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Visual outcome of penetrating eye injuries in Ibadan

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Abstract

Introduction: Penetrating eye injuries represent a significant cause of visual loss in the younger age groups. Many factors had been associated with poor visual outcome in these patients. The aim of this review is to evaluate the outcome of penetrating ocular injuries and the prognostic factors among patients presenting to a tertiary eye care.

Method: All cases of penetrating ocular injury presenting to our institution, over a 10 year period, were identified by a medical records search. Recruitment of cases was by a review of the eye clinic emergency register, ward admissions register and theatre operations register of the institution.

Result: One hundred and thirty-five cases (108 males) were analyzed with male to 27 female ratio of 4:1. The first (31.1%) and third (31.9%) decades of life were most affected. Seventy-two (53.3%) patients presented within 24 hours of injury, while only 44 (35.2%) had surgical repair within 24 hours of presentation. The major reason for delay in surgical repair was financial. At last follow-up, 20 (14.8%) eyes attained best corrected visual acuity better than 6/18, while 80 (59.3%) had acuity less than 3/60. Poor presenting visual acuity correlates well with a poor visual outcome in our patients. Four patients with delayed presentation and features of endophthalmitis underwent primary evisceration.

Conclusion: The visual prognosis in patients with penetrating eye injuries in our environment remains poor. Late presentation and delayed surgical repair are still rampant among our patients. Sustained efforts at enlightening the populace on early presentation to a health facility after sustaining ocular trauma, and subsidizing treatment for indigent patients, may help to reduce this burden in our environment.

Keywords: *Eye injuries, Ibadan, penetrating, prognostic factors, retrospective, visual outcome.*

Résumé

Les blessures affectant les yeux représentent une cause significative de la cause de la perte de vision chez les groupes des jeunes. Plusieurs facteurs ont été associés avec les résultats de la mauvaise vision chez ces patients. Le but de cette étude est d'évaluer les resultats des blessures oculaires et les facteurs pronostiques parmi les patients aux soins visuels tertiaires. Toutes les cas enregistrés dans les dernières dix ans étaient identifies par une recherché dans le registre. Le recrutement des cas était fait par un diagnostic cliniques des yeux, admission et chirurgie dans l'institution en santé. Cent trente cinq cas (108 males) étaient analyses dans les proportions de male-femelle de 4:1. La première (31.1%) et la troisième (31.9%) dizaines de la vie étaient les plus affectés. Saxointe douze (53.3%) patients se présentaient dans les 24 heures de la blessure, lorsque seulement 44 (35.2%) avaient une réparation chirurgicale dans les 2' heures de leur présentation. La raison du retard en chirurgie était financière. A la suivi 20 (14.8%) des yeux avaient une meilleure correction de l'acuité visuelle plus de 6/18, tandis que 80 (59.3%) avaient une acuité moins de 3/60. La faible acuité visuelle corrélait bien avec de résultat visuel faible chez nos patients. Quatre patients se présentant tardivement et ayant des symptômes de l' endophthalmite suivaient une éviscération primaire. Le pronostic visuel chez les patients avec des blessures oculaires dans notre environnement reste faible. La présentation tardive et la chirurgie retardée sont communes parmi nos patients. Les efforts soutenues dans la sensibilisation des populations sur la présentation précoce dans les facilités de santé après un traumatisme oculaire, et un traitement avec subsidie chez les patients indigènes peut aider à réduire cette souffrance dans cet environnement.

Introduction

Eye injury is a global problem, and penetrating eye injury has been a leading cause of monocular blindness in both developed and developing countries [1-4]. The type of ocular injury had been classified by the Birmingham Eye Trauma Terminology (BETT) study [5] as open or closed globe injury with sub-classifications. Penetrating eye injury, as defined by Kuhn *et al* [6] is an injury caused by a sharp inflicting agent, when a structure of the eye is cut, with only one entrance wound. No country is spared from traumatic blindness, and, though, the setting may vary in different areas, the need for rapid treatment and referral to save sight is the same [7,8].

Ninety per cent of eye injuries are thought to be preventable. Although they rarely result in bilateral visual loss, the impact of monocular blindness on the

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population at risk, the productive age group, and potential person-days loss of work associated with treatment are enormous [9,10]. Majority of eye injuries have been found to occur at home and in the work place [11].

Penetrating ocular injuries are more devastating, compared with blunt injuries, and as a rule, require treatment in the hospital [12,13]. The visual outcome of the injured eye largely depends on the severity of the initial injury, the first aid treatment given, interval between the injury and definitive care, quality of the care given and the pre existing ocular status [14,15]. Salvin [16] described poor prognostic indicators as poor visual acuity at presentation, vitreous haemorrhage, retinal detachment and endophthalmitis. This review, thus, was carried out to evaluate the outcome of penetrating ocular injuries in patients presenting to a tertiary eye care, over a 10-year period. This is with a view to determining the visual outcome, which pre- and post-operative factors are of prognostic importance; and make suggestions for the prevention of such injuries.

Materials and methods

Retrospectively, case records of patients who sustained penetrating eye injuries and managed in our institution over a 10-year period (January 1998 to December 2008), were analyzed. University College Hospital is located in Ibadan, the capital city of Oyo State, in the south western region of Nigeria. It has a vibrant eye department, and serves as a major referral centre for specialised eye care, not only for Ibadan and its surrounding towns and villages, but the entire south western region. Patients seen in the eye unit come through referral, although, emergency cases are also seen without being referred. Cases were recruited by a review of the eye clinic emergency register, ward admissions register and theatre operations register of the institution. The data retrieved included patients' demographic information, the cause and circumstance of injury, extent of injury, intervals between injury and time of presentation, and, time of repair, reason(s) for delay (>24h) in surgical repair (where such exists), visual acuity at presentation and last follow up, complications of the injury, visual and ocular outcomes. Repair of ocular injuries was carried out under general anaesthesia, corneal wound was closed with 10/0 nylon suture, scleral wound with 8/0 vicryl. Prolapsed iris was reposited, if it looked healthy on table, otherwise it was abscised. Soft lens matter wash-out was carried out in cases of lens capsule rupture; no primary intra-ocular lens was implanted. All patients received sub-conjunctival antibiotic injection at the end of the procedure.

Statistical analysis

The data obtained were entered and analyzed, using SPSS version 15 (SPSS, Inc., Chicago, IL, USA). Results are presented in frequencies, percentages, means, standard deviations and ranges. The chi-square test was used to compare two categorical variables. Student's t-test for independent groups was used to test differences between two groups, while the one way analysis of variance test (ANOVA) was used to compare differences among three or more groups. The comparison between visual acuity at presentation and last follow-up was accomplished with Mc-Nemar-Bowker's symmetry test for changes in responses, using the chi-square distribution. All tests were declared significant at the 5% level using two tailed p-values.

Results

A total of 146 patients with penetrating eye injuries were identified during the study period. One hundred and thirty-five of them had complete data in their case records, and were analysed. There were 108 (80%) males and 27 (20%) females, a ratio of 4:1 (p=0.697). The median age of the group was 18.0 years, (range 9 months to 70 years). The age distribution, (Table 1) shows injuries trend to occur most frequently in the third decade (31.9%), followed by the first decade (31.1%) of life.

Table 1: Age group of the cases with penetrating eye injury

Age group (years)	N	Percentage (95% CI)
0-9	42	31.1 (23.2- 39.0)
10-19	28	20.7 (13.8 – 27.7)
20-29	43	31.9 (23.8 – 39.8)
30-39	14	10.4 (5.2 – 15.6)
40+	8	5.9 (1.9 – 9.9)
Total	135	

Table 2: Other associated injuries in patients with penetrating eye injuries at presentation

Injury"	Frequency	Percentage (%)
Uvea prolapsed	92	68.1
Hyphema	64	47.4
Cataract	38	28.1
Lid laceration	19	14.1
Endophthalmitis	4	3.0
Intra ocular foreign body	6	4.4
Others	11	8.1
Nil	2	1.5

" More than one option possible

The right eye was affected in 45.9%. There were no bilateral injuries. Injuries involved mainly the corneal (43.7%) and corneo-scleral (41.5%) coats, while it was limited to the sclera in 14.8% of our

patients. Other ocular manifestations included uvea prolapse in 92 patients (68.1%), hyphema in 64 patients (47.4%), and lens involvement in 38 patients (28.1%), (Table 2).

Table 3: Duration before presentation and repair in patients with penetrating eye injuries

Duration (hours)	Duration before presentation Fre-quency	Percentage	Duration before repair Fre-quency	Percentage (%)
<24	72	53.3	44	35.2
24-72	24	17.8	42	33.6
>72	39	28.9	39	31.2
Total	135	100	125	100

Note: 6 pre-phthysical eyes were not repaired, 4 eyes with endophthalmitis were eviscerated.

Seventy-two (53.3%) patients presented within 24 hours of injury, 24 (17.8%) after 24 hours but within 72 hours, while 39 (28.9%) presented after 72 hours. Forty-four (35.2%) eyes had surgical repair within 24 hours of presentation, while 39 (31.2%) were repaired after 72 hours (Table 3). Primary surgical repair was not carried out in ten eyes, six of which were pre-phthysical at presentation, while the remaining four, with features of endophthalmitis, were eviscerated. Reasons for delay in repair are shown in the figure, the major constraint being financial (80.2%).

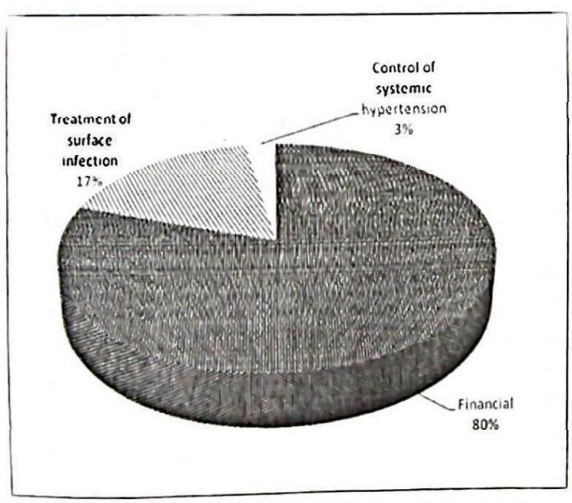

Fig.1: Reasons for delay (>24 hours) in surgical repair in patients with ocular injuries

Visual acuities at presentation and at last follow-up visit are shown in table 4. Eighty-five (63.0%) patients had presenting visual acuity less than 3/60, of which 22 (16.3%) had nil perception of light. Only 4 (3.0%) had acuity of better than 6/18. At last follow-up, 20 (14.8%) patients attained best corrected visual acuity greater than 6/18, while 80 (59.3%) had acuity less than 3/60, of which 34 (25.2%) had nil perception of light. There was a significant increase in the proportion of patients whose vision improved after surgical repair ($p<0.0001$).

Eyes with other problems at presentation had worse visual outcome, post-operatively. All patients presenting with vitreous haemorrhage and intra ocular foreign body had visual acuity of nil light perception (Table 5)

Reasons for poor visual outcome are presented in Table 6. All the 80 eyes (100%) had corneal opacity, while 56 (70%) had become phthysical or pre-phthysical. Twenty-eight (35%) had complicated cataract and 4 (5%) had retinal detachment.

The average hospitalization period was 10 days, and patients were followed up for an average of 24.6 weeks (range 12-312 weeks).

Discussion

Trauma is a leading cause of blindness in children and young adults and also a significant cause of blindness in older individuals [17]. Despite advances in diagnostic and therapeutic methods, ocular trauma remains a significant cause of visual impairment [18], yet a large proportion of eye injuries are believed to be preventable [9,13,19].

Males are usually engaged in activities and vocations with higher risk of ocular injuries, and this may account for the higher incidence of injuries in them [20,21]. The 80% male preponderance of injuries and peak ages of first and third decades of life in this review, are consistent with previous studies [1,9,12,20,22-25].

The commonest site of injury was the cornea, followed by the corneo-scleral coat. There is a similar trend in other studies [12,26,27], and it reflects the fact that the cornea is the most exposed part of the eye [28].

Various factors contributing to the visual outcome in ocular injuries include the mechanism of the injury, and, the severity of the resultant intra-ocular damage. Also, the timing and adequacy of surgical intervention play great roles in the overall visual outcome [29,30]. The greater proportion of the injuries in our series resulted from projectile objects (shattered glass, metallic and non-metallic missiles, gunshot etc), while the remaining 46.7% resulted from sharp tipped objects plunging into the eye (sharp tipped metallic and non-metallic objects, sharp edged instruments, fall on sharp edge of

Table 4: Visual acuity at presentation and last follow up of penetrating ocular injury cases

VA	At presentation Frequency	Percentage (95%CI)	At last follow up Frequency	Percentage (95%CI)	p-value
>6/18	4	3.0 (0.01-5.9)	20	14.8 (8.7-20.9)	
6/18-3/60	16	11.8 (6.3-17.4)	26	19.2 (12.5-25.9)	
<3/60	85	63.0 (54.7-71.2)	80	59.3 (50.8-67.6)	0.000
Not possible	30	22.2 (15.1-29.3)	9	6.7 (2.4-10.9)	
Total	135	100.0	135	100.0	

VA= Visual acuity

Table 5: Post-operative visual acuity of patients with penetrating eye injuries at last follow-up with other ocular problems

Injury	Post operative visual acuity >6/18 Frequency (%)	6/18-3/60 Frequency (%)	<3/60-LP Frequency (%)	No light perseption Frequency (%)	Total Frequency (%)
Uvea prolapsed	14 (15.2)	9 (9.8)	29 (31.5)	40 (43.5)	92 (100)
Hyphema	4 (6.3)	2 (3.1)	17 (26.6)	41 (64.0)	64 (100)
Cataract	1 (2.6)	6 (15.8)	21 (55.3)	10 (26.3)	38 (100)
Lid laceration	0 (0.0)	3 (15.8)	6 (31.6)	10 (52.6)	19 (100)
IOFB	0 (0.0)	0 (0.0)	0 (0.0)	6 (100.0)	6 (100)
Others	2 (25.0)	2 (25.0)	1 (12.5)	3 (37.5)	8 (100)
Vitreous hemorrhage	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)	3 (100)
Nil	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100)

IOFB= Intra ocular foreign body

pavement etc). A similar finding was reported in an earlier study in the sub-region [20], where most injuries resulted from projectile objects- road traffic accident, flying broken bottles, industrial metal and furniture chips.

Table 6: Causes of poor visual outcome (visual acuity < 3/60) in patients with penetrating eye injuries

Cause	Frequency	Percentage (%)
Corneal opacity	80	100
Phthysis bulbi	56	70
Cataract	28	35
Retinal detachment	4	5
Anterior staphyloma	1	1.3
Ciliary staphyloma	1	1.3
Vitreous hemorrhage	1	1.3

A significant number of people involved in high risk vocations generally do not wear protective eye devices, making them prone to eye injuries [31]. Noteworthy in our series is that, most injuries occurred under domestic setting, while carrying out minor repair works. Hence, the use of protective devices should not be limited to places of work, but also encouraged in those carrying out similar tasks even at home.

The initial visual acuity has been reported as a major prognostic indicator of the visual outcome in patients with ocular trauma [4,21,32-37]. Better initial visual acuity usually reflects milder ocular tissue damage, and, thus, ensures better visual outcome [33]. Comparing the visual acuity at presentation and last follow-up, the initial visual acuity significantly affects the final visual outcome in our patients. All four patients with initial visual acuity >6/18 maintained same visual acuity at last follow-up. Also, four of sixteen patients with visual acuity 6/18-3/60 still maintained same at last follow up while visual acuity improved to >6/18 in ten. However, sixty-two of the eighty-five patients with visual acuity <3/60 still had poor acuity at last follow-up, while eighteen and five improved to 6/18-3/60 and >6/18 respectively. There was however, a statistically significant increase in the overall proportion of patients whose vision improved after surgical repair ($p<0.0001$).

Patients presenting with other ocular problems had poor visual outcomes in our series. All six eyes with vitreous haemorrhage and three with intra-ocular foreign bodies had acuity of nil perception of light at last follow-up. Also, 75% of eyes with uveal prolapse and about 90% with hyphema had acuity of <3/60. However, the 2 eyes with simple corneal lacerations and no other problems at

presentation achieved acuity of >6/18. It has been reported that patients with penetrating ocular trauma associated with other ocular problems are a consequence of more severe injuries, and result in poor visual outcome [37-40].

A large proportion (46.7%) of our patients presented after 24 hours to the hospital for treatment, with almost a third presenting after 72 hours. Coupled with this, is the delay (>24 hours) in instituting early surgical repair, mainly due to financial constraints, in a third (64.8%) of these patients. Variable reports exist in literature on correlation between time from injury to surgery and visual outcome. While some author [8,41-45] identified late presentation, and delayed surgical repair as poor prognostic indicators for vision in patients with ocular injuries, others [35,37,46] did not find any correlation. Al-Mezaine *et al* [32] opined that the mechanism of the injury is a more important prognostic indicator, regardless of how quickly or aggressively the patient is treated. High prevalence of pre-hospital consultation practices and use of non-doctor prescription had been reported in our environment, and there is a tendency for the patient to have tried various medications, including harmful traditional eye medications, before presenting to the hospital [47]. Delayed presentation, however, did not statistically affect the visual outcome in our patients ($p>0.05$).

Four of our patients, presenting with features of endophthalmitis, and subsequently had primary evisceration came to the hospital after 72 hours. Rofail *et al* [35] also reported a strong correlation between delayed presentation and endophthalmitis at presentation in patients with open globe injuries. Adequate implementation of the national health insurance scheme by the government, to cater for indigent patients, had been suggested as a way of reducing this delay, thereby, improving the visual outcome in patients with ocular injuries in our environment [44].

The overall prognosis for vision, in our study was poor, with only 14.8% of our patients achieving best corrected visual acuity of better than 6/18 at last follow up, and about 60% having acuity less than 3/60, of which a quarter had nil light perception. This is very similar to findings from previous studies [24,41,48], penetrating eye injuries having been reported to have worse prognosis, compared with concussion injuries [3,13,24]. The major causes of poor visual outcome (visual acuity < 3/60) include corneal opacity in all 80 eyes and phthysis bulbi in fifty-six (70%). Other causes are complicated cataract, inoperable retinal detachment, staphyloma and vitreous haemorrhage (Table 6).

This study has some limitations. Being a retrospective study, we have reviewed static data in a disease that has a dynamic epidemiology. However, we tried to capture the data of as many of these patients who presented within the study period by retrieving records from the registers of all the units the patients would have had contact with during their management. The data, though, derived from a single institution, could still be representative of the sub-region, as it is the major trauma centrer for ophthalmic injuries requiring surgical intervention.

In conclusion, our study has shown, again, the grave visual consequence of penetrating eye injuries. There should be sustained efforts at enlightening the populace on early presentation to a health facility after sustaining ocular trauma. Subsidizing treatment for the indigent by the government may help in reducing delay in surgical intervention, thereby, improving visual outcome. Prevention of injuries generally plays a major role in the management, hence, public health education on the wear of protective eye devices, not only at work place, but also, when engaged in potentially high risk tasks at home should be encouraged.

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