Inner Retinal Fenestration for Pediatric Optic Disc Pit Maculopathy

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OBJECTIVE To investigate the use of inner retinal fenestration as a treatment for pediatric optic disc pit maculopathy, as fenestrations are hypothesized to allow an egress of fluid alleviating maculopathy.

PURPOSE To evaluate the efficacy of inner retinal fenestration as a surgical technique for the treatment of optic disc pit maculopathy in the pediatric population.

METHODS This retrospective, interventional case series included pediatric patients with optic disc pit maculopathy treated at two tertiary hospitals in London. All patients underwent pars plana vitrectomy with the creation of two inner retinal fenestrations. The partial thickness retinotomies were made radial to the optic disc pit using a 25-gauge MVR blade. Anatomic and visual outcomes were determined by optical coherence tomography (Spectralis OCT, Heidelberg Engineering, Germany) and best-corrected visual acuity (BCVA), respectively.

RESULTS A total of four eyes were included. Average patient age was 12.8±3.6 years. Preoperatively all eyes demonstrated subretinal and intraretinal fluid in the central macula. Mean preoperative BCVA was logMAR 0.74±0.26 (20/100). Patients were followed for a mean of 20.5±11.0 months after surgery (range 10-36 months). Mean postoperative BCVA was 0.58±0.29 (20/80) at two weeks, 0.40±0.32 (20/50) at three months, and 0.20±0.27 (20/32) at one year. Progressive resolution of intraretinal and subretinal fluid was observed in all eyes (Figure 1). Recurrence of macular detachment or intraretinal fluid was not observed.

CONCLUSION Inner retinal fenestration is an effective technique that resolves fluid and restores vision in pediatric patients with optic disc pit maculopathy. These results support the hypothesis that allowing an egress of fluid into the vitreous cavity can achieve long-lasting amelioration of the pathologic findings often associated with this condition.

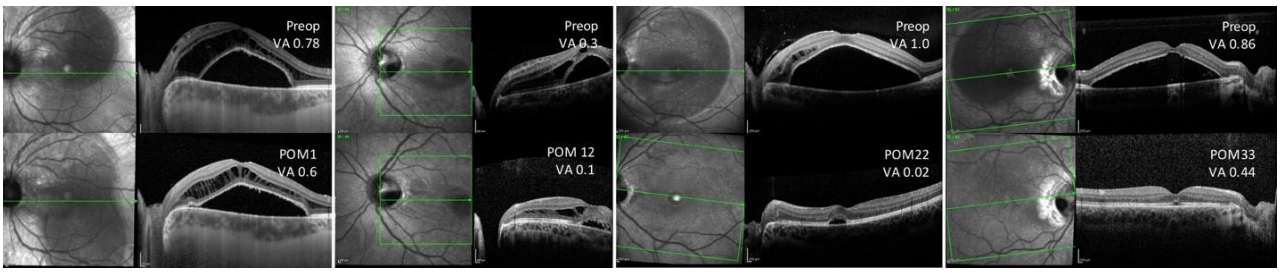


Figure 1. Pre- and Post- operative OCT scans for all four cases with corresponding best-corrected visual acuity. These images demonstrate the progressive resolution fluid and improved visual acuity after vitrectomy with inner retinal fenestrations.

HUMAN RESEARCH Yes: Approved by institutional review board

Surgical Outcomes of FEVR Associated Retinal Detachment in 66 Eyes: A Comparative Study

- Ekta Rishi, MD, FRCS
- Pukhraj P. Rishi, MD, DO, FRCS, FRCSEd

OBJECTIVE Comparative analysis of surgical outcomes in eyes with retinal detachment (RD) due to familial exudative vitreoretinopathy (FEVR) among children and adults

PURPOSE FEVR is often complicated with RD. The disease can go undiagnosed in childhood and present later in life. Most studies report on surgical outcomes in children. This study reports surgical outcomes in RD with FEVR in all age groups, analysing the differeces in presentation and outcomes in children versus adults.

METHODS Retrospective study of patients undergoing vitreoretinal surgery for RD in eyes with FEVR by 2 surgeons from 2008-2018. Patient demographics, RD details, surgical management, and treatment outcomes were studied. Diagnosis of FEVR was established with relevant birth and family history, examination, and fundus fluorescein angiography. Presentation and treatment outcomes were compared between children (<18 years) and adults. Patients underwent scleral buckling (SB) or microincision bimanual vitrectomy, encirclage, and silicone oil tamponade. Statistical analysis was done using SPSS 14.0 version. P value <0.05 was considered significant and Mann Whitney U test and Chi square tests were used.

RESULTS 66 eyes of 57 patients with mean age at surgery of 14.7±12.8 years and reduced vision from 16.3±4 months were included; 39(68%) were children. Family history noted in 11(20%) patients and 81% had less vision. Combined RD , abnormal vitreoretinal adhesion and atrophic holes were noted in 54(82%) eyes. Children presented with cataract in 16(24%), tractional RD in 12(18%), dragged macula with exudation in 100% and macular hole in 3(7%) eyes. Adults presented with atrophic holes and peripheral avascular retina without falciform fold(100%). SB

was done in 30(45%) eyes and vitrectomy in 36(55%). Retina attached in 100% eyes with SB and 80% eyes after vitrectomy. Average 1.2±0.6 procedures were required and recurrent RD was similar in children vs adults. After 23.5±18 months 90% eyes had attached retina, vision improved from 1.2±0.8 to 0.96±0.8 logMAR, final vision was better in adults. Hypotony was noted in 6(13%) eyes in children. Table 1 and 2 illustrates differences in children vs adults.

CONCLUSION Surgery for FEVR has good outcomes, SB has better retinal reattachment. Children present with more cataract, bilateral RD, tractional RD with falciform folds requiring more vitrectomy procedures. Adults recover better vision and retinal reattachment following surgery and present with less severe traction.

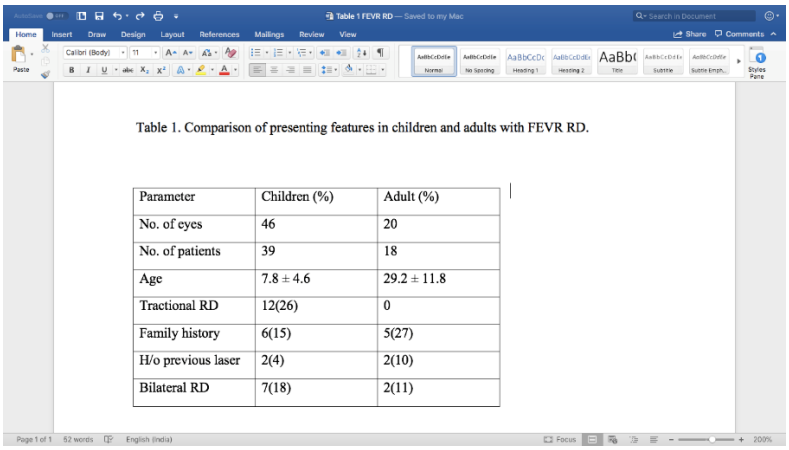
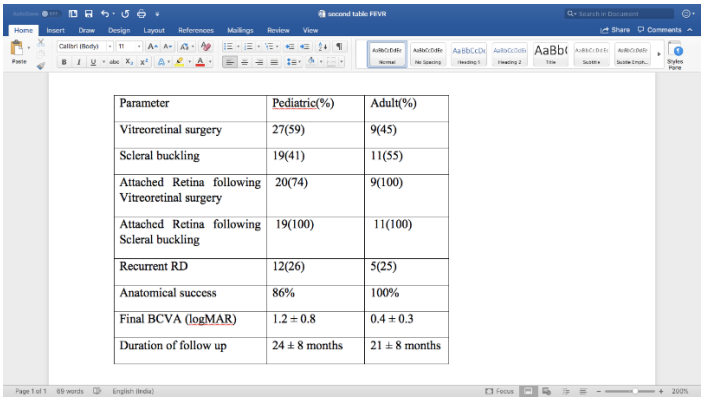


Table 1. Comparison of presenting features in children and adults with FEVR RD.

Parameter	Children (%)	Adult (%)
No. of eyes	46	20
No. of patients	39	18
Age	7.8 ± 4.6	29.2 ± 11.8
Tractional RD	12(26)	0
Family history	6(15)	5(27)
H/o previous laser	2(4)	2(10)
Bilateral RD	7(18)	2(11)

Comparison of presenting features in children and adults with FEVR RD



Parameter	Pediatric(%)	Adult(%)
Vitreoretinal surgery	27(59)	9(45)
Scleral buckling	19(41)	11(55)
Attached Retina following Vitreoretinal surgery	20(74)	9(100)
Attached Retina following Scleral buckling	19(100)	11(100)
Recurrent RD	12(26)	5(25)
Anatomical success	86%	100%
Final BCVA (logMAR)	1.2 ± 0.8	0.4 ± 0.3
Duration of follow up	24 ± 8 months	21 ± 8 months

Comparison of surgery and outcome in children and adults with FEVR associated RD

HUMAN RESEARCH Yes: Approved by institutional review board

Long-Term Lens Clarity After Lens-Sparing Vitrectomy for Persistent Fetal Vasculature Syndrome

- Irina De la Huerta, MD, PhD
- Kimberly A. Drenser, MD
- Antonio Capone, MD
- Michael T. Trese, MD

OBJECTIVE To describe the long-term outcomes of lens-sparing vitrectomy for persistent fetal vasculature syndrome.

PURPOSE The long-term outcomes of lens-sparing vitrectomy for persistent fetal vasculature syndrome (PFVS) with nonaxial lens opacification have not been well characterized. This may be due to rarity of the disease, and to the traditional belief that a lensectomy is required in the majority of PFVS cases. We aimed to determine the long-term effect on lens clarity of lens-sparing vitrectomy for PFVS.

METHODS A retrospective case series study was conducted of patients who underwent lens-sparing vitrectomy for tractional retinal detachments associated with combined anterior and posterior PFVS with nonaxial lens opacification between 2006 and 2015 at a single tertiary referral pediatric vitreoretinal practice. Patients with at least 3 years of postoperative follow-up were included. The main outcome measures were retinal reattachment after lens-sparing vitrectomy, cataract extraction after lens-sparing vitrectomy, lens status at the last follow-up and best corrected visual acuity at the last follow-up.

RESULTS Eleven eyes of 10 patients (6 male and 4 female) met the inclusion criteria for the study. The mean age at the time of lens sparing vitrectomy was 6.25 months (range: 0.5 months – 5 years). The average postoperative follow-up time was 7.6 years (range: 3 – 11 years). The reattachment rate after a single lens-sparing vitrectomy surgery was 81.8% (9 of 11 eyes). Reattachment was achieved after a second lens-sparing vitrectomy in one eye, and one eye was found to have an inoperable redetachment. Cataract extraction was performed in 3 eyes

(27.3%) due to progressive lens opacity at an average of 1.4 years (range: 1-2 years) after the lens sparing vitrectomy. At the last follow-up 90.9% (10 of 11 eyes) were attached. 72.7% (8 of 11) were phakic, 18.2% (2 of 11) were pseudophakic, and one eye was aphakic. Best corrected visual acuity was 20/158 (range: 20/30 – NLP).

CONCLUSION Lens clarity is observed in most eyes after lens-sparing vitrectomy for combined anterior and posterior PFVS with nonaxial lens opacification. Cataract extraction, when necessary, is most often performed 1-2 years following lens-sparing vitrectomy.

HUMAN RESEARCH Yes: Approved by institutional review board

Macular Microvascular Findings in Familial Exudative Vitreoretinopathy on OCT Angiography

- Lejla Vajzovic, MD

OBJECTIVE To describe macular retinal and microvasculature abnormalities in patients with familial exudative vitreoretinopathy (FEVR) using optical coherence tomography (OCT) and OCT angiography (OCT-A).

PURPOSE To study macular retinal and microvasculature abnormalities in patients with familial exudative vitreoretinopathy (FEVR) using optical coherence tomography (OCT) and OCT angiography (OCT-A).

METHODS Twenty-two eyes (11 eyes of 6 patients with FEVR and 11 control eyes) were imaged with OCT and OCT-A. Graders qualitatively analyzed the OCT-A images of the superficial and deep vascular complexes for abnormal vascular features and compared to OCT and fluorescein angiography (FA).

RESULTS Seven of 11 eyes with FEVR displayed abnormal macular vascular findings. Abnormalities in the SVC included dilation, disorganization, straightening, heterogeneous vessel density, and curls/loops. In the DVC abnormalities included areas of decreased density, disorganization, curls/loops, and "end-bulbs". Except for dragging and straightening of the vessels, none of these macular features were visible on FA. OCT demonstrated retinal thickening and thinning, macular edema, fovea irregularities and hyaloidal thickening.

CONCLUSION OCT-A revealed unique and marked macular abnormalities in eyes with FEVR that were not observed with FA alone, suggesting this is more than a disease of the retinal periphery with macular and deep retinal vasculature abnormalities. Similarly, OCT illustrated nonspecific and varied macular pathologic changes.

HUMAN RESEARCH Yes: Approved by institutional review board

Macular Hole Related Retinal Detachment in Children With Knobloch Syndrome

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- Abdulelah A. Al-Abdullah, MD
- Hassan Aldhibi, MD
- Leonore Engelbrecht, MD
- Marco Mura, MD

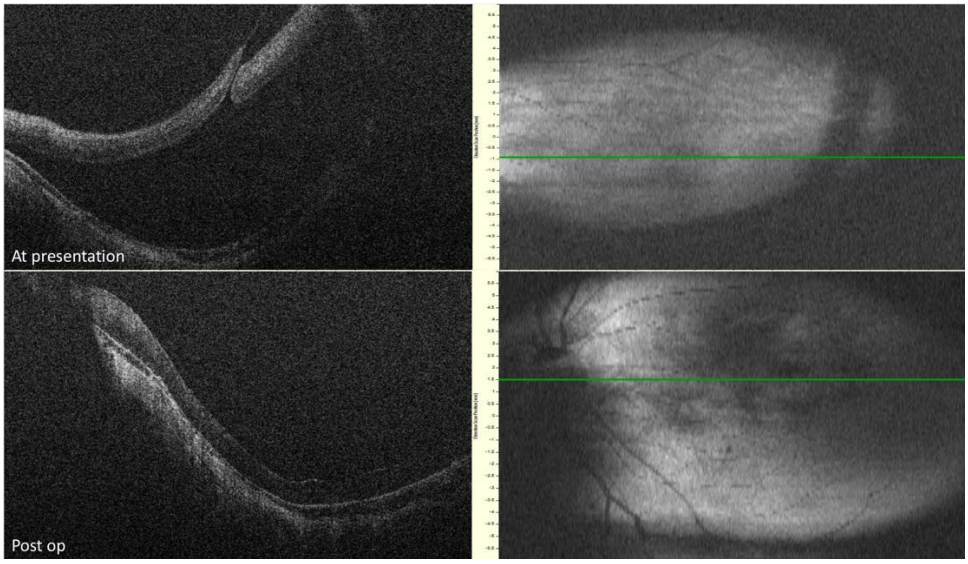
OBJECTIVE Could infants with Knobloch syndrome present with macular hole related retinal detachment?

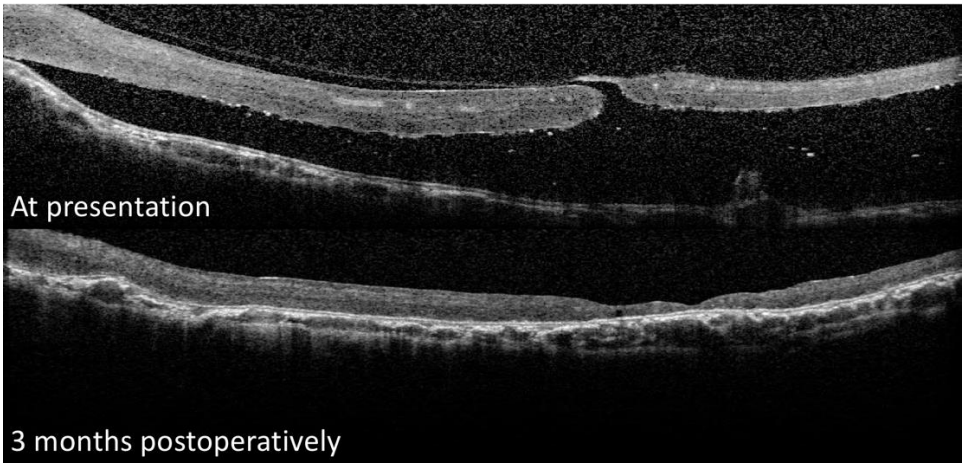
PURPOSE To describe the findings and management of a new phenotype of retinal detachment (RD) in children with Knobloch syndrome (KS).

METHODS Retrospective case series of patients with KS who presented with macular hole-related retinal detachment from 2012 to 2018. The intervention included pars plana vitrectomy and silicone oil tamponade with or without scleral buckle, drainage retinotomy or relaxing retinectomy.

RESULTS Six eyes of 4 female patients (age ranged from 3 months to 5 years; median age 5.5 months) were included. Presenting symptoms were poor fixation and nystagmus. The fellow eye of 2 patients had RD due to peripheral breaks. The MH was clinically visible in 5 eyes and detected only by optical coherence tomography in one eye. The RD was shallow and extended to the anterior equator in 5 eyes and localized to a punched out atrophic chorioretinal lesion in 1 eye. Five eyes underwent surgical repair. At last follow-up (range from 6 to 24 months), retinal reattachment with MH closure was achieved in 4 eyes along with marked improvement in fixation.

CONCLUSION KS patients may develop MH-related RD as early as infancy. The condition may be easily overlooked in children if not suspected.





HUMAN RESEARCH Yes: Approved by institutional review board

Cutis Marmorata Telangiectatica Congenita (CMTC): The Spectrum of Ocular Manifestations

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- Omar Moinuddin, BS
- Lisa Lagrou, MD, MSc, FRCS(C)
- Sanjana Sathrasala
- Flavio Mac Cord Medina Medina
- Monte Del Monte, MD
- Emmanuel Chang, MD , PhD FACS
- Brenda Bohnsack, MD, PhD

OBJECTIVE To describe the range of ocular manifestations in cutis marmorata telangectatica congenita (CMTC).

PURPOSE We describe various ocular manifestations of CMTC, including glaucoma and retinal vascular anomalies. The distinct finding of peripheral capillary dropout with prominent terminal vascular bulbs may be pathognomonic.

METHODS Multi-center retrospective non-consecutive case-series.

RESULTS We present the ocular findings in 9 patients with CMTC diagnosed clinically based on stereotypical cutaneous vascular malformations. The mean age of presentation was 43 weeks (2 weeks – 4 years). 6 patients were female and 3 were male. Avascular retina was identified in 11 eyes of 6 patients (67%). Retinal neovascularization was present in both eyes of 2 patients (22%) at presentation. One patient demonstrated retinal venous tortuosity, and another

patient had mild straightening of the nasal retinal vessels in both eyes. There were two patients (two eyes) with retinal detachment. The unique finding of peripheral capillary dropout with prominent terminal vascular bulbs was noted in 3 patients (33%). Granular pigment abnormalities were noted in the macula in 5 patients (56%). There were 2 patients (22%) with glaucoma, one requiring surgical intervention. Two patients were noted to have features of Adams-Oliver Syndrome, with genetic testing identifying a Notch1mutation in one patient.

CONCLUSION Retinal vascular abnormalities in CMTC may occur more frequently than previously recognized. Given the potential for progressive retinal vascular anomalies and retinal detachment, we recommend complete ophthalmologic evaluation including fluorescein angiography in infants with CMTC. The distinct finding of peripheral capillary dropout with prominent terminal bulbs may be pathognomonic for CMTC.

HUMAN RESEARCH Yes: Approved by institutional review board

Economic Impact of the Use of Anti-VEGF Monotherapy or in Combination With Panretinal Photocoagulation in the Treatment of Retinopathy of Prematurity

- Swati Agarwal-Sinha, MD
- Andres Gonzalez, MD
- Jade G. Guevara, MD, MS
- Sarina M. Amin, MD
- Samantha R. Prabakaran

OBJECTIVE To determine the direct cost of treatments for infants with Retinopathy of Prematurity (ROP).

PURPOSE ROP is a proliferative retinal vascular disease in premature infants. Its management requires a significant commitment from providers and caregivers alike, and can pose a large burden on caregivers. The purpose of this study is to evaluate the economic impact of intravitreal bevacizumab (IVB) monotherapy versus a combined approach of panretinal photocoagulation (PRP) and IVB for treatment of ROP

METHODS This was a retrospective review 51 infants treated with IVB (Group 1=26 infants, 47 eyes) and IVB with PRP (Group 2=25 infants, 48 eyes) from 7/2014–11/2018. The direct cumulative costs of screening examinations done as an inpatient and outpatient until last seen, PRP, IVB injections, examination under anesthesia (EUA), Retcam fundus photography, and fluorescein angiography (FA) were evaluated and calculated per CPT codes. The costs were extrapolated to 65 weeks post-menstrual age (PMA) in accordance with recently proposed

guidelines by the American Academy of Pediatrics. Costs of monitoring in a neonatal intensive care unit, anesthesia, and indirect cost to the parents were not included.

RESULTS Mean gestational age and birth weight was 25.3 weeks and 729 g in both groups. Mean PMA of IVB in both groups was 37.3 weeks; mean PMA of PRP in Group 2 was 37.4 weeks. 3 infants received IVB before PRP, otherwise PRP was administered concurrently as IVB in Group 2. Mean PMA follow-up (including EUA) was 121.9 weeks for Group 1, 44.8 weeks for Group 2. 8 eyes and 4 eyes developed a recurrence in each group at a mean of 48 weeks PMA; one infant in Group 1 had a late recurrence at 63 and 91 weeks PMA without complication.Mean inpatient and outpatient exams was 24.9 and 13.4 for Group 1 and 2 infants, respectively (p=0.0001). Average IVB and IVFA was 2.12 and 2.19 in Group 1 and 2.64 and 0.68 in Group 2, respectively (p=0.04;p=0.001). Mean EUAs were similar - 2.35 in Group 1 and 2.40 in Group 2.The average billed for all exams and procedures was $20,076 in Group 1 and $17,129.28 in Group 2. The average Medicaid reimbursement was $2,452 in Group 1 and $2,071 in Group 2 (p=0.005).

CONCLUSION The study demonstrates the financial impact of ROP screening in infants treated with IVB monotherapy with marginal increased cost and escalated number of visits when compared to treatment with IVB with PRP. Both modalities had good outcomes at their last examination. A further analysis of indirect costs and reimbursement practices would be beneficial in providing quality ROP care.

HUMAN RESEARCH Yes: Approved by institutional review board

Gene Therapy in Pediatric Retina Patients at the Bascom Palmer Eye Institute: What I Have Learned

- Audina M. Berrocal, MD
- Kimberly Tran

OBJECTIVE To show our experience with gene therapy among the pediatric population at Bascom Palmer Eye Institute.

PURPOSE The purpose is to discuss the surgical techniques and outcomes of these pediatric patients.

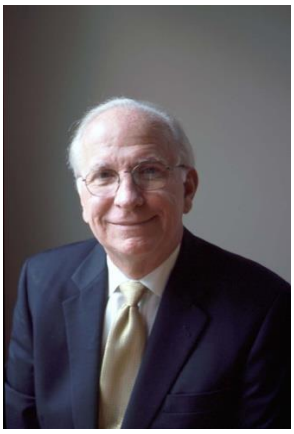
METHODS Retrospective review of the pediatric retina patients that received surgical treatment with voretigene since the approval of the medication.

RESULTS Four patients have undergone treatment with voretigene at the BPEI. All patients have improved. We will show surgical techniques for the management of these cases.

CONCLUSION Pediatric patients were successfully treated with voretigene for Lebers Congenital Amaurosis.

HUMAN RESEARCH No: Study does not involve

The Good, the Bad, and the Best of Wnt Signaling



- Michael T. Trese, MD
- Kimberly A. Drenser, MD
- Antonio Capone, MD
- Kenneth Mitton, PhD
- Wendy Dailey, MS

OBJECTIVE Norrin driven Wnt signaling is responsible for normal retinal vascular and neuronal development and maybe able to protect, repair,and regenerate those retinal elements life long. answer YES

PURPOSE Stimulation of Norrin driven Wnt signaling represents a new theraputic to protect, repair and regenerate appropriate retinal vascular and neuronal elements which mimics how these structure were formed originally in the healthy fetus and infant. In contradistinction to Wnt driven Wnt signaling that has been associated with pathologic angiogenasis and cancer This difference will be discussed.

METHODS We used in vitro and in vivo studies: tissue culture of both retina endothelial cells and neurons, OIR studies and flourscien angiography to demonstrate protection,repair and regeneration of retinal cellular elementsIn human adult retinal endothelial and neuronal cells we did a study to see if the Norrin Driven Wnt signaling system which grows normal healthy retina in infants could be activated in human adult cellsTo test for both tight junction and Plasma Lemma Vesicle Associated Protein PLVAP that is actvated by VEGFand causes massive leakage we used immunohistochemical techniques and gene expression measurments looking for protection repair and regeneration of retinal tissues.

RESULTS Our results showed that a modified Norrin molecle, Noregen, modified to have a more sustained effect did protect the endothelial cell tight junction adhesive proteins from degredation by VEGF therefore preventing vascular leakage from that source. We also demonstrated that Noregen reduced PLVAP gene expression by 75% protecting against massive leakageNoregen stimulation was able to activate Wnt signaling in human adult retinal endothelial cells Noregen stimulation of both retinal endothelial cells and neurons showed large numbers of progenitor cells and in the Oxygen Induced Retinopathy OIR model showed appropriately generated vascular and neuronal elements Speaking to in situ regeneration of retinal tissue by activating autologous dormant stem cells.Fluroscein angiography in the OIR animals at the time of the highest VEGF effect showed a chotic vascular pattern in the sham animals and in the Noregen treat animals an appropriate vascular pattern

CONCLUSION Noregen driven Wnt signaling supplies a microenvioment which supports protection and repair of vascular and neuronal retinal elments as well as in situ regeneration of retinal tissue by supporting differentiation of dormant autologus stem cells.

HUMAN RESEARCH No: Study does not involve