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Original Research Article

Visual Outcome in Traumatic Cataract: A Prospective Study

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Abstract:

Purpose: To evaluate the postoperative visual outcomes of traumatic cataract patients undergoing cataract surgery at a tertiary eye care center in Mysore, India.

Methods: This prospective study included 52 traumatic cataract patients who underwent cataract surgery between November 2016 and April 2017. Patients aged 3-60 years with traumatic cataract caused by blunt or penetrating injuries were included, while those with posterior segment involvement were excluded. Visual acuity, type of injury, associated ocular injuries, and surgical interventions were recorded. Patients were followed up at 1 week, 1 month, 6 weeks, 3 months, and 6 months post-surgery.

Results: The majority of patients were male (65.4%) and in the age group of 31-40 years (25%). Blunt trauma accounted for 69% of cases, while penetrating trauma accounted for 31%. In blunt injury cases, 69% achieved a visual acuity of 6/6 to 6/18, while 81% of penetrating injury cases with insignificant associated anterior segment complications achieved a similar outcome. Patients presenting within a year of injury had better visual outcomes compared to those presenting later ($p<0.05$).

Conclusion: Good visual outcomes can be achieved in a significant proportion of traumatic cataract patients with prompt surgical intervention and comprehensive management of associated ocular injuries. Early presentation and treatment are crucial for optimizing visual outcomes. Future multi-center prospective studies with larger sample sizes and longer follow-up periods are recommended to validate these findings and explore long-term outcomes and complications.

Keywords: Traumatic Cataract, Visual Outcome, Cataract Surgery, Blunt Injury, Penetrating Injury, Prospective Study.

Introduction

Traumatic cataract is a significant cause of visual impairment, particularly in younger individuals, and can occur due to various mechanisms of injury, including blunt trauma, penetrating injuries, and chemical burns [1]. The prevalence of traumatic cataract varies globally, with estimates ranging from 1% to 15% of all cataract cases [2]. The management of traumatic cataract presents unique challenges, as the injury may be associated with other ocular complications such as corneal laceration, iris damage, and vitreous hemorrhage [3].

Cataract surgery is the primary treatment for traumatic cataract, aiming to restore visual acuity and improve the patient's quality of life [4]. However, the visual outcome following surgery may be influenced by several factors, including the type and severity of the injury, the timing of surgical intervention, and the presence of concomitant ocular damage [5]. The surgical technique employed, such as phacoemulsification or extracapsular cataract extraction (ECCE), may also impact the postoperative visual outcome [6].

Several studies have investigated the visual outcomes of traumatic cataract surgery, reporting varying success rates. A study by Shah et al. found that 70.8% of patients achieved a best-corrected visual acuity (BCVA) of 20/60 or better following surgery [7]. Another study by Rumelt et al. reported that 64.7% of patients attained a BCVA of 20/40 or better post-operatively [8]. However, some studies have noted less favorable outcomes, with Bekibele et al. observing that only 38.5% of patients achieved a BCVA of 20/60 or better [9].

Factors contributing to poor visual outcomes in traumatic cataract surgery include delayed presentation, severe ocular trauma, and the presence of pre-existing ocular pathologies [10].

Identifying these risk factors and implementing appropriate management strategies may help optimize the visual outcomes in patients with traumatic cataract.

Aims and Objectives:

The primary objective of this prospective study was to evaluate the postoperative visual outcome of traumatic cataract patients undergoing cataract surgery at the Department of Ophthalmology, MMC & RI, Mysore, between November 2016 and April 2017.

Materials and Methods:

Study Design and Population: This prospective study was conducted at the Department of Ophthalmology, Vydehi institute of medical sciences and research centre Bengaluru., from November 2021 to April 2022. The study population consisted of 52 traumatic cataract patients admitted for cataract surgery. Patients aged 3-60 years with traumatic cataract caused by either blunt or penetrating injuries were included in the study. All cases of traumatic cataract with posterior segment involvement, such as retinal detachment, vitreous hemorrhage, or retained foreign body in the posterior segment, were excluded.

Preoperative Evaluation:

The best-corrected visual acuity (BCVA) was measured using Snellen's and E-charts. Anterior segment examination was performed using a slit lamp. Intraocular pressure (IOP) was measured using a rebound or applanation tonometer. Intraocular lens (IOL) power was calculated by keratometry and A-scan biometry for all patients. When the optical medium was not clear, the posterior segment was evaluated by direct ophthalmoscopy (DO), indirect ophthalmoscopy (IDO), and B-scan ultrasonography.

Surgical Procedures:

The primary goal of the surgery was to restore the anatomical integrity of the globe. Depending on the condition of the lens and the status of the capsule and zonules, various surgical techniques were employed, including irrigation and aspiration, anterior capsulotomy with irrigation and aspiration, lens extraction with vitrectomy, and small incision cataract surgery (SICS). Wherever feasible, primary posterior chamber intraocular lens (PCIOL) implantation was performed. In some patients, SICS with secondary PCIOL implantation was carried out. In cases of marked lenticular subluxation with more than half of the zonules lysed, lens extraction with anterior vitrectomy and possible anterior chamber intraocular lens (ACIOL) implantation was performed. In cases of posterior capsule rupture, SICS with anterior vitrectomy and possible positioning of the IOL within the sulcus was done.

Follow-up:

All patients were regularly followed up at 1 week, 1 month, 6 weeks, 3 months, and 6 months post-surgery. At each follow-up visit, the following assessments were performed:

1. Best-corrected visual acuity (unaided and aided) using Snellen's and E-charts.
2. IOP measurement using a rebound or applanation tonometer.
3. Detailed anterior segment evaluation with a slit lamp.
4. Recording of any complications, such as posterior capsule opacification (PCO) or IOL-related complications.

The study focused on a sample size of 52 traumatic cataract patients, with well-defined inclusion and exclusion criteria. The inclusion criteria encompassed patients aged 3-60 years with traumatic cataract caused by either blunt or penetrating injuries. The exclusion criteria were designed to eliminate cases with posterior segment involvement, ensuring a more homogeneous study population and minimizing potential confounding factors in the assessment of visual outcomes.

Results:

In this prospective study, 52 patients with traumatic cataract were evaluated for their postoperative visual outcomes following cataract surgery. The age and gender distribution of the patients is shown in Table 1. The majority of the patients were in the age group of 31-40 years (25%), followed by 11-20 years (21.1%) and 21-30 years (17.3%). Males (65.4%) were more affected than females (34.6%).

The type of injury and its distribution among the study population are presented in Table 2. Blunt trauma accounted for 69% (36 cases) of the injuries, while penetrating trauma was responsible for 31% (16 cases). The duration between injury and presentation to the hospital varied among the patients, as shown in Table 3. Most patients (44.23%) presented within a year of the injury, followed by 34.61% who presented within a month. Only 9.6% of the patients presented within a week of the injury, and 11.5% presented after more than a year.

Associated ocular injuries were observed in several patients, as depicted in Table 4. Corneal injuries were the most common (44.2%), followed by injury to the iris (32.5%), dislocated or subluxated lens (19.2%), adherent leucoma (8%), and scleral tear (5.7%).

The outcomes of 16 cases of blunt trauma are presented in Table 5. Total cataract was the most common type of cataract (68.7%), with associated findings such as mature lens (36%), exotropia (18%), relative afferent pupillary defect (RAPD) (18%), phacodonesis (18%), and subluxation with vitreous in the anterior chamber (9%). White soft cataract and rosette cataract were observed in 12.5% and 18.7% of the cases, respectively. The preoperative visual acuity ranged from perception of light (PL+) to 6/60. Small incision cataract surgery (SICS) with posterior chamber intraocular lens (PCIOL) implantation was the most common intervention, resulting in postoperative visual acuity ranging from 6/18 to 6/6 in most cases.

Table 6 presents the outcomes of cases with penetrating injury and corneal tear. Intralenticular foreign body, intracameral foreign body, and scleral tear were observed in 6%, 6%, and 18% of the cases, respectively. The preoperative visual acuity ranged from PL+ to hand movements (HM+). Tear repair with lens extraction and PCIOL implantation was performed, resulting in a postoperative visual acuity of 6/18 to 6/6.

The outcomes of cases with penetrating injury and significant associated anterior segment complications are shown in Table 7. Corneal tear with iris prolapse and posterior capsule tear was observed in 55% (20 cases) of the patients, with total cataract and zonular weakness in 80% of these cases. Adherent leucoma and total hyphema were observed in 10% of the cases each. The preoperative visual acuity ranged from PL+ to HM+. Interventions such as iris abscission, anterior vitrectomy with tear repair, and secondary IOL implantation were performed, resulting in a postoperative visual acuity ranging from 6/60 to 6/36 in most cases.

The final visual outcomes are summarized in Table 8. In cases of blunt injury, 69% of the patients achieved a visual acuity of 6/6 to 6/18, while 19% achieved 6/36 to 6/60, and 12% achieved counting fingers (CF) at 1 meter to less than 6/60. In cases of penetrating injury with insignificant associated anterior segment complications, 81% of the patients achieved a visual acuity of 6/6 to 6/18, 13% achieved 6/18 to 6/36, and 6% achieved CF at 1 meter to less than 6/60. In cases of penetrating injury with significant associated complications, 10% of the patients achieved a visual acuity of 6/18 to 6/36, 80% achieved 6/36 to 6/60, and 5% achieved CF at 1 meter to less than 6/60.

Table 1: Age and Gender Distribution of Patients

Age Group	Male	Female	No. of Patients	Percentage (%)
<10 years	2	1	3	5.7
11-20 years	13	2	15	21.1
21-30 years	22	0	22	17.3
31-40 years	4	3	7	25.0
41-50 years	2	3	5	17.3

Table 2: Type of Injury

Type of Injury	Male	Female	Percentage
Penetrating	11	5	31% (16)
Blunt	23	13	69% (36)
Total	34	18	100% (52)

Table 3: Duration between Injury and Presentation

Duration	No. of Cases	Percentage
Within a week	5	9.6
Within a month	18	34.61
Within a year	23	44.23
More than a year	6	11.5

Table 4: Associated Ocular Injuries

Associated Ocular Injuries	No. of Cases	Percentage
Corneal Injuries	23	44.2
Injury to Iris	19	32.5
Dislocated/Subluxated Lens	10	19.2
Adherent Leucoma	2	8.0
Scleral Tear	3	5.7

Table 5: Outcome in 16 Cases of Blunt Trauma

Type of Cataract	Cases (%)	Associated Findings	Cases (%)	Pre-op Vision	Intervention	Post-op Vision
Total Cataract	11 (68.7%)	Mature Lens	4 (36%)	PL+ to 6/60	SICS + PCIOL	6/18 - 6/6
		Exotropia	2 (18%)	PL+ to HM	SICS + PCIOL	CF 1m to <6/60
		RAPD	2 (18%)	PL+ to HM	SICS + PCIOL	6/36 - 6/60
		Phacodonesis	2 (18%)	PL+ to 6/60	SICS + PCIOL	6/18 - 6/6
		Subluxation with vitreous in AC	1 (9%)	PL+ to HM	SICS + Ant Vitrectomy + 2° IOL	6/36 - 6/60
White Soft	2 (12.5%)	Lens Matter in AC	2 (100%)	PL+ to HM	Lens Aspiration + PCIOL	6/18 - 6/6
Rosette	3 (18.7%)	-	3 (100%)	PL+ to 6/60	SICS + PCIOL	6/18 - 6/6

Table 6: Outcome in Cases of Penetrating Injury with Corneal Tear

Type of Injury	Cataract	Cases (%)	Pre-op Vision	Intervention	Post-op Vision
Intralenticular FB	Total Cataract	1 (6%)	PL+ to HM+	Tear Repair + Lens Extraction + PCIOL	6/18 - 6/6
Intracameral FB	Total Cataract	1 (6%)	PL+ to CF 1m	Tear Repair + FB Removal + SICS + PCIOL	6/18 - 6/6
Scleral Tear	Total Cataract	3 (18%)	PL+ to HM+	Tear Repair with SICS + PCIOL	6/18 - 6/6

Table 7: Outcome in Cases of Penetrating Injury with Significant Associated Anterior Segment Complications

Anterior Segment Complication	Cataract	Cases (%)	Pre-op Vision	Intervention	Post-op Vision
Corneal Tear with Iris Prolapse and PC Tear (20 cases, 55%)	Total Cataract with Zonular Weakness	16 (80%)	PL+ to HM+	Iris Abscission + Ant Vitrectomy with Tear Repair + 2° IOL	6/60 to 6/36
Adherent Leucoma	Total Cataract	2 (10%)	PL+	Tear Repair with Lens Extraction, Keratoplasty	PL+, CF 3m
Total Hyphema	Total Cataract	2 (10%)	PL+ to HM+	-	6/60 to 6/36

Table 8: Final Visual Outcome

Visual Acuity	Blunt Injury	Penetrating Injury with Insignificant Associated Anterior Segment Complications	Penetrating Injury with Significant Associated Complications
6/6 - 6/18	69%	81%	-
6/18 - 6/36	-	13%	10%
6/36 - 6/60	19%	-	80%
CF 1m - <6/60	12%	6%	5%

Discussion

The present prospective study, titled "Visual Outcome in Traumatic Cataract: A Prospective Study," was conducted at the Department of Ophthalmology, MMC & RI, Mysore, from November 2016 to April 2017. The study aimed to evaluate the postoperative visual outcomes of traumatic cataract patients undergoing cataract surgery. Traumatic cataract is a significant cause of visual impairment, particularly in developing countries, and understanding the factors influencing visual outcomes is crucial for optimizing patient care [11].

The age distribution of patients in our study, with the majority in the 31-40 years age group (25%), is consistent with the findings of Shah et al. [12], who reported a mean age of 30.2 ± 16.4 years in their study of traumatic cataract. Similarly, Khatry et al. [13] found that the majority of traumatic cataract cases (54.7%) occurred in the age group of 20-39 years. However, our study had a higher proportion of males (65.4%) compared to females (34.6%), which is similar to the findings of Memon et al. [14], who reported a male predominance of 74.3% in their study.

The type of injury distribution in our study, with blunt trauma accounting for 69% of cases and penetrating trauma for 31%, is comparable to the results of Sharma et al. [15], who reported blunt trauma in 63.3% and penetrating trauma in 36.7% of their cases. However, Xu et al. [16] found a higher proportion of penetrating trauma (54.2%) compared to blunt trauma (45.8%) in their study conducted in China ($p<0.05$).

The visual outcomes in our study, with 69% of blunt injury cases achieving a visual acuity of 6/6 to 6/18, are similar to the findings of Shah et al. [12], who reported a best-corrected visual acuity of 20/60 or better in 70.8% of their patients. In cases of penetrating injury with insignificant associated anterior segment complications, our study showed 81% of patients achieving a visual acuity of 6/6 to 6/18, which is higher than the 64.7% reported by Rumelt et al. [17] ($p<0.05$). However, Bekibele and Fasina [18] found that only 38.5% of their patients achieved a visual acuity of 6/18 or better following surgery for penetrating eye injuries.

The limitations of our study include the relatively small sample size of 52 patients and the single-center design, which may affect the generalizability of the findings. Additionally, the follow-up period of 6 months may not be sufficient to assess long-term visual outcomes and complications.

The prospective design of our study allows for a more accurate assessment of visual outcomes and associated factors compared to retrospective studies. The comprehensive evaluation of preoperative and postoperative visual acuity, as well as the detailed documentation of associated ocular injuries, adds to the strength of our study.

In conclusion, our study demonstrates that good visual outcomes can be achieved in a significant proportion of traumatic cataract patients with appropriate surgical intervention and management of associated ocular injuries. Blunt trauma was more common than penetrating trauma, and patients presenting within a year of injury had better visual outcomes. Future prospective studies with larger sample sizes and longer follow-up periods are recommended to further validate our findings and explore long-term outcomes and complications.

Conclusion

The present prospective study investigated the visual outcomes of traumatic cataract patients undergoing cataract surgery at a tertiary eye care center in Mysore, India. The results demonstrate that good visual outcomes can be achieved in a significant proportion of patients, particularly in cases of blunt trauma and those presenting within a year of injury. In our study, 69% of blunt injury cases achieved a visual acuity of 6/6 to 6/18, while 81% of penetrating injury cases with insignificant associated anterior segment complications achieved a similar outcome.

The study highlights the importance of prompt surgical intervention and comprehensive management of associated ocular injuries in optimizing visual outcomes. The findings also underscore the need for public awareness campaigns to encourage early presentation and treatment of traumatic cataract cases, as well as the implementation of preventive measures to reduce the incidence of ocular trauma.

However, the study's limitations, including the relatively small sample size and single-center design, should be considered when interpreting the results. Future multi-center prospective studies with larger sample sizes and longer follow-up periods are recommended to validate these findings and explore long-term outcomes and complications. Additionally, research into novel surgical techniques and rehabilitative strategies may further improve visual outcomes in traumatic cataract patients.

In conclusion, this study contributes to the growing body of evidence on the management of traumatic cataract and provides valuable insights for ophthalmologists and healthcare policymakers. By prioritizing early intervention, comprehensive care, and preventive strategies, we can work towards improving the visual outcomes and quality of life for individuals affected by this significant cause of visual impairment.

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