The long-term outcomes in children who are not compliant with spectacle treatment for accommodative esotropia

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PURPOSE To evaluate the long-term motor and sensory outcomes of children who have refractive accommodative esotropia and are noncompliant with spectacle wear.

METHODS The medical records of patients diagnosed with pure refractive accommodative esotropia between 1999 and 2004 were retrospectively reviewed. All patients had hyperopia of at least 3 D and at least 1 year’s follow-up. Patients were classified according to degree of compliance with spectacle wear as good, fair, and poor. The main outcome measures were sensory and motor outcomes.

RESULTS A total of 92 patients were included. The mean follow-up period was 61.4 months (range, 12-200 months). Compared to patients with good compliance, those with fair compliance had a significantly higher risk for poor sensory outcome (odds ratio [OR] = 4.56; 95% CI 2.1 - 24.7; P = 0.0003) and poor motor outcome (OR = 4.1; 95% CI, 1.44 -11.75; P = 0.0065). Patients with poor compliance likewise had a higher risk for poor sensory outcome (OR = 12.3; 95% CI, 1.29-96.79; P = 0.0061) and poor motor outcome (OR = 11.7; 95% CI, 2.38-74.19; P = 0.0006).

CONCLUSIONS Fair and poor compliance with spectacle use greatly increases the risk of poor sensory and motor outcomes in children with pure refractive accommodative esotropia. ( J AAPOS 2015;19:169-171)

Refractive accommodative esotropia is associated with moderate to high hyperopia. Prompt and appropriate optical correction is required to minimize the adverse effects of intermittent or constant esotropia on binocular sensory function and motor alignment.1 Although most children comply with spectacle wear, compliance in those who do not vary from nil to occasional wear. An alternative treatment is refractive correction with contact lenses. This option, however, may not be viable due to poor cooperation, increased cost, and frequent loss of contact lenses. Eye muscle surgery to correct the esotropia is not generally advised for pure accommodative esotropia. 2,3 Refractive surgery, although a viable option to reduce refractive error, is still experimental for this condition and has not yet been approved for use in children in the United States. The aim of this study was to evaluate the long-term sensory and motor outcomes of children who initially had pure accommodative esotropia and who were noncompliant with spectacle wear.

Subjects and Methods The medical records of patients at Children’s Medical Center, Dallas, Texas, from 1990 to 2004 were retrospectively reviewed. Our inclusion criteria included patients who had (1) an initial diagnosis of pure accommodative esotropia, defined as responding to orthophoria with glasses on for at least 1 visit, not including the last follow-up; (2) hyperopic spherical equivalent refractive error in both eyes of ≥3 D; (3) ≤1 D of anisometropia (4); follow-up of at least 1 year with at least 4 visits; (5) reliable sensory testing at final last follow-up examination; and (6) clear documentation of whether they wore glasses during all visits. Children with developmental or neurological abnormalities (poor compliance thought to be related to neurobehavioral problems) and those requiring surgery at any time prior to the last follow-up examination were excluded, as were patients with incomitant strabismus, concomitant vertical strabismus, any ocular pathology of the anterior or posterior segments, or nystagmus. Patients considered too young or too uncooperative for reliable sensory testing at final follow-up examination were excluded. Children were also excluded if in their record stated clearly that the child was unable to perform the test based on the discretion of an experienced orthoptist.

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Journal of AAPOS 169
The main variable analyzed was compliance with spectacle wear. Because compliance reports from parents can be inaccurate and overstated, we decided to define compliance as objectively as possible:

- **Good**: patients arrived at the clinic wearing spectacles for ≥75% of visits.
- **Fair**: patients arrived at the clinic wearing their spectacles for >25% but <75% of visits.
- **Poor**: patients arrived at the clinic wearing their spectacles in ≤25% of visits.

The angle of esotropia was measured with refractive correction using alternate prism and cover test at distance and near.

Stereoaucity was performed using the Titmus stereo test (Stereo Optical Inc, Chicago, IL). The continuous and perfect alignment of the test, the Titmus fly distance, was not controlled. Because of the possibility of false positive results from monocular clues with this test, the results were verified when possible by the orthoptist by turning the book upside down to confirm the reversal of the response. The test was typically repeated twice and reported only with consistent stereacuity results. Because false positives cannot be absolutely avoided, especially in higher degrees of stereoaucity, the sensory outcome results were divided according to the presence or absence of gross stereopsis.

The main outcome measures were sensory and motor. Children were divided from the sensory outcome standpoint according to the presence or absence of measurable stereopsis. Measurable stereopsis was defined as stereacuity of better than 3000 arcsec as determined by a positive response to the Titmus stereo test. Motor outcome was based on eye alignment at final follow-up with the most recent cycloplegic refraction in place in spectacles. Motor outcome was defined as good if the child had a final deviation within 10ª of orthotropia at distance and near at the final follow-up.

One-way analysis of variance was used to compare the initial mean age, refractive error, and distance and near deviations. The χ² test was used to compare the sensory and motor outcomes between the children in the different compliance categories. Odds ratio (OR) and 95% confidence intervals were calculated for each comparison. Statistical significance was set at P < 0.05.

**Results**

A total of 82 patients met all inclusion criteria. The mean age of onset of esotropia was 3.6 years (range, 6 months to 9 years). The mean follow-up was 61.4 months (range, 12-200 months). Forty-eight patients (59%) had good compliance; 25 (31%), fair compliance; and 9 (11%), poor compliance. There was no significant difference between groups regarding mean age at diagnosis; initial spherical equivalent refractive error of the right eye or the left eye; or initial deviation at distance or near (Table 1).

**Sensory Outcome**

Of the 82 patients, 49 (60%) had no measurable stereopsis, including 20 (42%) of the 48 patients with good compliance; 13 (52%) of the 25 with fair compliance, and 7 (78%) of the 9 that had poor compliance.

**Motor Outcome**

Of the 82 patients, 30 (37%) had poor motor outcome, including 10 (21%) of the 48 patients with good compliance, 13 (52%) of the 25 with fair compliance, and 7 (78%) of the 9 that had poor compliance.

**Discussion**

Our results demonstrate the adverse effect of poor compliance on both sensory and motor outcomes in children with pure accommodative esotropia. In our cohort, fair and poor compliance were associated with significantly fewer good final sensory and motor outcomes. These results are not unexpected. Other studies have shown that constant eye misalignment lasting at least 4 months significantly increases the risk for anomalous binocular vision. The continuous and perfect alignment of the eyes and the elimination of any ametropia appear critical for a good sensory outcome and hence maintenance of

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**Table 1. Mean age of onset, initial deviation at distance and near (without correction), and initial refractive error of the right and left eye at the 3 levels of compliance**

<table>
<thead>
<tr>
<th>Category</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>P value^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of onset</td>
<td>3.4 ± 1.2</td>
<td>3.5 ± 2.0</td>
<td>2.4 ± 1.3</td>
<td>0.28</td>
</tr>
<tr>
<td>Initial deviation</td>
<td>Distance: 33.1 ± 12.8</td>
<td>35.6 ± 8.5</td>
<td>33.4 ± 8</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>Near: 38.2 ± 12.5</td>
<td>39.2 ± 8.5</td>
<td>36.4 ± 12</td>
<td>0.83</td>
</tr>
<tr>
<td>Initial cycloplegic refraction</td>
<td>Right: 5.22 ± 1.61</td>
<td>4.68 ± 1.31</td>
<td>4.64 ± 1.2</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>Left: 5.47 ± 1.59</td>
<td>5.01 ± 1.52</td>
<td>4.35 ± 1.18</td>
<td>0.12</td>
</tr>
</tbody>
</table>

^a Analysis of variance.
satisfactory motor alignment. These results underscore the importance of searching for alternative treatment options for children who are consistently noncompliant with spectacle wear.

Refractive surgery is a potential option.\textsuperscript{5,6} It has been used successfully in the management of severe isoametropia and anisometropia associated with amblyopia in children who are poorly compliant with spectacle wear and/or patching.\textsuperscript{7} One disadvantage of refractive surgery in children with accommodative esotropia, however, is the anticipated continued eye growth, with possible long-term changes in the refraction.\textsuperscript{8,9} Yet it is also possible that surgical emmetropization from refractive surgery may stall further eye growth. This question remains unanswered.

The main limitations of our study stem from its retrospective nature, including the lack of a control group and the potential for inaccuracy regarding compliance with spectacle use. We tried to minimize reporter bias with spectacle use by defining compliance as objectively as possible and very rigidly as the percentage of visits at which the child wore spectacles. When testing for higher degrees of stereopsis, a concern exists that children will use monocular clues, with the possibility of false positive results.\textsuperscript{10} We elected to divide sensory testing results according to the presence or absence of measurable stereopsis to reduce the possibility of false positives. This parameter may have led to an inevitable combining of monofixators with bifixators in the group of children having measurable stereopsis.

Also, the study cohort had a relatively small number of children with poor or fair compliance.

References

Seeing Is Believing

“My son asked why he couldn’t see very well when he was around ten. I told him he was a survivor of SBS. He got angry and blamed me for going to work that day. It was one of many days that I cried. The guilt and anger have not gone away in twenty-two years. Everyone says you need to forgive, but that hasn’t happened yet and I don’t think it ever will.

One day he and my grandson were watching a television program. My grandson asked him why he had to sit so close to the TV. My son told him it was because a man shook him and then said, ‘When I get older we are going to find him, because he needs to pay.’ That was another day I cried. I wish the court system felt the same way.”


*Contributed by Alex V. Levin, MD, MHSc, Philadelphia, Pennsylvania*