

Ocular trauma in the emergency department of Goiás Eye Bank Foundation

Traumas oculares no Serviço de Urgência da Fundação Banco de Olhos de Goiás

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ABSTRACT

Purpose: To study and analyze the types of ocular trauma in the emergency department of Goiás Eye Bank Foundation, Goiânia – Brazil and guide general physicians about the first medical contact. **Methods:** An analysis was done in 351 visits between december, 2010 and february, 2011. The ocular trauma cases were evaluated by gender, age, origin, trauma type and treatment performed. **Results:** Three hundred fifty-one emergency medical visits were analyzed and were found 153 ocular traumas (43.6%), showing predominance of 131 cases (85.6%) of men. The most frequent age was 20 to 39 year-old young male in 90 cases (58.8%). Goiânia was the most frequent origin with 89 (58.2%). The superficial foreign body mechanical trauma was the most common trauma type with 95 cases (66.4%). Clinical treatment was performed in 149 cases (97%). **Conclusion:** Concerning the ocular trauma, superficial foreign bodies predominated in males in working age coming from Goiânia treated clinically. There is a strong relationship with occupational accidents requiring special attention to prevention.

Keywords: Eye injuries/etiology; Accidents, occupational/prevention & control; Eye foreign bodies; Corneal perforation; Eye health

RESUMO

Objetivo: Estudar e analisar os tipos de trauma ocular no serviço de urgência da Fundação Banco de Olhos de Goiás e orientar médicos generalistas quanto ao seu primeiro atendimento. **Métodos:** Foram analisados 351 atendimentos no período de dezembro de 2010 a fevereiro de 2011, sendo que apenas nos casos de trauma ocular foram avaliados o sexo, idade, procedência, tipo de trauma e o tratamento realizado. **Resultados:** Foi realizada uma análise de 351 atendimentos de urgência deste serviço, onde foi encontrado um total de 153 traumas oculares (43,6%), com predominância em 131 casos (85,6%) do sexo masculino. A faixa etária mais acometida foi a de adultos jovens de 20 a 39 anos, em 90 casos (58,8%). Goiânia foi a procedência mais frequente em 89 casos (58,2%). O trauma mecânico fechado por corpo estranho superficial foi o tipo de trauma mais comum com 95 casos (66,4%). O tratamento clínico foi amplamente mais predominante em 149 casos (97%). **Conclusão:** Em relação aos traumas oftalmológicos predominaram os pacientes com corpos estranhos superficiais do sexo masculino, na faixa etária economicamente ativa procedente de Goiânia, com tratamento clínico, e direta relação com acidentes ocupacionais, merecendo atenção especial quanto à prevenção.

Descritores: Traumatismos oculares/etiologia; Acidentes de trabalho/prevenção & controle; Corpos estranhos no olho; Perforação da córnea; Saúde ocular

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INTRODUCTION

Ophthalmic emergencies are important causes of morbidity among the population⁽¹⁾. Patients usually come to the ophthalmologist after being assessed by a non-specialist physician⁽¹⁾. Therefore, general practitioners, doctors on duty in the emergency room, and ophthalmologists should recognise the types of trauma in order to apply the appropriate treatment for each situation. These measures prevent iatrogenic complications and the lack of skills when facing such situations.

Patients are exposed to various risk factors in everyday life. When affected individuals seek emergency eye care, specialised care and appropriate treatment are needed, and long-term therapy may be necessary, especially in more severe situations.

Ocular trauma is trauma affecting the eyeball and its annexes. Ocular trauma can be mechanical, chemical, electrical, or thermal. Mechanical trauma is divided into open and closed trauma, depending on whether it affects the full thickness of the eye wall (cornea or sclera)⁽²⁾.

Open trauma is divided into lacerations and ruptures⁽²⁾. Lacerations comprise penetrating and perforating injuries and intraocular foreign bodies. A laceration is penetrating when the injury is caused by a sharp object and affects the full thickness of the eyeball, and it is penetrating when an object causes two lesions to the full thickness of the eyeball (entry and exit wounds)⁽²⁾. A rupture is an injury to the full thickness of the eye wall caused by a blunt object. The eyeball may rupture at the weakest point, and not necessarily at the site of impact⁽²⁾.

Closed trauma of the eyeball includes contusions, lamellar lacerations, and superficial foreign bodies. A contusion is a closed trauma resulting from impact by a blunt object. The lesion may or may not occur at the site of impact. A lamellar laceration is a closed trauma of the eye wall or bulbar conjunctiva caused by a sharp object, with injury at the site of impact⁽²⁾.

Takahashi⁽²⁾ states that according to the WHO, around 55 million eye injuries occur every year that restrict activity for at least one day. Of these, 750,000 require hospitalisation, and around 200,000 are open injuries of the eyeball. Worldwide there are about 1.6 million blind people due to traumatic injuries to the eyeball, as well as 2.3 million people with bilateral visual impairment and 19 million people with unilateral blindness or visual impairment.

Ocular trauma affects the most productive age group of the population, leading to huge treatment costs and a high social burden; it is often incapacitating and can result in disability retirement among young persons. All studies report that ocular trauma affects mostly men (72-95%), even among the elderly, although such predominance is less evident in the elderly. It is estimated that 90% of such lesions are preventable. Ocular trauma is the most important cause of unilateral visual loss in developing countries and it is the third leading cause of hospitalisation due to eye conditions.

Education and vigilance are important preventive measures, including the prevention of traffic accidents. In the workplace, use of protective eyewear should be strictly required for industrial activities with a risk of eye trauma; the same goes for sports and leisure activities. In the case of children, continuous supervision by adults is required during recreational activities, including contact with animals. It is also important to provide education on the prevention of household accidents with alkalis, acids and sharp objects, among others, as many accidents occur in the home environment.

Kara-Junior et al.⁽³⁾ state that the eyeball requires special attention due to its functional differentiation and sensitivity to injury; thus, ophthalmic emergencies pose an imminent danger of damage to the eye, which can be irreversible and should be diagnosed and treated as soon as possible.

Given the importance of the subject, this study aimed to assess the frequency and types of eye trauma and the gender, age, and origin of patients seen at the Goiás Eye Bank Foundation (FUBOG), a reference centre for ophthalmic emergencies, comparing results to the literature. The paper also aims to provide guidance to medical students and general practitioners on first aid measures in cases of ocular trauma. This study is part of the authors' end of course paper.

METHODS

We examined cases of ocular trauma in the ER of the Goiás Eye Bank Foundation from December 2010 to February 2011. The study was approved by the Research Ethics Committee of the Pontifical Catholic University of Goiás (project number: 0067.0.168.000-11). FUBOG is reference centre for ophthalmology, with teams of ophthalmologists and residents working 24 hours per day.

FUBOG's database had a total of 4133 medical records of patients seen in the emergency department during the 3-month study period. The medical records were numbered according to their order of registration in FUBOG's database, randomly drawn using Microsoft Excel software and selected in proportion to the number of visits per month, with 112 in December, 134 in January and 105 in February, totalling 351 medical records. They were stored in Microsoft Excel and statistically analysed using EpiInfo (Centers for Disease Control and Prevention, USA) software with a 95% confidence interval and a sampling error of 5%, representing this sample (4133). Graphs and charts were then prepared using Microsoft Excel. The chi-square test, which compares categorical variables, was used to analyse the sex and age group of participants, with $p < 0.001$ and $p < 0.05$, respectively.

Collected data included gender, age (distributed into age groups according to the international age classification), origin (place of residence), diagnosis, and type of treatment (medical or surgical). Diagnoses were classified into traumatic and non-traumatic injuries, as specified in Annex 1.

The study's draft project provided for data collection during six months, from December 2010 to May 2011, but it was only possible to collect data from December 2010 to February 2011 due to difficulties in obtaining the data.

RESULTS

We assessed 351 medical records of patients visiting the ophthalmic emergency department and found 153 cases of trauma (43.6%). In total, 231 patients were male, of which 131 had suffered trauma (85.6% of total trauma patients), and 120 were female, of which 22 had suffered trauma (14.4%).

Mean age was 35 years (standard deviation, ± 18.7), ranging from 1 to 76 years. The most affected age group was 20-39 years, as summarised in Table 1.

As regards origin, most trauma patients came from Goiânia (58%), followed by Aparecida de Goiânia (25%), as shown in Table 2.

As shown in Table 3, mechanical trauma by superficial foreign body was the most frequent type with 95 cases (66.4%),

Appendix

Appendix 1

1 – Questionnaire for data collection on ocular trauma

Patient's initials: _____

Age: _____

Origin: _____

Sex: () M or () F

Type of trauma:

1 - () mechanical

 1.1 - () open

 1.1.1 - () laceration

 1.1.1.1 - () penetrating

 1.1.1.2 - () perforating

 1.1.1.3 - () intraocular foreign body

 1.1.2 - () rupture

 1.2 - () closed

 1.2.1 - () contusion

 1.2.2 - () lamellar laceration

 1.2.3 - () superficial foreign body

2 - () chemical

3 - () electrical

4 - () thermal

5 - () mixed: _____

6 - () other: _____

Treatment: () medical () surgical

Table 1

Age groups of trauma patients

Age group	Trauma patients n (%)
1-4 years	4 (2,6)
5-9 years	6 (3,9)
10-14 years	3 (2,0)
15-19 years	6 (3,9)
20-29 years	49 (32,0)
30-39 years	41 (26,8)
40-49 years	28 (18,3)
50-59 years	12 (7,8)
60-69 years	3 (2,0)
70-79 years	1 (0,6)

Table 2

Origin of trauma patients

City/Town	Number of patients n(%)
Goiânia	89 (58,2)
Aparecida de Goiânia	39 (25,5)
Guapó	4 (2,6)
Senador Canedo	3 (1,9)
Anicuns	2 (1,3)
Bela Vista de Goiás	2 (1,3)
Nerópolis	2 (1,3)
Samambaia	2 (1,3)
Outras Cidades(*)	10 (6,5)

(*) Abadia de Goiás, Adelândia, Anápolis, Araguapaz, Goianésia, Hidrolândia, Itajá, Palmeira de Goiás, Terezópolis e Trindade

followed by thermal injury with 19 cases (13.3%), closed mechanical trauma due to contusion with 13 cases (9.1%), lamellar laceration with 7 cases (4.9%), chemical injury with 4 cases (2.8%), perforating trauma with 2 cases (1.4%), and penetrating injury, laceration, and rupture with 1 case each (0.7%).

Medical treatment was the most common with 149 cases (97%), while surgical treatment was performed in only 4 cases (3%).

DISCUSSION

Of the patients seen in this service, 153 (43.6%) had suffered ocular trauma, as specified in Annex 1. Of these, 85.6% were male and 14.4% were female.

The higher proportion of male patients seeking emergency care is probably related to greater exposure of socioeconomic

Table 3
Trauma frequency by type

Type	Frequency n (%)
Superficial foreign body	95(66,4)
Thermal	19(13,3)
Contusion	13 (9,1)
Lamellar laceration	7 (4,9)
Chemical	4 (2,8)
Perforating	2 (1,4)
Penetrating	1 (0,7)
Laceration	1 (0,7)
Rupture	1 (0,7)

(work, traffic) and cultural (sports) risk factors⁽⁴⁾.

The results of this study are consistent with other studies conducted in Brazil and elsewhere. Leonor et al.⁽¹⁾ reported that of 810 patients seen at the Ophthalmology Service of the Day Hospital Santa Casa de Misericórdia in Limeira, São Paulo, Brazil, 66.6% were male and 33.4% were female, and 38% of patients had suffered trauma; among male patients, the most common age group was 19-40 years. Vats et al.⁽⁵⁾ conducted a cross-sectional study on 6704 patients in Delhi, India; they found that male patients were most commonly affected, and the mean age of trauma patients was 24.2 years. In a large study, Nash and Margo⁽⁶⁾ analysed 2.32 million emergency eye care consultations in the United States; they found that 49% of visits were due to eye trauma, and 40.3% of patients were aged 24-44 years. Oum et al.⁽⁷⁾ conducted a study in the emergency department of the National University Hospital of Pusan, South Korea, and reported that of the total 1809 patients diagnosed with ocular trauma, 1183 (65.4%) were male, with a mean age of 32.3 years, and 636 (34.6%) were female, with a mean age of 29.9 years; the prevalence of ocular trauma was higher among men in all age groups. Curbelo Concepcion et al.⁽⁸⁾ conducted a study at the Cuban Institute of Ophthalmology in Cuba and found that among selected cases of ocular trauma from January 2006 to December 2007, 74.3% of patients were male and 25.7% were female; the mean age for both sexes was 28.1 years.

In our study, the mean age at the time of the traumatic event was 35 years, an age in which young adults are economically active and more prone to accidents. Males were more likely to suffer trauma, in agreement with the literature. Inexperience, lack of proper handling of work equipment and similar devices (such as electric welders), improper use of safety equipment, and work under inappropriate conditions are factors observed in this age group⁽¹⁾.

As regards the origin of patients, most lived in the state capital Goiânia, where the study hospital is located. We found that 41.8% of ocular trauma patients who sought FUBOG came from other municipalities. This demonstrates the lack of resources for specialised medical care in the regions surrounding Goiânia, leading to an increased demand for services at the study hospital. Patients travelled 22.8 to 407 kilometres to reach the study hospital. This is a factor to be considered, as this is a reference service for patients from the public health system, patients with private health insurance, and patients paying for their own health expenses. Patients living in other municipalities required transportation, companions, money for food/accommodation, time away from work with loss of working hours (which can cause

temporary or permanent socioeconomic deficit), and possible follow-up visits, which implies a significant burden.

Among traumatic injuries, mechanical trauma by superficial foreign body accounted for 66.4% of injuries. This is in agreement with other studies on trauma, such as Eleanor et al.⁽¹⁾, who found that superficial foreign body was the most common type of ocular trauma, affecting 32% of patients and 44% of male patients; Nash and Margo⁽⁶⁾ also found that most cases of ocular trauma in men were due to superficial foreign bodies, and most of these occurred in the workplace. This type of trauma results from lack or inappropriate use of protective eyewear during risky activities (welding, driving a motorcycle, boring, honing, hammering, sanding, blasting with gunpowder, insect bites, "motes in the eye"). General practitioners should refer the patient to a specialised clinic after washing the patient's eye and applying a bandage, which reduces discomfort.

Thermal injuries accounted for 13.3% of all cases, being the second most frequent type of trauma. This type of injury is caused by any substance that abruptly changes the temperature of the eye: For example, a cigarette lighter with a high flame; hot products like milk and fat for frying; cigarette ash; fireworks; and the most common in our study, thermal welding. Thermal burns are generally restricted to the affected site. They are more severe when there is perforation or the presence of an intraocular foreign body which prolongs contact of the object with the tissue⁽⁹⁾. The general practitioner should refer the patient to an ophthalmologist after applying a bandage; analgesics or non-steroidal anti-inflammatory agents can be used for pain control. Protective eyewear is essential to prevent accidents⁽¹⁰⁾.

The third most frequent type was contusion by blunt trauma, accounting for 9.1% of patients. Blunt trauma can occur in several situations: aggression, car accidents, sports, and work accidents⁽⁴⁾. In cases of blunt trauma due to car accidents, falls, or aggression, non-specialists should follow the standard ATLS (Advanced Trauma Life Support) assessment to discard the risk of imminent death and injuries to vital organs⁽¹¹⁾; subsequently, lesions to the orbit, eyelid, and eyeball should be investigated. The physician should palpate the orbital rim to investigate fractures and search for foreign bodies and impaled objects, perforations, redness, or loss of fluids⁽¹²⁾. Fractures with instability of the bony framework should be investigated and repaired (with the help of an otorhinolaryngologist or an oral and maxillofacial surgeon), followed by ophthalmic evaluation, as concomitant eye injuries can lead to important changes in visual function, such as loss of visual acuity and enophthalmos, impairment of extrinsic ocular muscles, or diplopia. It is important to assess the extent of damage and the presence of intraorbital foreign bodies⁽¹²⁾.

Closed trauma with lamellar laceration was the fourth most common type of trauma in our study, accounting for 4.9% of patients; its main cause was superficial contact of sharp objects with the eyeball, not affecting all layers⁽²⁾. The general practitioner should provide first aid and then refer the patient to a specialist service⁽³⁾.

Chemical trauma was the fifth most common type of trauma, accounting for 2.8% of patients. Chemical ocular burns are generally due to home or work accidents. They can be caused by acids or alkalis. According to Nassaralla et al.⁽⁹⁾, acid burns usually cause important necrosis and coagulation of proteins, while alkali burns are even more serious because alkalis successively combine with tissue proteins, with deeper tissue penetration and greater tissue damage. The most common chemical agents causing burns are ammonia (e.g., cleaning products, detergents, fabric softeners, fertilisers), sodium hydroxide or caustic soda (e.g., homemade soap), lime or calcium oxide (e.g., used industrially

as a pH adjuster, mortar components), hydrogen sulphide (e.g., used industrially as a catalyst), sulphuric acid (e.g., a component of acid rain), and acetic acid (e.g., vinegar). In such cases, immediate treatment should be instituted before taking the patient to a hospital with abundant irrigation with saline or clean water; the patient should then be referred to an ophthalmologist⁽¹³⁾.

Perforating trauma was uncommon in our study, accounting for 1.4% of patients, followed by penetrating trauma, open laceration, and rupture, with 0.7% each. Perforating trauma is mainly caused by car and work accidents, which can generally be prevented⁽⁷⁾. It is important to evaluate the patient together with a companion or assistant who can act as a witness in lawsuits. Initial care should also follow ATLS guidelines⁽¹¹⁾ to avoid the risk of death and injury to vital organs, and an occlusive dressing should be applied.

Only 3% of patients in our study required surgical treatment, while the other 97% required medical treatment only. Vats et al.⁽⁵⁾ reported similar values, with 89% of ocular trauma patients receiving medical treatment and only 11% receiving surgical treatment.

CONCLUSION

Most cases of ocular trauma in our institution during the study period were caused by superficial foreign bodies, and most patients were men of economically-active age living in the state capital Goiânia.

This shows the relationship of accidents with the occupation of patients. To prevent ocular trauma, it is important to know the situation of the affected population.

Cultural habits and regional and socioeconomic factors can influence the type of trauma. The determinants of trauma can explain the different mechanisms of eye injury. Studies to determine the main types of trauma can generate data which will help healthcare services provide proper care. This can help affected patients gain access to primary care services.

Despite its short study period, the results of this study were in agreement with the reviewed literature.

Many of our patients did not come from Goiânia, which highlights deficiencies in specialist eye care services in the surrounding towns. An interesting measure would be to establish eye clinics in strategic towns to avoid referring cases which could be resolved with medical treatment. The number of patients coming from distant cities indicates deficiencies in such services.

General practitioners and medical students, as well as the population as a whole, should also receive education and training on the importance of ocular trauma and its prevention. In particular, information should be provided on the prevention of ocular trauma at the workplace and during physical activities, which should be performed appropriately to prevent ocular harm and disability.

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