



## Original Article

# To study visual outcome with early intervention in secondary glaucoma following closed globe injury in a tertiary level hospital

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## Abstract

**Background:** Closed globe injuries are now on the rise and it is the third most common cause of secondary glaucoma. With serious implications on the ocular integrity and the potential to cause even total blindness, closed globe injury demands keen ophthalmological management and follow up.

**Objective:** To study the visual outcome of secondary glaucoma following closed globe injury.

**Methodology:** A descriptive study of 75 cases of closed globe injury admitted in a tertiary level hospital in southern part of Kerala. Data analysed included age, sex, cause, mode of injury, medical and surgical 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 the present study, subluxation of lens was noticed in 2.66% cases and dislocation of lens in 6.66% of cases. Both cases of subluxation were managed medically. All the 4% cases of posterior dislocation of lens also were managed surgically. All the 2.66% cases of anteriorly dislocated lens also underwent surgery. During 6 months of follow up only 5.71% developed angle recession glaucoma and patient who developed angle recession glaucoma underwent surgery.

**Conclusion:** The complication which develops because of elevated intraocular pressure after trauma are usually preventable if managed early or appropriately. In our study lenticular injury and injuries with posterior segment changes had poor visual prognosis

**Keywords:** lens subluxation, lens dislocation, closed globe injury, angle recession.

## Introduction

Ocular trauma can result in a wide spectrum of tissue lesions of the globe, optic nerve and adnexae, ranging from superficial to vision

threatening conditions. Mechanical trauma to the eye is subdivided into closed and open globe injuries.

**Classification of Closed Globe Injury<sup>1</sup>**

**Type**

- a) Contusion
- b) Lamellar laceration
- c) Superficial foreign body
- d) Mixed

**Grade (visual acuity)**

- a) >20\40
- b) 20\50 to 20\100
- c) 19\100 to 5\200
- d) 4\200 to light perception
- e) No light perception

**Pupil**

- a) Positive, relative afferent pupillary defect present in the injured eye.
- b) Negative, relative afferent pupillary defect absent in the injured eye

**Zone**

- a) External (limited to bulbar conjunctiva, sclera, cornea)
- b) Anterior segment (includes structures of the anterior segment and pars plicata)
- c) Posterior segment(all internal structures posterior to the posterior lens capsule)

Mechanisms of glaucoma in hyphaema are disruption of the trabecular meshwork, obstruction of the trabecular meshwork with RBCs or with inflammatory cells and fibrin. Hyphaema is graded according to the amount of blood in the anterior chamber<sup>2, 3,4,5</sup>

Grade	Hyphema size
Grade 1	<1/3 of the Anterior chamber
Grade 2	1/3-1/2 of the Anterior chamber
Grade 3	Near total
Grade 4	Total
Microscopic	Circulating RBCs only, no gross collection of blood

**Management of Hyphaema**

Medical and supportive treatment should be directed toward reducing the rebleeding rate, clearing the hyphaema, treating the associated tissue lesions and minimizing the long-term sequelae. Supportive care includes bed rest,

avoiding strenuous activity and elevation of the head end of the bed. Aspirin use has been reported to increase the rebleeding rate significantly in some<sup>6,7,8</sup>, but not in other<sup>9,10</sup> studies. Most clinicians favour avoiding the antiplatelet effect of aspirin and the subsequent prolongation of bleeding time. Cycloplegics may stabilize the blood-aqueous barrier, enhance patient comfort in case of traumatic iritis, and facilitate posterior segment evaluation. However, topical atropine was found not to have any beneficial effect on rebleeding, blood resorption, or vision<sup>11</sup>. Miotics are generally avoided because of their tendency to exacerbate inflammation and lead to synechia formation. Fibrinolytic agents such as TPA,<sup>12</sup> injected intracamerally, may have a role in stagnant clots. Corticosteroids are used topically to counter the associated traumatic iritis and to facilitate comfort. Systemic steroids are favoured by some<sup>13,14</sup> but not by others<sup>15</sup>. Prednisone at 40 mg /day in divided doses was effective in reducing the rebleeding rate to a level comparable to that achieved with systemic aminocaproic acid<sup>16</sup>. Systemic steroids have serious side effects but are generally well tolerated by the usually young and healthy patients. Antifibrinolytic agents (eg. aminocaproic acid, tranexamic acid) are used because they are fibrinolytically active and slow the rate of clot lysis. The efficacy of antifibrinolytic agents to reduce rebleeding has been confirmed. The recommended dosage for aminocaproic acid is 50 mg/kg every 4 hours up to a maximum of 30 g/day, for a total of 5 days. Surgical intervention is required in approximately 5% of eyes<sup>17</sup>. The traditional indications<sup>18</sup> included IOP elevation >50 mm Hg for 5 days, IOP elevation >35 mm Hg for 7 days to avoid optic nerve damage, IOP elevation >25 mm Hg for 5 days in cases of total or near-total hyphaema to prevent corneal blood staining or large stagnant clots persisting for 10 days to prevent peripheral anterior synechia formation. Currently surgical intervention is recommended if the IOP does not respond to intense medical therapy within 24 hours; and the patient has sickle cell disease or

sickle trait.

The various techniques available are paracentesis /anterior chamber washout for liquid blood which is the simplest and safest method<sup>19</sup>. Bimanual cutting/aspiration for clotted hyphaema using the vitrectomy probe, is effective in removing both loose blood cells and the clot<sup>20</sup>.

In the management of secondary glaucoma in hyphaema topical and oral aqueous suppressants are the main stay of therapy. Alpha agonists may be appropriate to use, although concern has been raised about their sympathomimetic effect. The role of prostaglandin agonists remains to be elucidated but it appears that it is best to avoid them in inflamed eyes. Oral or intravenous hyperosmotic agents are helpful for acute/high IOP elevations. Cycloplegics in case of pupillary block. More aggressive therapy, including surgical intervention, is indicated for patients with additional risk (eg. sickle cell disease, known glaucoma, optic nerve damage) and for eyes with large clots and/or corneal endothelial damage. Late glaucoma developing weeks to years after the hyphaema is generally due to angle recession, ghost cells, or the formation of peripheral anterior synechiae.

In angle recession glaucoma elevated IOP results from collateral damage and scarring of the trabecular meshwork. Scarring ensues and leads to chronic obstruction<sup>21</sup>. Another mechanism for IOP elevation is the extension of an endothelial layer with a descemet like membrane from cornea over anterior chamber<sup>22-23</sup>. Management of angle recession glaucoma includes medical and surgical. Medical therapy- recommended agents like beta-blockers, alpha agonists and topical and oral carbonic anhydrase inhibitors. The filtration surgeries are performed. Filtration surgery is less successful in patients with angle recession than with open angle glaucoma. The success rate of trabeculectomy without antimetabolite therapy in one report was 74% at 1 year, 53% at 3 years, and 29% at 5 years<sup>24</sup>. Statistically improved success rates were found in patients with mitomycin C compared with those without an antimetabolite,

the life- table success rates were 58% versus 39% at 1 year and 58% versus 26% at 2 years, respectively. Shunt surgery with Molteno tube implantation has been disappointing with 56% 1-year, 41% 3-year, and 27% 5-year life-table success rates<sup>24</sup>.

Other causes of secondary glaucoma in closed globe injury are ghost cell glaucoma hemolytic glaucoma, hemosiderotic glaucoma and lens associated glaucoma. Lens associated glaucoma are seen in subluxation, dislocation, phacomorphic, lens particle glaucoma and phacoanaphylactic glaucoma. Surgery is recommended to relieve the glaucoma or improve vision. The technique of lens removal depends on the area of zonular support and whether there is vitreous prolapse. Posterior segment changes occurring due to blunt trauma includes commotio retinae, traumatic macular hole, vitreous and retinal haemorrhage, retinal dialysis and retinal detachment.

#### **Aim of the Study**

To study the visual outcome with early intervention in secondary glaucoma following closed globe injury

#### **Materials and Methods**

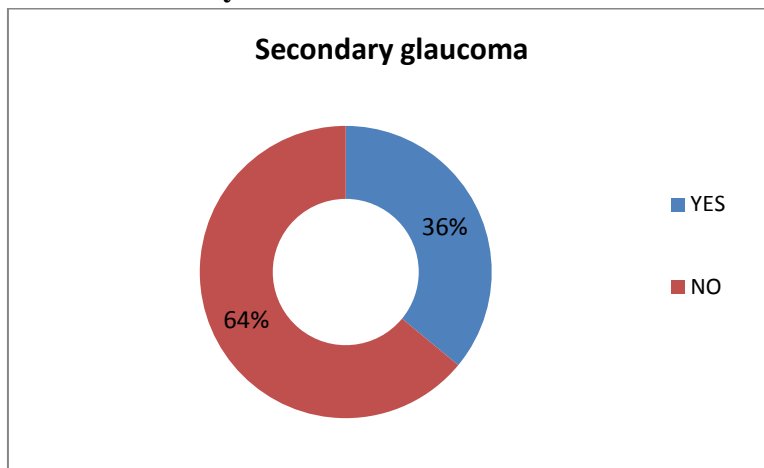
This is a descriptive study of 75 patient who sustained closed globe injury and was admitted in a tertiary level hospital in southern part of Kerala during the study period.

Inclusion criteria: All patients with closed globe injury admitted in a tertiary level hospital during the study period and who had given consent for participating in the study. An exclusion criterion was patients with pre existing ocular diseases.

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

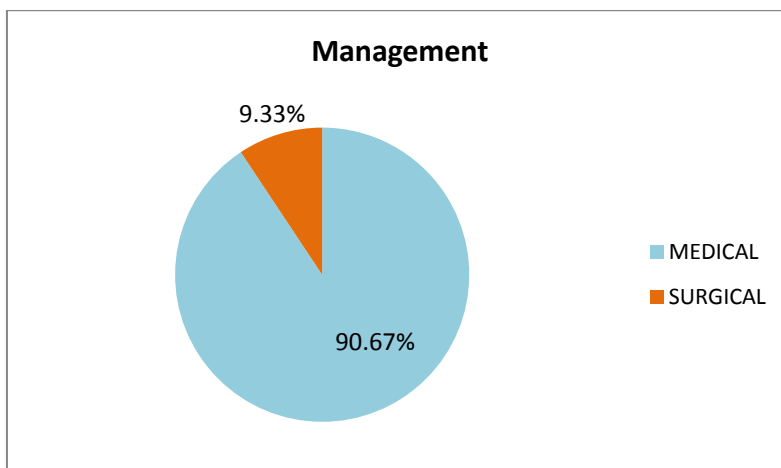
**Observation and Results**

**Analysis of Patients who had Secondary Glaucoma**



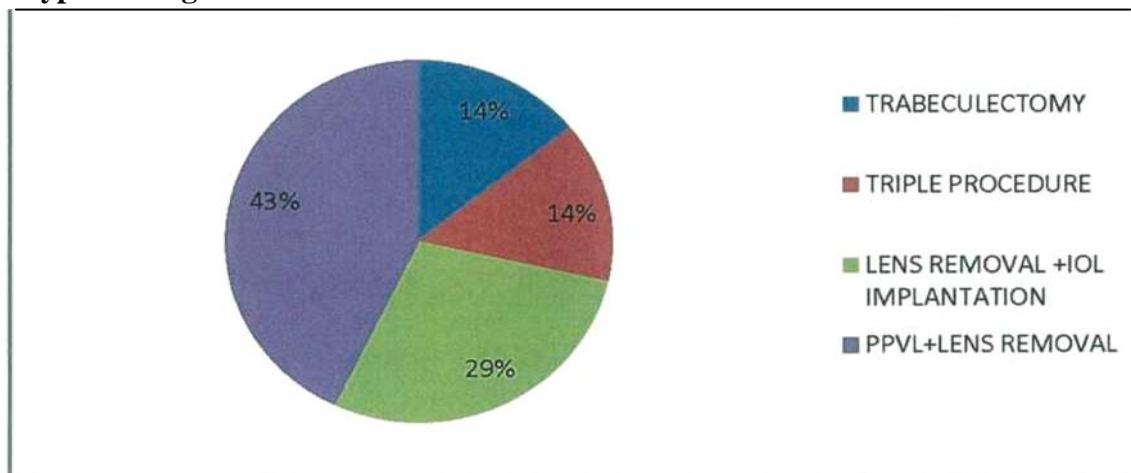
36% (n=27) of study population had secondary glaucoma.

**Analysis of Management**



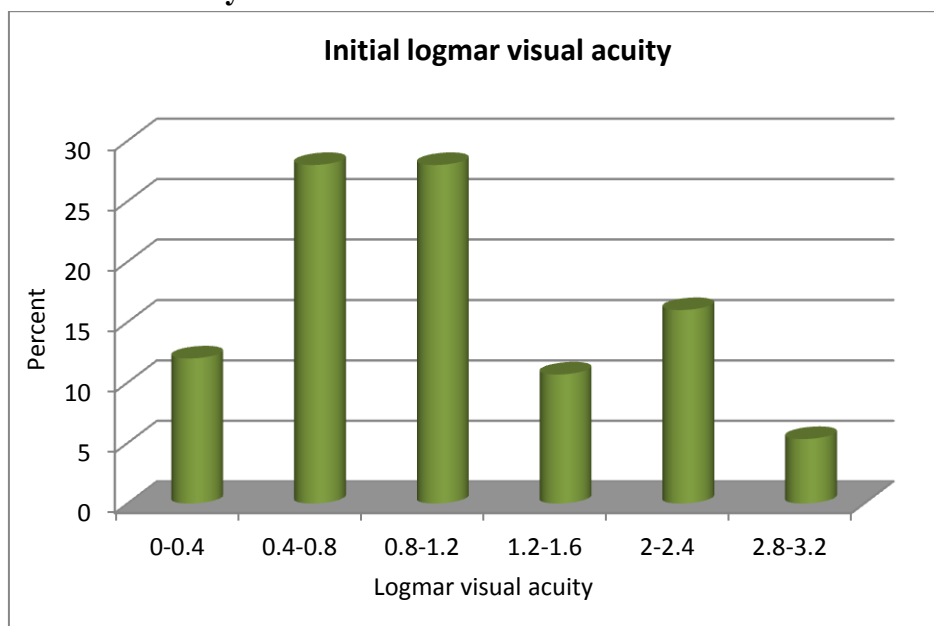
90.67% (n=68) of study population required medical management. Only 9.33% (n=7) required surgical management.

**Analysis of type of Surgical Interventions Needed**



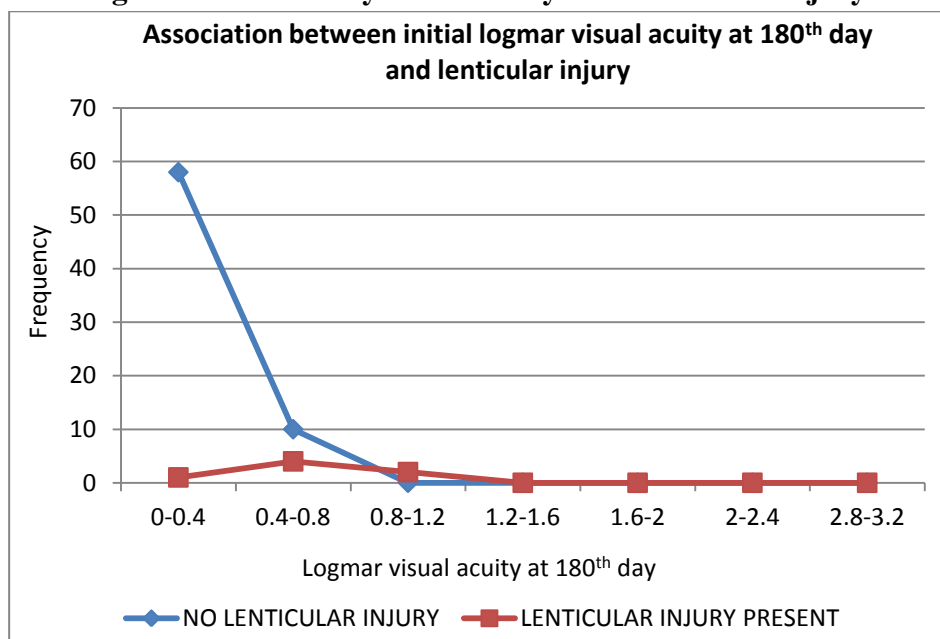
Among the patients who underwent surgical intervention 14.29% (n=1) each underwent trabeculectomy and triple procedure; 28.57% (n=2) underwent lens removal and IOL implantation; 42.85% (n=3) underwent PPV+Lens removal.

**Analysis of Logmar Visual Acuity at Initial Presentation**



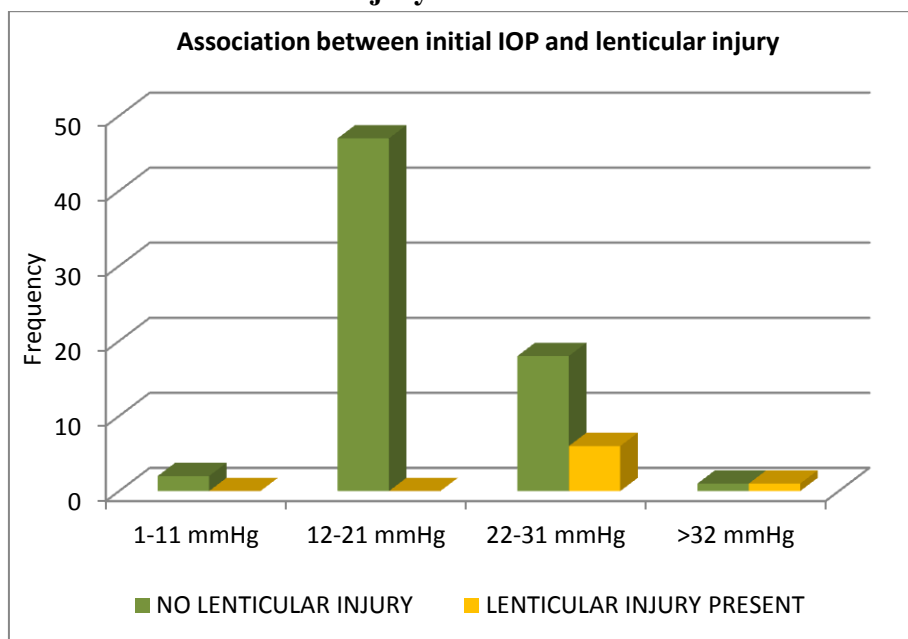
Initially only 12% (n=9) of study population has initial logmar visual acuity between 0-0.4.

**Association between Logmar Visual Acuity At 180<sup>th</sup> Day and Lenticular Injury**



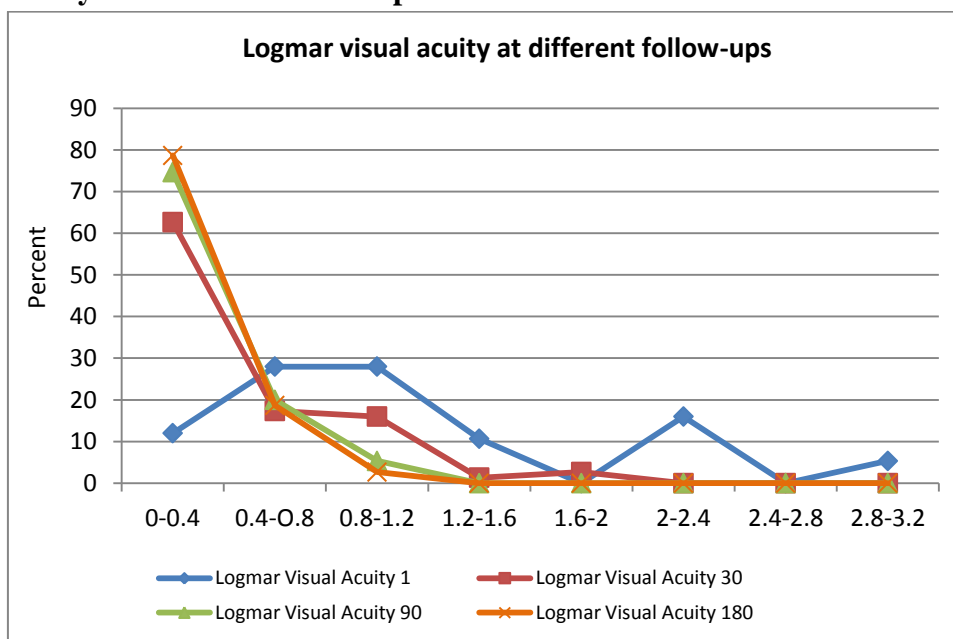
Among 7 patients who had lenticular injury, 28.57% (n=2) not improved to <1.0 logmar visual acuity at 6<sup>th</sup> month. This is statistically significant, p value <0.001.

**Association between Initial IOP and Lens Injury**



Among those who had lenticular injury 100% (n=7) had IOP >21mmHg 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.

**Logmar Visual Acuity at Different Follow Ups**



In our study initially only 12% (n=9) had logmar visual acuity between 0-0.4 . After 180 days of follow up 78.6% had logmar visual acuity between 0-0.4.

**Discussion**

In our study majority of patients were in school going age group. Males showed preponderance. Common mode of injury was stick injury. Hyphaema was the most common mode of presentation. In our study all cases of hyphaema

were managed medically. This was in concordance with the study by Arvo Oksala and Kushner who found medical treatment effective in treatment of hyphaema<sup>25</sup>. Although angle recession was common, angle recession involving more than two quadrants and leading to angle



recession glaucoma was less. During 6 months of follow up only 5.71% (n=2) developed angle recession glaucoma and both underwent surgery. This finding correlated with the studies by Salmon JF (5.5 %) <sup>26</sup>. But Julio et al. found that 7-9% of patients with angle recession developed glaucoma<sup>27</sup>. The difference may be because our follow up period was upto 6 months. With long term follow up, we may find more cases of angle recession glaucoma.

In this study subluxation of lens, dislocation of lens and traumatic cataract were noted. Both cases of subluxation of lens were managed medically. All the 4% cases of posterior dislocation of lens were managed surgically. All the 2.66% cases of anteriorly dislocated lens were also managed surgically. Majority of dislocated lens had significant posterior segment pathology which accounted for their poor visual acuity even after surgery.

In our study among 7 patients who had lenticular injury, 28.57% (n=2) not improved to <1.0 logmar visual acuity after 6 months of follow up. This is statistically significant, p value <0.001. The results were similar to a study done by Jaeseo Cho et al. at department of ophthalmology, Hanyang University, Seoul, Korea. In our study initially only 12% (n=9) had logmar visual acuity between 0-0.4. After 180 days of follow up 78.6% (n=59) had logmar visual acuity between 0-0.4. It is statistically significant, p value <0.001. 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 favorable, majority improved over 6 months with treatment and close follow ups.

### Conclusion

Traumatic hyphaema occur mostly at home and school, and frequently affect children and young adolescents. In our study majority of secondary glaucoma was due to hyphaema associated/ inflammatory glaucoma. Other causes of secondary glaucoma are due to angle recession glaucoma and lens induced glaucoma. All cases of

hyphaema were managed medically. In our study 90.67% (n=68) of study population required medical management. Only 9.33% (n=7) required surgical management. One person underwent trabeculectomy and other underwent triple procedure. Two patient who had lenticular injury underwent lens removal with IOL implantation. Three patient with posterior dislocated lens underwent pars plana vitrectomy and lens removal. 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. Final visual acuity in cases of hyphaema was good and in our study final visual acuity was poor in patient who had sustained posterior segment injuries.

Health education should be given in school to prevent stick related eye injuries and also provide improved eye health care services for patients who sustained eye injuries. Public education and general awareness can reduce the incidence of blunt trauma. Aggressive initial management will help in improving the final visual outcome in blunt trauma cases. The main limitation of our study is regarding duration of follow up. Angle recession glaucomas can take a longer duration to develop. Proper gonioscopic examination was difficult in very young children.

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