

by bars placed above, below, and on either side of it to account for the crowding phenomenon and to avoid overestimating VA.¹⁴¹⁻¹⁴³

Forced preferential looking using Teller Acuity Cards (Precision Vision, Woodstock, IL) can provide an assessment of grating acuity in infants, and the patient's measurement can be compared with normative data; however, this method of testing overestimates the VA obtained by recognition VA methods in children with amblyopia.^{144, 145}

For details of charts used for VA testing, see Appendix 3 in the Pediatric Eye Evaluations PPP.¹⁰⁸

Binocular Alignment and Ocular Motility

The corneal light reflection, binocular red reflex (Brückner) test, and cover tests are commonly used to assess binocular alignment. Cover/uncover tests for tropias and alternate cover tests for the total deviation (latent component included) in primary gaze at distance and near should be measured using accommodative targets. The cover test is performed by covering one eye and observing for a refixation movement of the fellow eye; if refixation of the fellow eye occurs, then a tropia is present. Cover tests require sufficient VA and cooperation to fixate on the desired target. Ocular versions and ductions, including into the oblique fields of gaze, should be tested in all infants and children. Eye movements may be tested using oculocephalic rotation (doll's head maneuver) or assessed by observing spontaneous eye movements in the inattentive or uncooperative child. Binocular alignment testing should be done before cycloplegia, because alignment may change after cycloplegia.

Cycloplegic Retinoscopy/Refraction

Determination of refractive errors is important in the diagnosis and treatment of amblyopia or strabismus. Patients should undergo cycloplegic refraction with retinoscopy, followed by subjective refinement when possible.⁶ Retinoscopy, done prior to cycloplegia, provides a rapid assessment of accommodation and may be helpful in evaluating a child with asthenopia who has high hyperopia or a child with accommodative insufficiency.^{146,147} Accurate accommodation when viewing a small target near the retinoscope light is seen as a neutral retinoscopic reflex or minor "with" movement. In dynamic retinoscopy, the examiner evaluates the change in the retinoscopic reflex from a "with" motion toward neutrality as the patient shifts fixation from a distant to a near target.

Adequate cycloplegia is necessary for accurate retinoscopic refraction in children because of their increased accommodation compared with adults. At present, there is no ideal cycloplegic agent that is safe, has rapid onset and recovery, provides sufficient cycloplegia, and has no local or systemic side effects.¹⁴⁸ Cyclopentolate hydrochloride 1% is useful because it produces rapid cycloplegia that approximates the effect of topical ophthalmic atropine 1% solution but with a shorter duration of action.¹⁴⁹ Cyclopentolate 1% solution is typically used in term infants over 12 months old. The dose of cyclopentolate should be determined based on the child's weight, iris color, and dilation history. In eyes with heavily pigmented irides, repeating the cycloplegic eyedrops or using adjunctive agents, such as phenylephrine hydrochloride 2.5% (which has no cycloplegic effect) or tropicamide 1.0%, may be helpful to achieve adequate cycloplegia and dilation to facilitate retinoscopy and ophthalmoscopy.¹⁴⁸ Tropicamide (0.5%) and phenylephrine hydrochloride (2.5%) may also be used in combination to produce adequate dilation and cycloplegia. For children younger than 6 months, an eyedrop combination of cyclopentolate 0.2% and phenylephrine 1% is often used.¹⁵⁰ In some children, higher concentrations or a repeat application may be necessary. In rare cases, topical ophthalmic atropine sulphate 1% solution may be necessary to achieve maximal cycloplegia.¹⁴⁹

The use of topical anesthetic prior to the cycloplegic agent reduces the stinging and promotes penetration of subsequent eyedrops.¹⁵¹ Uncommon short-term side effects of cycloplegic medications include hypersensitivity reactions, fever, dry mouth, rapid pulse, nausea, vomiting, flushing, somnolence, and, rarely, behavioral changes (i.e., delirium). Punctal occlusion may be useful to reduce these side effects. If the reaction is severe, the child should be referred to an emergency care setting and physostigmine may be given.