21 patients with IRDs (7 genetically confirmed, 11 clinically diagnosed, and 3 suspicious retinal dystrophies), 18 (86%) had abnormal photopic waveforms. Of the three normal photopic results, two were in the suspicious category, and one had a known rod-cone dystrophy. 20 patients presumed to have an IRD based on clinical findings completed dark adapted testing, and 100% had abnormal scotopic waveforms.
Discussion: Our results show that the RETeval handheld ERG is a practical and accurate tool for early diagnosis of pediatric IRD's, often avoiding the need for sedation and operating room time with conventional corneal electrode ERG testing.
Conclusions: To our knowledge, this is the first study investigating both scotopic and photopic responses obtained with the handheld RETeval ERG in a cohort of pediatric IRD patients. This device is especially useful in younger children and may allow for widespread use of ERG's outside the tertiary care setting.

037 Feasibility of eye patch assistant plus a microsensor to monitor objective adherence with patching. Jingyun Wang, Hongxin Xu, Reed M. Jost, Bryan De La Cruz, Sarah E. Morale, Eileen E. Birch
Introduction: A microsensor was suggested to monitor adherence with patching amblyopia treatment due to its advantages: small, waterproof, long-lasting battery. However, its application has been limited because of a number of practical challenges: (1) it is so small that it is hard to hold and is easily lost; (2) children or pets may swallow it due to its candylike appearance. To overcome these challenges, we designed a small device, the Eye Patch Assistant (EPA), to facilitate patching with a microsensor. This study reports pilot data for use of the EPA coupled with a microsensor to monitor patching adherence.
Methods: Thirteen adults (11 control, 2 amblyopic) and 20 children (6 control, 14 amblyopic) were enrolled. Participants were asked to wear an Ortopad eyepatch (patch) or an Ortopad eyepatch plus the EPA with a microsensor embedded (patch+EPA). Each adult completed both testing conditions for 2 hours each in random order and reported their wearing time (based on clock). Each child was randomized to either Patch or Patch+EPA for a short period of time (5-20 min). The sensor reading interval was set to 5 min. After each test condition, a questionnaire with 12 questions related to comfort was administered.
Results: In the adult group, self-reported time wearing patch+EPA (mean $\pm$ SD) was 119 $\pm$ 4 min, while the microsensor-reported 121 $\pm$ 6 min. In the child group, self-reported time wearing Patch+EPA was 9.4 $\pm$ 5.4 min, while the microsensor-reported 8.5 $\pm$ 5.3 min. There was no significant difference between self-reported and microsensor-reported patch-wear time (paired t test, $P = 0.5$).There was no significant in comfort scores ($P > 0.05$) for all questions.
Discussion: Objective adherence with patching can be monitored safely with a microsensor assisted with the EPA.
Conclusions: Within a predictable variability due to its 5 min sampling interval, a microsensor embedded in the EPA device provides a promising way to safely monitor adherence with patching in children.

038 Are piggyback IOLs recommendable for children? M. Edward Wilson, Rupal H. Trivedi
Introduction: The selective use of piggyback IOLs for young children has been reported since the mid-1990s but only in small numbers and without longer term follow-up. Surgeons currently have insufficient information about whether these techniques are recommendable.
Methods: An IRB-approved retrospective chart review was conducted of consecutive cases of piggyback IOL implantation in children at one institution.
Results: Fifty-one eyes of 40 children received piggyback IOL implantation, 42 eyes at the time of cataract surgery and 9 eyes as a later secondary procedure. Median age at cataract surgery and piggyback IOL placement were 0.51 and 0.73 years respectively. Four eyes (8%) underwent unplanned piggyback IOL removal (1 each for IOL tilt, pupillary capture, pupillary block, and pupillary membrane). Forty-four eyes had >5 years' follow-up (median, 12.42 years of follow-up); 35/44 eyes had the piggyback IOL explanted in a planned manner at a median of 3.24 years after implantation. 9 eyes have still not had the piggyback IOL explanted after a median 11.6 years of follow-up. 9 eyes have needed IOP-lowering topical medications, and 1 eye has been operated for glaucoma.
Discussion: Planned sulcus IOL explantation was uncomplicated in our series. While early-unplanned complications required IOL removal in 4 eyes, late complications were not noted and glaucoma developed at predictable rates for this population.
Conclusions: Piggyback IOL placement in young children (1 in the bag and 1 in the sulcus) appears to have an acceptable safety profile. It allows the surgeon to aim for emmetropia at surgery and manage increasing myopia over time rather than decreasing hyperopia.

039 Horizontal and vertical eye movements after horizontal and vertical recti were detached from eyes in patients with nystagmus. Dongsheng Yang, Ping Wang
Introduction: We usually believe that horizontal or vertical eye movements would be eliminated if horizontal or vertical recti were detached from the eye. However, we observed large horizontal or vertical eye movements after horizontal or vertical recti were detached from the eye. We will report the video-recorded eye movements.
Methods: The medial and lateral recti were surgically detached from insertions of the eyes during extra-ocular muscle (EOM) surgeries in 5 adult patients with infantile nystagmus syndrome. In another patient with acquired nystagmus, whose right superior rectus and inferior oblique were detached from her right eye, large (up to 20°) upword eye movements were also recorded. The amplitudes of the eye movements was estimated based on the distance of the movements.
Results: The amplitudes of the horizontal eye movements are about 25° $\pm$ 5° after the the medial and lateral recti were detached and amplitude of upward eye movements were about 20° after the superior rectus and inferior oblique were detached.
Discussion: Large horizontal and vertical eye movements were recorded after horizontal and vertical EOM were detached. It indicates that vertical recti may involve in horizontal eye movments and horizontal recti may involve in vertical eye movements.
Conclusions: Activity of vertical recti during the horizontal eye movements may need to be investigated, and vice versa for vertical eye movements.

040 Punctate hyperreflective vitreous opacities visualized by handheld spectral domain optical coherence tomography in premature infants screened for retinopathy of prematurity. Emily M. Zepeda, Thomas B. Gillette, Ayesha Shariff, Laura Grant, Leona Ding, Kristina Tarczy-Hornoch, Michelle T. Cabrera
Introduction: Vitreous changes in retinopathy of prematurity (ROP) are poorly understood. The goal of this study was to characterize

punctate hyperreflective vitreous opacities seen on handheld spectral domain optical coherence tomography (SD-OCT).
Methods: This is a prospective observational study of infants requiring ROP screening between July 2015 and December 2017. Infants were imaged using handheld SD-OCT at the time of routine examinations. Trained graders masked to the clinical assessment analyzed each OCT scan of the right eye for vitreoretinal findings. Disagreement was mediated by a third trained grader. Punctate hyperreflective vitreous opacities seen on OCT were correlated with clinical ROP severity and other OCT vitreoretinal pathologies.
Results: Among 93 infants studied (51% male, mean gestational age 28.3 $\pm$ 2.9 weeks, mean birthweight 1008.2 kg $\pm$ 287.8 g), 22/93 (38%) developed ROP (14/93 [15%] stage 3). Agreement for OCT graders was 91% ($\kappa = 0.8$; $P < 0.001$). Punctate hyperreflective vitreous opacities developed in 31/93 (33%) of infants and were associated with the presence of ROP ($P = 0.005$), maximum ROP stage ($P = 0.005$), and pre-plus or plus disease ($P = 0.002$).
Discussion: Punctate hyperreflective vitreous opacities seen on handheld SD-OCT were strongly correlated with presence of ROP, maximum stage, and pre-plus or plus disease among premature infants screened for ROP. The opacities may represent cellular proliferation, protein or hemoglobin associated with advanced ROP.
Conclusions: Punctate hyperreflective vitreous opacities on OCT are a marker for advanced ROP. Further study should explore handheld SD-OCT as a noninvasive ROP screening tool.

Posters

041 Biomechanical analysis of ligatures and technique for managing drainage tubes in pediatric glaucoma. Carolina Adams, Steven Kane, Steven Brooks
Introduction: Absorbable ligatures are often used with glaucoma drainage tubes to avoid early postoperative hypotony. We sought to measure the force required to ligate a drainage tube and to develop a modified technique to promote earlier release in pediatric patients, where plate encapsulation occurs more quickly than in adults.
Methods: A precision digital force gauge was used to measure the tensile strength of several common ophthalmic sutures, and the necessary tensile force required to achieve tube ligation. A novel technique for tube ligation was devised to allow sutures as small as 10-0 to be effectively used.
Results: The mean tensile strengths of unknotted sutures varied from 211 $\pm$ 127 g for 10-0 Vicryl to 477 $\pm$ 69 g for 6-0 chromic gut. The mean tensile force required to ligate a Baerveldt or Ahmed tube was 35.9 $\pm$ 0.9 g. However, 9-0 or 10-0 Vicryl could not be reliably used for ligation, due to breakage, unless a modified technique was employed, wherein the tube was first stretched to reduce its thickness and diameter.
Discussion: Frictional forces inherent to knot tying make it unfeasible to reliably use 9-0 or 10-0 Vicryl to ligate a drainage tube, despite the unknotted threads possessing apparently sufficient tensile strength. Our modified ligation technique overcomes this issue, allowing a wider range, of suture choices, and the potential for achieving more rapid release in pediatric cases.
Conclusions: A novel modification in technique allows the use of very small guage sutures to ligate tubes in glaucoma drainage implants, allowing for potentially faster release times that may be favorable in managing pediatric glaucomas.

042 Determination of the strabismus surgery dosage accuracy using a new technology. Satenik G. Agagulyan, Elena A. Kudryashova, Victoria O. Balasanyan, Igor E. Aznauryan
Introduction: Accurate dosage of strabismus surgery is one of the most important issues in strabismology. The aim of this study was to show the accuracy of mathematical computer program 'Strabo' with the use of Gazelab technology. Gazelab technology shows the motility of eyes and the angle of deviation with one eye closed and both eyes open.
Methods: All patients passed standard pre- and postoperative ophthalmologic examinations. Additionally all patients undergone Gazelab Free or 5-point test before and on the 7th day after surgery.
Results: Eleven patients were operated on (mean age, 5.8 $\pm$ 1.5 years). The average value of the deviation with one eye covered was 34.7° $\pm$ 12.2°; with two eyes open, 27.7° $\pm$ 13.9°. Evaluation of the effectiveness of surgery dosage was measured by postoperative angle of strabismus measured by Gazelab technology. The average value of the deviation after surgery with one eye covered was 12.45° $\pm$ 7.1°; with two eyes open, 10.3° $\pm$ 6.1°. Mathematical surgery simulation differed from the actual surgical results by only $\pm$ 4.7°.
Discussion: Results obtained after the strabismus surgery correlated with the expected results that was received by "Strabo" program.
Conclusions: A mathematical model of the surgery allows to distribute the surgical effect on both eyes with a high cosmetic and functional result.

043 Digital biometry in children undergoing cataract surgery in vitrectomized eyes. Sumita S. Agarkar, Swathi Mailankody
Introduction: To report the accuracy of biometry in children undergoing cataract surgery in vitrectomised eyes using SRK-II formula.
Methods: A retrospective review of medical records of children undergoing cataract surgery between 2008 and 2017 with a prior history of pars plana vitrectomy was done. Biometry was performed using Ocuscan Rxp (Alcon)and keratometry was performed using a handheld keratometer IOL power calculation was performed under general anesthesia in uncooperative children Adjustment in speed was made in silicon oil filled eyes. The main outcome variable studied was absolute prediction error (APE). APE was calculated as absolute difference between target refraction and postoperative refraction obtained at 6 weeks.
Results: A total of 92 eyes of 90 patients were included. Mean age at surgery was 12.04 $\pm$ 3.33 years. Mean axial length was 24.85 $\pm$ 1.94 mm. Mean APE using SRK -II formula was 1.29 $\pm$ 1.12 for the entire group. However, 35% of the eyes had APE between 0 and 0.5. APE was affected by axial length ($P = 0.007$).
Discussion: IOL power calculation remains challenging in children specially in younger children Various studies over the years have reported mean prediction error involving several different formulae. Kekunnaya et al reported mean APE of 2.27 with SRK 2 There is no such data available for Vitrectomised eyes. Children in this study were older as well as had longer axial lengths compared to that in litreture.
Conclusions: Prediction error using SRK-II formula in vitrectomized pediatric eyes is comparable to that in nonvitrectomized eyes as reported in litreture.

044 Effect of oral propranolol in astigmatism-induced orbital hemangioma. Nora Aldohayan, Yasser Al-Thnayan
Introduction: Capillary hemangiomas are the most common orbital tumor in infancy, with a course of rapid proliferation followed by spontaneous regression. It may cause astigmatism or amblyopia