Variations in Posner’s test for diagnosis of dissociated strabismus
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Abstract

Background: A particular feature of dissociated strabismus is that the frequency of presentation and its magnitude are variable. In certain examinations the condition is obvious, whereas in others it is not. To facilitate exploration, some maneuvers are described: Bielchowsky’s maneuver, Bielchowsky’s phenomenon and Posner test. We undertook this study in order to compare the presence and magnitude of the ocular movement in dissociated strabismus in Posner’s test using opaque vs. translucent occluders.

Methods: We carried out a prospective, cross-sectional descriptive study. Patients with diagnosis of dissociated strabismus were included. Posner’s test was done in two ways: 1) with opaque occluders and 2) with translucent occluders.

Results: Ninety five percent of the patients studied presented horizontal deviation. Posner’s test with opaque occluder was positive in all cases (100%). Posner’s test with translucent occluders was positive in 94% of the patients (p = 0.8). The magnitude of the ocular movement was significantly smaller using translucent occluders than opaque occluders (p = 0.0001).

Conclusions: Posner’s test using opaque occluders was more effective in clearly and precisely demonstrating the size of the ocular movement in dissociated strabismus.

Key words: dissociated strabismus, Posner’s test, opaque occluder, translucent occluder.

Introduction

Dissociated strabismus is a bilateral phenomenon characterized by occluding an eye that makes a movement of elevation, abduction and excycloversion and on uncovering the eye it descends, adducts and incycloverts. Each movement can manifest, to a different magnitude and direction, vertical or horizontal deviation or dissociation traction if the movement of elevation, abduction or excycloversion predominates, respectively. In a simpler way, it has been generically categorized as dissociated strabismus.1-3 The movements that come after the eye is uncovered are generally slow in the nondominant eye and rapid in the dominant eye.1 Dissociated strabismus may occur spontaneously in states of fatigue, lack of attention or in places with low lighting, or upon deleting the image, for example, with a lens or with a translucent occluder. In other patients it is manifested only when one eye is occluded and disappears when the eye is uncovered. This type is referred to as compensated and corresponds to 90% of the cases.1-8

It is particularly associated with congenital nonaccommodative strabismus, especially when there is latent nystagmus. In fact, it has been discussed if it is part of the congenital esotropia syndrome or an independent phenomenon that appears in cases of origin with important sensory deterioration.9-12 It is found with overfunction of the inferior obliques from 22.7 to 27.8% and an overfunction of the obliques >18.55%.1,12 The frequency of dissociated strabismus varies between 75 and 90% in eyes with profound amblyopia, with eccentric fixation or a corresponding retinal anomaly.1,12

A particular characteristic of dissociated vertical deviation is that the frequency of presentation is variable as with its magnitude. It is common to find that it is very evident in certain examinations and not so evident in others. The degree of hypertropia varies from one examination to another and during the measurement with prisms, so it is very difficult to evaluate its magnitude with prism diopters (PD). A qualitative and useful way to evaluate the magnitude of dissociated vertical deviation is through monocular occu-
sion, according to the following scale: $1+$ corresponds to a slightly noticeable deviation of $\sim 5$ PD, $2+$ to a deviation of $10$ PD, $3+$ to a deviation of $15$ PD and $4+ > 20$ PD.

The most important clinical maneuver for establishing the diagnosis of dissociated strabismus is with monocular occlusion, slow in the primary far position. During the occlusion there are three co-existing movements: elevation, abduction and excycloduction, which vary in magnitude. It is important to evaluate which of the three predominates. Because it is frequently associated with a constant horizontal deviation and occasionally with a vertical deviation, the rapid alternate occlusion allows for demonstrating the baseline deviation and monocular occlusion in the dissociated phenomena.

To demonstrate the existence of dissociated strabismus, some exploratory maneuvers have been described: those of Bielchowsky, the Bielchowsky and Posner phenomenon. The Bielchowsky maneuver is considered positive for vertical dissociated deviation when bowing the head, e.g., to the right, there is greater hyperopia of the left eye. However, this test is inconsistent and can change in the event of a superior rectus contracture.

The Bielchowsky phenomenon consists of placing a red filter of progressive density in front of the dominant eye and an occluder in the non-dominant eye. The eye behind the occluder performs a slow downward movement. The downward movement is in steps, proportional to the amount of light that enters the eye. Although the dissociated vertical deviation has been described as pathognomonic, it is not present in all cases. In a study by Olivares and Arroyo, the test was positive in only 55% of the cases. Posner proposed that the fixation is as important as the illumination in the production of the dissociated phenomenon and believed that the deviation varied more with visual attention than with the quantity of light that entered the retina. He mentioned that fixation and illumination increase the muscular tone to counter a primitive reflex that carries the eyes upwards. If the two eyes participate in the fixation it indicates that there is superior inhibitory control, but if only one fixates, the other eye deviates upwards. This explains why elimination of the fixation of the directing eye reduces hypertrophy of the nonfixating occluded eye in dissociated strabismus.

This principle is based on the Posner maneuver that consists of placing an opaque cover in front of the nonfixating eye, and the eye behind the occluder makes a slow upward movement. Another occluder is then placed in front of the fixating eye and it is observed that the nonfixating eye behind the occluder makes a downward movement (Figure 1).

With the objective of elucidating if the maneuver behaves differently when only the fixation is modified, but in order to allow entrance of light to the retina, modification

![Figure 1. (A) Eye above and behind the opaque occludor. (B) The eye comes down when the opaque occludor is placed in front of the dominant eye.](image)

of the test using translucent occludors was considered to compare the magnitude of the downward movement with the opaque occludors that modify both fixation and illumination. The objective of this study is to determine the existence and magnitude of the downward eye movement in dissociated strabismus when the Posner maneuver is compared and to compare it with two modalities: with opaque and with translucent occludors.

**Patients and Methods**

A prospective, cross-sectional descriptive and observational study was carried out from June 2010 to July 31, 2012. There were 50 patients with dissociated strabismus included who underwent the Posner diagnostic maneuver in two modalities: 1) with opaque occludors and 2) translucent occludors. We included patients with dissociated strabismus of any age and gender and who arrived at the outpatient pediatric ophthalmology and strabismus clinic of the Hos-
Results

There were 50 patients included (30 females) (60%). The average age at the time of diagnosis was 13.06 years (range: 2–36 years). The range of visual acuity in the dominant eye was from 20/20 to 20/400. The most common visual acuity was from 20/20 to 20/40 (66%). The range of visual acuity in the nondominant eye was 20/20 to uncentered and unstable fixation. The most common visual acuity was 20/100 and 20/400 (32%); 95.8% (46 patients) had horizontal deviation accompanying the dissociated strabismus, 77% were esotropias and 22% exotropias.

Vertical movement predominated in most of the cases for the dominant eye and for the nondominant eye in 94% of the cases. Only in three cases was predominance of horizontal movement demonstrated (6%).

The predominant magnitude of the movement of the dissociated strabismus in the dominant eye was +1 (25%); in contrast, the predominant magnitude of the deviation in the nondominant eye was +2 (19.4%). The speed of movement of the recovery was slow only in 12.5% of the dominant eyes and in contrast the movement in the nondominant eyes was slow in 54.1% of the patients.

The Posner maneuver with opaque occlusors was positive in 100% of the cases with dissociated strabismus in dominant and nondominant eyes. Upon using transparent occlusors this same test was positive in 94% of the cases with dissociated strabismus (p = 0.8) (Figure 2). The magnitude of the movement of recovery with the opaque occlusor in the dominant eye was, on the average, 1.08 with a median of 1; in the nondominant eye an average of 1.94 with a median of 2. With the transparent occlusor in the dominant eye, the average was 0.6 with a median of 0 and in the nondominant eye an average of 1 and a median of 1 (p = 0.0001) (Figures 3 and 4).

Discussion

The usefulness of the Posner maneuver for the diagnosis of dissociated strabismus is not well known.4,8,16 Although it was described by Posner in 1944, it is scarcely mentioned in the scientific literature. In the review we have available, it is only mentioned in a study by Laria et al.16 It was addressed once again in the last decade in the Hospital General de Mexico.

The original test was described with the use of opaque occlusors. However, after it was shown in some investigations that the low illumination helped to make dissociated strabismus evident,9 it was decided to modify the test using transparent occlusors (patches) that would decrease the amount of light the retina would receive but would also allow observation with more comfort and, using the occlusor, the behavior of the occluded eye. This idea prompted the objective of this study, which consisted of comparing the Posner maneuver modified with a transparent occlusor against an opaque occlusor as described by Posner in 1944.15
There are also other environmental and methodological variations that could increase the sensitivity of the strabological maneuvers to demonstrate the dissociated strabismus such as the following:

1) Decrease the light intensity in the examination room
2) Perform the Posner maneuver neutralizing the baseline nondissociated deviations whether it be esotropia, exotropia or vertical deviations secondary to hyperfunction, among others. These are frequently associated with dissociated strabismus.
3) Perform the Posner maneuver with the eye in adduction, looking to the front and in abduction.
4) Variation of the magnitude of movement between one examination and another.

Environmental variables and the diverse modifications in the strabological examination for the precise diagnosis of dissociated strabismus are not within the goals of this study.

**Figure 2.** Dissociated strabismus with the Posner maneuver.

**Figure 3.** Magnitude of dissociated strabismus in the dominant eye.
According to the results of this study, the original Posner maneuver with opaque occlusors was able to show more clearly and precisely the magnitude and direction of the predominant movement in dissociated strabismus when compared with the modified Posner maneuver with transparent occlusors. Even with the opaque occludor there was dissociated movement in 100% of the cases and in 94% with the transparent occludor. No statistical difference was demonstrated.

This could suggest, with regard to the pathology of dissociated strabismus, that the lack of fixation and attention towards a stimulus of fixation are more important factors and give more weight than the decrease in lighting to cause or precipitate the appearance of a dissociated strabismus. Also, the results confirm what has been demonstrated in many other studies that the vertical component of dissociated strabismus is the most frequent and most important.\textsuperscript{2,4,8}

Regardless, and due to the complexity of this pathology, there are other factors that could influence the manifestation of dissociated strabismus. The optimal conditions in which this disorder should be explored should be precisely determined.

In conclusion, with the use of both types of occlusors there was no significant difference shown in dissociated strabismus with the Posner maneuver. When done with opaque occlusors it was shown to be more effective to clearly and precisely demonstrate the magnitude of movement in dissociated strabismus when compared with transparent occlusors.

**References**


