Epidemiology of severe childhood eye injuries that required hospitalisation

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We conducted a retrospective study of all paediatric ocular injuries that were treated at the Prince of Wales Hospital between October 1991 and January 1997. Of the 60 injuries reviewed, eight (13.3%) resulted in some degree of visual deficit. The mean age was 5.5 years and the average male to female ratio was 2.75:1. The distribution of injuries was as follows: contusions, 29 (48.3%); non-penetrating lacerations, 14 (23.3%); penetrating lacerations, 6 (10%); chemical burns, 6(10%); and superficial foreign bodies, 5 (8.3%). Thirteen (21.7%) ocular injuries were associated with common household items, seven (11.7%) were due to toy gun pellets, and five (8.3%) were sports-related. A total of 28 operations were performed on 21 patients and the mean duration of hospital stay was 3.6 days. The visual outcome depended mainly on the type and severity of the injury. Some childhood eye injuries are preventable by means of more public education, improved safety measures, and closer adult supervision.

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Introduction

Severe eye injuries in childhood are not rare and can lead to significant visual impairment that can hinder children's development. Various studies have reported the percentage of children among all eye injury admissions to be between 12.5% and 33.7%.[1-5] Children have been reported to be involved in 23% to 34% of all penetrating eye injuries[6,7] and trauma has been found to be the cause for 20% to 29% of corneal transplants in children.[8,9] Trauma is no doubt one of the most important preventable causes of childhood blindness.[10]

Previous studies have also shown that many causes of paediatric ocular trauma are preventable by means of more adequate adult supervision.[8-11] The purpose of this study was to evaluate the patterns, risk factors, and visual outcomes of severe paediatric eye injuries that required hospitalisation in Hong Kong, with a view to identifying effective preventive measures.

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Subjects and methods

All children aged 12 years or less who presented with ocular injury and who were admitted to the Prince of Wales Hospital between October 1991 and January 1997 were included in the study. Age, sex, cause of injury, type of injury, and visual acuity were reviewed. The most recent visual acuity of each eye and the last recorded condition of the injured eye were ascertained from the case notes. The final best-corrected visual acuity was obtained after all necessary procedures (eg operations, spectacle correction, and occlusion therapy) had been performed. Children who failed appropriate vision tests were assumed to have normal vision if the results from clinical tests for vision were normal and if their visual axis and media were clear.[12] The duration of follow-up varied from 1 month to 6 years, depending on the severity and type of injury. All patients were studied until their last follow-up.

Table 1. Classification of the severity of visual loss[13]

Criteria	Visual acuity
Blindness	≤10/200
Significant deficit	>20/200 and ≤20/100
Mild deficit	≥20/70 and ≤20/40
No loss	≥20/30

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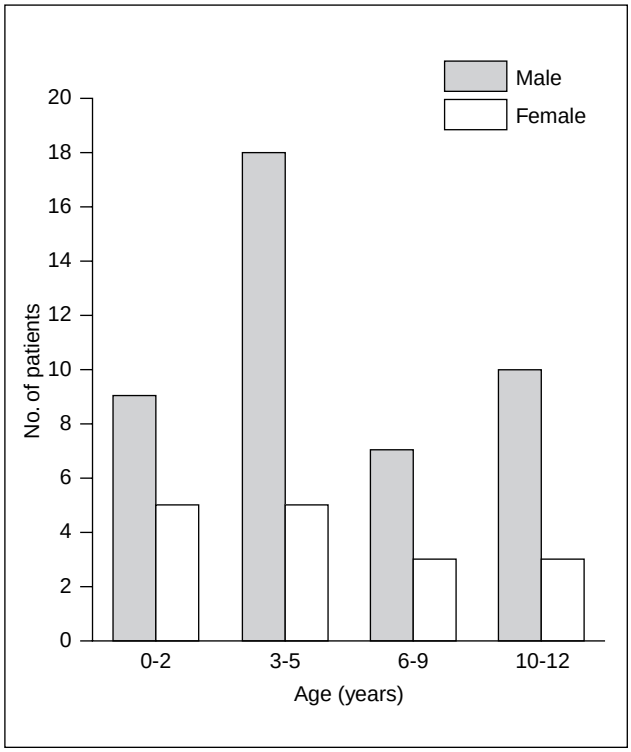

Fig. Age and sex distribution of children with severe paediatric eye injuries

The severity of visual loss was classified according to the criteria outlined in Table 1.[13] The type of injury was classified according to severity as follows: injuries involving superficial foreign bodies, contusions, non-penetrating injuries, penetrating injuries, and severe chemical injuries.[11,14] If more than one type of injury were involved, the injuries were classified according to the most severe one.

Results

Sixty children aged between 4 months and 12 years who had severe eye injuries and who were admitted to hospital during the study period accounted for 13% of all (ie child and adult) admissions involving eye injury. All 60 children had unilateral trauma and 44 (73%) were boys. The overall male to female ratio was 2.75:1 and the male predominance was highest in the 3- to 5-year age group (78%). Age distribution was uneven in the male group: 41% of the boys were aged 3 to 5 years and 25% were aged 10 to 12 years. The age distribution of the girls was more even. The figure illustrates the age and sex distribution of children in all age groups.

Contusions were the most common injuries (48%) and of the 29 cases of contusions, 19 (66%) were hyphaema; the remainder included six corneal erosions, three blow-out fractures of the orbit, and one cataract. The types of ocular injury and the resulting visual deficits are presented in Table 2. The relationship between age, sex, and different types of injuries is shown in Table 3. Contusions occurred in children aged 1 to 11 years—the same age range as those who had non-penetrating injuries. Penetrating injuries were found in children aged between 4 months and 10 years, and chemical injuries in those age between 1 and 12 years. The age range of children who had eye injuries involving superficial foreign bodies was 4 months to 5 years.

There were a wide variety of causes of eye injury. Common household items were associated with 13 (22%) injuries. Seven (12%) injuries were from toy gun pellets, and another seven (12%) were from falls. Various chemicals caused injuries to six (10%) children, and five (8%) injuries were sports-related. Fireworks caused three (5%) injuries.

Surgery was necessary in 21 (35%) children and a total of 28 operations were performed, which included eight eyelid repairs, six ruptured eyeball repairs, and five cataract operations; there were also glaucoma surgeries and corneal transplants. Twenty-six operations were performed under general anaesthesia. The mean duration of hospital stay was 3.6 days and 53% of patients stayed for 3 to 7 days. Only four patients needed to stay for more than 1 week.

Table 2. Types of eye injury and their visual outcome

	Visual outcome*			
	20/20-20/30	20/40-20/100	10/200-LP†	NLP‡
Contusions	18	6	1	0
Non-penetrating injuries	11	0	0	0
Penetrating wounds	3	0	1	0
Chemical burns	5	0	0	0
Superficial foreign bodies	4	0	0	0
Total	41	6	2	0

*11 children could not have their vision documented
† LP light perception
‡ NLP no light perception

Table 3. Relationship between age and sex, and type of injury

	Male				Female				Total
	Age range (years)				Age range (years)				
	0-2	3-5	6-9	10-12	0-2	3-5	6-9	10-12	
Contusions	1	10	3	5	2	2	3	3	29
Non-penetrating injuries	5	2	2	2	1	2	0	0	14
Penetrating wounds	1	1	2	1	0	1	0	0	6
Chemical burns	1	1	0	2	2	0	0	0	6
Superficial foreign bodies	1	4	0	0	0	0	0	0	5

None of the 60 children needed to have their eyes enucleated and all had light perception after treatment. Final vision was not documented in 11 very young and uncooperative children. Of all the children with documented final vision in our series, children with non-penetrating injuries, chemical burns, or superficial foreign bodies had normal visual outcome (Table 2). One of the four children who had a penetrating wound had a final vision of 5/200; the others had normal vision. Children with contusions had final vision ranging from normal to 10/200.

Discussion

The male to female ratio in this study (2.75:1) was within the range of 1.75:1 to 4.49:1 as reported in other studies.[2,11-12,14-18] The male predominance may be due to the greater liberty and aggressive behaviour of boys. The study also showed that the biggest group (30%) of injured children were 3- to 5-year-old boys, which may be related to their increasing activities and interactions with peers.

Common household items such as glass bottles, scissors, and photograph frames caused more than one fifth of the injuries. It is obviously impractical and impossible to prevent children from touching these items. However, accidents can be prevented by better adult supervision and by educating children about the dangers of the improper use of certain objects. Practical tips such as pointing a pair of scissors away from people and opening glass bottles away from oneself or others are effective preventive measures that should be taught to children by parents or teachers.

Injuries from toy guns have a higher prevalence in our study (12%) when compared with studies from other parts of the world (7%-8%).[14,15] This difference is probably due to the crowded environment in our locality that makes 'war game' accidents more likely. Fireworks and toy guns caused 17% of the injuries—these items are considered to be dangerous and are therefore put under legislative control in Hong Kong. However, the high percentage of resultant eye injuries related to these two items may reflect suboptimal law enforcement. In addition to better law enforcement, the public's attention to the risks involved in using fireworks and toy guns is desirable.

Sports accidents are reported to be one of the major causes of eye injuries in many studies, and account for 13% to 27% of paediatric eye injuries.[11,15,17] Nevertheless, only 8.3% of the eye injuries in this study were sports-related. There should not be a false impression that the lower frequency is the result of excellent sports safety among children in Hong Kong. The difference is most likely to be due to the lower level of sports participation of children in Hong Kong[19] and the difference in the popularity in the types of sports chosen by children of different cultures. For example, baseball—the most common eye-endangering sport reported in the literature[12,15,20]—is relatively unpopular in this locality. Given the increasing popularity of tennis and squash among children, it is advisable to enhance the measures of sports safety to prevent any increase in incidence of sports-related injury in the future.

Surgical intervention was required in one third of our series of patients, most of whom were given general anaesthesia; some children received more than one operation. Surgery causes both physical and psychological trauma to children and their parents, which no doubt causes an extra burden. The mean duration of hospital stay has been reduced substantially from 18.1 days in the 1950s and 9.9 days in the 1980s,[11] to 3.6 days in this study. This figure is similar to that from another study reported in 1990, in which the mean hospital stay was 5 days.[2] The reduction probably reflects the results of both improving medical care and the trend towards out-patient rather than in-patient care for paediatric patients.

Visual outcome in this study is comparable to or even better than that reported in similar studies (Table 4).[12,14,16] More than 75% of our series of patients had visual acuity higher than 20/100. The visual prognosis was related to the type and severity of injury. Better

Table 4. Visual outcomes reported in different studies

	Year	Visual outcome 20/20-20/100
LaRoche et al[14]	1988	50%
Moreira et al[16]	1988	55%
Cascairo et al[12]	1994	46%
Present report	1997	78%

visual outcome was achieved for patients with non-penetrating injuries, chemical burns, or superficial foreign bodies. Severe contusions or penetrating injuries had much worse visual outcome despite very active treatment.

In conclusion, eye injuries are not rare in children, especially among boys of kindergarten age. There is a broad spectrum of injuries in terms of cause, type, and severity; the visual outcome depends mainly on the type and severity of the injury. Some eye injuries in children are preventable. More public education, closer supervision from parents and teachers, and improved safety measures in household, schools, and sports settings are recommended.

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