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Optical Coherence Tomography Angiography in Retinopathy of Prematurity

- J. Peter Campbell, MD, MPH
- Michael F. Chiang, MD
- David Huang, MD, PhD
- Gangjun Liu, Ph D
- Jianlong Yang, PhD
- David Wilson
- Robison V.P. Chan, MD

OBJECTIVE To determine the feasibility and potential clinical utility of using optical coherence tomography angiography in the classification of zone, stage, and plus disease in in retinopathy of prematurity.

PURPOSE The purpose of this study was to evaluate the role of optical coherence tomography angiography (OCTA) in the clinical diagnosis of retinopathy of prematurity (ROP). The international Classification of Retinopathy of Prematurity (ICROP) classified ROP into zone, stage, and plus disease. OCTA may add a level of objectivity to the classification of each of those components.

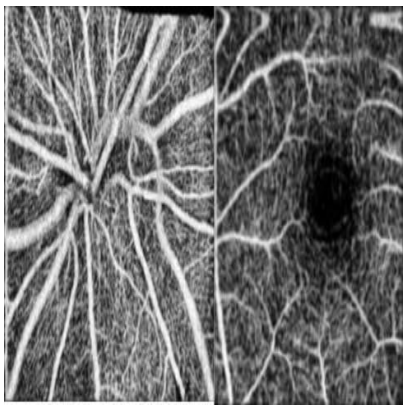
METHODS We designed a 100 kHz swept source OCTA system with a novel prototype handheld probe for use in the neonatal intensive care unit. Using this device, we are in the process of acquiring data in patients. In ROP, we will be focusing on determination of zone 1 disease, rapid structural OCT and OCTA of peripheral stage, and total retinal blood flow (TRBF) in all stages of disease and plus disease.

RESULTS Results of this work will be presented at the meeting under the following categories: 1) Determination of zone using OCTA 2) Determination of stage using

OCTA 3) TRBF as a function of disease severity and plus disease 4) Other potential applications of this technology in pediatric retina and pediatric ophthalmology.

CONCLUSION OCTA may play a role in the diagnosis of ROP. The current gold standard for diagnosis of zone, stage, and plus disease is the clinical exam, however inter-observer agreement for each of these components can be poor. In the same way OCT has enhanced our ability to care for adults with macular disease, OCT and OCTA may become integral in our care for patients with ROP.

TAKE HOME MESSAGE Optical coherence tomography angiography may play a role in the diagnosis of retinopathy of prematurity and other pediatric retinal conditions in the future.



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

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Comparison of Ultrasound Biomicroscopy and Scleral Trans-Illumination For the Determination of the Location For Intravitreal Injection and Sclerotomy

- Wai-Ching Lam, MD, FRCS(C)
- Abhishek Sharma, MBBS, MMed, DPhil (Oxon)
- Asim Ali, MD, FRCSC
- Robert Henderson, MD, FRCOphth
- CK Patel
- Cynthia VandenHoven, CRA

OBJECTIVE To correlate the perilimbal 'dark band' seen on scleral trans-illumination (STI) with the anatomy of the ciliary body defined by Ultrasound Biomicroscopy (UBM) in young children.

PURPOSE There is great variation of sclerotomy and intravitreal injection placement in young children in the literature, ranging from 0.5-3.0mm from the limbus. The objective of this study is to correlate the perilimbal 'dark band' seen on scleral trans-illumination (STI) with the anatomy of the ciliary body defined by Ultrasound Biomicroscopy (UBM) in young children under 3 years.

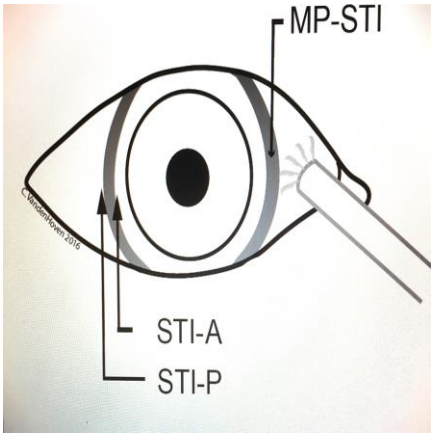
METHODS A prospective pilot study on children aged ≤ 36 months undergoing general anaesthesia. Scleral transillumination was performed to identify and measure the perilimbal dark band. UBM was then performed, and correlated with transillumination

findings. The midpoints of STI and UBM were compared to identify the safe site for sclerotomy.

RESULTS Nineteen children recruited, 36 STI and 35 UBM measurements obtained. Anterior edge of dark band had weak correlation with anterior border of ciliary body on UBM. Posterior edge had moderate to substantial correlation with posterior border of ciliary body. UBM measurements indicate safe midpoint for sclerotomy in age 0-6 months at 2.5mm, and for 6-36 months at 3.0mm from the limbus. Midpoints of transillumination had moderate to substantial correlation to UBM midpoints.

CONCLUSION Using UBM to measure ciliary body in-vivo to identify safe intravitreal approach, and to assess accuracy of scleral trans-illumination. UBM measurements differ from current cadaver-based guidelines, suggesting 2.5-3.0mm from the limbus is suitable in infants under 3 years of age. Midpoint of the dark band identified by trans-illumination is a reliable method for tailoring the sclerotomy site.

TAKE HOME MESSAGE Midpoint of the dark band identified by scleral trans-illumination is a reliable method for tailoring the sclerotomy site. At age 0-6 months is 2.5mm, and for 6-36 months is 3.0mm from the limbus.



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

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Surprises in Surgical Treatment of Persistent Fetal Vasculature: With Emphasis on Retinal Complications

- Sengul Ozdek, MD
- Ece A–zdemir, MD
- Hatice Tuba Atalay

OBJECTIVE To emphasize the high incidence of peripheral retinal anomalies associated mostly with anterior PFV cases and the surgical methods to avoid postoperative complications associated with these anomalies.

PURPOSE To identify the characteristics, frequency and complications of peripheral retinal anomalies associated with persistent fetal vasculature (PFV).

METHODS Retrospective, noncomparative case series of patients with PFV who underwent surgery during the last 6 years in a university clinic. Type of PFV, presence of peripheral retinal anomalies, extend of the retrolental membrane and retinal detachment, early and late complications, functional and anatomical results were evaluated.

RESULTS 24 eyes of 23 patients enrolled in the study; 12 eyes (50%) with anterior, 8 eyes (33%) with posterior, 4 eyes (17%) with combined PFV. Retina was found to elongate anteriorly as fingerlike projections beyond ora serrata, incorporating into retrolental

fibrovascular tissue in 67% of anterior PFV cases. Anterior PFV cases with more extensive retrolental fibrovascular tissue had a higher risk of retinal complication ($p=0.04$) and anterior segment complication ($p=0.009$) than those with localized disease. Leaving peripheral part of the fibrovascular tissue in place led to severe complications by later contraction. 42% of anterior PFV and 17% of posterior and combined PFV cases had 20/400 or better vision at the final follow-up. Anatomic success was reached in 84% of anterior cases, versus 50% of cases with posterior involvement.

CONCLUSION High incidence of peripheral retinal anomalies that are found in anterior PFV patients and its relation to retinal complications warrant careful examination of the ora serrata ciliary body area in these cases. Leaving peripheral part of the fibrovascular tissue may result in severe postoperative complications, which should be avoided.

TAKE HOME MESSAGE There is a high incidence of elongation of retina beyond ora serrata, reaching the fibrovascular tissue behind the lens in anterior PFV. Damage to these retina parts should be avoided which may result in RRD.

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Outcome of Vitreoretinal Surgery For Complications of X-Linked Juvenile Retinoschisis

- Parveen Sen, MBBS, MS
- Tarun Sharma, MBBS
- Pramod S. Bhende, MBBS, MS
- Pukhraj P. Rishi, MD, DO
- Muna Bhende, MD

OBJECTIVE To report the anatomical and visual outcome of vitreoretinal surgery for treatment of vision-threatening retinal complications of X-linked juvenile retinoschisis (XLRS).

PURPOSE Vision-threatening complications needing surgical intervention in XLRS include vitreous hemorrhage and rhegmatogenous retinal detachment (RRD). Management of RD in these cases is complicated by its presentation in pediatric age group and the underlying pathology. The present study was undertaken to evaluate the outcome of surgery in the management of posterior segment complication of XLRS.

METHODS This is a retrospective interventional consecutive case series of 30 eyes of 25 XLRS patients who underwent surgical treatment for posterior segment complications in our institute. Data collected included demographic details, visual acuity at presentation, ophthalmoscopy findings, indication for surgery, type of surgical intervention, additional surgical procedure (if required) and anatomical and visual outcome at final follow-up.

RESULTS Mean age at presentation was 9.2 ± 3.4 years. Indications for surgery were: rhegmatogenous retinal detachment (RRD) (24 eyes); vitreous hemorrhage (VH) with RRD (4 eyes); only vitreous hemorrhage and large foveal schisis(1 eye each). Eyes with

VH only and large foveal schisis underwent Pars plana vitrectomy(PPV). Out of the 28 eyes with RRD scleral buckle was done in 9 eyes and PPV with encirclage in 19 eyes. Attached retina was seen in 5/9 eyes(55.5%) and 10/19 eyes(52.6%) that underwent SB and PPV respectively after a single surgery. 13 eyes with recurrent RD underwent multiple surgeries to give an attached retina at final follow up in 22/28 eyes(78.5%) with a mean of 1.5 procedures per eye. Proliferative vitreoretinopathy was the main cause for recurrent RD. Visual acuity improved in 15 (50%) eyes, remained stable in 7 (23.3%) eyes and worsened in 8 eyes (26.6%). The cause of decrease in vision was recurrent RD and foveal atrophy.

CONCLUSION Vitreoretinal surgery is helpful in stabilizing and improving visual outcomes in a majority of XLRS patients with posterior segment complications. Though SB can be effective in uncomplicated cases, advanced vitreoretinal techniques and multiple surgical procedures are required in most of these eyes.

TAKE HOME MESSAGE Management of RD in XLRS is complicated by its presentation in younger age group and by the underlying pathology. Surgeons should be aware of the problems encountered during these procedures.

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

2:01 PM

Potential Safety Concerns of Bevacizumab for Retinopathy of Prematurity

- Robert L. Avery, MD

OBJECTIVE Off-label bevacizumab has been found to be very helpful in ROP treatment; however, there is increasing evidence of systemic effects from these injections, raising concern for potential harm.

PURPOSE In ROP, as in other retinal diseases, bevacizumab has not undergone registration trials to assess its safety. Premature babies are undergoing organogenesis and neurodevelopment, processes involving VEGF. Given their numerous comorbidities, it is difficult to assess potential systemic side effects of intravitreal injection of bevacizumab, which has been shown to enter the systemic circulation.

METHODS Studies evaluating the use of anti-VEGF agents for ROP were assessed looking for reports of systemic effects. Additionally, studies of pharmacokinetics of the different anti-VEGF agents were included to assess the biologic plausibility of any potential systemic effects.

RESULTS Two studies of neurodevelopment in ROP babies raise concern that bevacizumab use could contribute to developmental impairment relative to laser use

alone. There are reports of bevacizumab injection for ROP causing effects on fellow uninjected eyes, as well as reports of reduced cerebral blood flow after bevacizumab injection for ROP. These studies provide evidence of systemic effects of this treatment. Pharmacokinetic studies in ROP have shown a maximum serum concentration at 2 weeks almost 10 fold higher than reported in adults. Serum VEGF in ROP babies is reduced for at least 8 weeks, and other cytokines, some which could affect lung development, are affected as well. Ranibizumab has a much lower systemic exposure that bevacizumab, and may have a slightly shorter duration of effect in ROP than bevacizumab.

CONCLUSION There is increasing evidence that there are systemic effects of intravitreal bevacizumab injection for ROP. Prospective randomized trials are indicated to evaluate laser, bevacizumab, and ranibizumab in the treatment of ROP. Until these drugs are shown to be safe in such trials, laser or ranibizumab, with its lower systemic exposure, may be theoretically preferred in this population.

TAKE HOME MESSAGE Bevacizumab has been found to be very helpful in ROP treatment; however, there is increasing evidence of systemic effects from these injections, raising concern for potential harm. Trials are needed.