

# New Method of Sensory Fusion Rehabilitation Using Alternating Occlusion of Vision Fields

S.G. Agagulyan<sup>1</sup>, A.A. Shpak<sup>2</sup>, E.I. Aznauryan<sup>3</sup>, V.O. Balasanyan<sup>1</sup>, I.E. Aznauryan<sup>1</sup>

<sup>1</sup> Association of Pediatric Ophthalmology Clinics "Yasniy Vzor", Moscow, Russia

<sup>2</sup> The S. Fyodorov Eye Microsurgery Federal State Institution, Moscow, Russia

<sup>3</sup> Swiss Federal Institute of Technology Zurich, Switzerland

## ABSTRACT:

This study aims to analyze sensory fusion recovery using method of LCD glasses with alternating occlusion of vision fields and compare its efficacy with orthoptic treatment. 46 patients with prior esotropia and post-operative absence of sensory fusion were divided into 2 groups. Main group (15 patients) underwent treatment with LCD glasses, while the control group (31 patients) underwent synoptophore treatment. Stable sensory fusion was achieved in 12 (80%) patients in the main group. In control group stable sensory fusion was achieved in 3 (9.7%) patients. Binocular vision was achieved in 11 (73,3%) patients in the main group and in 3 (9,7%) patients in control group. Alternating occlusion of vision fields with LCD glasses is a more effective mean of sensory fusion and binocular function recovery than an orthoptic treatment on a synoptophore.

**KEY WORDS:** strabismus, sensory fusion, strabismus treatment, synoptophore

## 1. INTRODUCTION

Recovery of sensory fusion in children with congenital and early acquired strabismus is very important in the functional rehabilitation following strabismus surgery. Currently, only one way of restoring sensory fusion is used in clinical practice - orthoptic treatment on synoptophore. Disadvantages of this method are the need for daily visits to hospital, artificial separation of visual fields, presentation of different test objects for the right and left eyes. A new model of LCD glasses was developed to treat amblyopia. One of the authors of this article (I.E. Aznauryan) has developed a technique for using these glasses to restore sensory fusion in orthotropic children with an operated esotropia.

This study aims to analyze sensory fusion recovery using method of LCD glasses with alternating occlusion of vision fields and compare its efficacy with orthoptic treatment using synoptophore.

## 2. METHODS

The study included 46 patients with prior esotropia and post-operative absence of sensory fusion. Patients were observed in Association of Pediatric Ophthalmology Clinics "Yasniy Vzor" between 2014 and 2016. Patients were selected by a continuous method. Inclusion criteria were age from 4 to 11 years, the residual angle of strabismus measured on synoptophore no more than

10 degrees, hyperopic refraction (by spherical equivalent). We excluded patients with vertical strabismus and cyclotropia, medium and high amblyopia. All patients underwent autorefractometry, biomicroscopy, ophthalmoscopy, Worth test, examination on synoptophore with determination of the horizontal, vertical angles of strabismus and presence of cyclotropia. Main group (15 patients) underwent treatment with LCD glasses, while the control group (30 patients) underwent synoptophore treatment.

Patients in the main group wore LCD glasses with optimal correction 4 hours/day. Patients in the control group received 3-4 courses of synoptophore treatment during one year.

The criteria for the restoration of sensory fusion was the appearance of stable sensory fusion on synoptophore. The observation period was 12 months.

### 3.RESULTS

The age and sex characteristics of patients and other baseline data in the compared groups are presented in Table. 1.

Table 1

Patients characteristics in the compared groups before treatment,  $M \pm \sigma$  (Min-Max)

Characteristics of patients	Main group (n=15)	Control group (n=31)
Age, years	7,2±1,6 (4,0-10,0)	7,1±1,8 (5,0-9,0)
Sex, male/female	10/5	21/10
Age at the onset strabismus, years	1,4±0,9 (0,0-3,0)	1,9±1,0 (0,0-4,0)
Duration of strabismus, years	4,5±2,2 * (1,0-10,0)	2,7±2,3 (1,0-10,0)
Objective angle on the synoptophore, degrees	3,2±1,5 (2,0-5,0)	3,2±0,8 (3,0-5,0)
Best corrected visual acuity	0,91±0,12 (0,5-1,0)	0,97±0,07 (0,6-1,0)
Refraction (spherical equivalent) both eyes, diopters	0,96±1,7 (0,0 - +8,0)	0,96±1,19 (-1,38 - +6,00)

Mean age of patients was 7,1. All patients had hyperopic refraction. Post-operative angle of deviation was 3,2±1,1 degrees.

Treatment with the LCD glasses in the main group proved to be much more successful than the traditional orthoptic treatment in the control group (Table 2).

Table 2

Recovery of binocular function after treatment

	Main group (n=15)	Control group (n=31)	P
Restoration of sensory fusion	12 (80%)	3 (9,7%)	<0,00 0
Restoration of binocular vision			
Binocular vision restored	11 (73,3%)	3 (9,7%)	<0,00 0
Binocular vision not restored	4 (26,7%)	28 (90,3%)	

Stable sensory fusion was achieved in 12 patients in the main group. In control group stable sensory fusion was achieved in 3 patients. Binocular vision was achieved in 11 patients in the main group, and in 3 patients in control group.

#### 4.DISCUSSION

This study presents the first results of the clinical use of the new method of sensory fusion recovery by alternating separation of the visual fields with LCD glasses in patients with operated esotropia. The proposed method is highly efficient, significantly exceeding the efficiency of traditional orthoptic treatment on synoptophore.

The technique of alternating occlusion of vision fields has significant advantages. Convenience of this technology lies the possibility of comfortable treatment for a long time, no need for daily visit to hospital, a positive attitude of children to treatment with LCD glasses. A higher proportion of children with sensory fusion recovery in the main group is probably associated with a more effective influence on the patient's visual system to this method. This is also associated with a significantly higher recovery rate of binocular vision, which indirectly correlates with the restoration of sensory fusion.

#### 5.CONCLUSION

Alternating occlusion of vision fields with LCD glasses is an effective mean of sensory fusion and binocular function recovery in patients after successful strabismus surgery.

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