e-ISSN: 0975-1556, p-ISSN:2820-2643
Available online on www.ijpcr.com
International Journal of Pharmaceutical and Clinical Research 2024; 16(10); 146-152

Original Research Article

Prognostic Factors Affecting Visual Outcome in Unilateral Traumatic Cataract Patients Managed at Tertiary Eye Hospital in Central India

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Received: 25-07-2024 / Revised: 13-08-2024 / Accepted: 25-08-2024
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Conflict of interest: Nil

Abstract:

Ocular trauma is the leading cause of unilateral blindness in children worldwide. Traumatic cataract is common sequelae of ocular injuries in adults and children. The timing of surgery is important for visual rehabilitation especially in children as the risk of amblyopia is high due to media opacity. Careful examination and a management plan can simplify the difficult cases and provide the best possible outcome.

A total of 65 cases of unilateral traumatic cataract of age group 6-65 years with no co-existing posterior segment pathology, previous intraocular surgery or pathology were selected for the study. Study technique includes interview, clinical, ophthalmic examination and management. Patients were examined at 1st post operative day, 1 week and at 6 weeks. BCVA was taken at the end of 6 weeks and spectacles were prescribed accordingly.

Majority of the cases were found in the age group of 11-30 years (44.6%).

Blunt injury (55.4%) was more common than that of penetrating injury (44.6%). Total cataract (63.1%) was the commonest morphology seen. A statistically significant association was found between morphology of traumatic cataract and type of injury (p- value <0.05). The cause of decreased BCVA was mainly associated with zonular weakness and vitreous loss.

Our study shows that good visual results can be achieved with traumatic cataract surgery if the posterior segment is not involved and the corneal scar does not block the optical axis. Penetrating injuries are associated with poor visual outcome postoperatively than blunt injuries due to central corneal scarring and astigmatism.

Keywords: Traumatic cataract, ocular injuries, corneal scar, best corrected visual acuity.

Introduction

Ocular trauma is the leading cause of unilateral blindness in children worldwide[1]. Traumatic cataract is a common sequela of ocular injuries in adults and children[2,3]. The incidence of ocular injuries varies across the world. In India, the reported incidence is 20.53%[4]. Ocular trauma represents a large, potentially preventable burden on both victims and society as a whole.

The aetiology of ocular injury in rural areas is likely to differ from that in urban areas and is worthy of investigation. Any strategy for prevention requires knowledge of the cause of injury, which may enable more appropriate targeting of resources towards preventing such injuries.

Management of traumatic cataract that results from either blunt or penetrating ocular trauma needs special consideration because of associated injury to ocular and periorbital structures. Children and young adults, especially boys, are more predisposed to trauma and have a higher incidence of traumatic cataract[5]. Traumatic cataracts form a separate category of cataracts as they present with other ocular morbidity like corneal tears, iris injury, vitreous haemorrhage, and retinal tears; and they are, to some extent, preventable. Hence, the success rate may differ between eyes with traumatic cataracts and senile cataracts.

Traumatic cataracts occur secondary to blunt or penetrating ocular trauma. Infrared energy (glass-blower's cataract), electric shock, and ionizing radiation are other rare causes of traumatic cataracts [6]. Cataracts caused by blunt trauma classically form stellate or rosette-shaped posterior axial opacities that may be stable or progressive, whereas penetrating trauma with disruption of the lens capsule forms cortical changes that may remain focal if small or may progress rapidly to total cortical opacification. The extent of associated damage to the anterior and posterior segments, time of intervention, operative and postoperative complications go a long way in determining the ultimate prognosis.

In traumatic cataract, the lens needs to be removed, and as the other eye remains normal in most cases,

the problem of unilateral aphakia sets in. Spectacle correction and contact lenses help only to a certain extent in developing binocular vision. The timing of surgery is important for visual rehabilitation, especially in children, as the risk of amblyopia is high due to media opacity. In adults, cataract surgery should be carried out and completed within a year, and in children, it should be completed within 6 months[7]. Traumatic cataract can present many medical and surgical challenges to the ophthalmologist. Surgery for traumatic cataract can be primary or secondary. Primary cataract removal is recommended if the lens is fragmented, swollen, or if there is pupillary block. It allows visualization of the posterior segment, otherwise blocked by lens opacity. Secondary cataract removal is more beneficial due to improved visibility, proper intraocular lens calculation, and fewer chances of postoperative inflammation[8]. Careful examination and a management plan can simplify difficult cases and provide the best possible outcome.

The present study presents the experience in the management of cases of traumatic cataract with special reference to age, aetiology, preoperative status of the eye, timing of surgery following trauma, type of surgery, and final visual outcome.

Material and Method

A hospital based prospective, observational study was done in between December 2019-December 2020. A total of 65 patients with unilateral Traumatic cataract, of age group >6yrs to 60yrs were included in the study. Patients with co-existent ocular posterior segment pathology such as vitreous haemorrhage, retinal detachment, optic nerve avulsion, previous Intra ocular surgery or ocular pathology were excluded. After taking informed consent from the patients, a detailed history was taken. A complete ocular examination including visual acuity using Snellen's chart, BCVA was taken. Certain patients with corneal tear associated with traumatic cataract were initially taken up for suturing followed by cataract surgery after 8 weeks. Patients with traumatic cataract associated with inflammation or lens induced glaucoma were managed medically before cataract surgery. For routine uncomplicated traumatic cataract (no zonular dehiscence, normal lens position and intact posterior capsule), SICS or phacoemulsification with PCIOL implantation was done as a primary procedure. In complicated traumatic cataract, secondary iris claw or SFIOL implantation along with anterior vitrectomy was performed. Patients were examined at 1st post operative day, 1 week and at 6 weeks. BCVA was taken at the end of 6 weeks and spectacles were prescribed accordingly.

Result

The study group consists of 65 cases of unilateral traumatic cataract. Study was based on age and sex wise distribution, etiological distribution of traumatic cataract, morphology of cataract, associated ocular injuries and complications, surgical management, intra operative and postoperative complications and final Visual outcome. The data collected was systematically classified and tabulated. Quantitative analysis has been applied to the data for interpretation of the result. Statistical analysis conducted using SPSS v.16. In analysing the data, descriptive statistics including frequency, percentage were used. To test the association, Chi square test was applied and a value of $p< 0.05$ was considered to be statistically significant.

In our study we found that majority of the cases were found in the age group of 11-30 years (44.6%). These patients were mostly involved in outdoor activities and agricultural works and <10 years (18.5%) due to lack of adult supervision and while playing with M: F- 2.82:1

In the present study we found that out of 65 cases 36(55.4%) were blunt type of injury and 29 (44.6%) cases were penetrating injury. Wooden stick (23.1%) was the commonest object causing both blunt as well as penetrating type of ocular injuries. Mean age of patients with blunt trauma is 31.5 ± 13.9 years. Mean age of patients with penetrating trauma is 20.13 ± 13.36 years. Penetrating trauma was more common in younger patients and blunt trauma was found to be more in comparatively older patients in our study.

In our study we found that, wooden stick and stone were the commonest object causing both blunt as well as penetrating type of ocular injuries (47.7%) as shown in table 1. Other than this, blunt ocular injury was mostly caused by fall (9.2%) and fist injury (9.2%), and penetrating injuries due to metallic wire (7.7%). Other rare objects causing ocular injury are glass, metallic rod, ball, pencil, plastics, bamboo-stick, arrow etc.

Table 1: Distribution of traumatic cataract patients according to the type of object causing trauma

Mode of Trauma	Number of patients (N)	Percentage (%)
Arrow	1	1.5%
Ball	2	3.1%
Bamboo Stick	2	3.1%
Fall	6	9.2%

Firecracker	1	1.5%
Tip of cat (Gilli Danda)	2	3.1%
Glass	2	3.1%
Fist	6	9.2%
Iron Rod	3	4.6%
Metallic Wire	5	7.7%
Pencil	1	1.5%
Plastic Material	2	3.1%
Stone	16	24.6%
Thorn	1	1.5%
Wooden Stick	15	23.1%
Total	65	100.0%

Total cataract (63.1%) was the commonest morphology seen. White soft cataract (23.1%) cases and membranous type cataract (6.2%) were due to penetrating injury and rosette cataract (7.7%) was due to blunt trauma (table2).

Table 2: Morphology of cataract

Morphology of cataract	Frequency	Percentage (%)
Membranous type	4	6.2
Rosette cataract	5	7.7
Total cataract	41	63.1
White soft	15	23.1
Total	65	100.0

All the 15(23.08%) white soft cataract cases and 4(6/15%) membranous type cataract were due to penetrating injury. All 5 (7.69%) cases of rosette cataract were due to blunt trauma. Out of 65 cases, 41 had total cataract which was the most common type seen in both penetrating as well as blunt type of injury (table 3). A statistically significant association was found between morphology of traumatic cataract and type of injury (p- value <0.05).

Table 3: Association between type of injury and morphology of cataract

Morphology of cataract	Type of injury		Total
	Blunt	Penetrating	
Membranous type	injury0	injury 4(13.8%)	4(6.2%)
Rossette cataract	5(13.9%)	0	5(7.7%)
Total cataract	31(86.1%)	10(34.5%)	41(63.1%)
White soft	0	15(51.7%)	15(23.1%)
Total	36(100%)	29(100%)	65(100%)

Patients with penetrating trauma presented earlier with associated injuries than that of blunt trauma. Table 3 shows that 19 (29.23%) patients out of 65 had presented within one week of injury and 10 (15.38%) cases presented between 1week to 1 month. About 27 (41.5%) patients presented between 1 month to 1 year. Rest of the 9(13.8%) cases presented after a year of trauma.

Table 4: Duration between trauma and first OPD visit

Duration	Frequency	Percentage (%)
Within one week	19	29.23%
Within one week to 1 month	10	15.38%
1 month - 1 year	27	41.5%
More than 1 year	9	13.8%
Total	65	100.0%

Out of 36 blunt trauma patients, 41.7% (15 cases) had a preoperative visual acuity of hand movement (HM) and 44.8% (13 cases) out of 29 cases of penetrating trauma had visual acuity of HM as shown in table 7. 6 (20.7%) cases out of 29 cases of penetrating injury had visual acuity of perception of light (PL) and 1 (2.8%) out of 36 cases of blunt injury had VA of PL.

The association between the pre-operative visual acuity and type of injury was not found to be statistically significant. Majority of the cases had vision less than counting fingers (poor vision)

preoperatively in both penetrating and blunt trauma. The association between the pre-operative visual acuity and type of injury was not found to be statistically significant (p- value > 0.05).

Table 5: Association between preoperative visual acuity and type of injury

Preoperative visual acuity	Type of injury		Total
	Blunt	Penetrating	
6/60	6(16.7%)	g1(3.4%)	7(10.8%)
5/60	0	0	0
4/60	0	0	0
3/60	0	0	0
2/60	3(8.3%)	2(6.9%)	5(7.7%)
1/60	4(11.1%)	4(13.8%)	8(12.3%)
Counting finger close to face	7(19.4%)	3(10.3%)	10(15.4%)
Hand Movement	15(41.7%)	13(44.8%)	28(43.1%)
Perception of Light	1(2.8%)	6(20.7%)	7(10.8%)
Total	36(100%)	29(100%)	65(100%)

Majority of the cases (table 8) had corneal involvement (39.99%), while some had iris injury (12.3%) and phacodonesis (12.3%). Few patients had anterior capsular tear with lens matter in ac (6.15%), raised IOP (4.61%), subluxation of lens (6.15%), posterior capsular rupture (4.61%) and anterior uveitis (7.69%).

Table 6: Associated ocular injuries

Associated ocular injuries	Number of patients	Percentage (%)
Corneal tear	18	27.69
Corneal scar	8	12.30
Anterior capsular tear with lens matter in ac	4	6.15
Iris injury	8	12.30
Uveitis	5	7.69
Phacodonesis	8	12.30
Subluxation of lens	4	6.15

The operative procedures were assessed. Table 6 shows that SICS with posterior chamber intraocular lens implantation were done on 34 (52.31%) cases. Phacoemulsification with PCIOL implantation were done on 13 (20%) cases. Secondary iris claw implantation was done on 3(4.6%) cases and SICS with anterior vitrectomy with SFIOL implantation was done on 4(6.15%) cases. Phacoemulsification with anterior vitrectomy with PCIOL implantation done in 1 case (1.53%).

Early post operative complications seen were corneal edema (15.38%), hyphema (6.15%) and anterior uveitis (6.15%) which resolved with medications. Striate keratopathy was seen in 8 cases (12.3%). Late post operative complications which lead to decreased BCVA in majority of the case were central (6.15%) and peripheral corneal opacity (33.84%) and astigmatism (36.92%).

Visual result:

Patients were followed up at post-operative day 1, day 2, 1 week and 1 month after surgery. Final visual acuity (best corrected visual acuity) was measured at 6 weeks after surgery.

Table 7: Best corrected Visual acuity at Six weeks

BCVA	Number of patients	Percentage (%)
6/6	4	6.15
6/9	7	10.76
6/12	23	35.38
6/18	15	23.07
6/24	9	13.84
6/36	3	4.61
6/60- CF 3 mts	4	6.15
Total	65	100.0

The best corrected visual acuity was assessed at the end of 6 weeks and table 7 shows that 49(75.38%) out of 65 cases had BCVA 6/6-6/18 and 16(24.61%) cases had BCVA <6/18

3/60 (table 7). The causes of low vision were mainly central corneal opacity, peripheral corneal opacity and irregular astigmatism.

Out of 49 patients who had final BCVA of 6/6-6/18, in 11 (57.89%) cases, the duration between trauma and surgery was within a week, in 7 (70%) cases duration was between one week to 1 month and in 22 (81.48%) cases the duration was between 1 month to 1 year. In 9 (100%) cases the duration was for more than a year. Similarly in 8 (42.10%) cases, out of 16 patients who had final BCVA of <6/18-3/60, the duration between trauma and surgery was within a week, 3 (30%) cases within 1 week to 1 month, 5 (18.5%) cases after a month to a year. Therefore, statistically significant association was not found between the final BCVA and the duration between trauma and surgery.

Table 8 shows that post-operative final BCVA was found to be 6/6-6/18 in 75.38% (49) out of 65 cases, irrespective of their preoperative visual acuity. So, there was no statistically significant association between the best corrected visual acuity and preoperative visual acuity.

Table 8: Association between best corrected visual acuity and preoperative visual acuity

BCVA	Preoperative visual acuity						Total
	1/60	2/60	6/60	Counting Finger Close to	Hand Move-ment	Perception of Light	
6/6-6/18	7(87.5%)	5(100%)	7(100%)	8(80%)	19(67.85%)	3(42.85%)	49(75.38%)
<6/18-3/6	1(12.5%)	0	0	2(20%)	9(32.14%)	4(57.14%)	16(24.61%)
0 Total	8(100%)	5(100%)	7(100%)	10(100%)	28	7(100%)	65(100%)

In this study we found that 91.7% (33 cases) had a postoperative final BCVA of 6/6-6/18 out of 36 blunt trauma cases (table13) whereas out of 29 cases of penetrating trauma only 55.17% (16 cases) had BCVA of 6/6-6/18 and 13 (44.89%) cases had BCVA ranging from <6/18-3/60. Therefore, statistically significant association was found between postoperative final BCVA and type of injury. The visual outcome was better in blunt injury.

Table 9: Association between best corrected visual acuity and Morphology of cataract

BCVA	Morphology of cataract				Total
	Membranous	Rosette	Total	White	
6/6-6/18	type 3(75%)	cataract 5(100%)	cataract 34(82.9%)	soft 7(46.7%)	49(75.4%)
<6/18-3/60	1(25%)	0	7(17.1%)	8(53.3%)	16(24.6%)
Total	4(100%)	5(100%)	41(100%)	15(100%)	65(100%)

Association between BCVA and morphology of cataract is shown in the table 9. This study shows statistically significant association between BCVA and morphology of cataract.

Discussion

This study included 65 cases of unilateral traumatic cataract managed at Regional Institute of Ophthalmology, DR. BRAM Hospital, Raipur, India. In our study we found that majority of the cases were found in the age group of 11-30 years (44.6%). Manjula Mangane et al[9] also analysed 50 cases of traumatic cataract and found 31 (62%) of the cases ranged between 11-30yrs. these patients were mostly involved in outdoor activities and agricultural works and <10 years (18.5%) due to lack of adult supervision and while playing with M: F- 2.82:1. Akshay J. Bhandari et al[10] in his study found male preponderance 30 (60%) out of 50 cases with male to female ratio of 1.5:1.

In the present study we found that out of 65 cases 36(55.4%) were blunt type of injury and 29 (44.6%) cases were penetrating injury which is similar with the study done by Jyoti Bhuyan et al[11]. Jyoti Bhuyan et al[11] reported 28 (56%) cases of blunt trauma and 22 (44%) cases of penetrating injuries (n=50). Wooden stick (23.1%) was the commonest object causing both blunt as well as penetrating type of ocular injuries.

Total cataract (63.1%) was the commonest morphology seen.

White soft cataract (23.1%) cases and membranous type cataract (6.2%) were due to penetrating injury and rosette cataract (7.7%) was due to blunt trauma. Jagannath C et al[12] found white soft type of cataract was the common form of cataract developed after ocular trauma (47.5%) while total cataract was found 37.5% patients, rosette type in 5% cases and membranous type of cataract in 10% of the cases.

A statistically significant association was found between morphology of traumatic cataract and type of injury (p- value <0.05).

Patients with penetrating trauma presented earlier with associated injuries than that of blunt trauma.

Majority of the cases had vision less than counting fingers (poor vision) preoperatively in both penetrating and blunt trauma.

The association between the pre-operative visual acuity and type of injury was not found to be statistically significant (p- value > 0.05).

In our study majority of the traumatic cataract cases were caused by stone (24.6%), wooden stick (23.1%) followed by fall (9.23%), fist injury (9.23%) and rest by others. Trauma due to wooden stick and stone were the commonest cause as most of the cases were from rural areas.

The patients presented to Ophthalmology department varied from within a week to more than a year. 44.6% of the patients had presented within one month of injury and 41.6% of the cases presented between 1 1onth – 1 year. In a study done by Akshay J. Bhandari et al[10] the duration between injury and cataract surgery was less than 1 month in 17 (34%) patients, 1–6 months in 16 (32%) patients, 7–12 months in seven (14%) patients, and more than 12 months in 10 (20%) patients.

Majority of the cases had corneal involvement (39.99%), while some had iris injury (12.3%) and phacodonesis (12.3%). Few patients had anterior capsular tear with lens matter in ac (6.15%), raised IOP (4.61%), subluxation of lens (6.15%), posterior capsular rupture (4.61%) and anterior uveitis (7.69%). Akshay J. Bhandari et al[10] found that corneal involvement was the most common associated ocular damage. Preoperative findings included peripheral corneal perforation in 18 eyes, central corneal perforation in six eyes, irregular pupil in 15 eyes, and posterior synechiae in five eyes Mehul et al[13] also reported 71.3% of cases were associated with corneal injuries.

In our study, SICS with posterior chamber intraocular lens implantation were done on 34 (52.31%) cases.

Phacoemulsification with PCIOL implantation was done on 13(20%) cases. Secondary iris claw implantation was done on 3(4.6%) cases and SFIOL implantation was done on 4(6.15%) cases along with Anterior vitrectomy. Secondary PCIOL implantation was performed in 10 (15.38%) cases.

Post operative complication which led to decreased BCVA in cases with penetrating trauma was due to central (6.15%) and peripheral corneal opacity (33.84%) and irregular astigmatism (36.92%). Jagannath C et al[12] also found that the most important causes for decreased post-operative visual acuity were irregular astigmatism (27.5%).

On comparing the effect of time interval between injury and intervention on the final visual outcome, timing of intervention has no effect on the visual outcome in our study because none of the patients were in amblyopia age group and similar conclusion has been found in study done by Manjula Mangane et al[9].

About 91.7% (33 cases) had a postoperative final BCVA of 6/6-6/18 out of 36 blunt trauma cases whereas out of 29 cases of penetrating trauma only 55.17% (16 cases) had BCVA of 6/6-6/18 and 13 (44.89%) cases had BCVA ranging from <6/18-3/60. The visual outcome was better in blunt injury than that of penetrating injury. U. Srivastava et al[14] found final visual outcome was 6/6-6/18 in 43% of patients, 6/24-3/60 in 31% of patients and less than 3/60 in 26% of patients, though the visual outcome was better in blunt injury, the difference was not statistically significant.

Conclusion

Our study shows that good visual results can be achieved with traumatic cataract surgery if the posterior segment is not involved and the corneal scar does not block the optical axis. Penetrating injuries are associated with poor visual outcome postoperatively than blunt injuries due to central corneal scarring and astigmatism, also we have excluded the cases involving posterior segment pathology. Taking protective measures in sports and work and patient education can avoid ocular trauma and traumatic cataract formation. A lot of these injuries could have been prevented when proper protective wear being used during industrial and agricultural work. Local government schools should inculcate the safety habits through the school curriculum as has been done in many urban private schools in India, along with lessons on first aid and safety precautions. In addition, early reporting and adequate follow up especially in cases of children needs to be emphasized. Effective Intervention and management are the key points in preventing monocular blindness due to traumatic cataract.

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