

Refraction Techniques in a Child- From the Past to the Present

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Introduction: Correction of refractive error in children is very important as it can affect performance in school and his/her life time achievements.

Methods: Literature search of the various past and current techniques of refraction.

Results: The manual, photorefractive, automated, combined methods of refraction, aberrometers and keratorefractive surgeries can be carried out to correct errors in children.

Discussion: The major types of refraction are subjective and objective; dry or wet; and static or dynamic. Subjective requires input from patients and therefore not very effective in children. The judgement of the examiner is required to arrive at the correction by carrying out retinoscopy or refraction. From times past, retinoscopy has evolved from using retinoscopes such as plane mirror, spot retinoscopy, to now popular streak retinoscope.¹ In Near Retinoscopy, patient looks at a near object with accommodation relaxed e.g. Mohindra retinoscopy. Caution has been suggested in substituting this for cycloplegic retinoscopy because full latent hyperopia is usually not taken care of.² Can sometimes be a substitute for static retinoscopy in infants and can be done with or without cycloplegia. Dynamic Retinoscopy patient looks at near object with accommodation active. (Table 1)³ Static Retinoscopy patient looks at a distant object with accommodation relaxed. This relies on Foucault's principle i.e. the examiner simulates optical infinity to obtain the correct refractive power.

Manual current practices: Streak retinoscopy with or without cycloplegia. Cycloplegia is used in hyperopia, esotropia, convergence excess, accommodative spasm and when relative states cannot be found in the dry refraction. The Phoropter have mounted rotated lenses for subjective endpoints. Better used in the older child. Book Retinoscopy evaluates accomodative lag, near visuo-cognitive performance and prescribes

lenses or vision therapy sessions to improve performance during near cognitive activities like reading, studying, and playing videogames⁴

The Focometer is a hand held device that works by auto focus. Corrections are read off linearly.⁵ The Brückner test and the enhanced Brückner test (EBT) performed by transilluminating the pupil, shows the size of the bright pupillary crescent to indicate the presence of any significant refractive error^{6,7} EBT is very useful in screening.^{4,8} However, its reliability can be questioned when used by non-experienced persons.⁹

Automated methods: Automated refractors can be table tops or hand held. Their advantages are in giving good time management.

Photoscreeners are especially useful in screening for refractive errors and when patient's cooperation cannot be well maintained e.g. Plusoptix A09 (Plusoptix, Inc)¹⁰ Combined cyclopegia and auto refraction are also done.¹¹ Keratorefractive surgery is done also for very high errors.

Most current trends: Keratometry and Refraction are combined particularly in premature infants because of a significant correlation between corneal curvature growth and associated less hypermetropia when compared to from term infants.¹² Photorefraction is now thought to give accurate refraction results even better than autorefractors.¹³ Aberrometers are also being used.¹⁴

Table 1: Dynamic retinoscopy techniques

Dynamic Retinoscopy Techniques				
Test	Aspect assessed	Cognitive demand	Target location	Expecteds
Monocular Estimate Method (MEM)	Positioning of accommodation relative to convergence	Moderate	16 inches (40 cm) or Harmon distance for some youngsters	+0.5D
Nott Dynamic	Positioning of accommodation relative to convergence	Moderate	16 inches (40 cm)	+0.5D
OEP #5	Positioning of accommodation in space	Moderate	16 inches (40 cm)	Evaluated in comparison to test #7
Bell Retinoscopy	Positioning of accommodation relative to convergence	Low	20 inches (50 cm) at start of testing	With motion at 14-17 inches changing to against motion at 15-18 inches
Stress Point (Ceska's)	Response to stress	Moderate to high	20 inches (50 cm) at start of testing	Stress point at least 10 cm closer than Harmon Distance
Book (Getman)	Level of Visual Processing	High	Habitual Near Working Distance	Task related

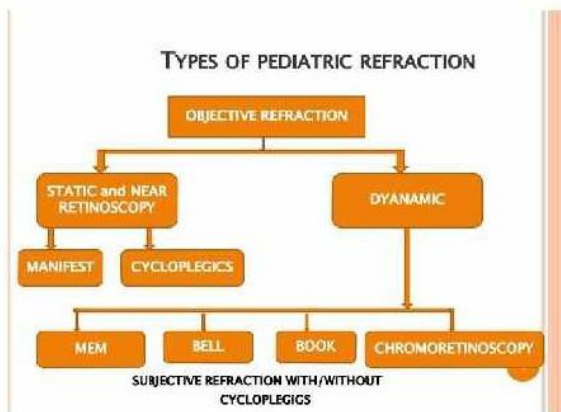


Fig. 1: Types of pediatric refraction

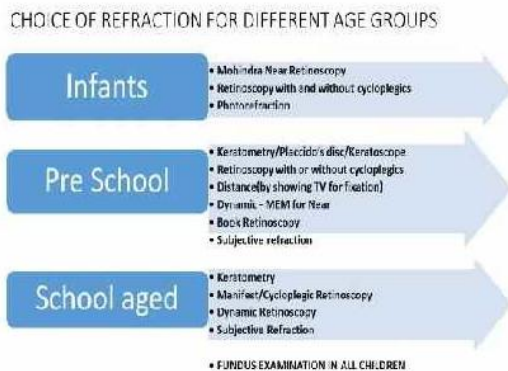


Fig. 2: Choice of refraction for different age groups

Conclusion: Refraction in children should be done meticulously, accurately and with expertise in order to bring out the best in a child's life.

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