

Farther Results of Combining Treatment of Concomitant Non-Accommodated Alternating Convergent Strabismus

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ABSTRACT

It is presented the comparisons of concomitant non-accommodated alternating convergent strabismus treatment methods in restoration of binocular vision. 35 patients from 2-15 year olds with convergent strabismus, were studied, who underwent surgical treatment 5-10 years ago. These patients were divided into age groups and according to their orthoptodiploptic treatment-into 3 sub groups simultaneously. After the analysis of their cosmetic and functional features it was clarified that binocular contact and fusial reserves were primarily developed in those children who underwent complete course of orthoptodiploptic treatment. Division according the age of onset showed that, fixation mechanism developed in non-trained children, only when the operation was done in early years and it showed that post operative vertical component prevented the development of binocular vision.

KEYWORDS: *concomitant strabismus, binocular vision, fusion accommodation, convergence, children*

Concomitant strabismus is a common condition in childhood. It is a cause of disorders in the mechanism of bifixation or impairment of binocular vision. Binocular vision is complex physiological function, the highest stage of evolutionary development of visual analyzer.

1 or 2 % of children, who are under 5, have manifested concomitant strabismus. Generally strabismus has an affect on child's psychics. Its not only cosmetic disorder, but functional insufficiency, that's why it's regarded a social problem.

Common cause of concomitant strabismus is a disorder of accommodation refractive factors and damage of oculomotorial apparatus.

It may be the result of congenital or acquired brain disease, such as cerebral palsy and craniofacial developmental anomalies. Causing factors also include ametropia, impairment of vision in one of the eyes, or blindness. The manifestation of squint may be supported by stress, acute infectious diseases, or tiredness of visual organs. Great significance is given to family history. In children cause of strabismus may be aniseikonia (misalignment of monocular image) and unequal intensive irritation of corresponding retinal zones of both eyes. At this age bifixational mechanism is not formed yet. It is known that the typical features of concomitant strabismus are:

1. Preserved unlimited movements of both eyes.
2. Equal angle of primary and secondary deviation.
3. Though binocular vision is damaged, diplopia is not present.

In non-corrected ametropia, the normal relationships between accommodation and convergence is disturbed.

During hypermetropia, there is a need of strong accommodation, which is straight proportional to the degree of hypermetropia. In a sense strong accommodation causes reinforcing impulses of convergence but, during short sightedness need of accommodation is impaired or there is no need of it at all, which weakens stimulus of convergence. Consequently during non-corrected hypermetropia there is a trend to

convergent strabismus and during non-corrected myopia-divergent strabismus.

Mentioned trend often is overcome with the help of fusial reflex and deviation of the eyes is not present. In this cases when the ability of confluence is damaged convergent-divergent movement is freed from control of bifixation mechanism and concomitant strabismus is developed, which has at the beginning intermittent and then constant character.

According to what has been said in a case of impairment of binocular apparatus the straining of accommodation leads to reinforcement of convergence and thus causes convergent strabismus. Also less need of accommodation results in impairment of convergence and divergent strabismus is developed.

According to surveys we know that in 60% of cases there is esophoria or convergent strabismus and in 20% exophoria or divergent strabismus.

According to direction of deviation there is horizontal, vertical and mixed strabismus. According to constancy of strabismus there is constant and intermittent strabismus. According to correction dependency: accommodated (when spectacles don't correct deviations), partial accommodative and non-accommodative. According to changeability there is alternative and monolateral strabismus. During alternative strabismus each monolateral system is perfect but participation of both eyes together in visual act is not possible. When one of eyes is involved in visual act the second does not take part in the process, which mainly spreads on central part of retina. The clinical manifestation of that process is functional scotoma, which is developed during the action of both eyes, only in the visual field of deviated eye. During monolateral strabismus when both eyes are involved in the process, only one participates and the second does not.

The aim of treatment of concomitant strabismus is the restoration of binocular vision; only after the achievement of this target it is possible to maintain strong symmetric eye alignment. For this there is the necessity of following conditions: straining of accommodation must be removed by spectacles, the highest acuity of vision, symmetric alignment of eyes the free movement of eyes in all directions, the ability of confluence of foveal image,

Group	Before operation										After operation										Remarks		
	Number	Character of vision					Synoptiform					Number	Character of vision					Synoptiform					
		Monocular	Simultan.	Binocular	Beforeal confluence	Scotoma	Fusial reserves	Monocular	Simultan.	Binocular	Beforeal confluence		Scotoma	Fusial reserves	Monocular	Simultan.	Binocular	Beforeal confluence	Scotoma	Fusial reserves			
I-non-trained	7 46,6%	7 100%	-	-	-	-	7 100%	7	100%	-	-	1 14,3%	3 42,8%	3 42,8%	3 4	3 42,8%	4 57,2%	-	-	-	Two of them had vertical component		
II-under went treatment completely	4 26,7%	4 100%	-	-	-	-	4 100%	4	100%	-	-	-	-	4 100%	4	100%	-	-	(0+5)	-	-		
III-under went treatment incompletely	4 26,7%	4 100%	-	-	-	-	4 100%	4	100%	-	-	-	-	4 100%	4	100%	-	-	(+10-4,0)	-	-		

Tab.1 Surgical treatment underwent patients 2-4 of age.

Group	Before operation										After operation										Remarks		
	Number	Character of vision					Synoptiform					Number	Character of vision					Synoptiform					
		Monocular	Simultan.	Binocular	Beforeal confluence	Scotoma	Fusial reserves	Monocular	Simultan.	Binocular	Beforeal confluence		Scotoma	Fusial reserves	Monocular	Simultan.	Binocular	Beforeal confluence	Scotoma	Fusial reserves			
I-non-trained	8 40%	8 100%	-	-	-	-	8 100%	8	100%	-	-	2 25%	6 75%	0	0	2 25%	6 75%	6 75%	8 40%	8 40%	Two of them had vertical component		
II-under went treatment completely	8 40%	8 100%	-	-	-	-	8 100%	8	100%	-	-	-	4 50%	4 50%	7 87,5%	1 12,5%	7 87,5%	1 12,5%	8 40%	8 40%	-		
III-under went treatment incompletely	4 20%	4 100%	-	-	-	-	4 100%	4	100%	-	-	-	1 25%	3 75%	4 100%	4	100%	-	4 20%	4 20%	-		

Tab.2 Surgical treatment underwent patients over 5.

sufficient fusial reserves, the symmetric image on retina (iseikonia). To achieve this goal there is complex treatment of strabismus, which include optic correction of ametropia and treatment of amblyopia, operations on oculomotorial muscle, pre- and post operative orthoptodiploptic treatment.

As it is known, the final objective in treatment of concomitant strabismus is restoration of binocular vision, which is unfortunately not always possible and we must be satisfied by those results which is achieved. Particularly difficult is to reach perfect result during convergent strabismus.

From the beginning there were different ideas about the treatment of non accommodated concomitant strabismus, which is present these days. One group of authors disapproved the role of orthoptodiploptic treatment in repairing of binocular vision and only supported surgical, "primary occlusion" or "penalization" methods, the other group of authors recognized the role of orthoptodiploptic treatment in repairing of binocular vision

The purpose of this research is the comparative analysis of both treatment methods.

MATERIAL AND METHODS

There were specially chosen 35 patients with alternating non-accommodated convergent strabismus, they were 2-15 year olds, who underwent operation 5-10 years ago. From this series of patients 20 patients underwent post-operative orthoptodiploptic treatment: on synoptofore, colored tests, trainings (using prisms) in order to develop bifixation mechanism, trainings in order to stop accommodation and convergation. Other 15 patients didn't undergo post-operative treatment, because of various reasons.

There were chosen group of patients whose visual acuity was over 0.4 (as low vision may disturb repairing of binocular vision) emetropic refraction was present in 5 patients, hypermetropia and hypermetropic astigmatism in 27, and myopia and myopic astigmatism in 3.

Before surgical treatment all patients had monocular vision and functional scotoma on synoptofore and bifoveal confluence wasn't present. This contingent of patient, according their age, was divided into 2 groups.

In first group were patients, who were operated upon when they were 2-4 year olds. In second group were patients who underwent operation when they were over 5.

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Mentioned group was also divided into 3 sub-groups:

1. Patients who didn't undergo orthoptodiploptic treatment because of various reasons (See *Tab.1,2*).
2. Patients who underwent treatment incompletely. Had only 5 courses.
3. Patients who had orthoptodiploptic treatment completely (3 courses during 4 years).

Examinations were done on colored tests, in order to define character of vision: tests were done from far 5 m distance and near from 33 sm. Fusial reserves, bifoveal confluence ability and strabismus angle were verified on synoptofore.

RESULTS

The analysis of treatment of this patients showed that 35 patients had symmetric alignment of the eye according Hirschberg's method, on synoptofore deviational angle wasn't over 5.4 patients had post operative vertical component.

In First group patients (2-4 year olds) who didn't undergo orthopto diploptic treatment binocular vision developed in 3 (42,8%), bifoveal confluence in 3 (42,8%), functional scotoma remained in 4 (57,2%) (See *Tab.1*).

In second group bifoveal vision developed in none, and bifoveal confluence developed in 2 cases (25%) functional scotoma remained in 6 (75%) (See *Tab.2*).

In those first group (2-4 year olds) children who underwent post operative orthoptodiploptic treatment binocular vision developed in 8 (100%) and bifoveal confluence in 100% and in second group (over 5 year olds) binocular vision developed in 7 (58,3%) bifoveal confluence in 11 (91,6%) functional scotoma remained in 1 (9,3%).

CONCLUSION

As the analysis of research showed the repairing of binocular vision and development of fusial reserves occurred in children who had undergone postoperative orthoptodiploptic treatment completely (3-4 courses a year during several years). And the comparing of age groups showed that binocular vision developed in non-trained children only after operation, done in early years. It's important to note that vertical component prevents development of binocular vision, which occurs during the examination on synoptofore.

Отдалённые результаты комбинированного лечения неаккомодационного содружественного альтернированного сходящегося косоглазия

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РЕЗЮМЕ

Проведено сравнение методов лечения неаккомодационного содружественного альтернированного сходящегося косоглазия в деле восстановления бинокулярного зрения. Обследовано 35 больных со сходящимся косоглазием от 2 до 15 лет, которые провели хирургическое лечение 5-10 лет назад. Больные были подразделены по возрастным группам и параллельно на три подгруппы (по ортоптодиплоптическому методу лечения). В результате анализа косметических и функциональных данных выяснилось, что бинокулярная связь и резервы физий развились преимущественно среди тех детей, которые после операции провели полный курс ортопто-диплоптического лечения. Возрастная группировка показало, что механизм бификсации развился только у нетренированных детей; которые были оперированы в раннем возрасте; и что развитию бинокулярного зрения мешает послеоперационный вертикальный компонент.

Ключевые слова: содружественное косоглазие, бинокулярное зрение, аккомодация, конвергенция, дети