

Analysis and Visual Outcome of Penetrating Eye Injury in a Nigerian Tertiary Hospital

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Abstract

Aim: The aim of this study was to analyze critically all cases of penetrating eye injury as regards the causes, the associated risk factors and their visual outcome in the environment.

Method: The case records of all patients that sustained penetrating eye injury over a seven year period were retrieved and analyzed for the study. The information extracted from the case records were coded and analysed using the Statistical Package for Social Sciences SPSS version 17.

Results: One hundred and thirty-eight patients with penetrating eye injury were analysed for this study, the male to female ratio was 4.5:1.

Their age range was 1 yr to 72 yrs with a mean of 24.8 yrs \pm 17.4, the predominant age group were 10 years and below (31.9%) while the greatest proportion were students (50.7%).

Most of the injuries occurred at school during playing/sporting activities (26.1%). Other settings were at work and during falls/act of violence. A good number of the patients presented within 24 hours (47.8%).

The right eye was affected in 57.2% while the left was affected in 42.8%. The cornea was the most common anatomical site of injury (60.9%) while the most common complication was cataract (40.6%).

The presenting visual acuity in 91.3% of them ranged from Counting Finger (CF) to No light perception (NLP) with just 8.7% of them having 6/18 or better vision.

Similarly their final visual acuity also ranged from CF to NLP (89.1%) with 10.9% having 6/18 vision or better, there is a strong correlation between the Initial Visual Acuity (IVA) and the best corrected Final Visual Acuity (FVA) irrespective of the early presentation and the prompt intervention, invariably all patients with poor IVA ended up with poor best corrected FVA and vice versa (spearman's correlation coefficient = 0.870).

Conclusion: Penetrating eye injury is a significant cause of uniocular visual loss and disfigurement and despite early presentation and prompt adequate management, the prognosis remains poor.

Keywords: Eye Injury; Ocular Trauma; Open Globe; Uniocular Blindness; Visual Loss

Introduction

Penetrating eye injury is a major cause of uniocular visual loss and impairment [1,2]. It accounts for 50% of ophthalmic emergencies that require admission in developed countries [2-4].

The incidence rate of eye injury varies from place to place and within the same place regional variation exists from time to time depending on the population studied [4-8]. In the united states for instance, approximately 2.5 million cases of eye injury occur every year resulting in approximately 50,000 people that loose partial or full vision [4].

Blindness from eye injury is usually enormous and most of the time irreversible, as such efforts should be geared towards its prevention, such efforts would be greatly enhanced by bringing to fore the notable risk factors for eye injury and the individuals at risk. Presently most studies [1,2] on eye injuries are outdated while there is dearth of information on the penetrating form of it.

In Ekiti State where this study was conducted, there is no available data yet, this study hopes to provide a baseline data for the state and make appropriate recommendations that can minimize penetrating eye injury in the environment.

Aim of the Study

This study aims at analyzing critically all cases of penetrating eye injury in the state as regards the causes, the associated risk factors and the visual outcome in the environment.

Method

The case records of all patients that sustained penetrating eye injury over a seven year period from January 2011 to December 2017 were retrieved and analyzed for the study. The information extracted included the Bio-data of the patient, the causative agent of the injury, the acuity associated with the occurrence of the injury and the time lag between injury and presentation at the hospital. Others are the initial and final visual activity of the patient, the anatomical site of the injury and the complications.

The information were extracted from the case records of the patients using the protocol form that was designed for the study. The information obtained were coded and analysed using the Statistical Package for Social Sciences SPSS version 17.

Approval for the study was obtained from the Ethical review Board of Ekiti State University Teaching Hospital (EKSUTH) Ado-Ekiti. The study was also conducted in line with the tenets of the declaration of Helsinki.

Results

A total of 138 patients with penetrating eye injury seen from January 2011 to December 2017 were analysed for this study. They comprised of 113 males (81.9%) and 25 females (18.1%) with a male to female ratio of 4.5:1. Their age range was 1 yr to 72 yrs with a mean of 24.8 yrs ± 17.4. The predominant age group were 10 years and below (31.9%), followed by 31 - 40, only (1.4%) were aged 70 years and above as depicted in table 1.

Age group	No	%
Age < 10	44	31.9
11 - 20	18	13.0
21 - 30	23	16.7
31 - 40	31	22.5
41 - 50	8	5.8
51 - 60	9	6.5
61 - 70	3	2.2
> 70	2	1.4
Total	138	100

Table 1: Age group of 138 patients with Penetrating eye injury (PEI).

As regards the occupation of affected patients. The greatest proportions were students (50.7%) followed by artisans/traders (28.3%). Only 6.5% were farmers as depicted in table 2.

Occupation	No	%
Civil servant	12	8.7
Artisan/Trading	34	24.6
Clergy	5	3.6
Student	70	50.7
Retired	3	2.2
Farming	9	6.5
Infant	5	3.6
Total	138	100

Table 2: Occupation of 138 patients with PEI.

In most cases, the injury occurred in accidental circumstances (81%) while 10% were due to assault and 9% were self-inflicted (Figure 1).

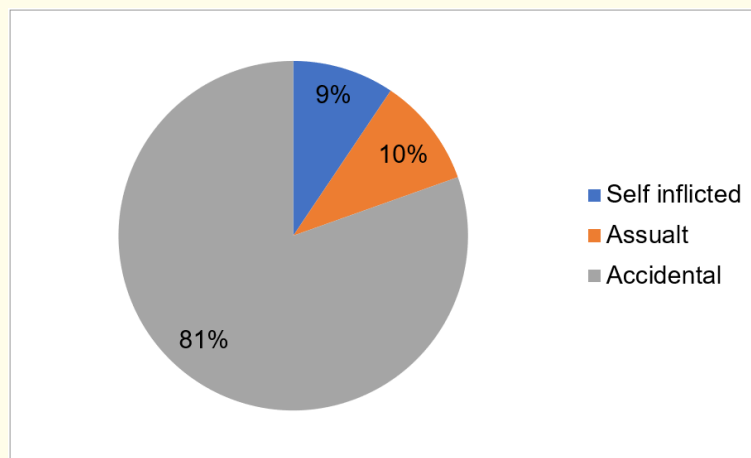


Figure 1: Source of injury.

The causative agents of injury were mainly sharp objects like nails, sticks, broken bottle/glass tools, bullets, door handle, table edge and twigs/tree branches. The most common setting whereby the injuries occurred mostly were at school during playing/sporting activity (26.1%), Other settings were at work, during falls/act of violence and some others (Table 3).

Activity	No	%
Playing/sport	36	26.1
Occupation/work	29	21.0
Fall/Act of violence	27	19.6
Domestic	21	15.2
Traffic/Transport	13	9.4
Others	12	8.7
Total	138	100

Table 3: Activity at Time of injury in 138 patients with PEI.

Zonal involvement

Anterior segment zone were mostly involved in the penetrating injuries seen in our study. Sixty nine percent were anterior segment while 31% were posterior segment zone.

In the corneal injuries, central and paracentral zones were mostly involved, hence these patients’ initial and final visual acuity were poor (severe visual impairment and blindness).

The right eye was affected in 57.2% while the left was affected in 42.8%, none of them sustained injury to the two eyes. The cornea was the most common anatomical site of injury in 60.9% followed by corneosclera in 29.7% of the patients while 9.4% had outright rupture of the globe. Sixty-six (47.8%) of the patients presented within 24 hours while 37.0% presented within 48 to 72 hours and the rest thereafter as depicted in table 4.

Time of presentation	NO	%
≤ 24hrs	66	47.8
≥ 24hrs ≤72hrs	51	37.0
≥ 72hrs ≤ 1 week	9	6.5
≥ 1 week	12	8.7
Total	138	100%

Table 4: Presentation time in 138 patients with PEI.

The presenting visual acuity in 91.3% them ranged from Counting Finger (CF) to No light perception (NLP) with just 8.7% of them having 6/18 or better vision. Similarly their final visual acuity also ranged from CF to NLP (89.1%) with 10.9% having 6/18 vision or better (Table 5), there was a strong correlation between the IVA and the best corrected FVA in this study irrespective of the early presentation and prompt intervention, invariably all patients with poor IVA ended up with poor best corrected FVA and vice versa (spearman’s correlation coefficient = 0.870).

Visual Acuity	IVA	FVA
≤ 6/18	12 (8.7%)	15 (10.9%)
CF	24 (17.4%)	21 (15.2%)
HM	18 (13.0%)	24 (17.4%)
LP	42 (30.4%)	27 (19.6%)
NLP	30 (21.7%)	39 (28.3%)
Child (undetermined)	12 (8.7%)	12 (8.7%)
Total	138 (100%)	138 (100%)

Table 5: Initial visual acuity (IVA) and Final Visual acuity (FVA) of 138 patients with PEI.

The most common complication was cataract with or without corneal opacity (42.8%), followed by blinding corneal opacity in 30.4% of the patients, sixteen (11.6%) did not suffer any visually disabling complication, other complications are as depicted in table 6.

Complications	Frequency	%
Cataract	59	42.8
Blinding Corneal opacity	42	30.4
Phthisis bulbi/Empty Socket	21	15.2
Nil	16	11.6
Total	138	100

Table 6: Complications of penetrating eye injury in 138 patients with PEI.

Surgeries performed	Frequency	Percent
Corneal Repair	74	53.6
Corneosclera repair	30	21.7
Enucleation	7	5.0
Evisceration	6	4.3
Vitrectomies	3	2.2
Lid repairs	9	6.6
Anterior chambers paracentesis	9	6.6
Total	138	100%

Table 7

Corneal laceration repair was most common surgery performed for the patients (53.6%).

Discussion

Penetrating eye injury is a notable cause of unocular visual loss and impairment. There is a preponderance of males in this study with a male to female ratio of 4.5:1, this is consistent with findings from other studies elsewhere [3,4] and in Nigeria [9-13]. This higher occurrence of eye injury in males can be attributed to the fact that males usually engage in high risk activities such as games and hazardous jobs like carpentry, welding and hunting unlike females that engage mostly in domestic duties and less hazardous jobs like trading and sewing.

The predominant age group in this study were 10 years and below (31.9%) followed by age group 31 - 40 years (22.5%) following which there was a sharp decline with only 1.4% being above 70 years. This is consistent with other studies on eye injury in Nigeria and elsewhere [3-6,9,12-14]. Ying, *et al.* [3] Salvatore., *et al.* [4] reported an average age of 35.5 yrs and 35.6 yrs respectively while Fasina [9], Onabolu [14] reported that most of their patients were younger than 30 years. In the study by Kyari., *et al.* [15] whose focus was on pediatric age group, 48.2% of their patients were in the age group of 5 - 10 yrs with a mean age of 7.7 yrs.

This is because children and young adults are more prone to activities and jobs that make them vulnerable to eye injury such as playing and sporting activities, for instance, in this study the most common activity resulting in injury was playing (26.1%), this differs from the study by Fasina [9] who reported domestic setting as the most common activity (58%), this might be due to the fact that the predominant age group in this study were school children who are usually playful and usually engage in unsupervised dangerous games, moreover they are also oblivious of the danger such activity can pose to their eyes. The next most common activity was work/ occupational duties (21.0%) this is because most of the adult patients affected were carpenters, welders, hunters and unskilled labourers who will not readily use any form of protective eye device due to their ignorance.

Falls/act of violence constitute a significant proportion in this study (19.6%) because of the predominant proportion of males in the study because males are usually more violent and aggressive in nature than females, the proportion involved during domestic activities are moderate in this study (15.2%), this is because most domestic duties are done by females and the proportion of females in this study was barely a quarter of the studied patients.

The most common occupational group in this study were school children (50.7%) followed by artisans and traders (28.3%), only 6.5% were farmers, this is because most agricultural related injuries are likely going to be due to vegetable matter such as shrubs rather than sharp objects.

In this study, the cornea was the most common anatomical site of injury (60.9%) while corneo- sclera wound occurred in 29.7% of cases, and the globe was ruptured in 9.4% of the patients. This is because the cornea is more exposed and thinner than the sclera. Most studies on penetrating eye injury also showed that the cornea is the most common anatomical site [4,9,20].

Salvatore., *et al.* [4] reported cornea as the most common site of injury in 40% of their patients while Fasina [9] reported 43.7%.

Furthermore, the greatest proportion of the patients presented within 24 hrs (47.8%) while 37.0% presented within 72 hrs and the rest thereafter. This is consistent with recent studies in the environment [9,12-17], Fasina reported that 53.3% of his patients presented within 24hrs while Bekibele., *et al.* reported a very high proportion of 75%, This implies that there is a high level of awareness in the environment on ocular emergency in recent times when compared with the late presentation reported in previous studies [14,18].

The Final Visual Acuity in this study was quite poor with 52.2% ending with count finger to light perception, 28.3% ended with NLP and only 10.9% had fairly good visual acuity that ranged between 6/12 and 6/60. This is because penetrating injury is usually devastating to the eyes because of its fragile nature, even when the injury is minimal, the aftermath of complications such as cataract, blinding corneal opacity and endophthalmitis usually renders the eyes blind and disorganized with a good number of them becoming phthisical.

Other studies [3,4,9-12,15-19] also shows that the final visual acuity following penetrating eye injury is invariably poor, for instance Ying., *et al.* [3] reported that only 5.7% of their patients had a FVA of 20/40 or better while 8.6% ended up with NLP and Fasina [9] reported a FVA of 6/18 or better in 14.8% of his patients while majority (59.3%) had 3/60 vision or less and 25.2% had NLP.

The initial visual acuity in this study was also poor as 60.8% had VA that ranged from Cf to Light Perception, 21.7% presented with NLP and only 8.7% had 6/18 vision or better. This poor IVA is consistent with other studies on eye injury especially the penetrating form [3,4,9,15]. Ying., *et al.* [3] reported IVA of 20/40 or better in only 3.6% of their patients who had penetrating eye injury, while 13.2% of them presented with NLP. Similarly, Fasina [9] whose article was principally on penetrating eye injury, reported IVA of 6/18 or better in 3.0% of his patients while majority 63.0% had less than 3/60 vision and 16.3% had NLP, also Kyari., *et al.* [15] reported that 67.6% of their patients were blind at presentation.

There is a strong correlation between the IVA and the FVA in this study irrespective of the presentation time and the prompt intervention (spearman's correlation coefficient = 0.870), invariably all patients with poor IVA ended up with poor FVA while those with fairly good IVA ended up with almost the same as their FVA even though few of them improved while some others also got worse. For instance, of the 60.8% who had poor initial visual acuity that ranged from CF to LP, 52.2% of them still had the same visual acuity range while the 21.7% proportion that had NLP increased to 28.3% despite management and the 8.7% that had IVA of better than 6/18 increased to 10.9% at final visit. Similarly, Kyari., *et al.* [15] reported that 67.6% of their series were blind at presentation and 62% still remained blind at final visit.

The result of this comparative analysis between FVA and IVA is consistent with other similar reports on penetrating eye injury [16,20-22], for instance in a multivariate analysis of prognostic factors in penetrating eye injury, Sterberg., *et al.* [20] noted that a good initial vision statistically correlates with a good final vision and vice versa.

The most common complication in this study was traumatic cataract (42.8%) which in most cases was complicated with posterior synechiae, followed by blinding cornea opacity (30.4%). Twenty-one of them (15.2%) ended up with phthisical eye/empty sockets as a result of evisceration and 11.6% did not have any blinding complication of the injury. Some of the patients had hyphema as part of their clinical feature at presentation and were treated accordingly; however traumatic cataract, corneal opacity and phthisis bulbi were sequela of the injury.

Cataract has been found to be the most common complication of penetrating eye injury by other authors [3,10-12], this singular complication can mar the visual outcome of a well managed case of penetrating eye injury because such cataracts are often complicated in nature, with some having 360° posterior synechiae and some degree of anterior synechiae as well.

It is worthy of note that only one eye was affected by injury in this study, no single case of bilateral injury, this is consistent with reports from some other studies [9,15]. This is quite a relieve to one because the patients will not be totally blind and become unproductive, unless he or she had suffered similar fate or another blinding disease in their second eye.

Conclusion and Recommendations

This study shows that penetrating eye injury is a significant cause of unocular visual loss and impairment and despite early presentation and prompt adequate management, the prognosis remains poor.

It is therefore of utmost importance to create public enlightenment on the avoidance of eye injury with school children and young adults treated as the main focus of such advocacy.

Also, use of protective eye wears should be encouraged among high risk occupational groups such as artisans and if necessary, such groups should be compelled to wear them through Government legislation.

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