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## Treatment of Strabismic Amblyopia with Refractive Correction

Pediatric Eye Disease Investigator Group\*

### Abstract

**Purpose:** To report data on the response of previously untreated strabismic amblyopia to spectacle correction.

**Design:** Prospective, interventional case series

**Methods:** 12 patients with previously untreated strabismic amblyopia were prescribed spectacles and examined at 5-week intervals until visual acuity was not improved from the prior visit.

**Results:** Amblyopic eye acuity improved by  $\geq 2$  lines from spectacle-corrected baseline acuity in 9 of the 12 patients (75%), resolving in 3 (IOD  $\leq 1$  line). Mean change from baseline to maximum improvement was  $2.2 \pm 1.8$  lines. Improvement continued for up to 25 weeks.

**Conclusion:** These results support the suggestion from a prior study that strabismic amblyopia can improve and even resolve with spectacle correction alone. Larger studies with concurrent controls are needed to confirm or refute these findings.

### Keywords

amblyopia; strabismus; visual acuity; refractive correction

### Brief Report

Stewart et. al. reported that refractive correction alone can be effective in treating young children with previously untreated strabismic amblyopia, even in the absence of anisometropia.<sup>1</sup> In 16 patients with strabismic amblyopia treated with spectacles alone, they found amblyopic eye acuity improved a mean of 3.0 lines over an 18-week period. This was somewhat surprising because, in such cases, the amblyopia is presumably due to the ocular misalignment, which most often would not be fully corrected with spectacles alone. We reviewed data from our recent prospective study<sup>2</sup> to determine if our results were consistent with those of Stewart and coworkers.

This study was registered at ClinicalTrials.gov (Identifier NCT00091923).<sup>3</sup> The full study protocol is available online.<sup>4</sup> The protocol and HIPAA-compliant informed consent forms were approved by the respective institutional review boards and the parent or guardian of each study patient gave written informed consent.

As a run-in phase to a randomized trial of patching treatment for amblyopia,<sup>5</sup> spectacles were prescribed to correct refractive error, no other amblyopia treatment was prescribed, and patients

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were followed until visual acuity appeared stable. Results in patients with previously untreated anisometropic amblyopia have been reported<sup>2</sup>. Data were available for 12 patients (75% female, 83% white, mean age 5.0±0.9 years) with previously untreated strabismic amblyopia who had a constant strabismus at distance and near and anisometropia of ≤0.75 D in spherical equivalent or ≤1.25 D in astigmatism (Table 1). Spectacle-corrected monocular distance visual acuity was measured using the electronic Amblyopia Treatment Study HOTV protocol<sup>6, 7</sup> at baseline and every 5 (±1) weeks provided amblyopic eye acuity had improved at least 1 line (0.1 logMAR) from the prior visit and remained at least 1 line worse than sound eye acuity. Patients whose acuity did not improve at least 1 line from the prior visit but still had ≥2 lines of interocular difference (IOD) entered a randomized trial.<sup>5</sup> Those randomized to the control group continued spectacles if needed but did not start other therapy, and provide additional data on the course of the amblyopia treated with spectacles alone.

Among the 12 strabismic patients, during the spectacles-only phase of follow up, amblyopic eye acuity improved by ≥ 2 lines from spectacle-corrected baseline acuity in 9 (75%) resolving in 3 (IOD ≤ 1 line), Table 2. Mean change from baseline to maximum improvement was 2.2 ± 1.8 lines. Improvement continued for up to 25 weeks. Additional amblyopia improvement ≥1 line occurred, though amblyopia did not resolve, in 3 of the 5 patients with residual amblyopia who entered the subsequent randomized trial as controls.

Our results support the suggestion of Stewart et al.<sup>1</sup> that strabismic amblyopia can improve and even resolve with spectacle correction alone. Although the results are consistent, they are not conclusive, because neither study had a concurrent control group and both had small numbers of patients. It is not possible to rule out the possibility that change in strabismus angle, learning effect, age effect, regression to the mean, or chance could account for some of the observed improvement. Larger studies with concurrent controls are needed to confirm or refute these findings.

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3) CONTRIBUTION OF AUTHORS Design of the study (SC, RA, WA, CB, RB, EB, SD, DE, JF, JH, RK, MR, DW, KW); all authors were involved in the collection, management, analysis, and interpretation of the data and the preparation, review, and final approval of the manuscript.

4)OTHER ACKNOWLEDGMENTS - None

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<sup>\*</sup>A list of Pediatric Eye Disease Investigator Group sites participating in this study appears in *Ophthalmology* 2006;113:895-903.

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Table 1

Baseline Clinical Characteristics and Change in Amblyopic Eye Visual Acuity

Patient	Age (Years)	Strabismus Type and Magnitude at Distance (Δ)	Strabismus Type and Magnitude at Near (Δ)	Cycloplegic Refractive Error in Amblyopic Eye	Baseline Amblyopic Eye Visual Acuity	Cycloplegic Refractive Error in Sound Eye	Baseline Sound Eye Visual Acuity	Change in Amblyopic Eye to Visit of Best of Best Acuity (Lines)
1	4.5	ET 6Δ	ET 10Δ	+5.75	20/50	+5.25	20/20	0
2	5.7	ET 15Δ	ET 18Δ	+2.50	20/63	+1.75	20/20	0
3	6.2	ET 12Δ	ET 12Δ	+2.00+0.25×075	20/63	+1.25+0.50×105	20/20	0
4	3.7	ET 4Δ	ET 12Δ	+3.00+1.50×090	20/80	+3.00+1.50×090	20/32	+2
5	4.2	ET 40Δ	ET 40Δ	+5.00+1.00×080	20/100	+4.75+0.50×100	20/40	+2
6	5.3	ET 20Δ	ET 25Δ	+5.00+0.25×080	20/50	+5.00+0.25×100	20/25	+2
7	5.9	ET 2Δ	ET 4Δ	+1.50	20/40	+1.50	20/16	+2
8	6.3	ET 4Δ	ET 4Δ	+4.75+1.00×090	20/50	+4.25+0.75×090	20/20	+2
9	4.0	ET 14Δ	ET 14Δ	+2.00+0.75×090	20/80	+2.00+0.50×090	20/25	+3
10	5.3	XT 10Δ <sup>†</sup>	XT 20Δ <sup>†</sup>	+0.00+1.50×165	20/250	+0.00+1.00×090	20/20	+3
11	4.6	ET 20Δ <sup>‡</sup>	ET 20Δ <sup>‡</sup>	+3.50+0.50×090	20/100	+3.00+0.50×090	20/40	+4
12	4.1	ET 25Δ	ET 25Δ	+5.00+1.00×090	20/100	+5.00+1.00×100	20/32	+6

Patients are sorted by lines change in amblyopic eye to visit of best acuity in amblyopic eye

\* Strabismus was measured at baseline and may not have been present after prolonged spectacle treatment

<sup>†</sup> Patient also had a left hypertropia of 25Δ at distance and 30Δ at near

<sup>‡</sup> Strabismus measured with Krimsky test

Improvement in Amblyopic Eye Visual Acuity and Resolution of Amblyopia Stratified by Degree of Refractive Error in Amblyopic Eye

Table 2

	Lines Improvement In Amblyopic eye						Interocular Acuity * Difference		Resolution of Amblyopia † N (%)		
	N	0	1	2	3	4	5	6		Mean	Mean
<b>Overall</b>	12	3	0	5	2	1	0	1	2.2	3.2	3 (25%)
<b>By Degree of Refractive Error in Amblyopic Eye</b>											
≤+3.00 D spherical equivalent	5	2	0	1	2	0	0	0	1.6	4.4	0
<1.50 D astigmatism	4	2	0	1	1	0	0	0	1.3	3.5	0
≥1.50 D astigmatism	1	0	0	0	1	0	0	0	3.0	8.0	0
>+3.00 D spherical equivalent	7	1	0	4	0	1	0	1	2.6	2.3	3 (43%)
<1.50 D astigmatism	6	1	0	3	0	1	0	1	2.7	2.0	3 (50%)
≥1.50 D astigmatism	1	0	0	1	0	0	0	0	2.0	4.0	0

\* Interocular acuity difference evaluated using better of sound eye acuity at baseline or sound eye acuity at visit of best measured amblyopic eye acuity.

† Interocular acuity difference within 1 line.