

ABSTRACT

Traumatic cataract is more common in younger individuals. Traumatic cataract is an important cause of uniocular visual loss and is often sudden in onset. Traumatic lens damage may be caused by mechanical or non-mechanical injury. Traumatic cataract is an indication of intraocular lens (IOL) implantation in children. In trauma visual outcome depends on the interval from injury to the surgery. Early intervention provides better visual outcome and less chance of developing amblyopia and strabismus. Intraocular lens implantation for unilateral cataract in children has a definite role in correcting aphakia, resulting in good visual outcome and thus helping to maintain binocularity. This article explains the basic pathology involving traumatic cataract, pathogenesis and management.

1. INTRODUCTION

The eye is one of the delicate organs in the body. Like any other part of the body eyes are also not exempt from injuries inspite of the fact that they are well protected by lids, projected margins of the orbit, the nose and a cushion of fat from behind. Ocular injury is an important cause of visual loss in children. [1,2]

Ocular trauma often leads to traumatic cataract along with damage to other ocular structures. Traumatic cataract is an important cause of uniocular visual loss and is often sudden in onset. Traumatic lens damage may be caused by mechanical or non-mechanical injury. Traumatic cataract is an indication of intraocular lens (IOL) implantation in children. IOL implantation is usually performed for

- a) to preserve vision by optical correction.
- b) to prevent development of amblyopia.
- c) to preserve binocular single vision.
- d) to avoid the inconvenience of contact lens or glasses not only for the child but for the parents.
- e) to avoid aberrations of high power plus lenses used for aphakia.

The visual outcome after IOL implantation varies with extent of damage to the other ocular structures and post operative complications. Hence, in the present study an attempt has been made to evaluate the visual outcome of children with traumatic cataract after IOL implantation.

Lens anatomy [3,4,5]

The lens is a transparent biconvex crystalline structure placed between iris and vitreous in a saucer shape depression the patellar fossa and supported by suspensory ligaments.

Traumatic cataract [5,6]

A cataract is a clouding of the normally clear and transparent lens of the eye, which may prevent a clear image from forming on the retina. Both penetrating and concussion injuries can cause traumatic cataract.

They are the results of the sudden acceleration imparted by the impact of blunt force. Traumatic cataracts are frequently seen after direct blows on the eyeball. They occur in 60% of cases after minor concussion on the globe (Davidson 1936). The total effects upon the eyeball may be due to several factors like direct impact of the force upon the globe with its maximum effects at the point where blow is received. Transmitted force appearing as a wave of pressure when the eye is suddenly compressed traveling throughout its fluids contents in all directions sometimes with expulsive force, in which case the maximum damage may be at a point distant from actual place of impact (contre-coup). Indirect forces whereby the globe is suddenly strikes against the elastic contents of the orbit and its resistant bony walls. **Forster (1887) concept (in Duke-Elder and Mac Faul 1972).** The effect of the impact of the wave of pressure traversing the fluid contents of the eye by which, when the cornea was driven in, the aqueous was forced backward, driving in front of it, the lens and hurling the vitreous against the posterior pole.

Pathogenesis of traumatic cataract [7-12]

Proteins

The concentration of insoluble protein (albuminoids) remains stable, while soluble proteins are markedly decreased and their synthesis is decreased. A loss of beta crystalline fraction is always conspicuous and this involves diminution of protein sulphhydryl groups. The active soluble proteins give place to inactive substances thus tending to metabolic inertia. These changes occur after opacification of lens has developed. In later stages of development cataract proteolysis occurs where soluble proteins are broken down by enzymes. The amount of albuminoids is small in young lens fibers, in these practically all proteins are thus broken up. Complete hydrolysis increases the osmotic pressure some 400 times, initial effect is an enormous inhibition of water with a consequent swelling. This may be followed as diffusion proceeded by an almost complete disappearance of lenticular substance. If capsule ruptures, the proteases in aqueous as well as phagocytic cells reach fibers and these help to complete breakdown of proteins.

Peptides

Most important is glutathione. Decrease in all from of cataract.

Nucleotides

ATP, diphosphopyridine (DNPH) and triphosphopyridine nucleotide (TPNH) are decreased in cataract.

Total Lipids

They are increased in cataract particularly free lipids (cholesterol). In later stage of opacification, free lipids may appear as visible crystalline deposits.

Inorganic Materials

A calcium concentration is increased in cataracts. Molecular disturbance in the protoplasmic structures of cell. In the lens intracytoplasmic changes leading to fragmented and necrosis of cells of the capsular epithelium of the lens.

Types of traumatic cataract

- Total/diffuse

67	• Anterior capsular
68	• Posterior sub capsular
69	• Intumescent
70	• Ruptured anterior capsule with flocculent lens matter in anterior chamber.
71	• Partially absorbed.
72	Lenticular opacities [13,14,15,16]
73	It occurs mainly due to imbibitions of aqueous and partly due to direct mechanical effects of the injury on the lens
74	fibers.
75	A blunt injury may cause lens opacification either as an acute event or as a late sequelae. A concussion cataract
76	may involve only a portion of the lens or the entire lens. Cataract results when the lens capsule ruptures by either a
77	direct or counter-coup injury. Rapidity of cataract formation depends on whether the lens capsule was ruptured. In
78	the presence of rupture the lens becomes hydrated and cataractous within hours.
79	Vossius's ring opacity
80	A circular ring of brown pigments is seen on anterior lens capsule. It occurs due to striking of contracted pupillary
81	margin against crystalline lens.
82	Discrete subepithelial opacities-Most common occurrence.
83	Sub epithelial disseminated traumatic opacities. It is similar to glaucoma flecken.
84	Cobweb sub capsular opacity.
85	Traumatic rosette shaped opacity.
86	Rosette cataract is the most typical clinical picture following both concussion and perforating injuries. It occurs
87	either in the presence or absence of a capsular tear.
88	Early Rosette (Punctate)
89	Sometimes it occurs in anterior capsule and at times in posterior capsule or in both simultaneously. Initially the first
90	changes are the appearance of a carpet of fine fluid droplets lying between radiating lens fibers immediately under
91	capsular epithelium. It appears as feathering lines of opacities along the star-shaped suture line, usually in posterior
92	cortex.
93	Late Rosette cataract
94	It occurs some years after the injury and is usually found lying deep in the cortex and in the nucleus. It develops in
95	posterior cortex. Its sutural extensions are shorter and more compact than early rosette cataract.
96	
97	Traumatic Zonular Cataract (Lamellar)
98	It usually follows an injury received in early youth and resembles lamellar cataract. Typical riders may present but
99	peripheries of lens are clear.
100	Post Traumatic atrophy of lens

101 It is characterized by thinning of lens substances. The shrinkage may be attributable partly to absorption of some of
102 its substances or partly to disturbances of growth of new fibers owing to epithelial damage.

103 Presenile and senile lens changes

104 Coronary cataract, water cleft, punctuates cortical opacities and sclerotic nuclear opacities.

105 Diffuse (total) concussion cataract

106 It is rare, unless associated with rupture of capsule. In such cases a rapidly milkiness appears owing to imbibitions
107 of aqueous in quantity, producing opacity resembling that following perforating wounds of lens. If tear is extensive
108 swollen fibers may herniate out from opening protruding either into anterior chamber or vitreous.

109 Traumatic absorption of lens

110 It may occur sometimes in young children resulting in aphakia.

111 Subluxation of lens

112 It may occur due to partial tear of zonules. The subluxated lens is slightly displaced in the pupillary area. On
113 dilatation of pupil its edge may be seen. It depends upon the sites of zonular tear. Subluxation may be vertical
114 (upward or downward) or lateral (nasal or temporal).

115 Dislocation of lens

116 It occurs when rupture of all the zonules is complete. It may be intraocular or extra ocular. Intraocular dislocation
117 may be anterior (anterior chamber) or posterior (into vitreous). Extraocular dislocation may be in the subconjunctival
118 space (phakocele) or it may fall outside the eye.

119 Penetrating and perforating wound of eye [16,17]

120 Penetrating trauma is caused by high-velocity impacts. Penetrating injury is a single full-thickness wound of the
121 eyewall caused by a sharp object. While perforating injury refers to two-full thickness wounds (one entry and one
122 exit) of eye wall caused by sharp object or missile. Any penetrating or perforating injury to anterior eye may be
123 complicated by damage to ocular lens. They are common particularly among children at play. The cause can be
124 knives, forks, needles, pins, sharp toys, glass piece, pen, pencils, nails, arrows, compasses, screw- drivers any
125 sharp instruments and flying foreign bodies.

126 Various forms of cataract develop following a perforating injury. Lens damage can vary from a small rent in anterior
127 capsule leading to a small localized cataract to a total cataract disruption with flocculent lens material filling the
128 anterior chamber. Capsular damage is invariable in such injuries, tear in capsule at first tends to gape and its edges
129 roll outwards, while between them the lens fibers sometimes protrude mushroom like into anterior chamber. If
130 healing proceeds, small cicatrix forms at site of rent with radiating traction folds of capsule. Localized change in the
131 lens substance varying from small dots or linear opacities to cloud like masses.

132 • Rosette

133 • Total traumatic cataract

134 • Intumescent cataract

135 • Lacerated cataract.

136 **Pediatric Intraocular Implantation [15,16]**

137 When aphakic spectacles are provided, the image is enlarged, there are prismatic and aberrational
138 effects, no accommodation, the field is limited with a roving ring scotoma all around (Welsh, 1961), distance
139 judgment is impaired and there is no prospect of binocular vision if the condition is unilateral (woods, 1964). In
140 children all these factors lead to a dense amblyopia (Binkhorst and Gobin, 1964).The implantation of unilateral
141 intraocular lens in a child's eye was first performed by Choyce in 1958 followed by Binkhorst in 1959.IOL
142 implantation is also indicated for bilateral and unilateral partial cataracts (congenital/ developmental), when it is
143 found that vision is insufficient for school education or recently developed squint. It is the best way of providing
144 better visual acuity and good chance of fusion (Binkhorst and Gobin 1970) for squinting eye. There are two major
145 indications for IOL implantation in children. The first and most important is to preserve vision and prevent
146 amblyopia. The second is the preservation of fusion (Binkhorst and Gobin, 1964). Extracapsular cataract extraction
147 with IOL implantation provides satisfactory results in children with traumatic cataract. Associated posterior segment
148 complications and development of PCO are the major obstacles to visual rehabilitation.

149 **IOL in traumatic cataract [17,18]**

150 Traumatic cataract is an indication for IOL implantation in children. Intraocular lens implantation in children
151 sometimes is very difficult. The problems are intensified and magnified if there is an additional factor of
152 superimposed trauma. There is no gross change in outlook for satisfactory visual in young children with traumatic
153 cataract. However traumatic cataract not complicated by severe damage to other ocular structure is definite
154 indication for an early surgical intervention with IOL implantation (Binkhorst and Gobin, 1967). Also children's eyes
155 have a tendency to exhibit increased inflammatory response to any injury. The presence of blood, lens, uveal
156 elements and vitreous in anterior chamber stimulate severe Iridocyclitis, formation of synechiae, cyclitic and vitreous
157 membranes (Hiles, 1977).Amblyopic therapy in amblyopia prone patients and spectacles correction for all patients'
158 aids in the restoration of visual function. If strabismus develops early surgery is indicated to restore a normal ocular
159 alignment and secure the best possible peripheral if not central vision (Hiles 1990). The posterior intraocular lens
160 should be implanted in eyes of children 2 years of age or older (Hiles et al 1987). Corneal opacity and amblyopia
161 were the most common causes of poor final visual acuity.

162 **Management [16-19]**

163 Stegmann believes that the prognosis for a traumatic cataract can be same as for a routine senile cataract if the
164 traumatic cataract is handled appropriately. This excludes cases in which there is damage to the posterior segment,
165 the vitreous has become cloudy, the retina is damaged from the same trauma or where infection has occurred.
166 Traumatic cataract is an indication of IOL implantation in children. IOL either primary or secondary has proved to be
167 useful after traumatic cataract extraction. With this thought IOL has been placed after extraction of the traumatic
168 lens. [19]

169 **The management of traumatic cataract has done with (15-19)**

- 170 1. Phaco aspiration.
- 171 2. Small incision cataract surgery.
- 172 3. Extra capsular cataract extraction.
- 173 4. Surgical Management

174 Surgical management of traumatic cataracts is performed through either an anterior limbal approach or a
175 posterior pars plana approach. The choice is often based on the degree of lens injury and the likelihood of
176 vitreous loss .

177 The anterior surgical approach is useful in the following circumstances: non-dislocated cataract with intact capsule,
178 capsular rupture with cataract, subluxated lens with or without cataract, and anterior lens dislocation with or without
179 cataract. The posterior surgical approach is useful in posterior capsular rupture with cataract, subluxated lens with
180 or without cataract, and posterior lens dislocation with or without cataract. (18,19)

181 **CONCLUSION**

183 In many children cataract accounts for visual morbidity following ocular trauma. The successful management of
184 traumatic cataract depends on age, extent of cataract and damage to other ocular structures, type of injury and
185 surgery undertaken.

186 Traumatic cataract is more common in younger individuals. Penetrating injuries are more commonly seen. Aphakic
187 glasses and contact lens are unsatisfactory for rehabilitation of aphakia because of various problems associated
188 with their use. At present lens removal with a posterior chamber lens implantation is the ideal method of
189 rehabilitation of patients with traumatic cataract. Timely operation and implantation of posterior chamber intraocular
190 lens is a permanent method of optical correction which provides stable retinal images, induces minimal aniseikonia
191 and thus help to maintain binocularity. In trauma visual outcome depends on the interval from injury to the surgery.
192 Early intervention provides better visual outcome and less chance of developing amblyopia and strabismus. The
193 whole development of vision as well as the personality of the child depends upon giving the best possible visual
194 acuity to the young patients at the earliest possible. Unilateral cataract in children has a definite role in correcting
195 aphakia, resulting in good visual outcome and thus helping to maintain binocularity.

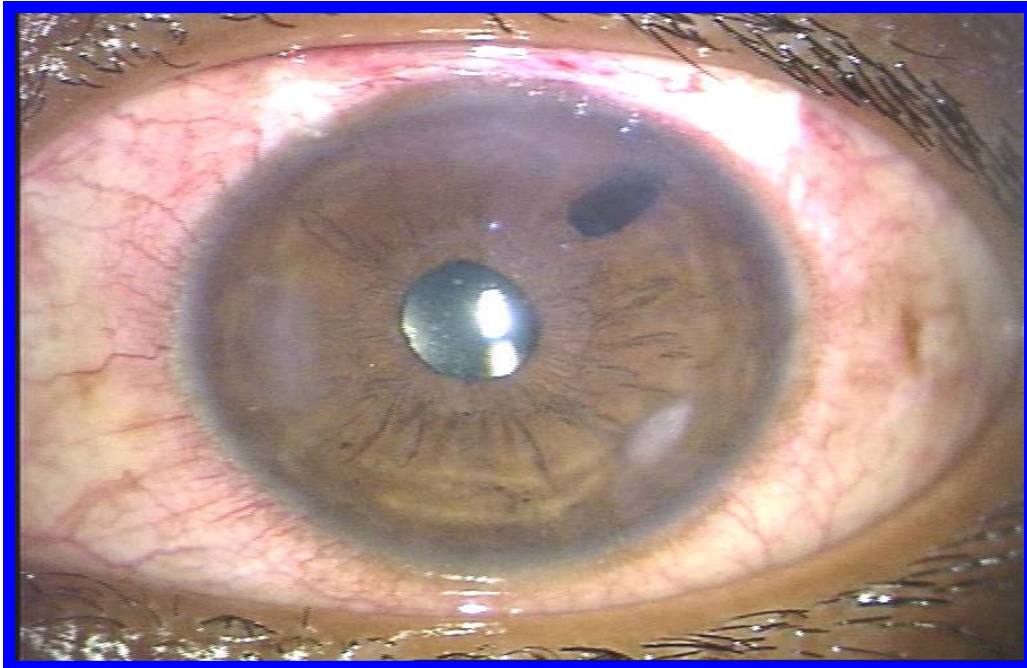
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238 **pediatric traumatic cataract.** *Indian J Ophthalmol*. 2011;59:347–351
- 239 20.



21. Wound of entry in Penetrating injury with Traumatic Cataract – Pre -operative

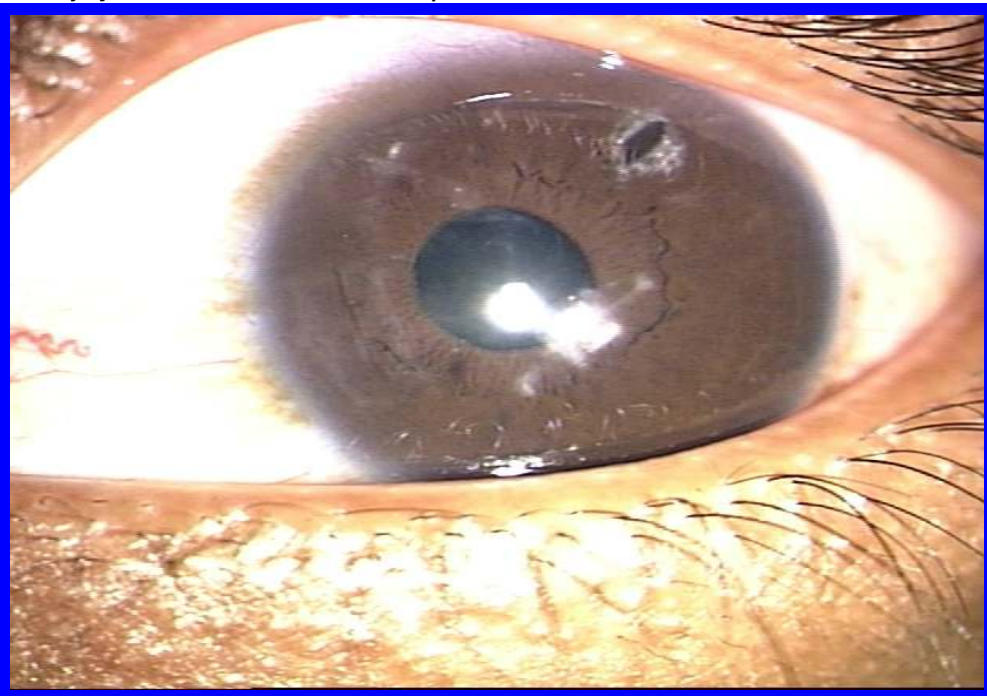


24. Penetrating injury with Traumatic Cataract – Post-operative- PC IOL in- situ

Fig 1



27. Blunt injury with Traumatic Cataract –Pre-operative



28. Blunt injury with Traumatic Cataract-Post-operative- PC
IOL in-situ

29. Fig 2