

# MASTERING THE ART OF PEDIATRIC RETINA EXAMINATIONS

Practical tips for working with this delicate patient population.

BY RU-IK CHEE, MD; YOSHIHIRO YONEKAWA, MD; AND R.V. PAUL CHAN, MD, FACS



Pediatric retina examinations can be daunting. Patients may be uncooperative, and both parents and patients

may not fully understand the need for an examination that can at times be uncomfortable for the child. Difficulty with peripheral retina visualization compounds the complexity of diagnosing and monitoring pediatric retinal conditions. A concerted effort must be made to understand and address the questions and concerns of patients and parents.

Despite these challenges, effective pediatric retina examinations are achievable (Figure 1). In this article, we share some practical tips for the retina specialist examining children in the office setting.

## AT A GLANCE

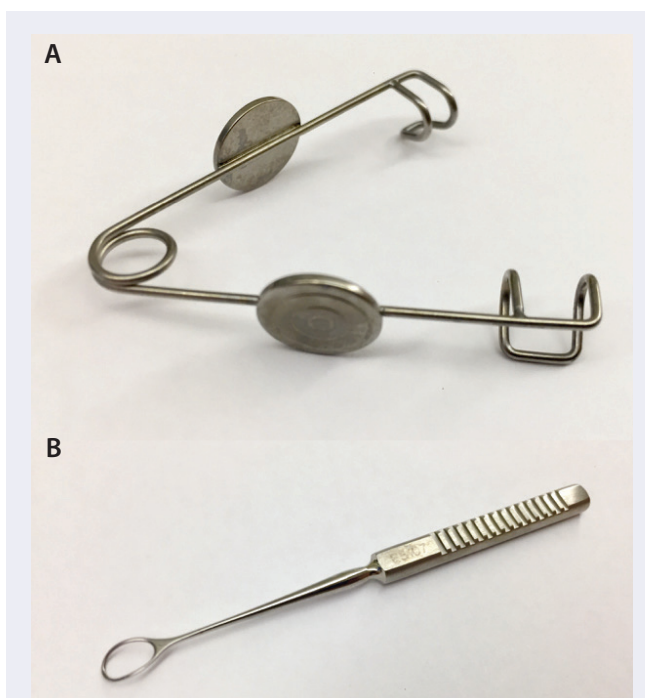
- Eye size, development, and anatomy all affect the interpretation of signs, timing of interventions, and surgical techniques appropriate for pediatric retina patients.
- Retinoblastoma is the most important pathology to rule out in a pediatric retina examination.
- A good pediatric retina examination should involve inspection of both eyes of the patient, regardless of the presence or absence of symptoms in the contralateral eye.
- Taking the time to educate caregivers is a critical component to building trust and improving overall care for the child.

## ANATOMIC CONSIDERATIONS

The pediatric retina examination depends upon the clinician's understanding of basic anatomic considerations in a pediatric patient. The pediatric eye is smaller, with a formed vitreous and a lens proportionally larger than



**Figure 1.** Retinopathy of prematurity examinations can be challenging. Depending on the infant, issues may include having to work with or around continuous positive airway pressure masks or endotracheal tubes, contact precautions, poor dilation if there is active disease, small anatomy, etc. Maximizing the examination environment before indirect ophthalmoscopy examination is a good idea. Tips for tackling this sometimes difficult process include swaddling the infant well, closing the curtains and darkening the room, bringing down the side rail nearest you, and being aware of oxygen delivery devices on the infant's face. The neonatal intensive care unit nurse can also be instrumental by helping you secure the infant, holding a pacifier in place, providing sweets, and keeping an eye on the infant's vital signs and any tubes or lines.



**Figure 2.** The Alfonso speculum (A) and Flynn scleral depressor (B) are particularly useful tools for neonatal peripheral retinal examinations.

in the adult eye. Vascularization of the retina is usually completed nasally and temporally by 36 and 40 weeks' gestation, respectively. These characteristics affect the interpretation of signs, timing of interventions, and surgical technique, all of which are dependent on a good retina examination.

## EQUIPMENT

Having the right tools and instruments in the office increases the chances of a successful pediatric eye examination. Below are some of our must-have items.

### Speculum

The Alfonso speculum and Flynn scleral depressor (Figure 2) are common tools that we find useful for performing peripheral retinal examinations for neonates. The Alfonso speculum is particularly useful to adequately keep the eyelids open in infants.

### Dilating Drops

Adequate pupillary dilation is critical to a good examination. If the fixed combination of anticholinergic cyclopentolate HCl 0.2% and adrenergic phenylephrine HCl 0.1% (Cyclomydril, Novartis) does not provide adequate dilation, consider adding phenylephrine 2.5% or cyclopentolate 1%.

### Portable Slit Lamp

It is useful to have a portable slit lamp available for evaluation of the anterior segment and anterior retrolenticular pathology. As an alternative, an indirect lens can be used as a magnifier.

### Tonometer

Although it may be intimidating to even attempt to measure a child's intraocular pressure (IOP), the Icare TAO1 tonometer (Icare) or a tonopen (multiple manufacturers) can be very useful. Many pediatric ophthalmologists now use the Icare tonometer for measuring IOP in children who can cooperate with the examination.

### Lenses

Depending on the examiner's preference, a 28-D, 30-D, or other lens may allow indirect ophthalmoscopy of a greater area of the fundus when the duration of cooperation is limited.

## PATIENT HISTORY AND APPROACH TO THE CLINICAL EXAM

### Rule Out Retinoblastoma

The most important pathology to rule out is retinoblastoma. Having a good ultrasound unit in your office will help identify masses that may have been difficult to see if your peripheral retinal exam is limited in the office. If there is no view of the retina or if you are unable to rule out this life-threatening condition with confidence, an examination under anesthesia should be performed, and/or the patient should be referred to a specialist.

### Take Detailed History

As with every patient encounter, whether with adults or children, it is critically important to have a detailed understanding of the patient's symptoms, medical history, and family history to help guide management. This information will also help tailor and target the clinical examination. Elicit any comorbid conditions, the child's mood, personality, fears, and behavior. Ask the parents about recent changes in behavior. Pictures and videos of the child may be helpful. Family history can also provide important clues about the patient's condition.

### Engage Parents and Patients

It is very important to build a rapport with the patient and the family. Try to keep everyone relaxed and put the child at ease. This will take some time, but it will potentially increase the level of cooperation by the child. Engaging the child with games, multicolor flashing lights, toys, and high-fives, showing cartoons on video monitors, or providing positive reinforcement with stickers may help distract or relax the patient. Increasingly, parents have smartphones

or tablets preloaded with the patient's favorite videos and songs, and these can be helpful distractions.

Excellent communication with explanation of every step of the examination is critical in gaining both the patient's and parents' trust. Cooperative parents can help children feel more secure and play a key role in assisting with the examination. Pretending to examine one of the parents first occasionally helps to reassure the patient. With very young infants, having the parents or an assistant hold the patient down may be required, but this should not necessarily be the first step for all examinations.

### Make the Exam Engaging

In the examination proper, try to pique the patient's interest in the proceedings. For example, ask the child whether he or she can see the examiner's eyes from the other end of the instrument, or tell the patient that the

examiner is going to try to find a dinosaur or other object of interest in the eye. Another useful trick is to ask the child what color he or she thinks the examination light is. For early school-age children, having the patient stand up at the slit lamp may sometimes be preferred ergonomically over sitting down for the examination.

In younger individuals, when visual acuity testing is unreliable, light perception can be checked with the binocular indirect ophthalmoscopy headset. Looking for the red reflex in several directions first can help the examiner grossly localize pathology, especially in cases of possible retinal detachment, cataract, tumor, persistent fetal vasculature, and vitreous hemorrhage. Knowing that an examination may be limited, starting the examination in this locality may increase the information yield from the start. Using a less bright illumination source and performing no-touch indirect examination without finger stabilization on the patient's forehead can help to reduce patient anxiety. Inferior fundus views, for which manual eyelid elevation is needed, can be saved for last.

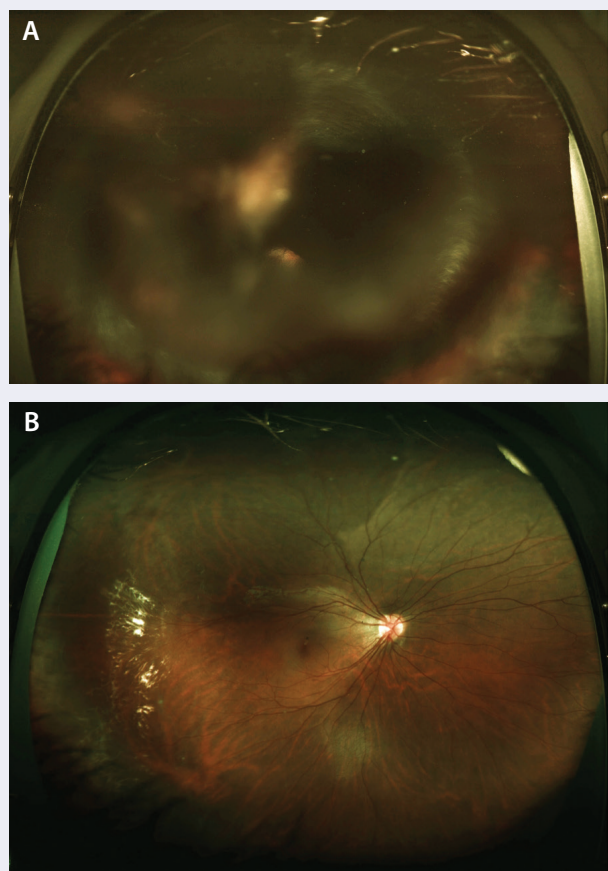
### Examine the Fellow Eye

A good examination should involve inspection of both eyes of the patient, regardless of the presence or absence of symptoms in the contralateral eye. We offer a clinical example of why this is vital (Figure 3): A 12-year-old boy presented with decreased vision in the left eye secondary to neovascular glaucoma and vitreous hemorrhage. Examination of the asymptomatic right eye enabled the elucidation of underlying retinal pathology. Prophylactic laser photocoagulation was performed to reduce the risk of further complications.<sup>1</sup>

### Perform Diagnostic Testing and Imaging

Advances in retinal imaging have significantly improved our ability to conduct a comprehensive outpatient pediatric retinal examination. Images can help educate patients and parents, provide baseline documentation for later comparison, guide future treatment, and educate trainees.

**Fundus Photography.** When possible, fundus images should be obtained in children, at least as baseline for retinal pathology. New camera systems can detect and document fundus pathology and allow temporal monitoring of disease activity and response to treatment. Ultra-widefield fundus images obtained with the Optos systems are often successful in children older than 3 years. In photophobic individuals, fundus photography may be better tolerated than binocular indirect ophthalmoscopic examination. Young children who can easily be lifted up and held are surprisingly amenable to the use of conventional fundus cameras.



**Figure 3.** A 12-year-old boy presented with acutely decreased vision in his left eye secondary to neovascular glaucoma and vitreous hemorrhage (A). Examination of the contralateral right asymptomatic eye revealed temporal vascular dragging and peripheral exudations consistent with familial exudative vitreoretinopathy (B).



**Fluorescein Angiography.** Ultra-widefield fluorescein angiography has been shown to aid in the evaluation of peripheral pediatric retinal pathology.<sup>2-4</sup> If use of intravenous fluorescein is not possible, mixing fluorescein with a beverage the child enjoys (eg, soda, juice), can make oral administration possible. Appropriate fundus images can be obtained 20 to 30 minutes after oral administration of fluorescein.

**Optical Coherence Tomography (OCT).** OCT often provides information that is difficult to obtain on examination and that may identify subtle macular pathology that can help explain vision loss. Some children tolerate OCT better than biomicroscopy.

**B-Scan Ultrasonography.** Ultrasound is useful to obtain important information, such as the presence or absence of a retinal detachment or mass, especially when peripheral ophthalmoscopic visualization is not possible. When one has difficulty obtaining still images, observation of the live video (dynamic ultrasonography) during the process of image acquisition can be useful. Many children tolerate ultrasonography well, and this is another way to enhance the examination of an uncooperative child.

#### *Review Imaging With Parents and Caregivers*

It is helpful to review images with the child's parents or caregivers in order to educate them about the patient's condition. This provides a new perspective for them and can reinforce the need for timely follow-up and compliance with care. Taking the time to educate is a critical component in building trust and improving the overall care for the child.

#### *Consider Examination Under Anesthesia*

When there is any suspicion of pathology and a thorough outpatient examination is not possible, or if necessary imaging is not tolerated, considering an examination under anesthesia (EUA) is an appropriate next step. EUA can be extremely helpful in creating a good management plan. Retinal imaging during EUA is also possible with systems such as the RetCam3 (Natus Medical), PanoCam LT (Visunex Medical Systems), 3nethra neo (Forus Health), and Icon (Phoenix Clinical) handheld widefield real-time retinal camera.

### THE ART OF PEDIATRIC RETINA EXAMINATIONS

The principles of clinical care and management and the need to understand our patients and their families are generally universal, but the art of the pediatric retina examination is something for which different physicians will develop their own personal skills and preferences over time.

The first and foremost goal in the clinical approach to the pediatric retina patient should always be to identify

life-threatening conditions such as retinoblastoma.

Administration of life-saving medical treatments should take priority over vision preservation in most cases. There may be situations in which referral to a subspecialist must be considered, especially when there are considerable risks or potentially limited benefits of intervention, and when there is a need for highly specialized medical treatments, surgical interventions, and services such as genetic counseling. Referral may also be considered in particularly challenging cases refractory to conventional treatments, or to gain access to novel treatments available only through clinical trials.

When in doubt, a second opinion benefits not only the referring physician but also the patient and his or her parents in formulating a management plan. An additional expert opinion and supplementary information may provide assurance and help with decision-making. Finally, it helps to stay up to date with the nuances of clinical diagnosis and management, which help to focus the physician's retina examination. ■

1. Yonekawa Y, Chan RVP. Widefield imaging-guided treatment of pediatric vitreoretinal diseases. *Retina Today*. 2014;9(2):54-57.

2. Kang KB, Wessel MM, Tong, et al. Ultra-widefield imaging for the management of pediatric retinal diseases. *J Pediatr Ophthalmol Strabismus*. 2013;50(5):282-288.

3. Kashani AH, Brown KT, Chang E, Drenser KA, Capone A, Trese MT. Diversity of retinal vascular anomalies in patients with familial exudative vitreoretinopathy. *Ophthalmology*. 2014;121(11):2220-2227.

4. Tsui I, Franco-Cardenas V, Hubschman JP, Schwartz SD. Pediatric retinal conditions imaged by ultra wide field fluorescein angiography. *Ophthalmic Surg Lasers Imaging Retina*. 2013;44(1):59-67.

#### **R.V. Paul Chan, MD, FACS**

- professor of ophthalmology and visual sciences; vice chair for global ophthalmology, director of pediatric retina and retinopathy of prematurity service, and co-director of the vitreoretinal fellowship program, department of ophthalmology and visual sciences, Illinois Eye and Ear Infirmary, University of Illinois at Chicago
- member of the *Retina Today* editorial advisory board
- financial disclosures: consultant for Alcon, Allergan, and Bausch + Lomb; scientific advisory board for Visunex Medical Systems
- rvpchan@uic.edu

#### **Ru-ik Chee, MD**

- fellow in vitreoretinal surgery, department of ophthalmology and visual sciences, Illinois Eye and Ear Infirmary, University of Illinois at Chicago
- financial interest: none acknowledged
- rchee2@uic.edu

#### **Yoshihiro Yonekawa, MD**

- pediatric and adult vitreoretinal surgeon at the Massachusetts Eye and Ear Infirmary and Boston Children's Hospital, Harvard Medical School
- financial disclosures: consultant for Allergan; ad-hoc consultant for Alcon and Regeneron
- yoshihiro\_yonekawa@meei.harvard.edu