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Perspectives

Prism Treatment of Strabismus in Childhood - An Overview of Forty Years

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Abstract

Background: Infantile concomitant squint is based on sensorial and motor defects. Successful treatment is required to modulate both components and not merely the eye position. Material and method: Esotropic or intermittent divergent squinting children aged 2-14 years, without amblyopia, with a squint deviation not more than 30°, wore fully corrective glasses and prismatic compensation of the squint angle. Press-on prisms, split to both glasses, were tolerated well and never caused amblyopia, which may occur only when a microtropia has developed behind the prisms. Ground-in prism glasses for schoolchildren prevent non-compliance. Results: The study consists of two parts: 1) Long-term prism treatment over one year prior to squint surgery. 100 prism-treated esotropic patients were compared to 78 children without prisms; the same surgeon used the same method. Patients treated with a prism achieved the following statistically proven benefits: a) the number of alignments after surgery increased from 68% to 93% (p=0.0001),b) the postoperative recurrent increase of squint deviation was less (50%), c) fewer second operations were needed in one and the same patient (8% instead of 25.6%, p=0.001), and d) improvements of the binocular state (p=0.0001), irrespective of the type of squint, doubled the number of cured cases and led to the development of peripheral fusion even in cases of congenital strabismus. 2.) Long-term wearing of prisms as conservative treatment. In a first study 44 patients were treated over a period of 2 to 6.5 years, irrespective of the type and angle of the squint. The results were 78% alignment without surgery. However, the limitations of the method were also revealed: The squint angle should not exceed 15° in convergent and 10° in divergent cases. Starting the treatment at an early age will reduce the time of recovery. Conclusions: Long-term prism treatment of concomitant strabismus improves the sensorial and motor functions of binocularity. The sole disadvantage of the treatment is the length of time it takes.

Keywords: Hepatocellular carcinoma, cirrhosis, screening, HCV

Introduction

At the start of my ophthalmological career I was taught that surgery is the sole means of curing strabismus. This approach, based on mechanistic rules, was disappointing because the postoperative parallel eye position was not stable; a squint developed again and worsened within a few months.

In view of the physiology of binocular vision, we must consider the closed control loop consisting of sensory functions in terms of retinal correspondence and fusion on the one hand, and the output of motoricity on the other. Thus, a squint position commonly arises not due to a dysfunction of an ocular muscle, but due to absent or insufficient fusion power.

French authors [1,2] reported the favorable effects of prism correction in terms of reducing the squint angle, and ushered a new era in the treatment of strabismus. Shortly after the introduction of press-on prisms in Austria around 1970, we started to use the prisms at the orthoptic department of the First University Eye Clinic in Vienna- not only for the correction of diplopia in the elderly, but above all for the treatment of the infantile squint. The purpose was to improve the conditions for

successful squint surgery.

Patients and Method

As the present report is based on previous studies published by the author, this section provides general characteristics of the patients and dispenses with the details. One prerequisite for squint surgery is that the patient should wear his/her glasses the whole day and his/her refractive error should be fully corrected. Children younger than two years of age frequently refuse to wear glasses; in these cases it will be necessary to wait. Any pre-existing amblyopia should be treated and cured before giving the patient a prism. A squint angle exceeding 30° degrees must be reduced by surgery in order to create better conditions for prism treatment.

Principally we used press-on prisms to a maximum of 25Δ for each side, because the foils reduce the patient's visual acuity and an amblyopia may develop. In fact, in my 40 years of experience as an ophthalmologist I have never seen a child becoming amblyopic due to prisms per se. An amblyopia develops only when the squint angle is not exactly corrected by the prisms. An overlooked and evident convergent squint behind the prisms causes vision loss.

Guidelines for fitting prisms

The aim should be to achieve an equal size of eye deviation for distance and near fixation, if necessary with the use of bifocals. The strength of prisms is determined by the alternate cover test and a prism bar until no movement occurs at any distance. This technique is not quite easy because the fixation movements of squinting eyes are not exact, but overshoot and then refix again. Finding the appropriate prism power depends on the practical skills of the examiner. A check with the unilateral cover test is advisable. At this point, a Bagolini striated glass test may be positive in many cases. Attaching the prisms distributes the foils to both glasses. In cases of a tendency towards unilateral suppression, the stronger prism should be given to the dominant eye, but the difference between the right and the left prism should not exceed 15Δ. As a reaction to the prisms, the squint angle commonly increases at the beginning of the treatment. The prism strength must be checked again and adapted after one hour and then after one week. A stabilized eye position must be checked regularly every two months. When wearing prisms, we noted the maximum squint angle after approximately three months. After a period of time without change, the squint angle may reduce.

In rare cases the prisms did not permit the acquisition of a stable parallel position. It appeared as if the eyes refused to achieve straight binocular vision. These children were given alternating occlusion for about four weeks, after which the prism correction was tolerated. Another problem may arise from the unusual aspect of prismatic foils on the glasses, especially in schoolchildren. A useful solution is to prescribe ground-in prisms und additionally thin – and nearly invisible - adjustable prism foils for further correction of the squint angle.

The majority of the patients wore the prisms for about one year continuously. The reason for this relatively long period is that binocularity is a function of the brain, and it takes time to acquire any ability. Perhaps even one year is not sufficient.

Results

Long-term prism treatment prior to squint surgery

Reports of printed publications on the topic

1974. The first publication [3] of the First University Eye Clinic Vienna: 48 convergent squinting patients, aged 2-14 years. After prism treatment for one year the patients were subdivided according to their age at the onset of the squint. This group was compared to an equivalent group of 106 children without prisms. All 154 patients had an angle of squint less than 45Δ; and after surgery every patient had an eye position of ± 1°. Surgery was performed by one and the same surgeon, using the same method. The following checks at one week, one month, three months, and one year later showed in the prism group a reversion to convergent squint of maximum+1°; untreated patients had +4° to+ 5°. The prisms also improved sensorial functions such as retinal correspondence and fusion. The results of surgery were not only favorable (improvement+24%), but also raised the number of fully cured squints [4] -according to the criteria of Lang - from 13% to 39%.

1980. In a second retrospective study [5] the author examined two groups of 178 children each, with or without prisms. One year after surgery the benefits of prism treatment became evident: 22% patients were cured (compared to 11% without prisms), and 93% achieved alignment (68% without prisms). An examination performed three and a half years later showed that the eye position had improved in both groups, but the quality of binocularity deteriorated even in the prism group, with exception of the patients with late onset of a squint.

1994. Zehetmayer and Schemper [6] analyzed a similar cohort of patients with statistical methods and confirmed my previous results: the prism group showed significantly (0.001) better alignment and improved binocularity, which also influenced the motor outcome. In the prism group the number of second operations for repeated squint was significantly reduced (8% as opposed to 25.6% without prisms), and no patient developed a consecutive exotropia.

Long-Term Wearing of Prisms without Surgery

A conservative way to cure squint deviations in childhood?

1998. Publication at the *VIIIth ISA Meeting in Maastricht* [7]. Two questions were addressed in this study: a) What can be done for patients who refuse to undergo surgery? b) Since many adults develop a divergent squint as a result of surgery in early childhood, ophthalmologists

should ask themselves whether they perform too much surgery of strabismus at too early an age. The long-term use of prisms is not a common treatment for a squint. The reason for the non-acceptance of this treatment is the increase of the squint angle, the so-called "eating up of prisms" [8]. This was evident in our cases too, but only during the first few months. After 3-6 months the eye position stabilizes; after a stable period of about 1-2 years it gradually develops into orthotropia.

This report included 44 eso- or exotropic cases aged 2-14 years (average 4.8 years), with a squint angle between 14Δ and 40Δ. All types of squints were included: congenital convergence, consecutive divergence, and convergent cases after previous surgery for convergence. The duration of wearing prisms was 2 to 6.5 years.

The best effect of angle reduction was noted in the youngest convergent children (-21.4Δ), but less so in patients who had undergone previous surgery. All divergent cases showed an average reduction of 11.9Δ.

This study revealed the limitations of our method. Its success depends on the degree of squint deviation at the start of treatment. In our non-selected cases, the result was 65.9% orthotropia or microtropia (alignment), and 15.9% positive but insufficient reactions because of an excessively high angle; 18.2% were non responders.

Conclusion

For some years now, prism treatment has proved to be a useful alternative to surgery for the treatment of squinting children, provided the squint deviation does not exceed +30Δ in convergent, and - 20Δ in divergent cases. A SURVEY of prism treatment for infantile strabismus is to be found in: 2012 [9]: a comprehensive German article with similar data as those reported above. 2014 [10]: This last publication about prisms describes the therapeutic value of prisms for intermittent divergent squint.The Open Access entry to this chapter is: https://www.nova-publishers.com/catalog/product_info.php?products_id=52286

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