Retinal Detachment in a Pediatric Population: A Retrospective Review of Etiology and Outcome at the Bascom Palmer Eye Institute

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OBJECTIVE Retrospective review of etiology and outcome of pediatric retinal detachment at a single institution.

PURPOSE Retinal detachment (RD), though a relatively common cause of blindness in adults, is rare in the pediatric population. The causes of RD are unique in the pediatric population and can be grouped into tractional (TRD), rhegmatogenous (RRD), and traumatic. This study examined the epidemiology and outcomes of pediatric RD at a single institution with the aim of clarifying the natural history and prognosis of this disease.

METHODS A retrospective review of the medical records of patients clinically diagnosed and operated on for RD between birth and 15 years of age. Recorded variables included etiology, surgical interventions, visual outcomes, anatomical success and globe conservation.

RESULTS Of 381 patients reviewed, 206 were included in this study and 41 had bilateral RD (total 234 eyes). Of those patients 60 (26%) were grouped as TRD due to

retinopathy of prematurity (ROP), persistent fetal vasculature (PVF), and familial exudative vitreoretinoipathy (FEVR); 51 (22%) had RRD due to myopia, X-linked retinoschisis (XLRS), or Stickler syndrome. Traumatic RD was noted in 69 patients (29%). Other causes of RD included Coats disease and coloboma. Presenting visual acuity (VA) better than 20/200 correlated with better final VA ($p<0.0001$). The most common surgery for traumatic and RRD was scleral buckle (SB) with pars plana vitrectomy (PPV)/tamponade whereas the most common in TRD was PPV alone. Anatomical success was strongly correlated with VA outcome ($p<0.00001$) and was significantly more likely in RRD versus TRD (55% vs. 29%, $p<0.05$). The rate of obtaining a final VA 20/200 or better was significantly worse in TRD (33%) compared to RRD (70%, $p<0.01$) or traumatic RD (69%, $p<0.05$).

CONCLUSION We report the incidence and outcomes of RD due to multiple etiologies presenting at a single institution. ROP and trauma were the most common cause of pediatric RD. RRDs were associated with the best outcomes whereas TRD had the lowest rate of positive visual outcome. Good visual outcome without anatomic success is rare, good anatomic success did not necessarily predict good visual outcome.

TAKE HOME MESSAGE It is important to understand pediatric retinal detachments, etiology and outcomes.

HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board

Computer-Based Image Analysis in Retinopathy of Prematurity: Are We There Yet?

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OBJECTIVE To compare and contrast the accuracy and reliability of binocular indirect ophthalmoscopy (BIO), digital fundus image (DFI) grading, and computer-based image analysis (CBIA) using the i-ROP system.

PURPOSE The purpose of this study was to compare the accuracy of BIO and DFI versus a reference standard diagnosis (RSD), to compare common areas of ICROP classification discrepancies among experts using DFI and BIO, and determine whether CBIA may compare favorably to the “gold standard” BIO exam for the diagnosis of plus disease.

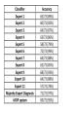
METHODS In a multicenter, prospective ROP cohort study, DFI were obtained alongside routine BIO. DFI were independently graded by 2 masked physicians and 1 trained reader, and a RSD was established. Absolute agreement and weighted kappa statistics were calculated to identify areas of disagreement, and overall accuracy compared to the

RSD between DFI and the BIO. A subset of these images were manually segmented and used to train a CBIA system (the i-ROP system) to classify images as normal, pre-plus, or plus, as well as independently classified by an set of 11 practicing ROP clinicians. The agreement of the 11 ROP clinicians versus the RSD was compared to the i-ROP system.

RESULTS A total of 1553 study eye examinations were acquired with DFI and BIO. For DFI classifications, there were frequent disagreements in stage (620/1553, 40%), plus/preplus (287/1553, 18%) and zone (117/1553, 8%), however agreement for type 1 disease was high (1512/1553, 97.4%). There were similar rates of disagreement between either expert's DFI classification and the BIO exam, and no systematic classification biases, except for identification of zone III disease. Table 1 summarizes the accuracy of the zone, stage, plus, and category classifications for each DFI grader and the BIO exam, demonstrating some variability between graders, but no systematic differences in overall accuracy between DFI and BIO. Among the subset of 73 images used for developing the i-ROP system, Table 2 displays the agreement of the 11 experts' classification of plus disease, and the performance of the i-ROP system compared to the RSD. Results from the fully automated i-ROP system will be presented at the meeting.

CONCLUSION These results affirm that DFI may provide reasonable accuracy compared to BIO, however the effectiveness of both is limited by significant inter-expert variability in ICROP classification. CBIA systems may complement image-based ROP screening programs, and provide a more objective tool to accurately identify children in need of referral for BIO and treatment.

TAKE HOME MESSAGE Remote telemedical grading of fundus images provides comparable accuracy to binocular indirect ophthalmoscopy, with some inter-expert variability, which image analysis for plus disease may improve.



HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board

Fluorescein Angiographic Evaluation of Peripheral Retinal Vasculature After Ranubizumab Injection for Type I Retinopathy of Prematurity

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OBJECTIVE To analyze vascularization of the peripheral retina using widefield digital fluorescein angiography of infants treated with intravitreal ranubizumab (IVR) for Type I retinopathy of prematurity (ROP)

PURPOSE Anti-vascular endothelial growth factor (VEGF) therapy is commonly used in the treatment of Type I ROP. One reported benefit of anti-VEGF treatment is the continued development of the retinal vasculature after treatment, whereas conventional laser therapy leads to destruction of the peripheral retina. This study was undertaken to evaluate the peripheral retinal vasculature after IVR treatment.

METHODS A retrospective evaluation was performed of medical records including RetCam Fundus and fluorescein angiogram images of 30 eyes of 16 neonates who received IVR as treatment for Zone I and posterior Zone II ROP between April 2013 and January 2015. All eyes were assessed to determine if they had reached Zone III based on the standard ETROP definition. In addition, we observed for changes including: vascular blunting, vascular loops, vascular leakage, vascular dilatation, and capillary drop-out.

RESULTS Mean gestational age and birth weight were 24 1/7 weeks and 697.6 grams. The mean gestational age at time of IVR treatment was 35 weeks. Fluorescein angiogram was performed at a range of 60-150 weeks. Minimum long-term follow-up for the demographic was 80 weeks estimated gestational age. All eyes had initial

resolution of posterior disease. 50% of eyes had reached Zone III. 27/30 (90%) of eyes had vascular blunting. 28/30 (93.4%) of eyes had vascular loops. 12/30 (40%) of eyes had vascular leakage. 27/30 (90%) of eyes had vascular dilatation. 28/30 (93.4%) of eyes had capillary dropout.

CONCLUSION Although IVR is effective in initial cessation of Type I ROP, full vascularization was only achieved in 50% of eyes in our series and the majority of eyes had vascular anomalies. These findings necessitate long-term careful observation of the avascular peripheral retina. If observation is not possible, consideration should be given to photocoagulation of these avascular areas.

TAKE HOME MESSAGE The majority of eyes with Type I ROP treated with ranibizumab continued to have vascular abnormalities and only 50% developed full vascularization to Zone III.

HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board