Original Article

Risk Factors for Poor Visual Outcome in Traumatic Hyphema: Jakarta Eye Trauma Study

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Abstract

Objective: To report the risk factors for poor visual outcome in traumatic hyphema. **Materials and Methods:** A retrospective study was done by collecting data from medical records between January 2011 and December 2015 in Jakarta, Indonesia. Clinical data included initial visual acuity (IVA), final VA at 3 months, slit lamp evaluation with grading of hyphema, intraocular pressure, and fundus findings on direct or indirect ophthalmoscopy. **Results:** The study included 97 patients, with males showing a preponderance, the ratio being 9:1. Soft gun pellet was the most common cause (27.8%), others being workplace injuries (12.4%), sports injury (14.4%), traffic accident (2.1%), and other injuries (43.3%). Poor visual outcome was due to vitreous hemorrhage, cataract, iridodialysis, and choroidal rupture. On statistical analysis, significant risk factors were causality (P = 0.018), IVA (P = 0.026), onset of injury (0.000), and grade of hyphema (P = 0.000). **Conclusion:** Grade of hyphema, IVA, causality, and onset of injury were significant risk factors related to poor visual outcome in traumatic hyphema.

Keywords: *Cause of injury, hyphema, intraocular pressure, paracentesis, risk factor*

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Introduction

Ocular trauma is a leading cause of ocular morbidity and visual impairment in children and young adults.[1] Visual loss due to blunt trauma is often preventable. Traumatic hyphema is usually seen in children or young adults with an incidence of approximately two per 10,000 children per year.[2] The mean annual incidence of hyphemas is approximately 17 in 100,000, with a peak incidence between 10 and 20 years.[3] The mean age of presentation is 25 years.[4] Males predominate with ratio of 3:1. Sport injuries account for 60% of traumatic hyphema.[5]

Two-thirds of traumatic hyphema are due to blunt ocular trauma and one-third is due to traumatic rupture of the globe.[3] Anteroposterior compression of the globe and simultaneous elongation of the equatorial area due to blunt injury of the globe or peribulbar tissues is followed by sudden increase in pressure in the anterior segment. This causes rupture of iris and/or ciliary body's blood vessels and finally causing hemorrhage in the anterior chamber (AC). The hemorrhage may be total or partial, mostly occupying the lower part of the AC, creating a level due to gravity.[3,6-8] Secondary hemorrhage may occur after blood clot dissolution, clot retraction, and contraction of the traumatized vessels.[9,10] Another mechanism of hyphema is by the direct damage of blood vessels and posttraumatic hypotony.[3,6,8]

Reports from developed countries cite severe eye injuries at work and leisure time[11] and at home.[12] This condition prevails differently in Jakarta with several tertiary hospitals,[13] where incidence is related more to outdoor activity. There are limited studies on factors affecting the final visual acuity (FVA). The aim of this study is to report the risk factors associated with poor visual outcome following blunt ocular trauma.

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Materials and Methods

This was a descriptive retrospective study of all patients with traumatic hyphema due to closed globe injury, referred to the tertiary hospital between January 2011 and December 2015 in Jakarta, Indonesia. The study was conducted following the tenets of the Declaration of Helsinki. Christian University of Indonesia Institutional Review Board granted approval for this study.

Patients' data were collected from medical records. The data included age, sex, cause and place of injury, onset of injury, the time interval between occurrence of trauma and management, and the treatment received before their admission. The additional data obtained were initial VA (IVA) and follow-up FVA at 3 months with Snellen chart, which was converted to LogMAR for statistical analysis. Individuals with open globe injuries and nontraumatic hyphema were excluded from the study. Individuals with traumatic hyphema with incomplete data or individuals with follow-up of <3 months were excluded from the analysis. Data collected during the follow-up visits included best-corrected VA and complications of anterior and posterior segment if there were any. Final clinical outcome was defined as poor if VA was <0.1.

Clinical data obtained were level of hyphema, based on the findings at slit lamp examination, intraocular pressure, and direct or indirect ophthalmoscopic findings. The level of hyphema was graded as Grade 1 (hyphema filling <one-third of the AC); Grade 2 (hyphema filling one-third to one half of the AC); Grade 3 (hyphema filling more than half of the AC, but less than the total); and Grade 4 (total hyphema with either red or black blood clots).[14]

All patients underwent baseline examination. A detailed history about the specific circumstances under which the trauma occurred and a general medical history about other diseases (anemia, blood disorders, medications used, and liver or kidney disease) were obtained from medical records. All patients with traumatic hyphema were admitted in the hospital and management included restriction of activities, cycloplegic eye drops (atropine 1% eye drops twice daily), topical corticosteroids, and patching of the affected eye with a rigid shield. Eyes with raised intraocular pressure were treated with topical and systemic intraocular pressure-lowering agents, commonly timolol maleate 0.5% eye drops and oral carbonic anhydrase inhibitor (unless contraindicated). Eyes with black ball hyphema and uncontrolled glaucoma underwent paracentesis and AC wash with an AC maintainer.

We analyzed the data using SPSS version 21.0 (SPSS, Inc., Chicago, IL, USA) for all statistical analysis, and $P < 0.05$ was considered statistically significant.

Results

There were 97 patients eligible for this study. Their demographic characteristics are shown in Table 1. Males: females ratio was 9:1 with age ranging from 2 to 68 years and a mean age of 19.11 + 12.75 ($P = 0.62$). Distribution of hyphema in this study was Grade 1 in 44.3%, Grade 2 in 27.8%, Grade 3 in 7.2%, and Grade 4 in 20.6%.

The variation in onset of injury was related to the distance from the place of injury to the hospital, most patients taking more than 1 h to report to the hospital. Patients who received treatment in <24 h had better visual outcome ($P = 0.000$). Of the 23 patients with secondary glaucoma and VA of hand movement, ten patients (43%) underwent paracentesis and AC wash with an AC maintainer. None of these patients had corneal blood staining.

There were five (5.2%) patients with follow-up VA (FVA) of <0.1. None of these patients underwent paracentesis for secondary glaucoma. Poor visual outcome of these patients was due to intravitreal hemorrhage in 2 (2%) of 97 patients, cataract and iridodialysis in 2 (2%) patients, and choroidal rupture in 1 (1%) patient. None had rebleeding. Soft gun pellet was intentional injury that affected unprotected eyes while gaming. The causes of injuries were soft gun pellet (27.8%), injuries at work (12.4%), sport injury (14.4%), traffic accident (2.1%), and others (43.3%) [Table 2].

Table 1: Characteristics of patients' clinical finding

Characteristics	Mean or frequency	*P*
Age (years)	19.11±12.75	0.622[a]
Gender (%)		
Female	9 (9.7)	0.748[b]
Male	88 (90.7)	
Initial VA (logMAR)	1.50±0.80	0.026[c]
Final VA (logMAR)	0.44±0.68	
Final IOP (mmHg)	8.32±6.91	
Onset of injury (h) (%)		
≤24	75 (77.3)	0.000[b]
>24	22 (22.7)	
Causality (%)		
Nontoygun	70 (72.2)	0.018[b]
Toygun	27 (27.8)	
Grade (%)		
<1/3	43 (44.3)	0.000[b]
1/3-1/2	27 (27.8)	
>1/2	7 (7.2)	
Total	20 (20.6)	
Secondary glaucoma (%)	23 (23.7)	
Paracentesis done (%)	10 (10.3)	

[a]Wilcoxon test, [b]Chi-square test, [c]Student's *t*-test. VA=Visual acuity; IOP=Intraocular pressure

Table 2: Causes of traumatic hyphema

Causal	Frequency (%)
Toygun	27 (27.8)
Accidents at work	12 (12.4)
Sports	14 (14.4)
Traffic accident	2 (2.1)
Other accident	42 (43.3)
Total	97 (100)

Mean IVA was 0.15, and the mean FVA was 0.64. Injury from toy gun pellets was one of the risk factors for poor visual outcome that was statistically significant (P = 0.018). Other significant factors were IVA (P = 0.026), onset of injury (P = 0.000), and grade of hyphema (P = 0.000).

Discussion

In this study, we evaluated the risk factors associated with poor visual outcome in traumatic hyphema after closed globe injuries. We found that IVA, the cause with soft gun pellets, onset of trauma before admission, and grade of hyphema were significant contributing factors. The causes of injury were soft gun pellet (27.8%), workplace injury (12.4%), sports injuries (14.4%), traffic accidents (2.1%), and other accidents (43.3%).

Traumatic hyphema is a common sequel to ocular injury. In our study, males were more affected than females with a ratio of 9:1, whereas in several prior studies, it was 3:1.[6,7] The male dominance is likely due to the combination of factors including male involvement in trauma-prone activities.[14] Toy gun injury was the most common cause in our study followed by workplace injury, sports, and traffic accidents. Reports from developed countries suggest that severe eye injuries take place during work and leisure or at home.[11,12] In developing countries, outdoor activity, assault, and riots have been responsible for an increase in eye injuries in recent years.[15] Apart from that, change of lifestyles globally might have important effects on the patterns of blunt eye injuries. Ocular trauma can be occurred in different settings depending on country, but mostly need eye protection.[16] The eye injuries can cause blindness, as reported in several countries in the region.[17]

In this study, we found that poor visual outcome in these patients was associated with coexisting intravitreal hemorrhage, cataract, iridodialysis, and choroidal rupture. In traumatic hyphema, the important clinical signs that determine the prognosis are the size of hyphema, the blood color, recurrent hemorrhage, the absorption time, the increase of intraocular pressure, and blood staining of the cornea. Other factors that contribute to this complication are damage to the corneal endothelium and microerosions of the Descemet's membrane. Corneal blood staining may persist for a long period, and its absorption starts from the periphery toward the center of the cornea.[18] The occurrence of rebleeding varies in several studies; Jahadi Hosseini *et al*. reported rebleeding in 3.3% of cases on the 4th day posttreatment,[19] Uhumwangho andn Umolo[15] found 13.3%, whereas in our study, none had rebleeding.

The aim of management of traumatic hyphema is to prevent complications from the trauma or from rebleeding, anterior uveitis, secondary glaucoma, optic atrophy, or corneal bloodstaining. These interventions included bed rest and patching of the eye; topical mydriatic or miotic agents to prevent movement of the iris, antiglaucoma medications to control intraocular pressure, corticosteroids to prevent uveitis, and elevation of the head to facilitate settling of the blood in the AC. Hospitalization is essential for close monitoring of the more severe cases of traumatic hyphema and rebleeding, thus ensuring timely medical or surgical intervention.[20,21] In our series, paracentesis was done in 10 cases (10.3%) using AC maintainer. This technique was reported as a safer and affordable alternative compared to Simcoe's cannula or vitrectomy in the removal of persistent traumatic hyphema.[22]

If hyphema is not properly treated, hyphema could cause further complications resulting from secondary hemorrhage that could lead to permanent impairment of vision, especially in patients with sickle cell trait/disease (very rarely seen in Indonesia).[23]

In meta-analysis of medical interventions for traumatic hyphema, the researchers found no evidence to show an effect on VA by any of the interventions evaluated in their review. Although evidence is limited, it appears that patients with traumatic hyphema who receive aminocaproic acid or tranexamic acid are less likely to experience secondary hemorrhaging. However, hyphema in patients on aminocaproic acid take longer to clear.[23] A paucity of standardized measurement and lack of funding have limited advances in the field of children's eye injury prevention. Improved eye injury surveillance and research funding along with collaboration with health-care providers are important components for strategies to prevent pediatric ocular trauma.[24] Ocular injury may need advance management but the result may not be favorable, especially if there are severe risk factors (choroidal damaged, endophthalmitis).[25] In Indonesia, before 2012, management of ocular injury can be delayed due to financial barrier nationally. However, after national universal health coverage launched, this barrier was solved.[26]

This retrospective observational study design has limitations such as information bias. A prospective study design with larger data is recommended. In conclusion, grade of hyphema, IVA, cause, and onset of injury are significant risk factors contributing to poor visual outcome after traumatic hyphema.

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Conflicts of interest

There are no conflicts of interest.

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