Efficiency of occlusion therapy for management of amblyopia in older children

Gagandeep S Brar, Supratik Bandyopadhyay, Sushmita Kaushik, Surishti Raj
Department of Ophthalmology, Postgraduate Institute of Medical Education and Research, Chandigarh, Punjab, India

Correspondence Address:
Gagandeep S Brar
Department of Ophthalmology, PGIMER, Chandigarh - 160 012
India

Abstract

Materials and Methods: This was a retrospective consecutive case series analysis of children treated for amblyopia at a tertiary care center. All children received full time occlusion (FTO) for the dominant eye. Results: Eighty-eight children older than 6 years at the time of initiation of therapy were included. Age at initiation of therapy ranged from 6 to 20 years (9.45 ± 3.11 years). Forty-two children (47.7%) had strabismic amblyopia, 37 (42.0%) had anisometropic amblyopia and 9 (10.2%) had a combination of strabismic and anisometropic amblyopia. Eighty out of 88 eyes (90.0%) had improvement in visual acuity following FTO. Visual acuity (VA) improved from 0.82 ± 0.34 at presentation to 0.42 ± 0.34 (P < 0.001) after FTO. In children with strabismic amblyopia, VA improved from 0.81 ± 0.42 to 0.42 ± 0.39 (P < 0.001). In children with anisometropic amblyopia, visual acuity of the amblyopic eye improved from 0.82 ± 0.24 to 0.36 ± 0.29 (P < 0.001) following FTO. Out of 13 children older than 12 years, only 6 children (46.1%) had improvement in VA. Mean follow-up after complete stoppage of occlusion was 8.37 ± 1.78 months. Conclusion: Occlusion therapy yields favorable results in strabismic and/or anisometropic amblyopia, even when initiated for the first time after 6 years of age. After 12 years of age, some children may still respond to occlusion of the dominant eye.

How to cite this article:

How to cite this URL:
Occlusion of the non-amblyopic eye is the most commonly used treatment for children with amblyopia.[1] The response to amblyopia therapy is related to type of amblyogenic stimulus, initial depth and duration of amblyopia, age at initiation of therapy, method of amblyopia treatment and compliance.[2] Reports of children treated for anisometropic and strabismic amblyopia continue to suggest that occlusion therapy yields better response to treatment up to 6 to 7 years of age.[3],[4] Flynn et al. reviewed the results of amblyopia therapy using pooled data from 961 children described in 23 published studies between 1965 and 1994.[5] and observed that the single factor that most clearly related to a successful outcome was age at initiation of therapy.[5] Epelbaum et al. found that efficiency of treatment for strabismic amblyopia decreases with age and it is null by 12 years of age.[6] Children with anisometropic amblyopia have been found to respond to therapy even at a late age.[6]-[8] The purpose of this consecutive patient series studied retrospectively was to analyze results of occlusion therapy for strabismic and anisometropic amblyopia in children above 6 years of age.

Materials and Methods

This was a retrospective consecutive case series analysis of children treated for amblyopia in the strabismus clinic of the department of ophthalmology at a tertiary care center from January 2001 to December 2002. A difference of 1 line or more on Snellen visual acuity chart was used as diagnostic criterion for amblyopia. A difference between the spherical equivalents of the two eyes exceeding 1.50 diopter (D) was considered anisometropia. Strabismic amblyopes who had constant esotropia or exotropia were included in this consecutive patient series. Children who had been treated with occlusion or had undergone any eye muscle surgery in the past were excluded.

All children had complete ocular examination and orthoptic work-up prior to treatment. A cycloplegic refraction was carried out using atropine 1% (children younger than 10 years) or cyclopentolate 1% (older than 10 years) in the first visit. Best-corrected visual acuity (BCVA) (line acuity) was measured in all children. Visual acuity (VA) was measured on the Carl Zeiss SZP 350 chart projector, which projects two letters each for the 20/200 and 20/160 line, three letters for the 20/125 line and four letters for each subsequent line. Children were deemed to have read the line if they read all letters of 20/200, 20/160 and 20/125 lines and at least three out of four letters for all subsequent lines. The chart has a regular doubling of the visual angle between different lines; so a log Mar conversion was done to facilitate calculation of mean acuity and to compare VA between different groups.

All children were advised to undergo occlusion of the better eye with adhesive patch applied for at least 80% of all waking hours/day and this was termed ‘full time occlusion’ (FTO). Children were followed up monthly to document improvement and record compliance. The parents were asked to maintain a daily diary detailing the number of hours of occlusion achieved each day. At each follow-up visit, the same examiner used the same method to assess BCVA. This treatment was continued till there was no further improvement for at least three consecutive visits or attainment of VA equal to that of the initially dominant eye. Thereafter, maintenance patching (6 h/day) was used for further 6 months to prevent recidivism. After completion of maintenance patching, children were followed up at 3 to 6-month intervals to record visual activity.

Results
This study included 88 eyes of 88 consecutive children who were treated with occlusion between January 2001 and December 2002 and were compliant with FTO. During the same period, there were another 26 children (22.8%) of amblyopia in the same age group who either refused to undergo trial of FTO or were noncompliant. The age at initiation of amblyopia therapy ranged from 6 years to 20 years with a mean age of 9.45 ± 3.11 years. There were 58 males (61.5%) and 30 females (38.4%). Forty-two children (47.7%) had strabismic amblyopia and 37 (42.0%) had anisometropic amblyopia. Nine children (10.2%) had a combination of strabismic and anisometropic amblyopia. Follow-up ranged from 10 to 28 months, with a mean follow-up of 15.76 ± 4.08 months. The demographic profile and clinical characteristics of the children are given in [Table 1].

Eighty out of 88 eyes had improvement in VA (90.0%) following FTO. The initial VA of the amblyopic eye ranged from 3/200 to 20/40, with mean log Mar of 0.82 ± 0.34. Following therapy, the mean VA of the amblyopic eye improved to 0.42 ± 0.34 (P < 0.007). The mean time required for initial improvement in VA was 1.94 ± 1.13 months (range 1 to 4 months) and time taken to achieve final improvement was 6.56 ± 2.78 months (range 3 to 12 months). The amount of improvement and time taken to improve for all the three types of amblyopia are given in [Table 2].

The oldest patient who received FTO in this study was a 20-year-old male with a combination of strabismic and anisometropic amblyopia. The patient had exotropia with anisometropia of 2.5 D (hypermetropia of 4.00 D in the amblyopic eye). VA at presentation was 20/120 and 20/20 respectively. Following FTO, the VA of the amblyopic eye improved to 20/40. The time taken for vision to improve by 1 Snellen line was 3 months and final improvement was achieved after 9 months of FTO. He subsequently underwent successful surgery for alignment and received 6 months maintenance patching, after which occlusion was stopped. The patient maintained the final vision even after 9 months of cessation of treatment.

Seventy-five (85.3%) out of total 88 children were younger than 12 years at the initiation of amblyopia therapy. Statistical analysis showed significantly better mean final VA (P = 0.044) in children who were younger than 12 years. Mean improvement in children younger than 12 years was 3.15 ± 0.83 Snellen lines, whereas it was 1.78 ± 0.46 Snellen lines in children older than 12 years (P = 0.037).

Out of 13 children older than 12 years, only 6 children (46.2%) had improvement in VA of the amblyopic eye following FTO: one had strabismic amblyopia, 4 had anisometropic amblyopia and one had a combination of strabismic and anisometropic amblyopia. In the 7 children who did not show any improvement, 4 had strabismic, 2 anisometropic and 1 had mixed amblyopia. Apart from the difference in type of amblyopia, there was no difference in age, initial VA, refractive error or compliance between those children who improved and those who did not. In children who improved, mean initial VA at presentation was 0.90 ± 0.11, whereas final VA achieved was 0.43 ± 0.12 (P = 0.388).

All children were kept under follow-up even after cessation of maintenance patching. The mean follow-up after complete stoppage of occlusion was 8.37 ± 1.78 months (range 5 to 12 months). None of the eyes had any deterioration of vision following cessation of occlusion treatment.

Discussion

The success of amblyopia therapy mainly depends on the age at initiation of treatment and initial depth of...
amblyopia in the affected eye.[5] Results of occlusion therapy have been found to be better in younger children,[5] but there is ample evidence in literature suggesting benefit of amblyopia therapy in older children.[2],[3],[7],[9],[10],[11],[12],[13],[14],[15]

In the present series, 80 (90.0%) out of 88 children had improvement in VA with FTO. The result showed that VA could be improved uniformly for strabismic, anisometropic or a combination of strabismic and anisometropic amblyopia in compliant children. We observed improvement in VA in 98.7% of children younger than 12 years and 46.2% of children older than 12 years at the time of initiation of occlusion therapy.

Oliver et al.[11] studied the results of occlusion treatment in 227 compliant children (age range 2 to 11½ years). There were 37 children (16.3%) who were above 8 years of age and 190 children (83.7%) were under 8 years at the initiation of amblyopia therapy. They noted significant improvement in VA following FTO in both the groups. The mean initial VA values at the initiation of treatment in the both the groups were comparable; corresponding to about 20/100 on the Snellen chart. At the end of the study, the mean final acuity in the younger age group was 20/30, whereas older children achieved mean final VA of 20/40. The difference approached one line of the Snellen chart and was significant. In the present series, we have analyzed the results of occlusion therapy in older children (age 6 to 20 years). Our result suggests that the children who were younger than 12 years had a significantly better chance of improvement in vision (P P et al.[13] reported positive results after sustained treatment of teenagers and a few adults who were affected by amblyopia. A randomized clinical trial carried out by the PEDIG[20] analyzed 507 patients aged 7 to 17 years with amblyopia, receiving optical correction and then randomized to receive treatment in the form of 2-6 h of occlusion of the dominant eye. In the 7-12 years age group, children on occlusion also received atropine sulfate 1% one drop daily in the dominant eye. They observed an improvement (> 2 Snellen lines) with occlusion in 53% of children younger than 12 years of age and in 47% of children older than 12 years. Although the results of the present study cannot be directly compared to the randomized trial because we gave FTO to our patients, we did observe a greater chance of improvement in younger children. Fifty-eight out of 88 eyes (65.9%) in our study improved by more than 2 Snellen lines. In children younger than 12 years of age, 56 out of 75 eyes (74.6%) improved by more than 2 Snellen lines.

Our results suggest that almost half the children older than 12 years may benefit from amblyopia therapy. The retrospective nature of this study has its limitations; hence further studies are needed to analyze various parameters influencing response to therapy in these children. Although chances of success reduce with advancing age, a significant number of older amblyopes can be improved with FTO. Therefore, we recommend that a therapeutic trial of occlusion is advisable even in older children.

References

6 Ennebaum M, Milleret C, Buissetet P, Dozier JL. The Sensitive Period for strabismic amblyopia in


