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Modern Methods of Treatment of Vertical Strabismus

Abdullaeva Dilorom Rustamovna
Samarkand State Medical University

Oblokulova Jasmina Muminjonovna
Samarkand State Medical University

Abstract: Strabismus is a common Form of pathology of the organ of vision: it occurs in 0.5-1.5% of children . Congenital esotropia with hyperfunction of the lower braids;-: drinking, at the same time, covers up to 60-70% of all forms of strabismus.

In addition to the cosmetic disadvantage, which is very painful psychologically, strabismus is accompanied by a serious disorder of vision, its various disorders and limits the patients' ability to choose a profession. At the same time, there is no doubt that congenital strabismus with hyperfunction of the inferior oblique muscle is a surgical problem and requires intervention in the early preschool period, since conservative methods of treatment here do not provide an opportunity to restore disturbed binocular functions.

Key words: organ of vision, strabismus, hypertropia, eyeball.

Introduction. Strabismus is a cosmetic and functional disorder of binocular vision and the oculomotor system, and is an important ophthalmological and social problem. The incidence of strabismus in the population reaches 2-5%. It is customary to divide strabismus into friendly and unfriendly. Strabismus is called unfriendly, in which the magnitude and direction of deviation change in different directions of the gaze[1,12]. The combination of esotropy with a vertical component is the most common in clinical practice. In this case, the vertical component is caused by hyperfunction of the inferior oblique muscle, which can be primary and secondary. Currently, as a result of numerous studies, it has become obvious that almost all cases of correction of esoterapy with hyperfunction of the lower oblique muscles require several stages of surgical intervention. However, a lifetime examination of the eyeball, which could contribute not only to a more accurate assessment of its size, but also facilitate individual planning of the volume of surgical intervention, has so far been conducted inadequately, which can be explained by the lack of an appropriate research methodology[2,13].

When examining a patient with vertical strabismus, it is first necessary to determine whether the deviation is friendly or unfriendly. In the latter case, the next step is to find out what the nature of strabismus is: paralytic, restrictive, or there is a manifestation of primary dysfunction of the oblique muscle. Finally, the doctor must determine whether there is a dissociated deviation (in which its vertical component does not follow the Hering law)[14]. It is best to describe strabismus in the way it actually manifests itself. So, if a patient with restrictive hypotropia of the right eye fixes with the left eye, this condition should be called hypotropia of the right eye, and not follow a long-standing agreement and describe it in terms of hypertropia — in this example, as hypertropia of the left eye. If the patient freely changes the fixation (alternates), then you should use the old rule. There is also confusion in the terminology describing dissociated vertical divergence. The terminology should be descriptive and define three parameters; indicate whether the deviation is: 1. Permanent or periodic. 2. Latent or manifest (i.e. phoria or tropia). 3. Dissociated or undissociated. The most frequent

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manifestation of dissociated vertical divergence is periodically manifesting hypertropia of one eye with latent hypertropia of the other eye (occurs only during dissociation, i.e. when covering with a flap). Accordingly, this condition is described by the term periodic manifest dissociated vertical divergence of one eye and latent dissociated vertical divergence of the other eye[3]. An alternative definition of this condition would be periodic dissociated hypertropia of one eye and dissociated hyperphoria of the other. a) The physiology of vertical strabismus. The cyclovertical muscles perform a triple function, including vertical, torsion and, to a lesser extent, horizontal action. When the head is tilted to the right or left, there is a slight compensatory torsion rotation of each eye, correcting approximately 5-10% of the tilt of the head. This is due to stimulation of the intorser muscles (upper oblique and upper rectum) of the eye towards which the head is tilted, and the extorser muscles (lower oblique and lower rectum) of the paired eye; the Bielschowksy three-stage Parks head tilt test is based on this phenomenon. Although the vertical action of the vertical rectus muscles is most pronounced in the state of reduction, they are the main elevators and depressors throughout the entire horizontal field of view. Obliques have a relatively weak vertical effect. If the upper rectus muscle is disconnected from the eyeball, one lower oblique muscle cannot lift the eye above the midline. The upper oblique muscle, however, has a stronger vertical effect than the lower oblique[4,15].

b) Examination of a patient with vertical strabismus: 1. Anamnesis. Before measuring the deviation, check if the patient has a spontaneous compensatory head position associated with visual tension. Although there are many reasons for the spontaneous compensatory position of the head, I believe that they serve mainly to position the eyes in the field of view so that the deviation is less, or to compensate for nystagmus. The presence of facial asymmetry usually indicates the existence of a spontaneous compensatory head position from early childhood. There is a shortening of the middle area of the face between the outer cleavage and the corner of the child's mouth on the side where the head is usually tilted. Measure the deviation when the head is tilted using a prism and an alternating cover test, and then in the straight position of the head. Although it is often possible to make a diagnosis based only on an assessment of deviations in the seven fields of view (primary, up, down, right and left) and with a tilt of the head to the left and right, the optimal treatment plan often requires additional measurements in the four oblique fields. When evaluating duction and convergence, special attention should be paid to the presence of hyperelevation or hyperdepression in oblique fields. If there is hyperelevation of the adducted eye when looking sideways, perform a cover test in this field of view to check whether vertical deviation is a manifestation of dissociated vertical divergence or true hyperfunction of the inferior oblique muscle[5]. Determine whether the deviation is dissociated or not. In case of undissociated deviation, hypotropia is observed on the contralateral eye when fixing with the raised eye above. In the absence of secondary deviation due to paralysis or restriction, the degree of hypotropia of one eye will be equal to the degree of hypertropia of the other eye. With dissociated vertical divergence, during fixation with the eye from the DVD, the hypotropy of the paired eye is either less or absent. Theoretically, the Parks three-step test can determine which of the eight cyclovertical muscles is paralyzed; however, in practice, this test best helps confirm the diagnosis of unilateral paralysis of the superior oblique muscle[6]. Even in cases of isolated paralysis of the superior or inferior oblique muscle, the results of this test can be misleading. The most important thing is that with this test it is impossible to determine whether strabismus is caused by paresis of one of the cyclovertical muscles, the test is based on the assumption that this is the case. The section below lists some of the common situations in which a three-step test leads to an incorrect diagnosis. One of our patients developed vertical diplopia immediately after a closed head injury sustained in an accident. He had hypertropia of the left eye, which increases when looking to the right and when tilting his head to the left, which, according to the criteria of the three-stage test, indicates paresis of the upper oblique muscle of the left eye. In fact, he suffered a fracture of the lower wall of his right eye socket. He was constantly fixing with his right eye due to mild amblyopia of the left eye. After the fracture was repaired, the diplopia disappeared. You should determine the presence of torsion in both objective and subjective ways [7].

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The latter is a test with two red Maddox cylinders, since localization artifacts often occur when using red and white cylinders; if there is a torsion on an eye covered with a white cylinder, the patient often feels that the torsion is present on the other eye, covered with a red cylinder with glass. However, even when I use two red glasses, I sometimes find that the two-cylinder Maddox test reveals the total amount of torsion of both eyes, and can be misleading as to which eye is affected. Objectively, the presence of a torsion is assessed using an indirect ophthalmoscope, this method is more informative when determining which eye actually has a torsion. Normally, the central fossa should be at the level of the lower third of the optic disc. The absence of subjective torsion in the presence of fundus torsion according to the results of objective tests usually indicates a long-term deviation and developed sensory adaptation. If the patient describes torsion, determine whether the patient is capable of fusion after compensating for vertical and horizontal deviation using prisms. If, despite the presence of torsion, the patient easily develops a fusion, torsion can be ignored when planning surgery. If the patient is not capable of fusion, he may have a central fusion disorder[8]. Synoptophore testing, which can be used to compensate for torsion, makes it possible to predict the presence of fusion after successful treatment of strabismus. Common diagnostic markers: 1. Are anamnesis and complaints informative in determining etiology? Is there diplopia, was there strabismus in childhood (if the patient is an adult) and is there dissociated vertical divergence? 2. Is the vertical or horizontal non-friendly component more pronounced? If the vertical non-friendly component is more pronounced, the presence of restriction or paresis of the vertical rectus muscle is likely. If the difference (primary and secondary angles) is greatest in the horizontal plane, oblique muscle pathology is likely. 3. Is there a limitation of rotation? Differentiate restrictions from paresis by using the forced induction test and evaluating the ability to exert active force. 4. Is there a pronounced torsion? If so, then oblique muscle pathology or vertical restriction is likely. 5. Can the patient fix with the affected eye? Always consider this in the presence of asymmetric corrected visual acuity. Check for secondary deviation [9].

Situations in which the results of the Parks three-step test can be misleading: 1. Dissociated vertical divergence 2. Damage to several muscles: - Bilateral paresis of the fourth nerve - Weakness of several other muscles 3. Heterotopy of the block 4. Hyperfunction/contracture of the upper rectus muscle 5. Restriction of the lower rectus muscle 6. Paresis of the upper rectus muscle 7. Paresis of the lower rectus muscle 8. Oblique deviation 9. Previous surgery on oculomotor muscles c) General principles of treatment of vertical strabismus. You should choose a treatment plan that will lead to maximum correction of the field of view in which the greatest deviation is noted. Therefore, it is necessary to pay attention to the nature of the non-friendly component and the presence of corrosion. Remember that the primary position and looking down (for reading) are the two most important fields of view, and they should not be neglected in favor of looking to the sides[10]. Surgical interventions on oblique muscles allow for greater correction of adduction and abduction, but with interventions on vertical muscles, the differences between correction of adduction and abduction are less pronounced. Also, interventions on oblique muscles lead to greater changes in torsion than operations on rectus muscles. The exception is cases of restriction of the vertical rectus muscle, in which the elimination of restriction can lead to correction of even pronounced torsion. In general, the least "gentle" interventions are on the lower rectus or upper oblique muscle. Recessions of the inferior rectus muscle by 5 mm or more can lead to a lag in this eye when looking down, except in cases when hypotropia was observed before surgery, which increased when looking down. Also, volumetric recessions of the inferior rectus muscle after surgery can cause retraction of the lower eyelid; this effect can be minimized by repositioning the capsulopalpebral bundle during surgery [11].

Conclusions: Thus, extensive resections of the inferior rectus muscle can cause narrowing of the ocular slit, and volumetric recessions of the inferior rectus muscle using the suspension technique (suspension adjustable suture) are characterized by a higher frequency of muscle stretching and suture failure. This is probably caused by a shorter arc of contact of this muscle, as a result of which, after surgery, when looking down, the area of the muscle's attachment to the eyeball may decrease if

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it is not fixed to the sclera. Muscle stretching can be prevented by using the technique of semi-adjustable sutures, or non-absorbable sutures.

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