The Bagolini striated lens test for cyclotropia

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Abstract. Measurements of cyclotropia obtained by two different techniques were compared in ten patients with superior oblique palsies. These techniques were the Maddox double rod test and a new test for cyclotropia using the Bagolini striated lenses. In contrast to the Maddox rods, the Bagolini lenses permit a nearly normal view of the visual environment; in addition with the Bagolini striated lens test, the patient's eyes were not prismatically dissociated as in the Maddox double rod test, but instead prisms were used when necessary to eliminate horizontal and vertical image disparities prior to measuring cyclotropia. The Bagolini striated lens test thereby permitted cyclotropia adaptive mechanisms to function under nearly normal viewing conditions. The two tests yielded similar measurements of cyclotropia under dissociated binocular conditions, but in several patients different results were found with the Bagolini striated lenses when associated vertical and horizontal heterotropias were eliminated spontaneously or prismatically. Three cases are reported in whom the Bagolini striated lens test provided important clinical information not revealed by the Maddox double rod test.

Introduction

Cyclotropia is commonly measured in patients with a suspected palsy of a cyclovertically acting muscle. Several techniques of performing this measurement have been described (von Noorden 1980; Hugonnier and Hugonnier, 1969). A popular method in the United States is the Maddox Double Rod (MDR) test which is based on haploscopic presentation of a linear visual target to each eye (von Noorden, 1983). This test can provide both qualitative and quantitative information. However, a potentially important disadvantage of this and of other haploscopic tests is that by providing a binocularly dissociated artificial visual environment, they interfere with cyclotropic adaptive mechanisms. These include motor and sensory cyclofusion (Sullivan and Kertesz, 1979), a sensory reordering of the spatial value of retinal meridians, and empirical factors from normal environmental clues (Ruttum and von Noorden, 1983). Thus, such tests may be misleading by indicating cyclotropia when none is present under casual binocular viewing conditions. To gain a better understanding of the role of cyclotropia in a dissociated and, conversely, in a nearly normal visual environment in patients with superior
oblique palsies, we compared results collected with the MDR test with those obtained with a new application of the Bagolini Striated Lenses (BSL) (Bagolini, 1958). We report herein three cases in which the BSL test was found to provide important clinical information not revealed by the MDR test.

Subjects and methods

Ten patients with acquired unilateral or bilateral superior oblique muscle palsies were tested for subjective cyclotropia by both the MDR and BSL techniques. Each patient complained of intermittent or constant vertical and torsional diplopia. None of the patients showed evidence of suppression or anomalous retinal correspondence.

The MDR test was performed by placing a red Maddox rod before the hypertropic eye and a white Maddox rod before the fellow eye, each with its axis at the 90° mark of the trial frame. Vertical dissociation of the eyes was assured by placing a six prism diopter prism base down before the hypertropic eye. The patient thus saw two vertically separated horizontal streaks, one red and one white, when viewing a shielded fixation light at a distance of four meters. The fixation light and the peripheral visual environment were not visible to the patient because of the distortion produced by the Maddox rods. The patient's task was to rotate one or both lenses in the trial frame as necessary to produce parallel streaks of light.

A slightly different technique was used for the BSL test. These lenses, which were devised originally for testing retinal correspondence with a minimum of binocularly dissociating factors or apparatus effect, (Bagolini, 1958) consist of transparent, plano lenses with numerous microscopic etchings along one axis. Like a Maddox rod, these lenses produce an image of a streak of light perpendicular to the axis of the striations when a point source of light is viewed through the lens. However, unlike the MDR test, the Bagolini striated lenses provide a haploscopic presentation of identical targets to each eye under nearly normal binocular viewing conditions and with an obstructed view of the fixation light and surrounding visual details. We modified commercially available lenses by marking the edge of the lens along the axis of the longest striation (i.e. the one that forms a diameter of the lens); the lenses were then placed in a trial frame with those marks at 90°. For direct comparison with the MDR test, subjective cyclotropia by the BSL test was first measured with the eyes dissociated by a six diopter vertical prism. Subjective cyclotropia was then remeasured without prismatic dissociation of the eyes. If the patient could not spontaneously fuse the disparate images of the fixation light, appropriate horizontal and vertical prisms were placed before the eyes to allow fusion of the fixation light which was confirmed by a cover test. The patient was asked to report the orientation of the streaks relative to each other and, if necessary, to