Original Article

Factors Affecting the Final Visual Acuity, After Repair of Open Globes in Children

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ABSTRACT

BACKGROUND: In children ocular trauma, although preventable public health problem is the leading cause of monocular blindness worldwide and therefore has significant socio-economic impact.

OBJECTIVE: To determine the visual outcome after open globe injuries in children in relation to different risk factors.

DESIGN: Prospective and Observational.

SETTING: Department of Ophthalmology Liaquat University of Medical and Health Science during September 2008 to August 2009.

METHODS: All open globe injuries were repaired with 10/0 or 8/0 sutures, postoperatively prophylactic broad spectrum antibiotics prescribed while corticosteroid eye drops / injections given if indicated. All patients were kept under follow-up for 1, 2, 4 and 6 weeks. The variables that can affect visual outcome after open globe considered includes, type of injury (defined by the mechanism of injury), grade of injury (defined by the initial visual acuity), zone of injury (defined by the location of wound), length of wound (<5mm, 5-10mm and >10mm) and time interval (<24 h, 24> 48 h and 48-72 h) between injury and repair were recorded. Associated variables, such as nature of injuring object and endophthalmitis were also considered for analysis. Final visual outcome, good visual acuity (>0.05 or more) and poor visual acuity (0.1 or less) were recorded.

RESULT: Good visual out come (visual acuity 0.5 or better) was achieved in 36(69.23%) patients and poor visual out come (visual acuity 0.1 or less) in 16(30.76%) patients. Univariate analysis showed that the type C injury (P=0.04), zone of injury III (P=<0.001), wound length between 5-10mm (P=0.002) and >10mm (P=<0.001) and time interval between injury & repair between 48-72 hours (P=0.15) were the risk factor for poor visual out come. Univariate analysis revealed that sharp object causing injury like scissor (P=<0.001) knife (P=0.065), stone (P=0.002), firecracker (P=<0.001) and bangle piece (P=0.002) were also found as risk factor for poor vision. A statistical significance was defined as p $\leq$0.05.

CONCLUSION: The prevalence of pediatric ocular trauma is higher in developing countries probably due to less stringent laws relating to child care. Many of the injuries in children can be prevented by parental supervision, awareness of child's activities and use of proper protective measures.

KEYWORDS: open globe, ocular trauma, and visual acuity.

INTRODUCTION

Open globe injury is one of the main causes of severe loss of vision in adults and children[1]. About 1.6 million patients become blind out of 55 million ocular injuries occurring each year worldwide, reported by WHO[2]. Children have higher rate of penetrating ocular injuries than adults comprising 19% to 58.3% of all cases of globe injuries[3, 4]. It is estimated globally that the leading cause of monocular blindness in children is ocular trauma[5, 6]. Delay in presentation is one of the reasons of visual loss as the children may not recognize or even verbalize a proper history of globe injury or complains of serious complications like endophthalmitis[7, 8]. Management of open globe injuries posses' great dilemma in children as the surgical repair in a child's eye is much more difficult and challenging than in adults. For this reason, this study was carried out to find the result of surgical repair of open globe injuries in children.

MATERIAL AND METHODS

This prospective study of 52 eyes of 52 children was conducted in Liaquat University of Medical and Health Science Hospital Hyderabad during a period from September 2008 to August 2009. All those patients who were less than 15 years and presented with open globe injuries were included in the study. Only those eyes were excluded who had injuries other than open

globe, or operated for other eye disease in the preceding three months, or repair done elsewhere. After recording the demographic data, (name, age, sex and living area). A detailed history was taken from all patients with the help of parents regarding the cause, circumstances, nature of object, and time lapsed since injury, length of the wound (5mm 5-10mm>10m) was also recorded.

To rule out the intraocular foreign body, X-rays orbit (postero-anterior and lateral view) and ultrasonography were carried out. During preoperative assessment visual acuity through Snellen's chart was also recorded then eyes were subjected to slit lamp biomicroscopy and indirect ophthalmoscopy using +90 D and +20 D lens respectively.

The location of wound in terms of zone (Zone I-III), mechanism of injury in term of type of injury (Type A-D) and grade of injury (Grade 1-5) were documented according to the recommendation of "International 'Ocular Trauma Classification" shown in table I. The length of wound (5mm,5-10mm,>10mm) and time interval (>24 hours, 24-48 hours, 48-72 hours) between injuries and repair was also recorded. The trauma like iris prolapse, lens disruption, vitreous in wound, hyphema, and posterior segment complications, if found, were also documented.

All the eyes having open globe injuries were operated, as early as possible under general anesthesia, once preoperative assessment accomplished. Corneal injuries were repaired by using 10/0 monofilament sutures, while scleral injuries as far posterior as possible were repaired by 8/0 silk sutures.

In case of lens injury the lens matter was aspirated during the time of primary repair and in most of the cases the secondary IOLs were implanted after a minimum period of one and half month. The iris prolapse when found, reposition in fresh cases while iris abscission in old cases was done. Open sky vitrectomy was performed with cellulose sponge in eyes with vitreous prolapse and the wound was cleared of vitreous prior to suturing. For removing foreign body(s) from anterior segment a separate limbal incision was made and for posterior segment intraocular foreign bodies patients referred to vitreoretinal surgeon.

Prophylactic intravenous cefotaxime with a dose of 10mg/kg body weight/12 hourly) were given to all patients for minimum of 5 days. Topical Tobramycin 0.3%, dexamethasone 0.1% and atropine 1% were instilled after surgery. Oral prednisolone (1mg/kg/day) was administered in cases with significant cellular inflammatory reaction.

Any case of suspected post traumatic endophthalmitis were treated following vitreous tap with 25 gauge needle for direct microscopy and culture and sensitivity. Intravitreal vancomycin 1mg and ceftazidime 2.25mg was injected after withdrawing 0.2cc of vitreous.

Patients were kept under regular follow-up at one week, two weeks, 4 weeks 6 weeks, and examined for any signs of endophthalmitis or other complications of post trauma repair. A functionally successful outcome was defined as gain of visual acuity of two or more than two lines over the base line visual acuity, where as worsening was a loss of more then two lines from the base line visual acuity. Also anatomically attached retina and no signs of infection at the time of last follow-up examination met the success criteria.

Statistical analysis was performed using SPSS software. The Univariate analysis was done to observe the pattern of response to different factors with outcome. The chi square test was applied to test relationship of variables of interest to final visual outcome as well as factors affecting it. The Fisher's exact test was used for unpaired analysis categorical data. P value < 0.05 was considered as statistically significant level.

RESULTS

A total of 52 cases were included in this study. The mean age of patients in this series was 8 years. Most children sustained injuries in the rural areas (Table-2). Among 52 injured eyes, the associated trauma to lacrimal system was found in 2(3.84%), iris prolapsed, in 10(15.38%), traumatic cataract in 10 (15.38%), hyphaema in 5(9.61%) and vitreous hemorrhages in 02 (3.84%) eyes. Such asscoiatedAll these were treated accordingly (Fig 1). Type A injury was seen in 03 (05.76%) eyes, Type B in 35 (67.30%) eyes, Type C in 10 (19.23%) eyes and Type D in 4(0.7.69%) eyes. Zone I was found in 23(44.23%) eyes, Zone II in 21 (40.38%) eyes and Zone III in 08(15.38%) eyes. Out of 52 eyes, the grade 1 was noted in 13(25.00%), grade 2 in 24(46.15%); grade 3 in 08(15.38%); grade 4 in 07 (13.46%). The ocular injuries sustained by pointed objects was seen in 31 (59.61%) eyes, by blunt objects in 17(32.68%) eyes and by other objects in 4(7.68%) eyes (Table 3).Out of 52 eyes, 29 (55.76%) presented within 24 hours after trauma, 9 (17.30%) between 24-72 hours and 14(26.92%) after 72 hours. At presentation length of wound was calculated and we found it to be <5cm in 28(53.83%), 5-10mm in 11 (21.15%) and more than 10 mm in 13 (25.0) eyes (Table 3). The outcome was measured with respect to final visual acuity; good visual outcome (visual acuity 0.5 or better) was achieved in 36 (65.30%) patients and poor visual outcome (visual acuity 0.1 or less) in 16(30.76%) patients. (Table 3) univerariat analysis showed that the type C injury (P=0.04), the grade of injury 4(P=0.065), zone of injury III (P=<0.001) wound length between 5-10mm (P=0.002) and >10mm (P=<0.001) and time interval

between injury & repair between 48-72 hours (P=0.15) were the risk factor for poor visual out come. Univariate analysis revealed that object of injury like scissor (P=<0.001) knife (P=0.065), stone (P=0.002), fire-cracker (P=<0.001) and bangle piece (P=0.002) were also found as risk factor for poor vision. A statistical significance was defined as p ≤0.05.

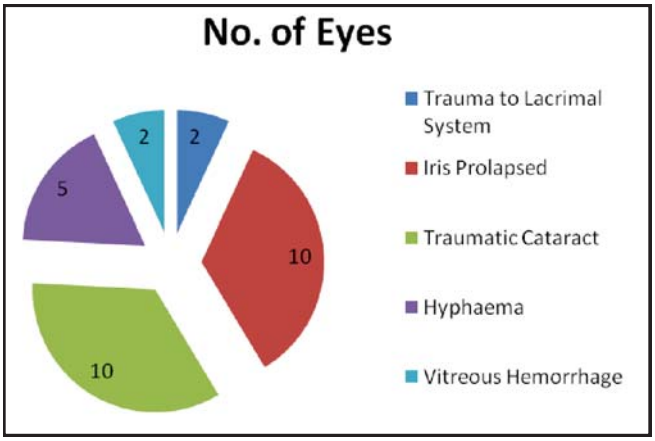
TABLE I: TYPE, ZONE & GRADE OF OPEN GLOBE INJURY (ACCORDING TO INTERNATIONAL OCULAR TRAUMA CLASSIFICATION)

Types of injury	Defined by mechanism of injury
A	Globe Rupture
B	Penetrating injury without intraocular foreign body (IOFB)
C	Penetrating Injury with IOFB
D	Globe Perforation
Zone of injury	Defined by Location of wound
I	Isolated Cornea
II	Limbos to a point 5mm Posterior in to the sclera
III	Posterior to anterior 5mm of sclera
Grade of injury	Defined by visual acuity
1	>0.50
2	0.40-0.20
3	0.19-0.025
4	0.02-Light perception
5	No light perception

TABLE II: DEMOGRAPHIC DATA (n=52)

Gender	No. of Patients	Percentage
Male	35	67.30
Female	17	32.69
Age (Years)		
Up to 5	19	36.53
6 to 10	23	44.23
11 to 15	10	19.23
Dweller		
Rural	35	67.30
Urban	17	32.69
Socio-economical Status		
Upper Middle Lower	6 12 34	11.53 23.07 65.38

FIGURE I: ASSOCIATED FINDING (n = 52)



DISCUSSION

Among all age group, children are more prone to ocular trauma[9]. The incidence of eye injuries presenting to the hospital (per100000 population per year) was 12.6% in Singapore [10], 15.2% in Sweden [11,] 13.2% in united states[12,] while in Pakistan the available data showed it about 12.9% [13].

In this study, 23 (44.23%) injured patients belongs 6 -10 year age group, while only 36.53% cases were seen in the 0-5 age group which is consistent with the finding from Finland[14] and India[15], but this varies considerably from a study in Brazil[16], which reported 61.0% incidence in 0-5 years age group. This difference may be due to a different social cultural milieu between the two populations.

An increasing incidence of eye injuries in boys (67.0%) is consistent with findings of other authors [17-22]. This is due to high ratio of degree of freedom and inherited aggressiveness in male as compared to female. Majority of patients were from rural area (67.30%), perhaps due to more laborious job, and frequent exposure to dangerous activities. This proportion of eye injury in rural population is quite consistent with the study from Nepal in 2004[18.] It is well known that the type of injury affects visual prognosis[19,20] In our study visual acuity 0.5 or better was achieved in 50.09% of patients with Type C injury, which is comparable to results from other studies [21]. Visual acuity 0.5 or better was achieved in 80.00% of our patients with Type B injury, which is higher percentage than that reported by other authors [22.] However; visual acuity 0.5 or better was achieved in 66.66% of patients with Type A injury, which is more than double percentage reported by Paramecia et al [19]. Grade of injury (initial visual acuity) is usually a strong prognostic factor in open eye injury [28,29,34,35.] Patients with grade 1 (initial visual acuity, 0.5 and better) had good visual outcome; 91% of these patients achieved ultimate good visual acuity. Seven (13.46%) of our patients

TABLE III: FACTORS AFFECTING THE VISUAL ACUITY (n = 52)

Factors	No of Cases (n = 52)		Good VA (n = 36)			Poor VA (n = 16)		
	n	(%)	n	(%)	p-value	n	(%)	p-value
Type of Injury								
A	03	05.76	02/03	66.66		01/03	33.33	
B	35	67.30	28/35	80.00		07/35	20.00	
C	10	19.23	05/10	50.09	0.5	05/10	50.00	0.04
D	04	07.69	01/04	25.00		03/04	75.00	
Grade of Injury								
1	13	25.00	10/13	76.92		03/13	23.07	
2	24	46.15	16/24	66.66	2.0	08/24	33.33	
3	08	15.38	04/08	50.00		04/08	50.00	
4	07	13.46	06/07	85.71	0.008	01/07	14.28	0.065
5	00		00			00		
Zone of Injury								
I	23	44.23	19/23	90.47		04/23	17.39	
II	21	40.38	15/21	65.21		06/21	28.57	
III	08	15.38	02/08	25.00	0.01	06/08	75.00	0.001
Length of Wound (mm)			26/28	92.85				
<5	28	53.83	04/11	36.36	0.007	02/28	07.14	
5-10	11	21.15	06/13	46.15	<0.001	07/11	63.36	0.002
>10	13	25.00				07/13	53.84	<0.001
Time Interval b/w Injury & repair (Hours)								
<24	29	55.76	25/29	86.20		04/29	13.79	
24-48	09	17.30	04/09	44.44		05/09	55.55	
48-72	14	26.92	07/14	50.00	0.15	0.5		
						07/14	50.00	0.15
Object of Injury								
Pointed								
Scissor	13	25.00	08/13	61.53	<0.001	05/13	38.46	<0.001
Pencil	11	21.15	10/11	90.90		01/11	09.09	
Knife	07	13.46	06/07	85.71	0.008	01/07	14.28	0.065
Bangle Piece	02	03.84	01/02	50.00		01/02	50.00	<0.001
Blunt								
Geometry Box	04	07.69	04/04	100.00		00/4	00.00	
Screw driver	02	03.84	02/02	100.00		00/2	00.00	
Stone	11	21.15	04/11	36.36	0.002	07/11	63.63	0.002
Others								
Fire Cracker	02	03.84	01/02	50.00		01/02	50.00	<0.001
Endophthalmitis								
Present	04	07.69	03/04	75.00	1.0	01/04	25.00	0.9
Absent	48	92.30	33/48	68.75		15/48	31.25	

had grade 4 (initial visual acuity, 0.02 – light perception).Out of seven patients71.42% had good visual outcome, and 58.57% had poor visual outcome. Good initial visual acuity undoubtedly has a good prognosis, but initial visual acuity does not correlate with poor visual outcome. It is well known in the open globe injury that the more posterior the wound, the worse the prognosis[i9, 20.] Wound location in the zones I and II in an open eye injury do not extend into the retina, and the visual prognosis is better. In our study out of 52, the patients with good visual outcome had wound location in the zones I (28.84%) and II (36.53%), and six (11.53%) patients with wound location in the zone III had poor visual outcome. Pointed objects (59.61%) were the most common causative agent in this study as well as others[17-22]. We found good visual outcome (77.41%) after repairing open globe injuries caused by pointed objects as compare to injuries caused by blunt objects especially stone, or fire cracker and bangle. The results of this study showed that the wound length is an important predictor of final visual acuity, which is in agreement with previous studies [23].

In the present study, poor visual outcome was significantly observed in cases where repair was delayed, and the same is also an independent risk factor for the development of post traumatic endophthalmitis. Farr et al[26] in a retrospective analysis showed that the extent and location of the wound, lens disruption, iris/ vitreous prolapse, presence of intraocular foreign body are not significantly associated with endophthalmitis or poorer final visual outcome in our series, this is in sharp contrast to the current study.

Visual prognosis in children is still worse than adults. Hence it is necessary to implement mass education programme regarding effects of ocular trauma, recognition of specific hazards and their prevention.

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