

Amblyopia

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KEYWORDS

• Amblyopia • Atropine • Levodopa • Patching

KEY POINTS

- Amblyopia is the most common cause of vision loss in children.
- Early detection and treatment of amblyopia are critical to restoring vision in amblyopic eyes.
- Regular vision screening and appropriate referral to a pediatric ophthalmologist are important steps in the detection of children at risk for amblyopia.
- The Pediatric Eye Disease Investigator Group (PEDIG) has published several studies in recent years providing evidence on which to base treatment decisions. Newer treatments including atropine drops and oral levodopa have been evaluated.

With an estimated prevalence of 2% to 4% in North America, amblyopia accounts for more cases of unilateral reduced vision in children than all other causes combined.¹ By definition, amblyopia refers to unilateral or, less commonly, bilateral reduction in best corrected visual acuity, not directly attributed to a structural abnormality of the eye or posterior visual pathways.¹ Its primary causes are strabismus, anisometropia (significant difference in refractive error between the 2 eyes) or bilateral high refractive errors, and stimulus deprivation. Early detection of amblyopia is crucial in obtaining the best response to treatment. If amblyopia goes unrecognized or untreated past the early years of life, it often cannot be successfully treated and vision cannot be fully restored in the amblyopic eye. Although there are exceptions to the rule, most ophthalmologists regard the age of visual maturity to be approximately 8 to 9 years of age. Beyond visual maturity, most cases of amblyopia respond poorly to any form of treatment. It is also generally accepted that amblyopia responds best to treatment in the first few years of life.

The earliest clinical description of human amblyopia is generally credited to Le Cat in 1713. Although amblyopia as a disease has been relatively well understood for many years and the treatment modalities have remained fairly standard, in the past several years much has been published regarding this disease, owing mostly to a series of Amblyopia Treatment Studies (ATS) undertaken by the Pediatric Eye Disease Investigator Group (PEDIG). These studies were designed to evaluate the traditional methods for treating amblyopia and provide evidence on which to base treatment decisions.

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Before the PEDIG studies, most published studies on amblyopia treatment were large retrospective reviews.²

Formed in 1997, and funded by the National Eye Institute, PEDIG is a collaborative network facilitating multicenter clinical research in strabismus, amblyopia, and other eye disorders that affect children. There are more than 100 participating sites with more than 200 pediatric ophthalmologists and optometrists in the United States, Canada, and the United Kingdom. PEDIG has completed more than 15 ATS to date, many with multiple phases. The published findings of the PEDIG ATS to date are summarized in [Table 1](#).

As presented as part of a 2006 Symposium at the Joint Meeting of the American Orthoptic Council, the American Association of Certified Orthoptists, and the American Academy of Ophthalmology, and subsequently reported in the *American Orthoptic Journal* in 2007, David K. Wallace has summarized several questions regarding amblyopia and its treatment that have been addressed by the PEDIG studies, including the following:

1. How well do glasses alone treat amblyopia?
2. Do we really know that patching works?
3. How many daily hours of prescribed patching are necessary?
4. What happens when patching is stopped?
5. Does patching work in older children?
6. Does atropine work as well as patching?
7. How often does atropine need to be used?
8. If improvement plateaus with patching, is it beneficial to increase patching time?

The following discussion summarizes the findings of the various PEDIG studies as they relate to these questions.

HOW WELL DO GLASSES ALONE TREAT AMBLYOPIA?

This question was the subject of the spectacle phase of ATS 5. Eighty-four patients participated, ranging in age from 3 to 7 years. Follow-up was up to 30 weeks. The results of this study demonstrated that 77% of amblyopic eyes improved by 2 or more lines of vision by using optical correction alone. Resolution of amblyopia using optical correction alone occurred in 27% of patients.³

DO WE REALLY KNOW THAT PATCHING WORKS?

This question was the subject of the ATS 5 randomized clinical trial phase. A total of 180 patients, ranging in age from 3 to 7 years, were followed for 5 weeks. After no further vision improvement with glasses alone, these patients were treated with 2 hours per day of patching combined with 1 hour of near visual tasks. In this group of patients, vision improved 1.1 lines compared with 0.5 lines in a control group.⁴

HOW MANY DAILY HOURS OF PRESCRIBED PATCHING ARE NECESSARY?

ATS 2A compared full-time with 6 hours of daily patching for those with visual acuity 20/100 to 20/400. A total of 175 patients between the ages of 3 and 7 years participated, with a follow-up of 4 months. In these patients, the vision improved 4.8 lines in the group patching 6 hours per day and 4.7 lines in the group patching full time. ATS 2B compared 6 hours of daily patching with 2 hours of patching per day for those with visual acuities ranging from 20/40 to 20/80. A total of 189 patients ranging in age from 3 to 7 years were studied, with a follow-up of 4 months. The improvement of

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