Current Recommendations for Amblyopia Treatment

Kyle A. Arnoldi, C.O., C.O.M.T.

ABSTRACT

Introduction: In spite of convincing scientific studies proving the efficacy of patching therapy, many researchers continue to devise and test alternatives to patching. Patching is unpopular with parents and children, and, as a result, compliance is poor. Poor compliance leads to patching failure.

Methods: A review of the literature published since 2000 in peer-reviewed medical journals on the management of amblyopia was done and the results compiled and summarized.

Results: Research has suggested that the key to successful amblyopia therapy is not necessarily what treatment method is prescribed, but when it is prescribed, and how strongly the clinician emphasizes compliance at the initial visit. Younger children tend to have a better outcome; however, even older children, teenagers, and prior patching failures can achieve meaningful and lasting improvements in vision, if compliance with therapy is improved.

Conclusion: The critical step in the management process may be taking time to convince the parents of the necessity and urgency of the treatment, that the treatment is effective, and that they are capable of carrying out the treatment plan.

INTRODUCTION

Oclusion works. Most clinicians know this to be true from personal experience, and now, thanks to some well-designed clinical research,¹⁻³ we have scientific proof of its efficacy. For more than two hundred years, occlusion of the sound eye has been used successfully in the treatment of amblyopia.

More than 75 articles have been published since 2000, directly or indirectly addressing amblyopia therapy. If occlusion is so effective, why has so much of the recent...
literature on amblyopia focused on alternatives to patching? Because patching only works if you actually do it! Studies have shown a statistically significant relationship between compliance and the improvement in visual acuity in patients with amblyopia. Even prior patching failures can respond if compliance is improved. Most of the clinical research and innovation in the area of amblyopia treatment over the last six years has as its root the improvement of compliance.

COMPLIANCE WITH THERAPY

Unfortunately, most parents and children do not enjoy patching. Rates of self-reported noncompliance as high as 54% have been described in the literature. Not surprisingly, compliance appears to be particularly difficult when the patient is between ages 15 and 30 months of age. Occlusion dose monitors designed to objectively measure compliance have revealed that most parents are only patching approximately half the number of hours prescribed. These same studies have shown that parents do not accurately report compliance, even when they know they are being monitored.

Why is compliance with patching so poor? Studies have shown that compliance is unrelated to the initial visual acuity, patient age, amblyopia type, or total number of occlusion hours prescribed. Parents report that noncompliance is also unrelated to their parenting skills or the personality of their child. Several studies have suggested that significant emotional stress on both the child and the parent is a main factor in noncompliance. Parents are also less likely to comply if they don’t perceive that the child is improving, or don’t believe that patching will be effective. Those parents who report that patching was ineffective for them when they were children are particularly difficult to convince. A lack of understanding of amblyopia and occlusion therapy has also been associated with poor compliance in some cases. Compliance behavior is also related to past compliance behavior. Those who have been noncompliant in the past are not likely to improve compliance spontaneously.

Several authors have proposed and tested methods to improve compliance, such as pamphlets to educate parents about amblyopia and its treatment, and diaries or other logs used to record daily patching time. Tripathi and co-authors found that compliance improved when parental preferences were considered in devising a treatment regimen. However, a recent poll of 75 orthoptists and pediatric ophthalmologists taken in June 2006 revealed that, currently, only 3% of respondents consider the parents’ choice as the primary determinant in selecting the management strategy (Figure 1). Some manufacturers have attempted to make occlusion more palatable by making the patches

FIGURE 1: Primary determinant in selecting the initial method of amblyopia treatment. Results based on a poll of 75 orthoptists and pediatric ophthalmologists, taken June 2006. Most clinicians consider the severity of the amblyopia the most important factor when deciding on an amblyopia treatment plan. Only 3% primarily consider the parents’ wishes when forming a management strategy.
more attractive or more comfortable (Ortopad®, Eye Care and Cure, Tucson, AZ; MYI™ Occlusion Eye Patch, The Fresnel Prism and Lens Co., LLC, Eden Prairie, MN). But most efforts at improvement of compliance have centered on alternatives to patching.

**TREATMENT OPTIONS**

Several ingenious—and sometimes bizarre—treatments have been proposed in lieu of patching therapy, and applied with varied success. These include opaque contact lenses,7-26 virtual reality or computer games supplementing occlusion,27-29 and even hospitalization to enforce occlusion.6 Other unpublicized forms of treatment employed have included oculinum injection to the levator muscle, or complete tarsorrhaphy of the preferred eye using sutures or surgical glue. One parent even engineered a papier-maché cast covering the head and the preferred eye! Pleoptics30 and in-office training on the synoptophore31 are still being used by some for the treatment of amblyopia. Occlusion has been supplemented by near activities32 and by the administration of neurotransmitters or their analogs, such as levodopa.33-36 More mainstream treatment alternatives include optical penalization with over-plus lenses over the dominant eye,37 occlusion of the spectacle lens using adhesive tape, Bangerter foils,38 or Min lenses39 for amblyopic patients who wear glasses, and perhaps most successfully and widespread, atropine penalization of the preferred eye.

Atropine penalization has been proven as effective as occlusion in the treatment of all types of moderate amblyopia.40-44 Visual gains resulting from pharmacologic penalization have been proven as stable as occlusion over time,45 and atropine is better tolerated by parents and children than occlusion.10 Instillation of atropine as infrequent as two days per week may be effective in moderate amblyopia.40 Yet in spite of these impressive results, part-time occlusion remains the initial treatment of choice for all types of amblyopia (Figure 2).

In spite of its lack of popularity with families, and the plethora of reasonable alternatives for amblyopia therapy, patching continues to be favored by clinicians because it is simple and easy for the parents to understand, relatively inexpensive, low risk to the patient, and effective. Unlike perhaps some other treatment modalities, patching is effective in all types and severities of amblyopia. The patching schedule can also be adapted to the family’s schedule and lifestyle. Though patching all, or almost all, waking hours is still recommended by some,41, 46-47 part-time patching has been proven quite successful.19, 48-49 In fact, some studies have shown that a minimum of only two hours per day may be sufficient to treat moderate amblyopia.14, 48

Several studies have found a dose-response relationship between the number of hours patching per day and the length of time to visual outcome, but there is not necessarily a relationship between number of hours patching and final visual acuity.14, 19, 47-49 Occlusion for more than 2 to 3 hours per day...
day seems to hasten the response, but not necessarily improve the visual outcome.

MAXIMIZING EFFICACY OF AMBLYOPIA THERAPY

Recent evidence suggests that the question of increasing efficacy of amblyopia therapy may not be one of ‘what to do’, but rather of ‘when to do it’. Several studies have shown that the two factors most closely associated with treatment success are the age of the patient, and the severity of the visual impairment at the initiation of treatment. Younger patients have a better overall outcome and require less treatment time to reach their visual potential.46, 50–52 Specifically, evidence suggests that detection of amblyopia before age three years is associated with better outcome.3, 14, 46, 53 This is particularly significant considering that most vision screening programs are designed for children aged three years and older. Treatment outcome is also associated with acuity at the initiation of treatment. The worse the vision at diagnosis, the worse the outcome,1, 50–52 and the longer it takes to reach visual potential.46

Detecting and treating amblyopia before age three years may be a goal for the future, but today many amblyopic children are presenting to the ophthalmologist at much older ages. This raises the question: when is it too late to treat amblyopia? In addition to several case reports of adults with spontaneous improvement in the amblyopic eye following loss of the preferred eye,54 there are a few prospective studies that suggest some adults may retain sufficient cortical plasticity to improve vision in the amblyopic eye. Chua and Mitchell55 and Rahi and co-workers56 have shown that approximately 10% of adults will show a spontaneous improvement in vision in the amblyopic eye with loss of vision in the nonamblyopic eye. Although there is at least one study concluding that there is no evidence that treatment of amblyopia patients over the age of ten years is beneficial,57 most recent studies have found that meaningful improvements in vision can be achieved with amblyopia therapy in 47–94% of children between the ages of 8 and 17 years.26, 27, 58–62 Interestingly, some studies suggest that older children with no prior treatment do better than those who have a history of failed patching therapy.58, 59 The reason for this relationship is unknown. However, knowing that past compliance behavior predicts future compliance behavior, one might hypothesize that the older children undergoing a second round of treatment are simply repeat compliance failures.

MONITORING PROGRESS

With reasonable compliance, amblyopia therapy works rapidly. Stewart and co-authors reported that approximately 80% of the improvement in acuity will occur within the first six weeks of therapy,14 with half of patients reaching their maximum improvement by 16 weeks of treatment.2, 41 The endpoint of therapy can be difficult to determine if the patient does not achieve either 20/20 or equal visual acuity. Evidence suggests that the patient is likely at his/her vision potential after six months of compliant therapy,63 or three consecutive monthly visits with no improvement,60, 64 whichever comes first.

Once the maximum improvement has been reached, what is the likelihood that the vision will slip if treatment is discontinued? Several reports have shown that regression is fairly common, occurring in 14–42% of patients, though the slippage tends not to be clinically significant, typically less than one line.65–68 There is some evidence that gradually weaning amblyopia therapy, rather than abruptly discontinuing treatment, may prevent regression,68 though this is not universally accepted.60
RECOMMENDATIONS FOR TREATMENT

Results of the recent studies on the management of amblyopia summarized above can be condensed into the following treatment guidelines and recommendations.

Develop, implement, and support vision screening programs that will get the amblyopia patient into the pediatric ophthalmologist’s office no later than age three years. However, should an older child or teenager present with undiagnosed amblyopia, do not hesitate to attempt treatment. Meaningful and permanent gains in visual acuity can be achieved in many patients over the age of eight years.

At the visit when the diagnosis is made, take extra time to clearly explain the diagnosis and treatment. You have this one opportunity to make a lasting impression on the parents, and this may be the critical step in the management process! You must take the time to convince the parents of the necessity and urgency of the treatment, that the treatment is effective, and that they are capable of carrying out the treatment plan. If you are unsuccessful in gaining the parents’ cooperation at this stage, it is unlikely that the family will comply in the future, no matter what treatment method you may try.

Devise a treatment plan that the parents are willing to follow, and involve them in the decision when it is reasonable to do so. It may not matter which method or combination of methods you use. If you are using occlusion, however, prescribe twice as many hours as you feel are absolutely necessary to gain improvement, keeping in mind that two hours per day is probably the absolute minimum required to make headway. If you are using atropine, prescribe more frequent dosing than you think absolutely necessary, keeping in mind that twice a week may be the absolute minimum required for improvement in patients with moderate amblyopia. Approximately one-half of your patients will not follow your prescription precisely. Those who do are in no danger, and will simply reach their endpoint faster.

Follow the patient closely during the first three months of treatment. This is when the greatest gains in vision will occur. With good compliance, most patients will reach their visual potential in less than six months of treatment. If the vision has been stable for three consecutive monthly visits, the acuity is not likely to improve with further therapy. Finally, once the endpoint is reached, wean the patient gradually from the treatment in order to lessen the risk of regression of vision.

REFERENCES

9. Hrisos S, Clarke MP, Wright CM: The emotional


35. Leguire LE, Rogers GL, Walson PD, Bremer DL, McGregor ML: Occlusion and Levodopa-
SYMPOSIUM: PATCHING, DRUGS, OR LASIK?


**Key words:** amblyopia, compliance, occlusion, atropine