

A review of paediatric penetrating ocular injury in Hospital Melaka, Malaysia.

Ting Xiao Wei^{1,2}, Siti Zakiah Md Khair¹,
Nor Fadzillah Abd Jalil¹, Julieana Muhammed²

¹Department of Ophthalmology, Hospital Melaka, Melaka, Malaysia

²Department of Ophthalmology and Visual Science, School of Medical Sciences,
University Sains Malaysia, Kelantan, Malaysia.

Background: About 2.4 million eye injuries occur in the United States annually, of which 35% are in children.¹ Incidence of open globe and closed globe injury were similar.² In children, penetrating injuries are generally more severe and are associated with more complications and longer hospitalization time when compared to closed globe injuries

Purpose: We aim to describe the demographics of penetrating ocular injuries among paediatric patients and to assess post trauma visual outcome and postoperative astigmatism.

Methods: A review of case notes of all paediatric patients who sustained penetrating ocular injuries who attended Hospital Melaka between 2013 and 2018.

Results: There were 15 children who were identified. Thirteen were male and two were female. The mean age was 6.2 years old. Majority of the patients were injured by stationary, followed by household items, toys, road traffic accidents and fire crackers. Thirteen patients (87%) sustained corneal laceration wounds, while two patients (13%) sustained corneal-scleral laceration wounds. The wound sizes ranged from 2 mm to 13 mm. Six patients (40%) had wounds involving the visual axis. Five patients (33%) achieved best corrected visual acuity (BCVA) of 6/12 and better at one-year post trauma, eight patients (53%) achieved BCVA of 6/15-6/60 while two patients (13%) had BCVA of worse than 6/60. Ten patients (67%) achieved astigmatism of less than -2.00D at one-year post trauma.

Conclusion: Majority of the injuries were caused by stationary, which is preventable with proper awareness. Visual outcome was related to the size and location of the wound. Astigmatism contributed minimally to the post-traumatic BCVA.

Keywords: ocular trauma, corneal laceration, children, astigmatism

EyeSEA 2021;16(1):69-75

DOI: <https://doi.org/10.36281/2021010207>

Introduction

Ocular injury is an umbrella term which constitutes a variant of clinical presentations and

causes. Penetrating injury is defined as a single full thickness laceration of the eyeball.³

Paediatric patients accounts for 20-50% of all ocular injuries.⁴ Among this age group, ocular injury is a leading cause of non-congenital monocular blindness.⁵ The socio-economic impact of ocular injury among this age group is significant, as the economic burden and visual rehabilitation would be a lifelong process.

Correspondence to:

Dr. Ting Xiao Wei, Department of Ophthalmology and Visual Sciences, School of Medical Sciences, University Sains Malaysia Jalan Raja Perempuan Zainab II, Kubang Kerian, 16150

Kota Bharu, Kelantan Malaysia.

Email: xwei_89@yahoo.com

Received : January 21, 2021

Accepted : February 15, 2021

Published : June 30, 2021

Moreover, many of the causes of paediatric ocular injuries are preventable. Penetrating injuries are generally associated with more severe injuries and longer hospitalization.

In this study, we aim to describe the clinical profile, including the demographics, nature of injury, visual outcome and related astigmatism in an urban area of Peninsular Malaysia. Hospital Melaka is the sole hospital with ophthalmology services in the state of Melaka. As such, all ophthalmology related referrals in the state will be made to our centre.

Subjects and Methods

We did a retrospective review of 15 patients (ages less than 18 years) who had undergone treatment in Hospital Melaka, Malaysia between January 2013 and December 2018. The minimum follow up period was one year. Patients who sustained ocular injury were classified according to the Birmingham Eye Trauma Terminology (BETT). Patients who sustained penetrating ocular injuries were included in our study. Patients with pre-existing ocular disease such as amblyopia, corneal opacity, refractive error, congenital optic atrophy, glaucoma, history of ocular surgery were excluded from the study.

We documented the following data, including age, gender, laterality, mechanism of injury, extent of injury and related injuries. Final best corrected visual acuity (BCVA) and postoperative astigmatism were also recorded.

Detailed ocular examination was performed for all patients during presentation. Subsequently, all patients underwent primary surgical repair under general anaesthesia. Additional procedures were required for thirteen patients which included cataract extraction, vitrectomy, intravitreal injection and intraocular foreign body removal, some of which were performed together with the primary surgical

repair. Final BCVA and post operative astigmatism were recorded at one-year post trauma.

This study was approved by the Medical Research and Ethics Committee of the Ministry of Health Malaysia (NMRR-20- 954-54897). We conducted the study according to good clinical practice and followed the guidelines of the Declaration of Helsinki.

Results

A total of 15 patients (15 eyes) were included in our study. There were 13 male patients (87%) and two female patients (13%). The mean age was 6.2 years, with ages ranged from five months to 13 years old. Right eye (n=11, 73%) was more frequently injured than the left (n=4, 27%). All our patients presented to the hospital within 24 hours of injury.

Stationary was the main mechanism of injury, consisting of six (33%) cases, followed by household items (n=4, 27%) and toys (n=3, 20%). Firecrackers and road traffic accidents resulted in one case (6%) each.

Thirteen cases (87%) had involved only the cornea, while two cases (13%) had both cornea-sclera involvements. The mean wound length was 6.8 mm. Three patients (20%) had wounds less than 4 mm, six patients (40%) had wounds between 4 mm and 8 mm and six (40%) had wounds longer than 8 mm. Six patients (40%) had wounds involving the central visual axis.

Traumatic cataract was the main associated injury, comprising of 13 cases (86%), while two patients (13%) had retinal detachment, one patient (6%) had endophthalmitis, one patient (6%) had choroidal rupture and one patient (6%) had intraocular foreign body.

All patients underwent primary repair. One patient underwent lens aspiration without intraocular lens implant at the primary setting. This patient underwent secondary intraocular lens implantation a few months later. Two

patients received intravitreal antibiotics (Vancomycin and Amikacin) at primary setting. Twelve patients underwent lens aspiration and intraocular lens implantation as a secondary procedure, three patients required vitrectomy, one patient required penetrating keratoplasty and one patient had intraocular foreign body removal.

At one-year post trauma, only five patients (33%) achieved good best corrected visual outcome (BCVA) of 6/12 and better, while eight patients (53%) achieved BCVA of 6/15-6/60. Two patients (13%) achieved BCVA of worse than 6/60. In regards to postoperative astigmatism, ten patients (67%) achieved astigmatism of less than -2.00D at one-year post trauma, four patients (27%) achieved astigmatism of less than -2.0D and one patient's refraction was unattainable due to dense cornea scar.

Discussion

Ocular trauma is a known cause of visual morbidity in Malaysia. Locally, many studies have been done regarding ocular trauma among the adult population. However, only a handful of studies have been done among paediatric patients. The effect of paediatric eye injury is greatly significant as the consequences of these injuries will burden the society economically and socially for a longer period of time as compared to injuries among adults. Many of these cases are preventable and early treatment could greatly reduce the resultant morbidity. To date, there are no studies done regarding ocular penetrating injuries among paediatric patients in Malaysia.

Our results showed a majority of male patients. The mean age was 6.2 years old. This was consistent with other paediatric ocular trauma studies.^{3, 6} A local study which reported

Table 1: Demographics and Injury Characteristics (n = 15)

Characteristics	No. (%)
Age (mean)	6.2 years
1-6	8(53%)
7-12	4(27%)
13-17	3(20%)
Gender	
Boys	13(87%)
Girls	2(13%)
Laterality	
Right Eye	11(73%)
Left Eye	4(27%)
Mechanism of Injury	
Stationary	6(33%)
Household items	4(27%)
Toys	3(20%)
Firecrackers	1(6%)
Road Traffic Accident	1(6%)

Table 2: Clinical characteristics of injury (n = 15)

Characteristics	No. (%)
Structural involvement	
Cornea only	13(87%)
Cornea-sclera	2(13%)
Wound Length	
<4 mm	3(20%)
4-8 mm	6(40%)
>8 mm	6(40%)
Associated Injuries	
Traumatic cataract	13(86%)
Retinal detachment	2(13%)
Endophthalmitis	1(6%)
Choroidal rupture	1(6%)
Intraocular foreign body	1(6%)

Table 3: Clinical Outcomes of Injury (n = 15)

Characteristics	No. (%)
BCVA at 1 year post trauma	
6/12 and better	5(33%)
6/15-6/60	8(53%)
worse than 6/60	2(13%)
Astigmatism at 1 year post trauma	
< -2.00D	10(67%)
> -2.00D	4(27%)
unattainable	1(6%)

on traumatic cataract among paediatric patients showed boys as the majority of their patients.² In our study, the majority of the offending objects were stationery, namely pencil. Saha et al reported sharp objects to be the most common cause of paediatric penetrating eye injury in their study, they have included knife, needle, scissors, wire, glass, pencil, pen in this category.⁷ Neeta et al. reported organic foreign body such as wooden sticks to be the most common cause of penetrating eye injury in their study.³ A local study conducted by Adlina et al on traumatic cataract also reported similar findings, whereby they reported wooden sticks, tree branches as the main cause of injury among their cohort.² Pencil is the main offending object in our study. Though the majority of our patients were less than six years old and were not school going children, stationaries are easily accessible by these young children. Injuries may also be inflicted by older siblings during playtime. Twenty-seven percent of injuries were caused by household items, which included kitchen utensils and gardening tools, both sharp and blunt tools. Vigilant adult supervision is highly recommended especially among younger children as benign objects such as stationery and easily accessible household items can be an offending object resulting in these serious ocular injuries.

The most frequent eye injury among children as reported by Ag et al were corneal injuries.⁸ All of our patients had corneal laceration, whereby two had scleral involvement as well. This was consistent with the findings of other studies. However, studies have shown no preferences of specific wound locations among these patients.^{3,8} Two patients received intravitreal antibiotics during primary repair, whereby both patients had received Vancomycin and Amikacin. Both patients had intensive anterior chamber activity even though they presented early to the hospital. One patient subsequently

developed exogenous endophthalmitis which required further intravitreal antibiotics. The patient's injuries were secondary to fire crackers. One patient underwent penetrating keratoplasty. He had sustained an extensive laceration which measured 13 mm across the cornea, involving the visual axis, which had resulted in significant cornea scarring.

Only five patients achieved BCVA of 6/12 and better at one-year post trauma. These patients were noted to have smaller sized wounds and their wounds did not involve the visual axis. Both patients with BCVA worse than 6/60 had wounds larger than 8 mm. The results of the visual outcome in this study was consistent with the findings of other developing countries.^{6,9,10}

Various studies had noted the relationship between the visual outcome and the wound type and size.¹¹⁻¹³ Other studies noted the timing of presentation and visual acuity at presentation to be predictive factors of poor visual outcome.^{2,14} In our study, there were no patients who presented later than 24 hours. Visual acuity at presentation was difficult to be obtained in our patients as many patients were uncooperative as the majority of the patients were in pain and were unwell.

Of the two patients who had BCVA >6/60, both cases were complicated with secondary glaucoma and epithelial downgrowth. With prompt intravitreal antibiotics, the one patient who developed exogenous endophthalmitis was able to achieve BCVA of 6/30. The patient who underwent penetrating keratoplasty too achieved BCVA of 6/30 post procedure.

At one-year post trauma, ten patients were able to achieve postoperative astigmatism of -2.00D and less. This is due the fact that the cornea has a substantial topographic memory that results in a marked normalization of contour after suture removal, as explained by Navon SE in his study.¹⁵ Moreover, the reading of astigmatism

attained was total astigmatism from refraction and not purely corneal astigmatism. Three out of four patients with astigmatism of more than -2.00D managed to achieve BCVA of 6/12 and better. Of the two patients with BCVA of worse than 6/60, one had astigmatism of less than -2.00D and the other patient's refraction was unattainable due to dense cornea scar.

Conclusion

In conclusion, the majority of our patients achieved functional visual outcome, however only one third had achieved BCVA of 6/12 and better. Factors associated with good visual outcome including size and location of the wound and severity of the associated injuries. Final astigmatism was low in the majority of our patients. Patients with high astigmatism were able to attain good BCVA. Mechanisms of injury in all cases were mainly preventable. Health care providers should work together with local authorities in creating awareness among the public regarding this preventable but devastating issue. Measures in prevention should be implemented in schools, homes and public areas where children frequented. Lastly, post trauma rehabilitation has to be done with the cooperation between the ophthalmology team and parents.

Conflict of Interest

There is no conflict of interest.

References:

1. Brophy M, Sinclair SA, Hostetler SG, et al. Paediatric eye injury-related hospitalizations in the United States. *Pediatrics*. 2006 Jun; 117(6) e1263-71
2. Adlina AR, Chong YJ, Shatriah I. Clinical profile and visual outcome of traumatic pediatric cataract in suburban Malaysia: a ten-year experience. *Singapore Med J*. 2014; 55(5):253-256.
3. Neeta M, Ajit K, Jawahirlal BA, et al. Penetrating ocular injuries in paediatric age group in a rural area of Western Maharashtra, India. *Niger J Ophthalmol*. 2015;23:60-4
4. Ebrahim AYAW, Amr AO, Macky TA. Epidemiological features of paediatric ocular trauma in Egypt. *Journal of Ophthalmology*. 2016;7874084.
5. Acar U, Tok OY, Acar DE, et al. A new ocular trauma score in paediatric penetrating eye injuries. *Eye (Lond)*. 2011; 25(3):370-374.
6. Dasgupta S, Mukherjee R, Ladi DS, et al. Paediatric ocular trauma - A clinical presentation. *J Postgrad Med*. 1990; 36:20-2
7. Saha BC, Kumari R. Clinical profile and management outcome of paediatric penetrating ocular trauma in a tertiary eye centre in eastern India. *International Journal of Contemporary Medical Research*. 2017;4(4):792-794
8. Ag EMM. Eye injuries in children aged 0 to 15 years. Apropos of 63 clinical reports. *J Fr Ophtalmol*. 1994;17:750-4
9. Moreira CJ, Debert-Ribeiro M, Belfort WJ. Epidemiological study of eye injuries in Brazilian children. *Arch Ophthalmol*. 1988;106:781-784
10. Koval R, Teller J, Belkin M, Romem M, Yanko L, Savir H, et al. The Israeli ocular injuries study. A nationwide collaborative study. *Arch Ophthalmol*. 1988;106:776-780.
11. Singh S, Sharma B, Kumar K, et al. Epidemiology, clinical profile and factors, predicting final visual outcome of pediatric ocular trauma in a tertiary eye care center of Central India. *Indian J Ophthalmol*. 2017;65(11):1192-1197.

12. Puodžiuvienė E, Jokūbauskienė, G, Vieversytė, M, et al. A five-year retrospective study of the epidemiological characteristics and visual outcomes of pediatric ocular trauma. BMC Ophthalmol 18, 10 (2018) <https://doi.org/10.1186/s12886-018-0676-7>
13. Park SJ, Byeong JS. The Relationship between Visual Outcome and Ocular Trauma Score after Open Globe Injuries in Children. J Korean Ophthalmol Soc. 2018 Nov;59(11):1062-1070.
14. Ambreen G, Ali R. Visual Outcome of Open Globe Injuries in Paediatric Patients. Journal of Rawalpindi Medical College (JRMC). 2017;21(3):226-228
15. Navon SE. Topography after repair of full-thickness corneal laceration. J Cataract Refract Surg. 1997 May;23(4):495-501