



War-related ocular injuries in Damascus during the Syrian Crisis

Ammar Hamzeh^a, Rita Ayoub^c, Sameh Issa^a, Nawras Alhalabi^{a,b}, Bisher Sawaf^{b,e}, Fatima Mohsen^b, Hazem Issa^a, Mohammad Ayham Mohsen^b, Mohamad Nasser Khattab^b, Gabriel Thomas^b, Mhd Basher Aljammal^a, Mosa Shibani^b, Mhd Amin Alzabibi^b, Hlma Ismail^b, Farah Hamzeh^a, Osama Almoree^d, Ahmad Al-Moujahed^f, Salim Saba^{c,*}

^a Department of Ophthalmology, Faculty of Medicine, Damascus University, Damascus, Syria

^b Faculty of Medicine, Syrian Private University, Damascus, Syria

^c Department of Surgery, American University of Beirut Medical Center (AUBMC), Beirut, Lebanon

^d Department of Ophthalmology, Damascus Hospital, Damascus, Syria

^e Department of Internal Medicine, Hamad Medical Corporation, Doha, Qatar

^f Byers Eye Institute, Department of Ophthalmology, Stanford University, Palo Alto, CA, United States

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ABSTRACT

Background: . Ocular injuries constitute a major cause of visual morbidity, and they have a significant socioeconomic impact worldwide. We aimed to document the types and causes of Syrian War related ocular injuries in Damascus, Syria.

Methods: . Medical records were retrospectively reviewed to evaluate all patients in Al-Mouwasat University Hospital and Damascus Hospital, whose ocular injuries were caused by war-related activities during the period extending between January of 2016 and December 2017.

Results: . 150 eye injuries in 127 patients were reviewed, in which 46 (31%) were bilateral and 87 (58%) were open globe injuries. The leading cause of the observed ocular injuries was improvised explosive devices (IED) [37 eyes (41%)]. The majority of patients presented with an initial best corrected visual acuity (BCVA) of “light perception” (LP) to “hand movement” (HM) [51 eyes (34%)]. Information on the final BCVA was available for 69 injured eyes only, and it was “no light perception” (NLP) in 20 eyes (29%).

Conclusion: . Explosive weaponry is the main culprit in most war-related ocular injuries in Syria. The high incidence of open globe injuries caused many of the cases to be severe in nature. Education on the precautionary measures that protect the eyes such as the use of combat eye protection during wartimes ought to be enforced, so that future ocular injuries can be prevented.

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Introduction

Ocular injuries constitute a major cause of visual morbidity, and they have a significant socioeconomic impact worldwide [1]. Over 1.6 million people become monocular blind from ocular injuries each year [2]. Ocular injuries account for approximately 10% of all

battle injuries and are a cause of morbidity in 28% of blast survivors [3,4].

Modern wars have witnessed an improvement in weapon technology with the introduction of high-velocity projectiles and explosive weapons [5,6]. In fact, the United States Army has reported that by 1980, the modern warfare had become 400–700% more powerful and lethal than what was available during World War II [7]. Upon blasting, explosive weapons send out large amounts of fragments of different sizes at high velocities [4]. Although the eyes constitute 1/375 of the body surface, they are highly susceptible to injury, as the smallest particle can easily lacerate or rupture the eyes [4,8]. As a result, the incidence of ocular injuries has increased with each succeeding modern-time war, and warfare ocular injuries became the leading cause of blindness [7,9].

The ongoing conflict in Syria since 2011 is no different than previous wars in terms of employing advanced explosive weaponry

Abbreviations: IED, improvised explosive devices; BCVA, best-corrected visual acuity; LP, light perception; NLP, no light perception; HM, hand movement; IOFB, intraocular foreign bodies; IRB, institutional review board; SPSS, statistical package for the social sciences; SD, standard deviation; CT, computed tomography; MR, magnetic resonance; US, ultrasonography.

* Corresponding author at: Department of Surgery, American University of Beirut Medical Center, Lebanon.

E-mail address: ss192@aub.edu.lb (S. Saba).

[10]. In Damascus and Rural Damascus, a minimum of 94,792 explosive weaponry use was recorded in 16,147 conflict events between 2013 and 2019 [11]. Hence, ocular injuries are expected to be frequently encountered among the Syrian casualties.

This study documents all Syrian War related ocular injuries admitted to the two major hospitals in Damascus between 2016 and 2017. Previous studies on ocular injuries during the Syrian civil war were limited to specific types of this injury [6,12]. To our knowledge, our study is the first to provide a comprehensive view of all types of ocular injury that resulted from combat activities during the Syrian War. Our results provide ophthalmologists with preliminary information on the nature of damage in the human eye in conflict situations, so they are better informed when diagnosing or treating such cases.

Methods

This was a non-comparative retrospective study, which included all patients who presented to the emergency or outpatient department of Al Mouwasat University Hospital and Damascus Hospital, and who had sustained ocular injury caused by war-related activities in Syria in the period extending between January 2016 and December 2017.

Al Mouwasat University Hospital and Damascus Hospital are major central hospitals in Damascus that attract the majority of the emergency and referral cases from both Damascus City and Rural Damascus governorates. The study was approved by both Damascus University Ethical Committee and Damascus Hospital Institutional Review Board.

Data collected, when available, included demographic data (age, gender, occupation, education), the involved eye(s), the type of injury (open vs closed), mode of injury, zones of ocular injury, concomitant non-ocular injuries, the initial visual acuity at presentation and the final visual acuity at follow-up. Information on the injury circumstances included the etiology of injury, the physical setting of the injury, and the duration between the injury and presenting to the hospital. The types of ocular injury were classified using the Birmingham Eye Trauma Terminology System, and the zones of ocular injury were characterized using the Ocular Trauma Classification System [13,14]. Initial and final decimal Snellen best corrected visual acuity (BCVA) was categorized as No Light Perception (NLP), Light Perception (LP) to Hand Movement (HM), <0.1, 0.1–0.4, and ≥0.5. Visual outcome was defined as poor if BCVA was <0.1 [15]. Patients who were dead on arrival to the hospital, who died before being examined by an ophthalmologist, or whose level of consciousness was reduced to the point that they could not be reliably examined were excluded from the study.

Data was entered using Microsoft Office Excel 2016 (Microsoft Corporation, Redmond WA) and statistical analysis was carried out using SPSS V25.0 (SPSS, Chicago, Illinois, USA). Continuous data was presented as mean and standard deviation (SD), and categorical data was described using frequencies and percentages. The association between categorical variables was analyzed using Chi-square (χ^2) test for nominal variables, Spearman correlation test for ordinal variables, and Kruskal–Wallis χ^2 -test for nominal and ordinal variables. Statistical significance was set at $p < 0.05$.

Results

Demographic and socioeconomic data

This study included a total of 150 injured eyes from 127 patients. 98 patients (77%) were males, and the mean age of the sample was 24.9 years (SD 15.5) (range: 1–71 years), of which 46 patients (36%) were less than 18 years old. The majority of patients [$n=65$ (51%)] had middle school or primary school education while

Table 1
Demographic and socioeconomic characteristics of the study sample (Number of patients = 127).

	Mean	S.D
Age (years)	24.9	15.5
	n	%
Gender		
Male	98	77
Female	27	23
Education		
Graduate or postgraduate	19	15
High school	43	34
Middle school or primary school	65	51
Occupation		
Professional	13	10
Semi-professional	35	28
Unskilled worker or unemployed	79	62

S.D: Standard deviation %: Percentage

Table 2
Characteristics of the ocular injuries.

	Frequency	%
Number of injured eyes	150	100
Involved eye(s)		
Right eye	58	38
Left eye	46	31
Bilateral	46*	31
Type of ocular injury		
Open globe	87	58
Closed globe	63	42
Mode of injury		
Open globe	87	100
Penetration	21	24
Perforation	10	12
IOFB**	45	52
Rupture	11	13
Closed globe	63	100
Superficial lacerations	29	46
Conjunctival injury	17	27
Partial thickness corneal or scleral wound	11	17
Foreign body on eye surface	6	10

%. Percentage.

* 46 eyes in 23 patients with bilateral ocular injury.

** IOFB: Intra-ocular foreign body.

only 19 patients (15%) had received graduate or postgraduate education. Similarly, 79 patients (62%) were unskilled or unemployed while only 13 patients (10%) had a professional occupation. Additional details are found in Table 1.

Characteristics of the ocular injuries

In all, 58 injuries (38%) involved the right eye, and 46 (31%) affected the left eye. In addition, 23 patients (18%) sustained bilateral injuries that affected 46 eyes (31%). Open globe injuries involved 87 eyes (58%), while the remaining 63 eyes (42%) sustained closed globe injuries. Most of the open globe injuries were intraocular foreign bodies (IOFB) [45 eyes (52%)], while the most common closed globe injury was superficial lacerations [29 eyes (46%)] (Table 2).

Regarding the zones of ocular injury, one zone was affected in 49 eyes (56%) with open globe injuries and 33 eyes (52%) with closed globe injuries. The most affected zone in open globe injuries was zone I [29 eyes (33%)] followed by “zone I + zone II” [26 eyes (30%)]. In closed globe injuries, the most affected zone was also zone I [15 eyes (24%)] followed by all zones [14 eyes (22%)]. Additional information on the zones of ocular injury is available in Table 3.

In addition to ocular injuries, injury to other organs was common. 151 non-ocular injuries were observed in concomitance with 75 injured eyes (50%). Of these, 18 eyes (24%) and 57 eyes (76%)

Table 3
Distribution of the zones of ocular injury.

	Open globe injury [87 eyes (100%)]		Closed globe injury [63 eyes (100%)]	
	Frequency	%	Frequency	%
Zone I ^a	29	33	15	24
Zone II ^b	9	10	7	11
Zone III ^c	11	13	11	18
Zone I + Zone II	26	30	12	19
Zone II + Zone III	5	6	4	6
All zones (Zone I + Zone II + Zone III)	7	8	14	22

^a Zone I: The cornea (including corneoscleral limbus).

^b Zone II: Corneoscleral limbus to a point 5mm posterior into the sclera.

^c Zone III: Posterior to anterior 5mm of sclera^{a,b,c}. Adapted from Islam et al (2016). Functional and anatomical outcome in closed globe combat ocular injuries%: Percentage.

Table 4
Distribution of non-ocular injuries among injured eyes (75 eyes).

	Frequency	%
Concomitant non-ocular injuries	151	100
Cranial injuries	41	27
Maxillofacial injuries	28	18
Thoracic injuries	17	11
Abdominal injuries	13	9
Tympanic membrane injuries	21	14
Extremity fractures	13	9
Vascular injuries	15	10
Urogenital injuries	3	2

#: Percentage

Table 5
Circumstances of the ocular injury.

	Frequency	%
Cause of injury (90 eyes) ^d		
Mortar/rocket	18	20
Mine	21	23
IED	37	41
Hand grenade	4	4.5
Car bomb	4	4.5
Gunshot	6	7
Physical setting of the injury (n=112 patients) ^e		
Home	41	37
Street	40	36
Open spaces	23	20
Inside of a vehicle	8	7
Duration between ocular injury and presentation to hospital (n=127 patients)		
<24 hours	108	85
24 to 48 hours	10	8
>48 hours	9	7

^d Data on the cause of ocular injury was available for 90 eyes

^e Data on the physical setting of the ocular injury was available for 112 patients%: Percentage.

were accompanied with one non-ocular injury and multiple non-ocular injuries, respectively. Cranial injuries constituted the majority of these cases [41 eyes (27%)] followed by maxillofacial injuries [28 eyes (18%)] (Table 4).

Circumstances of the ocular injury

The cause and physical settings of the ocular injury, in addition to the duration between the ocular injury and presenting to the hospital are presented in Table 5. Information on the cause of ocular injury was available for 90 eyes. The leading cause was improvised explosive devices (IED) [37 eyes (41%)] followed by mines [21 eyes (23%)] and rockets/mortars [18 eyes (20%)]. In total, IED caused 40.7% of the open globe injuries and 41.7% of the closed globe injuries with no significant difference (Pearson Chi-

Table 6
Initial and final best corrected visual acuity of the study sample.

	Initial BCVA ^{***} (150 eyes)		Final BCVA (69 eyes)	
	Frequency	%	Frequency	%
NLP ^f	42	28	20	29
LP to HM ^g	51	34	17	25
>0.1	20	13	14	20
0.1-0.4	19	13	9	13
≥0.5	18	12	9	13

*** BCVA: Best corrected visual acuity.

^f No light perception.

^g Light perception to hand movement%: Percentage.

square=0.008, df=1, p=0.93). Other causes included gunshot [6 eyes (7%)], hand grenades [4 eyes (4.5%)], and car bombs [4 eyes (4.5%)]. Information on the physical setting of the ocular injury was available for 112 patients. Most of the patients were injured at home [n = 41 (37%)] or on the street [n = 40 (36%)]. Other settings included open places [n=23 (20%)] and inside a vehicle [n=8 (7%)]. Finally, the duration between the ocular injury and presenting to the hospital was less than 24 hours in 108 eyes (85%), 24 to 48 hours in 10 eyes (8%), and greater than 48 hours in 9 eyes (7%).

Best corrected visual acuity (BCVA)

The initial BCVA was “no light perception” (NLP) in 42 eyes (28%), “light perception” (LP) to “hand movement” (HM) in 51 eyes (34%), <0.1 in 20 eyes (13%), between 0.1 and 0.4 in 19 eyes (13%), and ≥0.5 in 18 eyes (12%). Unfortunately, the final BCVA was only available for 69 injured eyes, and it was NLP in 20 eyes (29%), LP to HM in 17 eyes (25%), <0.1 in 14 eyes (20%), between 0.1 and 0.4 in 9 eyes (13%), and ≥0.5 in 9 eyes (13%) (Table 6). Twenty four hours after presenting to the hospital, final BCVA was better than initial BCVA in 27 eyes (39%) indicating improved vision, worse than initial BCVA in 13 eyes (19%) indicating deteriorated vision, and same as initial BCVA in 29 eyes (42%) indicating no change in vision status (Table 7). When examining the factors that affect the final BCVA, the results showed that there was a positive correlation between initial and final BCVA (Spearman’s r = 0.67, p<0.001). In addition, the type of ocular injury (open globe vs. closed globe) was significantly associated with final BCVA. The results showed that final BCVA was lower in open globe injuries compared to closed globe injuries, as 86.7% of the eyes with open globe injuries had final BCVA <0.1 [NLP (36%), LP to HM (29%), <0.1 (22%)], while 50% of the eyes with closed globe injuries had final BCVA <0.1 [NLP (17%), LP to HM (17%), <0.1 (17%)] (Kruskal-Wallis H=8.25, df=1, p=0.004). Finally, the number of ocular zones involved in the injury (one ocular zone vs. two or three ocular zones) was significantly associated with final BCVA. Final BCVA was poorer in eyes with injuries involving two or three ocular zones compared to eyes

Table 7
Best corrected visual acuity (BCVA^h) of the study sample following injury (initial BCVA) and 24 hours after presenting to the hospital (final BCVA) (69 eyes).

		Final BCVA				
		NLP	LP to HM	<0.1	0.1-0.4	≥0.5
Initial BCVA	NLP ⁱ	12 (17%)	9 (13%)	2 (3%)	1 (1.5%)	0 (0%)
	LP to HM ^j	8 (11.5%)	6 (9%)	7 (10%)	3 (4%)	0 (0%)
	<0.1	0 (6%)	0 (0%)	4 (6%)	1 (1.5%)	2 (3%)
	0.1-0.4	0 (0%)	2 (3%)	1 (1.5%)	2 (3%)	2 (3%)
	≥0.5	0 (0%)	0 (0%)	0 (0%)	2 (3%)	5 (7%)

^h Best Corrected Visual Acuity.

ⁱ No light perception.

^j Light perception to hand movement%: Percentage.

with injuries involving one ocular zone. The results showed that 88% of eyes with injuries involving two or three ocular zones had final BCVA <0.1 [NLP (27%), LP to HM (31%), <0.1 (22%)] while 70% of eyes with injuries involving one ocular zone had final BCVA <0.1 [NLP (30%), LP to HM (18%), <0.1 (22%)] (Kruskal-Wallis H=60.44, df=1, p<0.001).

Discussion

In this study, we described war-related ocular injuries during the Syrian Crisis. Another study that investigated the same topic was conducted by Özal et al in 2015, and it described war-related open globe ocular injuries among Syrian anti-regime forces and civilians [6]. The majority of patients in our study were males (77%). This result is in agreement with, however less than, what was reported in previously published studies that helped establish male predominance in war-related ocular injuries [16–23]. In specific, the percentage of males reported by Özal et al. was 87% [6]. Among army personnel, male predominance can be explained by the fact that men are more likely to be assigned to combat units than females [24]. Among civilians, males are more susceptible to ocular injuries since they tend to leave their homes more than females [25]. Next, the mean age of our sample was 24.9 years, which was consistent with similar studies including that conducted by Özal et al. [6,18–20,26]. Moreover, 36% of our population were minors, which partially explains the high percentage of patients that had intermediate or primary education (51%), were unskilled or unemployed (62%), and were injured at home (37%).

Our results showed that the right eye was injured more than the left eye (38% vs 31%). Several studies had similar findings [5,18,22,23,26,27], while other reports described a higher rate of war-related injury in the left eye [5,19,21,28]. Özal et al. reported that 47% of the injuries were to the left eye [6]. Moreover, Mansour et al., who studied ocular injuries during the Lebanese Civil War, found that the majority of the injuries were to the left eye (42%) [19]. As for bilateral injuries, studies show that they occur at a higher rate in wartimes compared to peacetime. On average, about 15–25% of the total number of war-related ocular injuries are expected to be bilateral [29]. However, rates as high as 73% have been documented in the literature [16]. In our study, 18% of the patients had bilateral ocular injuries, and our results fall within the aforementioned range and indicate a high rate of bilateral injuries in our sample. In contrast, Özal et al. reported a lower rate of bilateral injuries among Syrian war casualties at 10% [6]. This discrepancy could be explained by the fact that Özal and their colleagues included only open globe injuries in their study, whereas our study examined both open and closed globe injuries.

In wartimes, open globe injuries are more frequent than closed globe injuries [27], and our results were in consensus with this statement, as 58% of the injuries were open globe. Similar findings were reported by Thach et al. and Plestina-Borjan et al. [5,22].

Thach et al. observed that 54% of wartime ocular injuries sustained by 797 patients during the Iraqi War in 2003 were open globe [22]. In contrast, other studies indicated a higher incidence of war-related closed globe injuries [21,23]. In our study, IOFB was the most common type of injury accounting for 52% of the open globe injuries. Interestingly, our results were very similar to those reported by Özal et al. (51%) [6]. Mansour et al. also noted a high prevalence of IOFB among the Lebanese Civil War casualties (43%) [19]. In general, studies indicate that IOFB injuries are very common in modern war settings, with rates as high as 85% reported in some Middle Eastern conflicts [6,7]. The second most common open globe injury in our study was penetrating injury (24%). The same observation was made by Özal et al. (23%) and Mansour et al. (35%) [6,19]. The main cause of both types of injury are projectiles and fragments from explosive weapons [7]. As explosive weapons are key players in the Syrian war [10], this might explain the high incidence of open globe injuries.

The direct approach to diagnose ocular injuries is clinical examination. However, this may prove to be difficult in case of war-related ocular injuries as these are often associated with periorbital soft-tissue swelling and other body injuries. Moreover, oftentimes the patient is either unresponsive or uncooperative. Under these conditions, imaging is often used to assess the extent of the ocular trauma [30]. Computed Tomography (CT) is the technique of choice for the initial examination of ocular injuries. It is an easily accessible modality that offers high-quality resolution of orbital bones and ocular soft tissue and detects and localizes IOFB with high precision [2,31]. However, the major disadvantage of CT is its use of ionizing radiation [2]. Magnetic Resonance (MR) is also used in ocular injury examination, and it provides excellent definition of ocular tissues without the use of ionizing radiation. Yet, it is not always accessible, and its use is contraindicated in cases where IOFB is suspected. Finally, Ultrasonography (US) is a readily available technique that depicts several ocular injuries including IOFB without using ionizing radiation. However, it is not recommended in cases of global rupture [2,30].

Zones of ocular injury are very important in ocular injury assessment, as they play a key role in predicting the final visual outcome [32,33]. The zone of ocular injury reported to be most affected in war-related ocular injuries is zone III [27]. Özal et al. noted that 44% of the studied open ocular injuries were in Zone III [6]. Islam et al. observed that 51% of the closed globe injuries they examined were in zone III [27]. Our results did not align with these reports, as in cases where only one zone was involved, zone I was most affected in both open globe (33%) and closed globe (24%) injuries. Nevertheless, our observations validated the numerical simulations of ocular injury that were established by Karimi et al. In 2016, the authors used a three-dimensional computational dynamic anatomical based fluid-structure interaction model to compute the stresses and deformations of all human eye components due to primary blast waves of high detonation explosives. Their results showed that the highest levels of stress were in the cornea

(Zone I) and sclera (Zone II), while the lowest levels of stress were recorded in the vitreous and aqueous humour (Zone III) [34]. In 2018, similar results were obtained when the authors used the same computational model to calculate the stress and strain in all ocular components in response to collision of glass shards with the eye. The numerical simulation revealed that the highest level of stress was in the cornea, while the vitreous body showed the lowest level of stress [1]. These results reflect the importance of computational models in predicting the patterns of ocular injury and helping ophthalmologists prevent serious injuries to the eye.

War-related ocular injuries are oftentimes accompanied with systemic injuries [27]. In our study, 50% of the ocular injuries were accompanied with injuries in other body parts. Studies show that the face followed by the extremities are the most affected body parts [27]. Mansour et al. found that 56% of the non-ocular injuries were in the face, while 26.5% were in the extremities [19]. Unlike these reports, our results showed that cranial injuries were the most common non-ocular injuries (27%) followed by maxillofacial injuries (18%), while only 9% of the injuries were in the extremities. Perhaps studying the circumstances surrounding the injuries in our sample might explain the disparity between our results and what is reported in the literature. Unfortunately, such details were not available in the medical records.

In modern wars, the used explosive weapons encompass devices such as mines, grenades, bombs, IED, rockets, and mortars [5,35]. In our study, most ocular injuries were caused by IED (41%), which is consistent with several other studies. [16,20,21,27]. Mader et al. studied 251 ocular injuries sustained during the Iraqi war in 2004, and they noted that IED were responsible for 54% of these cases [20]. The flying fragments that result from the explosion of IED are responsible for the damage inflicted on the eyes [6]. IED cause considerable damage to the eyes, which results in the majority of IED-caused ocular injuries being open globe [16]. However, our results did not support this observation, as there was no significant difference in the incidence rates of open globe injuries and closed globe injuries caused by IED. Having information on the distance between the ocular injury patient and the exploding IED as well as the direction they were facing can be helpful in explaining how each injury was sustained as a result of IED explosion.

When assessing ocular injuries, it is very crucial to determine the initial visual acuity at presentation, as it is considered the “vital sign” of the eye and plays a key role in predicting the final visual acuity following treatment [4]. Indeed, our results have shown a significant association between initial and final BCVA, and the same was reported by Islam et al. [26,27]. War-related ocular injuries are characterized by a poor initial BCVA categorized as <0.1 [28]. In our study, 75% of the injured eyes had initial BCVA <0.1 [NLP (28%), LP to HM (34%), <0.1 (13%)]. Other studies reported an incidence of initial BCVA <0.1 that ranged between 44% and 83% [21,23,26–28]. Another characteristic of war-related ocular injuries is poor visual outcome [26]. Our results showed that 74% of the injured eyes had final BCVA <0.1 [NLP (29%), LP to HM (25%), <0.1 (20%)]. This number is higher than what was reported by Islam et al. (55%) and Moreno et al. (31%) [23,26,27]. One factor that contributes to poor visual outcome is open globe injury [26]. In our study, the type of injury (open globe vs. closed globe) was significantly associated with final BCVA, and 87% of the cases with final BCVA <0.1 were open globe injuries. However, this number was lower than what was reported by Özal et al., as 95% of their open globe injury cases had final BCVA <0.1 [6]. Zones of ocular injury are also associated with poor visual outcome [26]. Our results support this notion, as we noted an association between the zones of ocular injury and the final BCVA, with eyes sustaining injuries in two or three ocular zones having poor final BCVA (<0.1).

Finally, the manner in which war-related ocular injuries are managed directly after they occur greatly affects the final visual

outcome. Several studies have published guidelines on the immediate care for war-related ocular injuries. To begin with, BCVA of both eyes must be assessed to learn about the severity of the injury and whether it requires immediate evacuation. Then, both eyes as well as the adnexal structures must be examined to assess the injuries. Any contact lenses or foreign bodies that are sticking to the eye should not be removed. However, their presence should be documented [36]. Prophylactic broad-spectrum systemic antibiotics must be administered with tetanus prophylaxis to stop any potential infection. The last step is to protect the injured eye using an eye shield, while making sure not to apply any pressure on the eye that may cause the expulsion of the eye components. Finally, the patient must be evacuated to a medical facility with a well-equipped ophthalmology department [37]. It is preferred that evacuation and treatment take place within 24 hours following the injury, as early treatment significantly improves the final visual outcome [38].

The major limitation of this study is its retrospective nature with some of the information missing from the records such as cause of injury, physical setting of the injury, circumstances surrounding the injury, treatment details, and final visual acuity. Moreover, we could not divide the patients into civilians and military personnel due to lack of information, which prevented any possible comparative analysis.

In conclusion, ocular injuries have devastating consequences on the affected individuals, with the latter rendered unfit to work in the majority of the available occupations [10]. When projecting the numbers on the excess of 1.5 million people who have been wounded in the Syrian war so far [39], we can expect that the number of war-related ocular injuries is significantly large in the Syrian population. Explosive weaponry is the main culprit in the majority of the Syrian war ocular injuries, and the majority of the cases are severe in nature as evidenced by the high incidence of open globe injuries. Military personnel, as well as civilians, should be educated on the precautions and measures that protect the eyes during wartimes, so that future ocular injuries can be prevented.

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Availability of data and materials

All data supporting this paper's conclusion are available and stored by the authors. The data are available from the corresponding author on a reasonable request.

Ethics approval

This study was approved by the Damascus Hospital Institutional Review Board and the Syrian Private University Ethical Committee.

Declaration of Competing Interest

None

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