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Comparative Study between Synoptophore and Cover Test with Prisms at Far Vision

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Abstract

Objective: Based on the measurement of strabismus angle with prisms at far vision, which is the most widely used method, we compare it with the measurement performed with synoptophore. We evaluate which factors influence the measurement with synoptophore and with Cover Test with prisms at far vision.

Method: In a sample of 64 patients with a mean age of 27.6 years, we consider two common clinical methods of measuring the angle of ocular deviation: synoptophore and cover test with prisms. Given the differences, we find between the measurement of the angle of ocular deviation and what factors may influence the variability with both methods.

Results: Comparing the measured deviation angle in 64 patients with both methods at far vision, we found a statistically significant difference, with an average of 1,844 prism dioptres. If we compare both methods in esotropia or exotropia, in the 43 patients with esotropia found a statistically significant difference (mean difference 2.721Dp). On the other hand, in the 21 patients with exotropia there was no a statistically significant difference (mean difference 0.048Dp.). Considering gender, 35 men of the sample, we find statistically significant differences (mean difference 2.171Dp), and women, 29 patients of the sample, we also found statistically significant differences (mean difference 1.448Dp).

Conclusion: In esotropia we find that there are statistically significant differences in cover test with prisms at far vision. On the other hand, in exotropia we don't find statistically significant differences. In both the groups of patients with previous strabismus surgery and non-surgery there are no statistically significant differences. The fact that we find a greater deflection angle with the synoptophore at convergent strabismus confirms the ability of dissociation.

Keywords: Synoptophore; Cover test; Dissociate prism dioptre; Strabismus; Exotropia; Esotropia

Introduction

The stereoscope invented by Charles Wheatstone in 1830 used for oculomotoras and sensory evaluation. Its main use is to assess and treat strabismus, also used in vision therapy for the treatment of amblyopia [1]. It simulates far vision conditions and presents separate images for each eye. It studies oculomotoras and sensory capabilities mainly in strabismus patients [2]. Although the measure of the deviation angle is usually performed with prism bar or loose prisms, it is worth considering the synoptophore, given its characteristics.

Compared with measurement with cover test (CT) and prisms, in synoptophore we obtain:

A. A higher value of deviation as it is more dissociating.

B. More simplicity and comfort in the measurement of the 9 positions of gaze thanks to its mechanical structure.

C. The values are more reproducible, making it easier for monitoring the case.

D. More accurate values in high-angle strabismus, since in these cases the measure is not performed in leaps.

E. More objective measurement.

Materials and Methods

In a sample of 64 patients, with a mean age of 27.6 years, we consider two common clinical methods of measuring the angle of ocular deviation: synoptophore and Cover Test with prisms at far vision. We study which differences we find between both methods and what factors may influence the variability of the results. We studied the influence of factors such as the direction of the horizontal deviation (esotropia/ exotropia), if they had vertical deviation or some sort of alphabetical syndrome, if they

had undergone strabismus surgery previously and finally the patient's gender.

Results

Comparing the measurement of the deviation angle in 64 patients with synoptophore and cover test with prisms at far vision we find:

Comparison in factors (Table 1):

Table 1: P=0.0001.

	n	MEAN (Δ)	SD
Synoptophore	64	5,484	20,739
Ct prisms	64	3,641	19,353
Difference	64	1,844	3,578

Type of deviation

A. Esotropia: P<0,0001 (Table 2)

Table 2: Esotropia P<0,0001.

	n	MEAN (Δ)	SD
Synoptophore	43	17,465	9,888
Ct prisms	43	14,744	9,000
Difference	43	2,721	3,541

B. Exotropia: P=0,9426 (Table 3)

Table 3: Exotropia P=0,9426.

	n	MEAN (Δ)	SD
Synoptophore	23	18,913	10,553
Ct prisms	23	16,696	9,888
Difference	23	2,217	4,145

History of strabismus surgery

A. With previous surgery: P=0,0176 (Table 4)

Table 4: With previous surgery P=0,0176.

	n	MEAN (Δ)	SD
Synoptophore	23	18,913	10,553
Ct prisms	23	16,696	9,888
Difference	23	2,217	4,145

B. Without previous surgery: P=0,0036 (Table 5)

Table 5: Without previous surgery P=0,0036

	n	MEAN (Δ)	SD
Synoptophore	41	17,463	12,085
Ct prisms	41	15,878	11,775
Difference	41	1,585	3,279

With previous surgery

A. Esotropia: P=0,0104 (Table 6)

Table 6: Esotropia P=0,0104.

	n	MEAN (Δ)	SD
Synoptophore	14	17,786	10,334
Ct prisms	14	14,214	8,210
Difference	14	3,571	4,467

B. Exotropia: P=0,9001 (Table 7)

Table 7: Exotropia P=0,9001

	n	MEAN (Δ)	SD
synoptophore	9	20,667	11,269
ct prisms	9	20,556	11,479
difference	9	0,111	2,571

Without previous surgery

A. Esotropia: P=0,0003 (Table 8)

Table 8: Esotropia P=0,0003.

	n	MEAN (Δ)	SD
Synoptophore	29	17,310	9,849
Ct prisms	29	15,000	9,487
Difference	29	2,310	3,001

B. Exotropia: P=0,8675 (Table 9)

Table 9: Exotropia P=0,8675.

	n	MEDIA (Δ)	SD
Sinoftoforo	12	17,833	16,851
Ct prismas	12	18,000	16,376
Diferencial	12	0,167	3,380

Gender

A. Male: P=0,0017 (Table 10)

Table 10: Male P=0,0017.

	n	MEAN (Δ)	SD
Synoptophore	35	4,229	24,288
Ct prisms	35	2,057	22,601
Difference	35	2,171	3,761

B. Female: P=0,0280 (Table 11)

Table 11: Female P=0,0280.

	n	MEAN (Δ)	SD
Synoptophore	29	7,000	15,721
Ct prisms	29	5,552	14,681
Difference	29	1,448	3,366

We also assessed whether other factors such as vertical deviations or alphabetic syndromes could influence the comparison. Given the low percentage of patients who showed vertical strabismus or alphabetical syndrome, comparative under these factors was dismissed [3-8].

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Discussion

Despite significant statistical differences in convergent strabismus, in regular motor examination we always include the measurement with synoptophore as well as the measurement with prism at far vision.

We consider that the greater accommodative capability that convergent strabismus present, both at far and near vision, allows the synoptophore, as being more dissociating, to find greater deviation angles. We believe that although with synoptophore there is a risk of causing greater dissociation in some type of strabismus, for us its use for justified the measure, because it is more accurate, objective and reliable. Anyway we still complete the study with the measurement with prisms. In our protocol for measuring ocular alignment we consider the measurement with synoptophore, objectively, a complementary study to consider.

Conclusion

In esotropia we found that there was statistically significant differences respect to the measurement at distance with prisms at far vision. In exotropia we didn't find statistically significant differences. Both in patients with previous strabismus surgery and non-surgery there are statistically significant differences. The fact that we find a greater deflection angle with the synoptophore at convergent strabismus confirms the ability of dissociation that we initially suspected occurs with Synoptophore [9-12].

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