Chapter 9
Binocular Examination in Children

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ABSTRACT

This chapter introduces the reader to tests commonly performed in a binocular vision examination to determine a child's binocular status. The testings introduced in this chapter are all chairside techniques that do not involve a significant amount of extra equipment or time. The binocular examination consists of determining the ocular position and then accommodation, vergence, and ocular motor statuses. The ocular position consists of determining where the eyes point in space and if they are correctly aligned. Evaluation of ocular alignment and the ability to move the eyes with coordination can be determined with various techniques, including Hirschberg, Krimsky, cover test, as well as Modified Thorington, motor testing, and vergence ranges. This chapter will familiarize the clinician with the basics of binocular vision testing and improve the reader's comfort with the various elements of the binocular vision examination.

INTRODUCTION

This chapter introduces the reader to tests commonly performed in a binocular vision examination, including various techniques the clinician can use to determine a child's binocular status. The testing introduced in this chapter are all chairside techniques that do not involve a significant amount of extra equipment or time intensive elements. Therefore, they can be easily included into the clinician's eye examination. The objectives of this chapter are to familiarize the clinician with the basics of binocular vision testing and to improve the reader's comfort with this testing.

BACKGROUND

Most patients will benefit from a thorough binocular vision evaluation, which should be performed after the correct determination of the child's refractive error. The binocular examination consists of determining the ocular position, and then accommodation, vergence, and ocular motor statuses. The ocular position consists of determining where the eyes point in space, and if they are correctly aligned. Ocular alignment can be determined with various techniques, including Hirschberg, Krimsky, cover test, as well as Modified Thorington. Motor testing, or the evaluation of the ability to move the eyes with coordination, can be determined with vergence assessment. Vergences can be performed in phoropter with Risley prisms or out of phoropter in free space with prism bars. This chapter will familiarize the reader with the various elements of the binocular vision examination.

HIRSCHBERG TEST

Indication

The Hirschberg test allows for an estimated objective assessment of ocular alignment. It is very useful in infants, toddlers, and children with developmental delays. It determines the presence of strabismus, as well as the direction, laterality, frequency, and magnitude of the deviation.

Background

The Hirschberg test estimates the amount of strabismus present based on the first Purkinje image. That is, the decentration of the corneal light reflex produced by a light source (e.g., a transilluminator) in the deviating eye compared to the corneal light reflex of the fixating eye. An equal or symmetrical corneal light reflex indicates alignment. An asymmetric Hirschberg reflex is confirmed by occluding each eye separately to determine the fixating eye and assessing angle kappa. Angle kappa (angle lambda) is the angle between the visual line and the pupillary axis. A positive angle kappa (displacement toward the nose indicated by a "+" sign) of up to 5 degrees can be physiologic. This slightly decentered reflex nasally is often noted as +0.5 mm. A negative angle kappa is when the reflex is displaced temporally and is recorded with a "-" sign. A positive angle kappa may mask a small angle esotropia or cause pseudoexotropia, whereas a negative angle kappa may simulate esotropia or mask exotropia. A 1 mm displacement is approximately 22 prism diopters (Δ) in misalignment (Caloroso, EE and Rouse MW, 1993). The position of the corneal light reflex indicates the type of deviation (Table 1).

Table 1a. Position of corneal light reflex and type of deviation

Position of Corneal Light Reflex	Type of Deviation
Nasal	Exo
Temporal	Eso
Above	Hypo
Below	Hyper

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