

# Visual Prognosis of Intraocular Lens Implantation in Cases of Traumatic Cataract in a Tertiary Care Hospital, Ganjam

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## ABSTRACT

### BACKGROUND

Traumatic cataract is one of the common sequelae following ocular injury. It is one of the leading causes of preventable blindness. Ocular trauma leading to traumatic cataract, if managed early gives good visual outcome. Associated ocular structure involvement has much bearing on the management and prognosis of traumatic cataract. We wanted to study the visual outcome of cataract surgery in traumatic cataract.

### METHODS

All patients included in this prospective study were subjected complete ocular examination, intra ocular lens (IOL) power calculation and small incision cataract surgery (SICS) with IOL implantation. Visual outcome was assessed after 1<sup>st</sup> week, 2<sup>nd</sup> week, 6<sup>th</sup> week and 6 months. Postoperative visual outcome and post-operative complications were assessed.

### RESULTS

Out of 50 cases studied, 56 % of cases were in the age group of less than 20 years. Male: Female ratio was 2.57 : 1. Traumatic cataract was higher in patients of rural background as compared to urban background (64 % vs 32 %). In 58 % of cases, penetrating injury was the type of trauma. 60 % of patients had visual acuity of less than 3/60 at presentation. Corneal injuries (34 %), scleral tear in (22 %) and iris related problems (18 %) were the most common associated findings. All the patients were treated with SICS with IOL implantation. Most common intra-operative complication was posterior capsule rupture seen in 14 % of cases, 34 % of patients had anterior uveitis as early post-operative complication and 24 % of patients developed PCO as late post-operative complication; 68 % of the patients achieved visual acuity of above 6/18.

### CONCLUSIONS

Timely management and involvement of other structures in traumatic cataract determines the visual prognosis of cataract surgery in traumatic cataract. Thus, our study showed that traumatic cataract can be successfully managed surgically with intraocular lens implantation with good visual outcome, unless there is associated corneal opacity or posterior segment involvement. More emphasis should be laid on the preventive measures like mass health education and awareness about risk of ocular trauma, and need to adopt safety measures should be focused, especially during playground, and at workplace.

### KEYWORDS

Traumatic Cataract, Small Incision Cataract Surgery, IOL, Visual Acuity

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## BACKGROUND

Eye is one of the delicate organs in the body. Like any other part of the body, eyes are also not exempt from injuries in spite of the fact that they are well protected by lids, projected margins of the orbit, the nose, and a cushion of fat from behind. Despite the fact that the eyes represent only 0.27 % of the total body surface area and 4 % of the facial area, they are the third most common organ affected by trauma, after hands and feet.<sup>1</sup> Ocular trauma often leads to traumatic cataract along with damage to other ocular structures.<sup>2</sup> Traumatic cataract remains an important cause of visual impairment and physical as well as vocational disability in spite of recent diagnostic and therapeutic advances.<sup>3</sup> Traumatic lens damage may be caused by mechanical or non-mechanical injury.<sup>4</sup> It may occur secondary to blunt or penetrating trauma. Some other rare causes are infrared energy (glassblower's cataract), electric shock, ionizing radiation (X-rays) etc.<sup>5</sup> Traumatic cataract has also been reported after vigorous ocular massage.<sup>6</sup> The occurrence of traumatic cataract could be observed immediately or several years after eye injury. There are various morphological types of lenticular opacities such as vossius ring opacity, subepithelial disseminated opacities, cob-web subcapsular opacities, early and late rosette-shaped cataract, and total traumatic cataract.<sup>7</sup>

Such cataract is usually associated with injuries to other ocular structures. All these factors go a long way in determining the ultimate visual prognosis in these injured eyes.<sup>8</sup> Traumatic cataract presents an important medical and surgical challenge to an ophthalmologist. A detailed history, careful examination and a clear management plan can simplify these cases and provide the best possible visual outcome. As most of the traumatic cataracts are unilateral, visual rehabilitation is a problem in these unioocular aphakic. IOL implantation is a procedure of choice for visual rehabilitation in case of traumatic cataract. The intraocular lens produces a more physiological image than by contact lens, spectacles which facilitate binocular single vision and results in best type of optical correction provided that intra and post-operative complications are avoided or effectively controlled. The timing of surgery has a vital role for visual recovery, especially in children who are at high risk of amblyopia. Several studies have revealed that early cataract extraction with IOL implantation in traumatic cataract results in good vision, useful vision can be restored through surgery depending on other sight limiting complications.<sup>9</sup>

The present study was done to analyse the visual prognosis following cataract extraction and intraocular lens implantation in traumatic cataract caused by ocular injuries.

## METHODS

The study was conducted in the Department of Ophthalmology, MKCG Medical College, Berhampur. It is a prospective study conducted from October 2017 to September 2019. The study was registered with the institutional review board and was approved by ethics

committee. The study was conducted on 50 patients having traumatic cataract undergoing primary cataract surgery and intraocular lens implantation. Inclusion criteria included all open and closed globe injuries with traumatic cataract. Exclusion criteria included patient unsure about history of trauma, complicated cataract, optic nerve avulsion, retinal detachment, vitreous haemorrhage, ruptured globe, intraocular foreign body and extensive ocular damage.

The personal information of all the patients was recorded and a detailed clinical history regarding diminution of vision, its mode of onset and duration, nature of trauma, associated ocular damage, time lapse between the occurrence of trauma and treatment were recorded. Complete ocular examinations were carried out which included visual acuity, slit-lamp examination, tonometry, funduscopy, keratometry (opposite normal eye was used in case of corneal opacification), IOL power calculation (using SRK-II formula), and B-scan was carried out. X-ray orbit was done in all cases to look for integrity of orbit and any intra ocular foreign body (IOFB). Computerised tomography (CT) scan orbit was done in selected cases. Children and uncooperative patients were examined under general anaesthesia (EUA) prior to any intervention. All patients were started on topical antibiotics and steroid drops prior to surgery, as there will be more chances of post-operative inflammation in these patients. All patients were treated by small incision cataract surgery with IOL implantation. Post-operatively, topical steroid, antibiotic, and cycloplegics were prescribed. Follow-up was done at 1st week, 2nd week, 6th week and 6 months for visual acuity (VA) and anterior and posterior segment examination and the details were recorded.

## Statistical Methods

The data processing was carried out on statistical package for social science (SPSS) version 10.0 software and expressed as frequencies, percentages, mean and standard deviation.

## RESULTS

A total of 50 patients were included in the study. Out of 50 patients, 36 (72 %) were males and 14 (28 %) were females giving a male to female ratio of 2.57 : 1. The age of patients ranged between 3 to 58 years. A total of 58 % patients of traumatic cataract were less than twenty years of age.

| Type of Trauma     | Number of Cases | Percentage |
|--------------------|-----------------|------------|
| Penetrating injury | 28              | 56         |
| Blunt trauma       | 22              | 44         |
| <b>Total</b>       | <b>50</b>       | <b>100</b> |

**Table 1. Types of Injury Causing Traumatic Cataract**

The type of trauma was noted from the table 1.56 % (28) of the cases presented with penetrating injuries and 44 % (22) of the cases presented with blunt trauma. It was observed that most common activity leading to injury was occupational work (28 %) followed by ground activity such as playing (22 %), followed by road traffic accident (16 %), household job (14 %), fall (8 %), firework (4 %), and fights

(4 %). It was observed in this study that the prevalence of traumatic cataract was higher in patients of rural background as compared to urban background (64 % vs 32 %). The object causing injury was analyzed. Out of 50 cases of traumatic cataract, 14 were caused by stick or thorn, 10 were caused by stone particles, 8 caused by thorn, 6 were caused by metallic particles, 5 were caused by ball, 3 were caused by glass piece, 2 were caused by hand and firecracker each. While evaluating the various occupations among patients of traumatic cataract in the study, farmers were found to be most commonly affected (36 %) followed by industrial workers (24 %). The other occupations more commonly involved were labourer (12 %), house wives (10 %) and students (18 %).

| Time of Presentation | Number of Cases | Percentage |
|----------------------|-----------------|------------|
| < 24 hours           | 14              | 28         |
| 1 - 7 days           | 9               | 18         |
| 7 - 30 days          | 12              | 24         |
| 1 - 6 month          | 11              | 22         |
| > 6 months           | 4               | 8          |

**Table 2. Interval between Injury and Time of Presentation**

The duration between trauma and presentation to the hospital was analysed and it was found that the duration varied from less than 24 hours to more than 6 months. Among 50 patients, majority of patients that is 14 cases presented within 24 hours of injury followed by 12 patients reported within the first month, 9 cases presented during 1-7 days, 11 cases between 1 - 6 month and 4 cases after 6 months of trauma.

| Ocular Damage        | Number of Cases | Percentage |
|----------------------|-----------------|------------|
| Lid injury           | 2               | 4          |
| Corneal injury       | 17              | 34         |
| Limbal /scleral tear | 11              | 22         |
| Iris injury          | 9               | 18         |
| Lens subluxation     | 2               | 4          |
| Vitreous loss        | 2               | 4          |
| <b>Total</b>         | <b>33</b>       | <b>62</b>  |

**Table 3. Associated Ocular Damage**

The above table represented the ocular injuries associated with traumatic cataract. Out of 50 patients, associated ocular injuries were found in 62 % (31) of patients. 34 % (17) patients had corneal injuries. Scleral tear in 22 % (11), iris injury in 18 % (9), lid injury 4 % (2) and subluxation of lens was seen in 4 % (2) patients, vitreous loss in 4 % (2).

In this study the associated damage are corneal injuries in the form of scar, laceration and opacity seen in 14 cases. Corneal wound was repaired with 10 - 0 nylon suture. Corneal scarring and opacity affected the visual acuity by obstructing the visual axis and causing astigmatism. Injury to the iris was seen in 9 cases in the form of traumatic mydriasis, uveitis and iris prolapse. Uveitis was controlled with cycloplegics and topical and systemic steroid. Adequate control of uveitis is very essential so as to bring successful IOL implantation in traumatic cataract. Iris prolapse occurred in 2 cases within the previous 24 - 36 hours and the iris was viable, the iris was repositioned back. In 1 case, iris did not appear viable, then it was abscised. The abscission involves pulling of the iris tissue and cutting some part of normal healthy iris tissue along with non-viable iris

tissue which is prolapsed out. It was observed that out of total 50 cases, IOP was normal in 76 %, raised in 10 %, low in 14 %. IOP was low due to corneal perforation and was high because of anterior displacement of lens, peripheral anterior synechia and lens matter in anterior chamber due to rupture of anterior capsule.

| Intraop Complications | Number of Cases | Percentage |
|-----------------------|-----------------|------------|
| PCR                   | 7               | 14         |
| Hyphema               | 3               | 6          |
| Vitreous loss         | 5               | 10         |
| Postop complications  | Number of Cases | Percentage |
| Shallow AC            | 4               | 8          |
| Striate keratopathy   | 12              | 24         |
| Uveitis               | 17              | 34         |
| Hyphema               | 4               | 8          |
| Retained lens matter  | 9               | 18         |
| PCO                   | 12              | 24         |
| IOL decentration      | 1               | 2          |
| CME                   | 1               | 2          |
| Pupillary capture     | 2               | 4          |
| Retinal detachment    | 1               | 2          |

**Table 4. Incidence of Intra-operative and Post-Operative Complications**

Intra-operative complication was studied. Complication during surgery can be either due to trauma or surgery or both. The most common complication was rupture of posterior capsule and vitreous loss in 10 % (5) each followed by hyphema (6 %). From the above table, post-operative complications were observed. Among early post-operative, most common complication was uveitis (34 %) followed by striate keratopathy (24 %) retained lens matter (18 %), shallow anterior chamber (8 %) and hyphema (8 %). Posterior capsular opacification (24 %), IOL decentration (2 %), cystoid macular oedema (CME) (2 %), pupillary capture (4 %) and retinal detachment (2 %) were the late post-operative complications.

| Visual Acuity  | No of Patients with Pre-Operative VA at the Time of Presentation | No of Patients with Post-Operative VA at 6 Months |
|----------------|--|---|
| < 3/60         | 30   | 4   |
| 3/60 - <6/18   | 15   | 12  |
| 6/18 and above | 5  | 34  |
| <b>Total</b>   | <b>50</b>  | <b>50</b>   |

**Table 5. Visual Acuity at Presentation and after Surgery of Traumatic Cataract Cases**

Table 5 shows a comparison of the pre and post-operative visual acuity. There is significant visual acuity improvement after cataract extraction and IOL implantation. Around 60 % patients presented with visual acuity of < 3/60, 30 % patients had VA between 3/60 - < 6/18, 10 % had VA of 6/18 and above at the time of presentation. The final visual acuity was assessed in 50 cases after 6 months post-operatively. After the surgery, it was found that 68 % of patients had regained visual acuity more than or equal to 6/18 while in 24 % cases, the visual acuity ranged between 6/18 to 3/60 and in 8 % final visual outcome < 3/60.

**DISCUSSION**

Traumatic cataract management is always challenging as it is difficult to know and predict the final visual outcome.<sup>10</sup> In such a situation it is very important to understand the

predictors of visual outcome which helps to plan management strategy and to know visual prognosis.<sup>11</sup> In our study, incidence of traumatic cataract was 1.02 % in relation to total cataract which is similar to Govind et al. (2013)<sup>12</sup> where the magnitude of ocular trauma was found to be 1.03 %. In this study, male preponderance was found, with a male to female ratio of 2.57 : 1 which is consistent with studies by Shilpi et al. (2018),<sup>13</sup> Sudhir et al. (2017),<sup>14</sup> Ashish et al. (2016).<sup>3</sup> Male predilection was also reported in the studies by Tetz and colleagues (1993)<sup>15</sup> and Synder et al. (1999)<sup>16</sup> who reported 60 % and 75 % males, respectively. Male majority has been observed among the victims, possibly because of the involvement of males in sports and outdoor activities. This was supported in our findings. They also indulge more in violence and rash driving and are more employed in factories and manual jobs. In paediatric age, boys generally are granted more liberty than girls.

In this study, majority of patients were rural dwellers. They are involved in various activities in agricultural land, forest and so are more prone for trauma. Majority of the patients were in the age group of 11 - 20 years (46 %) in our age group which is similar to Sofi et al. (2016)<sup>17</sup> Mariya et al. (2012),<sup>18</sup> Zaman et al. (2006)<sup>19</sup> Sethi et al. (2009).<sup>20</sup> Thompson et al. observed that a majority of the ocular trauma in children occur at home due to lack of adult supervision.<sup>21</sup> The reason of the higher number of younger age cases with male predominance may be due to more exposure of outdoor activities such as playing or occupations related to the field. This study showed penetrating trauma was common mode of injury i.e. 28 (56 %) cases and blunt trauma was seen in 22 cases (44 %), comparable with a study by Sudhir et al. (2017)<sup>14</sup> Sofi et al. (2016),<sup>17</sup> Ashish et al. (2016),<sup>3</sup> Synder A et al. (1999)<sup>22</sup> and Staffieri SE et al. (2010)<sup>23</sup>. Most of the patients (70 %) presented within one month which is similar to study findings by Ashish et al. (2016),<sup>3</sup> Jagannath C et al. (2015),<sup>24</sup> Mariya et al. (2012).<sup>18</sup>

Penetrating injuries presented earlier in view of associated injuries and sudden loss of vision compared to blunt injuries. Patient belonging to rural community reported late due to the distance from eye care center, lack of awareness, unavailability of transport and shortage of money. But patients from urban area usually reported early because of their health consciousness. Penetrating trauma was found in a greater number of cases, it was because the study included majority of rural population working in fields who injured with stick, thorn, branches of tree.

Mode of injury was found to be correlated to activity during trauma. In household injury, females and children were more commonly traumatized by objects such as scissors, pencil tip, and toys, resulting in penetrating injury. In outdoor injury, iron rod and wooden stick were the main etiological agent. In this study, farmers were the maximum victims of traumatic cataract because they were mainly field workers, less educated, less health consciousness and widespread poverty supervene this problem. There is also higher incidence in the industrial workers because of increasing industrialization and accompanying rise in trauma.

In the current study, it was found that out of 50 traumatic cases, 48 lenses were in normal position and in

only 2 cases lens was displaced anteriorly. Lens capsule was intact in 40 cases. The anterior capsule tear in 7 cases and posterior capsule tear in 3 cases. Analysing the type of cataract, it was found that 44 cases had total cataract, 3 of the cases had membranous cataract, 2 case had white soft cataract and 1 case was found to be of rosette type.

Association of ocular tissue trauma along with traumatic cataract was a common observation. Corneal tear was the most common comorbidity in our study that is 34 %, causing corneal scar which was associated with poor visual outcome which was also observed in a study of which is similar to Sudhir et al. (2017),<sup>14</sup> Daljit Singh et al. (1983),<sup>25</sup> Krishnamachary et al. (1997),<sup>26</sup> Mehul et al. (2011),<sup>27</sup> Marcus Blum et al. (1996).<sup>28</sup> Associated ocular structure involvement has much bearing on the management and visual prognosis of traumatic cataract. We have managed the cases according to coexisting ocular co-morbidities which helped in good visual outcome.

Lens extraction by manual SICS and IOL implantation was done in all cases. Implantation of IOL in traumatized eyes after removal of traumatic cataract depends on the availability of capsular support. Capsular bag or sulcus fixation is preferred if there is sufficient capsular and zonular support. In this present study anterior chamber intra ocular lens (ACIOL) was implanted in 5 cases, posterior change intra ocular lens (PCIOL) in 45 cases.

The most common intra-operative complication was rupture of posterior capsule and vitreous loss in 10 % (5) which is comparable to study by Sudhir et al. (2017)<sup>14</sup> Sofi et al. (2016)<sup>17</sup> Dakshyani et al. (2014).<sup>29</sup> In case of total PCR, ACIOL had been given and in case of partial rupture of posterior capsule, PCIOL was implanted in sulcus. An anterior chamber washout with irrigation and aspiration was performed in case of hyphema. Manual anterior vitrectomy was performed and miotics were instilled in case of vitreous loss.

We noted most common early post-operative complication as anterior uveitis in 34 % which responded medically with steroids and atropine and common late post-operative complication as posterior capsular opacification in 24 % at 6 months managed by Nd YAG laser capsulotomy which is consistent with Sudhir et al. (2017)<sup>14</sup> Mariya et al. (2012)<sup>18</sup> Lacmanovic et al. (2004).<sup>30</sup> Other early complications like Striate keratopathy was observed in 24 % of cases which got cleared within 7 to 8 days. Hyphema get absorbed spontaneously and do not require any treatment in 3 cases. In 1 patient the blood did not get absorbed in a week's time, a paracentesis had been done. Retained lens matter in anterior chamber in 9 cases, where 1 patient underwent aspiration and irrigation and rest 8 cases were left to be absorbed spontaneously with steroid drops. Shallow anterior chamber is managed conservatively with pad and bandage and in 1 case suturing of leaking wound was carried out.

Out of 50 cases of traumatic cataract that underwent surgery, the final visual acuity was assessed after 6 months, in 34 cases (68 %) final visual outcome was 6/18 and above and in 12 cases (24 %) final visual outcome was between < 6/18 – 3/60, in 4 cases (8 %) final visual outcome < 3/60. A similar observation was reported by Ahmed et al. (2011),<sup>31</sup>

Weinand F et al. (2003),<sup>32</sup> Mariya et al. (2012),<sup>18</sup> Zaman et al. (2006),<sup>19</sup> Sudhir et al. (2017),<sup>14</sup> Cheema and Lukran (1991)<sup>33</sup> where nearly 50 % patient had post-operative visual acuity of 6/18 or better.

The main cause for the poor vision i.e. < 3/60 in 4 patients in this study was IOL decentration in 1 case, central dense corneal scarring obstructing the visual axis in 2 cases, and retinal detachment which was secondary to the postoperative vitreous loss. Patient underwent retinal detachment surgery but there was no much improvement in vision. The common causes of decreased visual acuity (< 6/18 – 6/60) despite surgery were irregular astigmatism, peripheral corneal opacity, amblyopia, vitreous haze, cystoid macular oedema and posterior capsular opacification. Good visual outcome was because of early presentation and other ocular structures being uninvolved. Our study demonstrates that with timely intervention of traumatic cataract, good post-operative visual acuity can be achieved in cases without involvement of posterior segment or central corneal scars.

### CONCLUSIONS

Small incision cataract surgery with IOL implantation provides satisfactory results in traumatic cataract. Appropriate management of traumatic cataract in time minimises complications and gives good visual outcome. Awareness about timely intervention of ocular trauma among the general population will help in giving better outcome.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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