Simplification of the Bielchowsky head tilt test for the general practitioner

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Abstract

The following is a short, but nonetheless important idea in orthoptics. It has the potential of not only facilitating a difficult part of exam questioning but also of simplifying an examination technique for the practitioner.

Abrégé

Cet article présente une procédure d'examen simple, mais néanmoins importante du bilan orthoptique. Cette technique a non seulement l'avantage d'être utile à une partie plus difficile de l'anamnèse mais aussi de simplifier une technique d'examen pour le praticien.

The Bielchowsky head tilt test[1,2] helps us to diagnose the offending muscle (vertical or oblique) in paralysis or paresis of long standing. Because of the secondary contractures taking place in the antagonist, the yoke muscles and their antagonists, the deviation may become increasingly concomitant, after which the difference between primary and secondary deviations decreases or disappears. As the result of these changes, conventional ocular motility testing becomes useless or frequently yields equivocal findings. Consequently, the diagnosis of the defective vertical or oblique muscles must be based on their antagonistic action during supraduction and infraduction and their synergistic effect during incycloduction and excycloduction[2].

Physiologic principles

The physiologic basis of the head tilt test was explained by Hofmann and Bielchowsky[3], who also fully confirmed this theory on clinical grounds. The head tilt phenomenon can be briefly explained as follows[2]. When the head is moved around an anteroposterior axis, compensatory eye movements occur around an antereposterior axis of the globe because of reflex innervation originating in the otolith apparatus. Thus, when the head is tilted to the right, the right superior oblique and rectus muscles contract to provide incycloduction of the right eye. In the left eye the left inferior oblique and rectus muscles contract to effect excycloduction of that eye. Analogously, cycloductions occur in the opposite direction when the head is tilted to the left. The compensation of the head inclination by wheel rotations of the eyes is incomplete and does not fully offset the angle of inclination.

Muscles that act synergistically during cycloductions become antagonists when elevating and depressing the globes. Under normal conditions, however, the vertical action of the rectus muscles exceeds that of the oblique muscles, and conversely, the effect of the oblique muscles on cycloductions is greater than that of the vertical rectus muscles.

When the head is tilted toward the involved side in a case of right superior oblique paralysis, the vertical and adducting action of the RSR is unopposed. Contraction of this muscle in an attempt to incycloduct the eye results in an upward movement of the right eye (positive Bielschowsky head tilt test), thus increasing the vertical deviation.

The Three-Step Method

Parks[4] popularized this diagnostic scheme by suggesting the three following questions to determine the paretic muscle: (1) does the patient have a right or left hypertropia in primary position? (2) Does this deviation increase in adduction or abduction? (3) Does it increase with the head tilted to the right or left shoulder? This test is usually performed objectively (Hirschberg method, prism cover test, etc.), but it can also be done subjectively. Using this three-step method, one can distinguish a paretic oblique or vertical rectus muscle in most instances. A table elaborated by Griffin[5] summarized the results for each step and for any given vertical or oblique muscles.

However, for the student and for the general optometrist, who doesn't use the test routinely, it is difficult to take the data obtained from the three cover tests and come up with the deficient muscle. To make the diagnosis without a table takes not only command of the anatomy, but also a logical deduction of

Table 1 The three-step method

Step 1	step 2	step 3	paretic muscle
R	R	R	L.I.O.
R	R	L	R.I.R.
R	L	R	R.S.O.
R	L	L	L.S.R.
L	R	R	R.S.R.
L	R	L	L.S.O.
L	L	R	L.I.R.
L	L	L	R.I.O.

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which muscle does what in which position. To come up with the right muscle not only takes time but with one slip, it is easy to isolate the wrong muscle. With a patient to analyze, it is time consuming and potentially confusing.

The simplified method

To simplify this method, Schwarting[6] patented a computer to indicate the correct muscle according to a three step method approach almost identical to that of Bielchowsky's. An elaborate and efficient system but of no need to the practitioner. More recently, Koch[1] presented a system to make the Bielchowsky head tilt test simple to interpret. With this system, it is no longer necessary to think out what is going on with respect to intortion, elevation, etc. but only to follow three simple steps. It should be noted here, that although it is of great help to use this method, one should be aware of what is going on just the same.

The starting point is a diagram of the two eyes of the patient with the vertical fields of action of the muscles indicated (figure 1). It should be noted that the recti work into their like field and the obliques into their opposite. Therefore upward gaze to the right requires the R.S.R. and the L.I.O.

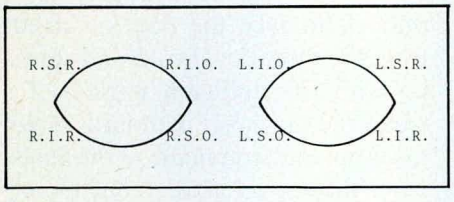

Figure 1 — Starting diagram

In this simplified method, there are also three steps:

Step I: Vertical deviation: circle the two muscles opposite to the vertical deviation in each eye;

Step II: Horizontal field of worse deviation: determine the version (right or left) with the greatest hyper deviation and circle the four muscles on the same side;

Step III: Direction of head tilt going toward the worse deviation: determine the head tilt to the right or left with the greatest hyper deviation and circle the two muscles of each eye in the same axis as the patient's face.

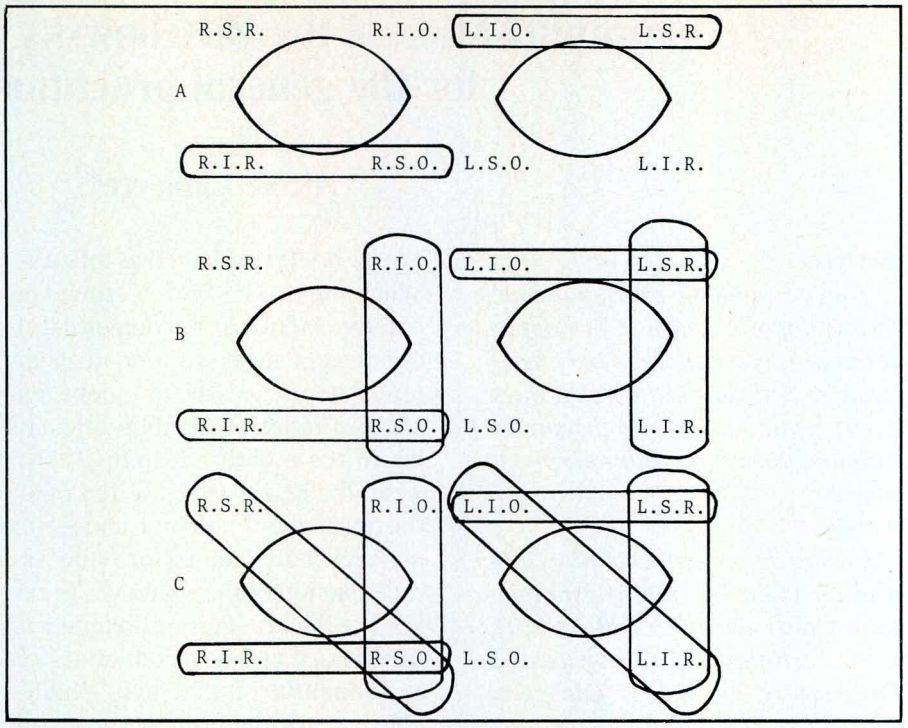

Figure 2 — Hypoaction of the R.S.O.

For example, in a patient with a right hyper (left hypo), one circles the right depressors and the left elevators (figure 2a). If the deviation is greatest to the left, step II tells us to circle the right obliques and the left recti (figure 2b). Finally, if the deviation is greatest with the head tilted to right (step III), one circles the R.S.R. and the R.S.O. of the right eye (intorders) and the L.I.O. and the L.I.R. (extorders) of the left eye (figure 2c).

Examination of the completed diagram will show only one muscle which is circled three times, that is the hypo-active muscle. In this example, it is the R.S.O. which is indicated. This system works for any combination and has no exceptions. From our clinical experience this procedure is extremely fast and simple. No deductions, calculations, or referring to tables is required. Everything is done on the diagram and at the end, one has a written record of what was done. It also helps to predict preferred head position of the patient since it will be opposite to the circles made on the diagram in steps two and three. (In this example, head to the left shoulder and looking toward the left or gaze to the right).

Simple interpretation makes any test more viable in a clinical situation. This new way to work through the head tilt test may make it less intimidating to optometrists in general practice.

References

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Abbreviations used:

R.I.R.	right inferior rectus
R.S.R.	right superior rectus
R.S.O.	right superior oblique
R.I.O.	right inferior oblique
L.I.R.	left inferior rectus
L.S.R.	left superior rectus
L.S.O.	left superior oblique
L.I.O.	left inferior oblique