The ABC's and 123's of Refractive Error Management for Infants and Toddlers

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This course reviews normal visual development, the important concepts of emmetropization, and the detrimental affects of anomalous refractive error on the developing visual system. Guidelines for refractive management of infants, toddlers, and preschool aged children are outlined.

I. Why is it important?
   A. Early intervention

   B. Common diagnoses
      1. Refractive error in 5-72 months olds
         a. Myopia 3-7%
         b. Hyperopia 20-27%
         c. Astigmatism (≥ 1.50 D) 12-17%
         d. Anisometropia (≥ 1.00D) 4-6%
      2. Strabismus: 3-4%
      3. Amblyopia: 2-3%

II. Evaluation Strategy
   A. General Strategy
      1. Rely on objective tests
      2. Minimize subjective tests
      3. Use age and developmentally appropriate targets
      4. Be prepared to change your testing methods and be flexible
      5. Have a child friendly environment

   B. Tips
      1. Mail history forms prior to the exam
      2. Schedule child during a time they are normally awake
      3. Have parents bring their favorite snack
      4. Take off your “doctor’s coat”
      5. Allow young children to sit on parent’s lap
      6. Call procedures “games” instead of “tests”
7. Change your vocabulary (kids love putting on “magic glasses”)
8. Change targets frequently (stickers, toys, puppets)
9. Give a lot of praise and provide positive reinforcement with stickers or a trip to the treasure chest
10. Tell them what you want them to do (“working position”)
11. Work quickly, but keep it fun

III. What are the expected findings for an infant/toddler and preschooler?
   A. Developmental History
      1. Sit up and crawl -- 8 months
      2. Walk -- 9-15 months
      3. Say 1-2 words – 12 months

   B. Visual acuity
      1. Infants
         a. A rule of thumb; visual acuity expressed in cycles per degree is approximately equal to the age in months up to about 1 year.
         b. The range of acuities (in normal infants) may span 2 octaves, an octave being a doubling of spatial frequency
      2. Toddlers (95% CI)
         a. 30-35 months: 20/63
      3. Pre-school and school age
         a. 36-47 months: 20/50
         b. 48-59 months: 20/40
         c. 60-72 months: 20/32

   C. Refractive Error
      1. Spherical equivalent
         i. 4 months: +2.03 ± 1.56 D
         ii. 9 months: +1.32 ± 1.13 D
         iii. 18 months: +1.23 ± 0.91 D
         iv. 24 months: +1.19 ± 0.83 D
         v. 36 months: +1.00 ± 0.76 D
      2. Astigmatism variable and transient
      3. Anisometropia also variable at this young age

   D. Accommodation
      a. Improves rapidly during the first few months of life
      b. Accuracy (MEM) may give insight into emmetropization

   E. Vergence
      a. Gross convergence within days of birth
F. Eye Alignment and sensory fusion
   a. Rapid development of stereopsis over first 6 months
   b. Strabismus can be transient (more likely if strabismus is inconsistent in nature, less likely if constant of consistent size, especially over 2 months (ET) to 4 months (XT))

IV. Examination Strategies
   A. Infant/Toddlers
      1. Visual acuity
      2. Eye Alignment/Accommodation
      3. Refractive Error
      4. Ocular Health
   B. Pre-schoolers
      1. Visual Acuity
      2. Eye Alignment/Accommodation
      3. Refractive Error
      4. Sensory Fusion
      5. Ocular Health

V. Refractive Management
   A. Issues to consider for prescribing
      1. Normal Development
         a. Infants
         b. Toddlers
         c. Preschoolers
         d. School-aged
   B. Refractive error as a risk factor for amblyopia and strabismus
      1. Isometric amblyogenic risks
      2. Anisometric amblyogenic risks
      3. Strabismus
   C. Prescribing for hyperopia
      1. Prescribing for the nonstrabismic, non-symptomatic child
         a. Infants and Toddlers: how much is too much?
         b. Preschool children
         c. If prescribing, reduce the full cycloplegic refraction
      2. Prescribing for the strabismic / amblyopic child
         a. Esotropia
            1. Infant: At what age to prescribe and how much?
            2. Toddler: Typically give full cycloplegic refraction
2. Preschooler and school-age: Consider an add for if AC/A is high (more eso at near)
   b. Exotropia
      1. Infant
      2. Toddler
      3. Preschooler and school-age
      4. Minimize the hyperopic correction
   c. Begin strabismus treatment if still present after refractive error correction

D. Prescribing for astigmatism
   1. Development
   2. Amblyopia – meridional
   3. Prescribing for the nonstrabismic, non-symptomatic child
      a. Infants and Toddlers
         1. Longitudinal measures are necessary
      b. Preschool children
   4. Prescribing for the strabismic / amblyopic child
      a. Goal – provide the clearest retinal image

E. Prescribing for anisometropia
   1. Anisometropic amblyogenic risks
      a. Hyperopia
      b. Astigmatism
      c. Myopia
   2. Prescribing for the nonstrabismic, non-symptomatic child
      a. Infants and toddlers (young preschoolers)
      b. Preschool
   3. Prescribing for the strabismic / amblyopic child

F. Prescribing for myopia
   1. Prescribing for the nonstrabismic, non-symptomatic child
      a. Infants
      b. Toddlers
      c. Preschool children
   2. Prescribing for the strabismic / amblyopic child
      a. If esotropic, minimize the myopic correction
         1. Consider an add for preschoolers or older if AC/A is high (more eso at near)
      b. If exotropic, typically give full refraction
      c. Begin strabismus treatment if still present

VI. Patient case scenarios