RefRACTive ERRORS and Retinoscopy

Merrill Stass-Isern MD
Section Chief Ophthalmology
Nemours Pediatric Subspecialty Care, Jacksonville
Professor University of Florida
Assistant Professor Mayo Clinic
Refract – To bend light

• The main job of the front part of the eye is to bend light so that the incoming light rays are focused on the retina
  
  – Cornea, lens, pupil, tear film
Refractive Error

• Light rays that are not focused on the retina
  – Hyperopia (farsightedness)
Hyperopia

The eye is “too short”
Not enough power
Refractive Error

• Light rays that are not focused on the retina
  – Hyperopia (farsightedness)
  – Myopia (nearsightedness)
Myopia

The eye is “too long”
Too much power
Refractive Error

• Light rays that are not focused on the retina
  – Hyperopia (farsightedness)
  – Myopia (nearsightedness)
  – Astigmatism
Astigmatism

The eye is “not round”
Steeper in one axis than the other
My child needs glasses???
How do you know???
Measuring Refractive Error

**Adults**
- Subjective Refraction
- Better one? Better two?

**Children**
- Objective Refraction
- Retinoscopy
Retinoscopy

- The great mystery of pediatric ophthalmology

- What in the world are you looking at??
Retinoscopy
What do we see?

“With” motion

“Against” motion
What do we see?

With motion

Add

With motion

Add
What do we see?

“Against” Motion
Add Minus
What do we see?

“Neutralized”
Hyperopia - Corrected
When are glasses prescribed for children?

<table>
<thead>
<tr>
<th>Condition</th>
<th>1 year and younger</th>
<th>1 to 2 years</th>
<th>2 to 3 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>nearsighted (myopia)</td>
<td>-5 or worse</td>
<td>-4 or worse</td>
<td>-3 or worse</td>
</tr>
<tr>
<td>farsighted (hyperopia) with strabismus</td>
<td>+3 or worse</td>
<td>+2 or worse</td>
<td>+1.5 or worse</td>
</tr>
<tr>
<td>farsighted (hyperopia) with no strabismus</td>
<td>+6 or *  worse</td>
<td>+5 or * worse</td>
<td>+4.5 * or worse</td>
</tr>
<tr>
<td>astigmatism</td>
<td>3 or worse</td>
<td>2.5 or worse</td>
<td>2 or worse</td>
</tr>
</tbody>
</table>
How can we treat refractive errors in children?

• Glasses

• Contact lenses
  • Refractive surgery
    – LASIK/PRK
    – Phakic IOL
How can we treat refractive errors in children?

• Glasses
  – Most common form of correction in children
  – Safest, most economic option
  – Can be fit for the smallest infants
How can we treat refractive errors in children?

• Contact Lenses
  – Option for responsible teens
  – Aphakic infants and children
  – High refractive errors
  – Risk of infection is always present
How can we treat refractive errors in children?

• Refractive surgery
  – Not FDA approved until at least age 18
  – Very few cases are good candidates as children
    • High refractive error in 1 eye (anisometropia) with amblyopia
    • High refractive errors in developmentally delayed children
Common questions about refractive errors in children
Common questions

• Will my child wear his/her glasses?

• Answer: Yes, the vast majority of children will wear glasses happily. Children will adapt quickly to even high powered glasses.
Common questions

• Why don’t all hyperopic children need glasses?
Hyperopia in children

Kids have powerful muscles in their eyes that allow the eye to "zoom" or accommodate. A considerable amount of hyperopia can be tolerated without correction.
Common questions

• What is the refractive error in aphakia?
Aphakia

High hyperopia
Common questions

• Why can’t I see through my child’s glasses?

• Answer: For the same reason you can’t wear you child’s shoes, each pair of glasses is unique for the patient.
Common questions

• Will my child outgrow his/her glasses?

• Answer: Many children who are hyperopic will outgrow the need for glasses as they get older. Most myopic children will not outgrow the need for glasses.
Common questions

• Will my child’s eyes get “worse” from wearing their glasses? Will they become dependent on the glasses?

• Answer: No. The glasses will not have a negative effect on the eyes. A child may wear them more often if they appreciate clearer vision.