

## Forensic Aspects of Ocular Trauma

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### Abstract

**Introduction:** Sometimes, in cases of ocular trauma, the ophthalmologist must provide forensic evidence showing the status of the victim, and this requires a detailed eye examination, including an accurate description of lesions and appropriate investigations to support the diagnosis.

**Aim of the Paper:** We present the epidemiological characteristics of a series of 109 cases of ocular trauma, in order to analyze the age, sex, type of injury, impaired eye and injured eye structures, and their forensic aspects.

**Material and Methodology:** Of the 6839 patients admitted in the Ophthalmology Department of the "Prof. Dr. Nicolae Oblu" Emergency Clinical Hospital, Iassy, Romania, for a period of three years (01.01.2010-01.12.2012), a number of 109 patients with ocular trauma were studied. The electronic medical record of each patient was reviewed and informations were extracted and entered into a database. Cases were analyzed by age, gender, type of trauma, the affected eye, and ocular structures involved.

**Results:** During a three years period (01.01.2010-31.12.2012), 109 patients (26 women and 83 men) were diagnosed with ocular trauma. They represented a rate of

1.59% of the total of 6839 patients admitted in the Ophthalmology Department of the "Prof. Dr. Nicolae Oblu" Clinic Hospital of Emergency, Iassy, Romania. Males were more affected than females (76.14% and 23.86%, respectively). 32.12% of patients were aged 3-20 years, 33.94% were aged 20-50 years and 33.94% of patients were over 50 years. The two eyeballs were affected in similar percentage (53.22% right eyeball and 46.78% left eyeball). Penetrating or perforating ocular injuries that mostly required eyeball reconstruction were the most common (88.07%).

**Conclusion:** Open globe injuries are an ophthalmological emergency and require fast medical attention, as visual acuity recovery is extremely important. In certain cases, such as severe physical aggression, eye injury may result in eyeball loss and thus permanently mutilate the patient. Any ophthalmologist must be familiar with the laws in effect, in order to be able to detect forensic cases and to draft documentation, as thorough as possible of each clinical case.

**Keywords:** Ocular Trauma; Forensic Medicine; Loss of Visual Acuity

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## Introduction

Annually, about 1.6 million people lose their visual acuity, with a maximum incidence in young adults and in the elderly [1-4]. If visual loss occurs after the loss of the eyeball due to a physical assault on a victim it is considered a legal case. The ophthalmologist must provide forensic evidence showing the status of the victim, and this requires a detailed eye examination, including an accurate description of lesions and appropriate investigations to support the diagnosis.

Ocular trauma types most often encountered are ocular contusions (47%), followed by penetrating trauma (27%), perforating trauma (2%), and penetrating/perforating trauma with intraocular foreign body (5%), chemical burns, accompanied by partial or total loss of visual acuity and even the eyeball. Penetrating ocular trauma is the most frequent and important cause of vision loss worldwide [1].

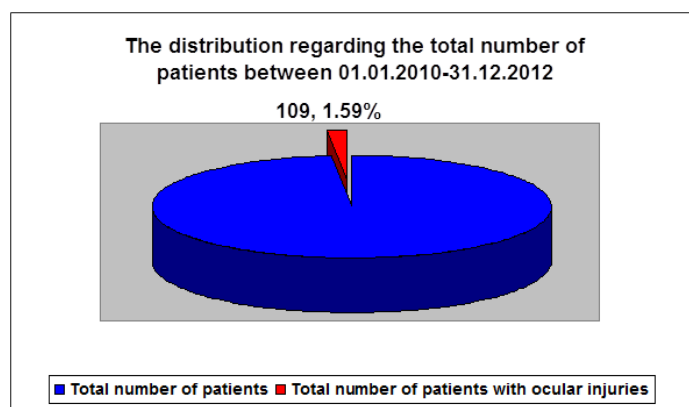
We present the epidemiological characteristics of a series of 109 cases of ocular trauma, illustrate it with the clinical presentation of a case with severe opened eye injury caused by a physical assault with a metal body, and discuss the forensic implications of a sense organ loss.

## Material and Methodology

Of the 6839 patients admitted in the Ophthalmology Department of the "Prof.Dr.Nicolae Oblu" Emergency Clinical Hospital, Iassy, Romania, for a period of three years (01.01.2010-01.12.2012), a number of 109 patients with ocular trauma were studied. The electronic medical record of each patient was reviewed and informations were extracted and entered into a database. Cases were analyzed by age, gender, type of trauma, the affected eye, and ocular structures involved.

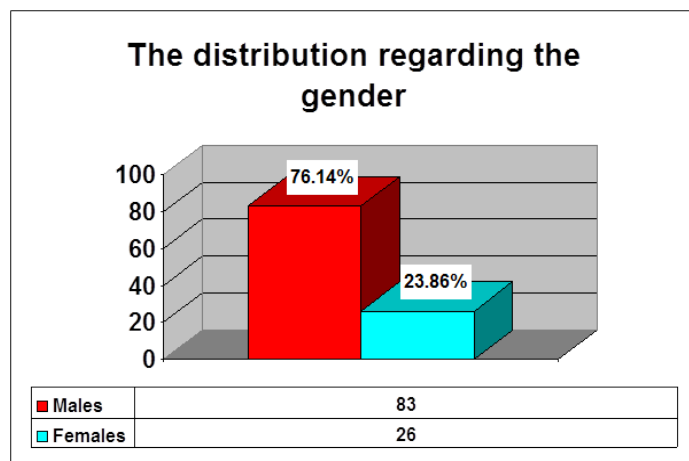
## Results

During a three years period (01.01.2010-31.12.2012), 109 patients (26 women and 83 men) were diagnosed with ocular trauma. They represented a rate of 1.59% of the total of 6839 patients admitted in the Ophthalmology Department of the "Prof. Dr. Nicolae Oblu" Emergency Clinical Hospital, Iassy, Romania (Chart 1).



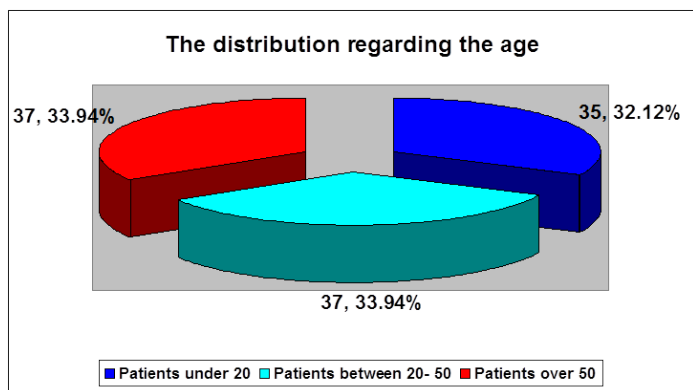
**Chart 1:** Percentage of patients with ocular trauma over a period of 3 years

Males were more affected by ocular trauma than females (76.14% and 23.86%, respectively), male/female ratio being 3.1 (Chart 2).



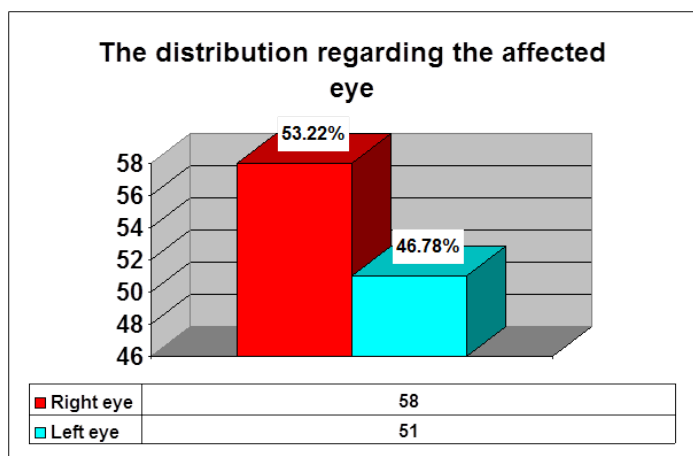
**Chart 2:** Distribution of patients with ocular trauma regarding the gender

32.12% of patients were aged 3-20 years, 33.94% were aged 20-50 years and 33.94% of patients were over 50 years (Chart 3).



**Chart 3:** Distribution of patients with ocular trauma according to their age

The two eyeballs were affected in similar percentage (53.22% right eyeball and 46.78% left eyeball), albeit with a slight predominance of the right eyeball (Chart 4).



**Chart 4:** Location of ocular trauma regarding the affected eyeball

Penetrating or perforating ocular injuries that mostly required eyeball reconstruction were the most common (88.07%) (Table 1).

**Table 1:** Types of ocular trauma according to the etiological mechanism

Type of ocular trauma	Number of cases (%)
Penetrating/perforating trauma	96 (88.07)
Non-penetrating trauma	6 (5.50)
Penetrating/perforating trauma with intraocular foreign body	7 (6.43)

Taking into account the ocular structures involved, we found a complex pattern of the ocular trauma encountered, as there were frequently associations of different lesions. Most often we recorded corneal wound and traumatic cataract, often associated with lesions of the iris and of the sclera (Table 2).

**Table 2:** Patterns of ocular trauma according to the affected ocular structures

Structural damage to the eyeball	Number of cases
Eyelid wound	2
Conjunctival wound	11
Corneal abrasion /corneal ulcer	3
Corneal leucoma	13
Corneal siderosis	1
Corneal wound	39
Corneo-scleral wound with iris hernia	11
Corneal wound with iris hernia	12
Scleral wound	28
Traumatic cataract	48
Dislocation / subluxation of the lens	5
Irido-dialysis / iris coloboma	3
Traumatic exogenous uveitis	20
Hyphaema	3
Secondary Glaucoma	10
Vitreous bleeding	5
Retinal detachment	9
Macular edema	1
Hemophtalmus	14
Endophtalmitis	5
Traumatic optic neuropathy	1
Eyeball atrophy	3
Orbital cellulitis	2

## Discussion

Eye injuries are an important cause of morbidity worldwide [5]. One of 20 patients goes to the ophthalmologist

because of an eye injury resulted in uni- and bilateral visual loss. These situations have a social, economic and forensic impact [4]. Annually, from 6 million ophthalmologic patients with visual disorders, 2.3 million cases have bilateral decrease in visual acuity and 1.9 million cases have unilateral loss of visual acuity, in the latter situation trauma being the most common cause [6, 7]. Open globe injuries are a major cause of permanent visual impairment and blindness [8].

The standard practice of ophthalmologists in open globe injuries has been to undertake a primary surgical repair to restore the structural integrity of the globe, at the earliest opportunity regardless of the extend of the injury and the presenting visual acuity [9].

Penetrating eye injuries occur in all circumstances and are related to aggression, leisure, household, and occupational activities, traffic accidents, etc. [10].

Literature review showed that 35% of patients diagnosed with ocular trauma are children aged up to 17 years [11], but our study shows that those three analyzed age-groups (<20 years; 20-50 years;> 50 years) were affected almost similar.

Many authors reported a frequency of ocular trauma four times higher in male patients than in female patients [4, 7,12, 13], and this feature was also identified in our study, as among patients treated for ocular trauma in our clinic there were three times more men, than women.

Parmar et al. [13] found that cornea (47.60%), iris (32.64%) and eyelids (25%) were most commonly involved ocular structures in ocular trauma. Also, in our study, cornea has been affected most frequently, and traumatic optic neuropathy occurred only in one case.

The two eyeballs were affected in similar percentage (53.22% right eyeball and 46.78% left eyeball), although there was a slight predominance of the right eyeball.

The management of cases with ocular trauma depends on the type and extent of ocular lesions and also of their location: the anterior or the posterior pole.

Eye injuries can be divided into:

-simple ocular trauma

-severe eye injuries

-life-threatening eye injuries.

All penetrating or non-penetrating ocular trauma causing loss of an organ (or part of an organ, except the eyelid lashes loss) and which have as a consequence the facial disfigurement or post trauma sequelae formation (ptosis, entropion, strabismus, even with the maintaining of VA = 6 / 6) have forensic implications, and the abuser is sentenced depending on the severity of these lesions [14].

Patient presentation to an ophthalmologist is mandatory within 6 hours after injury, but frequently it was recorded within 24 hours. There were situations when the patient presented at 7 days after ocular trauma. Delayed surgery after 24 hours involves a risk factor in the occurrence of endophthalmitis and retinal detachment as sub retinal fluid accumulates and final visual acuity decreased, constituting an aggravating factor in terms of forensic medicine [7].

Depending on the severity of ocular trauma, in forensic cases the patient assessment must be detailed and well documented in order to determine visual acuity, ocular motility, and pupillary reflexes. Also, direct ophthalmoscopy, fluorescein 2% Seidel test, orbital X-ray, ocular ultrasound B-mode, computer tomography, and magnetic resonance image should be taken into consideration [15].

The prognosis of patients with penetrating ocular trauma has significantly improved, due to microsurgical techniques, newly surgical instruments, mixed surgical teams, made up of anterior and posterior pole surgeons, and to attempting more often the structural reconstruction of the eyeball, avoiding evisceration, which has serious aesthetic, psycho-emotional and forensic consequences.

Loss of visual acuity by eyeball loss constitutes a serious injury, as it is provided in Romanian Penal Code. The penalty is imprisonment of the defendant for a period ranging from 2 to 10 years, since aggression had as a consequence the loss of a sense organ associated with permanent physical disability [16].

Some of these nosological entities may have recurrent evolution, and this situation complicates the forensic assessment

as each episode could contribute in a negative and different manner to the evolution of disability. If the clinical picture clearly circumscribed, for each patient, the diagnosis, the treatment, and even the prognosis, then the impact of the social, familial, professional, and economic consequences on the sufferer can be extremely varied and individual and, as such, difficult to assess.

Consequently, because of the complexity of the context, the forensic approach should show more accuracy, flexibility, multi-disciplinary and responsibility, in order to be an act of fully balanced correction.

In addition, the ophthalmologist should know the applicable laws because, only so he could promote proper management of forensic cases. In the case of an ocular trauma made by aggression, the ophthalmologist has to develop a clear and true history, and should adopt a therapeutic management, proper to be addressed as soon as possible, thereby preventing further complications.

## Conclusion

The cases of ocular trauma are emergencies requiring an immediate therapeutic management. In situations when they are produced as a result of blunt assault to the body and have as consequences the loss of eyeball and of visual acuity they become forensic cases. We recommend proper documentation and investigations of these patients, so that forensic evidence should be sufficient, accurate and detailed for the correct classification of the offense according to the Penal Code.

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