

Research Article

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Eye Injuries Requiring Surgery in the Bahamas

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Abstract

Objective: The purpose of this study is to describe the age and sex profile of the study participants, the identification of the clinical procedures concerning eye injuries that presented to the emergency department, and to identify those injuries that resulted in surgical management at the Princess Margaret Hospital (PMH) Ophthalmology Unit in The Bahamas. Furthermore, to describe the range of surgical procedures performed for ocular injuries among the study participants.

Method: An audit of the PMH Eye Theater Surgical Logbook was conducted for all patients who underwent surgical management for eye injuries as recorded during the period June 2013 – December 2018. A data sheet was used and included the following variables: age, gender, surgery date, type of surgery, type of anesthesia used, and level of training of the surgeon. Statistical analysis was performed using IBM SPSS.

Results: Ages ranged from 1.25 to 89 years old, with a mean age of 34.3 ± 18.7 . Approximately, 82% of cases requiring surgical procedures were male and 18% were female. A male: female ratio of 2.5:1.2. Sixty-three percent of cases required globe rupture repair (corneoscleral lacerations) and among them, three-fifths of the cases involved corneal lacerations. Globe exploration was the most common type of operation done in almost 70% of cases. Globe rupture repair was found in 63% of cases. Almost 30% of cases had eyelid and brow involvement requiring repair. Foreign body removal involved only 4%. Anterior chamber washout and anterior chamber vitrectomy represented a small percentage of the cases, roughly 2%. Evisceration and enucleation were rare accounting for a minuscule <1% of cases.

Conclusion: Eye injuries were more common in males and displayed a multimodal pattern of age, ranging from infant to elderly. While corneal lacerations were the most common eye injuries requiring surgery, globe exploration was the most common type of surgery performed in this study. Repair of eyelid and brow lacerations were the second most common surgical procedures.

Keywords: Eye trauma; Ocular injury; Bahamas; Penetrating trauma; Blunt trauma; Eye emergency.

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Introduction

Globally there are over 50 million eye injuries annually. Eye injuries can be helpfully seen as falling firstly into two major categories, (1) blunt injuries and (2) penetrating injuries. Both are potentially sight-threatening and can be complicated with bleeding and infection. Given that eye injuries are a leading cause of preventable monocular blindness, they are considered a significant public health concern [1-3]. Indeed, a holistic view appreciates that ocular trauma can involve associated socioeconomic burden, increased medical care costs, a reduced vision which may necessitate vocational rehabilitation, loss of career opportunities, major lifestyle changes, psychological impact, and permanent physical disfigurement.

These eye injuries occur across a very broad spectrum ranging from self-healing corneal abrasions and disfiguring eyelid lacerations to sight-threatening globe ruptures. The required surgical interventions range from precisely reopposing and suturing simple lid lacerations to more technical repairs that involve the lacrimal apparatus, globe rupture repair, and even sadly evisceration and enucleation as last resort with their attendant psychological and social implications.

The purpose of this study is to evaluate the patterns of eye injuries which required surgical management over five years at The Princess Margaret Hospital, the primary tertiary center in The Bahamas. The mission of the Ophthalmology Service of the PMH is to provide excellent ophthalmic care to all coming through the clinic's doors and lessons learned from this study will advance that thrust. Certainly, this complements the ophthalmology service's vision of a nation well educated on the importance of eye health and conscientiously partnering with eye health professionals in a timely manner.

Materials and methods

This audit used a retrospective chart review of patients who underwent surgical management for eye injuries as recorded during the period June 2013 - December 2018. The study was conducted using an audit of the PMH Eye Theater Surgical Logbook. The sampling approach employed a non-probability consecutive sampling procedure.

The inclusion criterion was participants of all ages who underwent surgical procedures for ocular injuries during the period June 2013 – December 2018. Patients who underwent surgical procedures not related to acute ocular injuries and those who underwent surgical procedures, not within the study period were excluded.

The researchers expected that about 50% of patients seen would have globe ruptures and next would be lid lacerations just below 50% of the cases. The minimum sample size calculated assumed a 10% margin of error (i.e. ± 0.10) and 5% Type I error (i.e. α ; ± 0.10) and it was ≥ 97 participants. This was exceeded, as the medical records of 105 participants were selected in this study.

Permission was sought from the Joint Public Hospitals Authority (PHA) and the University of The West Indies, Ethics Committee in Nassau Bahamas to review the surgical logbook of the PMH Eye Theater. Thereafter, the data was collected in a private setting within the PMH Eye Theatre, ensuring confidentiality. Data collected included patients' age, sex, surgery date, type of surgery, type of anesthesia used, and level of training of the surgeon.

The data were managed using both Microsoft Excel application software and version 27 of IBM SPSS Statistical application software for data analysis. Both descriptive and inferential statistical analysis were carried out on the collected study data. Descriptive statistics included appropriate measures of central tendency (percentages, modes, medians, and means) as well as accompanying measures of dispersion (full ranges, interquartile ranges, and standard deviations). Inferential statistics were used to analyze the results for statistical significance (p -value criterion: ≤ 0.05). Correlation coefficients used in this study included those based on the Chi squared test of independence (Phi and Cramer's V) as well as Spearman's rho correlation coefficient (r_{sp}).

The Chi-squared test of homogeneity or Fisher's exact test was employed to assess the statistical significance of differences in percentage distributions of each categorical variable of interest when cross-tabulated with another categorical grouping variable.

Results

Socio-demographic profile

Participants' mean age was 34.3 (± 18.7) years old and ranged from 1.3 years old to 89.0 years old. Table 1 displays participants' ages in groups as well as sex and the year of their injury being attended to at the PMH Eye Theatre.

Their median age group was 31-40 (IQR: 21-30, 31-40) years of age range and their modal sex was males with 86 (81.9%) having that status. It was during the years 2014 and 2016 that most eye injuries were attended to at this facility (Table 1) as together they accounted for 46 (45.1%) of patients in this study. The trend of these eye trauma occurrences appeared to be somewhat sinusoidal undulations.

Table 1: Clinicopathological characteristics of PEACs in comparison with MCC.

Variables	n (%)
Sex	
Male	86 (81.9)
Female	19 (18.1)
Age groups	
<11 yrs. old	8 (8.5)
11-20 yrs. old	14 (14.9)
21-30 yrs. old	20 (21.3)
31-40 yrs. old	26 (27.7)
41-50 yrs. old	11 (11.7)
51-70 yrs. old	10 (10.6)
>70 yrs. old	5 (5.3)
Years of injury	
2013	16 (15.7)
2014	24 (23.5)
2015	10 (9.8)
2016	22 (21.6)
2017	16 (15.7)
2018	14 (13.7)

Nature of eye injuries and frequency of interventions for eye injuries

Table 2 and Graph 1 show that the most common (modal) eye trauma repair procedure over the period 2013-2018 was globe exploration, followed by globe rupture repair, and regularly participants had multiple procedures done. General anesthesia was used on 75 (71.4%) of the occasions when doing the eye injury repair. Among these 75 cases, the surgical procedure was globe exploration for 64 (85.3%), globe rupture repair 60 (80.0%), corneal laceration 28 (37.3%), eyelid/eyebrow laceration repair 12 (16.0%), corneal aspiration 7 (9.3%), anterior chamber washout, anterior vitrectomy or enucleation each for 2 (2.7%) and suture removal, degloving injury, canalicular repair, evisceration each on 1 (2.7%) of the procedures done on 75 patients. Thirty patients received local anesthesia and among them, there were 18 (60.0%) eyelid/eyebrow laceration repairs, 8 (26.7%) globe explorations, 5 (16.7%) globe rupture repairs, 3 (10.0%) cases requiring re-suturing, 2 (6.7%) repairs involving the canalicular apparatus, 2 (6.7%) foreign body removals and 1 (3.3%) case each for removal of sutures and repair of conjunctival laceration.

The use of general or local anesthesia did not differ statistically significantly by participants' sex. Among the 68 males, 63 (73.3%) were given general anesthesia and among the 19 females, 12 (63.2%) were given the same ($p=0.378$). The use of general or local anesthesia did not differ statistically significantly by patients' mean age. Among the 69 cases given general anesthesia, the mean age was 34.8 (± 2.3 years old). Among the 25 cases given local anesthesia, the mean age was 32.9 (± 3.5 years old) ($p=0.667$).

There was a statistically significant relationship between participants' suture removal status and their sex status ($p=0.031$). Here, none (0.0%) of the 86 males had suture removal, while of 19 females, 2 (10.5%) had suture removal. The mean age for the 56 participants who had globe rupture repair under general anesthesia was 37.5 (± 2.6) years old, while for the 13 receiving local anesthesia the mean age was 23.1 (± 4.2) years old. This 14.4 (± 5.7) years age difference was statistically significant ($p=0.014$). No such relationship existed for those with globe rupture repair who received local anesthesia.

Regarding the 75 patients who were given general anesthesia, their gender status was also related to their foreign body removal procedure status ($p=0.020$). Here, none of the 63 males had foreign body removal, while 2 (18.2%) of 11 females had foreign body removal under anesthesia. Regarding the 30 given local anesthesia, 2 (8.7%) of 23 males had foreign body removal, and none of the 7 females had this procedure. However, this difference was not statistically significant.

The mean age of participants who received local anesthesia was 22.5 (± 0.5) years old for the 2 persons who had a foreign body removal and 33.8 (± 3.7) years old for the 23 not having this procedure, but this 11.3 (± 12.8) years old difference was not statistically significant. However, for the 68 given general anesthesia, of which 2 had foreign body removal, their mean age was 8.0 (± 2.0) years old compared to 35.6 (± 2.4) years old for the 66 not having a foreign body removal and this 27.6 (± 13.6) years old age difference was statistically significant ($p=0.023$). In this study, no other statistically significant relationships were found by participants' age, sex or, use of local or general anesthesia.

Table 2: Frequency and percentages of procedures for participant eye injuries in the study period.

Procedure	n (%)
Globe exploration	72 (68.6)
Globe rupture repair	65 (61.9)
Corneal laceration repair	30 (28.6)
Eyelid/eyebrow laceration repair	30 (28.6)
Cataract aspiration	7 (6.7)
Resuturing	5 (4.8)
Foreign body removal	4 (3.8)
Canalicular repair	3 (2.9)
Anterior chamber washout	2 (1.9)
Removal of sutures	2 (1.9)
Anterior vitrectomy	2 (1.9)
Enucleation	2 (1.9)
Conjunctival laceration	1 (1.0)
Evisceration	1 (1.0)
Degloving injury	1 (1.0)

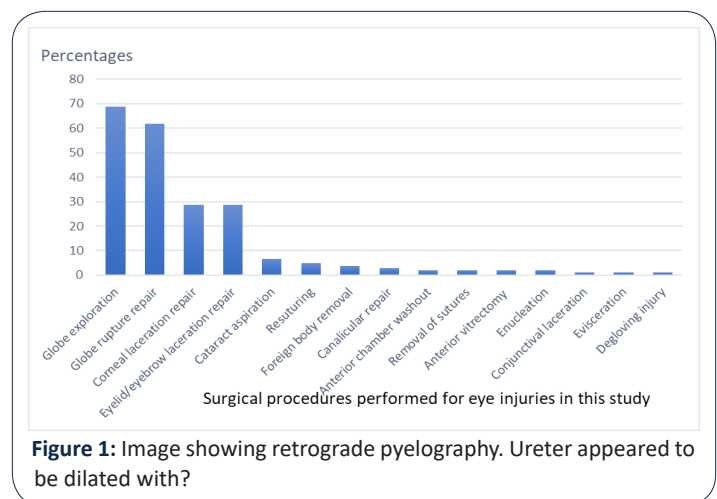


Figure 1: Image showing retrograde pyelography. Ureter appeared to be dilated with?

Discussion

Ocular injuries are a salient cause of avoidable and monocular visual impairment or blindness and a major public health problem affecting all age groups. This study, conducted over five years from 2013-2018, reports on the incidence of eye injuries with sufficient severity or sight-threatening sequelae that warrant surgical intervention in The Bahamas. The minimum sample size was met, with data collected from a total of 105 individuals exceeding the expected study size of 97. Ages ranged from 1.25 to 89 years old, with a mean age of 34.3/ \pm 18.7. These results suggest eye injuries are possible at either end of the age spectrum but notably amongst the age range 22-43 years, in which the interquartile range was found. The incidence of eye injuries peaking in the early 20s to early 40s provokes the question as to what factors may have contributed to this outcome.

A wide discrepancy was observed between the incidence of eye injuries in males and females. Roughly, 82% of cases requiring surgical procedures were male and 18% were female. These

results are consistent with prior studies done [4]. For example, in 2014 a study done in Jamaica identifying the patterns of ocular trauma that presented to the University Hospital of The West Indies, Nelson-Imoru et al reported that males were more susceptible to eye injuries than females, irrespective of age. In this study, there was a male: female ratio of 2.5:1. 2 [5]. These results are further supported by a survey conducted in the U.S. in 2010, by the American Academy of Ophthalmology Academy and the American Society of Ocular Trauma (ASOT). The data showed that men sustained nearly three times as many ocular injuries as females. It was found that 73.5 percent of eye injuries sustained were males [6]. Another study done in New Zealand attributes the male predominance in eye injuries to factors such as occupational exposure, participation in dangerous sports and hobbies, alcohol misuse, and risk-taking behavior.

Interestingly, during the time of the assessment, the months of June and November were found to be those in which greater numbers of procedures were performed. November accounted for 20 surgical procedures followed by June which peaked at 15. The significance of this data may correlate to sports-related eye injuries. In the Bahamas, the peak of basketball and baseball season are in November and June respectively. Another factor worth considering is that of natural disasters. It was found that most males within the age range 31-40 were at increased risk, particularly during the month of November [7]. The official hurricane season in the Caribbean is from May 1st to November 30th and this fact may account for the interesting rise in the number of injuries in young males requiring surgical intervention in the months of June and November. Moreover, of the five years, there has been a cyclic pattern in the occurrence of eye injuries. Some years more frequent than others, namely 2014 and 2016, which had the most scheduled surgeries, accounting for 24 and 22 persons respectively. In 2016, the Bahamas was hit by Hurricane Matthew, a category 5 hurricane that had a tremendous impact on the islands. Perhaps this occurrence is an explanation for the increased number of surgical procedures for possible injuries from flying objects, or windblown debris to the eye.

The type of surgical procedures performed showed much variation with globe exploration being the most common type of operation done in almost 70% of cases. Furthermore, globe rupture repair was found in 63% of cases. As it relates to the nature of injuries found in the study, sight-threatening corneoscleral lacerations were the most common eye injuries requiring surgery with corneal lacerations involving 3/5 of the cases. Notably, almost 30% of cases had eyelid and brow involvement requiring repair. Surprisingly, foreign body removal involved only 4%. Anterior chamber washout and anterior chamber vitrectomy represented a small percentage of the cases, roughly 2%. Evisceration and enucleation were rare accounting for a minuscule <1% of cases, perhaps reflecting our goals to preserve ocular structures and normal anatomy as much as possible. Almost 95% of ocular surgical procedures were sutured by a trained physician and 5% required re-suturing. One thing we found was that most of the eye injuries sustained were serious enough that they required general anesthesia in about 78% and the remaining 22% required local anesthesia.

Eyesight is a significant determinant of health and not enough emphasis is placed on eye care and prevention of ocular trauma

which poses a public health issue. In fact, eye injuries have a major global impact and have the capacity to cause a socioeconomic burden. For instance, persons affected may be without a job for weeks to years or are limited to the type of occupation in which they can pursue, cutting back on household income. Other social impacts include children being unable to attend school resulting in parents staying home from work or paying for a caretaker, which may cause a further financial burden. Additionally, an individual may be psychologically impacted by a reduction in vision requiring vocational rehabilitation, loss of career opportunities, major lifestyle changes, permanent physical disfigurement, and possibly diminished quality of life. In order to circumvent this major public health problem, prevention strategies must be put in place and perhaps targeted toward those in our population at increased risk of eye injuries. Most of the findings of this study suggest that preventative eye care be advanced and especially targeted towards those individuals falling within the early 20s and 40s age range. Firstly, patient and staff education through eye care programs and raising awareness about common eye injuries is one strategy to consider. Secondly, proper eye health can be promoted through public healthcare facilities, schools, outpatient centers, and the wider community. Moreover, information on trends of eye injuries is a helpful means of enhancing eye care services and patient education.

Governments also play an important role. For example, the implementation of health policies and legislation geared toward encouraging the use of protective eyewear in high-risk working conditions. Moreover, enforcing these regulations by providing some form of compensation for persons who are adherent and penalties to those individuals who are non-compliant can further promote eye health protection. All in all, a multisectoral approach should be taken as all sectors of society are needed to help make a difference in eye health outcomes. Therefore, health education, prevention, promotion, and protection are key tools that we as healthcare providers and patient advocates can use to catapult us over the hurdle of preventable eye injuries and decrease the morbidity associated with ocular trauma.

Declarations

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