Use of Hand-held SD-OCT in the Management of Pediatric Retinal Diseases

BY RAJEEV H. MUNI MD, FRCSC; AND THOMAS C. LEE, MD

Ocular coherence tomography (OCT) has revolutionized the diagnosis and management of several adult vitreoretinal diseases. It has allowed us to identify subtle pathology not visible on clinical examination and has had a profound impact on how we treat and follow patients with common retinal disorders such as age-related macular degeneration and diabetic macular edema. The standard OCT setup requires the patient to be cooperative while sitting upright and holding his head steady on the chin-rest. As a result, the use of OCT in very young children and babies can be problematic. The recent development of the Hand-Held Spectral Domain OCT (HHSD-OCT) by Bioptigen (Triangle Park, NC) in association with Cynthia Toth, MD, at the Duke University Medical Center has enabled us to obtain high-resolution retinal scans of infants and children with various retinal disorders such as retinopathy of prematurity (ROP), X-linked retinoschisis, and shaken baby syndrome. Scott et al\(^1\) concluded that the HHSD-OCT is a safe, noninvasive, and effective method of obtaining in vivo high-resolution information regarding retinal morphologic features in children.

We have found the use of HHSD-OCT useful in a tertiary care pediatric retina practice. It has been particularly useful in the diagnosis and management of progressive ROP. Stage 4 ROP most often represents a tractional retinal detachment secondary to fibrovascular proliferation at the junction of the vascular and avascular retina. Although surgery can be beneficial in some cases, it is often difficult to diagnose the severity of early Stage 4 disease. This may be partially related to the shallow nature of the detachment in these cases.

We have summarized a case in which ROP continued to progress despite laser photocoagulation of the avascular retina. In this case, findings from the HHSD-OCT were helpful in making difficult management decisions for a premature neonate.

**CASE REPORT**

A female twin with a birth weight of 560 g was delivered at 26 weeks gestation of a 33 year-old mother. Her hospital course was complicated by respiratory insufficiency, urinary tract infection, osteopenia of prematurity, anemia of prematurity, and multiple episodes of sepsis. The infant has chronic lung disease and is...
dependent on oxygen via a nasal cannula. The infant was treated with laser photocoagulation in both eyes on two separate occasions for zone 2 Stage 3 ROP with plus disease at 36 and 38 weeks corrected age at a community hospital. Despite full laser treatment, the ROP continued to worsen with persistent vascular activity in both eyes, at which point the decision was made to transfer the patient to a tertiary care pediatric retina center.

On examination at 40 weeks gestational age, the infant had irregular pupils in both eyes with no neovascularization of the iris. The remainder of the anterior segment examination was normal in both eyes. Examination of the fundus in both eyes revealed mild plus disease with active stage 3 temporally with traction, worse in the right eye (Figure 1). There was no obvious involvement of the fovea. After discussion with the mother, the decision was made to proceed with off-label bevacizumab (0.75 mg/0.03 cc) injection in the right eye. One week following the injection, the vascular activity in the right eye had improved, although there was progressive traction in both eyes. After discussion with the parents, the decision was made to perform a careful examination under anesthesia, including assessment with the HHSD-OCT.

Examination under anesthesia confirmed the presence of a stage 4 tractional detachment temporally with white fibrotic scar tissue extending up to the vitreous base in both eyes.

The HHSD-OCT revealed a temporal retinal detachment in both eyes, with fluid extending into the temporal macula in both eyes (Figure 2). After discussing the findings with the parents, the decision was made to proceed with lens-sparing pars plana vitrectomy for both eyes.

The HHSD-OCT system contains a mobile imaging hand piece that is connected via a 1.3-m flexible fiberoptic cable to a cart holding the SD-OCT system. This hand-held system eliminates many of the technical challenges involved in imaging the retinas of young children. Scott et al provide a detailed discussion of the design and image-processing algorithms used with the HHSD-OCT and describe its use in children with shaken baby syndrome. With appropriate lateral scanning, Bioptigen’s HHSD-OCT enables high-resolution 2-D and 3-D images with resolution better than 10 µm.

The HHSD-OCT adds a new dimension to the imaging of pediatric retinal disorders. This technology enables us to obtain high-resolution images of macular and peripheral pathology that is of tremendous benefit in the management of these patients. The HHSD-OCT allows shallow detachments to be diagnosed earlier and more accurately than would otherwise be possible. Visualizing the interaction of the retina, the vitreous, and the ridge in progressive ROP is just one example where the HHSD-OCT provides insight into the pathophysiology of the disease and assists with complex management decisions.

Rajeev H. Muni, MD; and Thomas C. Lee, MD, are with the The Vision Center, Childrens Hospital Los Angeles, Doheny Eye Institute, University of Southern California in Los Angeles. The authors state that they have no financial relationships to disclose. Dr. Lee can be reached via e-mail at ThLee@chla.usc.edu.

Figure 2. HHSD-OCT demonstrates retinal detachment in both eyes with intraretinal changes (A and B).