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# STRABISMUS IN THE PERIOD OF EARLY GROWTH AND DEVELOPMENT

# STRABIZAM U PERIODU RANOG RASTA I RAZVOJA

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## ABSTRACT

A sensorimotor disorder characterized by a deviation from the parallel position of the eyes is called strabismus, strabismus or strabismus. Strabismus can be non-paralytic, then paralytic (they appear at any age), and concomitant strabismus, the peculiarity of which is that they appear in childhood and are found in 4-6% of the total population. Long-term treatment is required, and it consists of pleoptic methods that include occlusion and exercises for amblyopia, which treat low vision and other sensory complications, and orthoptic methods that refer to: glasses, occlusions, prisms, which establish and maintain the parallelism of the visual axes. After exhaustive conservative treatment, the operative procedure is started. Experience thus far indicates that it is necessary to change and introduce new methods appropriate to the age of a child and the stage to which the treatment has progressed.

**Keywords:** esotropia, exotropia, amblyopia

## SAŽETAK

Senzomotorićki poremećaj koji je karakteriziran odstupanjem od paralelnog položaja očiju naziva se strabizam, razrokost ili škiljavost. Strabizmi mogu biti neparalitički, potom paralitički (pojavljuju se u svakoj životnoj dobi), te konkomitantni strabizmi čija je osobitost da se javljaju u dječjoj dobi, i nalaze se kod 4-6% ukupne populacije. Liječenje je dugotrajno i sastoji se od pleoptičkih metoda koje podrazumijevaju: okluzije i vježbe za ambliopiju, kojima se liječi slabovidnost i druge senzorne komplikacije, te od ortoptičkih metoda koje se odnose na: naočale, okluzije, prizme, koje uspostavljaju i zadržavaju paralelnost vidnih osovina. Nakon što se provede iscrpno konzervativno liječenje pristupa se operativnom zahvatu. Dosadašnja iskustva ukazuju na to da je potrebno mijenjati i uvoditi nove metode primjerene dobi djeteta i etapi do koje se napredovalo u liječenju.

**Ključne riječi:** esotropija, exotropija, ambliopija

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## INTRODUCTION

Strabismus or crossed eyes is the name for the non-parallel position of the visual axes. Since the disease changes a child's aesthetic appearance and binocular vision, it has long been noticed. Strabismus can be paralytic that appears at any age and non-paralytic or concomitant strabismus that occurs in early childhood; this classification dates back to the time of Hippocrates and is still valid today. Strabismus occurs when it is impossible to direct both visual axes simultaneously towards the fixated point. Strabismus occurs in 5-6% of the total population (Kanski JJ, 1999), while half of that population has low vision in the eye that is affected by strabismus (Lang J., 1995). The prevalence of strabismus in Central Europe is 5.3-7.4% (de Decker W, 1973). In children in Sweden, the prevalence of convergent strabismus is three times higher than divergent strabismus (Nordlow W., 1964). The prevalence of infantile convergent strabismus is 0.1%. Thus, convergent strabismus is more common in children, while divergent strabismus is more common in adults (Figure 1). (Noorden GK von. 1996)

Figure 1. Convergent strabismus is more common in children than divergent strabismus in adults

Charasteristics of concomitant strabismus are an orderly anatomy, all eye muscles function normally, there is an anomaly in the position of the eyes, and the mutual harmony of agonists, antagonists and synergists in both eyes is disturbed, resulting in deflection (turning) of one or both eyes (Voskresensky V., 1994) ( Figure 2).

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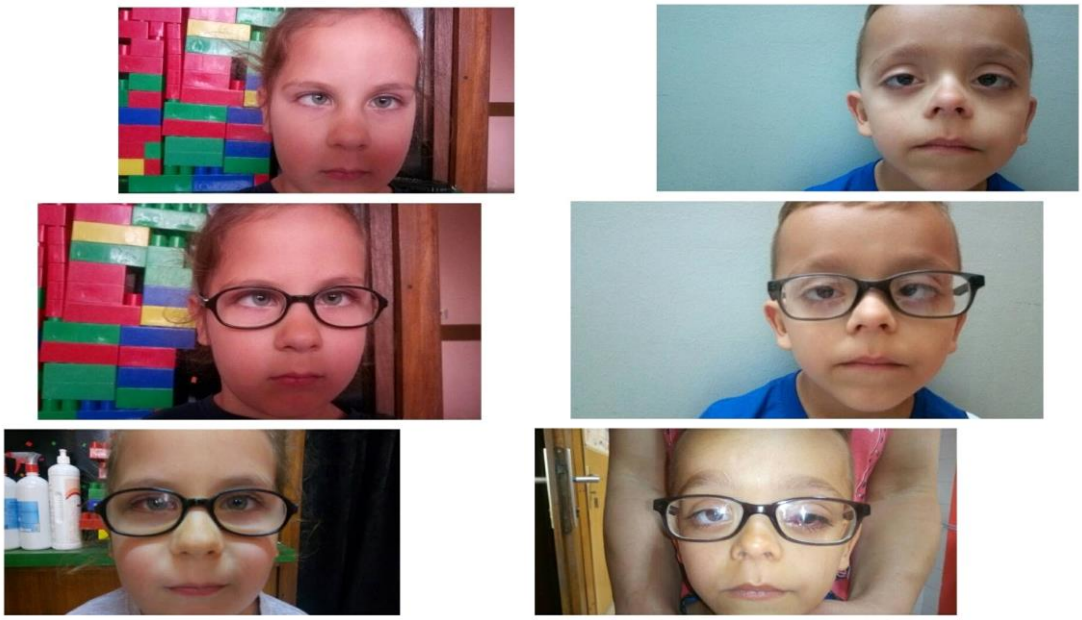

Figure 2. Strabismus accompanied by deviation of one or both eyes

Unlike concomitant strabismus where the eye is mobile in all directions of gaze, in paralytic strabismus the eye lags behind in the direction of action of the paretic muscle Figure 3.

Figure 3. Paralytic strabismus preoperatively, postoperatively and at the first postoperative check-up

The eyeball is moved by six external eye muscles, namely four straight muscles: m. rectus medialis, m. rectus lateralis, m. rectus superior and m. rectus inferior, and two oblique muscles: m. obliqus superior and m. obliqus inferior. They are innervated by three brain nerves: n. oculomotorius, n. trochlearis, n. abducens. The peculiarity of the eye movements is that they are conjugate, so that both eyes move in harmony in the same direction and at the same speed.

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Eye movements are controlled by numerous brain structures, therefore, any disorder in that area can lead to motor outbursts and the appearance of strabismus. Strabismus is not only a motor disorder, but also a sensory disorder, that is, a disorder that causes inability to see binocularly (CPAM, 2003). In childhood strabismus, the sensory components are mostly secondary, it occurs most often by the age of 4 or 5. Childhood strabismus is divided into early strabismus, which occurs before the second year of life, and late, which appears after that period. However, parents notice the turning of the eyes from birth or in the first few months of life. If the turning of the eyes is noticed from birth or in the first few months of life, it is congenital strabismus. All cases of strabismus that appear in the first 6 months of life are called infantile strabismus, however, if it occurs after that age, it is an acquired strabismus (Archer SM, 1989). In addition to classic, actual strabismus, there is also apparent, false or psudostrabismus. Epicantus (wide root of the nose) as well as narrow interpupillary distance often give the appearance of convergent strabismus, while wide interpupillary distance gives the impression of divergent strabismus. The diagnosis is simple: cover test-negative, central fixation, good visual acuity and clear binocular vision Figure 4. (Čelić, Dorn 2004).

Figure 4. Epicantus

Newborns rarely have their eyes in a parallel position in the first weeks of life, the eyes more often move between convergent and divergent deflection. Normal oculomotor balance develops by the third month of life (Nixon RB, 1985). There are several divisions of strabismus. According to the intensity of the motor disorder, strabismus can be manifest or latent. Heterotropia or manifest strabismus is a noticeable deviation of one or both eyes. It is not possible to direct both visual axes to the fixation object at the same time. Also, only one eye may be deviated (monolateral) or sometimes one eye is deviated, and then the other eye (alternating). Heterophoria or latent strabismus has a hidden, occasional deviation that appears in certain unfavorable circumstances, that is, at the moment when the fusion is switched off (Helveston EM., 1993). Division of tropi according to the direction of

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deflection: horizontal and vertical. Pure vertical deviations are rare and are more often combined with the most common, horizontal strabismus (6).

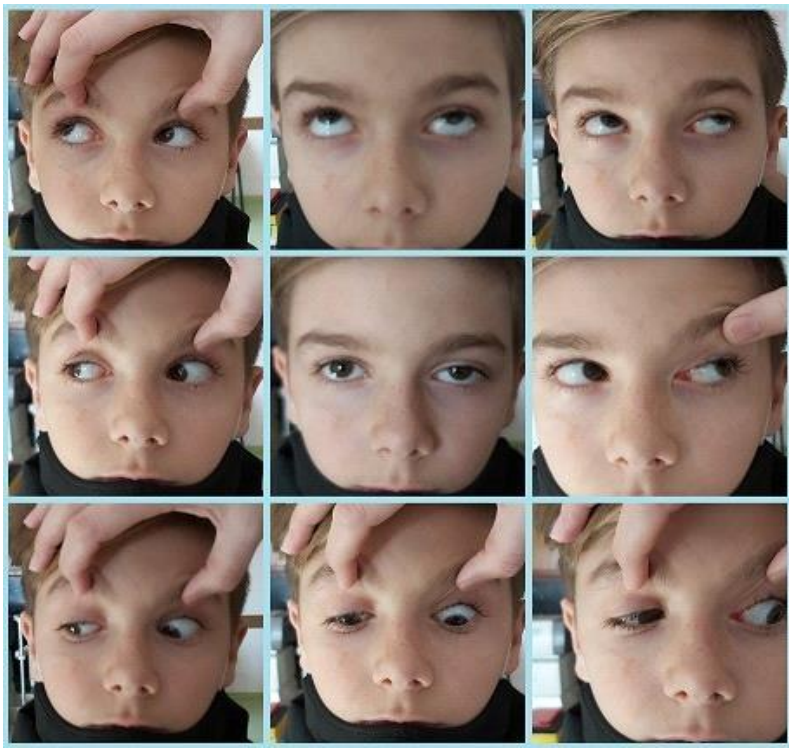

Figure 5. Vertical strabismus

Our patients

The patients shown in the above pictures are patients, hospitalized or not, at the Clinic for Eye Diseases of UKC Tuzla (University Clinical Center of Tuzla), that is patients at the Cabinet for the Treatment of Amblyopia and Strabismus. Before carrying out the diagnostics and photographing the patients, the parents were verbally informed about the needs and purpose of those actions, and gave their consent, along with explanations of the purpose and goal of the research. The duration of the interview was between five and seven minutes.

## STRABISMUS DIAGNISTICS

Strabismus in the period of early growth and development requires a detailed and careful diagnostic analysis, in order to undertake adequate treatment based on the correct diagnosis.
The diagnosis of a patient with strabismus has one usual sequence, it starts with an anamnesis, for which the family anamnesis is very important. An inspection is then conducted, in which irregularities in the position of the head, the structure of the face, and the appearance of the root of the nose (epicantus) are observed. Next, the visual acuity test takes place, which is a subjective method and depends on the age of the child (small children are tested for visual acuity with the help of pictures, hooks and later optotypes with letters and numbers). It continues by measuring the objective angle of the aperture, which can be done in several ways: orientational measurement according to the light reflex on the cornea (Hirschberg's test). Madox cross with prisms (Krimsky test).

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Exact measurement on the synoptophore and using prisms in free space. The PAT test or the prism adaptation test is performed in people over 12 years of age to rule out postoperative diplopia. The Cover test is indispensable, which is also the basic test that can be used to determine whether there is strabismus, and what type it is, as well as the presence of low vision. By testing motility, which tests the mobility of the eyes in 9 directions of gaze (inwards, outwards, up, down and diagonally) and convergence. The test is performed monocularly and binocularly. Convergence is tested using a lamp or a toy, starting at a distance of about 40-50 cm in front of the child, and then moving it towards the child to a position about 2 cm in front of the nose. A complete ophthalmological examination that includes an examination from the cornea to the lens, the vitreous to the fundus, in order to rule out other eye diseases. Determining fixation with a visuscope using test images (star, circle) that are projected onto the retina. Fixation can be determined as early as the second month of life.

## STRABISMUS TREATMENT

Treatment of strabismus is conducted exclusively conservatively and surgically. *Conservative treatment* is the treatment of low vision, which is often associated with strabismus, in order to improve visual acuity, and also to establish and strengthen the central fixation of the farsighted eye. This area of strabology is called pleoptics. It is solved by correction of the refractive error, occlusion or closing of one eye, mydriasis of the leading eye, penalization (blurring) of the leading eye, which is achieved with increased diopters in order to use the low-sighted eye. Pleoptic exercises are carried out on devices such as centrophore, coordinator, separator, synoptophore (Helveston EM, 1985). *Surgical treatment* is performed on the eye muscles. Operations on the straight eye muscles include retroposition - movement from the limbus towards the equator, anteposition - movement towards the limbus, resection - muscle shortening, elongation "Z" myotomy - muscle lengthening. Surgery on the oblique muscles is the anteposition of the inferior oblique muscle from the posterior pole in front of the equator of the eye. Strabismus surgery is performed in cases of large deviation angle, non-accommodative convergent strabismus, early-onset strabismus (essential convergent strabismus), and in some cases of paralytic strabismus. Conservative and operative treatment complement each other (Kanski JJ., 2007).

## CONCLUSION

Strabismus in the period of early growth and development is most often concomitant. Their basic characteristic is a motor anomaly or non-parallelism of visual axes. The motor component very quickly causes sensory disorders: from an anomalous correspondence of the two retinas to severe low vision, therefore, the causation has a two-way character. In the dream of concomitant strabismus, there are neurophysiological dysfunctions of higher brain structures (in the brain stem and cortex) as well as refractive anomalies. The treatment is long-term and includes the treatment of both sensory and motor disorders with corrective dioptric glasses, orthoptic and pleoptic treatment, and finally, when all methods of conservative treatment are exhausted, operative treatment is approached.

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By detecting strabismus during the period of early growth and development of a child, it is possible to prevent its complications, the most severe of which is low vision (amblyopia) as well as binocular vision disorder. When strabismus appears, it is necessary to diagnose the cause of its occurrence, timely and adequate treatment, regardless of whether it is conservative or operative, so that at a later age the child will have good vision, thus a functional but also aesthetically satisfying component.

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