Clinical outcome of open glob injuries in Western Turkey

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ABSTRACT

PqPurpose: To assess clinical outcome and visual progression of open globe traumas at the tertiary hospital in western Turkey.

Materials and Methods: From January 2015 to October 2019, patients referred to us from the Emergency Unit at our hospital for ophthalmologic surgery were evaluated retrospectively. The patients were divided into four groups based on age: 0–14 years as group 1, 15–34 years as group 2, 35–59 years as group 3, and ≥ 60 years as group 4. Initial and final best corrected visual acuity (BCVA) were converted into logarithm of the minimum angle of resolution (LogMAR) units to make an analysis._

Results: Eighty-two (75.9%) male and 26 (24.1%) female 108 patients were included in the study. The mean age of the patients was 40.42 ± 17.79. Visual improvement in group 1; 0.42 ± 0.40 LogMAR (p= 0.021), in group 2; 0.70 ± 0.50 LogMAR (p<0.01), in group 3; 0.40 ± 0.45 LogMAR (p < 0.01) and in group 4; 0.25 ± 0.38 LogMAR (p= 0.036). Visual improvement statistically significantly correlated with the patient's age (p=0.003), initial vision (p=0.007) and retinal disorder (p=0.002).

Conclusion: The OTS has not been prospectively validated yet. In our study, the prognosis is worse for elderly patients with an extensive injury size, posterior segment disorders and intraocular foreign body. Injury size, which can be one of the crucial indicators, adding into the calculation of OTS can be beneficial to predict visual prognoses in the future.

Keywords: Intraocular foreign body, trauma, ocular globe injury, retinal injury.

INTRODUCTION

Open Globe Injury (OGI), which is nearly seen in 3.5 per 100,000 persons per year, is defined as a full-thickness wound of the globe.[1] These traumas could be concluded with severe morbidity and higher postoperative complications in comparison to the closed globe injury.[2-4]

Some studies have been conducted to predict the prognosis of open globe injuries.[5,6]

It is a well-known ocular trauma scoring (OTS) system for estimating visual prognosis and patient morbidity.[7,8] The new health developments and awareness about ocular trauma could affect patient morbidity. But, these are changing from country to country.[9] Many variations in the countries about OGI incidences and expected ocular improvements may be observed. There is a lack of new data about ophthalmic traumas in the literature. We aimed to assess the latest information on ocular traumas from the tertiary centre, one of the leading referral hospitals in western Turkey.

MATERIALS AND METHODS

The study adhered to the tenets of the Declaration of Helsinki. Patients diagnosed with open-globe injury at Hospital between 2015 and 2020 were analyzed retrospectively. The Ethics Committee approved this study.

Demographic features, including gender, age, and side of the eye, were noted. Clinical records, including initial best corrected visual acuity (BCVA), the zone of trauma before the operation, and clinical signs and features (initial BCVA, hyphema, lens trauma, retinal injury, globe rupture, endophthalmitis, and perforating injury) were recorded. After follow-up, data, including the final BCVA, were noted, and the OTS was calculated. To note if there was

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foreign body data, other diagnostic tools like computed tomography orbital X-rays were assessed.

OTS system was used to define the wound location. Zone I injuries were confined to the cornea and limbus, Zone II involved the anterior 5mm of the sclera, and Zone III injuries involved full-thickness scleral defects >5mm posterior to the limbus.[10, 11]

The patients were divided into four groups based on age: 0–14 years as group 1, 15–34 years as group 2, 35–59 years as group 3, and ≥ 60 years as group 4.

Initial and final BCVA were converted into logarithm of the minimum angle of resolution (LogMAR) units to make an analysis.

Inclusion criteria required that participants did not have a previous ocular surgical trauma history and a follow-up period of over one month.Exclusion criteria were a history of any ocular disease or systemic disease with ocular findings, previous ocular surgery, laser therapy and follow-up periods of less than one month.

Data Analysis

The quantitative variables were expressed as mean ± S.D and qualitative as numbers and percentagesKolmogorov-Smirnov test was used for normality. The change between the initial and final BCVA was assessed using a paired sample t-test. Prognostic factors analyses were performed using SPSS (Version 21.0, SPSS Inc., Chicago, IL, U.S.A.), and p-values of <0.05 were considered statistically significant.

RESULTS

Eighty-two (75.9%) male and 26 (24.1%) female 108 patients were included in the study. The mean age of the patients was 40.42 ± 17.79. There were 8 (7.4%), 34 (31.5%), 53(49.1%), and 13 (12%) patients in groups 1,2,3 and 4, respectively (Table 1). The mean BCVA was 1.18 ± 0.53 LogMAR at presentation. The final mean BCVA was 0.70 ± 0.62 LogMAR (p<0.01). Visual improvement in group 1; 0.42 ± 0.40 LogMAR (p= 0.021), in group 2; 0.70 ± 0.50 LogMAR (p<0.01), in group 3; 0.40 ± 0.45 LogMAR (p < 0.01) and in group 4; 0.25 ± 0.38 LogMAR (p= 0.036) (Figure 1).

Visual improvement statistically significantly correlated with the patient's age (p=0.003), initial vision (p=0.007), and retinal disorder (p=0.002). But, hyphema (p=0.11) and sex (p=0.21) were not correlated with visual improvement.

Initial vision statistically significantly correlated with initial lens trauma (p<0.001), retinal injury (p=0.005), hyphema (p<0.001), size of injury (p<0.001), and age of patients (p=0.012).

In group 1, traumatic lens, iris, retinal injuries, and hyphema were 12.5%, 12.5%, 0%, and 0%, respectively. In group 2, traumatic lens, iris, retinal injuries, and hyphema

Table 1: *Demographic data of patients*

	Group 1	Group 2	Group 3	Group 4	Total
	8 (100%)	34 (100%)	53 (100%)	13 (100%)	108 (100%)
Female	4 (50%)	4 (11.8%)	14 (26.4%)	4 (30.8%)	26 (24%)
Male	4 (50%)	30 (88.2%)	39 (73.6%)	9 (69.2%)	82 (76%)
Right Eye	2 (25%)	17 (50%)	26 (49.1%)	7 (58.8%)	52 (48%)
Left Eye	6 (75%)	17 (50%)	27 (50.9%)	6 (46.2%)	56 (52%)
Mean Size	4.43±0.90 mm	5.44±2.95 mm	6.22±3.12 mm	8.0±4.32 mm	6.06±2.22 mm
Zon I	4 (50%)	20 (58.8%)	28 (52.8%)	9 (69.2%)	61 (56.5%)
Zon II	1 (12.5%)	7 (20.6%)	17 (32.1%)	3 (23.1%)	28 (26%)
Zon III	3(37.5%)	5 (14.7%)	5 (9.4%)	1 (7.7%)	14 (13%)
Zon I+II	0	2 (5.9%)	3 (5.7%)	0	5 (4.6%)
Foreign body	0	3 (8.8%)	4 (7.5%)	1 (7.7%)	8 (7.4%)
Retinal Injury	0	9 (26.5%)	16 (30.2%)	8 (61.5%)	33 (30.6%)
Lens Injury	1	16 (47.1%)	28 (52.8%)	12 (92.3%)	57 (52.8%)
Iris Injury	1 (12.5%)	14 (41.2%)	23 (43.4%)	5 (38.5%)	43 (39.8%)
Hyphema	0	7 (20.6%)	19 (35.8%)	6 (46.2%)	32 (29.6%)

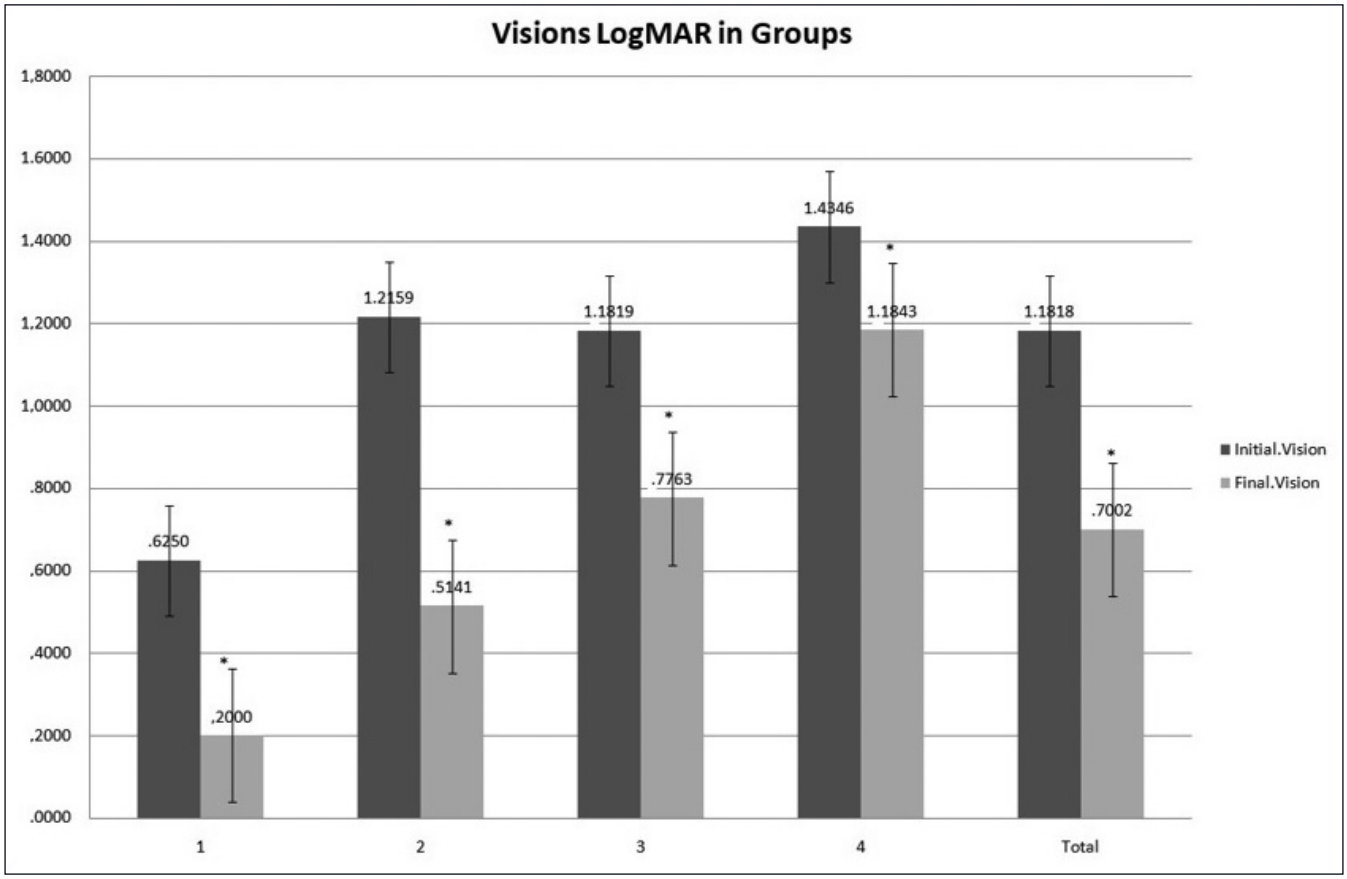

Figure 1: *Visual change in groups.*
x-axis: (1: Group 1, 2: Group 2, 3: Group 3, 4: Group 4), **y-axis:** LogMAR visual scale
*means p<0,05, statistically significant

were 47.1%, 41.2%, 26.5%, and 20.6%, respectively. In group 3, traumatic lens, iris, retinal injuries, and hyphema were 52.8%, 43.4%, 30.2%, and 35.8%, respectively. In group 4, traumatic lens, iris, retinal injuries, and hyphema were 92.3%, 38.5%, 61.5%, and 46.2%, respectively. A foreign body was seen in 7.4% of the patients.

DISCUSSION

Because of the vulnerable feature of ocular tissues, lots of trauma is probably not harmful to other body tissues and could cause massive damage.[12] Ocular injury has been lately highlighted as one of the crucial aetiologies of noncongenital and monocular visual failure and blindness worldwide. Ocular trauma establishes 7% of whole bodily traumas and 10%–15% of all ocular diseases.[3] In this study, our primary goal is to define factors that affect final visual acuity in participants with OGI.

In the present study, 108 patients were included, and visual improvement correlated with the patient's age, initial vision, and retinal disorder. Also, we reported the initial vision associated with initial lens trauma, retinal injury, size of injury, and hyphema.

In the literature, the incidence of OGI is nearly six times higher in males than in females.[14,15] In our study, the male rate was high (about 3.5 times) but not as much as these previous reports. Males were 75.9% and females were 24.1%. The male predominance was reported in ophthalmic traumas.[13] Male preponderance is seen in all ages except older people and infants. The high outdoor activities of males and young boys probably explain this preponderance in males.

An intraocular foreign body has been reported to be 9% in the U.K., 24% in Iran, 12.8% in Australia, 15% in the United States, and 5.3% to 17.8% seen in Turkey.[15-18] In our study, 7.4% of the patients had a foreign body. If not extracted, these foreign bodies could make inflammatory responses according to the type of foreign body, such as siderosis and chalcosis. None of the patients in our study had an inflammatory response. Presumably, this results from performing early operations for all patients. Glass mainly does not cause an intraocular reaction. Still, because of its sharp nature, it should be extracted early after trauma. Otherwise, retinal damage could be seen. However, early operations in intraocular foreign bodies could be associated

with posterior segment disorders. Other factors, foreign bodies' high-velocity, high-energy, and big traumas with globe ruptures, could also be associated with posterior segment disorders.[19] Posterior segment complications concluded with visual failure and led to further surgeries.[20] The rate of retinal injuries in our study was 61.5%, and these injuries correlated with permanent visual loss (p =0.005). Kim et al. determined that zones of the ocular injury are associated with final visual acuity.[21]

On the other hand, in our study, the zone of the ocular injury was not correlated with final vision (p=0.12). However, the size of the injury was significantly associated with final visual acuity regardless of the ocular injury zone (p<0.001). So, we thought the injury size could have a more critical effect on visual prognosis than the zone of injury.

The older age group (group 4) in the current study has worse initial and final BCVA. Its reason may be traumas were different types in the older patients with OGI. Blunt traumas (47.7% wood) are primarily seen in geriatric patients with OGI. On the other hand, metal objects are mostly the reason for OGI in the young age group.[22]

One of the most severe but rare complications of the OGI is sympathetic ophthalmia (SO). SO is classically defined as bilateral granulomatous panuveitis, and this ocular disease has an incidence of about 0.03 per 100,000 ophthalmic cases seen per year. Bilateral granulomatous üveitis in most SO cases could even be observed after one year.[18] But, in the current study group, we have not had any SO cases in the last five years.

Cataracts, corneal scarring, and astigmatism after ocular trauma were also significant risk factors in open globe and zon I ocular traumas. These risk factors are the most frequent reasons for vision failure in penetrating traumas. Traumatic cataracts, corneal scarring, and astigmatism are more common in zone 1 injuries, while posterior segment injuries are relatively less common. An excellent anterior segment surgery allows for a significant vision increase in these patients. Thakker and Ray reported 48.8% traumatic cataracts after OGI. Authors reported traumatic cataracts could occur after several years of the OGI.[23] In our study, traumatic cataract was seen in 52.3% of the OGI patients. Traumatic cataracts were mostly seen in the old age group.

The main limitation of this study was its retrospective nature. However, our study has some strengths, like a long follow-up period, a significant number of participants, and real-life data.

In conclusion, this study reports western Turkey's latest OGI demographic data. According to our data, we could emphasize being male is a risk factor for ocular trauma, and OGI prognosis is not good for patients with elderly, a large injury size, posterior segment disorders, and intraocular foreign body. The OTS has not been prospectively validated yet. Injury size, which can be one of the indicators added into the calculation of OTS, can be beneficial to predict visual prognoses in the future.

Ethical Declarations

Competing interests: The authors declare that they have no conflict of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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