ESOTROPIA AND HYPEROPIA

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SUMMARY

The correction of hyperopia has long been used as a treatment tool for the simultaneous correction of an esodeviation. This is due to the fact that many esotropias benefit, at least partially, from a plus spherical lens, because many esotropias have an accommodative component. This article investigates the association between various subtypes of esotropia and hyperopia with regard to their clinical picture and treatment options.

Abbreviations: AC/A - accommodative convergence over accommodation, NPA - near point of accommodation, ICL - implantable collamer lens, PD - prism diopter, ARC - abnormal retinal correspondence

Key words: Convergent strabismus, accommodative esotropia, hyperopia

RéSUMÉ

L’éotropie et l’hypermétrie

La correction de l’hypermétrie est utilisée depuis longtemps comme outil de traitement pour la correction simultanée de l’ésotropie. Ceci est dû au fait que de nombreux éotropies bénéficient, au moins partiellement, d’une lentille sphérique en plus, parce que beaucoup d’éotropies ont une composante accommodante. Cet article examine l’association entre les différents sous-types de l’éotropie et l’hypermétrie à l’égard de leur image clinique et les options thérapeutiques.

Mots clés: strabisme convergent, éotropie accommodante, hyper-métrie

Accommodative esotropia

Accommodative esotropia is the type of esotropia that is caused by an increased accommodative effort or a high AC/A ratio. It is further classified in multiple entities that benefit from different treatment options.

Refractive accommodative esotropia (normal AC/A ratio)

Refractive accommodative esotropia is a type of esodeviation that can be fully corrected in all directions of gaze using the spectacle correction of the underlying hyperopia (1) (fig. 1, 2).

From an etiologic point of view, the majority of patients with hyperopia will try to overcome the retinal image blur by accommodating and thus, generating convergence (a physiologic mechanism discovered in 1884 by Donders). If the fusional divergence is not sufficient to maintain orthophoria with a normal or high AC/A, esotropia will ensue. If, on the other hand, fusional divergence is adequate, then the patient will only exhibit esophoria, and if the AC/A ratio is low, the patient may even show orthophoria. Some patients, usually the ones who are highly hyperopic, will rather tolerate the retinal image blur than accommodate. They will be orthophoric, but will develop a bilateral ametropic amblyopia and/or an accommodation deficiency with a reduced NPA (2).

Clinically, refractive accommodative esotropia manifests itself around 2-3 years of age, and, until recently, it was thought that this was due to the maturation of the accommodation reflex around this age. However, recent studies (3–5) have proven 6 month-old children to have both the accommodation reflex and the accommodative convergence reflex. Von Noorden (6), Pollard (7), Coats (8) & co and Havertape (9) & co have all presented cases of hyperopic children aged between 4 ½ months and 1 year with an esotropia that could be fully corrected with glasses. These findings show that the initial viewpoint cannot be upheld and that further research is warranted.

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The variable angle is a frequently found characteristic in this type of esotropia, and the angle is usually greater at near than at distance fixation. The objective angle depends on the state of the patient at a given time (fatigue, anxiety) and on the accommodation effort.

Some authors (6,10) claim that around 50% of these patients can acquire a superimposed nonaccommodative strabismus over time, although they had been previously adequately managed. Such cases have been operated and the authors have explained the phenomenon through the lack of bifoveal fusion in the early onset cases.

Symptoms include asthenopia, headaches, and intermittent diplopia (associated with the intermittent deviation present at the onset). The child will usually close one eye to overcome the diplopia which occurs more often at near fixation.

The full correction of the hyperopia measured by cycloplegia is sufficient to restore orthophoria and binocular single vision. Patients that have never worn glasses may complain about blurry vision because of the full spherical correction. Early follow-up is recommended with measurement of refraction and adjustment of the prescription to preserve eye alignment.

Although hyperopia regresses with age, most of these patients will be wearing spectacles their whole lives. Contact lenses may become useful in adolescence and patients may also benefit, later on, from laser refractive surgery (Bimedial rectus recession or retro-equatorial myopexy).

Nonrefractive accommodative esotropia

Nonrefractive accommodative esotropia defines an esotropia that is greater at near fixation, that is not associated with uncorrected hyperopia and which is determined by a high AC/A ratio. The etiology is abnormal synkinesis between convergence and accommodation characterized by an exaggerated accommodative convergence response. If fusional divergence is sufficient to counteract the excessive convergence tonus at near fixation, then the patient will only exhibit esophoria. Otherwise, the deviation will become manifest (6).

Patients may be myopic, emmetropic or hyperopic, but they are, usually, moderately hyperopic.

Treatment focuses on reducing the residual angle at near fixation. This may be achieved through bifocal/progressive correction, myotic drops or surgery (Bimedial rectus recession or retro-equatorial myopexy).

Partially accommodative esotropia

Partially accommodative esotropia defines the esotropia where accommodative factors are responsible for the total deviation, but not entirely. For this reason, cycloplegic refraction is important in order to eliminate the possibility of an uncorrected refractive error.

Refractive or nonrefractive esotropia are not always pure and they are sometimes superimposed. The total deviation is the sum of the accommodative and the nonaccommodative components, which can occur in any chronological order (6). In a child with essential infantile esotropia, an accommodative component may develop as the child grows, while in a case with purely accommodative esotropia, a new nonrefractive deviation may occur, after a period of apparent control (6,16).

Treatment involves spectacles and surgery. The surgical dosage is based on the objective angle measured with total hyperopic correction. Caution is advised in such cases with highly hyperopic patients that have worn plus spherical correction for a long time as surgical predictability is low.

Essential infantile esotropia

Essential infantile esotropia refers to the esotropia that occurs during the first 6 months of age in a child with no neurological deficiency. Hugonnier added the term “essential” to underline the unknown etiology and to differentiate
it from other types of congenital esotropia (6th nerve palsy, Duane syndrome) (17). Although the prevalence of essential infantile esotropia is 0.1%, it is the most common form of strabismus (18).

Clinically, the objective angle is usually over 30 PD and constant, but may augment with time. Initially, the child alternates fixation when amblyopia is not present, but may become monocular because of a fixation preference. On rare occasion, fixation may be monocular from the beginning. It may be accompanied by nystagmus, face turn or bilateral abductor pseudoparesis and when all three are present they define the Ciancia syndrome (19).

A study of 500 patients with essential infantile esotropia conducted by Costenbader (20) revealed the distribution of refractive errors amongst these patients: 3.8% myopia, 54.8% low hyperopia, 39.4% moderate hyperopia and 2% high hyperopia.

Bimedial rectus recession is the surgery of choice for cases over 4 months of age with no nystagmus or amblyopia. Surgical dosage should take into account the age of the patient as well as the objective angle [see table 1 (21)].

If amblyopia is suspected through a fixation preference, treatment should begin with occlusion, following an age-appropriate protocol. Hyperopia less than 3 diopters is not usually corrected with spectacles, as these have been shown to have little effect on the deviation. However, glasses are prescribed for hyperopia in excess of 3 diopters for the accommodative component of the deviation (1).

Conflict of interest

There is no conflict of interest.

REFERENCES


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