

Evaluation of Ocular Trauma Applying to Emergency Department Due to Explosion Injuries

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ABSTRACT

Purpose: The aim was to evaluate the demographic and clinical data of patients who presented to Azez Vatan and Çobanbey Hospitals between 2019 and 2020 due to ocular trauma resulting from an injury with explosive weapons.

Materials and Methods: Patients of all ages who had mono ocular trauma as a result of explosive weapon injury and underwent emergency surgery between January 1, 2019 and December 31, 2020 were included in the study. Demographic characteristics, best corrected visual acuity (BCVA) and anterior segment examinations of the patients were evaluated. Surgical technique and follow-up times were also evaluated.

Results: 201 patients who were injured in only one eye were included in the study. 69(34.3%) of the patients were female, 132 (65.7%) were male and the mean age was 32.11-21.25 years. Full thickness corneal perforation was found in 77 patients (38.3%), traumatic cataract in 79 patients (39.3%), vitreous hemorrhage in 54 patients (27.7%) and retinal detachment in 116 patients (57.7%). After the initial examination in the emergency department, 81 (40.3%) cataract, 30 (14.9%) keratoplasty and 90 (44.8%) vitrectomy surgeries were initially performed.

Conclusion: Our study shows that visual acuity increases after surgeries performed for war-related ocular injuries in the region. However, these visual gains will increase if surgical conditions are improved to a better level.

Keywords: Emergency Department, Explosion Injuries, Ocular Trauma, Syria.

INTRODUCTION

Ocular injuries are a major cause of visual morbidity and have a significant socioeconomic impact worldwide.¹ More than 1.6 million people become monocular blind each year due to eye injuries.² The most common causes of ocular injuries are in or out-of-vehicle traffic accidents, gunshot wounds, and workplace injuries.^{3, 4} In the war zone, as expected, injuries from explosive weapons are the most common cause.^{2, 5}

Recently, developments in the technology of explosive materials and high-velocity projectiles have emerged as part of modern warfare.^{6, 7} The increase in mortality and morbidity in people exposed to these materials on the battlefield is a dramatic consequence of this modern war. Ocular and ocular adnexal injuries, which can occur along with other organ and extremity injuries, cause severe visual impairment.⁸

Ocular injuries account for approximately 10% of all combat injuries and 28% of blast survivors have ocular

morbidity.^{6, 9} Most ocular warfare injuries in combat result from fragmentation munitions such as improvised explosive devices (IEDs), rocket-propelled grenades (RPGs), grenades and conventional munitions including mortar fragments and land mines. Although these fragmentation munitions generally target the extremities, they also cause a disproportionate amount of eye trauma. The ocular region accounts for 0.27% of the body surface area, 0.54% of the anterior body surface area, and 4.0% of the face. However, the incidence of ocular injury on a battlefield is 20-50 times higher than would be expected based on surface area.^{10, 11}

In the last 20 years, Middle East has been a region on the world's agenda with increasing internal conflicts. Since the spring of 2011, Syria in the Middle East has been one of these dramatic regions. Although safe zones are being established with the support of neighboring countries and the United Nations, civilian injuries from terrorist bombings in settlements are occurring. However, the war in the region has also affected hospitals in Syria. It

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has been found that at least 57% of public hospitals have been damaged since the war began, 37% are out of service and at least 50% of health workers have left the country. Turkey, Syria's longest border neighbor, launched the Peace Operation in 2019 with the approval of United Nations. This operation paved the way for the construction of new hospitals to meet the needs of the region, as well as the renovation of damaged hospitals in regions liberated from terrorism. While patients were referred to neighboring countries due to the damaged hospitals, in 2019 and 2020, the number of referrals abroad decreased as the number of functional hospitals in the region increased, and qualified health services began to be provided in regional hospitals.

In this study, we aimed to evaluate the demographic and clinical data of patients who presented to Azez Vatan and Çobanbey hospitals due to ocular trauma resulting from explosive weapon injury between 2019 and 2020.

MATERIALS AND METHODS

This is a retrospective study in which patients with blast-induced ocular trauma were evaluated. Patients of all ages who had mono ocular trauma resulting from explosive exposure and underwent emergency surgery in the emergency departments of Azez Vatan Hospital and Çobanbey Hospital in Northwest Syria between January 1, 2019 and December 31, 2020 were included in the study. Our study does not include patients who presented to the emergency department and did not undergo surgery. Since patients admitted to hospitals with bilateral eye trauma are referred, our study does not include these patients with bilateral eye trauma. Patient data were obtained from the emergency department admissions and hospital archives of these two hospitals.

In addition to patient demographic characteristics, best corrected visual acuity (BCVA) at initial admission and postoperative follow-up was evaluated using the Snellen chart. Anterior segment examinations, biomicroscopic examinations and posterior segment examinations were performed with noncontact 90 D lenses after pupillary dilation. In patients whose posterior segment could not be evaluated with the biomicroscope, B-mode ultrasonography was performed. Surgical technique and follow-up times were evaluated.

Approval of our study was granted on "14/01/2021" by the Ethics Committee of Hatay Mustafa Kemal University for non-interventional research.

Statistical Package for the Social Sciences (SPSS) package program was used for statistical analysis. In descriptive statistics, frequency and percentage were used for categorical data and mean and standard deviation for numerical data. The chi-square test was used in the analysis

of categorical data, the non-parametric Mann-Whitney U test was used in the analysis of numerical data, and the analysis of variance and the Bonferroni-corrected Mann-Whitney U test were used in the analysis of groups of three or more. Statistically, $p < 0.05$ was considered significant.

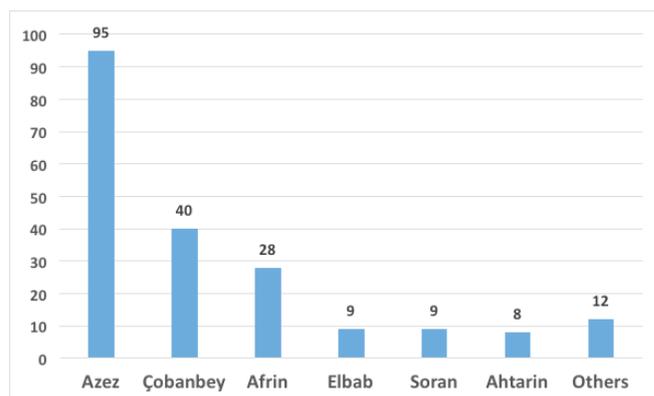
FINDINGS

201 eyes of 201 patients with ocular trauma who had blast injuries and underwent emergency surgery were included in the study. Since patients with bilateral eye trauma were referred, our study did not include patients with bilateral eye trauma. Of the patients, 82 (40.8%) were admitted in 2019 and 119 (59.8%) in 2020 for ocular trauma. Sixty-nine patients (34.3%) were female and 132 (65.7%) were male. The mean age was 32.11-21.25 (1-90) years. The number of pediatric patients (0-18 years) with blast ocular trauma accounted for one third of all patients ($n=66$, 33%). Elderly patients (> 65 years) accounted for 8% ($n=16$) of the patients included in the study (Table 1). Most patients were from Azez ($n=95$) and Çobanbey ($n=40$) regions (Graph).

The initial examination of patients in the emergency department by ophthalmologists, full-thickness corneal perforation was detected in 77 (38.3%) patients, traumatic cataract was detected in 79 (39.3%) patients, and cataract was detected in 54 (27.7%) patients, vitreous hemorrhage was noted in 54 (27.7%) patients, retinal detachment in 116 (57%, 7)

Table 1: Age distributions by gender.

Age	Female		Male		Total	
	n	%	n	%	n	%
0-6	11	15,9	4	3	15	7,5
07-12	9	13	19	14,4	28	13,9
13-18	6	8,7	17	12,9	23	11,4
19-65	37	53,6	82	62,1	119	59,2
>65	6	8,7	10	7,6	16	8
Total	69	100	132	100	201	100



Graph 1: Number of patients by region.

patients, intraocular foreign body with traumatic cataract in 2 (1%) patients, and lens subluxation in 1 (0.5%) patient. Subsequently, cataract surgery was performed in 81 (40.3%) patients, keratoplasty in 30 (14.9%) patients, and vitrectomy in 90 (44.8%) patients.

When the patients' preoperative visual acuity was evaluated, 15 (7.5%) patients had negative light perception and 50 (24.8%) patients had positive light perception. There were no patients with a preoperative BCVA of 0.5 or more, and in 12 (5.9%) patients the BCVA examination could not be evaluated because they were under 5 years of age. In the first month postoperatively, BCVA was 0.5 or above in 22 (10.9%) patients (Table 2). In 28% of patients (n=57), the final visual acuity was better than the initial visual acuity.

Table 2: Preoperative and postoperative visual acuities of the patients.

BCVA	Number of patients (n)	
	Preoperative	Postoperative (one month)
LP(-)	15	12
LP(+)	50	28
HM(+)	78	60
≤ 0,1	21	9
0,1-0,5	25	32
≥ 0,5	0	22
Not evaluated	12	38

LP(-): Light perception negative, LP(+): Light perception positive, HM(+): Hand motion positive.

In the postoperative follow-up 46 patients (22.9%) had retinal detachment and strabismus, 34 patients (16.9%) had endophthalmitis, 75 patients (37.3%) had isolated retinal detachment, 46 patients (22.9%) had traumatic cataract and lens subluxation. Secondary interventions were planned according to their priority order.

DISCUSSION

Eye injuries account for approximately 10% of all combat injuries and are a leading cause of ocular morbidity in 28% of blast survivors.¹⁰

In our study, which examined patients with ocular trauma injured by explosions during civil unrest in Syria, most patients were male and the mean age was 32.11 years; 33% of these patients were children. Similar to our study, in a study conducted in Damascus during a similar time period, most of the injured were males and about one-third were under 18 years of age.² Similarly, in a 4-year retrospective study evaluating patients referred to Gaziantep and treated during this period, most patients were male and the mean

age was 25.9 years.¹² In the evaluation of patients referred to Hatay, the male to female ratio was higher and the average age was 27.35 years.¹³ While the difficult living conditions in Syria during and after the war and the low number of elderly people can be attributed to the low age group of patients in general, the difference in age ratio between regions can be related to regional population and living conditions. The fact that women spend less time outside the house, shelter or tent than men due to socio-cultural conditions and security can be explained by the fact that they are less exposed to violence.

Most patients were from Azez (n=95) and Çobanbey (n=40) regions. Two of the largest hospitals in northwestern Syria are located in these regions. Again, these are the most densely populated regions in Northwest Syria Region. As the Azez region is more populated than the Çobanbey region, more people may have been exposed to trauma. For this reason, it can be assumed that explosions are more common in this region and more injured people are admitted to hospitals in this region.

When the admission diagnoses were evaluated, most patients were admitted with retinal detachment (57.7%), traumatic cataract (38%), and corneal injury (39%). Vitreous hemorrhage was seen in 26% of the patients. In a study by Elbeyli et al, in contrast to our study, the rate of vitreous hemorrhage was 15.17%, and most of the patients had an intraocular foreign body.¹⁴ In our study, an intraocular foreign body was found in 1% of the patients. The reason for this may be that most of the patients with intraocular foreign body were referred and not included in the study, as the high rate of foreign body in the patient profiles of hospitals accepting referrals from Syria supports this view.¹² In another study conducted on Syrian patients, the rate of traumatic cataracts was 56.4% and the rate of vitreous hemorrhage was 53.8%, which was higher than in our study, while the rate of retinal detachment was 23%, which was lower than in our study.¹² In the study of Arslanhan et al, majority of the patients admitted in Hatay had vitreous hemorrhage, retinal detachment and traumatic cataract.¹³ After the blast, patients are initially evaluated in regional hospitals, and patients who might benefit from further treatment are referred to hospitals in Turkey. In studies conducted in hospitals that accept referrals from Syria, such as Hatay, Gaziantep, and Kilis, assessments may have been performed on groups of patients selected for surgery. This could be a reason for the different rates observed in our study. However, the fact that patients with isolated ocular trauma due to blast are less than those with multiple traumas can be shown to be the cause of heterogeneity in selected groups of patients.

In a study by Gürler et al., the rate of retinal detachment after the first surgery for ocular injury was 10.2%,

while the rate of endophthalmitis was 1.2%. The rate of endophthalmitis is reported to be 1% in the literature.¹² The higher rate of endophthalmitis in the patients in our study may be explained by the explosives in this region and the environmental pollution at the blast site. Although systemic and local antibiotic applications and routine topical antiseptics are used in the operating room in the hospitals of the region according to the Turkish health guideline, it can be assumed that factors other than medical and surgical methods increase the infection rates.

Regarding vision on arrival at the hospital, the majority of patients had positive light perception (n=50) or positive hand motion (n=78). Visual acuity could not be evaluated because 12 patients were under 5 years of age. Final visual acuity was better than initial visual acuity in 57 (28%) patients. In a study conducted in Damascus, light perception and hand movement were positive in the majority of patients, similar to our study. In that study, 39% of patients had better final vision than on arrival.² Similarly, in another study, while hand movement was positive in most patients, the rate of patients with negative light perception was found to be 2.6%.¹⁴ In our study, the number of patients with negative light perception at initial vision was 15 (7.46%). The high rate in our study can be attributed to the fact that ocular structures are more damaged due to the use of modern combat vehicles. At the same time, eyelid edema, which makes visual examination difficult due to the effect of the blast, or temporary corneal edema, which impairs vision, may also lead to low visual acuity at baseline. The fact that lower final visual acuity occurred in our study compared to the Damascus study can be explained by the selection of patients who can be further treated and their referral to Turkey. Considering the patients who are staying in the region, it can be understood that they have made significant progress in eye treatment with the support of local hospitals.

CONCLUSION

Consequently, as a reflection of the devastating effects of modern warfare, wars today increasingly affect ocular structures and increase the rate of ocular mortality and morbidity. The primary care of patients who sustain ocular injuries in the war zone has a very important place in visual rehabilitation. If possible, patients should be referred to the nearest center for surgical intervention in better conditions; if referral is not possible, it is very important for the vitality of the eye to perform the first intervention in the region. In our study, it is seen that in war related ocular injuries, visual acuity increases and visual rehabilitation occurs after the surgeries performed in that area. However, these visual gains can be further increased by improving the surgical conditions and equipment.

LIMITATIONS

Imaging results could not be included in our study because imaging records at the hospitals where our study was conducted could not be stored digitally in automation systems for more than one month and there was no way to manually print these images. Again, in the case of admissions for emergency eye trauma due to explosions, multiple surgeries could not be performed in the hospitals and the procedures were performed for the most urgent diagnosis at the time of admission.

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