Original Article

# Analysis of Operated Patients with Ocular Trauma: A 10-Year Retrospective Study

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## Abstract

**Background:** Ocular trauma is one of the most common causes of hospitalization in patients with ocular injuries. It imposes many direct and indirect physical and psychological costs on the patient and the community.

**Materials and Methods:** The present descriptive cross-sectional and retrospective study includes all patients with ocular trauma who underwent surgery in the referral center's ophthalmic operating room for 10 years. A checklist was completed for each patient, including demographic information and the variables required for the study. A total of 927 patients who underwent eye surgery due to ocular trauma were eligible for the study. All descriptive data were reported as the mean plus standard deviation for quantitative variables and distribution tables and frequency percentage for qualitative variables. Inferential tests such as independent t-test and Chi-square test were used to evaluate the research questions.

**Results:** This study showed that most ocular traumas occur at a young age and mostly in males. The types of trauma in the studied eyes were divided into penetrating and non-penetrating in different age groups. The results showed that the most common type of surgery was corneal laceration repair, and in all patients, visual acuity improved significantly after surgery. In this study, a total of 81% of patients underwent only one operation.

**Conclusions:** Training and caring for children and adolescents about high-risk behaviors and educating industry professionals to wear goggles, and increase workplace safety can reduce these types of trauma.

**Keywords:** Corneal trauma, eye injuries, operative procedures, vision

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## Introduction

Ocular injury is an essential etiology of unilateral blindness and visual impairment in many populations. Eye injuries usually occur either as separate injuries or as part of the head or facial traumas.[1] Ocular traumas are classified into two general categories: penetrating and non-penetrating traumas. Penetrating injury is caused by a sharp object and the entire thickness of the eye wall is involved. Non-penetrating trauma is an injury that causes the internal parts of the eye to be crushed and torn without the penetrating object entering the eye.[2] The most common causes of ocular trauma vary depending on the study area. However, accidents with vehicles, sports, burns, fists (mostly in adults), splashing of glue into the eyes, direct contact with sharp objects such as knives, pencils, needles, and sharp toys, throwing foreign body, small metal and non-metallic eye injuries, falls, and other penetrating traumas are the most common causes of eye injuries.[3-6]

Because there is not enough information available about the prevalence of eye injury in patients undergoing eye surgery and there are no prior studies about eye trauma with reliable data in southwest of Iran (our region), and also due to many variations in the epidemiology of ocular trauma in different

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regions present research in this field seems to be necessary. This study aims to investigate and analyzes ocular trauma for 10 years.

## Materials and Methods

The present investigation is a descriptive, cross-sectional, and retrospective study. A total of 927 patients from 2008 to 2017 who had ophthalmic surgery due to eye trauma in referral hospitals of Iran's southwest were enrolled in the study. The subjects with inadequate records were excluded. A checklist including demographic and the main variables data was completed for each subject. Demographic data were age, gender, occupation and the main variables were time elapsed from trauma to hospitalization, cause of trauma, site of the injury, injured eye, vision on arrival and discharge day, the initial diagnosis, and the number of surgeries per patient.

### *Statistics*

All descriptive data were reported as mean and standard deviation. Quantitative variables were expressed in distribution tables, and qualitative variables were expressed in frequency and percentage. Inferential tests such as independent *t*-test and Chi-square test were used to evaluate the research issues. All data were statistically analyzed using SPSS software, and the level of significance was considered ≤0.05%.

## Results

In the present study, 927 people were eligible to enter the study, so their details and information were included in the research project. Preliminary examination of the data showed that more than 90% of the operated ocular injuries were penetrating trauma. About two-thirds of those affected are men, but no significant difference was observed between men and women regarding penetrating and non-penetrating damage. As shown in Table 1, the type of trauma was examined in penetrating and non-penetrating in different age groups. In this study, the lowest quantity was in the age group of 70–80 years, and the highest abundance of traumas was in the 0 to 10 years. Also, penetration damage had a higher percentage in all groups, and no significant difference was observed between different age groups [Table 1].

Then the frequency of various types of injuries in operated eyes was checked. Corneal laceration and hyphema had the highest frequency among all injuries, while the least number of injuries were related to orbital fracture, scleral laceration with iris prolapse, and vitreous hemorrhage. Corneal laceration with iris prolapse and scleral laceration were significantly higher in men than women., Significant differences were observed in the penetrating and non-penetrating groups regarding scleral laceration, scleral laceration with iris prolapse, and corneoscleral laceration. For more details, look at Table 2. Examination of eye injuries based on the causative agent showed that the most harmful agents were knives and sharp glasses. Also, the lowest number of injuries was related to falling and firecracker. Injuries caused by knives and sparks of the grinders were significantly more common in men. There was no difference between men and women in other harmful factors [Table 3].

**Table 1: Demographic data and frequency**

| Gender Age group | Frequency (%) | Penetrating Trauma (%) | Non-penetrating Trauma (%) | *P* |
|---|---|---|---|---|
| Total | 927 patient | 853 (92%) | 74 (8%) | - |
| Female | 226 (24.4%) | 209 | 57 | 0.76 |
| Male | 701 (75.6%) | 644 | 17 | |
| 0-10 | 307 (33.1%) | 279 | 28 | 0.38 |
| 10-20 | 150 (16.2%) | 137 | 13 | |
| 20-30 | 176 (19%) | 166 | 10 | |
| 30-40 | 141 (15.2%) | 129 | 12 | |
| 40-50 | 66 (7.1%) | 61 | 5 | |
| 50-60 | 38 (4.1) | 37 | 2 | |
| 60-70 | 28 (3%) | 25 | 3 | |
| 70-80 | 10 (1.1%) | 8 | 2 | |
| 80-90 | 11 (1.3) | 11 | 0 | |

Investigation of different surgeries revealed that corneal repair has the highest frequency. We also considered hospitalization days after each operation. Analyzes showed that a small percentage of people were hospitalized for more than ten days in all surgery types. Analysis showed that majority of patients were hospitalized for 3–5 days. The hospitalization days were significantly different in most surgeries, for more details see Table 4. Visual acuity examination before and after surgery based on different operations showed a significant improvement in all surgeries [Figure 1].

In the continuation of the investigations, we observed that there was no difference between the frequency of the left and right eye among ocular injuries. Also, the traumatic injury scene was on the street and the workplace for most men, while the scene of the event was home for most women. The results showed that in 81%, recovery occurred after one operation, two surgeries were needed in 15%, in 3.5%, three surgeries, and less than 0.5%, and more than four surgeries were performed to achieve the ideal recovery. Also, no significant difference was observed between the number of surgeries and gender. Due to no small amount of data, we refused to provide more details of the above tables.

## Discussion

This retrospective investigation exhibits data about the prevalence and clinical features of hospitalized subjects that has been operated for ocular trauma from 2008 to 2017. A large number of patients who suffered from ocular trauma (33.1%) were recognized in the pediatric age group (0–10 years). Wang *et al*.[7] in 2017 in a five-year retrospective study has reported that the most frequent age group for eye injuries was under the age of 18 years. Another study in India in 2020 stated that the kids are more vulnerable to firecracker injuries because they

**Table 2: Variety of trauma in men and women in both penetrating and non-penetrating types**

| | Total (%) | Female (%) | Male (%) | *P* | Penetrating (%) | Non-penetrating (%) | *P* |
|---|---|---|---|---|---|---|---|
| Corneal laceration without iris prolapse | 34.2 | 77 (34.1) | 240 (34.2) | 0.96 | 38.1 | 0.0% | 0.000 |
| Hyphema | 30 | 61 (27) | 217 (31) | 0.25 | 26.8 | 66.2% | 0.000 |
| Cataract | 19.7 | 45 (19.9) | 138 (19.7) | 0.94 | 21.2 | 2.7 | 0.000 |
| Corneal laceration with iris prolapse | 14 | 36 (15.9) | 94 (13.4) | 0.34 | 15.2 | 0.0 | 0.000 |
| Canalicular laceration | 14.3 | 34 (15) | 99 (14.1) | 0.73 | 15.6 | 0.0 | 0.000 |
| Eyelid laceration | 9 | 23 (10.2) | 60 (8.6) | 0.45 | 9.7 | 0.0 | 0.005 |
| Orbital fracture | 2.5 | 8 (3.5) | 15 (2.1) | 0.23 | 2.5 | 2.7 | 0.70 |
| Corneoscleral laceration with iris prolapse | 6.4 | 24 (10.6) | 35 (5) | 0.003 | 6.9 | 0.0 | 0.01 |
| Scleral laceration | 11.5 | 14 (6.2) | 93 (13.3) | 0.004 | 11.3 | 14.9 | 0.35 |
| Scleral laceration with iris prolapse | 2.5 | 5 (2.2) | 18 (2.6) | 0.76 | 2.6 | 1.4 | 1 |
| Vitreous hemorrhage | 2.4 | 2 (0.9) | 20 (2.9) | 0.09 | 1.8 | 9.5 | 0.001 |
| Corneoscleral laceration without iris prolapse | 3.7 | 9 (4) | 25 (3.6) | 0.77 | 4 | 0.0 | 0.1 |

*P*<0.05 assign as significant difference

**Table 3: Cause of ocular trauma in men and women**

| Cause of trauma | Total (%) | Female (*n*) | Male (*n*) | *P* |
|---|---|---|---|---|
| Knife | 265 (28.6) | 84 | 181 | 0.001 |
| Sharp glass | 141 (15.2) | 34 | 107 | 0.94 |
| Stick | 82 (8.8) | 21 | 61 | 0.79 |
| Metal wire | 112 (12.1) | 21 | 91 | 0.14 |
| Stone | 40 (4.3) | 6 | 34 | 0.16 |
| Pencil | 50 (5.4) | 17 | 33 | 0.10 |
| Jet stone | 47 (5.1) | 2 | 45 | 0.001 |
| Tree branch | 56 (6) | 11 | 45 | 0.40 |
| Car accident | 56 (6) | 15 | 41 | 0.66 |
| Firecracker | 18 (1.9) | 4 | 14 | 1 |
| Jab | 21 (2.3) | 4 | 17 | 0.56 |
| Small shot | 20 (2.2) | 2 | 18 | 0.19 |
| Falling | 19 (2) | 5 | 14 | 0.79 |

*P*<0.05 assign as significant difference

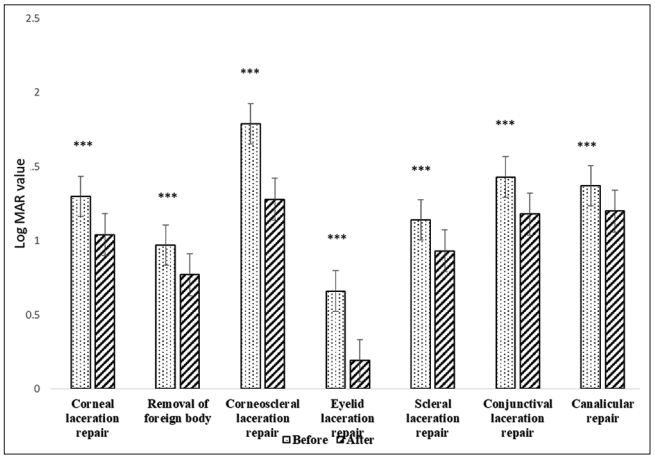


**Figure 1:** Patients' vision based on Log MAR before and after different surgeries. *** *P* value < 0.001

do not know how to protect themselves. Kids aged 6–10 years compared to others were generally affected by ocular trauma, and there were no significant differences between rural and urban children.[8] The kids are more vulnerable to firecracker injuries because they do not know how to protect themselves. This emphasizes the necessity to focus more on safety tactics (measures) for children to prevent eye injuries.

Most of the ocular trauma cases similar to more studies were men, and the event frequently occurred in the street and workplaces and was mainly caused by a knife and sharp glass. Because men are more active in outside work than women, they are more likely to be injured.[9-11] Cao *et al*.[12] (2018 in China), over 10 years of examination of 3644 patients, explained that the most common types of injuries are work- and home-related injuries. Moreover, the ratio of job-relevant ocular trauma in developing nations is higher than that in developed countries, and mostly the workers lack safety awareness.[13,14] A large number of these traumas could be prevented by wearing safety glasses. In the current analysis, about 90% of the operated eye injuries were penetrating. In two studies, the type of injury in 90% of operated eyes was penetrating.[8,15]

In this research, regarding the type of causative agent except knife and grinder sparks which was significantly higher in men. Prevalence of eye injuries of the harmful agent in terms of the harmful device from country to country can be influenced by many factors such as different cities. In an industrial city, the prevalence of eye injury is more than in a traditional city. In an industrial city, the prevalence of eye injury is more than in a traditional city.[16-18] In this 10-year investigation, the most common injury in the operated eyes was corneal laceration and hyphema, vitreous hemorrhage, orbital fracture, and iris prolapse had the lowest prevalence, respectively. The types of eye injuries in men and women were similar except for corneoscleral laceration with iris prolapse and scleral laceration. Syal *et al*.[19] in 2018 reported that corneal laceration was the most common type of injury in the operated eyes and most of the surgeries performed were related to repairing corneal laceration. The results of this study are in line with the findings of the present study. Also, in terms of penetrating and non-penetrating trauma, there was no significant difference between men and women. Similar to our results, Onakpoya *et al*.[18] revealed, most of the injuries were penetrating, and there were significant differences between the various types of trauma-based on the genders.

**Table 4: Distribution of surgeries and the hospitalization days**

| Hospitalization Days/Surgery | Total | 1-3 Days | 3-5 Days | Days 5-10 | 10< Days | *P* |
|---|---|---|---|---|---|---|
| Corneal laceration repair | 421 | 92 (21.8%) | 157 (37.3%) | 149 (35.4%) | 23 (5.5%) | <0.0001 |
| Removal of foreign body | 228 | 87 (38.1%) | 77 (33.7%) | 58 (25.4%) | 6 (2.6%) | 0.222 |
| Corneoscleral laceration repair | 108 | 3 (2.7%) | 41 (37.9%) | 56 (51.9%) | 8 (7.4%) | <0.0001 |
| Eyelid laceration repair | 101 | 53 (52.5%) | 25 (24.8%) | 22 (21.8%) | 1 (1%) | <0.0001 |
| Scleral laceration repair | 126 | 34 (27%) | 47 (37.3%) | 41 (32.8%) | 4 (3.2%) | 0.347 |
| Conjunctival laceration repair | 174 | 62 (35.6%) | 62 (35.6%) | 44 (25.3%) | 6 (3.4%) | 0.659 |
| Canalicular repair | 118 | 78 (66.1%) | 35 (29.6%) | 4 (3.4%) | 1 (0.8%) | <0.0001 |

*P*<0.05 assign as significant difference

Visual loss is apparent after ocular trauma, but its determination is often postponed due to the complexity that injured patients may be unconscious and incapable of giving a clinical history.[20] As mentioned in the study method, all subjects underwent various surgeries; 45.5% corneal repair, 24.6% removal of a foreign body, 18.8% conjunctival repair, 13.6% scleral repair, 12.7% canalicular repair, 11.6% corneoscleral repair, and 10.9% eyelid repair. In agreement with previous studies, our retrospective study found that vision improved after surgery compared to before in all types of surgeries.[21-24]

The results of the present and all other studies show the care and attention in the use of sharp tools and the need to observe safety tips in this area. By informing and educating parents in providing toys appropriate for the child's age; Authorities' oversight of the use of high-quality materials in its construction can also be expected to reduce eye trauma in children. To reduce and prevent occupational accidents, safety during work should be mandatory, and eye protection devices should be used. At home, women are the most affected by eye trauma, which should help reduce the trauma by training and following safety instructions.[25-29]

## Conclusion

Because the underlying factors of eye trauma can be caused by accidents, conflicts, toys, and low occupational safety, appropriate solutions should be considered to reduce these problems. For example, in most accidents, due to non-observance of safety principles, eye trauma occurs, which can be prevented and reduced by wearing seat belts, raising the standard of cars, having airbags, and similar measures. Appropriate culture building, teaching anger control strategies, conflict prevention, and reduction of car accidents should be done.

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### *Conflicts of interest*

There are no conflicts of interest.

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