



## Original Research Article

## Visual outcome in patients operated for traumatic cataract: A prospective hospital based study

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## ABSTRACT

**Background:** Ocular trauma is the commonest cause of unioocular cataract in young individuals.

Aim of this study was to quantify the visual outcome in terms of visual acuity after removal of traumatic cataract and implantation of an IOL.

**Materials and Methods:** A prospective study was done in department of ophthalmology at a tertiary care teaching hospital of Andhra Pradesh. The Birmingham Eye Trauma Terminology System was used to classify ocular trauma. All patients underwent for detailed clinical history and ocular examinations including visual acuity, slit lamp biomicroscopy, direct/indirect ophthalmoscopy and a B-Scan ultrasonography etc. Patients were followed up for 3 months postoperatively. The data was analyzed using suitable statistical tests.**Results:** Out of total 65 patients, 77% patients were males and 30.7% were less than 20 years of age. 66.2% patients sustained penetrating trauma while 33.8% got blunt injury. 9.2% cases had some degree of vision (6/30 to 6/120). After three months of surgery, 76.9% patients had visual acuity of >6/18. The difference in visual outcome at 3rd month evaluation between blunt and penetrating ocular injury was statistically insignificant ( $p=0.813$ ). The younger age was significantly associated with better visual acuity ( $p=0.016$ ). Patients receiving foldable IOL showed statistically better result ( $p=0.0231$ ) as compared to rigid IOL.**Conclusion:** Traumatic cataract occurs mostly in young, active males who are mostly illiterate. IOL is the treatment of choice. Younger age of the patient, early surgery, implantation of foldable lens in intact capsular bag are favorable factors for achieving good visual acuity (>6/18).© This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

## 1. Introduction

"Sight" is the most cared for function of human physiology. In spite of the nature providing the well protective lids, the eyes are exposed to various types of injuries. Ocular trauma is a most common cause of blindness and visual impairment worldwide.<sup>1,2</sup> Approximately, 2.5 million eye injuries occur in United States annually and it is estimated that 4-5% of ophthalmologists' patients are secondary to ocular injury.<sup>3,4</sup> Trauma (penetrating or contusion) is the commonest cause of unioocular cataract in young individuals.<sup>5,6</sup> Less common causes of traumatic cataract

are ionizing, infrared, ultraviolet radiation and electric shock and rarely a bee sting,<sup>7</sup> self-inflicted, accidental explosion of carbonated beverage bottle, air-bag injury in automobile accidents and even vigorous ocular massage.<sup>8</sup> In a bizarre incidence of revenge, the gouging out of the eye has also been reported in India. Battery acid, however, has been known to cause serious eye injury in automobile workshops.<sup>9</sup>

The ocular trauma related loss of visual acuity in a developing country like India poses long term implications in terms of both, economic and social problems. The opaque lens (cataract) needs removal, thus starts the problem of unioocular aphakia. The aphakic eye, if not managed, becomes divergent and amblyopic over the years,

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particularly in an immature visual system. The spectacles do not help in achieving binocular vision and the contact lenses are helpful only to a certain extent. The evolution of IOL (Intra ocular Lens) implant and the technique over the years has helped in improving the prognosis of the problem.<sup>9</sup>

The Birmingham Eye Trauma Terminology (BETT) has been used to define ocular tissue injury. BETT classification is unambiguous, consistent and simple.<sup>10</sup> The literature is full of reports on the various aspects of ocular trauma, but the reports on Traumatic Cataract are sparse. Associated damage to anterior and posterior segments, time of intervention, operative and post-operative complications have been identified so as to determine the final prognosis in such cases.<sup>11</sup> So, the present study was planned to quantify the visual outcome in terms of visual acuity after removal of traumatic cataract and implantation of an IOL.

## 2. Materials and Methods

This prospective clinical study was conducted in department of ophthalmology at tertiary care teaching hospital of Andhra Pradesh. Patients included were among those who came to ophthalmology OPD of tertiary care teaching institute of Andhra Pradesh with history of ocular trauma, after the approval from ethical committee of Institute. Patients with traumatic cataract aged  $\geq 10$  yrs, with history of blunt or penetrating injury were included in study after taking informed consent. Patients with cataract not attributable to injury by history and examination (e. g. senile cataract, documented ocular pathology prior to trauma), patients being operated for cosmetic purpose, patients with contraindications for surgery (infected ocular wound, systemic disease not under control) were excluded from the study. Patients were interviewed as per proforma and examination were done pre-operatively, intra-operatively and post operatively and on subsequent follow-ups till 3 months. Patient data and ocular status was documented in the format of proforma. Detailed personal particulars and the clinical history were recorded with special reference to treatment taken before coming to hospital, level of education, profession of the patient, inflicting object, activity during which the injury was incurred.

Snellen's visual acuity chart, slit lamp biomicroscopy, direct/indirect ophthalmoscopy and a B-Scan ultrasonography were used for ocular examination. Birmingham Eye Trauma Terminology System (BETTS) was used to classify the type of injury. Visual acuity noted and compared after regular follow up till 3 months.

All the patients were operated by a single surgeon (KSP) which removed the factors affecting the outcome of surgery due to variable surgical technique and skill of the surgeon. In a single sitting, small incision cataract with posterior chamber intraocular lens insertion (SICS+PCIOLI) was done in most of the cases.

The data was entered into the excel sheet and analyzed using standard statistical tests. Descriptive statistical analysis was carried out in the present study. Results on continuous measurements are presented in Mean $\pm$ SD and results on categorical measurements are presented in number (%). Fisher Exact test has been used to find parameters on categorical scale between two or more groups. Significance was assessed at 95% level of significance. The statistical software SPSS 15.0 was used for analysis of the data.

## 3. Results

A total of 14974 eye patients with various ailments were registered in the Ophthalmology OPD during the study period. Total 65 cases of traumatic cataract detected from these patients and included in the present study with an incidence of 0.43% or 4.3 patients per 1000 patients of eye OPD. The age ranged in present study from 10 to 70 years with mean age of  $29.48 \pm 15.29$  years. The male to female ratio was 3.3:1. (Table 1)

**Table 1:** Socio-demographic and clinical characteristics of patients

	Numbers (%) N=65
Male/Female ratio	3.3/1
Age (in years) Mean $\pm$ SD	29.48 $\pm$ 15.29
<b>Eye involved</b>	
Right	31(47.7%)
Left	4(52.3%)
Illiterate	27 (41.5%)
<b>Age groups</b>	
10-19	20 (30.77%)
20-29	15 (23.08%)
30-39	12 (18.46%)
40-49	07 (10.77%)
50-59	09 (13.85%)
>60	02 (3.08%)
<b>Types of injury</b>	
Penetrating	43 (66%)
Non penetrating	22(34%)
<b>Types of ocular findings</b>	
Corneal wound	34 (52%)
Shallow Anterior Chamber	11 (16.9%)
Anterior Capsular tear	9 (13.8%)
Traumatic Iridotomy & Mydriasis	9 (13.8%)
Partially absorbed Cataract	4 (6.2%)
Perforation	1 (1.5%)
Irregular Anterior Chamber	1 (1.5%)
<b>Visual acuity at the time of presentation</b>	
6/30 to 6/120	6 (9.2%)
CF 1/2 m to 3 m	13 (20%)
CFCF	11 (16.9%)
HM	27 (41.5%)
PL	8 (12.3%)

Implantation of IOL was done in the capsular bag in posterior chamber in 56 eyes whereas 09 received it in sulcus. The best corrected visual acuity after three months follow-up was good ( $> 6/18$ ) in 50 (76.9%) patients. Poor visual acuity ( $< 6/60$ ) was, however, seen in 7 (10.8%) patients. The result of penetrating and non-penetrating groups was similar. Distribution of visual outcome at 3rd month was statistically insignificant ( $p=0.813$ ) (Table 2).

A linear correlation with the time lag between injury and surgeries versus the acuity of vision at 3 months was observed. Visual acuity was significantly associated with surgical lag ( $p<0.05$ ). Younger age was significantly associated with better visual acuity ( $p=0.016$ ). (Tables 3 and 4)

The relation between type of lens and visual acuity was achieved at the 3 months follow up. Most of the patients had uneventful postoperative period. No major post-operative complication was recorded in this prospective study. Good outcome is seemingly associated with use of foldable lens but not statistically significant ( $p=0.231$ ). (Table 5)

#### 4. Discussion

Eye is the most important sense organ for the mind to interact with the environment and hence, restoration of sight becomes a matter of paramount importance for the patients and the treating clinician.<sup>12</sup> An injured eye challenges the attending surgeon to use all his expertise to deal with the situation. The traumatic cataract is a part of this injured eye and has to be treated holistically keeping in view the comprehensive clinico-pathological presentation of the injured eye.<sup>13</sup>

In the present study, an incidence of 0.43% was recorded. Jain et al.<sup>14</sup> also reported an incidence of ocular trauma as 1.43% of the total cases attending ophthalmic OPD. Doutetien et al.,<sup>15</sup> reported an incidence of traumatic cataract as 6.9% of all cataracts. The incidence of traumatic cataract alone is, however, not known.

The most common age group involved in the present study was 10-19 yrs of age with mean age being  $29.48 \pm 15.29$  years. Males were affected more than females. Thus, like other studies<sup>16,17</sup> the present study also revealed the high incidence of traumatic cataract in young active; male most of them receiving eye injury while performing household chores or playing. It is suggested that "Prevention" of eye injury could be taught in the school as a part of curriculum by including a chapter on this aspect in the subject of Science and Technology. But, as evident in the present study, many of the affected persons of traumatic cataract are illiterate for them; the wide coverage of Visual electronic media (television) could be effectively used. It is also suggested that the co-operation of various NGOs and other social organizations should be solicited to educate the people in general and the rural illiterate masses in particular about the importance of eye injuries

and how to protect the eyes from these injures. The street shows/drama could also serve as an effective media in this matter. Another important point about cutting down the morbidity of traumatic cataract is an early referral to a qualified and experienced ophthalmologist. Because of illiteracy and ignorance, patient may report to the trained Ophthalmologist quite late. In the present study also, the ultrasound scan was routinely used and surgery was done at the earliest. The implantation of IOL was, however, done in all the cases primarily.

The first critical factor in the management of traumatic cataract by IOL implantation is meticulous surgical technique.<sup>16</sup> Maintaining the integrity of lens capsule while extraction, the meticulous removal of the cataractous lens, fool-proof closure of the incision lines, the proper decision to place the IOL in bag or sulcus etc. are important steps to be followed, the use of Trypan Blue in the surgical management is also found to be very helpful. Selective staining of the anterior lens capsule using Trypan Blue enables the surgeon to identify the extent of structural damage and plan the surgery accordingly.<sup>18</sup>

In literature, results of IOL implantation in post-traumatic cataract have been variable. Blum et al.,<sup>17</sup> had reported a very high incidence of rehabilitation in 90% patients of their traumatic cataract, caused by both blunt and perforating injuries. Bekibebe et al.,<sup>19</sup> reported less than satisfactory vision ( $< 6/18$ ) in 64.4% cases due to associated complications of ocular trauma. In another study reported from Poland,<sup>20</sup> unacceptable vision due to delayed complications was observed in 64.39% cases. In the report of a series from Pakistan<sup>21</sup> the final good visual acuity was recorded in 68.83%. Bhatia et al.,<sup>22</sup> found "after cataract" as the commonest cause of poor vision in their series. Krishnamachary et al.,<sup>23</sup> observed that associated posterior segment complications and development of posterior capsule opacification could adversely effect the final outcome of IOL implantation in traumatic cataract.

It has been widely agreed that a vision of  $>6/18$  is considered to be useful/satisfactory following surgery for traumatic cataract.<sup>19,23</sup> In the present series 50 patients (77%) achieved "useful acuity of vision" ( $>6/18$ ) at 3 months follow up. There were, however, 07 patients who had very poor acuity of vision of  $<6/60$ . An analysis of these seven cases revealed that two patients had very old injury of  $> 1$  year. The other five patients, though had recent injuries, had associated elements of posterior segment involvement. Hence, from this study, it can be inferred that the IOL implantation after traumatic cataract is the rational treatment in traumatic cases provided the injury is confined to anterior segment of the globe and not very old.

Visual outcome after 3 months in case of penetrating and non-penetrating injuries is in tune with similar results reported in other study.<sup>11</sup> It seems that the traumatic shock

**Table 2:** Visual outcome after 3 months in case of penetrating and non-penetrating injuries

Visual outcome after 3 months	Penetrating injury (n=43)	Non penetrating injury (n=22)
6/6 to 6/9	24 (55.8%)	12 (54.5%)
6/12 to 6/18	10 (23.3%)	4 (18.2%)
6/24 to 6/36	5 (11.6%)	3 (13.6%)
6/60 to 6/120	1(2.3%)	1 (4.5%)
CF 3m to CFCF	3 (6.9%)	1 (4.5%)
HM	0	1 (4.5%)

**Table 3:** Interval between injury and surgery v/s visual acuity up to 3 months interval

Visual Acuity	Surgical lag				Total
	same day	< 1 week	< 1 month	Up to 3 months	
6/18-6/6	1 (1.5%)	12 (18.5%)	24 (36.9%)	11 (16.9%)	48 (73.8%)
6/36-6/21	0	2 (3.1%)	4 (6.2%)	1 (1.5%)	7 (10.8%)
6/90-6/45	0	2 (3.1%)	0	1 (1.5%)	3 (4.6%)
CFCF-6/120	0	3 (4.6%)	0	4 (6.2%)	7 (10.8%)
Total	1 (1.5%)	19 (29.2%)	28 (43.1%)	17 (26.1%)	65 (100%)

**Table 4:** Visual acuity at months follow-up in different age groups

Visual Acuity	Age groups in years						Total
	10-19	20-29	30-39	40-49	50-60	> 60	
6/18-6/6	16(24.6%)	14(21.5%)	8 (12.3%)	6 (9.2%)	4 (6.2%)	0	48 (73.8%)
6/36-6/21	2 (3.1%)	0	1 (1.5%)	0	2 (3.1%)	2 (3.1%)	7 (10.8%)
6/90-6/45	0	1 (1.5%)	1 (1.5%)	1 (1.5%)	0	0	3 (4.6%)
CFCF-6/120	1 (1.5%)	1 (1.5%)	2 (3.1%)	0	3 (4.6%)	0	7 (10.8%)
Total	19(29.2%)	16(24.6%)	12(18.5%)	7(10.8%)	9 (13.8%)	2 (3.1%)	65 (100%)

**Table 5:** Type of lens used (Foldable or non-foldable) and the visual acuity

Visual outcome	Foldable lens (n=16)	Non-foldable lens (n=49)
6/6 to 6/9	11 (68.8%)	25 (50.1%)
6/12 to 6/18	3 (18.8%)	11 (22.4%)
6/24 to 6/36	0	8 (16.3%)
6/60 to 6/120	0	2 (4.1%)
CF 3m to CFCF	1 (4.5%)	3 (18.8%)
HM	1 (4.5%)	0

waves of superficial penetrating injury are dissipated as the biological barrier of cornea is broken, but the shock waves (coup) of the non-penetrating injuries travel throughout the globe damaging the structures of the eyes at various levels and also produce countercoup effect. On the other hand, the deep penetrating injury may cause damage to the posterior segment of the eye and also central corneal opacity which may jeopardies the visual acuity post-operatively.<sup>23</sup> Then there is a risk of infection also in the penetrating injury. This would require a proper handling of the clinical condition by an experienced surgeon and use of modern wide spectrum antibiotics to control the menace of infection. Hence, it could be safely inferred from the foregone discussion that the results of IOL in traumatic cataract with blunt and superficial penetrating injury involving the anterior segment are similar. On the other hand, the deep penetrating injury may not produce good result.

Did the acuity of vision achieved after IOL implantation in traumatic cataract have direct relation with the surgical lag? Most of the reports in the literature revealed an association of poor results and delayed surgery. Bhatia et al.,<sup>22</sup> concluded that treatment in the traumatic cataract should be completed within one year. Billore et al.<sup>11</sup> reported that traumatic cataract of long-standing duration had hard nucleus which was difficult to remove or may even got dislocated. In the present study the association between final visual acuity and the surgical lag is significant. The explanation could be the associated problems of amblyopia, retinal degeneration and astigmatism appearing after traumatic cataract over a period of time.

When the age of operated patient was plotted against the acuity of vision at three months follow up, it was seen that the younger patients did better, outcome was found to be better with the use of foldable lens as compared to non-foldable lens implant but statistically not significant. Similar

results were reported by Chuprov et al.<sup>24</sup> These workers accounted for the good results due to a low specific weight of the elastic IOL implant and the minimal injury inflicted to the tissues of the eye by such lenses. The results of achieving acuity of vision using multifocal IOL has been found better than those of monofocal IOL.<sup>25</sup>

The early complications include corneal edema and mild to moderate inflammation. The delayed complications were posterior capsular opacity, glaucoma, cystoid macular edema and even retinal detachment.<sup>19</sup> In the present study (with limitation of short follow-up), no such serious complication was recorded except in one case where central corneal scar was seen due to the initial injury. However, to comment on actual outcome long term follow up is mandatory.

## 5. Conclusions

Traumatic cataract occurs mostly in young, active males who are mostly illiterate. IOL is the treatment of choice. Younger age of the patient, early surgery, implantation of foldable lens in intact capsular bag are favorable factors for achieving good visual acuity (>6/18). The follow up of the present study was short and long follow-up studies are required to evaluate the long-term results of the IOL implantation in traumatic cataract and the results of foldable IOL versus non foldable IOL may vary with another factor of intact capsular bag.

## 6. Source of Funding

None.

## 7. Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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