

Traumatic Cataract

ABSTRACT

Traumatic cataract is more common in younger individuals. Traumatic cataract is an important cause of unioocular 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 unioocular 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

28 has been made to evaluate the visual outcome of children with traumatic cataract after IOL
29 implantation.

30 **Lens anatomy [3,4,5]**

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

33 **Traumatic cataract [5,6]**

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

37 They are the results of the sudden acceleration imparted by the impact of blunt force.

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

50 **Pathogenesis of traumatic cataract [7-12]**

51 Proteins

52 The concentration of insoluble protein (albuminoids) remains stable, while soluble proteins
53 are markedly decreased and their synthesis is decreased. A loss of beta crystalline fraction
54 is always conspicuous and this involves diminution of protein sulphydryl 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
- Anterior capsular
- Posterior sub capsular
- Intumescent
- Ruptured anterior capsule with flocculent lens matter in anterior chamber.

- Partially absorbed.

Lenticular opacities [13,14,15,16]

It occurs mainly due to imbibitions of aqueous and partly due to direct mechanical effects of the injury on the lens fibers.

A blunt injury may cause lens opacification either as an acute event or as a late sequelae. A concussion cataract may involve only a portion of the lens or the entire lens. Cataract results when the lens capsule ruptures by either a direct or countercoup injury. Rapidity of cataract formation depends on whether the lens capsule was ruptured. In the presence of rupture the lens becomes hydrated and cataractous within hours.

Vossius's ring opacity

A circular ring of brown pigments is seen on anterior lens capsule. It occurs due to striking of contracted pupillary margin against crystalline lens.

Discrete subepithelial opacities-Most common occurrence.

Sub epithelial disseminated traumatic opacities. It is similar to glaucomflecken.

Cobweb sub capsular opacity.

Traumatic rosette shaped opacity.

Rosette cataract is the most typical clinical picture following both concussion and perforating injuries. It occurs either in the presence or absence of a capsular tear.

Early Rosette (Punctuate)

Sometimes it occurs in anterior capsule and at times in posterior capsule or in both simultaneously. Initially the first changes are the appearance of a carpet of fine fluid droplets lying between radiating lens fibers immediately under capsular epithelium. It appears as feathering lines of opacities along the star-shaped suture line, usually in posterior cortex.

Late Rosette cataract

It occurs some years after the injury and is usually found lying deep in the cortex and in the nucleus. It develops in posterior cortex. Its sutural extensions are shorter and more compact than early rosette cataract.

109

110 Traumatic Zonular Cataract (Lamellar)

111 It usually follows an injury received in early youth and resembles lamellar cataract. Typical
112 riders may present but peripheries of lens are clear.

113 Post Traumatic atrophy of lens

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

117 Presenile and senile lens changes

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

119 Diffuse (total) concussion cataract

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

124 Traumatic absorption of lens

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

126 Subluxation of lens

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

131 Dislocation of lens

132 It occurs when rupture of all the zonules is complete. It may be intraocular or extra ocular.
133 Intraocular dislocation may be anterior (anterior chamber) or posterior (into vitreous).
134 Extraocular dislocation may be in the subconjunctival space (phakocoele) or it may fall
135 outside the eye.

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

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

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

- 152 • Rosette
- 153 • Total traumatic cataract
- 154 • Intumescent cataract
- 155 • Lacerated cataract.

156 **Pediatric Intraocular Implantation [17,18]**

157 When aphakic spectacles are provided, the image is enlarged, there are prismatic
158 and aberrational effects, no accommodation, the field is limited with a roving ring scotoma all
159 around (Welsh, 1961), distance judgment is impaired and there is no prospect of binocular
160 vision if the condition is unilateral (woods, 1964). In children all these factors lead to a dense
161 amblyopia (Binkhorst and Gobin, 1964).The implantation of unilateral intraocular lens in a
162 child's eye was first performed by Choyce in 1958 followed by Binkhorst in 1959.IOL

163 implantation is also indicated for bilateral and unilateral partial cataracts (congenital/
164 developmental), when it is found that vision is insufficient for school education or recently
165 developed squint. It is the best way of providing better visual acuity and good chance of
166 fusion (Binkhorst and Gobin 1970) for squinting eye. There are two major indications for IOL
167 implantation in children. The first and most important is to preserve vision and prevent
168 amblyopia. The second is the preservation of fusion (Binkhorst and Gobin, 1964).
169 Extracapsular cataract extraction with IOL implantation provides satisfactory results in
170 children with traumatic cataract. Associated posterior segment complications and
171 development of PCO are the major obstacles to visual rehabilitation.

172 **IOL in traumatic cataract [19;20;21]**

173 Traumatic cataract is an indication for IOL implantation in children. Intraocular lens
174 implantation in children sometimes is very difficult. The problems are intensified and
175 magnified if there is an additional factor of superimposed trauma. There is no gross change
176 in outlook for satisfactory visual in young children with traumatic cataract. However traumatic
177 cataract not complicated by severe damage to other ocular structure is definite indication for
178 an early surgical intervention with IOL implantation (Binkhorst and Gobin, 1967). Also
179 children's eyes have a tendency to exhibit increased inflammatory response to any injury.
180 The presence of blood, lens, uveal elements and vitreous in anterior chamber stimulate
181 severe Iridocyclitis, formation of synechiae, cyclitic and vitreous membranes (Hiles,
182 1977). Amblyopic therapy in amblyopia prone patients and spectacles correction for all
183 patients' aids in the restoration of visual function. If strabismus develops early surgery is
184 indicated to restore a normal ocular alignment and secure the best possible peripheral if not
185 central vision (Hiles 1990). The posterior intraocular lens should be implanted in eyes of
186 children 2 years of age or older (Hiles et al 1987). Corneal opacity and amblyopia were the
187 most common causes of poor final visual acuity.

188 **Management [19-22]**

189 Stegmann believes that the prognosis for a traumatic cataract can be same as for a routine
190 senile cataract if the traumatic cataract is handled appropriately. This excludes cases in
191 which there is damage to the posterior segment, the vitreous has become cloudy, the retina
192 is damaged from the same trauma or where infection has occurred. Traumatic cataract is an
193 indication of IOL implantation in children. IOL either primary or secondary has proved to be
194 useful after traumatic cataract extraction. With this thought IOL has been placed after
195 extraction of the traumatic lens. [23]

196 **The management of traumatic cataract has done with (23-26,27,28)**

- 197 1. Phaco aspiration.
- 198 2. Small incision cataract surgery.
- 199 3. Extra capsular cataract extraction.
- 200 4. Surgical Management

201 Surgical management of traumatic cataracts is performed through either an anterior
202 limbal approach or a posterior pars plana approach. The choice is often based on the
203 degree of lens injury and the likelihood of vitreous loss .
204 The anterior surgical approach is useful in the following circumstances: non-dislocated
205 cataract with intact capsule, capsular rupture with cataract, subluxated lens with or without
206 cataract, and anterior lens dislocation with or without cataract. The posterior surgical
207 approach is useful in posterior capsular rupture with cataract, subluxated lens with or without
208 cataract, and posterior lens dislocation with or without cataract. (26-27,28)
209

210 **CONCLUSION**

211 In many children cataract accounts for visual morbidity following ocular trauma. The
212 successful management of traumatic cataract depends on age, extent of cataract and
213 damage to other ocular structures, type of injury and surgery undertaken.
214 Traumatic cataract is more common in younger individuals. Penetrating injuries are more
215 commonly seen. Aphakic glasses and contact lens are unsatisfactory for rehabilitation of
216 aphakia because of various problems associated with their use. At present lens removal with
217 a posterior chamber lens implantation is the ideal method of rehabilitation of patients with
218 traumatic cataract. Timely operation and implantation of posterior chamber intraocular lens is
219 a permanent method of optical correction which provides stable retinal images, induces

minimal aniseikonia and thus help to maintain binocularity. 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. The whole development of vision as well as the personality of the child depends upon giving the best possible visual acuity to the young patients at the earliest possible. Unilateral cataract in children has a definite role in correcting aphakia, resulting in good visual outcome and thus helping to maintain binocularity.

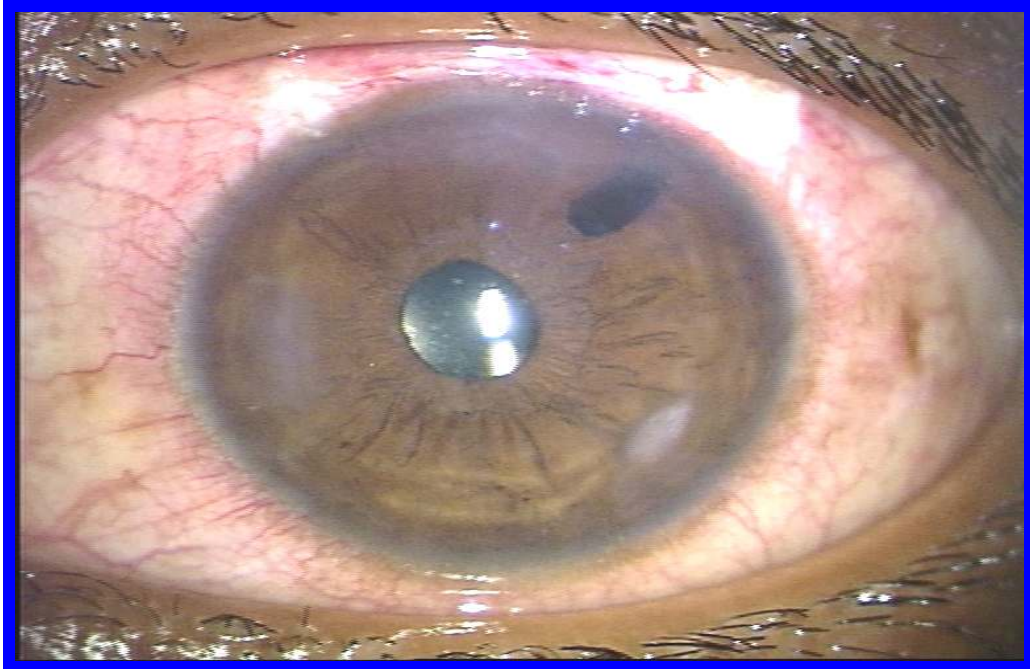
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- 291 30. **Wound of entry in Penetrating injury with Traumatic Cataract – Pre -operative**
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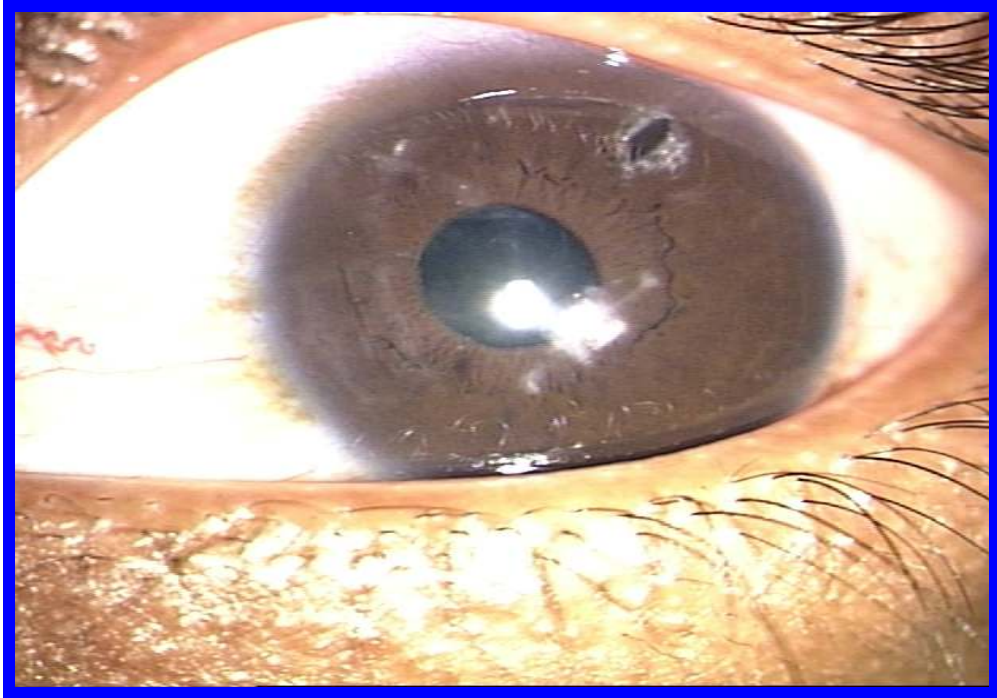
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33. Penetrating injury with Traumatic Cataract – Post-operative- PC IOL in- situ
34.
35. Fig 1



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36. Blunt injury with Traumatic Cataract –Pre-operative



- 301 37. Blunt injury with Traumatic Cataract-Post-operative- PC
302 IOL in-situ
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304 38. Fig 2

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