The Clinical Features and the Factors Affecting Visual Prognosis in Pediatric Open-Globe Injuries

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Research Article

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Abstract

Purpose: To investigate clinical features and factors affecting visual prognosis after pediatric open-globe injuries.

Methods: Children with final logMAR-visual acuity (LVA)>0.70 were determined as poor-vision group (group1, n=108) and those with final LVA≤0.70 as good-vision group (group2, n=115). Analyzes were done.

Results: Compared to group1, group2 had better initial and final visions (1.21±0.26 vs 0.60±0.28, $p<0.001$ for initial-LVA; 1.00±0.32 vs 0.30±0.13, $p<0.001$ for final-LVA), greater ocular trauma score (OTS) (1.72±0.53 vs 3.73±0.61, p=0.025) and smaller injury size (10.4±3.5 vs 5.8±2.4 mm, p=0.002). Globe rupture (37.0% vs 17.4%, p=0.015) and relative afferent pupillary defect (RAPD) (44.4% vs 17.3%, p=0.037) were higher in group1, while penetrating injury (45.4% vs 72.2%, p=0.044), zone 1 involvement (39.8% vs 65.2%, p=0.038) and metal object injury (29.6% vs 51.3%, p=0.041) were higher in group2. Final LVA (for group1 and group2) was negatively correlated with OTS (r=-0.398, p=0.037; r=-0.369, p=0.040), while positively correlated with injury size (r=0.412, p=0.031; r=0.318, p=0.046) and initial LVA (r=0.335, p=0.043; r=0.402, p=0.034).

Conclusion: To our knowledge, this is the first study investigating effects of age, time between trauma and surgery, OTS, injury size, follow-up time and initial vision on final poor and good visions in detail. Low OTS, poor initial vision, globe rupture and RAPD were poor prognosis indicators, while small injury size, penetrating injury, zone 1 involvement and metal object injury were good prognosis indicators. Additionally, in both groups final vision worsened as OTS decreased, injury size increased, and initial vision worsened. These prognostic factors may be useful in managing trauma.

Introduction

Open-globe injury (OGI) is one of the preventable causes of vision loss in children [1]. Full-thickness defect in cornea and/or sclera is considered as an OGI [2]. The annual incidence of OGIs is between 2.8–5.1 per 100,000 [3–5]. Varying levels of low vision or blindness may occur after trauma, and this condition may cause lifelong negative impacts on both children and parents [6]. Additionally, OGIs are an important public health problem as they reduce the quality of life [5, 7, 8].

Clinical findings related to ocular trauma may provide valuable clues about the visual prognosis. Knowing the ocular risk factors capable of affecting the final vision may be important for the visual rehabilitation. Although there were studies investigating OGIs in children, most of them were about the epidemiology [5–7, 9–13]. To the best of our knowledge, this is the first study investigating the effects of age, time between trauma and surgery, ocular trauma score (OTS), injury size, follow-up time and initial vision on final poor and good visions in detail. In this study, we aimed to determine the clinical features and to investigate the factors affecting the visual prognosis in OGIs involving a large number of pediatric cases in a tertiary reference hospital.

Methods

This study was performed with approval of Izmir Tepecik Training and Research Hospital's Medical Research Ethical Committee (approval number: 2020/14 – 1) and in line with ethical principles of the Declaration of Helsinki. Written consent forms were received from the participants and parents. Initially, 257 cases aged 7–18 years and diagnosed with OGI between May 2014-August 2020 were detected from files and system records. Children with a history of ocular trauma, cataracts, amblyopia or ocular surgery prior to ocular injury, the cases having chronic ocular disease, the children whose visual acuities could not be determined during the admission and/or follow-up, the cases having multiple injury type, injury localization or injury cause, and the children with the multisystem trauma accompanied by head injuries were excluded from the study. Data of 223 children attending to the control examination regularly, followed up for at least 6 months and having complete follow-up data were analyzed.

Age, gender and medical histories of cases were recorded. Damaged eye, time between trauma and surgery, OTS at presentation, follow-up time after injury, initial and final best corrected visual acuity levels, and injury size were detected. Snellen visual acuity was converted to logarithm of the minimum angle of resolution (logMAR) unit for the statistical analysis accuracy and convenience [14]. The logMAR-visual acuity (LVA) levels were considered as 2.0 at cases only counting fingers, 2.3 at children detecting hand motion, 2.7 at cases with only light perception and 3.0 at children with no light perception [15]. The type, localization and cause of OGI were determined. Anterior and posterior segment findings were recorded. At presentation, accompanying ocular findings such as uveal tissue damage, relative afferent pupillary defect (RAPD), lens damage, vitreous hemorrhage and retinal detachment were evaluated. At last visit, ocular findings such as eyelid disorders, corneal opacity, lens opacity, posterior capsule opacification and posterior segment defect were recorded.

Open-globe traumas were defined according to the Birmingham Eye Trauma Terminology system and Ocular Trauma Classification Group guidelines [2, 16]. Injury types were classified into 4 groups as penetrating injury (only if there was an entrance wound or the same entrance-exit wound), globe rupture (if there was a full-thickness wound at the weakest point of the eyewall because of blunt trauma), perforating injury (if there were separate entrance and exit wounds) and intraocular foreign body injury (if there was a foreign body in the ocular structure) [2]. Injury localizations were divided into 3 regions as zone 1 (within the corneal and/or limbal area), zone 2 (within the scleral area extending 5 mm back from the limbus) and zone 3 (within the area posterior to Zone 2) [16]. OTS was calculated according to the visual acuity level of cases at presentation and the presence of globe rupture, endophthalmitis, perforating injury, retinal detachment and RAPD [17]. According to ocular trauma raw score, OTS was determined as score 1 (0–44 points), score 2 (45–65 points), score 3 (66–80 points), score 4 (81–91 points) and score 5 (92–100 points) [17]. Causes of injury were categorized as metal objects (fork, knife, needle), broken glass, blunt objects (ball, punch), pen-pencil and unidentified objects (if the cause of injury could not be determined). In all cases with OGI, primary globe repair ± additional procedures (according to accompanying ocular findings; eyelid repair, anterior chamber lavage, lensectomy, anterior vitrectomy, intraocular foreign body removal or pars plana vitrectomy) were performed under general anesthesia.

Children with final LVA > 0.70 (Snellen visual acuity < 20/100) were determined as poor-vision group (group 1, n = 108) and those with final LVA ≤ 0.70 (Snellen visual acuity ≥ 20/100) as good-vision group (group 2, n = 115). Intragroup and intergroup comparisons were done. In addition, effects of age, time between trauma and surgery, OTS, injury size, follow-up time and initial LVA on final LVA were analyzed in groups.

Statistical Package for Social Sciences (SPSS 20.0; IBM, USA) software was used for statistical data analysis. Continuous variables were given as mean ± standard deviation (minimum-maximum) values, while count data were expressed as case number and percentage. Whether the variables complied with the normal distribution in groups was determined by the Kolmogorov-Smirnov test. Since there was no normal distribution, Mann-Whitney U test, Wilcoxon test and Kruskal-Wallis test were used in comparisons. Count data were evaluated by the Chi-square test. Relationships between the final LVA with the age, time between trauma and surgery, OTS, injury size, follow-up time and initial LVA were assessed by the Spearman's correlation analysis. P < 0.05 was considered statistically significant.

Results

The number of male was significantly higher in both poor-vision group (68.5% male vs 31.5% female, p=0.002) and good-vision group (66.9% male vs 33.1% female, p=0.004). Mean ages, damaged eyes, time between trauma and surgery, and follow-up time of groups were similar (p>0.05). In both groups, final visions were better than initial visions (1.00±0.32 vs 1.21±0.26, p=0.039 for LVA in group 1; 0.30±0.13 vs 0.60±0.28, p=0.023 for LVA in group 2). Compared to group 1, group 2 had better initial and final visions (1.21±0.26 vs 0.60±0.28, p<0.001 for initial LVA; 1.00±0.32 vs 0.30±0.13, p<0.001 for final LVA), greater OTS (1.72±0.53 vs 3.73±0.61, p=0.025) and smaller injury size (10.4±3.5 vs 5.8±2.4 mm, p=0.002). Clinical characteristics of groups were given in table 1.

In intragroup comparison, while the distribution of injury types was similar in poor-vision group (p=0.492), the penetrating injury was found to be most frequent (72.2%) in good-vision group (p=0.031). Compared to group 1, group 2 had more frequent penetrating injury (45.4% vs 72.2%, p=0.044) and less frequent globe rupture (37.0% vs 17.4%, p=0.015). Both perforating injury and intraocular foreign body injury rates of groups were similar (p>0.05). In intragroup comparison, while the distribution of injury localizations was similar in poor-vision group (p=0.645), zone 1 involvement was determined to be most frequent (65.2%) in good-vision group (p=0.046). Compared to group 1, group 2 had more frequent zone 1 involvement (39.8% vs 65.2%, p=0.038). Both zone 2 and zone 3 involvement rates of groups were similar (p>0.05). In intragroup comparison, the distribution of accompanying ocular findings at presentation was similar in each group (p>0.05). The presence of RAPD was significantly higher in poor-vision group than in good-vision group (44.4% vs 17.3%, p=0.037). There were no differences in rates of uveal tissue damage, lens damage, vitreous hemorrhage, retinal detachment and other rare findings such as hyphema between the groups (p>0.05). There were three cases (2.8%) with endophthalmitis in group 1, and none in group 2.

In intragroup comparison, while the distribution of injury causes was similar in poor-vision group (p=0.713), injury with metal objects was detected to be most frequent (51.3%) in good-vision group (p=0.035). Compared to group 1, group 2 had more frequent metal object injury (29.6% vs 51.3%, p=0.041). There were no differences in rates of injuries with broken glass, blunt objects, pen-pencil and unidentified objects between the groups (p>0.05). In intragroup comparison, the distribution of ocular findings at last visit was similar in each group (p>0.05). Posterior segment defect were found to be higher in group 1 than in group 2 (33.3% vs 15.7%, p=0.024). There were no differences in rates of eyelid disorders, corneal opacity, lens opacity, posterior capsule opacification and other rare findings such as glaucoma between the groups (p>0.05). There were three children (2.8%) with phthisis bulbi in poor-vision group, and none in good-vision group. Ocular trauma characteristics of groups were given in table 2.

In both groups, correlations between the final LVA with the age, time between trauma and surgery, OTS, injury size, follow-up time and initial LVA were investigated. In groups, the final LVA was negatively correlated with OTS (r=-0.398, p=0.037 for group 1; r=-0.369, p=0.040 for group 2), while positively correlated with injury size (r=0.412, p=0.031 for group 1; r=0.318, p=0.046 for group 2) and initial LVA (r=0.335, p=0.043 for group 1; r=0.402, p=0.034 for group 2). No correlations were detected between the final LVA with the age, time between trauma and surgery, and follow-up time in groups (p>0.05). Correlations between the final LVA and clinical characteristics were given in table 3.

Discussion

In literature, mean ages of children with OGI were stated as 6.6–11.6 years [1, 7, 11, 13, 18, 19]. In our study, mean ages were 9.0 ± 1.9 years in poor-vision group and 9.2 ± 2.0 years in good-vision group, and they were consistent with the literature. These ages are the time period at which children act independently without parental supervision. Therefore, children may be more prone to trauma during this period. The age less than 6 years old at presentation was reported to be associated with lower final visual acuity [19]. We found no correlation between the age and final visual acuity in both groups. Similarly, AlDahash et al. determined no relationship between the final visual acuity and age [18]. All cases in our study were 7 years of age or older at presentation, and this condition might be the reason why we could not find any correlation between the age and final visual acuity. Pediatric OGIs were detected with a higher rate (58–82%) in males [1, 10, 13, 18, 19]. In our study, rates of males were 68.5% in group 1 and 66.9% in group 2, and they were consistent with the literature. The reason for the higher rate of males may be that males are more active during games, sports or fights, and thus they may become more prone to trauma. In pediatric OGIs, the involvement rate of the right eye was reported to be similar to that of the left eye [5, 7, 19]. We also found no significant difference between the involvement rates of the right and left eyes.

In children with OGI, ensuring the globe integrity with surgery as soon as possible may be important in preventing the complications and blindness. In our study, time between trauma and surgery was similar in both groups, and surgical repairs of all cases were performed within the first 48 hours. We detected no correlation between time to surgery and final visual acuity in both groups. This result may be related to the relatively early surgical intervention. Similarly, Ozturk et al. determined no relationship between the final visual acuity and time to surgery [1]. In cases with ocular trauma, OTS is useful both in evaluating visual results and informing patients [16]. OTS was stated to have a sensitivity of 97.4% in predicting visual survival [20]. In our study, good-vision group had higher OTS than poor-vision group. Additionally, we found that final vision worsened as OTS decreased in both groups. In literature, the higher OTS at presentation was reported to be associated with the better final vision [1, 21].

In previous studies, pediatric cases were followed up between 11.1–21.7 months after OGI [1, 5, 18]. Our follow-up times were longer, and they were 32.7 ± 11.4 months in poor-vision group and 33.1 ± 12.2 months in good-vision group. Unlike previous studies [1, 5, 18], the effect of follow-up time on final visual acuity was also assessed in both groups in our study. We found no relationship between the final visual acuity and follow-up time in groups. The injury size may affect the course of wound healing and the final vision. AlDahash et al. stated that there was a better visual prognosis in OGIs smaller than 10 mm [18]. Ozturk et al. reported that large injury size indicated poor visual prognosis [1]. In our study, injury sizes were 10.4 ± 3.5 mm in poor-vision group and 5.8 ± 2.4 mm in good-vision group, and the difference was statistically significant. In addition, we found that final vision worsened as injury size increased in both groups. This result may be associated with the increases in both the inflammatory response and ocular complications after large OGIs.

In children with OGI, appropriate medical and surgical treatments may be beneficial in providing the visual improvement. In literature, after treatment the final visions were shown to be better than the initial visions in cases with OGI [1, 5]. Similarly, we determined that final visions were better than the initial visions in both groups. Additionally, initial visual acuity levels of patients with OGI may give an idea about their final visions. In our study, good-vision group had better initial and final visions compared to poor-vision group. Also, we detected that final vision worsened as initial vision worsened in groups. It was reported that low initial vision could create poor visual prognosis [1], while high initial vision could create good visual prognosis [18, 21].

Depending on the type of ocular injury, the visual prognosis may change. In literature, it was shown that the most common type of OGIs occurred as penetrating injury [5, 7, 21], and its frequency was 54.0-86.6% [1, 5, 11, 21]. In addition, penetrating injuries were reported to have better visual outcomes than the other injury types [9, 21]. In our study, penetrating injury was the most frequent injury type (72.2%) in good-vision group. We also found that good-vision group had more frequent penetrating injury (72.2% vs 45.4%) and less frequent globe rupture (17.4% vs 37.0%) compared to poor-vision group. OGI was stated to occur most frequently in zone 1 [1, 5, 11, 21]. Ozturk et al. determined no relationship between the injury localization and final vision [1]. However, Batur et al. showed that children with zone 1 involvement had better final visions [5]. Worse visual outcomes were reported in ocular injuries with the zone 3 involvement or the extending towards the posterior of the globe [22, 23]. In injuries involving the posterior of the globe, even if there is anatomical improvement, vision loss may be seen due to retinal or optic nerve damage [22, 24]. In our study, zone 1 involvement was the most frequent injury localization (65.2%) in good-vision group. We also found that good-vision group had higher zone 1 involvement (65.2% vs 39.8%) compared to poor-vision group.

Some accompanying ocular findings at presentation may have a negative effect on visual prognosis. The pupil status may be a guide in predicting the retinal or optic nerve function after eye injuries. The presence of RAPD in patients with ocular injury was stated to be an indicator of poor final vision [23, 25, 26]. Additionally, the presence of lens damage, vitreous hemorrhage, retinal detachment or endophthalmitis in ocular injury cases may indicate poor prognosis [1, 21]. We detected that poor-vision group had more frequent RAPD (44.4% vs 17.3%) compared to good-vision group. Also, there were three cases (2.8%) with endophthalmitis in poor-vision group, and none in good-vision group. However, in our study, rates of uveal tissue damage, lens damage, vitreous hemorrhage and retinal detachment were similar in both groups.

OGI was reported to occur most frequently with metal or sharp objects [9, 18, 21]. Depending on the causes of ocular injury, the clinical course may be affected. Injuries with sharp objects can cause less ocular damage as they can occur with lower energy. On the other hand, injuries with blunt objects can cause more severe ocular damage such as globe rupture, as they can require higher energy [21, 27, 28]. The visual prognosis was determined to be better in injuries with sharp objects [1]. In our study, injury with sharp metal object was the most frequent injury cause (51.3%) in good-vision group. We also found that good-vision group had more frequent sharp metal object injury (51.3% vs 29.6%) compared to poor-vision group. Despite appropriate and effective trauma management, low vision level may be permanent in children. Compared to adults, children were thought to be more prone to the development of complications because of the features of eye structures and the strong inflammatory responses [13, 18, 29]. It was reported that conditions such as corneal opacity [29, 30], lens opacity [31–33], posterior segment defects [13, 18, 34] or phthisis bulbi [13, 30] might occur after globe injuries in children. Eyelid disorders, corneal opacity, lens opacity, posterior capsule opacification, posterior segment defect and glaucoma were among the ocular findings detected at the last visit in our study. We found that poor-vision group had more frequent posterior segment defect (33.3% vs 15.7%) compared to good-vision group. Also, there were three children (2.8%) with phthisis bulbi in group 1, and none in group 2.

This study had some limitations. Data were collected retrospectively. Children aged 0–6 years were not included in this study, since their visual acuities could not be determined accurately during the admission and/or follow-up due to low cooperation. In summary, as far as we know, this is the first study investigating the effects of age, time between trauma and surgery, OTS, injury size, follow-up time and initial vision on final poor and good visions in detail after pediatric OGIs. In our study, low OTS, poor initial vision, globe rupture and RAPD were poor prognosis indicators, while small injury size, penetrating injury, zone 1 involvement and metal object injury were good prognosis indicators. Additionally, in both groups final vision worsened as OTS decreased, injury size increased, and initial vision worsened. There were no correlations between the final visual acuity with the age, time between trauma and surgery, and follow-up time in both groups. These prognostic factors may be useful in managing trauma and informing parents about the possible consequences.

Declarations

Consent to participate and consent to publish

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

Written informed consent was obtained from the parents.

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. This study was performed with approval of Izmir Tepecik Training and Research Hospital's Medical Research Ethical Committee (approval number: 2020/14-1) and in line with ethical principles of the Declaration of Helsinki.

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Conflict of interest: The authors report no conflicts of interest.

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [Hakan Öztürk] and [Bediz Özen]. The first draft of the manuscript was written by [Hakan Öztürk] and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Tables

Table 1. Clinical characteristics of the groups.

Clinical characteristics		Poor-vision group (Group 1, n=108) (Final LVA> 0.70) (Snellen VA< 20/100)	Good-vision group (Group 2, n=115) (Final LVA£ 0.70) (Snellen VA≥ 20/100)	p (intergroup comparison)
Age (year)		9.0 ± 1.9 (7-18)	9.2 ± 2.0 (7-18)	0.706[b]
Gender (n, %)		p=0.002[a] (intragroup comparison)	p=0.004[a] (intragroup comparison)	
	Male	74 (68.5%)	77 (66.9%)	0.927[a]
	Female	34 (31.5%)	38 (33.1%)	0.867[a]
Laterality (n, %)		p=0.751[a] (intragroup comparison)	p=0.708[a] (intragroup comparison)	
	Right	57 (52.8%)	55 (47.8%)	0.671[a]
	Left	51 (47.2%)	60 (52.2%)	0.729[a]
Time between trauma and surgery (hour)		23.6 ± 14.5 (6-48)	22.9 ± 13.2 (5-48)	0.687[b]
Ocular trauma score (1-5)		1.72 ± 0.53 (1-3)	3.73 ± 0.61 (3-5)	0.025[b]
Follow-up time (month)		32.7 ± 11.4 (6-69)	33.1 ± 12.2 (7-69)	0.472[b]
Injury size (millimeter)		10.4 ± 3.5 (5-14)	5.8 ± 2.4 (3-10)	0.002[b]
Visual acuity		p=0.039[c] (intragroup comparison)	p=0.023[c] (intragroup comparison)	
	Initial LVA (Snellen VA)	1.21 ± 0.26 (0.80-2.70) (20/324)	0.60 ± 0.28 (0.30-1.0) (20/80)	<0.001[b]
	Final LVA (Snellen VA)	1.00 ± 0.32 (0.76-3.00) (20/200)	0.30 ± 0.13 (0.10-0.70) (20/40)	<0.001[b]

Descriptive features were expressed as mean ± standard deviation (minimum-maximum) values

VA: Visual acuity, LVA: Logarithm of the minimum angle of resolution (LogMAR)-VA, n: Number of cases

[a] Chi-square test, [b] Mann-Whitney U test, [c] Wilcoxon test, $p < 0.05$ statistically significant.

Table 2. Ocular trauma characteristics of the groups.

Ocular trauma characteristics		Poor-vision group (Group 1, n=108) (Final LVA> 0.70) (Snellen VA< 20/100)	Good-vision group (Group 2, n=115) (Final LVA£ 0.70) (Snellen VA≥20/100)	P (intergroup comparison)
Types of injury (n, %)		p=0.492[b] (intragroup comparison)	p=0.031[b] (intragroup comparison)	
	Penetrating injury	49 (45.4%)	83 (72.2%)	0.044[a]
	Globe rupture	40 (37.0%)	20 (17.4%)	0.015[a]
	Perforating injury	10 (9.3%)	6 (5.2%)	0.277[a]
	Intraocular foreign body injury	9 (8.3%)	6 (5.2%)	0.386[a]
Zones of injury (n, %)		p=0.645[b] (intragroup comparison)	p=0.046[b] (intragroup comparison)	
	Zone 1	43 (39.8%)	75 (65.2%)	0.038[a]
	Zone 2	39 (36.1%)	26 (22.6%)	0.123[a]
	Zone 3	26 (24.1%)	14 (12.2%)	0.074[a]
Accompanying ocular findings at presentation (n, %)		p=0.578[b] (intragroup comparison)	p=0.613[b] (intragroup comparison)	
	Uveal tissue damage	42 (38.8%)	34 (29.5%)	0.351[a]
	Relative afferent pupil defect	48 (44.4%)	20 (17.3%)	0.037[a]
	Lens damage	19 (17.6%)	15 (13.0%)	0.482[a]
	Vitreous hemorrhage	32 (29.6%)	24 (20.8%)	0.273[a]
	Retinal detachment	14 (12.9%)	6 (5.2%)	0.085[a]
	Other rare findings	7 (6.5%) [4 + 3]	5 (4.3%) [5 + 0]	0.502[a]

	[hyphema + endophthalmitis]			
Causes of ocular injury (n, %)		p=0.713[b] (intragroup comparison)	p=0.035[b] (intragroup comparison)	
	Metal objects (fork, knife, needle)	32 (29.6%)	59 (51.3%)	0.041[a]
	Broken glass	23 (21.3%)	21 (18.3%)	0.639[a]
	Blunt objects (ball, punch)	20 (18.5%)	16 (13.9%)	0.427[a]
	Pen-pencil	18 (16.7%)	11 (9.6%)	0.166[a]
	Unidentified	15 (13.9%)	8 (6.9%)	0.125[a]
Ocular findings at last visit		p=0.394[b] (intragroup comparison)	p=0.107[b] (intragroup comparison)	
	Eyelid disorders	34 (31.5%)	31 (26.9%)	0.680[a]
	Corneal opacity	43 (39.8%)	48 (41.7%)	0.847[a]
	Lens opacity	17 (15.7%)	19 (16.5%)	0.887[a]
	Posterior capsule opacification	13 (12.0%)	9 (7.8%)	0.466[a]
	Posterior segment defect	36 (33.3%)	18 (15.7%)	0.024[a]
	Other rare findings [glaucoma + phthisis bulbi]	8 (7.4%) [5 + 3]	7 (6.1%) [7 + 0]	0.708[a]

VA: Visual acuity, LVA: Logarithm of the minimum angle of resolution (LogMAR)-VA, n: Number of cases

[a] Chi-square test, [b] Kruskal-Wallis test for intragroup comparison, $p< 0.05$ statistically significant.

Table 3. Correlations between the final LVA and clinical characteristics for the groups.

Clinical characteristics	Final LVA in poor-vision group (group 1)		Final LVA in good-vision group (group 2)	
	r	p	r	p
Age	-0.052	0.716	-0.081	0.648
Time between trauma and surgery	0.254	0.148	0.185	0.293
Ocular trauma score	-0.398	0.037	-0.369	0.040
Injury size	0.412	0.031	0.318	0.046
Follow-up time	0.097	0.594	0.072	0.711
Initial LVA	0.335	0.043	0.402	0.034

LVA: Logarithm of the minimum angle of resolution (LogMAR)-visual acuity,

r: Spearman’s correlation coefficient, $p < 0.05$ statistically significant.