus surgery with medial rectus myectomy but still have residual esotropia. This study explored the effectiveness of lateral rectus resection in these patients. In this retrospective analysis, 15 patients with at least 25 prism diopters of esotropia before their first strabismus surgery underwent unilateral or bilateral medial rectus myectomy. Those with residual esotropia of at least 10 prism diopters subsequently underwent lateral rectus resection, with dosing based on 1mm of resection per 2 prism diopters of esotropia. Lateral rectus resection proved effective in these patients, with no reported complications. This study provides valuable information about a surgical option for a specific subset of Graves' ophthalmopathy patients, given the limited literature on this topic. However, it lacks a control group and focuses on resections performed after myectomies rather than the typical medial rectus recessions, potentially limiting its generalizability. Despite these limitations, the study demonstrates reasonable success for lateral rectus resections after medial rectus myectomies in Graves' ophthalmopathy with residual esotropia.

Efficacy of the Subtenon Block in Children Undergoing Strabismus Surgery: A Systematic Review and Meta-Analysis
Pehora C, Johnston B, Shah U, Mireskandari K, Ali A, Crawford MW
Am J Ophthalmol 2024;268:108-122
This systematic review and meta-analysis evaluated the effectiveness of subtenon block in reducing postoperative pain, opioid consumption, and associated complications in children undergoing strabismus surgery. Researchers searched Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, Scopus, Web of Science, and clinicaltrials.gov, including only randomized controlled trials (RCTs) investigating subtenon block efficacy in this population. Outcomes assessed included postoperative pain severity, opioid and non-opioid analgesia requirements, incidence of postoperative nausea and vomiting (PONV), intraoperative oculocardiac events, and block-related complications. Continuous outcomes were analyzed using a random-effects model, while dichotomous outcomes were pooled to estimate relative risk (RR). Risk of bias and quality of evidence were assessed using the Cochrane Risk of Bias

tool and the GRADE framework, respectively. Nine RCTs with 607 participants were included. Subtenon block significantly reduced early postoperative pain scores (MD = -1.9, 95% CI -2.2 to -1.5) and opioid analgesia requirements (RR = 0.59, 95% CI 0.37-0.92), with high-quality evidence. It also reduced pain on PACU admission (MD = -1.8, 95% CI -2.2 to -1.4) and non-opioid analgesia use (RR = 0.52, 95% CI 0.27-0.98), with moderate-quality evidence. PONV, particularly vomiting, and intraoperative oculocardiac events were significantly reduced. No block-related complications were reported. This comprehensive review, with its robust methodology and quality assessment, demonstrates the effectiveness of subtenon block in improving early postoperative recovery and reducing opioid use in pediatric strabismus surgery. Despite limitations such as heterogeneity in surgical procedures and limited long-term data, the findings support the subtenon block as a safe and effective adjunct, aligning with modern anesthesia guidelines promoting multimodal analgesia and opioid-sparing strategies. Future research should focus on long-term effects, optimizing anesthetic protocols, and assessing efficacy in high-risk surgical cases. This study provides strong evidence for the routine use of subtenon block in pediatric strabismus surgery to enhance postoperative recovery and minimize opioid use.

Effect of Prophylactic Topical Antibiotics on Rates of Infectious Complications After Strabismus Surgery: A Large Database Study
Binczyk NM, Koo EB, Lambert SR
Am J Ophthalmol Published online December 10, 2024
This study investigated whether prophylactic topical antibiotics after strabismus surgery effectively reduce postoperative infection rates. Concerns regarding their efficacy, cost, potential for antibiotic resistance, and patient discomfort have led to a search for alternative preventive measures. This retrospective cohort study utilized data from the TriNetX electronic health-record registry, including 84,052 patients who underwent strabismus surgery over the past 20 years. Patients were categorized into those who received postoperative topical antibiotics (46%) and those who did not. The incidence of endophthalmitis, orbital cellulitis, and preseptal cellulitis was compared between the groups. Results showed low overall infection rates, with no statistically significant differences between the antibiotic and non-antibiotic groups. This large-scale study, with its access to a vast dataset and objective data collection, provides strong evidence that routine postoperative topical antibiotics do not significantly reduce infection risk after strabismus surgery. Despite limitations such as its retrospective nature and potential for misclassification bias, the findings support the use of alternative infection control measures, such as povidone-iodine, and encourage a more selective approach to antibiotic use. This could lead to reduced cost, improved patient comfort, and decreased antibiotic resistance, while maintaining low postoperative infection rates.

Three-year Outcomes of Botulinum Toxin Versus Strabismus Surgery for the Treatment of Acute Acquired Comitant Esotropia in Children
Nguyen MTB, Cheung CSY, Hunter DG, Wan MJ, Gise R
Am J Ophthalmol Published online January 3, 2025
This study compared the long-term effectiveness of botulinum toxin (BTX) injections versus strabismus surgery for treating acute acquired comitant esotropia (AACE) in children. This

multicenter, retrospective, nonrandomized, clinical noninferiority study included 76 children aged 2-10 years with AACE, followed for at least 36 months. 44 children received BTX injections in the medial rectus muscles, while 32 underwent bilateral medial rectus muscle recession surgery. The primary outcome was the success rate at 36 months, defined as a horizontal deviation of ≤10 prism diopters and evidence of binocular vision. At 6 months, the BTX group had a significantly higher success rate (89%) than the surgery group (59%, P =.005). However, at 36 months, the success rates were comparable (72% for BTX vs. 56% for surgery, P =.24), establishing noninferiority for BTX. BTX also required significantly less general anesthesia and shorter recovery time. Temporary ptosis and exotropia were common with BTX, while surgery was associated with conjunctival scarring and longer recovery. Early treatment was linked to better outcomes, with patients treated within 4 months having higher success rates at 36 months (P =.04). This study, with its large cohort and long-term follow-up, demonstrates that BTX is a viable noninferior alternative to surgery for AACE, offering faster intervention, reduced anesthesia exposure, and potentially lower healthcare costs. While surgery may still be necessary in some cases, BTX provides a less invasive and more accessible option, particularly when treatment is initiated early.

Psychological and functional outcomes of horizontal squint surgery in adults with no preoperative diplopia using Quality-of-Life AS-20 questionnaire
El Meshad N, Soliman H, Hunt S, et al
Br J Ophthalmol 2024;109(1):152-156
This was a a retrospective cohort study on patients with uncomplicated, horizontal squint conducted as part of a departmental clinical audit. It also aimed to challenge local clinical commissioning group (CCG) funding restrictions for what they regarded as a ‘cosmetic procedure’. 28 patients with median age 39 years with strabismus but no diplopia completed the QOL AS-20 questionnaire pre-op and at 3 months post surgery. 2/3 of the patients achieved successful alignment while 1/3 needed adjustment. There were no complications or diplopia and about 20% of patients with both ET and XT showed improvement in binocular function assessed by Bagolini lenses. The median QOL AS-20 score increased significantly from 28.1 to 88.75, with the function subscale increasing from 46.25 to 87.5 and the psychological subscale increasing from 15 to 90. The authors conclude that squint surgery in non-diplopic adults with horizontal squint surgery should be regarded as restorative of normal anatomy from a pathological state rather than a cosmetic procedure. This is important for our profession to continue to provide this essential service.

Clinical features and surgical management of traumatic acquired isolated superior rectus palsy
Wang X, Zhu B, Fu L, Tang S, Yan J
Eur J Ophthalmol 2025;35(1):133-141
Isolated acquired superior rectus palsy (ASRP) is extremely rare, making it crucial to document its clinical manifestations and surgical treatment protocols. This retrospective analysis of strabismus surgeries identified 16 cases of traumatic isolated ASRP out of 23,498 surgeries. The authors investigated the causes of injury, exam findings, surgical treatments, and outcomes. Among the ASRP cases, iatrogenic injury during orbital/brain tumor removal was the most common cause, followed by injuries from sharp objects, blunt instruments, car accidents,

dog bites, and falls. The primary features were large-angle hypotropia with limited supraduction in the affected eye, often accompanied by exotropia and excyclotorsion. Surgical procedures included inferior rectus recession and/or superior rectus resection, which significantly improved hypotropia, with a 50% success rate. Despite limitations such as diverse etiologies, varying durations, and variable angles of deviation, this study highlights the effectiveness of vertical rectus muscle surgery for this rare condition. Currently, inferior rectus recession and superior rectus resection are the primary surgical options for isolated ASRP, offering limited but significant success.

Laterality Targeting in Graded Inferior Rectus Tenotomy Corrects Lateral Incomitance of Hypertropia in Sagging Eye Syndrome
Lai WY, Demer JL
Am J Ophthalmol 2025;269:78-83
This study investigated whether targeting Graded Vertical Rectus Tenotomy (GVRT) to the nasal or temporal side of the inferior rectus (IR) muscle improves lateral incomitance in patients with sagging eye syndrome (SES) and compared its effectiveness to inferior oblique (IO) recession. This retrospective comparative interventional clinical study included 73 consecutive SES patients who underwent GVRT of the IR from July 2012 to October 2023 and 8 patients who underwent IO recession. Patients with previous strabismus surgery, cranial nerve palsies, trauma, thyroid ophthalmopathy, or other confounding pathologies were excluded. GVRT was performed under topical anesthesia, with nasal or temporal tenotomy selected based on the side of greater hypertropia (HT), and titrated intraoperatively to achieve orthotropia in central gaze. IO recession was performed 4 mm posterior and 3 mm lateral to the IR insertion. Preoperative and postoperative measurements of HT in central and lateral gazes, stereopsis, and lateral incomitance correction were analyzed using Student's t-test and linear regression modeling. Results showed that nasal GVRT (41 patients) corrected about 1° of lateral incomitance, with greater effect in contralateral gaze (3.2° correction) than ipsilateral gaze (2.1°, $p = 0.025$). Temporal GVRT (32 patients) corrected about 2° of lateral incomitance, with greater effect in ipsilateral gaze (4.9° correction) than contralateral gaze (2.9°, $p = 0.0002$). Mean HT in central gaze reduced significantly for both nasal and temporal GVRT ($p < 0.0001$). IO recession (8 patients) corrected 12.5° of lateral incomitance, significantly more than GVRT, and also significantly reduced HT in central, contralateral, and ipsilateral gazes. This study, with its strengths in sample size, uniform surgical technique, and use of topical anesthesia, demonstrates the effectiveness of laterally selective GVRT for correcting small horizontal incomitance in SES, with nasal GVRT favoring contralateral gaze and temporal GVRT favoring ipsilateral gaze. IO recession remains the preferred option for larger incomitance. Despite limitations such as its retrospective design and lack of randomization, this study provides valuable guidance for ophthalmic surgeons, enabling tailored strabismus surgery based on laterality for improved patient outcomes.

Cutaneous Lower Eyelid Retractor Release Averts Lower Lid Malposition After Inferior Rectus Muscle Recession
Lai WY, Demer JL
Am J Ophthalmol 2025;269:466-470

This study evaluated the effectiveness of a new surgical technique called cutaneous lower eyelid retractor release (CLERR) in preventing lower eyelid retraction after inferior rectus (IR) muscle recession surgery. Lower eyelid retraction is a common complication of IR recession, often requiring further corrective procedures. CLERR aims to prevent this complication without additional conjunctival dissection. In this retrospective comparative interventional case series, 89 patients who underwent IR recession between September 2019 and May 2024 were included, with 71 also receiving CLERR. The CLERR procedure involves blunt dissection of the lower eyelid retractors from the inferior tarsal margin through a small skin incision after local anesthetic infiltration. The main outcome measure was inferior scleral show, assessed an average of 116 days postoperatively. Results showed that patients who underwent CLERR had significantly less inferior scleral show (0.2 ± 0.9 mm) compared to those who did not (0.7 ± 1.0 mm) (P = 0.043), even though the CLERR group had a greater mean IR recession. CLERR was equally effective in patients with thyroid ophthalmopathy. Minor complications included lower lid ecchymosis, which resolved quickly without long-term issues. This study demonstrates that CLERR is a simple, quick, and minimally invasive procedure that effectively prevents lower eyelid retraction following IR recession. Despite limitations such as its retrospective nature and short follow-up duration, CLERR offers a significant advancement in strabismus and oculoplastic surgery, potentially reducing the need for secondary procedures and improving patient outcomes. It can be readily adopted by strabismus surgeons and may become a standard adjunct to IR recession, especially in high-risk patients.

Botulinum Toxin A Augmentation of Strabismus Surgery for Large-Angle Strabismus: A Retrospective Case Series and Literature Review
Dikkaya Çiçek F, Karaman Erdur S S, Karaaslan N.
J Pediatr Ophthalmol Strabismus 2025;62(1):5-11
This study reported the outcomes of botulinum toxin A (BTA)-augmented strabismus surgery in patients with large-angle horizontal strabismus (≥55 prism diopters). In this retrospective case series, 24 patients with a minimum 6-month follow-up underwent either unilateral recession-resection or bilateral rectus muscle recession surgery with intraoperative BTA injection into the recessed muscle(s). The main outcome measures were postoperative angle of deviation and success rate, defined as a final deviation of ≤10 prism diopters. Successful outcomes were achieved in 75% of esotropia patients and 50% of exotropia patients. The study acknowledges limitations such as a small sample size with diverse strabismus etiologies, lack of a control group, and non-standardized surgical dosing.

Y-split Recession of Lateral Rectus With and Without Medial Rectus Recession in the Management of Exotropic Duane Retraction Syndrome With Significant Overshoot and Retraction
Farvardin H, Safari F, Safari F, Farvardin H, Farvardin M.
J Pediatr Ophthalmol Strabismus 2025;62(1):67- 74
The purpose of this paper was to compare the effectiveness of two surgical approaches in the management of exotropic Duane retraction syndrome (DRS) cases with significant overshoot and retraction. A retrospective analysis was conducted on patients with exotropic DRS who experienced significant overshoot and globe retraction. Patients with incomplete medical

records or previous strabismus surgery were excluded. Overshoot and retraction were graded on a scale of 1 to 3. Surgical outcomes were based on exotropia correction, head turn correction, leash correction, and globe retraction correction. Twenty-one patients with unilateral type III exotropic DRS were included in the study. The Y-split recession of the lateral rectus muscle (LR) group comprised 13 patients who underwent Y-split recession of the LR alone and the Y-split recession of LR + ipsilateral MR recession group consisted of 8 patients who underwent Y-split LR recession combined with medial rectus (MR) recession. Both surgical approaches showed promising results in managing exotropic DRS cases with significant overshoot and retraction. Y-split LR recession combined with MR recession could possibly be a better surgical option in cases where severe retraction and overshoot are the main issues.

Surgical management of oculomotor nerve palsy – a review of the literature
Hankinson J, Shuaib A
European Journal of Ophthalmology 2024;34(6):1667-1674
This study reviews the surgical management techniques available for patients with oculomotor nerve (OMN) palsy, comparing and contrasting the approaches and subsequent outcomes. A search of the literature through PubMed, Ovid, and Cochrane Library was carried out to yield all papers relevant to the topic, and a wide spectrum of surgical techniques were identified. These included: muscle shortening and lengthening procedures, muscle transposition, globe fixation and ptosis surgery. Patients often require a synergistic combination of these techniques, and complete OMN palsies prove to be the most challenging to address surgically. This study reiterates the fact that there is no general consensus among surgeons for the best surgical approach to address complex cases of OMN palsy, but given the chance to improve the quality of life, independence and aesthetics for the patient with these diagnoses, being familiar with the surgical approaches available is important for a strabismus surgeon’s practice.

Trauma

No entries for this period.
.

Uveitis

Intravitreal 0.18-Mg Fluocinolone Acetonide Implant For Pediatric Uveitis
Wangyu S, Jung JL, Pecen PE, et al.
Retina 2024;44(10):1823-1827

The 0.18mg intravitreal fluocinolone acetonide implant is a sustained release corticosteroid that is designed to last for 36 months for treatment of non-infectious uveitis affecting the posterior segment. This study explored using the intravitreal fluocinolone acetonide implant in pediatric patients. The is a retrospective review of 11 eyes of 7 patients who received the fluocinolone implant between June 2020 and March 2023 at a single academic center. Mean age at placement of the implant was 10.2 years, and most patients had pars planitis. The rate of remaining recurrence-free was 82% at 6 months, 60% at 12 months, and 60% at 24 months. Two of the six phakic eyes at baseline required cataract extraction during follow-up. Two of the four eyes that did not have intraocular pressure lowering surgery before implantation required surgery in follow-up. Overall, this study shows that the fluocinolone implant as similar efficacy as in adult patients, with the benefit of a long duration of action. One disadvantage is the higher rates of ocular hypertension requiring intervention as compared to adult patients. Although this is a limited study with a small sample size, it illustrates that the fluocinolone implant may be useful in the treatment of pediatric pars planitis and has the advantage of long duration of action with a single injection, which is particularly helpful in children who may require anesthesia for intravitreal or subtenons injections.

Vision Screening

Comparison of the GoCheck Kids and Spot Screener photoscreening devices for the detection of amblyopia risk factors using 2021 AAPOS recommendations
Applebaum SS, Sopeyin A, Mohamedali A, et al.
J AAPOS 2024;28(6):104035
The 2021 AAPOS amblyopia risk factors (ARFs) guidelines aim to reduce excess referrals in young children. This study compared the Spot Vision Screener (SPOT) and the GoCheck Kids mobile application (GCK) in evaluating ARFs, according to these updated guidelines for instrument-based pediatric vision screening. The study prospectively evaluated children aged 1 to <7 years referred to a pediatric ophthalmologist between October 2020 and December 2022 for failed vision screening. SPOT, GCK (using the two-photo mode), and a complete eye examination (CEE) were performed. The primary outcomes were sensitivity, specificity, and positive predictive value (PPV) for each photoscreener. Of the 267 subjects, 42% had at least one 2021 guideline ARF after CEE. Overall, SPOT and GCK had similar sensitivity (0.765 and 0.748, respectively), specificity (0.769 and 0.755, respectively), and PPV (0.728 and 0.712, respectively) with no statistically significant differences ($P > 0.05$ for all). In children ≥4 years old, SPOT had higher ARF sensitivity (0.900) than GCK (0.750; $P = 0.005$). Conversely, in children <4 years old, SPOT had lower sensitivity (0.487) than GCK (0.744; $P = 0.004$). No statistically significant differences were found between SPOT and GCK in specificity among younger (0.750 and 0.676, respectively) or older (0.785 and 0.823, respectively) children, or in strabismus detection. The area under the receiver operating characteristics (ROC) curve ranged from 0.857 to 0.980 for SPOT and 0.809 to 0.931 for GCK. Strengths of the study include its prospective design, moderate sample size, masked examiners, and experienced technicians. Limitations include the enriched cohort (not generalizable to the population), the lack of recorded ethnicity, sex, or eye color, and the use of GCK's two-photo mode, which is not commercially available. Despite these limitations, the study concludes that SPOT and GCK have similar sensitivity, specificity, and PPV for identifying ARFs using the 2021 AAPOS guidelines.

Access to vision care for children from immigrant and nonimmigrant households: evidence from the National Survey of Children's Health 2018-2019
Asare AO, Stagg BC, Stipelman C, Keenan HT, et al.
AAPOS 2024;28(6):104044
A previous study indicated that first-generation children aged 3-17 were twice as likely, and Hispanic children three times as likely, to report vision loss compared to third-generation children, after adjusting for sociodemographic factors. This study investigated the association between immigrant generation and caregiver-reported vision testing using nationally representative data from the 2018-2019 National Survey of Children's Health. Immigrant generation was categorized as first-generation (child and all parents born outside the US), second-generation (child born in the US, at least one parent born outside the US), and third-generation (all parents in the household born in the US). The main outcome was caregiver-reported vision testing in the past 12 months. Odds ratios, adjusted for sociodemographic characteristics, and 95% confidence intervals were calculated based on

immigrant generation. The sample included 49,442 US children aged 3-17. A lower proportion of first-generation children (60.3%) had vision testing in any setting compared to third-generation children (74.6%; aOR = 0.54; 95% CI, 0.41-0.71). This association persisted after excluding children without health coverage. Among Hispanic children, both first-generation (aOR = 0.58; 95% CI, 0.36-0.94) and second-generation (aOR = 0.73; 95% CI, 0.55-0.96) children had lower odds of vision testing compared to third-generation Hispanic children. Strengths of the study include the use of a national, validated survey. Limitations include potential non-representativeness due to survey response rates (~40%), a smaller number of first-generation children, self-reported data, the cross-sectional design (limiting causality determination), the survey's availability only in English and Spanish, and a lack of information on parent employment status and citizenship. The study's findings suggest that first-generation children, especially those in Hispanic households, have lower odds of vision testing than third-generation children, even after adjusting for sociodemographic characteristics.

The effect of inconsistent guidelines on variability in pediatric vision screening referral outcomes
Sechrist SJ, de Alba Campomanes AG
J AAPOS 2024;28(6):104057
Yearly vision screenings, often conducted in primary care settings, are crucial for detecting ocular disorders in children. However, discrepancies exist in referral guidelines, particularly for children aged 5-6. This study compared different pediatric vision screening (PVS) referral guidelines to evaluate the impact of these discrepancies on referral rates. Researchers retrospectively applied various PVS referral guideline thresholds to a cohort of 5- to 6-year-olds who underwent visual acuity screening during well-child visits. These results were then compared to actual referral rates. Analysis revealed a 2.7-fold difference in the proportion of children failing vision screening and an 18% difference in referral rates depending on the guideline applied. This highlights the uncertainty among primary care providers caused by conflicting PVS guidelines. Limited by its retrospective, cross-sectional design at a single academic center, this study emphasizes the need for consistent, evidence-based PVS referral guidelines, particularly for 5- to 6-year-olds. Harmonizing discordant criteria and improving alignment between professional organizations involved in pediatric vision screening are essential to ensure appropriate referrals and timely management of vision problems in children.

Vision screening for preschoolers with commercial insurance: impact of geography
Asare AO, Horns JJ, Stagg BC, et al.
J AAPOS 2024;28(6):104054
The American Academy of Pediatrics recommends pediatric vision screening to detect and refer vision disorders during critical early years. This study determined the vision screening rate for US children aged 3-5 with commercial insurance and compared rates between rural and urban areas. A cross-sectional study using 2011-2020 commercial claims data from the Merative MarketScan Database was conducted. The primary outcome was the proportion of children with a vision screening claim. Adjusted incident rate ratios (aIRR) with 95% confidence intervals were calculated for rural versus urban children. The study included claims for 2,299,631 children, most of whom (1,724,923 [75.0%]) were in preferred provider organization plans and lived in urban areas (2,031,473 [88.3%]). Overall, 662,619 children (28.8%) had a vision

screening claim. Children in rural areas had a lower adjusted vision screening rate (15.1%) compared to urban areas (30.6%), with an aIRR of 0.57 (95% CI, 0.53-0.61) after adjusting for sex, age, region, and insurance type. Strengths of the study include its large, multi-state sample. Limitations include potential underestimation of vision screening numbers and the inability to measure potential confounding variables not available in the claims database. The findings indicate low vision screening rates among preschool children with commercial insurance, particularly in rural areas. This suggests a need to consider incentives and pipeline programs to increase the primary and eye care professional workforce in rural areas.

Contrast Sensitivity and Low Contrast Visual Acuity in Children With Normal Visual Acuity
Jayaraman D, Bagga DK, Ag A, et al
Am J Ophthalmol 2024;268:54-65
This study aimed to measure and report normative values of contrast sensitivity (CS) and low contrast visual acuity (LCVA) in children aged 5-15 years with normal visual acuity (VA), providing age-specific benchmarks for clinical assessments. In this prospective, cross-sectional study conducted in schools in Southern India, 1,052 children aged 5-15 years with normal presenting VA (0.00 logMAR or better in both eyes) and stereoacuity of 40 seconds of arc or better underwent testing. Distance and near CS were measured using Pelli-Robson charts, LCVA was assessed at 5% and 2.5% contrast using LEA symbols, and repeatability testing was conducted on 246 children. The overall normative values were 1.75 ± 0.11 logCS for distance CS, 1.72 ± 0.10 logCS for near CS, 0.20 ± 0.10 logMAR for LCVA at 5% contrast, and 0.39 ± 0.11 logMAR for LCVA at 2.5% contrast. Distance CS improved until age 11, and near CS until age 13, while LCVA at both contrasts improved until age 10, after which they plateaued. Repeatability testing showed good reliability, with variability increasing as contrast levels decreased. This study, with its large sample size and comprehensive assessment, provides robust age-specific normative values for CS and LCVA in children, demonstrating age-related improvements and good reliability of the measures. Despite limitations such as the school-based setting and lack of cycloplegic refraction, the findings have significant clinical impact, aiding in early detection of visual impairments and establishing expected developmental trends. This emphasizes the importance of contrast sensitivity testing in pediatric vision assessments, as standard VA tests may not detect functional impairments. The study also offers guidelines for clinically significant changes in CS and LCVA, enabling better monitoring of visual function in children. By establishing normative benchmarks for contrast sensitivity and low contrast visual acuity, this research supports contrast testing as an essential tool in pediatric ophthalmology, aiding in the early detection and monitoring of vision-related disorders beyond standard acuity measures.

Validation of the eye screening tool GoCheck Kids for the detection of amblyopia risk factors in toddlers in Flanders
Otto H, Deschoemaeker M, Van Overmeire B, et al.
J AAPOS 2024;28(5):104008
Amblyopia is a common childhood eye disorder caused by abnormal visual experiences early in life. Early detection and treatment can prevent long-term vision impairment. Having a reliable screening tool is important for identifying children who are at risk for this condition. This study

evaluated the accuracy of the GoCheck Kids photoscreening app for detecting amblyopia risk factors (ARFs) in children around 12-months-old. This was a cohort study of 453 children who underwent both GoCheck Kids screening and a confirmatory ophthalmological examination. Sensitivity of the automatic onsite screening was 52% and went up to 56% after manual review. Specificity of the automatic onsite screening was 90.0% went up to 90.3% after manual review. Strengths of this study were its large size and prospective nature. Limitations were it's generalizability given the limited demographics of the study participants. This was an important study as it provides a non-commercial validation of GoCheck Kids in a real-world setting, giving pediatric ophthalmologists independent data on its accuracy.

Visual Impairment

Diagnosis and Care of Children With Cerebral/Cortical Visual Impairment: Clinical Report
Lehman SS, Yin L, Chang MY;
Section On Ophthalmology ; Council On Children With Disabilities; American Association For Pediatric Ophthalmology And Strabismus, American Academy Of Ophthalmology; American Association Of Certified Orthoptists
Pediatrics 2024;154(6):e2024068465
Cerebral/cortical visual impairment (CVI) is a leading cause of pediatric visual impairment in developed economies and is increasing in developing economies. Because vision is crucial for learning, delayed CVI diagnosis can negatively impact education, making early detection and management essential. Routine vision screening may not accurately identify CVI, and co-occurring neurocognitive impairments and medical conditions can further complicate diagnosis. CVI is defined as "a verifiable visual dysfunction which cannot be attributed to disorders of the anterior visual pathways or any potentially co-occurring ocular impairment." This emphasizes that either there is no ocular abnormality, or visual function is worse than expected based on the degree of ocular pathology. Common etiologies of CVI include central nervous system malformations, head trauma, hydrocephalus, hypoxic-ischemic encephalopathy, infections, seizures, toxins and drugs, and intraventricular hemorrhage/periventricular leukomalacia in prematurity. Cerebral palsy is a frequent comorbidity, especially in children born preterm. Characteristics of CVI include challenges with visual focus, latency in response to visual stimuli, light sensitivity or affinity, enhanced object detection with movement, unusual visual behaviors, difficulty interpreting complex visual scenes, challenges with object/face recognition, and variable visual responses depending on the environment. To improve outcomes for children with CVI, recommendations include early identification, improved communication among healthcare providers, addressing disparities in medical care, optimizing transition of care planning for young adults with CVI, supporting CVI research, and improving educational resources regarding CVI.

Self-reported history of childhood vision impairment among older adults screened for dementia
Chauhan MZ, Rickels KL, Chacko JA, et al.
J AAPOS 2024;28(6):104051
The Lancet Global Health Commission has highlighted the relationship between visual impairment (VI) and cognitive deterioration, suggesting that addressing VI could slow cognitive decline and reduce dementia risk in the elderly. This study investigated the link between self-reported VI in youth and dementia development later in life using data from the Panel Study of Income Dynamics household survey, which included the Eight-item Informant Interview to Differentiate Aging and Dementia screen. The study included 1029 subjects, of whom 217 (21%) had positive dementia screens and 11.2% reported childhood VI. Adults with a history of childhood VI had significantly higher odds of positive dementia screening. Even after adjusting for confounders, a twofold increase in dementia risk was observed in those reporting early VI. Limitations include reliance on survey data and self-reported VI; the retrospective, cross-sectional design, which only allows for correlation analysis; the relatively small sample size; and the lack of objective clinical findings and current visual function data. Despite these

limitations, this study raises awareness of the potential long-term impact of early VI and the public health importance of early detection and correction of VI.

Characterization of pediatric low vision and socioeconomic determinants of health at an academic center: a 5-year analysis
Kim S, Rachitskaya A, Babiuch A, et al.
J AAPOS 2024;28(6):104033
A gap in knowledge exists regarding vision impairment and its association with social factors in children in the United States. This cross-sectional study investigated the demographics, eye surgeries, and social determinants of health in pediatric patients with low vision in one or both eyes at a single US center. Children aged 3-18 examined at an academic eye center from 2014 to 2019 were included. Low vision was defined as a distance best-corrected visual acuity (BCVA) of <20/70 in at least one eye. Patient income was estimated using ZIP codes and a public third-party database. Of 47,571 children examined, 882 had low vision in at least one eye, with 88 (10%) having BCVA <20/400 in at least one eye, and 228 (26%) having bilateral low vision. The most common cause was refractive/strabismic amblyopia (n = 304), while the most severe vision loss (BCVA<20/200) was primarily due to retinal dystrophies or detachment (n = 91). Three hundred patients (34%) had undergone at least one ophthalmic surgery, predominantly extraocular muscle procedures in mild visual loss cases and vitreoretinal surgeries in more severe cases. Vision loss severity was significantly associated with both the likelihood and number of surgeries (P < 0.0001). Income and insurance coverage were not significantly associated with BCVA or the likelihood or number of surgeries. Limitations of the study include its single-center, tertiary care, and retrospective design; a predominantly white subject population; underrepresentation of children with cortical visual impairment (CVI); overrepresentation of patients with retinal dystrophies; the assignment of a single primary diagnosis per patient; exclusion of children <3 years of age; and the limited socioeconomic factor study based on ZIP code estimates. Despite these limitations, the study allows for counseling patients that the severity of vision loss correlates with the type and number of surgeries.

Special Commentary: Cerebral/Cortical Visual Impairment Working Definition: A Report from the National Institutes of Health CVI Workshop
Chang MY, Merabet LB;
CVI Working Group
Ophthalmology 2024;131(12):1359-1365
This is a special report released by the NIH CVI workshop. It is a set of criteria established by medical experts to define and diagnose CVI, which is a visual impairment arising from damage to the brain's visual processing areas, causing functional vision deficits beyond what would be expected based solely on an eye exam alone. The established working definition is as follows:(1) CVI encompasses a spectrum of visual impairments caused by an underlying brain abnormality that affects the development of visual processing pathways and is characterized by deficits in visual function and functional vision (2) The visual dysfunction in CVI is greater than expected by any comorbid ocular conditions alone. (3) The visual dysfunction in CVI may manifest as lower-order or higher order afferent visual deficits, or both, leading to characteristic

behaviors in affected individuals. (4) Although CVI may be comorbid with other neurodevelopmental disorders, CVI is not primarily a disorder of language, learning, or social communication. (5) The underlying neurologic insult of the developing brain may go unrecognized or undiagnosed until later in life. Rationale for this working definition is further discussed in the report. The authors hope that this definition will help guidance of future research in the area. The NIH is also developing a CVI registry to collect relevant data prospectively and longitudinally to help inform future research questions on CVI. Future work is needed to achieve consensus on nomenclature, diagnostic criteria, and strategies for early identification and intervention.