

## Pediatric Traumatic Cataract: Epidemiology, Surgical Intervention, Posterior Capsule Opacification (PCO) Rates and Outcomes

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### Abstract

**Aim:** To analyze the etiology, treatment, Posterior Capsule Opacification (PCO) rates and visual outcome in children with traumatic cataract

**Methods:** Retrospective, non-comparative review of 41 children (>16 years) with traumatic cataract managed at a single institution during a 2-year period with regard to demographic data, mode of injury, management, development of PCO and visual outcome.

**Results:** **Wooden** stick (8/41, 20%) was observed to be most common mode of injury, followed by stone (4, 10%) and cracker injury (4, 10%). Mean preoperative visual acuity was  $2.4 \pm 0.7$  logMAR units, which improved to  $0.3 \pm 0.4$  logMAR units post operatively. PCO developed in 14 children (50%), of whom 3 had acrylic and 11 had Polymethylmethacrylate (PMMA) lenses. PCO developed in 9 out of 11 (82%) children with intact posterior capsule and in 5 out of 17 (29%) children with primary posterior capsulorrhexis.

**Conclusion:** In view of the higher rates of PCO occurrence in children with intact posterior capsule, primary posterior capsulotomy irrespective of the age is recommended in pediatric traumatic cataract.

**Keywords:** Traumatic cataract; Epidemiology; Surgical intervention, Posterior capsule opacification.

### Background

Ocular injuries are the leading cause of visual disability and blindness in children.[1] Children show a disproportionately high incidence of ocular injuries, and the damage sustained is often of a more serious nature.[2] Ocular trauma in children differs from trauma in adults as children may not verbalize the symptoms resulting in delayed diagnosis, and amblyopia acts as another obstacle resulting in poor visual recovery. Fine, sharp and pointed objects have been reported as the most common cause of severe ocular injuries.[3] Ocular trauma is frequently associated with

cataractous changes in the lens. Direct injury of the crystalline lens can occur through penetrating injury or blunt trauma to the globe. Visual outcomes vary depending upon extent of trauma and complications of surgery.

The present study was undertaken to review the mechanisms of ocular injury, type of surgical interventions required, development of posterior capsule opacification (PCO) and visual outcomes in pediatric traumatic cataract.

### Material and Methods

#### *Study population and study period:*

After approval of institutional review board, a retrospective review of patient case records was carried out to identify the children less than 16 years of age who underwent cataract extraction following ocular trauma, during the period between February 2007 and January 2009. 41 eyes of 41 children operated for traumatic cataract were studied for

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demographic details and type of trauma, while 28 eyes of 28 children with follow up of more than 6 months were analyzed in detail for postoperative complications.

#### *Data Collection*

The data was retrieved from patient admission charts and surgical records in the form of age, sex, description of injuring object, preoperative visual acuity, associated ocular injuries, status of lens, type and detail of surgical intervention, postoperative complications, duration of follow up and best corrected visual acuity.

#### *Methodology*

Depending upon the type of injury, injuries were classified as either blunt or penetrating. In children  $\leq 7$  years and older children in whom posterior capsule was breached by trauma or was thick and fibrous, a primary posterior capsulorrhexis with anterior vitrectomy was performed. In children with open globe injury, lens extraction was performed as a second and separate procedure after the primary repair of globe. Visual acuity was recorded at each follow up visit, glasses prescribed 1 month postoperatively and amblyopia therapy initiated as and when required.

PCO was considered significant when vision dropped by 2 lines from the best corrected post-operative vision or when the retinoscopy or fundus examination was not possible. Nd:YAG capsulotomy was done for cooperative children and membranectomy for younger children in cases with significant PCO.

#### *Statistical analysis*

Statistical analysis was done using statacorp 11, Texas. Categorical data was analysed using chi square or Fischer exact test, Continuous data was analysed using Mann Whitney U test. P value less than 0.05 was considered significant.

## **Results**

Over 2-year period, 47 patients underwent cataract surgery following trauma. Of the 47 cases identified, follow-up data were available for 41 cases (87%) with a mean follow-up of  $11.9 \pm 9.6$  months (range 1 month to 33 months). 13 patients had less than 6-month follow-up. For the purpose of study, 41 cases were included in the analysis for demographics and other factors, while detailed analysis was done for the 28 patients with minimum follow up of 6 months (mean follow up  $16.25 \pm 8.5$  months).

Age of the patient ranged between 3-16 years (Mean  $\pm$  SD;  $8.57 \pm 3.5$  years) with 14 children (50%)  $\leq 7$  years age and 14 (50%)  $> 7$  years. Peak age at the time of injury was 4-6 years. Males represented 75% of the study population and left eye was the injured eye in 64% children. Mean length of follow up was  $16.25 \pm 8.5$  months (range: 6-33 months)

#### *Mechanism of injury*

A variety of sharp or blunt objects were identified as the cause of injury. Of these, injury by wooden stick (8/41, 20%) was observed to be most common, followed by stone (4, 10%) and cracker injury (4, 10%). In children younger than 7 years, injury by stone or knife was found to be more common than older children, in whom cracker injury was more frequent.

#### *Wound classification*

Depending upon the integrity of the globe, wounds were classified as open globe or closed

**Table 1: Mechanism of injury**

Mechanism of injury	No. of patients (n=41)	$\leq 7$ years	$> 7$ years
Wooden stick	8 (19.5%)	5	3
Stone	4 (9.8%)	3	1
Cracker injury	4 (9.8%)	1	3
Gulel	4 (9.8%)	1	3
Knife	3 (7.3%)	3	0
Arrow head	3 (7.3%)	0	3

**Table 2: Initial and final visual acuities following surgical intervention for traumatic cataract in children**

Visual acuity	n=41	≤7 years	>7 years
PL-, PR inaccurate	1(2)	0(0)	1(2)
• Less than 6/60	38(3)	23(2)	15(1)
• 6/60-6/18	2(7)	0(7)	2
• 6/12-6/6	0(29)	0(14)	0(15)
<b>Mean logMARvision</b>	<b>1.54±0.49</b> (0.31±0.38)	<b>1.7±0.3</b> (0.44±0.4)	<b>1.4±0.6</b> (0.2±0.3)

globe type. 19 out of 41 (46%) sustained an open globe injury while 22(54%) had a closed globe injury.

*Associated ocular injuries*

In association with traumatic cataract, 17 patients (42%) had corneal tear and 2 patients (5%) had corneoscleral tear. Other associations included iridodialysis (3), hyphema (2), zonular dialysis (4), Berlin’s edema (2), traumatic glaucoma (1), vitreous hemorrhage (2) and traumatic endophthalmitis (1).

*Surgical procedure*

In 17 patients (42%), primary surgery performed was corneal tear repair followed later by cataract extraction and intraocular lens implantation, with mean difference of 1.2 months between the two procedures. 37 out of 41(90%) were rehabilitated visually by intra ocular lens implantation at the time of cataract extraction, 4 were left aphakic initially, rehabilitated by glasses and later secondary

IOL implantation performed. 1 patient presented with traumatic endophthalmitis and intraocular foreign body and underwent vitreoretinal surgery as the primary procedure.

*Visual acuity*

Visual acuity outcome data were available for all 41 cases and ranged from 6/6 to no perception of light, with one eye developing phthisis bulbi and one absolute glaucoma (Table 2). Mean corrected visual acuity at time of final examination was approximately 6/12 Snellen (0.3±0.4 logMAR). Mean logmar vision was 0.44±0.4 in children below 7 years and 0.2±0.3 in older children (p=0.037). Final visual outcome was found to be linearly related to the age at time of trauma, with visual outcome improving with each passing year. Final visual acuity was poor in 29% of children who sustained open globe injuries and 12% of patients who sustained closed globe injuries, though this difference failed to achieve significance (p 0.434). Final visual outcome was poor if delay in treatment was more than 1 month (p=0.048). This difference was statistically significant in children younger than 7 years (p=0.009). However in older children it failed to reach significant levels (p=0.427).

The most common long term postoperative complication in our series was posterior capsule opacification (PCO).PCO developed in 14 children (50%) (6 children d” 7 years and 8 children >7 years), of whom 3 had

**Table 3: Visual acuity outcome of pediatric patients following surgery for traumatic cataract**

Authors and year	Type of trauma	N	Age group	VA>6/18	PCO%	Follow up (months)
Bienfait 1990 <sup>6</sup>	Blunt + penetrating	23	1-13 years	70%	83%	78
Eckstein 1998 <sup>6</sup>	Blunt + penetrating	52	2-10 years	75%	92%	33
Segev 2007 <sup>7</sup>	Penetrating	8	2-10 years	62%	37%	18
Brar 2001 <sup>8</sup>	Blunt + Penetrating	40	4-12 years	65%	91%	18
Kumar 2008 <sup>9</sup>	Penetrating	114	3-10 years	50%	21%	12-36
Present study 2012	Blunt + Penetrating	28	3-16 years	73%	50%	18

VA: Visual Acuity, PCO: Posterior Capsular Opacification

acrylic and 11 had PMMA lenses. PCO developed in 9 out of 11 (82%) children with intact posterior capsule and in 5 out of 17 (29%) children with primary posterior capsulorrhexis. PCO was treated by Yagcapsulotomy in 8 and membranectomy in 6 patients.

## Discussion

In this study, we retrospectively analyzed the findings in 41 children who underwent surgery for traumatic cataract following blunt or penetrating ocular trauma. Boys outnumbered girls by a ratio of 3:1, similar to that reported in previous studies on traumatic cataract in children.[3] 75% of our study patients achieved visual acuity better than 6/18 and all except one achieved visual acuity better than 6/60. This one was the patient who presented with traumatic endophthalmitis and IOFB. Older age at the time of cataract surgery has been correlated with better visual outcome in children with traumatic cataract.[4] This trend also was observed in our series of patients with traumatic cataract.

Wooden stick (8/41, 20%) was observed to be most common, followed by stone (4, 10%) and cracker injury (4, 10%). Similar previous Indian studies report trauma with wooden stick (33%) to be the commonest cause followed by stone injury (21%). Visual acuity outcomes and PCO rates are compared with various studies[5-9] on pediatric traumatic cataract (Table 3).

The most common long term postoperative complication in our series was posterior capsule opacification (PCO). In our series, 50% patients developed visually significant PCO requiring treatment. PCO is reported to occur in 17% to 100% of pediatric patients undergoing cataract extraction with IOL placement[10,11]. Some authors have suggested that the incidence of PCO may be greater in patients with traumatic cataracts.[10] 9 out of 11 (82%) eyes with an

intact capsule and 5 out of 17 (29%) eyes that had primary posterior capsulorrhexis with anterior vitrectomy developed PCO. These findings suggest that the option of routine primary posterior capsulorrhexis with anterior vitrectomy, particularly in pediatric patients with traumatic cataract should be considered. Hemo and Benezra[12] recommend posterior capsulotomy combined with anterior vitrectomy as part of the management of traumatic cataract in children.

Traumatic cataract in pediatric age group is one of the most common reversible causes of monocular blindness in children. Males are more likely than females to suffer from ocular injury with a variety of sharp and blunt objects. The management of trauma in children is quite challenging. However, by systematic management with appropriate surgical technique, visual rehabilitation with IOL and prompt management of amblyopia and PCO, good visual outcomes can be obtained.

In lieu of the higher rates of PCO occurrence in children with intact posterior capsule, primary posterior capsulotomy irrespective of the age is recommended in pediatric traumatic cataract.

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