



## Are Bifocals Necessary for Children with High AC/A Esotropia?

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Esotropia with a high accommodative convergence-to-accommodation (AC/A) ratio is a relatively common type of strabismus in children. Typically, it presents in early childhood as esotropia greater at near than distance fixation; however, not all of these cases are considered high AC/A. If the near deviation reduces significantly when the child looks through +3.00-diopter (D) lenses, then the deviation is established as accommodative rather than the result of an excess of convergence driven by near proximity. The AC/A ratio can be measured using the gradient method or the heterophoria method. Using a +3.00-D lens at near fixation, the AC/A ratio by the gradient method is simply the difference in prism diopters of esotropia with versus without the lens, divided by 3 D (lens power). An AC/A ratio of more than 5 is abnormally high.

The traditional treatment of high AC/A esotropia has been bifocals, which reduce the accommodative demand at near fixation and reduce or eliminate the esotropia. However, other treatments have included single-vision lenses, pharmacologic therapy, and extraocular muscle surgery. Long-acting cholinesterase inhibitors such as echothiophate iodide act directly on the ciliary body to facilitate accommodation. Surgical approaches have included bilateral medial rectus recessions with<sup>1</sup> or without<sup>2</sup> posterior fixation sutures, and some investigators have reported outstanding surgical results. In one study, surgery eliminated the need for bifocals in 22 of 23 children with high AC/A esotropia.<sup>3</sup>

Compared with single-vision lenses, bifocals seem to have the advantage of allowing a child to spend more time with excellent near alignment. Many children with bifocals demonstrate excellent near alignment and stereopsis in the office setting. In fact, many children will lift their chins to maintain fixation through the bifocal on a near target, strongly suggesting that they are deriving visual benefit from wearing a bifocal. Proponents of bifocals point out that, if a child spends more time with excellent alignment, it is likely that he or she will develop better binocularity and stereopsis. Intuitively, this makes sense. However, there are many examples of treatments that intuitively seem beneficial, but did not show any advantage when tested versus another treatment or placebo in a properly conducted randomized clinical trial.

Despite the theoretical advantages, there are many disadvantages to wearing bifocals for high AC/A esotropia. They are more expensive than single-vision lenses, and it can be difficult for some children to accept and wear bifocals. For school-aged children, there is the social stigma of not only wearing glasses, but also of wearing glasses that look very different. Although progressive lenses without a line are an option, it can be more difficult for young children

to learn to look far enough down to get the full effect of the added lens power. When executive bifocals are prescribed, sometimes it is not clear to opticians that the bifocal line must be high, and glasses can be made inappropriately with a small, inferiorly placed bifocal segment that the child never uses. Even when properly made, a bifocal can interfere with the active lifestyles of many children. They can make normal children seem clumsy when on the playground or walking down steps. Because of these substantial disadvantages, the article by Whitman et al<sup>4</sup> in this issue of *Ophthalmology* (see page 690) was indeed “music to my ears.” I would love to take most of my high AC/A patients out of bifocals, but I have not been able to do it without the gnawing feeling that I am potentially harming their binocular development.

Whitman et al report that stereoacuity outcomes were similar after bifocals or single-vision glasses in a large group (n = 180) of esotropic patients with high AC/A ratios. In addition, they found that the rate of surgical intervention was higher (16% vs. 4%;  $P = 0.04$ ) in the group wearing bifocals. Proponents of bifocal wear may wonder why, when ocular alignment is improved with bifocals, it does not give a better result than single-vision glasses. The authors propose an intriguing hypothesis to explain their results. They speculate that “binocular experience at distance with variable deviation at near... may drive sustained fusional divergence to decrease the near deviation and maintain some degree of binocularity in everyday life.... Single-vision wearers thus might ‘learn’ to control their deviations over a range of distances more effectively.” It seems plausible to me that a child may need to have normal ocular alignment only for part of the time to achieve his or her best stereopsis. That is, whatever a child’s individual potential for stereoacuity development, he or she can achieve it by spending at least some of the time with excellent ocular alignment, and that having straighter eyes when looking down through a bifocal does not enhance binocular development further.

Whitman et al understand and acknowledge that their study does not definitively answer the question of whether treatment with bifocals is superior to treatment with single-vision lenses. The primary reason is that, using their observational study design, we cannot know that the 2 treatment groups are truly similar. Baseline data with key variables are presented in their Table 1, and the bifocals and single-vision glasses groups seem similar. However, there can be unknown or unmeasurable factors associated with treatment groups that can introduce bias into observational studies. For example, the authors acknowledge that “bifocals may have been prescribed or recommended by clinicians who prescribe on a case-by-case basis as a last-ditch

effort before surgery, which could theoretically explain why more bifocal patients progressed to surgical intervention.” There can be subtle reasons why a doctor prescribes single-vision lenses for some patients and bifocals for another; for example, he or she may have a “gut feeling” that a particular patient needs a more aggressive treatment, or the child’s parents may push for additional treatment to improve the eye alignment. These factors can be associated with a worse outcome or greater likelihood for surgery, and if more of these patients are in the bifocal group, then outcomes will favor the single-vision lenses group. To their credit, the authors measured and adjusted for many potential confounding variables. Given the limitations of an observational study, I think they designed and executed the best possible study. As they point out, there are always limitations to comparing 2 treatments when the subjects are not randomized. Randomization helps to ensure that the groups are similar in every way except for their treatment assignment.

When considering children with esotropia greater at near than at distance, I think it is very useful to consider subgroups, which differ in terms of approaches and responses to treatment. First, there are convergence excess patients, who have normal AC/A ratios. Since their alignment does not improve with a bifocal, there is no role for it. Second, there are children who are esotropic at distance fixation and remain esotropic with or without +3.00 adds at near fixation. In this scenario, I do not prescribe bifocals to simply convert a near esotropia to a smaller near esotropia. Even if converting a larger esotropia to a microtropia could encourage gross binocularity, this questionable benefit is outweighed by the numerous disadvantages of bifocals. For some of these children, the angle of esotropia at distance and near is considerable, so they benefit from surgical treatment. Third, there are patients with good motor fusion at distance fixation who are still esotropic with or without +3.00 adds at near fixation. I typically do not prescribe bifocals for these patients, because they still have a manifest deviation at near. Finally, there are patients with good motor fusion at distance fixation who at near fixation are esotropic but show motor fusion with +3.00 adds. These are the high AC/A patients for whom I usually prescribe bifocals, giving the minimum amount of plus power needed to eliminate the constant near esotropia, and attempt to taper the bifocal over time. As these patients grow older, some of them wish to stop wearing bifocals, and strabismus surgery is an option for them.

When reading the study by Whitman et al, I initially suspected that the authors found no difference between their treatment groups because they mixed patients with different responses to bifocals or +3.00 adds at near. Some had good

motor fusion through bifocals or +3.00 adds, whereas others were still esotropic. However, I was pleased to see that they compared outcomes of the phoric bifocal group (defined as phoric at near through the bifocal) with the phoric single-vision group (defined as phoric at near through a +3.00 diopters add). In this analysis, they observed no difference between bifocals and single-vision lenses in stereopsis improvement, final stereopsis, or final distance or near deviation. Admittedly, the numbers are small when looking at subgroups, but these data are certainly encouraging and point to the need to explore this question further.

The authors suggest that a randomized trial would be very useful to address more definitively the question of whether bifocals or single-vision glasses are preferred in children with high AC/A esotropia. I agree that this is a very important question and that strong consideration should be given for a large randomized trial. No doubt there is controversy in our field on this topic, as there are advantages to both approaches. In my mind, the primary group of interest are those who fuse at near with +3.00 adds but do not fuse without. I think it is less compelling that there is benefit to reducing the magnitude of esotropia to a smaller, yet still constant, esotropia. In a larger study, there would be challenges to recruiting and randomizing a sufficient number of subjects in this subgroup of interest and to following a large cohort long enough to be able to detect a difference in stereoacuity or other important outcomes. However, the potential benefits of answering this question are substantial. If single-vision glasses are at least as good as bifocals, changing our practices would save considerable health care dollars, not to mention saving many children from the struggle of navigating their busy worlds while wearing a bifocal.

## References

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## Footnotes and Financial Disclosures

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