Macular Optical Coherence Tomography Characteristics at 36 weeks Postmenstrual Age in a Cohort of Preterm Infants Examined for Retinopathy of Prematurity

Cynthia Toth, M.D.
Durham, NC

Shwetha Mangalesh, MBBS, Brendan McGeeHan, MS, Vincent Tai, Xi Chen, M.D., Ph.D., Du Tran-Viet, BS, Lejla Vajzovic, MD, Christian Viehland, BS, Joseph A Izatt, PhD, C. Michael Cotten, MD, Sharon F Freedman, MD, Maureen McGuire, PhD

Purpose:
To report our ability to capture, grade reliably and analyze bedside macular optical coherence tomography (OCT) images from preterm infants and relate OCT findings to biological factors and retinopathy of prematurity (ROP) status at a single time window in the Study of Eye imaging in Preterm infantS (BabySTEPS).

Methods:
This prospective observational study included 85 preterm infants eligible for ROP screening, with parental consent for research and a 36±1 weeks postmenstrual age (PMA) visit. We imaged both eyes of infants with an investigational non-contact, handheld swept-source OCT at the time of clinical ROP examinations. Macular OCT features and layer thicknesses for untreated eyes of infants at 36±1 weeks PMA were compared to demographic data (gender, race/ethnicity, gestational age, birth weight) and the clinical ROP examination performed by experts. Statistical analyses accounted for the use of both eyes of infants.

Results:
We captured macular OCT from 169 eyes (one eye excluded for prior ROP treatment) at 36±1 weeks PMA. The quality of OCT volumes was excellent in 33 eyes (19%), acceptable in 112 (67%), poor in 24 (14%) and unusable in 0. Macular edema was present in 60% of eyes and bilateral in 82% of infants with edema. At the fovea, retinal thickness and inner nuclear layer (INL) thickness increased with edema severity: 183±36µm and 51±27µm in mild edema (16% of eyes), 308±57µm and 163±53µm in moderate (25%) and 460±76µm and 280±83µm in severe (12%), respectively. With an increase in ROP stage from 0 to 2, the mean (standard deviation) retinal thickness at fovea increased from 227(124) to 297(99)µm, p<0.001. The choroid was thinner 155(72) with pre-plus/plus disease versus without 236 (79), p=0.04, while retinal thickness did not vary.

Conclusions:
We demonstrate that in preterm infants in BabySTEPS at 36±1 weeks PMA, the methods of non-contact imaging are reliable, INL thickness is an objective and reproducible measure of macular edema, and while macular edema severity relates to ROP stage, only choroid differs (is thinner) relative to pre-plus/plus disease. The difference in retinal and choroidal response to ROP may reflect their different location relative to the blood-eye barrier.