

CLINICOEPIDEMIOLOGICAL ANALYSIS OF SECONDARY GLAUCOMA FOLLOWING CLOSED GLOBE INJURY IN A TERTIARY LEVEL HOSPITAL

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ABSTRACT

BACKGROUND

Closed globe injury is one of the commonest cause of secondary glaucoma. Angle recession, hyphaema-associated and lens-associated mechanisms are the most common causes of secondary glaucoma after blunt ocular trauma.

The Objective of the study is to study incidence, risk factor and clinicoepidemiological profile of secondary glaucoma in closed globe injury.

MATERIALS AND METHODS

A descriptive study of 75 cases of closed globe injury admitted at a tertiary level hospital in southern part of Kerala. Data analysed included age, sex, cause, mode of injury, treatment given, initial and final visual acuity, intraocular pressure at the time of admission and in follow up period and extent of ocular injury.

RESULTS

In our study group 29.33% of patients were in the age group of 11 -20 years and 66.67% was ≤ 30 years of age and most common mode of injury was by stick which constituted about 37.33% followed by tennis ball which constituted about 22.67%. The most common anterior segment finding was hyphaema in 66.67%, 46.67% had angle recession but only 4% had angle recession more than two quadrants. Among 36% patients who had secondary glaucoma, hyphaema associated/inflammatory glaucoma constituted about 66.67%, lens induced constituted 25.92%, angle recession glaucoma constituted 7.41%.

CONCLUSION

Hyphaema associated/inflammatory glaucoma constituted major share of secondary glaucoma followed by lens induced glaucoma and angle recession glaucoma. In our study, those who had initial better vision and normal IOP either maintained the condition or improved. Poor final visual outcome was significantly associated with lenticular and posterior segment injuries.

KEYWORDS

Blunt Ocular Trauma, Hyphaema, Lens Induced Glaucoma, Angle Recession Glaucoma.

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BACKGROUND

Ocular trauma is a major cause of worldwide visual impairment. Most of the secondary glaucomas are a result of blunt trauma. It can occur acutely or more often delayed as in angle recession. Injury is an especially common etiology for elevated intraocular pressure in young patients. In a study, trauma was the cause of glaucoma in 36% of patients under the age of 30 years, whereas it was the cause in only 1.3% of patients over 30 years of age.¹ Trauma related glaucomas are a mixed bag of conditions that raise the intraocular pressure (IOP) and hence compromise the

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optic nerve function. Birmingham Eye Trauma Terminology System (BETTS)² provides a clear definition for all injury types. By always using the entire globe as the tissue of reference, classification is unambiguous, consistent, and simple. The ocular trauma classification group³ has developed a classification system based on BETT and features of globe injury at time of presentation. Mechanical trauma to the eye is subdivided into open and closed globe injuries. These have different pathophysiological and therapeutic ramifications. The system categorizes trauma by four parameters:

1. Type-based on the mechanism of injury. The type of injury should be determined based on the history and clinical examination.
2. Grade-as defined by visual acuity at the initial examination.
3. Pupil: presence or absence of a relative afferent pupillary defect.
4. Extent or zone of injury.

*Glaucoma in Closed Globe Injury**Classification⁴**Early Onset*

- a. Traumatic uveitis
- b. Trabecular meshwork disruption
- c. Haemorrhage-associated
- d. Lens-associated

Late Onset

- a. Angle recession
- b. Closure of cyclodialysis cleft
- c. Haemorrhage associated
 1. Ghost cell
 2. Haemolytic
 3. Haemosiderotic

Lens Associated

1. Subluxation
2. Phacomorphic
3. Lens particle glaucoma
4. Phacoanaphylactic glaucoma

Hyphaema commonly results from contusion, which causes a tear in the ciliary body and bleeding from the small branches of the major arterial circle of the iris. Complications of hyphaema include rebleeding, glaucoma and corneal staining. Rebleeding remains one of the greatest concerns following traumatic hyphaema because it is associated with a higher complication rate (58%) than eyes that do not suffer rebleeding (22%).⁵ The most critical time for rebleeding seems to be 2-5 days after injury when lysis and retraction of the clot occur. Glaucoma can be an early or late complication. Approximately 25% of eyes develop acute IOP >25 mm Hg and 10% of eyes >35 mmHg.⁶ The acute IOP rise appears to be due to impaired aqueous egress through normal trabecular meshwork pathways because of outflow obstruction by red blood cells, fibrin/platelet aggregates, and degraded cell products. Contusion damage to the trabecular meshwork and inflammation aggravate the problem, as does topical or systemic steroid use. The treatment of glaucoma following hyphaema depends on the level of IOP elevation and whether or not the patient has sickle cell disease. Corneal blood staining occurs in 5% of hyphaema patients.⁷

Angle recession represents a tear between the longitudinal and circular fibres of the ciliary body. Angle recession is observed in 71 to 100% of eyes with hyphaema, but glaucoma seen only in 7 to 9% of these eyes.⁸⁻¹² Elevated IOP results from collateral damage and scarring of the trabecular meshwork. Scarring ensues and leads to chronic obstruction.¹³ Another mechanism for IOP elevation is the extension of an endothelial layer with a Descemet like membrane from cornea over anterior chamber.¹⁴⁻¹⁶ Patients may present during the first year after injury or as late as more than 10 years after the trauma. The amount of angle recession affects the time of presentation. Patients with more than 270 degrees of recession usually present earlier.¹³ Gonioscopic findings suggestive of angle recession are widened ciliary body; Prominent scleral spur secondary to angle recession and a gray to white membrane covering the angle. Lens-associated glaucoma can occur in subluxation and dislocation. Subluxation typically occurs if more than

25% of the zonular fibres are ruptured.¹⁷ The lens causes pupillary block and subsequent angle closure when displaced anteriorly.¹⁸ A lens whose zonular support has been completely severed can be dislocated into the anterior chamber or intravitreally. Traumatic cataract caused by blunt trauma classically form stellate or rosette shaped posterior axial opacities that may be stable or progressive. Traumatic mydriasis can occur as early or late complications of trauma and is due to sphincter rupture or laceration. Posterior segment changes occurring due to blunt trauma includes commotio retinae, retinal detachment, traumatic macular hole, vitreous and retinal haemorrhage and retinal dialysis.

Imaging for traumatized eye includes ultrasound imaging of the eye and orbit, CT Scan, MRI Scan, Ultrasound Biomicroscope (UBM).¹⁹ The most common UBM findings in closed globe injuries were zonular deficiency (64.2%), angle-recession (43.3%), iridodialysis (17.9%), dislocated lens (16.4%), hyphaema (13.4%) and peripheral anterior synechiae (8.9%).²⁰

Aims and Objectives

To study incidence, risk factor and clinicoepidemiological profile of secondary glaucoma in closed globe injury.

MATERIALS AND METHODS

This is a descriptive study of 75 patients with closed globe injury who got admitted in a tertiary level hospital in southern part of Kerala during the study period.

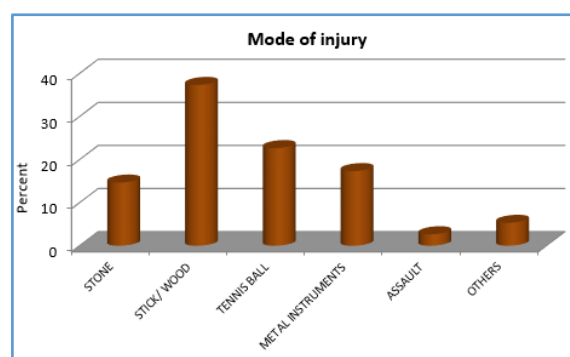
Inclusion Criteria

All patients with closed globe injury admitted in a tertiary level hospital and who had given consent for participating in the study

Exclusion Criteria

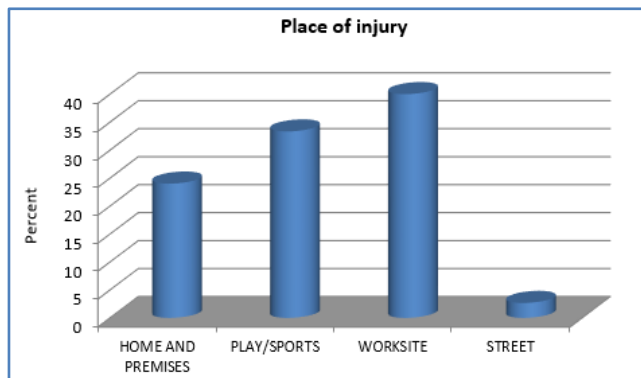
- Patients with pre-existing ocular diseases/surgeries
- Patients not willing to participate in the study

Information extracted from the patients includes history, ocular examination including visual acuity, slit-lamp, intra ocular pressure, gonioscopy and fundus examination. Patients were treated accordingly and followed up for 6 month. At the time of follow up, visual acuity was recorded and all other relevant examinations including slit lamp examination, IOP recording, gonioscopy and fundus examination were carried out.

RESULTS*Analysis of Mode of Injury*

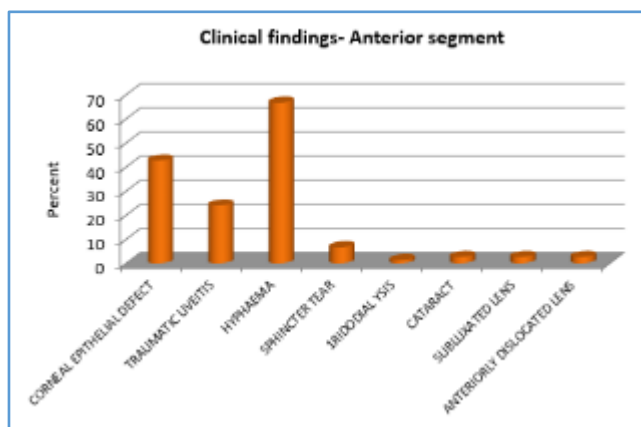
Majority (37.33%) of injury were caused by stick/wood.

Analysis of Place of Injury



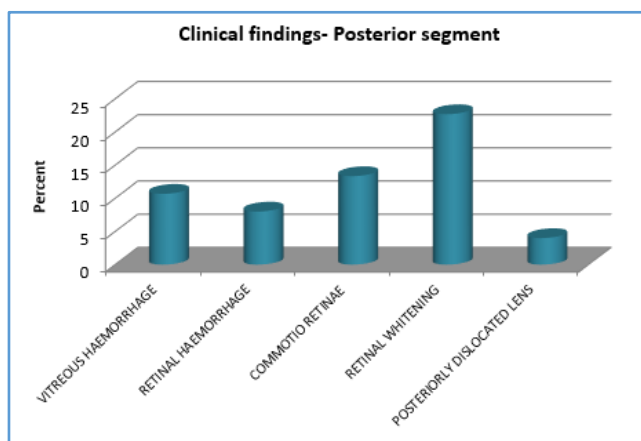
Work site injuries constituted about 40% followed by Play/Sports injuries 33.33%.

Analysis of Clinical Findings (Anterior Segment)



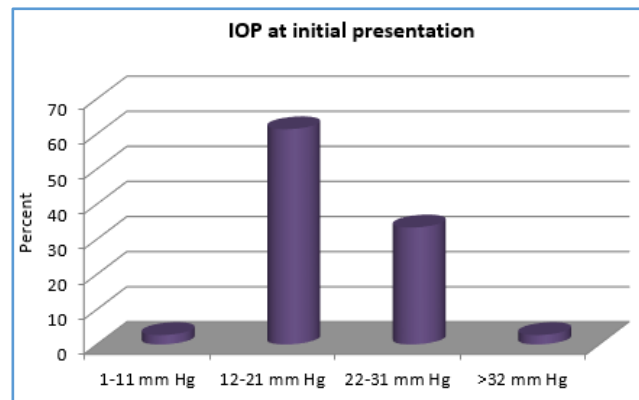
Hyphaema constituted 66.66% of anterior segment findings.

Analysis of Clinical Findings (Posterior Segment)



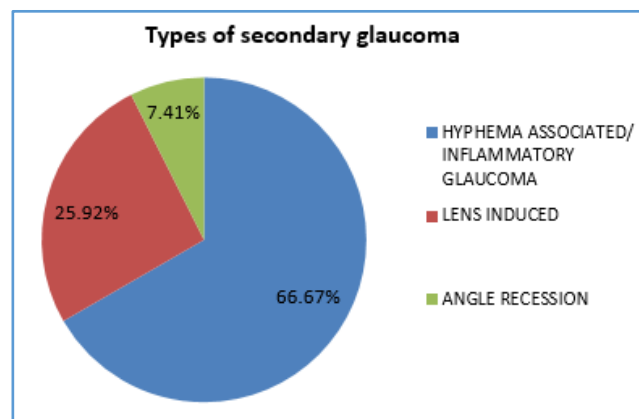
Retinal whitening constituted 22.67% (n=20) of posterior segment findings.

Analysis of IOP at Initial Presentation



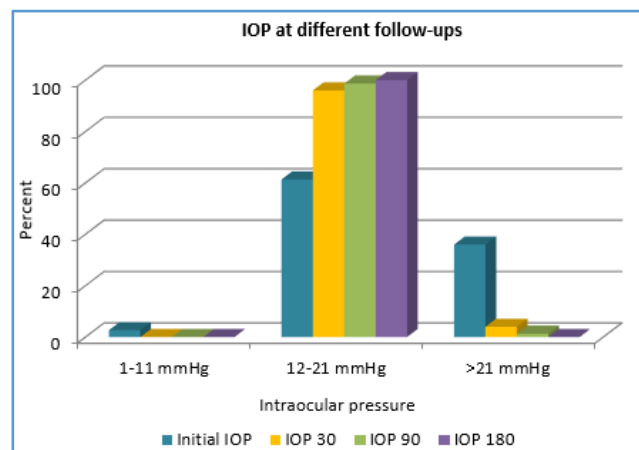
61.33% (n=46) of study population had normal IOP at presentation.

Analysis of Types of Secondary Glaucoma



Among those who had secondary glaucoma 66.67% (n=18) had hyphaema associated/inflammatory glaucoma. 25.92% (n=7) had lens induced glaucoma.

IOP at Different Follow ups



At initial presentation only 61.33% had normal IOP. But at the end of 180 days of follow up 100% of the study population had normal IOP.

DISCUSSION

Ocular trauma is a major cause of worldwide visual impairment. It is the single most important cause of monocular blindness worldwide. Ocular trauma can occur in any setting including home settings, recreational and sports-related activities, and workplace and road traffic accidents. The young individuals are the main victims of trauma and the effect of it on their career and future life is devastating.²¹ In our study group 29.33% (n=22) of the study population was between the age group of 11 -20 years that is the school going group and 66.67% (n=50) of the study population was ≤30 years This is in concordance with study by Badrinath et al,²⁰ which showed 67% of patients were below age of 30 years . In our study, male preponderance (86. 67%) was seen and male: female ratio was 6.5:1. Viestenz et al. showed 85% were males.²² Male preponderance is understandable as they are more involved in outdoor activities, sports, employed in factories and industries and rash driving. In our study most common mode of injury was by stick/wood which constituted about 37.33% (n=28) followed by tennis ball which constituted about 22.67% (n=17). This correlates well with the study conducted by Michael Ilsar, Moses Chirambo, Abrahaam and Vitale.²³ Worksite injuries constituted about 40% (n=30) of total injuries followed by play/sports injury which constituted 33.33% (n=25). This is in concordance with study by Boo Sup Oum, Jong Soo Lee and Young Sang Han,²⁴ which showed 34.9% of injuries occurred at worksite.

In our study the most common anterior segment finding noted was hyphaema in 66.67% (n=50). 60% (n=30) of the study population had only Grade-1 hyphaema on presentation. 20% (n=10) had microscopic hyphema. This is similar to the study done by Arif Y. Balatay And Haval R. Ibrahim.²⁵ The results were at the time of presentation 24 patients (60%) had grade I hyphaema, 9 patients (22.5%) with grade II, 5 patients (12, 5%) with grade III and 2 patients (5%) with grade IV. In our study 46.67% (n=35) had angle recession but only 4% (n=3) had angle recession more than two quadrants. Julio et al., Ferenz Kuhn and Ellong A reported 60-80% incidence of angle recession in their studies.²⁶ During 6 months of follow up only 5.71% (n=2) developed angle recession glaucoma with long term follow up, we may find more cases of angle recession glaucoma. In the present study 36% (n=27) patients developed raised IOP and this correlates well with the studies conducted by Krishnan Mathew and Sreenivasan Renuka who found secondary glaucoma in 22.07% cases.²⁷ Among 36% (n=27) patients who had secondary glaucoma, hyphaema associated/inflammatory glaucoma constituted about 66.67% (n=18), lens induced constituted 25.92% (n=7), angle recession glaucoma constituted 7.41% (n=2). Another finding noted in our study was that majority of patients were having normal or below normal IOP in the initial phase which can be explained by the ciliary-body shock, occurring after blunt trauma.

In the present study, subluxation of lens was noticed in 2.66% cases and dislocation in 6.66%. The incidence of traumatic cataract in the present study is 2.66%. The study

conducted by A Viestenz showed 10% of traumatic cataract.²² In our study among those who had lenticular injury 100% (n=7) had IOP >21 mmHg and among those who had no lenticular injury only 27.94% (n=19) had IOP >21 mmHg. This is statistically significant, p value <0.001. At initial presentation only 61.33% had normal IOP and after 6 months of follow up and treatment 100% of the study population had normal IOP. So even though the initial vision and IOP is not favourable, majority improved over 6 months with treatment and close follow ups.

CONCLUSION

In our study, school going children in the age group of 11-20 years were the major group. Male preponderance was seen. Most common mode of injury was by stick/wood. Work site injuries and play/sports injuries were associated with significant ocular morbidity. Sports and related activities in our country is a major cause of injury in the older group of children. Safety standards as recognized by standard organizations need to be introduced and implemented. In our study population hyphaema was the commonest clinical presentation requiring admission. Majority of patients had grade-1 hyphaema at initial presentation. Although angle recession was common, angle recession involving more than two quadrants was less. Hyphaema associated/inflammatory glaucoma constituted major share of secondary glaucoma followed by lens associated glaucoma and angle recession glaucoma. In our study, those who had initial better vision and normal IOP either maintained the condition or improved. Poor final visual outcome was significantly associated with lenticular and posterior segment injuries. The complications from elevated intraocular pressure after trauma are usually preventable if management is initiated appropriately and timely.

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