

# A Study of Perforating Eye Injuries at the Ophthalmology Department, National University of Malaysia

M Zainal, MSurg, P P Goh, MSurg, Department of Ophthalmology, Faculty of Medicine, Universiti Kebangsaan Malaysia, P O Box 12418, Kuala Lumpur

## Summary

One hundred and sixty seven (167) perforating eye injuries involving 159 patients were analyzed in a retrospective study over a three-year period. The degree of blindness and their associated factors were determined. Most patients were in the first three decades of life and were males. One hundred and seven (64%) eyes had vision of 3/60 or worse at initial assessment. Of these only 45% of eyes had improved vision to 6/36 or better at six months of follow-up. Fifty-five per cent of eyes were blind. The only significant associated factor identified was the extent of injury. Age, time interval and mechanism of injury were not significant factors.

*Key Words:* Perforating eye injuries, Blindness, Associated factors

## Introduction

Perforating eye injury is a significant cause of visual impairment and diminished quality of life, especially in the developed countries. In the United States of America, ocular trauma results in 40,000 cases of visual impairment and 2.4 million eye injuries annually<sup>1</sup>. The prevalence of ocular injuries is high in Malaysia. It is second only to cataract as a cause of visual loss<sup>2</sup>.

In view of the severe impact of eye injury, a three-year retrospective review on patients with perforating eye injury (PEI) was performed. The aims of this study were to discover the magnitude of blindness and their prognostic factors following perforating ocular trauma. Blindness is defined as vision of 3/60 or worse according to the World Health Organisation classification of visual impairment<sup>3</sup>.

## Materials and Methods

The subject of this study comprised of all patients with perforating eye injuries who were admitted to the Universiti Kebangsaan Malaysia Ophthalmology

department from January 1990 to December 1992. This is one of the two public ophthalmic centres serving the capital city of Malaysia, Kuala Lumpur. Patients' case files were retrospectively reviewed. The age, sex, race, the settings and mechanism of ocular injury, the time interval between injury and treatment as well as associated ocular complications were recorded. Information regarding the type of ocular injury, the vision at presentation and final visual outcome were established.

In this study, perforating eye injuries covered a spectrum of ocular trauma including laceration of eyewall (ie. cornea, corneosclera and sclera), ruptured globe and intraocular foreign body.

Patients whose vision at presentation were 3/60 or worse were divided into two groups. Group I comprised of patient whose vision after six months of follow-up were 6/36 or better. Those who remained legally blind were grouped in group II. To determine the associated factors, analysis of the following factors: age, vision at presentation, the time interval between injury and treatment, extent/type of injury, and

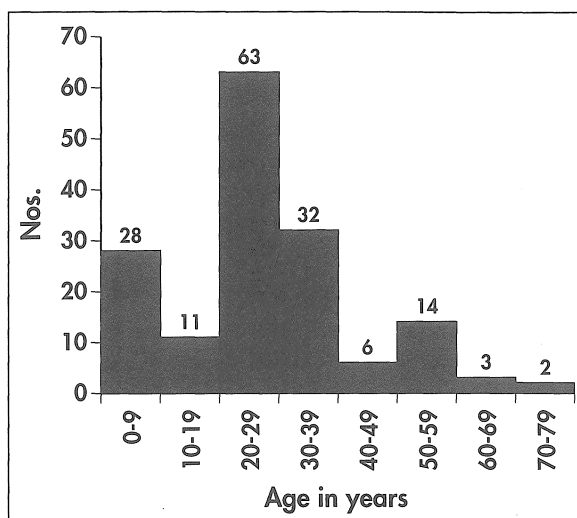
mechanism of injury between the two groups were performed. Chi-square and T-test were used.

**Results**

A total of 159 patients (167 eyes) were admitted to the Universiti Kebangsaan Ophthalmology department from January 1990 to December 1992.

**Age, sex and race**

The age distribution of patients with perforating eye injury is shown in Figure 1. 87% of the cases occurred in patients under the age of 40 years. Of the 159 injured persons 139 (83.2%) were men, and 20 (16.8%) were women. The male female ratio was 7 to 1. The racial distribution showed Malays contributed 46% of cases followed by Chinese (29%), Indians (16%) and others (9%).



**Fig. 1: Age distribution of patients with perforating eye injury**

**Table I**

**Vision outcome<sup>1</sup> 6 months following initial visual presentation (6/60) in 107 patients according to age, type of ocular injury, time interval and mechanism of injury**

Factor	Group I n=48	Group II n=59	p-value
<b>Age (in years)</b> mean ± std. dev	29.3 (13.3)	27.2 (15.6)	0.1500 <sup>2</sup>
<b>Ocular injury</b>			
Corneal laceration	30	20	0.0012 <sup>3.1</sup>
Cornea-scleral laceration	9	21	
Scleral laceration	9	18	
<b>Time interval between injury and treatment</b>			
Within 24 hours	36	43	0.8040 <sup>3.2</sup>
After 24 hours	12	16	
<b>Mechanisms</b>			
Motor vehicle accident	15	22	0.4270 <sup>3.3</sup>
Occupational injury	27	26	
Blunt/blast	6	11	

<sup>1</sup> Outcome : Group I = Vision 6/36 or better; Group II = Legally blind

<sup>2</sup> t-test for 2-independent samples (d.f. 105; t=1.05)

<sup>3.1</sup> Chi-square test (d.f. = 2; X<sup>2</sup> = 8.76)

<sup>3.2</sup> Chi-square test (d.f. = 1; X<sup>2</sup> = 0.06)

<sup>3.3</sup> Chi-square test (d.f. = 2; X<sup>2</sup> = 1.70)

**Activity at the time of injury**

Occupational injuries contributed 35% of the perforating eye injury. Motor vehicle accidents accounted for up to 29% of cases. 23% was due to domestic accidents that mainly involved children below the age of 10. Activities in school, sport and recreation as well as assault contributed 12% of cases studied.

**Time interval between injury and treatment**

The time interval between injury and treatment were categorised into Day 1 (within 24 hours), Day 2 to 3, Day 4 to 7 and more than 7 days. Although most of the cases presented within 24 hours after the injury, there were about 26% (28 cases) of them who presented later. Twelve of them were in group I and 16 were in group II. The longest delay prior to seeking treatment was 14 days. The detail results of the time interval and their analysis are shown in Table I. There was no statistical significance difference between the time interval between injury and treatment and visual outcome.

**Vision and blindness**

Most of the cases (146 of 167 eyes) were visually impaired (vision of 6/18 or worse) at the time of presentation. The distribution of cases according to the vision at time of presentation is shown in Table II. There were 21(12.6%) cases with normal vision, 39 (23.4%) cases with low vision whereas 107 (64.0%) cases had vision of 3/60 or worse. Of those with vision of 3/60 or worse, after six months of follow-up, 59 cases (55%) remained legally blind. Only 48 cases (45%) whose initial vision was 3/60 and worse had final vision of 6/36 or better. 11 cases whose initial vision were 6/60 or better had final vision of 3/60 or worse.

On the whole, after six months of follow-up only 35% of patients with perforating eye injuries had normal vision, 23% had low vision and 42% were legally blind. The causes of blindness are shown in Table III. Figure 2 compares the initial visual acuity and the final visual outcome.

**The type of injury**

The commonest injury was corneal laceration (83 cases or 50%). Corneoscleral laceration accounted for 50

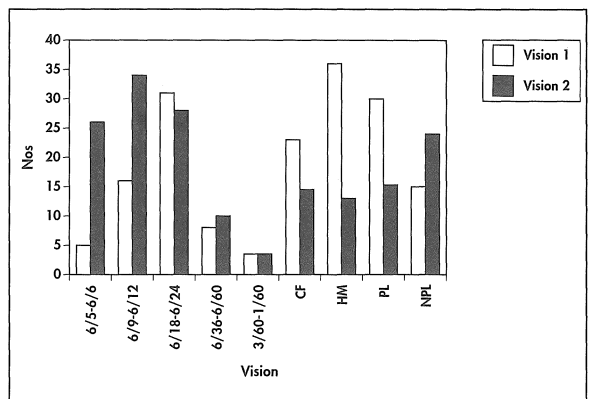
cases or 30% and scleral laceration was seen in 34 cases or 20% of cases. Besides laceration of the eyewall, 10 eyes were ruptured, 30 eyes had intraocular foreign body and 2 eyes with double perforations.

**Associated factors**

Table I shows the mean age, the number of cases according to the type of ocular injury, the time interval and mechanisms of the two groups. Analysis performed showed no significant difference between the age, time interval and the mechanism and the visual outcome ( $p>0.01$ ). The relationship between the types of injury and the visual outcome were highly statistically significant ( $p= 0.0012$ ).

**Table II**  
Distribution of cases according to vision at presentation and final vision

	Number (Eyes)	Percentage
<b>Total cases</b>	167	
<b>Vision at presentation</b>		
6/6 - 6/12	21	12.6
6/18 - 6/60	39	23.4
3/60 and worse	107	64.0
<b>Final vision</b>		
6/6 - 6/12	58	35.0
6/18 - 6/60	38	23.0
3/60 and worse	70	42.0



**Fig. 2:** Comparison of vision at presentation (Vision 1) and final vision after six months follow up (Vision 2)

**Table III**  
**Causes of blindness in patients with perforating eye injuries**

Causes	Number	Percentage
1. Retinal detachment	24	34%
2. Globe rupture	13	19%
3. Corneal scar/ anterior segments deformity	11	16%
4. Endophthalmitis	9	13%
5. Phytisis bulbi	5	7%
6. Traumatic optic neuropathy	5	7%
7. Epiretinal membrane	3	4%
Total	70	100%

### Discussion

Perforating eye injuries cause variable magnitude of visual impairment and quality of life of the individual. The appalling magnitude of blindness inflicted is illustrated in this study. The impact of blindness caused by perforating eye injury is reflected by its demographic pattern and its severity.

It was found that most patients were young adults, in the first three decades of life, and were males. The demographic pattern of perforating eye injury observed in this study was similar to those surveys undertaken by several authors<sup>4,5,6,7</sup>. In the study by Gilbert *et al* the mean age was 27 years with male female ratio of 4 : 1<sup>4</sup>. Wykes found the age distribution of patients with perforating eye injury was highest in the second to fourth decades<sup>5</sup>. Blindness in these age groups, undoubtedly leads to tremendous economic impact in terms of lost wages, reduced workforce and increased health care expenses.

In this study, the prevalence of blindness caused by perforating eye injury was considerably high. 42% of 167 cases were legally blind with vision of 3/60 or worse after six months of follow up. This is almost double the prevalence found by Wilkes in his 10-year survey of penetrating ocular injury in Gwent<sup>5</sup>. This

ominous impact reflected the severity of the injury sustained by most of the patients.

The commonest cause of blindness was retinal detachment which complicated most severe posterior segment injury. This accounted for 34% of the causes. In this study, only two cases had retinal detachment at the time of presentation. Otherwise it was seen as a late complication of perforating eye injuries. In relation to that some surgeon believe in applying cryotherapy during the initial wound repair, although its role is controversial, to reduce the risk of retinal detachment. In this review, cryotherapy was applied in 5% of cases (eight eyes) where view of the posterior segments were not obscured and scleral lacerations involved the recti muscles insertion.

Globe rupture which were beyond repair, and extensive corneal scarring and anterior segment deformity were the other major causes of blindness. And despite early institution of antibiotics and vitrectomy, about 13% of eyes were lost because of endophthalmitis.

In view of the above devastating effects, it is of first magnitude to identify the factors associated with the perforating eye injuries. In this study, majority of cases had severe visual impairment at the initial presentation. Thus greater precautions need to be taken when managing these cases. The skill and experience of the managing surgeon is also crucial as they can affect the visual outcome.

The other associated factors identified was the type of injury. Analysis of this factor in the two groups of patients with different visual outcome showed a highly statistical relationship between the type of injury and the visual prognosis ( $p < 0.001$ ). The size and location of the penetrating wound was not unexpectedly a principal determinant of the visual outcome.

Most of the patients who regained vision of at least 6/36 sustained corneal laceration. Whereas about 66% who became blind sustained either cornea-scleral or scleral laceration. Scleral laceration which extends beyond the insertion of the rectus muscle carries an unfavourable outcome. The disruption of the wall of the posterior segment had resulted in significant number of retinal detachment in this study. These

findings confirmed the observations made in a smaller size study by Gilbert *et al*<sup>4</sup>.

Although almost 20% of the injuries occurred in children below the age of 10, the visual prognosis was not statistically worse than the other age groups. Other factor such as the settings of injury also did not differ significantly. The time interval between injury and treatment is always presumed to affect the visual prognosis. The delay in seeking treatment would predispose an eye to an exogenous infection. However, analysis of this factor did not show any statistical significant difference in term of visual outcome. Perhaps this was due to almost similar distribution of cases seen in the two groups.

Considering those with low vision, perforating eye injury is a very important cause of visual impairment in Malaysia. The impact of perforating eye injury is thus ominous. It is regrettable to lose the eyes following penetrating eye injuries as most of the cases are preventable.

The majority of the injuries in this study were occupational injury and preventable. Simple eye protection could have saved the eye and expenses incurred in managing the cases. Despite compulsory usage of seat belt in Malaysia, motor vehicle accident contributed much to the occurrence of ocular injuries. As Malaysia is rapidly developing and progressing to an industrialized nation, invariably the magnitude of this problem will increase unless appropriate preventive measures are taken.

---

## References

1. Nanda SK, Mieler WF, Murphy ML. Penetrating ocular injuries secondary to motor vehicle accidents. *Ophthalmology* 1993;100 : 201-7.
2. Selvarajah S. Rehabilitation of the visually handicapped in Malaysia. *Current Aspects in Ophthalmology. Proceedings of the XIII Congress of the Asia Pacific Academy of Ophthalmology.* Amsterdams: Elsevier Science Publishers B V. 1992. Vol 1. 155-8.
3. Simons K. Visual acuity and the functional definitions of blindness. In Tasman Ed. *Duane's Clinical Ophthalmology.* Washington: Harper and Row Publisher, 1993: Volume 5, Chapter 51, 1-3.
4. Gilbert CM, Soong HK, Hirst LW. A two-year prospective study of penetrating ocular trauma at the Wilmer Ophthalmological Institute. *Ann Ophthalmol* 1987;19 : 104-6.
5. Wykes WN. A 10-year survey of penetrating eye injuries in Gwent, 1976-85. *Br J Ophthalmol* 1988;72 : 607-11.
6. Macewen CJ. Eye injuries : a prospective survey of 5671 cases. *Br J Ophthalmol* 1989;73 : 888-94.
7. Liggett PE, Pince KJ, Barlow W *et al.* Ocular trauma in an urban population, review of 1132 cases. *Ophthalmology* 1990;97 : 581-4.