

Visual Outcome Following the Reduction or Cessation of Patching Therapy After Early Unilateral Cataract Surgery

Scott R. Lambert, MD; David A. Plager, MD; Michael J. Lynn, MS; M. Edward Wilson, MD

Objective: To evaluate the impact on visual acuity of reducing or abandoning patching therapy during the first 6 years of life following early unilateral cataract surgery.

Methods: We reviewed the medical records of 9 children with unilateral congenital cataracts who underwent cataract surgery when 6 weeks or younger. All had good compliance with optical correction until 6 years of age and with patching therapy until at least 12 months of age.

Results: The children underwent cataract surgery at a mean (SD) age of 21.7 (9.5) days. At 12 months of age, the children were patched a mean (SD) of 6.7 (2.4) hours/d. Patching compliance declined steadily thereafter.

By 6 years of age, they were only being patched a mean (SD) of 1.7 (2.0) hours/d. Four of the 9 children abandoned patching prior to the 6-year examination. Acuities improved or remained the same for 3 of these children but worsened for 1 child by 2 lines.

Conclusion: Our study suggests that some children who undergo early unilateral cataract surgery and are compliant with their optical correction and patching during early childhood can maintain a good visual outcome even if patching therapy is reduced or discontinued prior to their sixth birthday.

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A NUMBER OF STUDIES HAVE shown that good visual outcomes can be achieved in children with unilateral congenital cataracts following early cataract surgery, consistent optical correction with either a contact lens or an intraocular lens, and with part-time patching therapy of the fellow eye.¹⁻⁵ However, the amount and duration of patching therapy necessary to achieve a good visual result is not known. While some clinicians have customized patching regimens based on the visual acuities of children's aphakic eyes,^{2,6-8} most have recommended patching the phakic eye a fixed number of hours each day.⁹⁻¹² In the Infant Aphakia Treatment Study, parents are asked to patch their child 1 hour a day per month of life until 8 months of age and then one-half of the child's waking hours.¹³ It is generally recommended that patching therapy be continued until a child is at least 6 years of age, but some investigators have recommended patching until 9 years of age.^{9,10} We performed a retrospective study to determine if the age at which patching therapy was reduced or discontinued was related to the

visual acuity obtained in the aphakic/pseudophakic eye.

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METHODS

After obtaining approval from the respective institutional review boards of 3 pediatric ophthalmologists, the medical records of all children with a visually significant unilateral congenital cataract (≥ 3 -mm central opacity) who underwent cataract surgery when 6 weeks or younger were reviewed. To be included in the study, children had to have (1) a normal intraocular pressure, retina, optic disc, and ciliary processes and a corneal diameter of 9 mm or more in the eye that was operated on; (2) a normal fellow eye; (3) good compliance with optical correction of the aphakic/pseudophakic eye until 6 years of age; (4) 3 hours/d or more of patching therapy as reported by the caregiver at the 12-month examination; and (5) an annual ocular examination at least until the child was 6 years of age. Children were excluded from the study if postoperatively they either developed glaucoma (an elevated intraocular pressure > 25 mm Hg persisting for more than 2 weeks after topical corticosteroid use was discontinued or an intraocular pressure

Author Affiliations: Emory Eye Center (Dr Lambert) and Rollins School of Public Health, Emory University (Mr Lynn), Atlanta, Georgia; Indiana University Medical Center, Indianapolis (Dr Plager); and Storm Eye Institute, Charleston, South Carolina (Dr Wilson).

Table 1. Surgical and Optical Treatments

Patient No.	Age at Cataract Surgery, wk	Optical Treatment	Additional Surgeries
1	3.7	CL	None
2	3.9	CL	None
3	4.6	CL	Strabismus
4	2.0	CL	Strabismus (2 surgeries)
5	3.4	CL	Strabismus
6	2.9	CL	Strabismus
7	4.9	IOL and spectacles	None
8	0.7	CL	Secondary IOL
9	1.9	CL	Secondary IOL; strabismus

Abbreviations: CL, contact lens; IOL, intraocular lens.

>21 mm Hg with any 1 of the following findings: enlargement of the cornea, asymmetrical progressive “myopic” shift, or increased optic nerve cupping) or a visual axis opacity requiring a membranectomy. Nine children qualified for the study. Data on these children were then entered on standardized case report forms that included the inclusion criteria, the date and type of cataract surgery and postoperative complications, and clinical data on the ocular examinations performed closest to the children’s birthdays at 1, 2, 3, 4, 5, and 6 years of age. Included in the case report forms were the date of each of these examinations, the number of waking hours per day of patching on average as reported by the parents, the type and power of the optical correction being worn, and the child’s optotype acuity, including the test used to obtain the measurement. The case report forms were then faxed into a database from which summaries were produced. Values are reported as means and standard deviations.

RESULTS

The children underwent cataract surgery at a mean (SD) age of 21.7 (9.5) (range, 5-34) days (**Table 1**). Eight children were left with aphakia and initially treated with a contact lens while 1 child underwent primary intraocular lens implantation (811A; Pharmacia, Uppsala, Sweden) combined with spectacle overcorrection. Two children underwent secondary intraocular lens implantation (patient 8, MA60, and patient 9, SN60; Alcon, Fort Worth, Texas) when 4 and 6 years of age, respectively. No serious contact lens–associated complications were reported. Five patients subsequently underwent strabismus surgery. No other operations were performed during the follow-up period.

At the 1-year examination, the parents reported patching the children a mean (SD) of 6.7 (2.4) (range, 3.5-10) hours/d (**Table 2**). By the 2-year examination, the mean (SD) duration of patching had decreased to 4.7 (3.7) (range, 0.5-11) hours/d and then increased slightly at the 3-year examination to 5.2 (3.1) (range, 1.5-11) hours/d. There was a gradual decline thereafter due to patching being discontinued in 4 children and markedly reduced in 2 children. At the 4-year examination, the mean (SD) duration of patching was 3.9 (3.3) (range, 0-11) hours/d; at the 5-year examination, 2.6 (2.5) (range, 0-6) hours/d; and at the 6-year examination, 1.7

(2.0) (range, 0-5) hours/d. Patching was abandoned in 2 children between the 3- and 4-year examinations, in 1 child between the 4- and 5-year examinations, and in 1 child between the 5- and 6-year examinations.

Optotype acuities were available for all of the children at the 5- and 6-year examinations and in all but one of the patients at the 4-year examination (**Table 3**). Acuities in the fellow eyes ranged from 20/20 to 20/25. Acuities in the aphakic/pseudophakic eyes ranged from 20/30 to 20/200 at 6 years of age. The acuity improved in the aphakic/pseudophakic eyes from the 4- to the 6-year examination for 4 patients, worsened for 3 patients, and remained the same for 1 patient. The acuities remained the same for the 3 patients who discontinued patching prior to the 6-year examination but worsened for 1 patient (20/25 to 20/40). No correlation was noted between the intensity of patching at the 12-month examination and the visual outcome when these children were 6 years of age.

COMMENT

There was a gradual reduction in the number of hours of patching therapy reported by the parents in our study as their children became older. This is not surprising considering the difficulty of maintaining a treatment that requires so much parental involvement for so many years. In addition, 4 patients discontinued patching therapy entirely prior to the ocular examination closest to their sixth birthday. Despite the reduction and in some cases cessation of patching therapy in some of these children prior to the 6-year examination, the visual acuities remained stable once optotype acuity testing could be performed. Even though 4 patients discontinued patching therapy when 3 to 6 years of age, the visual acuities remained the same or improved in 3 patients and only decreased in 1 patient.

The optimal amount and duration of patching necessary to achieve the best visual outcomes in children following early unilateral cataract surgery is unknown. While many investigators recommend patching the fellow eye a fixed number of hours each day or a percentage of a child’s waking hours, others have tried to customize patching regimens based on the visual acuity of the aphakic or pseudophakic eye. Since a subjective visual acuity cannot usually be assessed until a child is at least 3 years of age, customized patching regimens have generally relied on serial visual assessments using visual evoked potentials, preferential looking, or fixation preferences. Beller and colleagues² prescribed patching regimens ranging from 4 to 8 hours/d based on the results of monthly visual evoked potential testing. Catalano et al⁶ prescribed patching regimens ranging from 10% to 100% of a child’s waking hours based on serial preferential looking testing. Lloyd and coworkers⁷ used 3 different patching regimens based on interocular acuity differences using preferential looking assessed at each follow-up examination (<0.5 octaves=patching 50% of waking hours; 1-1.5 octaves=patching 75% of waking hours; ≥2 octaves=patching 100% of waking hours). Finally, Brown and colleagues⁸ customized patching regimens based on spontaneous fixation preferences or induced tropia testing. However, none of these studies addressed the issue of

Table 2. Average Waking Hours per Day Parent Reported Patching Child at Each Annual Examination

Patient No.	Hours/d					
	1 Year	2 Year	3 Year	4 Year	5 Year	6 Year
1	9.0	7.0	6.0	6.0	6.0	0
2	3.5	0.5	1.5	4.0	4.0	4.5
3	7.5	1.5	1.5	2.0	1.0	2.0
4	10.0	1.0	6.0	0	0	0
5	8.0	8.0	8.0	4.5	5.0	5.0
6	8.0	11.0	11.0	11.0	5.0	2.0
7	6.0	6.0	3.0	0	0	0
8	4.0	1.5	6.0	3.5	2.0	2.0
9	4.0	5.5	4.0	4.0	0	0

Table 3. Longitudinal Optotype Visual Acuities in the Aphakic/Pseudophakic Eye^a

Patient No.	Visual Acuity					
	1 Year	2 Year	3 Year	4 Year	5 Year	6 Year
1	20/100	20/70	20/70 ^b
2	20/80	20/45	20/35
3	20/200	20/200
4	20/40	20/30 ^b	20/25	20/30 ^c
5	20/60	20/80	20/40 ^c
6	...	20/60	20/60	20/30	20/40 ^c	20/40 ^c
7	...	20/25	20/30	20/25 ^b	20/40	20/40 ^c
8	20/60 ^d	20/50 ^d	20/70 ^c	20/80 ^c
9	20/40 ^d	20/30 ^{b,d}	20/30 ^c

^aAllen acuities unless otherwise indicated.

^bExamination when caregiver reported discontinuing patching.

^cSnellen acuities.

^dHOTV acuities.

at what age patching therapy could be discontinued without adversely affecting the visual acuity of the aphakic or pseudophakic eye.

Generally, patching therapy is recommended for children with unilateral aphakia or pseudophakia following early cataract surgery until it is believed that they are no longer at risk of developing amblyopia. Parks⁹ reported using part-time patching therapy until children were 9 years of age. Birch and Stager¹⁰ reported using 6 to 8 hours/d of patching the phakic eye until at least 6 years of age, followed by stopping all patching by 9 years of age. Finally, Lundvall and Kugelberg¹⁴ recommended part-time patching until children were 6 to 7 years of age.

Patching therapy is discontinued in most children with strabismic or anisometropic amblyopia without a recurrence of their amblyopia. Holmes and colleagues¹⁵ reported a recurrence rate of only 25% in children younger than 8 years with anisometropic or strabismic amblyopia after the cessation of patching therapy. They also reported that the recurrence of amblyopia was mitigated by reducing patching therapy from 6 to 8 hours/d to 2 hours/d prior to discontinuing patching. One-half of the children in their study were younger than 6 years when patching therapy was terminated. They also reported that the better the visual acuity in the amblyopic eye, the more likely the amblyopia would recur.¹⁶

Amblyopia in children with unilateral congenital cataracts can arise from visual deprivation, strabismus, or anisometropia.¹⁷ It is unlikely that the children in our study had visual-deprivation amblyopia because all of them underwent cataract surgery prior to 6 weeks of age and none of them developed visually significant opacities of the visual axis postoperatively. Birch and Stager¹⁸ and others^{19,20} have empirically shown that there is a latent period for visual development during the first 6 weeks of life. It has been hypothesized that this latent period stems from vision being subcortically mediated during the neonatal period.²¹ As a result, infants are not believed to be at risk of developing visual-deprivation amblyopia during the first 6 weeks of life. More likely, the patients in our study developed anisometropic or strabismic amblyopia. Anisometropic amblyopia may arise in children with unilateral aphakia or pseudophakia because of periods of noncompliance with contact lens or spectacle use or aniseikonia induced by optical correction. Strabismus is also common in children with unilateral aphakia or pseudophakia and it may have been partially responsible for the amblyopia in these children.^{5,22} Five of the 9 patients had strabismus severe enough to warrant strabismus surgery. Therefore, the risk of their amblyopia developing or worsening following the discontinuation of patching therapy would likely be similar to that reported by Holmes and colleagues.¹⁵ It is unclear if the same risk would apply for a

child with unilateral aphakia or pseudophakia whose amblyopia was principally due to visual deprivation secondary to a delay in cataract surgery beyond the first 6 weeks of life or to visually significant opacities of the visual axis arising postoperatively.

No correlation was noted between the intensity of patching at the 12-month examination and the visual outcome when these children were 6 years of age. In fact, the 2 children who were reported to be patched the least amount at the 12-month examination (patients 2 and 9) had some of the best visual outcomes in their aphakic/pseudophakic eyes when 6 years of age (20/30 and 20/35). While the patient in our study who underwent the most intensive patching regimen (patient 6) only had a visual acuity of 20/40 in his aphakic eye when 6 years of age, the visual acuity in this eye improved to 20/20 after he was fit with a rigid gas-permeable contact lens when 7 years of age. Clearly, the more intensive patching regimen used for patient 6 can result in an excellent visual outcome. However, it is less clear whether this amount of patching is necessary to achieve a similar visual result. In addition, such an intensive patching regimen may interfere with the development and maintenance of high-grade binocularity.^{23,24}

This study has a number of limitations. First, it is retrospective and visual acuities were not measured in a uniform manner. One site primarily used Allen pictures to measure acuity, whereas the other 2 sites used HOTV letters in younger children and a Snellen chart in older children. Allen acuities have been reported to overestimate visual acuity by 1.5 lines in eyes with mild amblyopia and 2.5 lines in eyes with severe amblyopia.²⁵ Second, the sample size was small. Third, the amount of patching was based entirely on the caregiver's report at an annual examination. It would have been preferable if patching had been measured directly with an occlusion dose monitor²⁶ or else recorded daily in a diary. Finally, the visual acuities may have improved when the children were older either owing to refinements of their optical corrections or enhanced cognitive abilities.

It is also uncertain at what age patching therapy may be reduced or discontinued without inducing or worsening preexisting amblyopia. Our study suggests that some children who undergo early unilateral cataract surgery and are compliant with their optical correction and patching during early childhood can maintain a good visual outcome even if patching therapy is reduced or discontinued prior to their sixth birthday.

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Correspondence: Scott R. Lambert, MD, Emory Eye Center, 1365-B Clifton Rd NE, Atlanta, GA 30322 (slamber@emory.edu).

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