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Case series
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Clinical features of ocular trauma requiring vitreoretinal surgery: a case series

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Abstract

Background: Ocular trauma is a significant cause of monocular blindness and visual impairment worldwide. This report describes the clinical characteristics of ocular trauma requiring vitreoretinal surgery presented to the vitreoretinal unit of Hospital Canselor Tuanku Muhriz, Kuala Lumpur, Malaysia.
Case presentation: A retrospective case series study of all traceable records of ocular trauma from the surgical logbook of a single vitreoretinal surgeon from January 1, 2008 to December 31, 2019 was performed. Demographics, causes of injury, types of ocular trauma, presenting visual acuity (VA), and postoperative VA were recorded and analysed. All patient data were collected from the medical records system. Of all the ocular trauma cases requiring vitreoretinal surgery, 63.6% were contusions. The most common cause of injury in our group of patients was sports injury (28%). Patients with open-globe injury had poorer preoperative and postoperative VA (logMAR) when compared to those with closed-globe injury (preoperative VA: 1.55 versus 1.39; postoperative VA: 0.93 versus. 0.67, in open- and closed-globe injury respectively, $p = 0.467$).
Conclusion: Specific injury prevention strategies, which include the use of protective eyewear, must be advocated in the workplace and during sports to reduce the incidence and severity of ocular trauma.

Keywords: clinical characteristics, ocular trauma, vitreoretinal surgery

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Ciri-ciri klinikal trauma okular yang memerlukan pembedahan vitreoretina: satu pengumpulan kes

Abstrak

Latar belakang: Trauma okular merupakan punca utama kebutaan monokular dan kecacatan penglihatan di seluruh dunia. Laporan ini menerangkan ciri-ciri klinikal trauma okular yang memerlukan pembedahan vitreoretina di unit vitreoretina Hospital Canselor Tuanku Muhriz, Kuala Lumpur, Malaysia.
Pembentangan kes: Kajian siri kes retrospektif ini melibatkan semua rekod trauma okular daripada buku log pembedahan yang dilakukan oleh seorang pakar bedah vitreoretina dari 1 Januari 2008 hingga 31 Disember 2019. Data deemografi, punca kecederaan, jenis trauma okular, tahap penglihatan sebelum, dan selepas pembedahan telah direkodkan dan dianalisa. Semua data pesakit diperolehi daripada sistem rekod perubatan. Daripada semua kes trauma okular yang memerlukan pembedahan vitreoretina, 63.6% adalah akibat kontusi. Sebab kecederaan utama dalam siri kes ini adalah kecederaan semasa bersukan (28%). Pesakit yang mengalami kecederaan glob terbuka mempunyai tahap penglihatan sebelum pembedahan dan selepas pembedahan yang lebih rendah (logMAR) jika dibandingkan dengan mereka yang mengalami kecederaan glob tertutup (sebelum pembedahan iaitu 1.55 berbanding 1.39 sebelum pembedahan dan selepas pembedahan adalah 0.93 berbanding 0.67 ($p = 0.467$).
Kesimpulan: Strategi khusus bagi pencegahan kecederaan perlu dititikberatkan, termasuk penggunaan cermin mata pelindung wajib digalakkan di tempat kerja dan semasa bersukan untuk mengurangkan kejadian dan keterukan trauma okular.

Kata kunci: ciri-ciri klinikal, pembedahan vitreoretina, trauma okular

Introduction

Ocular trauma is a preventable cause of visual loss. It is a major contributor to monocular blindness worldwide.[1] Vitreoretinal involvement is present in almost half of all severe eye injuries secondary to blunt or penetrating trauma.[2] In addition to vision loss, ocular trauma also results in a significant economic burden to families and countries. Improved surgical techniques, especially in the field of vitrectomy, have helped surgeons salvage and restore vision to eyes following injury. Despite constant refinements in the management of ocular trauma, the

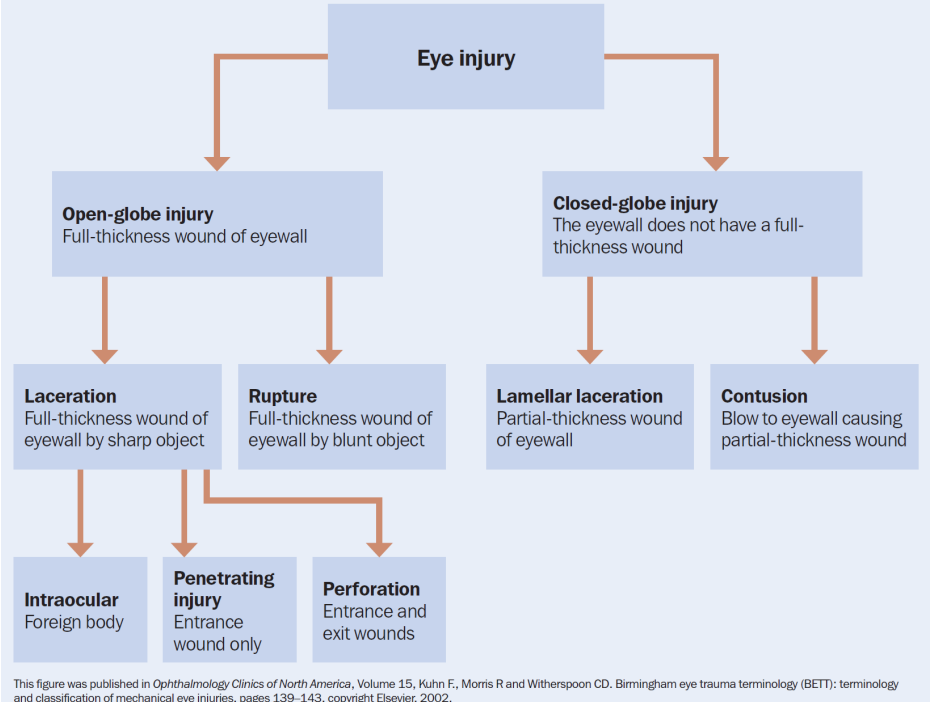

Fig. 1. Birmingham Eye Trauma Terminology (BETT) system.

visual prognosis of severe ocular trauma remains poor.

Based on the Birmingham Eye Trauma Terminology (BETT) system (Fig. 1), ocular trauma is broadly divided into open-globe injury and closed-globe injury.[3] Open globe injuries are subdivided into penetrating injury, perforating injury, intraocular foreign body (IOFB), and rupture. Closed-globe injuries are further divided into lamellar lacerations and contusions.

The epidemiology of ocular trauma in developed countries has been well described. However, there is limited data in developing countries such as Malaysia. The primary purpose of this report is to describe the epidemiology of ocular injuries treated by the vitreoretinal unit in the Department of Ophthalmology of Hospital Canselor Tuanku Muhriz, Kuala Lumpur, Malaysia.

Table 1. Clinical data of the patients

Case	Gender	Age (years)	Occupation	Location of injury	Cause of injury	Main complaint	Clinical presentation	Diagnosis	Preop VA	Postop BCVA	Complication
1	Male	47	Workshop foreman	Workshop	Metal	Blurred vision	Conjunctival laceration	IOFB	6/36	6/9	-
2	Male	13	Badminton coach	Badminton court	Shuttlecock	Pain	Cataract	Contusion	6/9	6/6	-
3	Male	11	Student	Field	Fireworks	Redness	Macular hole	Contusion	1/60	1/60	Angle-recession glaucoma
4	Male	61	Retired police	Roadside	Fall	Blurred vision	Dislocated intraocular lens	Contusion	1/60	6/12	Angle-recession glaucoma
5	Female	42	Nurse	Roadside	Unknown object	Blurred vision	Cataract	Contusion	6/24	3/60	Rhegmatogenous retinal detachment
6	Male	81	Retired dean	Golf course	Golf ball	Floaters	Hyphaema	Contusion	CF	6/9	Secondary glaucoma
7	Male	38	Labourer	Construction site	Metal	Pain	Corneal laceration	Penetrating	HM	HM	Endophthalmitis
8	Male	69	Retired construction worker	Roadside	Assault	Blurred vision	Dislocated lens	Contusion	6/18	6/18	Angle-recession glaucoma
9	Male	12	Student	Field	Football	Blurred vision	Cataract	Contusion	PL	6/24	Secondary glaucoma
10	Male	66	Labourer	Roadside	Motor vehicle accident	Blurred vision	Corneal laceration	Rupture	HM	6/24	Angle-recession glaucoma
11	Male	54	Businessman	Roadside	Unknown object	Blurred vision	Retinal detachment	IOFB	6/36	6/24	Angle-recession glaucoma

RE: right eye; LE: left eye; Preop: preoperative; Postop: postoperative; VA: visual acuity; BCVA: best-corrected visual acuity; IOFB: intraocular foreign body; CF: counting fingers; HM: hand movement; LP: light perception

Case presentation

This case series investigates 11 ocular trauma patients who underwent vitreoretinal surgery at our centre from January 1, 2008 to December 31, 2019. Keywords used to search for relevant cases in the surgical logbook of a senior vitreoretinal consultant ophthalmologist included ocular trauma, ocular injury, giant retinal tear, IOFB, and traumatic vitreous haemorrhage. Cases included in this study were those that required at least one vitreoretinal surgery. Twenty-one ocular trauma cases in the surgical logbook were initially identified. However, of these, the medical records of 10 patients had been deleted by the medical record department as the medical records are kept for a maximum of ten years from the end date of the patient's treatment.

Data collected from the medical records included age, gender, occupation, cause of injury, classification of ocular trauma, presenting and postoperative visual acuity (VA), accompanying symptoms, and management. Table 1 summarises the clinical data, including the cause of injury, clinical presentation, preoperative and postoperative best-corrected VA, diagnosis based on BETT classification, and complications for all 11 patients.

Patient demographics are presented in Table 2. The majority of patients were male (90.9%). The mean age of patients was 45 years (range 11–81 years). All cases had unilateral involvement. Most of the injured eyes (72.7%) were right eyes. Seven patients suffered contusion (63.6%) due to blunt trauma, while three sustained penetrating injuries (27.3%), two of which had IOFB.

As shown in Figure 2, three patients had sports-related ocular injuries, while two patients sustained work-related injuries. Other causes of injury include foreign body of unknown material, motor vehicle accident, fall, fireworks, and assault. Our data also shows that 6 of 11 patients presented to our ophthalmology clinic within one day after injury. None of the patients used protective eye gear during the injury. Almost all patients (90.9%) complained of blurred vision upon presentation. Other presenting symptoms included eye redness (27.3%), eye pain (27.3%), and floaters (18.2%).

The intraoperative procedures performed (Fig. 3) were analysed. All the patients required vitrectomy. Endolaser was performed in 91% of patients, while 72.7% of the patients required cataract removal. Intraocular tamponade was inserted in 54.5% of the patients. Other vitreoretinal procedures included cryotherapy, scleral buckle, and membranectomy. We also analysed the correlation between the time from trauma to surgery and the improvement in VA after surgery, which showed a statistically significant linear relationship ($r = 0.792$, $p = 0.004$). It means that the sooner the patients receive treatment after injury, the greater their VA gain.

Table 2. Demographics of patients

Demographic variables	Number	%
Total patients	11	
Age		
< 20	3	27.3
20–39	1	9.1
40–59	3	27.3
> 60	4	36.4
Gender		
Male	10	90.9
Female	1	9.1
Ethnicity		
Malaysian		
Malay	7	63.6
Chinese	3	27.3
Non-Malaysian	1	9.1
Laterality		
OD	8	72.7
OS	3	27.3
Type of ocular injury		
Contusion	7	63.6
Penetrating	3	27.3
IOFB	2	18.2
Rupture	1	9.1

OD: oculus dexter; OS: oculus sinister; IOFB: intraocular foreign body

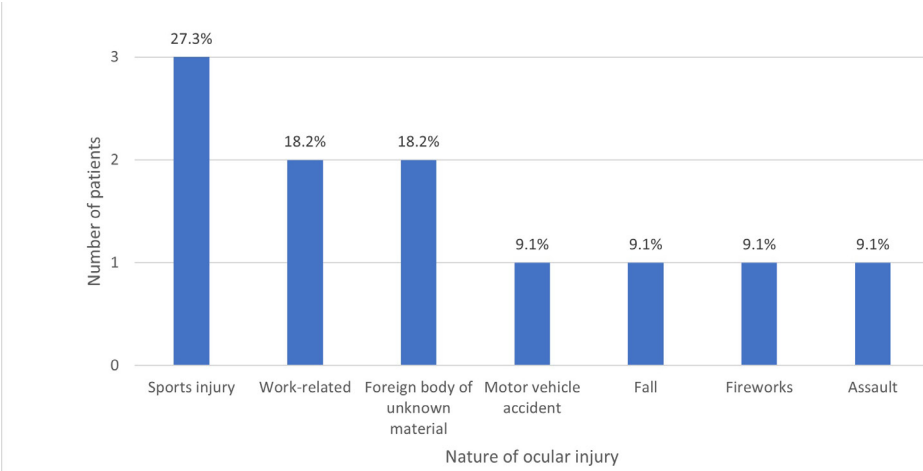

Fig. 2. Nature of ocular injury.

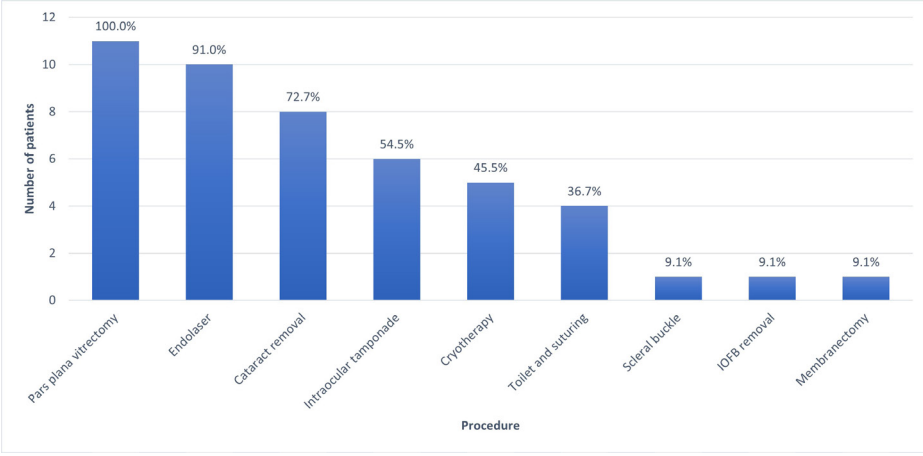

Fig. 3. Intraoperative procedures performed.

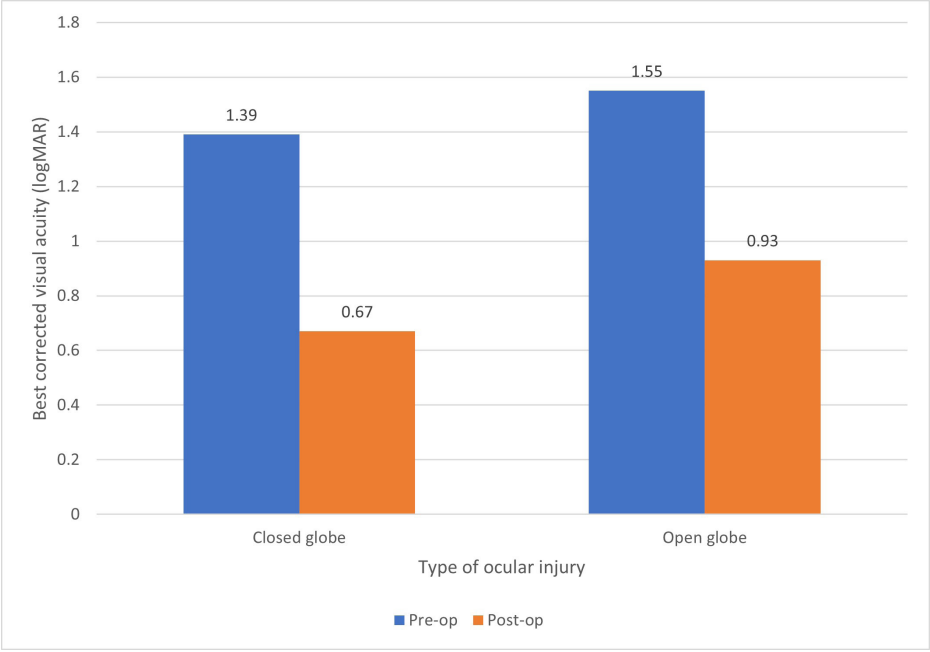

Fig. 4. Mean visual acuity (logMAR) according to the type of ocular injury.

We also analysed the preoperative and postoperative VA of these patients according to the type of ocular injury (Fig. 4). The patients were divided into closed-globe and open-globe groups. The baseline VA of patients varied from 6/9 to light perception based on the Snellen chart. In the seven eyes with closed-globe injury, VA in logMAR (logarithm of the minimum angle of resolution) improved from 1.39 ± 0.96 preoperatively to 0.67 ± 0.65 ($p = 0.137$) postoperatively. The remaining 4 patients with open-globe injury had poorer preoperative and postoperative VA with less improvement in VA after surgery (1.55 ± 0.87 to 0.93 ± 0.94, $p = 0.198$) than the closed-globe group.

According to our data, all the patients required secondary procedures. These included the removal of silicone oil and secondary intraocular lens implantation. In addition, 5 patients (45.5%) developed angle-recession glaucoma (ARG) during follow-up.

Discussion

Males (90.9%) were the group at highest risk for ocular trauma in our case series. This concurred with the universal pattern that ocular trauma mainly occurs in young adult males, irrespective of the severity of ocular trauma and country of origin.[4-6] The higher risk in young men could be due to high-risk activities related to work, assault, sports, and motor vehicle accidents. However, the precise size of the population at risk is not known. This is because our hospital is only one of several tertiary referral centres for ophthalmic emergencies in the city. Thus, the data from our study cannot be generalised to the whole population.

Sports injury was the main cause (28%) of ocular trauma in our patients. A literature review revealed that sports-related trauma contributes to 37–52% of ocular injuries, mainly affecting young children in 58–70% of cases.[7,8] Badminton being one of the most popular sports in Malaysia, the impact of the shuttlecock often causes high-velocity eye injuries. The second most common nature of injury in our study was work-related. This is a significant concern in our community as most ocular injuries are related to workers in the manufacturing and construction industry, which is one of the fastest-growing industries in Malaysia.[9] Furthermore, previous studies have found that the incidence of work-related ocular trauma in developing countries is higher than in developed countries.4,5,10 (4,5,10)644 injured eyes from 3,559 patients over the 10-year period: 2,008 (55.1% Fire-works-related injury is also a genuine concern in Malaysia, especially during the festive seasons.

Our analysis shows that patients with open-globe injuries had poorer preoperative and postoperative VA when compared to those with closed-globe injuries. This is consistent with results from previous studies.[4,6,10] Open-globe injuries often destroy the global structure, causing severe damage and prolapse of the intraocular contents, thus leading to poorer visual recovery. Fortunately, all the patients in our report sustained unilateral injuries, and none were deemed legally blind after treatment.

Among the long-term consequences of ocular trauma is the development of angle recession and subsequently ARG. Almost half (45.5%) of our patients developed ARG throughout follow-up. A study reported that 80.5% of patients who suffered a blunt ocular injury may have some degree of angle recession.[11] Glaucoma is a major concern because many cases may go unnoticed and are diagnosed only when there is irreversible optic nerve damage. Medication and financial burdens severely impair a patient's quality of life, and some patients may even require glaucoma surgery in case of uncontrolled intraocular pressure. Ocular features associated with traumatic glaucoma include poor baseline visual acuity, hyphaema, an angle recession of more than 180°, traumatic cataracts, displacement of the lens, and iris injuries.[12]

The initial assessment of ocular trauma is vital. Early recognition of vision-threatening conditions and immediate ophthalmologic consultation can prevent blinding complications. Any ocular trauma with poor presenting VA warrants urgent management. The most significant adverse prognostic factor in open-globe injuries is presenting VA < 5/200, as reported by Rao *et al.*[13] Vitrectomy is a crucial treatment in severe ocular trauma. Three published randomised controlled trials conducted in China, which included a total of 173 participants, revealed that earlier vitrectomy in open-globe injuries resulted in better final VA and lower rates of complications.[14-16]

The use of protective eyewear needs to be advocated at high-risk workplaces as well as during contact or racquet sports to prevent blinding ocular trauma. Fong and Taouk identified the lack of eye protection as a risk factor for ocular trauma, with at least 22% of patients with open-globe injuries and 9% with closed-globe injuries failing to wear eye protection.[17] Another study in Canada showed that after wearing protective eye gear was made mandatory, the incidence of eye injuries in amateur hockey players was significantly reduced.[18]

Conclusion

This study highlights the impact of visual loss and long-term complications following ocular trauma despite timely vitreoretinal intervention. Sports injuries and work-related injuries were prevalent in our case series. Open-globe injury had a poorer visual prognosis than closed-globe injury. These injuries may be prevented through proper training and education about protective eye gear. Protective eyewear should be made mandatory at the workplace with higher risks of ocular injury.

Declarations

Informed consent for publication
The patients and/or their guardians have provided informed consent for the publication of the clinical data contained in the case series.

Competing interests
None to declare.

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None to declare.

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