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Research Article

# Observational Retrospective Descriptive Study Ocular Trauma due to Social Disturbances in Bogota, Colombia

**Camilo Eduardo Martínez, Paula Rocío Moreno, Sara Margarita Pérez* and Nicolás Soto**

*Department of Ophthalmology, Hospital Universitario San Ignacio, Pontificia Universidad Javeriana, Bogota, Colombia*

***Corresponding Author:** Sara Margarita Pérez, Department of Ophthalmology, Hospital Universitario San Ignacio, Pontificia Universidad Javeriana, Bogota, Colombia.

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## Abstract

**Background:** The eye is one of the three most affected organs by trauma, and in the Colombian context it is associated with considerable morbidity due to social disturbances.

**Objective:** To characterize the clinical, epidemiological and visual prognosis profile of patients with ocular trauma that occurred in social manifestations between the period of July/2019 and January/2020 treated at the ophthalmology´s department of the Hospital Universitario San Ignacio.

**Study Design:** Observational retrospective descriptive study.

**Method:** The target population was patients with a history of ocular trauma that occurred during social disturbances between the period of July/2019 and January/2020 in Bogotá, Colombia. Both clinical and paraclinical variables were analyzed and trauma was classified according to BETT (The Birmingham Eye Trauma Terminology) and the OTS (Ocular Trauma Score).

**Results:** Data were collected from 16 patients with ocular trauma in the period July/2019 and January/2020. The age range was between 16 and 35 years, mostly men. 68.8% presented visual acuity of counting fingers (CF), 81.3% of the cases presented blunt ocular trauma and the most frequent finding in the posterior pole was vitreous hemorrhage. The visual prognosis of the patients with follow-up was between light perception (PL) and (CF).

**Conclusion:** The results support the statement that ocular trauma is a significant cause of visual loss, and therefore prevention resources should be assured in men and young people which are the most vulnerable groups.

***Keywords:*** *Ocular Trauma; Visual Prognosis; Social Disturbances; Colombia; BETT Score; OTS Score*

## Introduction

Despite the fact that the eye accounts for only 0.27% of the total body area and 4% of the facial area, it is the third most common organ affected by trauma, which is why in risky contexts the adequate and timely use of protective equipment is recommended [1,2]. It is estimated that 750 thousand eye traumas occur in the world each year requiring hospitalization; and that there are currently more than 1.6 million blind people and more than 19 million with unilateral blindness or low vision secondary to ocular trauma [3].

The highest rates of eye trauma occur in young adult males, related to work, sports, assaults and traffic accidents. Less common causes are gunshot wounds, war-related eye injuries and fireworks in children [4,5]. Assault injuries, injuries sustained in the street and those caused by gunshots increase the risk of blindness and being at home was found to be the most frequent site of eye injury [6]. These injuries have a significant socioeconomic impact both for the affected individuals and their families and for their country, due to lost work time, costs of hospital care, treatment by specialists, prolonged follow-up and visual rehabilitation [3,7].

In recent years, several countries in Europe, Africa, Asia and America have been the focus of attention due to the large number of civil demonstrations and protests [8], which often involve the use of crowd control weapons that can have serious consequences such as disability and death [9-11]. In this paper we describe an understudied context of ocular trauma associated with protests and social disturbances in Colombia, where we give evidence of the type of trauma by using the BETT trauma classification, eyeball damage and visual sequelae.

## Materials and Methods

### Design and sample

A retrospective review of the medical records of all patients treated at the Department of Ophthalmology, in the Hospital San Ignacio, Bogotá, Colombia, with a history of ocular trauma occurring in the context of social disturbances between the period July 2019 and January 2020 was performed. Data included age, sex, mechanism of trauma, visual acuity at admission, details based on slit lamp microscopy findings, intraocular pressure, ophthalmoscopy, results of complete eye and orbit evaluation, imaging, treatment performed and visual outcomes. Injuries were classified according to BETT (The Birmingham Eye Trauma Terminology) and the OTS (Ocular Trauma Score) was calculated.

## Results and Discussion

During the period analyzed, 16 patients with ocular trauma that occurred in the context of demonstrations and civil protests were evaluated. Fifty percent were between 16 and 20 years old, 37.5% were between 21 and 25 years old, and 12.6% were between 26 and 35 years old. 81.3% were men and 18.8% were women. Regarding the mechanism of trauma, 81.2% of the cases were secondary to non-lethal crowd control weapons, and the remaining 18.8% were due to an unknown mechanism.

In terms of visual acuity, 68.8% of the cases presented on admission with visual acuity worse than or equal to counting fingers (CF). Regarding BETT classification, 81.3% of the cases presented with blunt ocular trauma and 18.2% of the cases presented with ocular burst.

On external ocular examination, 43.75% of the traumas presented periorbital hematoma and 22.2% eyelid injuries. The most frequent finding in posterior pole using binocular indirect ophthalmoscopy was vitreous hemorrhage as shown in figure 1 where the findings of indirect ophthalmoscopy are shown and in figure 2 those found during ocular ultrasound.

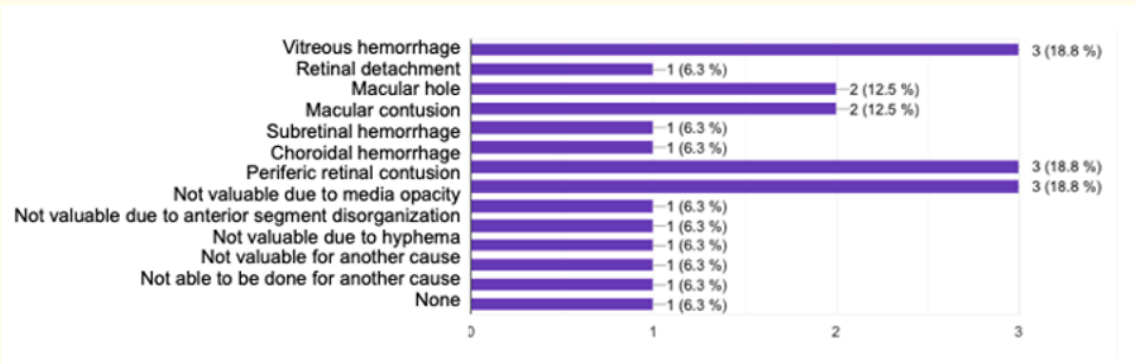


***Figure 1:*** *Findings by indirect ophthalmoscopy.*


***Figure 2:*** *Findings found by ocular ultrasonography.*

Regarding surgical management, 50% of the cases (8 patients) required surgery. Of the traumas surgically intervened, the most frequent procedure was posterior vitrectomy, which was performed in 75% of the cases that were taken to surgery, initial diagnosis and reason for the procedure undertaken in each patient is exposed on table 1. Similarly, among the surgical procedures performed, 37.5% required corneoscleral suture, 37.5% lensectomy, and 25% of the cases required preretinal membrane stripping figure 3.

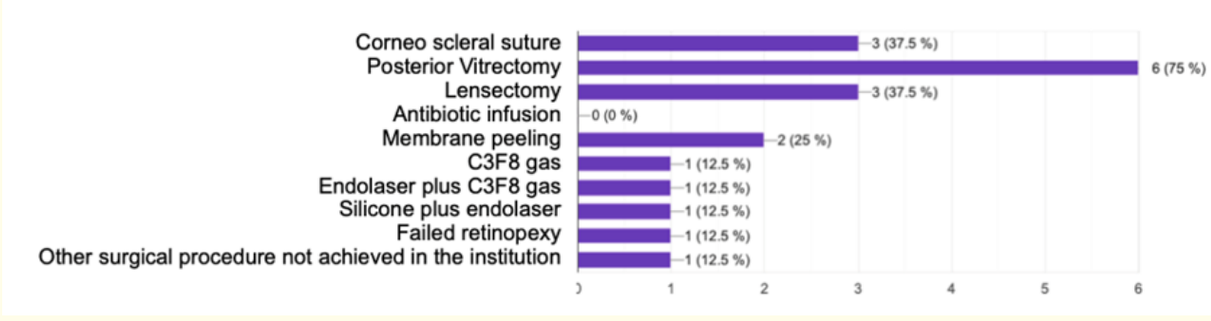


***Figure 3:*** *Surgical procedures performed per patient.*

| Patient | Anterior segment findings | Findings by indirect ophthalmoscopy | Surgical intervention |
|---|---|---|---|
| 1 | Corneo-scleral injury, hyphema, corneal edema | Impossibility to perform due to anterior segment disorganization. | Corneo-scleral suture |
| 2 | Conjunctival injury | Choroidal detachments, extensive retinal contusion. | Non surgical management |
| 3 | Hyphema | Impossibility to perform due to extense hyphema. | Corneo-scleral suture, posterior vitrectomy, lensectomy |
| 4 | None | Macular hole | Posterior vitrectomy, peeling, Gas C3F8 infusion. |
| 5 | Angle recession | Vitreous hemorrhage, retinal detachment, macular hole, macular contusion | Posterior Vitrectomy, peeling, Endolaser, Gas C3F8 infusion |
| 6 | Hyphema, corneal edema | Impossibility to perform due to anterior segment opacity | Non surgical management |
| 7 | Angle recession, corneal epithelial defect, corneal edema | Subretinal hemorrhage, peripheral retinal contusion | Non surgical management |
| 8 | Iridodialysis, hyphema, corneal epithelial defect, Corneal Edema | Impossibility to perform due to anterior segment opacity | Posterior vitrectomy, Lensectomy, Endolaser, silicone |
| 9 | Corneo-scleral injury, hyphema, angle recession, corneal epithelial defect, corneal edema | Peripheral retinal contusion | Non surgical management |
| 10 | Corneo-scleral injury, conjunctival injury | None | Non surgical management |

| | | | |
|---|---|---|---|
| 11 | Corneo-scleral injury, hyphema, corneal edema, atalamia | Impossibility to perform due to anterior segment opacity | Corneoscleral suture, posterior vitrectomy, lensectomy, retinopexy was not achieved. |
| 12 | Hyphema, corneal edema | Vitreous hemorrhage, macular contusion | Non surgical management |
| 13 | Hyphema, corneal edema | Peripheral retinal contusion | Non surgical management |
| 14 | Traumatic cataract, lens subluxation hyphema, corneal edema, rupture of the iris sphincter | Vitreous Hemorrhage, Partial Zonular Rupture, Partial posterior vitreous detachment. | Non surgical management |
| 15 | Iridodialysis, hyphema, corneal Edema | Impossibility to perform due to anterior segment opacity | Non surgical management |
| 16 | Traumatic cataract, hyphema, corneal epithelial defect, corneal edema | Vitreous hemorrhage | Posterior Vitrectomy |

***Table 1:*** *Anterior and posterior segments findings and intervention taken in each of the 16 patients.*

Of these, 62.5% (10 patients) had a follow-up of less than one month, 30% between 1 and 3 months and 10% between 3 and 6 months.

Of these 10 patients followed up, visual acuity after treatment and surgical interventions was (CF) in 4 patients, light perception in 4 patients, 20/40 in 1 patient and 20/80 in 1 patient.

Although confrontations between the civilian population and the public forces are frequent in Colombia during civil protests and demonstrations [13], this is the first report of this type of injury in the country. It was carried out with the purpose of providing information necessary to educate the population and develop preventive measures during civil disturbances.

Weapons used for crowd control, upon contact with the orbit or adjacent structures, have the potential to cause injuries of varying severity to the eyeball (from conjunctival irritation to eye popping) and orbit. Despite the widespread use of these weapons during social demonstrations, there is limited regulation of their development and use. Manufacturers are not required to keep records of injuries from their products and in most countries, there is no legal requirement for the collection of data on injuries caused by law enforcement [14,15].

Tissue damage induced by rubber pellets is due to crushing by the blunt tip of the pellet and the shock wave generated by the impact, which creates lacerations and fractures distant from the impact area. When the force applied by the pellet deforms the tissue beyond its limits of elasticity (tendency to recover its original state) or viscosity (resistance to change of shape during movement), the cohesion of the surface is lost and leads to tissue penetration [16]. In tissues with low elasticity or viscosity such as the bones of the face and eyes, the risk of penetration increases, even when the pellets are fired from a certain <<safe>> range according to the protocols of these weapons [17].

As in previous reports from other countries [17-24], most of the recorded injuries occurred in men and young adults (probably associated with their greater participation in civil demonstrations), as reported in a prospective study of ocular trauma in Colombia. Most of the injuries occurred in people of working age with a poor visual prognosis, which has negative effects on their personal and working life in the short and long term. This is secondary to the visual rehabilitation, medical follow-up and possible limitations they will face as a consequence of their visual impairment. They also have a higher risk of developing complications and requiring additional treatments in the future such as painful blind eye, corneal leukoma, cataract, glaucoma and retinal detachment, among others.

When comparing our report with those published in the literature on eye injuries occurring in the context of civil unrest, we found that, like the studies conducted in Israel [17,23], Chile [18] and France [24], the majority of eye injuries were caused by rubber bullets, while in

studies conducted in India [19], Egypt [20] and Nigeria [21] those caused by stones and firearms were more common.

Regarding visual sequelae, studies in Israel report a higher rate of visual acuity worse than 20/200, in their study they describe that 53% of their patients had a visual acuity worse than 20/200 and 29% had no light perception. Forty percent retained acuity of 20/63 or better and 7% had acuity between 20/200 and 20/63 [23]. In contrast, in Chile the visual outcomes are similar to those reported in this study, with 52.9% of cases with visual acuity less than 20/200 [18]. The study by Mpyet., *et al.* in Nigeria reported the worst visual outcomes, with 81.8% with visual acuity less than 20/200. In Colombia a study conducted by Zawaski., *et al.* [19] between June 2013 and January 2018 in 619 patients with ocular trauma attended in different hospitals in Colombia, reported that the most frequent initial visual acuity range was hand movement (HM) to light perception (LP).

Regarding the type of trauma, in France they reported a higher frequency of open eyeball (25 cases of open eyeball injuries and 18 of blunt eye trauma), despite the fact that the main mechanism of trauma was the same (rubber pellets) [23], which is reflected in their worse visual outcomes (58% no light perception). With the exception of the studies performed in Egypt [21], France [23] and one of those performed in Israel [17], the other published analyses [18-24] as well as ours, reported a higher frequency of ocular blunt trauma. Zawaski., *et al.* [19], reported that in Colombia the most frequent type of injury was contusion with 48.63%, followed by penetrating trauma (30.21%) and intraocular foreign body (7.92%).

Weaknesses of this study are associated with the loss and short follow-up of patients who were seen, which limited the ability to report visual outcomes and long-term complications.

## Conclusion

The results of this article support the statement that ocular trauma is a significant cause of visual loss in Colombia, therefore preventive strategies should be assured in order to educate vulnerable population, especially young people, for the sake to reduce permanent vision loss or profound sequalae during civil disturbances.

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## Conflict of Interest

The authors declare there is no conflict of interest.

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