

THE HARTWELL FOUNDATION

2008 Individual Biomedical Research Award

Review of Proposed Research

Investigator: Cynthia Toth, MD
Professor
Departments of Ophthalmology and Biomedical Engineering

Institution: Duke University

Proposal: Spectral Domain Optical Coherence Tomography for Imaging of Infant Eyes: A Practical Diagnosis Tool and Methodology



Dr. Toth proposes a revolutionary alternative to current state-of-the-art diagnosis and management of pediatric eye disease. To prevent childhood blindness prior to permanent damage, it is critical to properly identify and treat evolving disease of the retina (the light sensitive layer at the back of the eye interior, which converts light into nerve signals to communicate with the brain). For example, 3% of all cancers in children under the age of 15 are due to retinoblastomas of the eye; the incidence of retinopathy of prematurity, a blinding condition affecting the retina of newborns in the US is 68% among infants of less than 3 ½ pounds. Currently, only color photographs or manual drawings of the interior of the eye are used to record and monitor retinal disease in children, providing only 2-dimensional information about retinal structures or evolving disease processes. Improved diagnosis and monitoring of pediatric retinal disease is required to provide specific, measurable endpoints such as the presence or absence of specific pathology. Today, imaging by optical coherence tomography (OCT) is a technology that provides 3-dimensional, cross-sectional images of the retina (like ultrasound but with higher magnification). It is now standard for diagnosis and management of retinal disease in adults and older children. However, because OCT is a cumbersome, slow-capture, time-domain imaging device, it is impossible to use it in young children who are unable or unwilling to cooperate for imaging. Moreover, for an intubated and anesthetized infant there is difficulty and considerable risk in achieving alignment with the scanning system; problems which negate the use of OCT in a nursery or neonatal and pediatric intensive care units. By contrast, Dr. Toth seeks development of a faster and more effective technology, called spectral domain OCT (SDOCT), which in its presently available research format will require image optimization and further development to be clinically useful. In addition, it will be essential to develop a methodology to obtain images from children's eyes without employing sedation. If successful, the deployment of a clinically useful pediatric SDOCT device will not only transform the current grading level of children's retinal disease and its risk of progression, but it will also make possible new critical imaging endpoints for drug therapy, thus improving the overall management of pediatric retinal disease.