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Original Research Article

An Observational Assessment of the Clinical Profile of Raised Intraocular Pressure in Closed Globe Injury and its Management

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Abstract

Aim: We studied the clinical profile of patients with raised intraocular pressure (IOP) in closed globe injury and outcome of medical and surgical management.

Methods: The present study was conducted in the department of Opthalmology, Anugrah Narayan Magadh Medical College & Hospital, Gaya, Bihar, India between July 2020 to June 2021, 50 patients attending the glaucoma department with closed globe injury followed by raised IOP of > 21 mm Hg willing to give a written, informed consent were included in the study.

Results: 10 patients (20%) were ≤20 years. 25 patients (50%) belonged to 21-40 years and 15 patients (30%) belonged to 41 to 60 years. Minimum and maximum age being 10 and 60 years respectively. Mean age distribution of study participants SD 16.06) years. Most common mode of blunt injury was industrial accidents (22%), followed by injury while playing (18%) and home accidents (18%). Injuries while farming accounted for 16% of total injuries. The least common causes being assault (12%) and road traffic accident (14%).

Conclusion: There was no significant difference between medical and surgical intervention while treating glaucoma secondary to closed globe injury.

Keywords: Trauma, Closed globe injury, Glaucoma, Medical, Surgical intervention

Introduction

A significant number of blindness cases worldwide are related to ocular trauma. Over two million cases of ocular trauma are reported every year, of which over 40,000 result in significant vision loss. Traumatic ocular injury negatively affects the quality of life of the patients and their families, as well as their socioeconomic status and psychological well-being. Injury to a person or a tissue or organ is defined as the interruption of tissue function due to the transfer of external energy (mechanical, thermal, radiant, nuclear, chemical, or electrical). [1]

Ocular trauma is one of the most common causes of ophthalmic morbidity and monocular blindness worldwide. They have a significant impact on an individual and society in terms of sufferings, medical cost, and loss of productivity. [2] Of all types of ocular emergencies, ocular trauma

is by far the most common constituting nearly 75%. [3] It can be open globe or closed globe injuries doesn't have full thickness wound. It is caused by partial thickness sharp force (lamellar laceration), blunt force (contusion), and superficial foreign body. [4] A serious complication of ocular trauma is secondary glaucoma. [5]

This is a major concern because many cases go unnoticed. Without close follow-up, patients are diagnosed years later with irreversible glaucomatous optic nerve damage.

Globally, ocular trauma is the most common cause of visual disability and morbidity. In India, over 500 lakh people suffer from blindness, and every year the blind population increases by 38 lakhs. Of note, 1.2% of cases of blindness are caused by avoidable ocular injuries. A rural population (4.5%) may have a higher prevalence of blindness compared to an urban one (3.97%). [6] People living in rural areas are often uninformed about protective devices such as goggles and shields. Agricultural work and handling of animals are also major causes of eye injuries.

In India, there are more than 50 million blind people and this number increases by about 3.8 million per year. Among India the total number of blind cases, 1.2% is contributed by injuries which are preventable.[7] The WHO program for the prevention of blindness, indicated that there are approximately 55 million eye injuries per year that restrict activities for more than one day.[8]

An attempt to recognize the causes of raised intraocular pressure (IOP) following blunt trauma, severity of disease and its management is made in this study.

Materials and Methods

The present study was conducted in the department of Opthalmology, Anugrah Narayan Magadh Medical College & Hospital, Gaya, Bihar, India between July 2020 to June 2021, 50 patients attending the glaucoma department with closed globe injury followed by raised IOP of > 21 mm Hg willing to give a written, informed consent were included in the study.

Patients with pre-existing primary open angle or angle closure glaucoma, secondary glaucoma due to systemic or ocular pathology, penetrating/perforating injury, history of previous ocular surgery or unwilling to give consent for the study were excluded from the study.

Methodology

A detailed medical and ocular history was taken in a pre-structured proforma. Best corrected visual acuity (BCVA) testing was done on Snellen's chart. A careful slit-lamp examination was done to assess anterior and posterior segment. Intraocular pressure (IOP) measurement was done using Goldmann applanation tonometer. Gonioscopy was performed using a Sussman type 4 mirror hand-held gonioscope. Gonioscopy was deferred in patients with hyphaema for 1 month. Stereoscopic evaluation of the fundus and disc was performed using +90D/+78D and 20D.

The data was recorded. Patient's BCVA was tested by Snellen's, slit lamp examination, IOP measurement by Goldmann's applanation tonometer, gonioscopy using a Sussman type 4-mirror handheld gonioscope, stereoscopic fundus examination using +90D/+78D was undertaken. Visual fields using Humphrey automated perimetry was done at 1-, 3-, 6- and 12-month's interval. Response to treatment was assessed based on IOP reduction to target IOP range, as measured on Goldmann applanation tonometer. Patients who were on anti-glaucoma medications, compliance to treatment was checked at every visit and response to treatment was assessed based on IOP reduction. Medication was chosen based

upon IOP control, target pressure, status of optic nerve head, visual fields and compliance of patients to medical treatment.

Patients in whom the hyphaema was non resolving with uncontrolled IOP or blood stained cornea were taken up for paracentesis after obtaining written informed consent.

Patients having lens dislocation /subluxation were taken up for lensectomy Intraocular lens (IOL) implantation after obtaining written informed consent. Patients with traumatic cataract which was visually significant were taken up for small incision cataract surgery (SICS) with or without IOL implantation after obtaining written informed consent.

Trabeculectomy alone or with combined cataract extraction was planned in patients in whom IOP remained uncontrolled despite maximally tolerated medical therapy, progressive glaucomatous damage on maximum medical therapy and with corresponding visual field changes, patient unable to tolerate or adhere to medical regimen after obtaining written informed consent. The data was entered in MS Excel spread sheet and analysis using IBM SPSS version 24.0 software. Results presented as descriptive statistics in the form of mean/proportion and percentage and possible association was derived by using suitable parametric and nonparametric tests of significance.

Results

Table 1: Age distribution of study participants

Age	Number	Percentage (%)
≤20 Years	10	20
21 to 40 Years	25	50
41 to 60 Years	15	30
Total	50	100
Mean ±SD	36.08±16.06	
Minimum age	10	
Maximum age	60	

10 patients (20%) were ≤20 years. 25 patients (50%) belonged to 21-40 years and 15 patients (30%) belonged to 41 to 60 years. Minimum and maximum age being 10 and 60 years respectively. Mean age distribution of study participants. SD 16.06) years.(Table 1)

Table 2: Cause of injury in study participants

Cause	Number	Percentage (%)
Assault	6	12
Injuries while farming	8	16
Home accident	9	18
Industrial accident	11	22
Injuries while playing	9	18
RTA (road traffic accident)	7	14
Total	50	100

Most common mode of blunt injury was industrial accidents (22%), followed by injury while playing (18%) and home accidents (18%). Injuries while farming accounted for 16% of total injuries. The least common causes being assault (12%) and road traffic accident (14%). (Table 2)

Table 3: Initial vision of study participants

Initial vision on snellen's Chart	Number of Patients
6/9	5
6/12	4
6/18	6
6/24	12
6/36	8
6/60	7
Hand Movement	8

5 (10%), 4 (8%), 6 (12%), 12 (24%), 8 (16%), 7 (14%), 8 study subjects (16%) had vision of 6/9, 6/12, 6/18, 6/24, 6/36, 6/60 and Hand movements respectively. (Table 3)

Table 4: Cornea injury distribution of study participants

Corneal Injury	Number	Percentage (%)
Present (Lamellar tear)	15	20
No	35	70
Total	50	100

Corneal injury at presentation was seen only in 15 subjects (30%) with all being lamellar tears while remaining 35 patients (70%) had no corneal injury. (Table 4)

Table 5: Iris injury distribution of study participants

Iris injury	Number	Percentage (%)
Present	7	14
Absent	38	76
No view	5	10
Total	50	100

7 eyes (14%) had iris injury, 38 eyes (76%) did not have iris injury and in 5 eyes (10%) eyes, details could not be visualised. (Table 5)

Table 6: Vitreous disturbance of study participants

Vitreous	Number	Percentage (%)
Present	12	24
Absent	30	60
No view	8	16
Total	50	100

30 eyes (60%) had no vitreous disturbance, 8 eyes (16%) had no view at presentation. (Table 6)

Table 7: Choroidal injury distribution of study participants

Choroidal injury	Number	Percentage (%)
Present	8	16
Absent	32	64
No view	10	20
Total	50	100

32 eyes (64%) had no choroidal injury, 10 eyes (20%) had no view at presentation. (Table 7)

Discussion

30 (60%) of our study participants were males and 20 (40%) patients were females. Studies conducted by Girkin and Ozer et al [9, 10] showed affected males to be 79.9% and 87.1% respectively. A study conducted by Ligget et al [11] on 931 ocular injury patients consisted of 82% males and 18% females. Our study and a few studies quoted above shows a male preponderance. This can be accounted for more outdoor activities, strenuous physical work in male population across the globe.

In our study, most common mode of blunt injury was industrial accidents (22%), second most common being play injury (18%) and home accidents (18%) followed by farm accidents (16%), with least common being assault and road traffic accident (14%). Usha vasu et al [12] conducted a retrospective study on occupational globe injury and found that 43 out of the 129 cases (33.3%) to be occupation related. Karaman K et al [13] have reported in their study that only 13.8% of the injuries are related to agriculture and our study constituted 9.4% of farm injuries. Patrick Kearns [14] in his retrospective study of 314 cases has reported 17.8% of the injuries to be home accidents, 9.95% to be work accidents and assault 10.8% of injuries. Punnonen et al [15] found that 40% of the ocular trauma is due to domestic/playing accidents and 36% were occupational. Though agriculture is the main occupation in India, since the study was conducted in a metro city like Bangalore, industrial accidents were predominant compared to farm accidents. However, occupational injury to eye was more common in our study which is in accordance to study conducted by Usha Vasu et al. [12]

35 (70%) patients had an initial vision of ≤ 6/60 while 7 (14%) patients had ≤ 6/60 on Snellen's chart. Study conducted by Ozer et al 10had an initial vision of ≤ 6/60 in 78% patients and only 22% had ≤ 6/60 vision. [16]

Our study had posterior segment findings in only 8 eyes (16%). 4 eye (8%) had vitreous hemorrhage of grade 2, 1 eye (3.1%) had choroidal rupture. Girkin et al 9reported 0.5% vitreous injury and 2% choroidal injury which is similar to our study.

Medical therapy is usually the first line of treatment. In our study, 28 eyes (56%) were managed by medical therapy alone. Medical therapy failed in six eyes (12%) which were managed later by surgery. Drug therapy was based upon target IOP to be achieved, cup disc ratio, visual field changes and patient compliance to drugs.

Beta blockers, alpha agonist, carbonic anhydrase and prostaglandin analogues were used either singly or in combination based on the clinical condition of the patient. Prostaglandin analogues and miotics were avoided in cases with significant inflammation in the anterior segment. Mean number of antiglaucoma medications at the start of therapy was 2.6 which reduced to 1.6 at 6 months and 1.1 at 12 months. The mean IOP at presentation was 26.18 ± 5.124 mm Hg and at 12 months was 14.83 ± 2.287 mm Hg with a p value of <0.0001. A reduction of 44% IOP was seen at the end of 12 months in medical group. In a study conducted by Ozer et al, [10] 45.7% study participants were managed medically.

Surgical procedures were done on 22 eyes (44%) in our study. Indications include non-compliance to drug therapy, intolerance to medical therapy, inadequate IOP control despite maximal medical therapy, lens involvement, non-resolving hyphema and blood-stained cornea. 3 eyes (25%) underwent lensectomy + IOL implantation. The IOL implanted was iris claw. These were done in cases with lens subluxation and anterior dislocation. 1 eye

(8%) underwent AC wash for total hyphema. one eye (8%) underwent small incision cataract surgery for traumatic mature cataract.

Trabeculectomy remains the gold standard in surgical management of glaucoma. Studies show that success rate of trabeculectomy in secondary glaucoma (48%) was low compared to primary glaucoma (74%). 3 cases in our study underwent two surgical procedures at some point of time during their follow up, out of which one underwent anterior chamber wash for total hyphema at one week followed by trabeculectomy with MMC six months later. Another case underwent lensectomy + IOL implantation at one week followed by trabeculectomy with MMC at six months. The initial IOP and final IOP in surgical group was 35.80 ± 7.330mm Hg and 18.60 ± 3.777 mm Hg respectively with a p value of <0.0001. A reduction of 48% IOP was seen at the end of 12 months in surgical group.

The mean difference of IOP in medical and surgical group was 11.364 ± 4.635 and 17.200 ± 8.651. This shows that medical and surgical therapy did reduce final IOP of the patient but there was no significant difference between medical and surgical intervention.

Conclusion

Ocular trauma is one of the potential causes of visual morbidity which is preventable. One of the most visual threatening complications of ocular trauma is secondary glaucoma. Closed globe injury following blunt injury is quite common in young adults and children with play and accidental injuries. It is not uncommon to neglect such injuries. Glaucoma that follows trauma is a major concern because many cases may go unnoticed and without close follow-up are diagnosed many years later as having irreversible glaucomatous optic nerve damage. Prompt diagnosis and early treatment is the key to prevent blindness occurring due to traumatic glaucoma. Primary preventive approach such as promoting safe riding practices and strict implementation of traffic rules such as riding at safe speed, wearing seatbelts and helmet for head safety, and avoiding alcohol before driving is needed to prevent RTA and associated ocular morbidity. Emphasizing the need to use eye protective measures among workers in industries and fireworks to prevent ocular injuries. The impact of ocular trauma in terms of medical care, loss of income, and cost of rehabilitation services clearly highlight, the importance of preventive strategies.

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