ORIGINAL ARTICLE

OCULAR TRAUMA PATIENTS ADMITTED TO A TERTIARY EMERGENCY DEPARTMENT: RETROSPECTIVE STUDY

Üçüncü Basamak Acil Servise Kabul Edilen Oküler Travma Hastaları: Retrospektif Çalışma

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ABSTRACT

Objective: This study aimed to retrospectively evaluate the demographic characteristics, causes of trauma, types of trauma, examination findings, and posttraumatic visual status of patients with ocular trauma admitted to the Emergency Department of Balıkesir University Hospital.

Material and Methods: The study retrospectively reviewed the file records of 402 ocular trauma patients admitted to Balıkesir University Hospital between January 1, 2020, and December 31, 2023, including mechanism, type, anatomical localization, associated injuries, examination findings, and visual status. Visual status was classified based on the clinical evaluation performed following ophthalmology consultation.

Results: The mean age of the patients was 44.10±20.64 years, and 75.12% were male. The most common settings of trauma were gardening/agricultural work (30.10%), home accidents (20.15%), and work accidents (11.19%). The most common type of trauma was blunt trauma (66.20%), followed by penetrating injuries and occupational accidents. Visual impairment (blurred vision/diminished vision) and vision loss were most commonly observed in isolated eye trauma and blunt trauma.

Conclusion: Eye traumas are frequently caused by preventable causes, and gardening and agricultural activities are important risk factors, especially in rural areas.

Keywords: *Ocular Injuries; Emergency Department; Visual Loss*

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ÖZET

Amaç: Bu çalışmanın amacı, Balıkesir Üniversitesi Hastanesi Acil Servisi'ne başvuran göz travmalı hastaların demografik özelliklerini, travma nedenlerini, travma türlerini, muayene bulgularını ve travma sonrası gelişen görme durumlarını retrospektif olarak değerlendirmektir.

Gereç ve Yöntemler: Çalışma, 1 Ocak 2020- 31 Aralık 2023 tarihleri arasında Balıkesir Üniversitesi Hastanesi'ne başvuran 402 göz travmalı hastanın dosya kayıtlarının retrospektif olarak incelenmesiyle gerçekleştirildi. Travmanın mekanizması, türü, anatomik lokalizasyonu, eşlik eden yaralanmalar, muayene bulguları ve görme durumu analiz edildi. Görme durumu, oftalmoloji konsültasyonunu takiben yapılan klinik değerlendirmeye göre sınıflandırıldı.

Bulgular: Hastaların yaş ortalaması 44,10±20,64 olup, %75,12'si erkekti. Travmaların en sık meydana geldiği ortamlar bahçe-tarım işleri (%30,10), ev kazaları (%20,15) ve iş kazaları (%11,19) idi. En yaygın travma türü künt travmalar (%66,20) olup, bunu penetran yaralanmalar ve iş kazaları izledi. Görme bozukluğu (bulanık görme/görmede azalma) ve görme kaybı en sık olarak izole göz travması ve künt travmalarda gözlendi. Görme kaybına en çok neden olan muayene bulguları ise kornea perforasyonu, total hifema ve korneaskleral perforasyondu.

Sonuç: Göz travmaları sıklıkla önlenebilir nedenlere bağlı gelişmekte olup, özellikle kırsal bölgelerde bahçe ve tarım faaliyetleri önemli bir risk faktörüdür.

Anahtar Kelimeler: *Göz Travması; Acil Servis; Görme Kaybı*

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INTRODUCTION

Ocular trauma is a significant public health problem worldwide and a leading cause of preventable monocular vision loss (1,2). Eye trauma is an important cause of visual impairment, accounting for approximately 3% of emergency department visits (3,4). According to the World Health Organization (WHO) Prevention of Blindness Programme, it is estimated that approximately 55 million people experience ocular trauma or disability each year. Approximately 19 million of these cases involve unilateral blindness, 2.3 million involve bilateral reduced visual acuity, and 1.6 million involve blindness due to traumatic causes requiring hospitalization (5).

The prevalence of eye trauma among patients admitted to emergency departments is relatively high. The most common causes of eye injuries among these patients include foreign objects in or near the eye, motor vehicle accidents, falls, and domestic accidents. Studies have shown that young adult males and elderly individuals are at higher risk (3,5–7). The main types of eye trauma include orbital fractures and open globe injuries, which can lead to severe visual loss (8,9).

Timely and accurately evaluating ocular trauma in emergency departments is crucial for early diagnosis and effective treatment. However, since ocular traumas often occur with other associated injuries, they may sometimes be overlooked in emergency departments, resulting in delays in diagnosis and intervention. This can lead to permanent visual impairment and other serious consequences (9,10).

In conclusion, adopting a multidisciplinary approach in emergency departments is crucial for effectively managing ocular trauma. Strengthening the coordination and cooperation between ophthalmologists and other related specialties is essential for the early diagnosis of trauma cases, determining appropriate intervention methods, and minimizing long-term complications. Therefore, increasing the training of emergency service teams on ocular trauma and establishing effective interdisciplinary communication mechanisms will significantly contribute to preserving visual functions and improving patients' quality of life.

MATERIALS AND METHODS

This retrospective study was conducted among patients from the Balıkesir University Medical Faculty Emergency Department from January 1, 2020, to December 2023.

The study analyzed data from the hospital's automation system and patient records. This included various information such as the date of admission, age, gender, type of eye complaints (monocular or bilateral), type and mechanism of trauma, any concomitant injuries, the diagnosis made in the emergency department, whether an orbital Computed Tomography (CT) scan was performed, whether a consultation was conducted with the Ophthalmology department, and the discharge status of the patients.

In this study, we considered demographic characteristics such as age and gender, trauma mechanisms, types of trauma, injury localization, associated injuries, and hospitalization status as independent variables. The dependent variable was visual impairment and loss due to trauma.

The patients' demographic and clinical admission data were obtained retrospectively from the hospital data processing service. Records of 582 patients were reviewed; 180 patients with no ocular trauma or missing data were excluded. A total of 402 patients were included in the study.

Mechanisms of trauma were categorized as gardening and agricultural activities, home accidents, falls, occupational accidents, assault, traffic accidents, sports injuries, animal injuries, and gunshot wounds. Types of traumas were categorized as blunt, penetrating, piercing-cutting instrument, chemical, thermal trauma, and presence of foreign bodies.

Localization of the trauma (right, left, or bilateral), concomitant traumas (head trauma, multitrauma, etc.), need for consultation, ocular examination findings, and patient outcomes (discharge, ward admission, intensive care unit admission, referral, and refusal of treatment) were evaluated in detail.

Visual status was evaluated jointly by emergency physicians and ophthalmologists based on bedside gross visual assessments performed during emergency department consultations. In cases where standard visual acuity measurement (e.g., Snellen chart) was not feasible, alternative clinical assessments were used, including the patient's ability to count fingers, detect hand motion, perceive light, or respond to bright light

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exposure. Based on these evaluations and intraocular findings, patients were categorized as having normal vision, reduced vision, permanent vision loss, transient vision loss, or unassessable vision.

Data was analyzed using SPSS 26.0 (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.). Continuous variables are presented as means, standard deviations, minima, and maxima, while categorical variables are shown as counts and percentages.

This study was conducted according to the principles outlined in the Declaration of Helsinki. Due to the study's retrospective nature, written informed consent was waived. Institution: Balıkesir University Health Sciences Non-Interventional Ethics Committee Date: 25.06.2024 Approval no: 2024/97.

RESULTS

The mean age of the 402 patients included in the study was 44.10±20.64 years, and 38.06% were between 36 and 59 years. Of all patients, 75.12% (n=302) were male, and 24.88% (n=100) were female. According to the localization of the trauma, 50.25% of the injuries were isolated in the left eye (n=202), 45.02% were isolated in the right eye (n=181), and 4.73% were bilateral (n=19). Orbital CT was used in 73.13% (n=294) of patients, and 92.79% (n=373) were referred to the ophthalmology department. Regarding hospitalization status, 63.93% (n=257) of the patients were discharged, 28.86% (n=116) were hospitalized in the ward, 1.99% (n=8) were followed up in the ICU due to multitrauma/traffic accident, 2.99% (n=12) were referred to an advanced center and 2.24% (n=9) refused treatment. The most common cause of trauma was gardening- an agricultural environment and work (30.10%; n=121) due to the impact of wood and tree branches. This was followed by home environment accidents due to glass, bottle caps, iron, and wire (20.15%; n=81), falls (11.19%; n=45), occupational accidents (9.20%; n=37), battery (7.46%; n=30), and motor vehicle accidents (6.21%; n=25). Less common causes of trauma included animal-related injuries (4.97%; n=20), sports accidents (2.24%; n=9), and gunshot wounds (1.24%; n=5) (Table 1). A statistically significant association was found between the trauma mechanism and the visual outcome ($p<0.05$).

Blunt trauma (66.20%; n=266) was the most common type. This was followed by occupational accidents (7.70%; n=31), traffic accidents (6.50%; n=26), and intraocular foreign body injuries (6.50%; n=26). Penetrating injuries (6.70%; n=27) and penetrating sharp injuries (4.70%; n=19) were less common.

In visual function evaluations, 49.25% (n=198) had normal vision, 36.07% (n=145) had blurred vision or decreased vision, 12.19% (n=49) had visual loss, 0.75% (n=3) had transient visual loss, and 1.74% (n=7) were intubated and could not be evaluated. The most common causes of vision loss (12.19%; n=49), decreased vision, and blurred vision (36.07%; n=145) were isolated eye trauma and blunt trauma. Most of the patients had isolated eye trauma (74.90%; n=301). When organ and system injuries accompanying ocular trauma were analyzed, the most common causes were head trauma (15.7%; n=66) and multitrauma (8.00%; n=32) (Table 2). A statistically significant association was found between the presence of concomitant injuries and the visual outcome ($p<0.05$).

Although subconjunctival hemorrhage and periorbital ecchymosis/hematoma were the most common ocular examination findings after injury, hyphema and epithelial defect were the most common findings causing visual impairment (decreased/blurred vision). Corneal perforation, total hyphema, and corneascleral perforation were the most common findings causing visual loss (Figure 1).

DISCUSSION

Traumatic eye injuries are one of the most common causes of preventable visual impairment and blindness worldwide. These injuries can occur due to many causes, including accidents, sports injuries, workplace accidents, and daily activities. The frequency and mechanism of injury also vary according to geography, demographics, and age groups (8,11). Eye traumas cause serious social and psychological problems in individuals and, as a result, can have permanent consequences that negatively affect quality of life. However, many of these injuries can be prevented by identifying risk factors, increasing social awareness, and taking protective measures, especially in specific environments such as the home, workplace, and school (12,13).

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Table 1. Distribution of demographic and clinical characteristics of patients according to place of trauma

	Farm	Home	Fall	Work	Assault	Motor Vehicle Crash	Animal-Caused	Sports	Gunshot	Other	Total N (%)
Gender											
Female	32	18	18	1	7	3	9	0	0	12	100 (24.88%)
Male	89	63	27	36	23	22	11	9	5	17	302 (75.12%)
Age(Years)											
1-17	6	14	5	2	3	2	0	3	0	9	44 (10.95%)
18-35	15	25	7	14	8	10	3	5	3	10	100 (24.88)
36-59	47	33	11	16	13	8	13	1	2	9	153 (38.06%)
≥60	53	9	22	5	6	5	4	0	0	1	105 (26.12%)
Affected Eye											
Left	64	44	22	20	15	7	10	5	1	14	202 (50.25%)
Right	56	36	19	12	14	11	10	4	4	15	181 (45.02%)
Bilateral	1	1	4	5	1	7	0	0	0	0	19 (4.73%)
Orbital CT	86	56	38	25	28	25	17	4	5	10	294 (73.13%)
Consultation	116	77	37	33	29	22	18	7	5	29	373 (92.79%)
Patient Outcome											
Discharged	78	52	26	22	23	12	15	8	0	21	257 (63.93%)
Hospitalization	41	24	13	15	6	3	5	0	5	4	116 (28.86%)
ICU	0	1	1	0	0	6	0	0	0	0	8 (1.99%)
Transfer	1	2	4	0	0	3	0	0	0	2	12 (2.99%)
Treatment Refused	1	2	1	0	1	1	0	1	0	2	9 (2.24%)
Total	121	81	45	37	30	25	20	9	5	29	402 (100%)

ICU: Intensive Care Unit; CT: Computed Tomography

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Table 2. Vision examination findings according to the type of trauma and concomitant trauma

	Normal	Blurred Vision/Reduced Vision	Vision Loss	Temporary Vision Loss	Unevaluable	Total N (%)
Type Of Trauma						
Blunt Injury	128	104	28	3	3	266 (66.20%)
Work Accident	20	6	5	0	0	31 (7.70%)
Penetrating Injury	8	7	12	0	0	27 (6.70%)
Traffic Accident	15	5	2	0	4	26 (6.50%)
Intraocular Foreign Body	13	12	1	0	0	26 (6.50%)
Penetrating And Sharp Instrument Injury	10	8	1	0	0	19 (4.70%)
Chemical Injury	4	2	0	0	0	6 (1.50%)
Thermal Injury	0	1	0	0	0	1 (0.20%)
P Value (Chi-Square)				P<0.001*		
Concomitant Trauma						
Isolated Eye Trauma	136	122	39	3	1	301 (74.90%)
Head Trauma	42	12	7	0	0	66 (15.7%)
Multitrauma	17	11	1	0	3	32 (8.00%)
Extremity Trauma	2	0	2	0	1	5 (1.20%)
Chest Trauma	1	0	0	0	0	1 (0.20%)
P Value (Chi-Square)						p<0.001*
Total	198(49.25%)	145(36.07%)	49(12.19%)	3(0.75%)	7(1.74%)	402 (100%)

*Chi-square test, p<0.05 considered significant.

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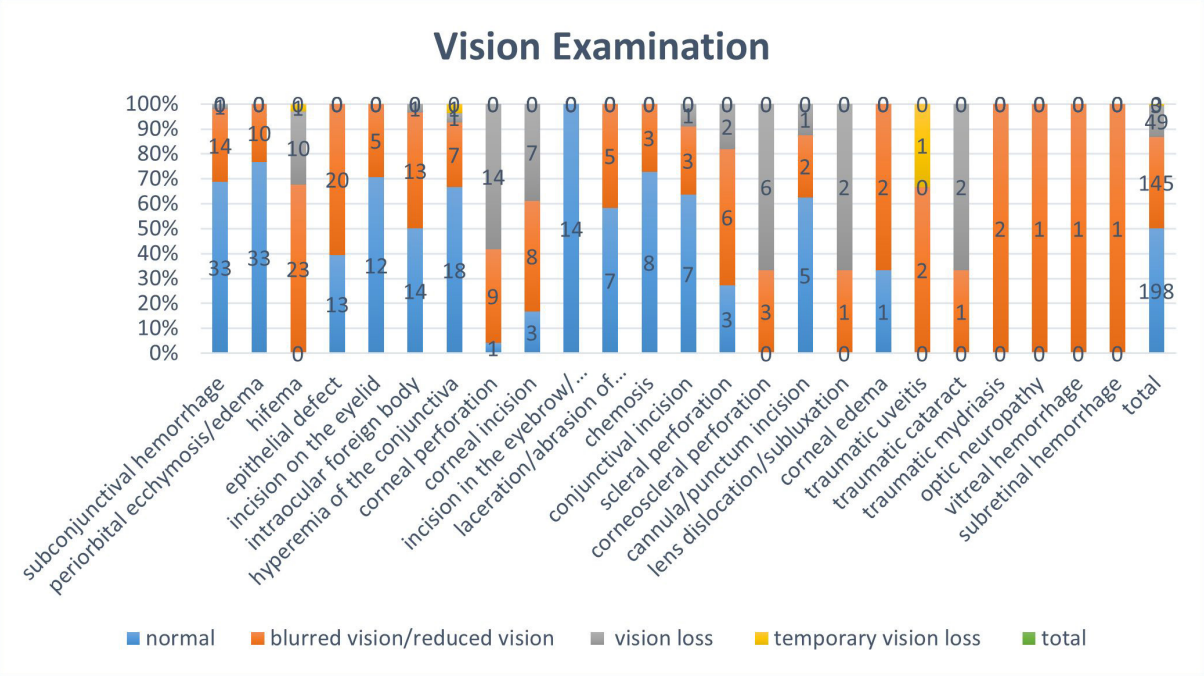

Figure 1: Vision examination findings

Balıkesir University Hospital, where our study was conducted, provides tertiary emergency health services in its region and serves as the referral center for eye trauma in Balıkesir province. This situation causes the trauma cases admitted to the hospital to vary in mechanism and type.

Research conducted by Li et al. regarding global ocular injuries found that the occurrence was more prevalent among males across all age categories, with injuries often observed in the younger and middle-aged groups (25-49 years) (12). In our study, the most common age group was 36-59 years (38.06%), followed by 18-35 years (24.88%). The high incidence of trauma is explained by the fact that men are more likely to be involved in risky working environments, traffic, renovation work, and sports activities. In our study, 72.12% of the patients admitted with eye injuries were males, similar to the literature (1,10–13).

May et al. reported that the most common causes of serious eye injuries were home accidents, work accidents, accidents on the street, and sports injuries, respectively (14). He et al. reported that the most common cause of eye trauma was falls; however, the mechanism, localization, and severity of trauma varied according to age, gender, and ethnicity (15). In our study, the most common settings of trauma were gardening/agricultural work (30.10%), home accidents (20.15%), and workplace accidents (11.19%). In addition, in our study, it was observed that patients who were consulted for trauma and underwent CT scans for the presence of foreign bodies/fractures were most frequently injured during gardening and agricultural work. In alignment with our study, Shrestha et al. identified gardening and agricultural work as the predominant cause of injury, particularly involving materials like branches and wood. This finding reflects the specific characteristics of the region where their research took place, contrasting with numerous studies conducted in Western countries (16). These findings suggest that rural characteristics and socioeconomic conditions may be determinants among the factors affecting the mechanism of eye trauma.

When the etiologic distribution of traumas in our study was analyzed, blunt traumas were the most common, followed by occupational accidents, penetrating injuries, and traffic accidents, respectively. This situation has been reported similarly in many previous studies (8,12). The majority of cases with visual loss were observed to have isolated eye trauma. It is known that blunt trauma can cause severe damage to deep

structures such as the retina and lens, leading to complications such as traumatic retinopathy and traumatic cataracts, which may result in visual loss (16). Similarly, in penetrating injuries, disruption of the integrity of the eye and complications such as endophthalmitis and retinal detachment can lead to permanent visual loss (17). In addition, it has been found that anatomical and functional outcomes in open-eye injuries with orbital fracture are pretty poor, and especially the presence of retinal detachment is an important marker for unfavorable prognosis (18). All these data suggest that not only the etiologic distribution but also the clinical outcomes of the types of trauma should be taken into consideration.

This study's single-centered and retrospective design limits the generalization of findings to larger populations or different geographical regions. Additionally, it is possible that some clinical parameters (Such as visual acuity at the time of trauma, duration of symptoms, and pre-traumatic eye health status) were recorded incompletely or inadequately due to the nature of retrospective data collection.

The treatment approach for eye injuries is influenced by various factors, including the mechanism of injury, the presence of associated conditions, and the duration since the injury occurred. Simple injuries are typically treated with conservative methods, whereas more complex cases may necessitate surgical intervention and a multidisciplinary approach. Kaplan et al. reported that 41.7% of patients were found to have corneal and extracorneal foreign bodies, with 81.1% of cases being discharged after treatment (19). In our study, 63.93% of patients were discharged following diagnosis and treatment, while 28.86% required admission to relevant departments for surgical intervention.

Alpay et al. reported that in the Western Black Sea Region, trauma related to wooden objects was the most common cause of injury in rural areas. Conversely, work-related injuries were most prevalent among males aged 30–50. Furthermore, corneal-scleral lacerations were identified as the most severe ocular injuries, impacting both initial and final visual acuity (20). In our study, the predominant cause of trauma was injuries incurred during agricultural activities. This prevalence can be linked to insufficient protective equipment and a lack of awareness in rural communities. When considering vision loss, it was found that penetrating injuries were correlated with a greater severity of vision impairment.

Doğan et al. reported that the most prevalent causes of eyelid injuries include sharp object injuries (33%), blunt trauma (30%), falls (22%), and traffic accidents (15%). Furthermore, foreign bodies were found at the wound site in 11.1% of cases, and concomitant canalicular lacerations were observed in 22.2% of instances (20 lower eyelids and 10 upper eyelids). A range of additional ocular findings was noted, including conjunctival lacerations (17%), open globe injuries (10.3%), corneal epithelial defects (7.4%), vitreous hemorrhage (6.6%), hyphema (4.4%), and retinal detachment (3.7%) (21). Our study similarly observed concomitant orbito-ocular pathologies in several cases, particularly in penetrating injuries associated with more severe intraocular complications. These findings underscore the importance of not only considering the etiological distribution of injuries but also evaluating the clinical outcomes of various types of trauma. Additionally, the lack of long-term follow-up data limits our ability to assess late post-traumatic complications and determine final visual outcomes.

CONCLUSION

Ocular traumas globally are primarily caused by preventable factors, highlighting the necessity for effective prevention strategies and enhanced public awareness. Promoting the use of personal protective equipment, enhancing educational initiatives, and establishing prompt diagnosis and intervention protocols, particularly in high-risk activities, will play a crucial role in reducing vision loss due to trauma. Our findings can inform public health policies that should be implemented locally and nationally.

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