CLINICAL PRESENTATION OF OCULAR BLUNT INJURIES IN A TERTIARY EYE CARE CENTRE IN SOUTH INDIA

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ABSTRACT

BACKGROUND

The firm belief that only a severe blow to the eye will affect the vision, often results in complacency and delay in reporting to the ophthalmologist. This study is to emphasize that trivial injuries uncared for will result in severe visual deficiency.

MATERIALS AND METHODS

150 cases of blunt injuries who presented to our hospital were in included in our study after applying appropriate inclusion and exclusion criteria. 42% of patients had anterior segment injuries, 20% had posterior segment injuries, 28 % had combined anterior and posterior segment injuries and 10% of them had orbital injuries.

RESULTS

102 males and 42 females were included in the study. Among the anterior segment manifestations the commonest presentations were subconjunctival haemorrhage and iridocyclitis the incidence of both being 16%. Traumatic iridocyclitis was seen in 16%, iris sphincter tear was found in 15% and hyphaema was found in 14% of the patients. Iridodialysis was found in 9% and 6% of the patients developed traumatic rosette type of cataract. Subluxation or posterior dislocation of the lens or the posterior chamber intraocular lens was found in 5%. Among the posterior segment injuries, the commonest finding in our study was traumatic macular oedema (commotio retinae) which was seen in 35%. Vitreous haemorrhage was found in around 30%. 19% had retinal detachment and 11% ended in traumatic optic neuropathy. Choroidal tear and chorioretinitis sclopetaria were seen in 2% and traumatic macular hole was seen in 1% of the patients.

CONCLUSION

Therefore even in patients with no gross external injuries, sight threatening posterior segment injuries may occur. Therefore ophthalmic examination should be mandatory however trivial the trauma maybe.

KEYWORDS

Ocular Injuries, Subconjunctival Haemorrhage, Corneal Oedema, Retinal Detachment.

HOW TO CITE THIS ARTICLE: Hariharan L, Mohankumar A. Clinical presentation of ocular blunt injuries in a tertiary eye care centre in south india. J. Evid. Based Med. Healthc. 2017; 4(9), 449-455. DOI: 10.18410/jebmh/2017/86

BACKGROUND

The incidence of ocular injuries is on the increase with increase in industrialization and modernization, where life is fast with faster modes of transportation. Despite the protection afforded to the eye by nature– anatomically by its situation in the elastic fatty tissues of the orbital cavity over hang on all aspects except downwards and temporally by the sturdy bony projections of the orbital rim and nose, and physiologically by the blinking reflex and head turning reflex on approach of objects and copious lacrimation on exposure to any irritant materials – injuries to the eye are common and may involve any tissue.[1]

Ocular trauma is an important cause of ocular morbidity worldwide which is essentially preventable.[2] From an etiological point of view, ocular injuries occur from innumerable causes in every circumstances of life. They include intrauterine injuries, birth injuries, domestic and workplace injuries, industrial hazards and war injuries. According to the Birmingham Eye Trauma Terminology System (BETTS), the concussion and contusion injuries may involve the anterior or the posterior segment.[3] Involvement of the posterior segment should not be missed as it may result in loss of vision.

AIMS AND OBJECTIVES

The firm belief that only severe blow to the eye will affect the eye and vision often results in complacency and delay in reporting to an ophthalmologist. The aim of this study was to show that even trivial injuries to the eye can cause grave vision threatening consequences. The purpose is to

Financial or Other, Competing Interest: None.
Submission 05-01-2017, Peer Review 12-01-2017,
Acceptance 25-01-2017, Published 27-01-2017.
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DOI: 10.18410/jebmh/2017/86

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emphasize the need for proper examination of the eye however miniscule the trauma may be.

MATERIALS AND METHODS

This observational, combined prospective and retrospective study was conducted from June 2016 to December 2016 in Regional Institute of Ophthalmology and Government Ophthalmic Hospital, Egmore and Chennai. The study included a total of 150 patients who presented to our outpatient department and emergency services.

Inclusion Criteria

All patients who sustained a blunt injury to the eye with resulting closed globe injuries as defined by BETTS as no evidence of full thickness wound of the eye wall were included in the study. This includes

- Contusion– The damage may be due to direct energy delivery/shock wave by the object (e.g., choroidal rupture), or to changes in the shape of the globe (e.g., angle recession).
- Lamellar Laceration– partial thickness wound of the eyeball.

Exclusion Criteria

Any open globe injury as defined by the BETTS as full thickness wound of the eye wall which includes

- Penetrating Injury– which has only an entry wound
- Penetrating wounds with retained intraocular foreign body
- Perforating Injury– which has both entry and exit wounds caused by the same agent was excluded from the study.

A detailed history was recorded from the patients which included the nature of injury, object with which the injury was inflicted, if it was accidental or non-accidental, if it was a workplace, domestic or other type of injuries and the duration after which the patient presented to the hospital.

A thorough ocular examination including preliminary best spectacle corrected visual acuity, measurement of intraocular pressure, slit lamp examination of the anterior segment and detailed fundus examination with a slit lamp biomicroscopy and indirect ophthalmoscopy was done along with gonioscopic evaluation of the angle structures using a Goldmann single mirror lens was done.

Patients also underwent ultrasound b scan, ultrasound biomicroscopy and fundus Fluorescein Angiography when required. The patients with orbital margin tenderness and crepitus underwent x-ray orbit and/or CT orbit when required. Field examination was performed with Octopus perimetry. The patients who required surgical intervention for raised intraocular pressure underwent the procedures.

The patients were reassessed after a week, 1 month and 6 months. During each follow up a detailed anterior segment examination with a slit lamp and fundus examination with slit lamp biomicroscopy and indirect ophthalmoscopy were done.

RESULTS

A total of 150 patients were included in the study. Among the study population 102 patients were males and 48 patients were females. 68% of the patients included in the study were males which highlights the male preponderance. [Figure 1, Table 1]

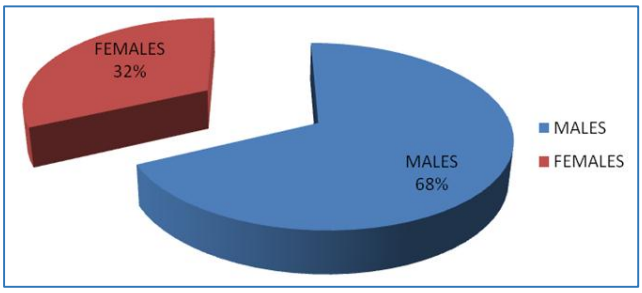

Figure 1. Sex Distribution

Gender	
Males	102
Females	42

Figure 1. Sex Distribution

The age of the patients in our study ranged from 2 years to 64 years. Among the male patients 38 (37.25%) patients fell in the 31– 40 years age group whereas 24 patients were in the 21– 30 years age group. Among the female patients 33.3% of patients belonged to the 21– 30 yrs. age group and 29.2% of patients belonged to 31– 40 year age group [Figure 2, Table 2].

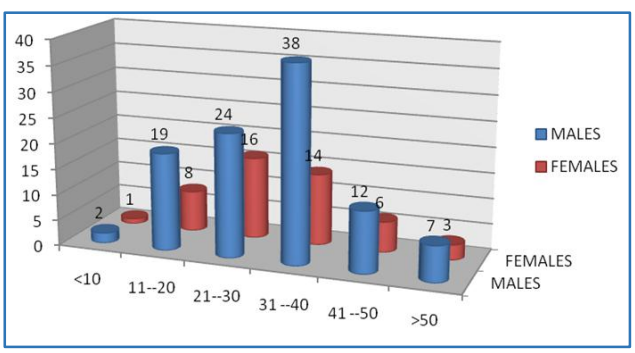

Figure 2. Age Distribution

Age Group	<10	11-20	21-30	31-40	41-50	>50
Males	2	19	24	38	12	7
Females	1	8	16	14	6	3

Table 2. Age Distribution

When the object causing or the mode of injuries were analysed, 40% of males sustained trauma due to road traffic accidents whereas 42% sustained injury by a fist mostly of her husband which was indicative of domestic violence. Other objects like stones (10% in males and 8% in females), stick (13% in males and 6% in females) were also implicated in intentional or unintentional injuries. Injuries during sports related activity included accidental injury with a ball or a shuttlecock (12% in males and 6% in females). [Figure 3, Table 3].

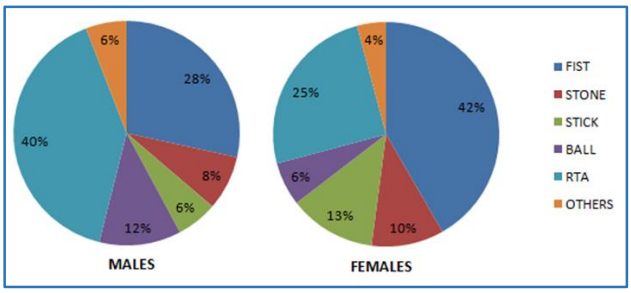

Figure 3. Objects Modes of Injury

Objects	Fist	Stone	Stick	Ball	RTA	Others
Males	29	8	6	12	41	6
Females	20	5	6	3	12	2

Table 3. Objects Causing Injuries

When the setting in which the injury occurred was considered, accidental, workplace and injury due to assault was 34%, 33% and 33% in males indicating that men were vulnerable to injury in all these settings equally. Whereas when women were considered assault in a domestic setting was 46% (42% due to injuries with a fist and the remaining were assaulted using other objects mentioned above) and accidental injury was 42%. Workplace related injury was only 12% in females. [Figure 4, Table 4]

Type	Accidental	Workplace	Assault
Males	35	33	34
Females	20	6	22

Table 4. Nature of Injuries in our Study Population

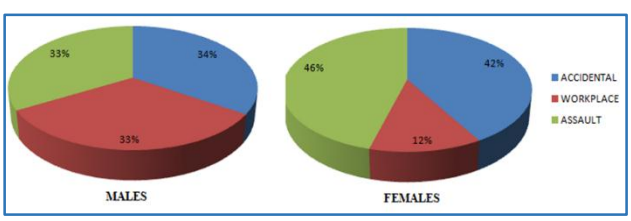

Figure 4. Nature of Injuries

On analysing the presenting visual acuity, nine patients denied perception of light. These patients had sustained severe injuries and had injuries in both the anterior and posterior segment. Such patients had a dense vitreous haemorrhage associated with retinal detachment and injury to the optic nerve. 26 of patients presented with ability to perceive hand movements of counting fingers close to face. 39 patients were able to count fingers at distances ranging from one to six meters. 34 patients had visual acuity between 6/36 to 6/18 and 42 patients had a presenting visual acuity between 6/12 to 6/6. [Figure 5, Table 5].

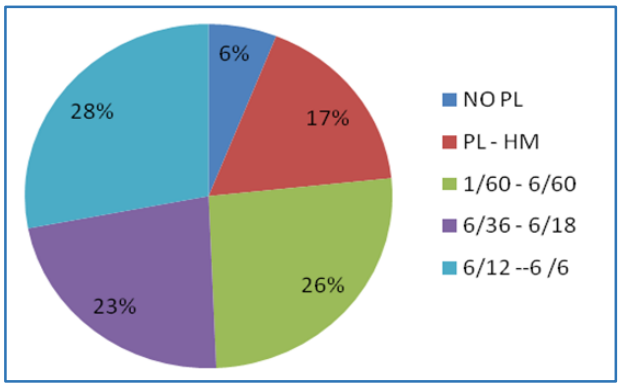

Figure 5. Visual Acuity on Presentation

No PL	No PL	PL - HM	1/60 - 6/60	6/36 - 6/18	6/12 - 6/6
No. of Patients	9	26	39	34	42

Table 5. Visual Acuity of Patients at Presentation

27% of the patients had an intraocular pressure between 11–15 mm hg at presentation. 14% of patients had a presenting IOP between 21– 25 mm hg, 18% between 26–30 mm hag and 9% had an IOP mare than 30 mm hg. All these patients with IOP more than 20 mm hg were evaluated thoroughly and adequate IOP lowering measures were instituted [Figure 6, Table 6].

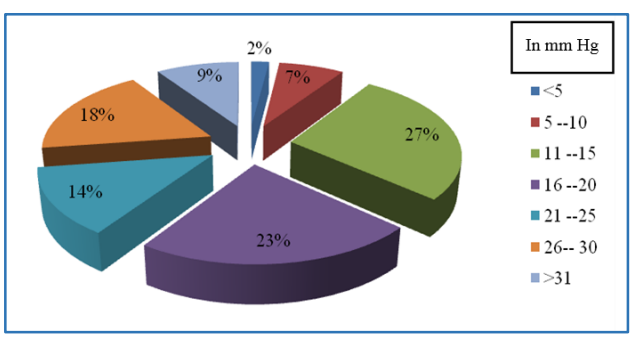

Table 6. IOP at Presentation

IOP	<5	5-10	11-15	16-20	21-25	26- 30	>31
<5	3	11	41	34	20	27	14

Table 6. Intraocular Pressure at Presentation

Among the segment of the eye involved in the trauma, 42% has involvement of the anterior segment while 20% of the patients had involvement of the posterior segment. 28% of the patients had combined anterior and posterior segment injuries. 10% of the patients suffered orbital injuries. Among our study population 13 presented with orbital blow out fractures which required intervention from the oral maxilla facial surgeon. Two presented with retrobulbar haemorrhage [Figure 7, Table 7].

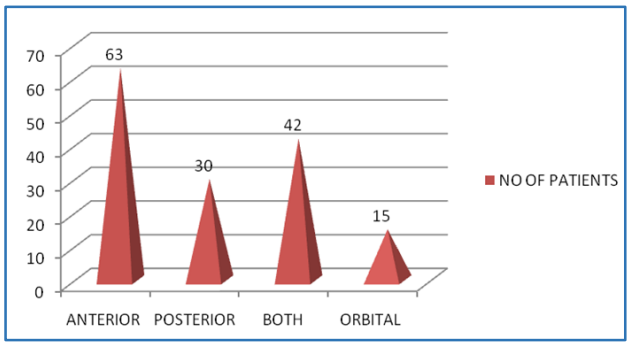

Figure 7. Segment Involved

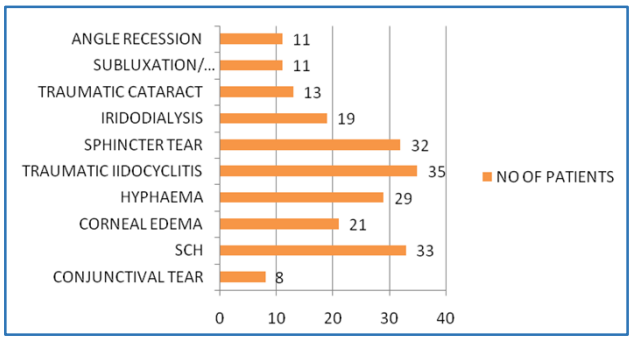

Figure 8. Anterior Segment Injuries

Anatomical Region	Anterior	Posterior	Both	Orbital
No. of Patients	63	30	42	15

Figure 7. Segment Involve in Eye Injuries

Among the anterior segment manifestations the commonest presentations were subconjunctival haemorrhage and iridocyclitis the incidence of both being 16%. Patients with subconjunctival haemorrhage were managed with lubricants and reassured about the benign nature of the condition and that it will eventually go away. Patients with traumatic iridocyclitis were treated with topical steroids (1% prednisolone acetate) in tapering doses and cycloplegics (2% homatropine) eye drops. Iris sphincter tear was found in 15% of the patients and hyphaema was found in 14% of the patients. Among the 29 patients with hyphaema, only two patients had persistent non resolving blood clot in the anterior chamber, three patients had persistently elevated intraocular pressure and one patient developed corneal staining which required surgical intervention. These patients underwent anterior chamber irrigation and aspiration through a small entry (anterior chamber washout). The other patients were treated with topical steroids and cycloplegics. Those with elevated intraocular pressures were treated with adequate IOP lowering measures. These patients underwent anterior chamber wash for the removal of the blood clot. 10% of the patients had corneal oedema. Iridodialysis was found in 9% of the patients and 6% of the patients developed traumatic rosette type of cataract. These patients underwent cataract surgery with suitable intraocular lens implantation depending on the posterior capsular and zonular status as determined by B scan ultrasonography and Ultrasound Biomicroscopy. Subluxation or posterior dislocation of the lens or the posterior chamber intraocular lens was found in 5% of the patients. These patients underwent Pars plana vitrectomy with removal of the dislocated lens with intraocular lens implantation either in the same sitting or in a second sitting. 4% of the patients had conjunctival tear. These patients were managed conservatively [Figure 8, Table 8].

Injury	No. of Patients
Conjunctival tear	8
SCH	33
Corneal edema	21
Hyphaema	29
Traumatic iidocyclitis	35
Sphincter tear	32
Iridodialysis	19
Traumatic cataract	13
Subluxation/Dislocation of IOL	11
Angle Recession	11

Table 8. Anterior Segment Injuries of the Eye

Image 1. Depicts Circumcornal Congestion with Corneal Edema and Hyphaema

Among the posterior segment injuries, the commonest finding in our study was traumatic macular oedema (commotio retinae) which was seen among 35% of the patients. These patients were treated with either topical steroids or topical non-steroidal anti-inflammatory agents (0.1% nepafenac). The oedema resolved and responded well to these medications. Vitreous haemorrhage was found in around 30% of the patients. Among the patients with vitreous haemorrhage one patient had an associated intracranial bleeding due to the severity of the force causing the trauma therefore diagnosed as Tersons syndrome. 19% of the patients had retinal detachment and 11% of the patients ended in traumatic optic neuropathy. Choroidal tear and chorioretinitis sclopetaria were seen in 2% of the patients and traumatic macular hole was seen in 1% of the patients [Figure 9, Table 9].

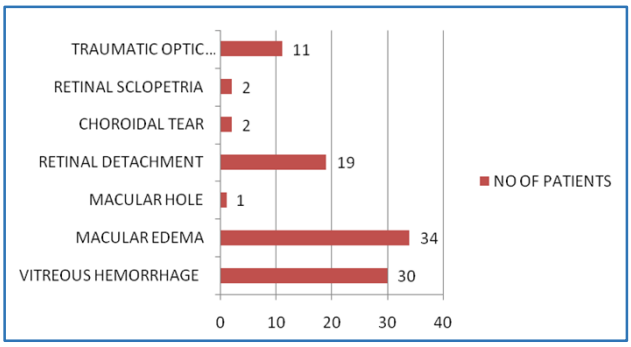

Figure 9. Posterior Segment Injuries

Injury	No. of Patients
Vitreous hemorrhage	30
Macular edema	34
Macular hole	1
Retinal detachment	19
Choroidal tear	2
Retinal sclopetria	2
Traumatic optic neuropathy	11

Table 9. Posterior Segment Injuries of the Eye

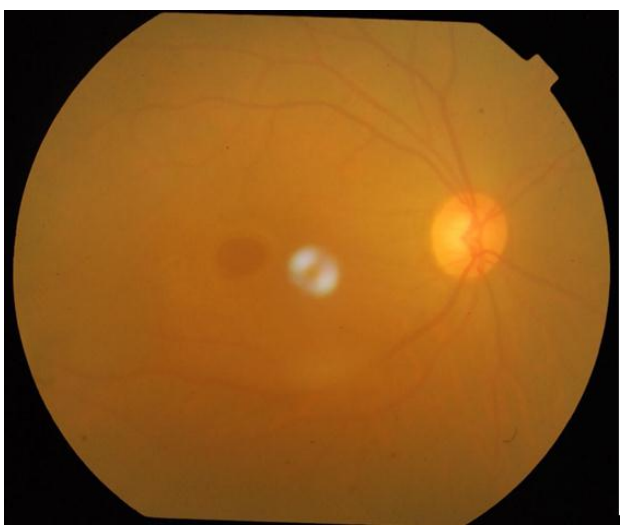

Image 2. Macular Hole in a Patient After Long Standing Macular Edema Following Trauma

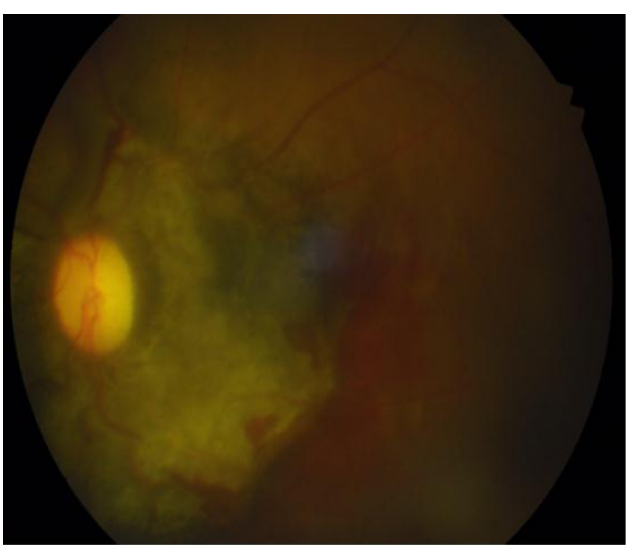

Image 3. Chorioretinitis Sclopeteria in a Young Male

DISCUSSION

This study was conducted for a period of six months at Regional Institute of Ophthalmology and Government Ophthalmic Hospital to assess the clinical manifestation of blunt trauma in 150 patients selected in random. Cases with gross external injuries or with gross loss of vision following injury were mainly included in this study.

In our study the incidence of injuries were more in males (68%) compared to females (32%). In a 10 year survey of ocular injuries conducted in northern Ireland, the ratio of injuries was shown to be 3:1 in males and females.[4] This could be explained by the fact that males are exposed to more injuries when compared to females. Majority of males who sustained injuries fell in the age group of 31–40 years whereas majority of females belonged to the age group of 21–30 years. The incidence of ocular injuries declined rapidly after the age of 40 years in our study. The study conducted by Ilsar M et all also showed a similar decline in the incidence of ocular injuries after 40 years of age.[5]

When analysing the nature of injuries, accidental injuries and injuries due to assault were 37% each whereas incidence of injuries occurring in the workplace was 26%. While males were equally exposed to injuries due to assault, injuries and workplace majority of injuries in females were due to assault. Most of them were injured due to domestic violence injured by their husbands. This highlights the prevalence of domestic violence against women in our society. The object causing the injury in majority of the females was the fist of their husbands whereas males included in our study were most commonly injured due to road traffic accidents. When Matti Niiranen an Iikka Raivio studied the ocular injuries among children in 1987, majority of children who were affected were males.[6]

The visual acuity on presentation depended upon the presenting clinical feature, and patients with bleeding into the anterior or the posterior segment presented with very poor visual acuity. Patients with reduced vision due to causes like corneal oedema, macular oedema or traumatic iridocyclitis responded well to treatment and had a good visual recovery. Patients who presented with a traumatic retinal detachment or choroidal tears did not have good visual recovery.

32% of the patients had a presenting intraocular pressure more than 25 mm hg in our study. The causes of raised intraocular pressure were due to hyphaema, angle recession more than 180^{o} and traumatic displacement of the lens. These patients were managed with adequate IOP lowering agents and patients with hyphaema and lens displacements were managed by appropriate surgical procedures. 2% of the patients presented with hypotony, IOP <5 mm hg. This may have been due to ciliary shock due to trauma which may have led to the failure of production of aqueous.

The study conducted by Ramanjit Sihota et al, analysed the factors which would indicate the occurrence of chronic traumatic glaucoma in patients with blunt injury to the eye. They concluded that increased pigmentation of the angle, increased baseline IOP, hyphaema, traumatic displacement

of the lens and angle recession more than 180° were significantly associated with an increased risk of glaucoma following blunt injury.[7]

The anterior segment was most commonly involved with 42% patients presenting with anterior segment manifestations. The contusions in the conjunctiva may vary from small petechiae to large extravasations with clot formation. They are usually of little importance unless the posterior edge of the haemorrhage is not visible which may be due to the tracking forward of blood from the orbit due to fracture of the orbit or base of the skull. Small tears of the conjunctiva heal rapidly with local antibiotic treatments and gaping conjunctival wounds may require suturing. The cornea may develop epithelial defects or oedema due to the effect of blunt injury. The development of corneal oedema is due to the temporary disturbance of cells of the corneal endothelium which results in altered permeability which results in free access of aqueous to the corneal tissues.[8] corneal oedema is usually treated with 5% sodium chloride eye drops. Corneal lacerations may also occur which may require suturing. None of the patients in our study developed rupture of the cornea.

Traumatic mydriasis which was seen in 32 patients, may occur due to a single or multiple tears of the iris sphincter which usually does not require any specific treatment. Traumatic iridocyclitis (16% of patients) indicated by circumcorneal congestion, cells and flare in the anterior chamber may occur due to the vascular effects on the uveal vessels which is characterized by an initial ischaemic spasm followed by reactive vasodilation.

Hyphaema occurs due to rupture of a small arteriole. Total or subtotal hyphaema may occur due to the rupture of a vessel of large caliber. Small haemorrhages may absorb rapidly but may be complicated by the occurrence of secondary haemorrhages on the second or the fifth post traumatic day which is probably due to the lysis and retraction of the clot and the fibrin which has occluded the injured vessels. Systemic administration of antifibrinolytic substance like aminocaproic acid reduces the incidence of secondary haemorrhage.[9] Most of them resolve spontaneously leaving no trace. Absorption is mainly through the crypts in the anterior surface of the iris and through the trabecular meshwork. Surgical intervention is required when the IOP is more than 50 mm hg for three days, total non-resolving hyphaema or when corneal staining is expected. Iridodialysis occurs when the iris is torn away from its insertion into the ciliary body when the expansion of the corneoscleral ring is opposed by the contraction of the sphincter and pressure wave from the aqueous impinges on the stretched iris which leads to the dehiscence of the iris from its insertion. This may result in a D shaped pupil and a uniocular diplopia. Anterior chamber recession is one of the commonest sequelae of blunt injuries produced by a concussive force. This force results in tears into the face of the ciliary body resulting in a separation of the circular and radial fibres from the longitudinal muscles.[10] Recession of more than 180° is usually significant causing raised intraocular pressure. The development of glaucoma following angle recession may occur within one year and or after ten years of injury.

Injury to the lens and its zonules are common of which traumatic cataract is a frequent sequel. This may be a rosette type of cataract resulting from damaged lens fibres beneath the anterior, posterior or both lens capsules. Total opacification of the lens capsules might also occur. A Vossius ring which may partial or complete corresponding to the papillary aperture composed of iris pigments may occur.

Subluxation (lens torn partially from its zonular attachments) or dislocated lens (lens torn completely from its zonular attachment) was seen in 5%. Posterior dislocation is more common than anterior dislocation. In our study all 11 patients had posterior dislocation of the lens.

The commonest posterior segment finding was commotio retinae or Berlins oedema found in 35% of the patients. It usually involves the macula and might involve the peripapillary area in severe cases and might stand out as a bright red spot compared to the rest of the retina. Berlin attributed this to an extravasation of blood between the choroid and sclera which resulted in ischaemia due to pressure on the choriocapillaries and a consequent transudation of oedematous fluid into the retina. All these patients showed complete resolution of the oedema and had good visual acuity if other posterior segment injuries were absent.

Vitreous haemorrhage was found in 30% of the patients. Blood in the anterior vitreous phase may be due to bleeding from the ciliary body or the iris root whereas blood in the posterior vitreous cavity may be due to damage to the retina and choroid. Traumatic vitreous haemorrhage usually resolves slowly and it may organize to form a proliferative retinopathy which may exert traction on the retina to cause a retinal detachment. Twelve patients with vitreous haemorrhage had persistent organized vitreous haemorrhage. Pars plana vitrectomy is a good option in these patients but may have a poor outcome due to the associated damage to other structures. Among our patients with traumatic retinal detachment, most commonly breaks were located near the ora serrata. Simultaneous anterior and posterior dialysis is pathognomonic of concussive retinal detachment[11]. Traumatic optic neuropathy was found commonly among patients who sustained blunt trauma to the eye along with RTA. These patients did not have good visual recovery. Chorioretinitis sclopetaria which is defined as full thickness injury to the retina and choroid as a result of high velocity missile passing adjacent to the globe but not penetrating the globe.[12] This finding was also seen in a young male after sustaining injury by a fist.

CONCLUSION

This analytical study on blunt injuries to the eye clearly shows that trivial injury can cause grave damage to the eye. Anterior segment injuries to the lens like traumatic cataract and dislocation cause gross diminution of vision and maybe amenable to surgical management. Even cases with no extensive external eye injury could have sustained injury to the posterior segment. Posterior segment injuries are

sinister and if not promptly intervened may lead to loss of useful vision in the involved eye. Any case of ocular trauma however trivial should be properly examined before asserting that no injury has occurred to the eye.

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