

# Hyphema due to blunt injury: a review of 118 patients

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## Abstract

- **AIM:** To determine the causes, associated ocular findings and visual acuity on presentation, complications and visual outcome following treatment in patients of hyphema due to blunt injury

- **METHODS:** A retrospective study was performed in 118 patients with hyphema due to blunt injury admitted in University of Malaya Medical Centre, Kuala Lumpur, Malaysia. The gender, age, race, cause of blunt injury resulting in hyphema, eye involved, vision at admission, other associated ophthalmological findings, complications and visual outcome were noted from the case records of patients. The data were analyzed using SPSS programme.

- **RESULTS:** Males were more predominantly affected (93.2%). Two-thirds of patients (67.8%) were aged below 30 years. Sports related injury (38.1%) was the most common cause for hyphema. Hyphema disappeared within 5 days in 66.9% of patients. Iris injuries were very commonly associated in the form of mydriasis, sphincter tear and iridodialysis. Associated vitreous haemorrhage was noted in 11.9% of patients. During the hospital stay, secondary haemorrhage was observed in 3.4% of patients. The best corrected vision of 6/18 or better was noted in 85.4% of patients at the last follow-up. The follow-up of these subjects was very poor and thus the incidence of secondary glaucoma could not be established. Moderate blood staining of cornea occurred in 0.8% of patients.

- **CONCLUSION:** Sports related injury is the most common cause of hyphema in Malaysia. Good visual recovery, without serious complications, is possible with appropriate and in-time treatment in hyphema patients due to blunt injury.

- **KEYWORDS:** blunt injury; hyphema; sports injury; blood staining of cornea

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## INTRODUCTION

Injury to the eye is one of the most common causes of unilateral blindness worldwide. Hyphema and concomitant injuries to ocular structures following blunt trauma are not an infrequent cause of presentation to the emergency unit in many hospitals [1-5]. The causes of poor vision after blunt injury include black ball hyphema, secondary glaucoma, cataract, vitreous haemorrhage, commotio retinae and retinal detachment [6]. Recognition of factors related to poor visual outcome, appropriate medical therapy, surgical intervention when indicated and careful follow up will help in preserving vision in these patients. Posterior segment injuries [7], size of hyphema at presentation and retinal damage [8] have been reported to be significant predictors of poor visual outcome in these patients; while topical steroids and/or cycloplegic medication [8] and occurrence of secondary haemorrhage [7,8] did not influence the final visual outcome.

There is no report available in the literature on traumatic hyphema from Malaysia, even though many reports are available on this from different countries in the world [1-9]. Therefore, this study was undertaken to determine the cause of blunt injury resulting in hyphema, visual acuity and other ocular findings on presentation, complications and visual outcome in these patients. This information may help in the development of appropriate preventive measures to reduce the morbidity in cases of blunt injuries of eye.

## MATERIALS AND METHODS

**Subjects** This is a retrospective study of 118 patients with traumatic hyphaema due to blunt injury treated in the eye ward of University of Malaya Medical Centre, Kuala Lumpur over a period of ten years. Patients with postoperative hyphema, perforating injury with hyphema, and those who absconded from the ward within a day after admission were not included in this study. After taking history, visual acuity was tested on Snellen chart and the anterior segment was examined with slit-lamp biomicroscope. Intraocular pressure (IOP) was measured

**Table 1 Different objects responsible for blunt injury in 118 patients with hyphema**

Different objects	n (%)	Different objects	n (%)
Sports related injury			
Shuttle cock	25 (21.2)	Home injury	
Foot ball	5 (4.2)	Bottle cap	4 (3.4)
Shuttle racquet	4 (3.4)	Elastic spring	3 (2.5)
Squash ball	4 (3.4)	Rubber hosepipe	2 (1.7)
Airgun plastic bullet	3 (2.5)	Broom stick	2 (1.7)
Table tennis ball	2 (1.7)	Wooden stick	2 (1.7)
Golf ball	1 (0.8)	Hit on the door edge	1 (0.8)
Tennis ball	1 (0.8)	Fire cracker	1 (0.8)
Industrial/work injury			
Nail	6 (5.1)	Toothpaste tube	1 (0.8)
Hammer	4 (3.4)	Assaults injury	
Wood stick	5 (4.2)	Fist/ punch	7 (5.9)
Grass cutting	3 (2.5)	Wooden stick	4 (3.4)
Battery explosion	2 (1.7)	Rubber hosepipe	2 (1.7)
Metal piece	2 (1.7)	Rubber belt	2 (1.7)
Bottle cover	2 (1.7)	Motor vehicle accident	
Radiator cap	2 (1.7)	Fall on the ground	4 (3.4)
Screw driver	2 (1.7)	Hit on the door	3 (2.5)
Wire cable	2 (1.7)	Fall in the drain	2 (1.7)

with applanation tonometer and fundus examination was done after dilating pupil with 2.5% phenylephrine eye drops using 90D lens and slit-lamp.

**Methods** The age, gender, race, type of blunt injury, vision at admission, other ocular findings, grading of hyphema, treatment given, time taken for absorption of hyphema, follow-up period, complications and best corrected vision at last follow-up were noted from the patients' records. Based on the level of blood in the anterior chamber (AC) at slit-lamp examination, hyphema was graded as microscopic hyphema when no clot was present (circulating red blood cells only), grade I - blood filling <1/3 of AC, grade II - blood filling < 1/2 of AC, grade III - blood filling more than 1/2 of AC, and grade IV - total hyphema with red or black clots<sup>[1]</sup>.

The standard protocol of management of hyphema was followed which included admission to the hospital, complete bed rest with restricted ambulation to bath room, elevation of head up to 45 degrees, patching the affected eye with rigid shield, using topical cycloplegics (homatropine 20g/L eye drops bd), corticosteroid (dexamethasone 1g/L eye drops qid), and Tab. Vitamin C 500 mg daily. Eyes with raised intraocular pressure were treated with timolol 5g/L eye drops bd, and Tab. Acetazolamide 250 mg tds. When the IOP was high (more than 30mmHg) inspite of glaucoma medications, IV mannitol was given. Surgical evacuation of the blood was performed in eyes with total hyphema and uncontrolled intraocular pressure with medication. Patients were monitored of blood level in the anterior chamber, visual acuity and intraocular pressure daily during their stay in the hospital. Secondary haemorrhage was diagnosed if the size

of hyphema was increased or if fresh blood was present in the anterior chamber.

Gonioscopy was performed during the examination in first follow-up visit. The angle appearance was noted according to Shaffer classification from grade 0 to grade IV angle and abnormalities such as angle recession and peripheral anterior synechiae were also noted. In patients where gonioscopy was not done, it was listed as not done while noting down the findings from records. The above data were tabulated and analyzed using SPSS programme.

## RESULTS

Out of 118 patients, majority were males (110 cases,93.2%). Age: 11-20, 21-30, 31-40, 41-50, 51-60, 61-70 and 71-80 years were 29 cases (24.6%), 51 cases (43.2%), 20 cases (17.0%), 10 cases (8.5%), 6 cases (5.1%), 1 case (0.8%) and 1 case (0.8%), respectively. Two-thirds of patients (67.8%) were young and below 30 years of age. The mean age of the patients was 21.6 years (range 12-78 years). 39.5% (n=46) were Malays, 40 cases (33.5%) were Chinese; 16 cases (13.6%) were Indonesian; 11 cases (9.3%) were Indian and 5 cases (3.8%) were Bangladesh. Hyphema was present in one eye only in all the patients in our study, and 63 eyes (53.3%) were in the right; 55 eyes (46.7%) were in the left. Sports injuries (n=45, 38.1%) were the most common cause of hyphema, the others being industrial (n=30, 25.4%), home (n=16, 13.5%), assault (n=15, 12.7%) and motor vehicle accidents (n=9, 7.6%). The details of different objects responsible for blunt injury and resulted in hyphema are shown in Table 1. The visual acuity at presentation ranged from perception of light to 6/6 ; 29(24.5%) of them had poor vision (<6/60); 6 cases (5.0%) had perception of light (PL), 9

**Table 2 Associated ocular findings in 118 patients with hyphema**

Ocular findings*	n (%)	Ocular findings*	n(%)
Eyelids		Iris and pupil	
Oedema	43 (36.4)	Mydriasis	65 (55.1)
Ecchymosis/haematoma	38 (32.2)	Sphincteric tear	59 (50.0)
Laceration	2 (1.7)	Iridodialysis	11 (9.3)
Conjunctiva		Miosis	2 (1.7)
Chemosis	50 (42.4)	RAPD	2 (1.7)
Subconjunctival haemorrhage	16 (13.6)	Lens	
Cornea		Cataract	12 (10.2)
Oedema	52 (44.1)	Phacodonesis	4 (3.4)
Abrasion	42 (35.6)	Dislocation	3 (2.5)
Partial laceration	2 (1.6)	Retina	
		Comotio retinae	37 (31.0)
		Vitreous haemorrhage	14 (11.9)
		Macular striae	2 (1.7)
		Macular hole	1 (0.8)
		Choroidal detachment	1 (0.8)

\* Some patients had more than one finding ; RAPD: Relative afferent pupillary defect

cases (7.6%) had hand movements (HM), 6 cases (5.0%) had counting fingers (CF), 8 cases (6.7%) had 3/60, 10 cases (8.4%) had 6/60, 5 cases (4.2%) had 6/36, 8 cases (6.7%) had 6/24, 10 cases (8.4%) had 6/18, 17 cases (14.3%) had 6/12 and 14 cases (11.8%) had 6/9. Vision was normal in 25 (21.0%) patients. The IOP at admission ranged between 8 and 42 mmHg. The IOP of 20mmHg or below was seen in 91(77.1%) patients; 19(16.1%) had 21-30mmHg and 8 (6.7%) had 31 mmHg and above (secondary glaucoma in 27 (22.8%) patients). In addition to hyphema, there were associated findings in the globe and adnexa (Table 2). Ecchymosis/haematoma was seen in 32.2% of patients while sub conjunctival haemorrhage was seen in 13.6% and bleeding into the vitreous in 11.9% of patients. More than one sign were present in some of the patients. Hence the total number of patients are much more in this table. There was no fracture of orbital bones in any of the patients. The most common form of hyphema in our study was grade I, seen in 66 (55.9%) patients, Grade II in 20 (16.9%), Grade III in 12 (10.2%), Grade IV in 10 (8.5%), and microscopic in 9 (7.6%). Patients with grade III/IV hyphema had associated periorbital haematoma in 14 patients, iridodialysis in 3 patients, and traumatic mydriasis in 18 patients. Secondary haemorrhage was seen on second day after admission in 2 (1.6%) patients and on third day in 1 (0.8%) patient, which resolved completely with bed rest and treatment. There were sphincter tears in these patients and all were shuttle cock injuries. All patients were treated as per the standard protocol as mentioned in the methods. Surgical intervention was needed only in 2 elderly patients of grade IV hyphema

(vision only hand movements) in whom the IOP did not come down to normal level in spite of medical treatment. Paracentesis and evacuation of blood clot was done in both patients. The IOP was controlled with medical treatment. The best corrected vision improved to 6/18 in one patient. However, the other patient developed moderate blood staining of cornea and vision improved to only 6/60. This patient had cataract in the affected eye; following extracapsular cataract extraction and posterior chamber intraocular lens implantation, the best corrected vision improved to 6/24 only. The IOP on discharge was 20 mm Hg or below in 115 (97.5%) patients and between 21 and 30 mm Hg in 3 (2.5%) patients. The IOP came to normal reading with continued glaucoma medication in these 3 patients during the follow up examination after 3 weeks. The time taken for absorption of hyphema ranged between 2 and 20 days; in two-thirds of patients (79, 66.9%) hyphema was absorbed within 5 days. Five out of 22 patients with grade III/IV hyphema stayed for 15 days or more in the hospital. All these patients were discharged from the hospital only after complete absorption of hyphema.

Gonioscopy findings were available in 69 patients only; the high default rate of follow up examinations was the probable cause for this. The angle of the anterior chamber was normal in 50 out of 69 (72.4%) patients; angle recession was 90° in 15 (21.7%); 180° in 3 (4.3%); and 360° in 1 (1.4%) patients. All the patients with angle recession sustained shuttle cock injuries. Follow-up of patients was very poor; ranging from 1 to 56 months. The follow up was for 1 month in 84 (71.2%) patients, for 6 months in 70 (59.3%) and for

12 months in 41 (34.7%) patients. Secondary glaucoma was noted in 8 out of 19 patients with angle recession. Since the gonioscopy was not done in all the patients in the present study and long term follow up was very poor, this figure can not be taken into account regarding then incidence of secondary glaucoma. The best corrected vision recorded at the last follow up ranged between counting fingers ( $n=3$ , 2.5%) and 6/6 ( $n=66$ ,55.9%); 15 (12.7%) had 6/9; 12 (10.1%) had 6/12; 8 (6.7%) had 6/18; 3 (2.5%) had 6/24; 3 (2.5%) had 6/36; 4 (3.4%) had 6/60;and 4 (3.4%) had 4/60; and 7 (5.9%) of them had poor vision ( $<6/60$ ) and 101 (85.6%) patients had vision of 6/18 or better.

## DISCUSSION

Kuala Lumpur is the capital city of Malaysia. There are three tertiary government hospitals (two university hospitals and one ministry of health general hospital) and one private eye hospital where eye emergencies are treated. In addition, there are many private eye specialists practicing in this city. The probable reason for small number of patients in this study over a period of ten years could be the availability of many eye care facilities in the city. The higher frequency of hyphema in males in our study is because of more males working in different industries, their participation in sports and their involvement in assaults/accidents. The male to female ratio in our study (2.5:1) is similar to that reported from Nigeria<sup>[5,6]</sup>. However, much higher frequency of this ratio (8:1) was reported from south Korea<sup>[7]</sup>. Two-thirds (67.8%) of patients in our study were young (below 30 years) and a similar figure was reported from UK (77%)<sup>[3]</sup>. However, similar age patients were reported to be in much higher percentage of patients from Nigeria (90%<sup>[6]</sup> and 96%<sup>[5]</sup>). In a prospective study of 5671 cases of eye injuries presented to the eye casualty, Macewen<sup>[7]</sup> from UK reported hyphema in 31 (0.6%) cases. In their study, the eye injuries resulting in hyphema occurred during different activities such as sports (21 cases), domestic (5), at work (3), assault (10) and unknown cause (1 case).

In our study, sports/ games related injuries were the most common cause for hyphema (38.1%), of which shuttle badminton game accounted for 64.4% (29 out of 45cases). The ocular injury in this game occurs commonly with round ended shuttle cock in the smash hit by opponent player in the single game, while the injury is due to long stick end of the racket of the partner player or with shuttle cock hit by the opponent player in the doubles game. Getting injury to the eye is an unacceptable price while playing this game. Wearing the protective glasses during play like in squash game can prevent ocular injuries. Sports/play related injuries reported from UK (49.2%)<sup>[3]</sup>, Nigeria (42.1%)<sup>[5]</sup> and Pakistan (66.6%)<sup>[4]</sup> are much higher than our study (38.1%).

However, a much lower figure (9.1%)<sup>[6]</sup> has been reported in a recent study of 472 cases of hyphema from Nigeria. Industrial accidents/accidents at work place responsible for hyphema were more common in foreigners (Indonesians, Bangladeshis) because majority of the construction workers/people working in factories are from Indonesia and Bangladesh. Kearns<sup>[3]</sup> reported accident at work was the cause of hyphema in 9.9% of patients in UK, while a less frequency of the same (7.6%)<sup>[6]</sup> was observed in Nigeria. Domestic causes/injury at home was responsible for hyphema in 13.5% of the cases in our study, while the same was higher (17.8%)<sup>[3]</sup> in UK patients. However, a much lower figures(7.9%<sup>[5]</sup> and 2.5%<sup>[6]</sup>) were reported in Nigerian patients. Shaking the carbonated drinks bottle before opening the cap to release the gas faster, is the most common cause of bottle cap eye injuries at home. Bottle cap injuries were noted in 3.4% of patients in our study while the same was reported in 2.7% of patients in Seoul by Cho *et al*<sup>[7]</sup>. Assaults injury with different objects was responsible for hyphema in 12.7% of patients in our study while the same was reported in 20.7% of patients in UK by Kearns<sup>[3]</sup>. Motor vehicle accidents resulted in hyphema in 7.6% of cases in our study, while the traffic accidents as the cause of hyphema has been reported to be in 1.6% of cases by Cho *et al*<sup>[7]</sup>. Secondary haemorrhage was seen on second day after trauma in 3.4% of patients, while the same was reported to be varying between 3.8%<sup>[7]</sup>, 4.1%<sup>[3]</sup>, 6.7%<sup>[2]</sup>, 8.7%<sup>[10]</sup> and 9.2%<sup>[5]</sup> of patients in different countries. Ng *et al*<sup>[10]</sup> demonstrated that the size of hyphema on presentation and the presence of retinal damage did not affect the probability of secondary haemorrhage. The incidence of secondary haemorrhage was found to decrease significantly with the use of topical steroid, but did not appear to be influenced by the use of cycloplegics. This emphasizes the therapeutic importance of topical steroid in the treatment of hyphema due to blunt trauma.

The main treatment is bed rest and topical medical therapy to prevent iritis. Visual acuity and intraocular pressure are to be monitored daily during the hospitalization of the patient. Surgical evacuation of the blood has to be done when the IOP is 50 mm Hg for >5 days, or 30 mm Hg for >7 days inspite of maximal anti glaucoma medications; when there is no sign of absorption of blood within 3-4 days after injury in patients with total hyphema and when there is impending blood staining of cornea. The optimum duration of surgery is 5<sup>th</sup> to 7<sup>th</sup> day after injury for the following reasons: 1) if the IOP is normal, blood staining of cornea is unlikely to occur after 5<sup>th</sup> day of trauma; 2) too early attempts to remove the blood clot may in fact cause further bleeding because of manipulations in the anterior chamber, sudden lowering of

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IOP and dislodgement of clot; 3) surgery after 7 days of injury would be difficult due to firm adhesions and fibrosis; 4) new blood vessels and organization of clots occur within the first 5 days after trauma; 5) secondary haemorrhage mostly occurs in the first 4 days after trauma [11]. The best corrected vision of 6/18 or better in 85.6% of patients in our study indicates the beneficial effect of appropriate and in-time treatment in patients of hyphema due to blunt trauma. The causes of poor vision in the rest of patients were the effects of associated retinal findings such as commotion retinae, macular edema and scarring, macular hole and secondary glaucoma. Wearing protective glasses during shuttle badminton, squash games and at work places, supervision of children while playing, dissemination of preventive methods of eye injuries through media and in the schools/colleges will help to reduce the ocular morbidity in young patients.

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