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Amblyopia therapy in children with penetrating corneal injuries

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Abstract:

BACKGROUND: The role of part-time occlusion therapy in children with penetrating ocular injuries has not been studied. The aim of the study is to analyze the role of part-time occlusion therapy in children with penetrating ocular trauma following surgical intervention.

MATERIALS AND METHODS: This is a retrospective case series with a median follow-up of 17 months (range: 3–105 months). The study was carried out at a tertiary referral center. Consecutive children with penetrating corneal tear injury who underwent surgical intervention were included in the study. These patients were subjected to part-time occlusion, and those with good compliance and follow-up were included in the study. The role of part-time occlusion therapy in children with ocular trauma is studied.

RESULTS: There were 26 patients included in the study of which 23 were male and 3 were female, with a median age at presentation of 5 years (range: 1–11 years). The vision following surgical intervention at 6 weeks was 0.85 logMAR units (range: 0.3–2.8). Final median visual acuity was 0.48 logMAR units (range: 0–2). Paired *t*-test done for improvement in visual outcome before and after amblyopia therapy was statistically significant ($P = 0.007$).

CONCLUSION: Amblyopia therapy shows promising results for patients following penetrating intraocular injury despite corneal scar in the visual axis in our group. A study on larger population is indicated.

Keywords:

Amblyopia, part-time occlusion, penetrating corneal injury

Introduction

Ocular trauma is a common cause of ocular morbidity and blindness in children.^[1-3] It accounts to 10%–15% of all eye diseases in children.^[1,4] Even in developing countries, ocular trauma accounts to >10% of ocular morbidity in children.^[5] The clinical presentation following penetrating trauma is varied ranging from corneal tear, traumatic cataract, retinal detachment, endophthalmitis, and panophthalmitis.^[6] Vision following surgical intervention remains subnormal in these patients. Saxena *et al.* reported an improvement to 20/40 only in 15.45% of patients.^[7] Despite good anatomical outcome, one of the reasons for low vision in these

children is deprivational amblyopia.^[3,4] The incidence of visual deprivational amblyopia is the least, albeit most difficult to treat.^[8] Due to the low incidence of deprivational amblyopia following trauma, the outcome of amblyopia therapy has not been studied in these groups of patients. There are no specific guidelines on the same. Hence, we have undertaken this study to assess the outcome of part-time occlusion therapy in children with penetrating ocular trauma.

Materials and Methods

A retrospective chart review of children <12 years who underwent amblyopia therapy following penetrating ocular trauma was done. The study was approved by our institutional review board. A detailed ocular examination including age, gender, date, delay in presentation, mechanism

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of injury, visual acuity at presentation, extent of tear, and anterior and posterior segment examinations was done. Children with injury involving Zone I according to the modified ocular trauma classification group were included in the study, whereas those with scleral tear and other retinal pathologies were excluded from the study. Ultrasound B-scan was performed once the integrity of the globe was achieved in children where fundus visualization was not possible. In primary setting, patients underwent primary tear repair and subsequently patients underwent secondarily necessary surgery for any associated problem. Vision assessment in verbal children was performed using picture chart. For analysis purpose, Snellen chart was converted to logMAR. In nonverbal children, vision was assessed using Cardiff visual acuity charts in cooperative children. In smaller children, vision was assessed using the central-steady-maintained method. Vision was assessed at 6 weeks following the primary surgery or additional surgical procedures wherever indicated. Children whose vision did not improve with glasses and scar was in visual axis causing high irregular astigmatism rigid gas permeable contact lenses were advised. When improvement was not noted, these children were subjected to part-time occlusion. Part-time occlusion therapy was initiated depending on the severity of amblyopia after the surgical procedures were completed and visual axis was clear apart from the corneal scar. Patients were divided into two groups, namely corneal scar involving visual axis and sparing visual axis. Visual acuity at the final visit was also assessed. Follow-up duration of the patients was recorded. Children with good compliance for patching were included in the study. All the statistical analysis were performed using SPSS software version 16 (Illinois, Chicago, USA), and a two-sided $P = 0.05$ or less was considered to be statistically significant. For pre- and postinterventional analysis, paired t -test was performed. To compare quantitative data, nonparametric method ANOVA was used.

Results

The study included 26 patients of which 23 were male and 3 were female. Median age at presentation was 5 years (range: 1–11 years). Mode of injury is tabulated in Table 1. Median delay in presentation was 12 h (range: 4–168 h). Visual acuity at presentation could not be assessed in 11 patients due to poor cooperation. Perception of light was positive in 10 patients and rest could count fingers at 1 m. Visual axis was involved in 16 patients and spared in 10 patients. Associated ocular pathology is summarized in Table 2. In primary setting, patients underwent corneal tear repair. Two patients had ruptured lens capsule with cataractous lens and underwent lens aspiration along with primary

repair. Patients subsequently underwent additional surgery as tabulated in Table 3. Cataract was a common association and extraction was performed in 20 eyes. Raised intraocular pressure occurred in two patients and they were treated with medical management. One patient developed endophthalmitis in the follow-up period treated with vitrectomy. The same patient improved to 20/200 with occlusion therapy. Of the 26 patients, four were young who did not cooperate for visual acuity assessment preamblyopia therapy. These patients were excluded from the analysis of visual acuity following patching therapy. Vision at 6 weeks following final surgery was median 0.85 logMAR units (range: 0.3–2.8, 22 patients) before commencement of occlusion therapy. Median duration of part-time occlusion was 17 months (range: 3–105 months), with a median of 4 h a day (range: 2–6 h). Final median visual acuity was 0.48 logMAR units (range: 0–2) following occlusion therapy. Part-time occlusion therapy showed improvement in both groups irrespective of corneal scar involving visual axis or not [Table 4]. Visual axis involved in 14 patients and improved from 1 to 0.54. Visual axis was spared in 8 patients and vision improved from 0.65 to 0.39. (median) 4 patients (2 involving visual axis and 2 with spared visual axis) were excluded from analysis

Table 1: Mode of injury

Cause	n
Stick	10
Stone	3
Knife	2
Pen and pencil	2
Glass	3
Plastic	2
Metallic object	2
Scissors	1
Needle	1

Table 2: Associated pathology

Pathology	Number of patients
Iris prolapse	7
Hyphema	4
Iris prolapse with hyphema	9
Iris prolapse with hypopyon	1
Cataractous lens	20

Table 3: Secondary surgery

Procedure	n
Cataract extraction with IOL	12
L+V	1
SFIOL	2
L+V + SFIOL	5
V+EL+SFIOL	1
Anterior vitrectomy	1
Penetrating keratoplasty	1

L=Lensectomy, V=Vitrectomy, EL=Endolaser, IOL=Intraocular lens; SFIOL=Scleral fixated IOL

Table 4: Vision improvement postocclusion therapy (median)

Visual axis involvement	n	Vision before occlusion therapy	Vision postocclusion therapy	P
Not involved	8	0.65	0.39	0.020
Involved	14	1	0.54	0.047

n=number of patients, statistically significant $P \leq 0.05$

of visual acuity as they had presenting visual acuity of fixation and follow. Involvement of visual axis was not significant indicator of occlusion therapy. In between the two groups, the improvement in visual axis was not statistically significant by Kruskal–Wallis test ($P = 0.650$). There was no correlation between age and amblyopia therapy on visual outcome ($P = 0.668$). Iris prolapse and hyphema did not alter the visual acuity following patching ($P = 0.772$).

Discussion

Ocular injury is a common preventable cause of unocular blindness in children.^[1,4] Blindness following trauma increases social and economical burden.^[1] The incidence of ocular trauma was noted to be significantly higher in males (88.46%) in our study, as seen in previous studies. The most common mode of injury was wooden stick explaining the rural setting in most of the cases. Similar trend was seen in a study done by Bukhari *et al.*^[2] Acar *et al.* identified iris prolapse and hyphema as poor prognostic factors.^[1] However, we did not encounter the same in our study. Cataract was a common sequela of penetrating injury, and cataract extraction was performed in 20 patients.

The role of amblyopia therapy has been well proven in the amblyopia treatment studies.^[8] In our study, patients with peripheral corneal tear improved with good visual outcome following surgery. Patients with scleral tear had associated retinal pathology where vision was poor limiting the need for amblyopia therapy. Thus, most of the patients included in our study were patients with corneal scar in visual axis. Patients with or without corneal scar involving the visual axis improved with amblyopia therapy. There was no difference in amblyopia therapy with respect to age group in our patients.

In our knowledge, this is the first study in assessing the visual outcome of amblyopia therapy postpenetrating corneal injuries. However, sample size of our study is small, which is a major limitation of our study. A similar prospective study with larger study

population would help in enhancing our knowledge in this aspect.

Being a retrospective study, it has its own limitations. One of the limitations of our study was that there was no record of visual acuity before trauma. Thus, preexisting amblyopia, if present, cannot be ruled out. HOTV optotypes used in amblyopia treatment study were not used in our study.^[9] Despite good outcome, we recommend parental awareness for strict vigilance for children at play and home to avoid such debilitating eye diseases.

Conclusion

Trauma is common. The good surgical intervention followed by aggressive amblyopia therapy can give good outcomes. We recommend amblyopia therapy for children who have undergone repair for corneal injury despite corneal scar in visual axis.

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Conflicts of interest

The authors declare that there are no conflicts of interest of this paper.

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