# PRIMARY INTRAOCULAR LENS IMPLANTATION IN TRAUMATIC CATARACT - VISUAL OUTCOME

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# CERTIFICATE

This is to certify that this dissertation entitled **"PRIMARY INTRAOCULAR LENS IMPLANTATION IN TRAUMATIC CATARACT - VISUAL OUTCOME."** Has been done by **Dr. Govindraj B** under my guidance in the Department of Ophthalmology, Madurai Medical College, Madurai.

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This is submitted to The Tamil Nadu Dr. M.G.R. MedicalUniversity, Chennai, in partial fulfillment of the requirement for theaward of M.S.,(Ophthalmology) Branch - III degree Examination to be held in APRIL 2013.

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# CONTENTS

1. Introduction…………………………........1

2. Aims and Objectives ……………………...3

3. Review of Literature ……………………...4

4. Methodology …………………………….56

5. Analysis of Data and Results……………63

6. Discussion ………………………………75

7. Conclusion ……………………………....87

8. Summary ………………………………..89

**Annexures**

Annexure I : Bibliograpy

Annexure II : Proforma

Annexure III : Master chart

Annexure IV : Ethical Committee Approval Form

Annexure V : Anti Plagarism Certificate

# INTRODUCTION

Cataract is the commonest cause for blindness in India (62.60%)[13]. Traumatic cataract accounts for about 29% of pediatric cataracts[32].

Ocular trauma is an important cause of visual loss, and cataract formation following trauma is an important cause for visual loss after ocular trauma.

Traumatic cataract may be caused by blunt or penetrating ocular trauma, electric shocks, ionizing radiations like x-rays, non- ionizing radiations such as infrared and ultraviolet light.

Children and young adults are more prone for trauma and have a higher incidence of traumatic cataract.

In traumatic cataract lens needs to be removed and as the other eye remains normal in most of the cases, the problem of unilateral aphakia sets in. spectacle correction and contact lens help to certain extent only 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.

Several studies have revealed early cataract extraction with primary intraocular lens implantation in traumatic cataract results in good vision.

This study was done at GOVT. RAJAJI HOSPITAL MADURAI to assess the visual rehabilitation that can be achieved following cataract extraction and primary intraocular lens implantation in traumatic cataract caused by blunt and penetrating ocular injuries.

This study is done with reference to age, etiology, associated ocular injuries, type of surgery, surgical complications, and final visual outcome after cataract surgery and primary intraocular lens implantation.

# AIMS AND OBJECTIVES

To assess the visual outcome of cataract extraction with primary intraocular lens implantation for traumatic cataract caused by blunt and penetrating ocular injuries.

# REVIEW OF LITERATURE

## Historical aspects

Ezra Dyer (1867) recorded earliest changes in the lens following concussion. He reported to the American Ophthalmological Society the appearance of a fracture of the lens and anterior capsule in a man who was hanged. He confirmed the etiological relationship by observing the same effect in experiment on dog.

Vogt (1921-31) described many morphological forms, these lens changes may assume. He traced their life history and established their prognostic significance.

Several observers have expanded his observation among which Kohy (1930), Lugli (1935) and Davidson (1940) deserve special mention[3].

## Literature survey

1. Daljithsinghet al[4] (1982) studied 61 cases of traumatic cataract. Blunt injuries were seen in 24(39.3%) and penetrating injuries were seen in 30(49.2%) cases.

Male: female ratio was 52:9. Associated ocular injuries seen were corneal (33.7%), iris related(26.2%), posterior synechiae(9.8%), dislocated lens(6.5%).

Final visual acuity of 6/6 to 6/12 was achieved in 70% of cases.

2. Bhatia CM, Panda et al[2] (1982) conducted a study of 101 cases of traumatic cataract with special reference to age, time of surgery following trauma and final visual outcome.

   In their study, 63 cases were children and 38 adults. The male: female ratio was 4:1.

   The commonest cause of poor vision was posterior capsular opacification.

3. Das R, Roy M, Midya A[5] (1989) studied 14 cases of traumatic cataract who underwent cataract extraction with intraocular lens implantation.

   They concluded that intraocular lens either primary or secondary has proved to be useful.

Problem of binocular single vision will be better solved and traumatic eye becoming divergent and amblyopic can thus be avoided.

4. Jones WL[6] (1991) studied the mechanism of traumatic cataract, concussive trauma to the eye produces shock wave that progress and cause insult to both anterior and posterior structures.

   Rosette cataract is characteristic of concussive trauma. Luxation and subluxation of lens are additional complications of traumatic cataract.

5. Gupta AK, Grover AK, Gurha N[7] (1992) studied 22 cases of traumatic cataract who underwent intraocular lens implantation.

   They concluded that despite associated corneal opacities and several intraoperative and postoperative complications, management of traumatic cataract with intraocular lens implantation plays a major role in good visual outcome.

6. Marcus Blum, Manfred R Tetz, Claudia G Reiners[8] (1996) studied 148 eyes with traumatic cataract.

Blunt trauma group A included 85 eyes, average age was 56.1+/-15.6 years.Penetrating trauma group B included 63 eyes and average age was 43.6+/- 19.2.

Post traumatic morphological changes included anterior chamber angle recession.

Iris defects in almost every second eye. More than one third eyes showed luxation or subluxation of lens. Rate of secondary glaucoma was 14.4%.

In group A- 72 patients (84.7%), a posterior chamber IOL was implanted. Postoperatively 69 patients (82.1%) had mean visual acuity of20/30; seven patients (8.2%) remained hand movements because nine of severe post traumatic retinal pathology.Nine patients with aphakia reached 20/40.

In group B, 42 eyes (66.6%) PCIOL were implanted. This had postoperative visual acuity of 20/35. Twenty one eyes with aphakia had visual acuity of 20/45 in 14 eyes (22.2%) and seven eyes (11.1%)

had visual acuity of hand movements to light perception because of extensive damage to posterior segment.

7. MuraliKrishnamachary, Varsha Rathi[9] (1997) reviewed 137 children, 110 boys and 127 girls who developed traumatic cataract.

   Nature of injury, type of cataract, management and outcome were evaluated.

   Most of the injuries (54.7%) were caused by stick or bow and arrow. Most (53.2%) of the cataract were total, corneal scarring (60.5%), iris-related problems (49.6%) were most common associated findings.

   Extracapsular cataract extraction with intraocular lens implantation was performed in 65.67% of patients. Visual acuity improved from 20/200 or worse in 97.7% of patients preoperatively to 20/60 or better in 74.1% of patients postoperatively.

   Posterior capsule opacification (PCO) was noted in 42.3% of patients. They concluded ECCE with IOL implantation provides satisfactory result.Associated posterior segment complication and development of PCO are major obstacles to visual rehabilitation.

8. Eckstein, Miachael, Vijaylaxmi, Killedar P[12] (1998) studied 52 children undergoing unilateral cataract extraction with IOL implantation for traumatic cataract.

   There were no serious operative complications, clinically significant posterior capsular opacification was almost universal (92%). Visual acuity was 6/12 or better in 67% of eyes.

9. Joseph Moisseiw, FaniSeger, Noga Harizman[15] (2001) reviewed 21 patients with traumatic cataract with corneal or scleral laceration caused by penetrating trauma.

   Lens with primary IOL implantation was performed in all cases. 14 eyes (67%) achieved final visual acuity of 20/40, 95% obtained 20/60 and all eyes achieved 20/1000 or better final visual acuity.

10. Mehul Shah, Shreya Shah, Shashank Shah, Vinay Prasad, and Avadh Parikh[33] (2009) evaluated 555 cases of traumatic cataract.

    They evaluated visual recovery after managing traumatic cataracts and determined the predictors of a better visual prognosis.

Study included 555 eyes with traumatic cataracts 394 eyes in Group 1 and 161 in Group 2. Six weeks postoperatively, the visual acuity in the operated eye was >20/60 in 193 (48%) and 49 (29%) eyes in Groups 1 and 2, respectively (*P* = 0.002, ANOVA).

At follow-up, >20/60 vision was significantly higher in Group 1 than in Group 2 (OR = 1.61; 95% CI, 0.85–3.02). Overall 242 (43.5%) eyes gained a final visual acuity of >20/60.

11. N A Rowe, S Biswas, I C Lloyd[34] (2004) performed a retrospective analysis of clinical data on eyes of 61 infants and children who underwent cataract surgery with primary IOL implantation.

Age at operation ranged from 3 weeks to 15 years. Mean follow up duration was 24.5 months (range 0.5–68 months). Factors examined included type of IOL (PMMA, acrylic), performance of a primary posterior continuous curvilinear capsulorhexis (PCCC) or capsulotomy with limited anterior vitrectomy, perioperative complications, and subsequent intervention for posterior capsular opacification (PCO).

Risk factors for perioperative complications were examined with 2x2 tables to give odds ratios (OR) as measures of association. A survival analysis was performed to assess risk of subsequent intervention for PCO with different IOL types.

They found that compared to acrylic, PMMA IOLs were significantly associated with perioperative complications (OR 5.2, 95% CI 1.4 to 19, p = 0.01). No statistically significant difference in risk of subsequent intervention for PCO was found between different IOL types.

They concluded that primary implantation of foldable soft acrylic IOLs in pediatric eyes may allow fewer perioperative complications than rigid PMMA IOLs.

12. Weinand F, Plaq M, Pavlovic S[35] (2003) performed a retrospective study of primary implantation of posterior chamber IOL after traumatic cataract.

Retrospective study of 15 patients admitted for traumatic cataract with corneal laceration with and without IOFB. In all patients, lens removal and lens removal and primary IOL implantation was performed.

53% achieved a final vision of 20/40 or better. 12% eye achieved 2/100 or better final visual acuity. Major causes for limited vision were irregular astigmatism, central corneal scar. 25% developed secondary cataract and underwent yag laser capsulotomy.

# Anatomy biochemistry and physiology of the crystalline lens

## Anatomy

The lens of human eye is a biconvex, transparent, ellipsoid, avascular, crystalline structure situated in the patellar fossa between irisanteriorly and the vitreous posteriorly.

As the lens grows throughout the life its dimensions are increased as age increases[36]. The diameter of lens is about 6.5mm at birth which increases to about 9-10 mm in the second decade of life. Thickness varies from 3.5mm at birth to 5mm at extremes of age and weighs between 135mg at younger age to 255mg in older age group[37].

Overall refractive index of lens is 1.39; refractive index of the nucleus is about 1.42 which is slightly higher than refractive index of the cortex which is about 1.38.

The lens contributes to about 15 diopters of the total 40 diopters power of the eye[38].

Lens also changes in color with increasing age, which changes from being transparent in infants to yellowish in 3rd decade to amber colored in old age.

Lens is made up of capsule- which surrounds the lens completely, anterior lens epithelium- which lies beneath the anterior lens capsule and the lens fibres- which are formed from epithelial cells.

Lens capsule

It is elastic, collagenous, transparent membrane secreted by lens epithelium anteriorly and elongating fibres posteriorly. It is the thickest basement membrane in the body and thicker anteriorly than posteriorly[37].

Capsule is made up of mainly collagen mostly of type 4 and glycosaminoglycan’s.

Under light microscopy the lens capsule shows a homogenous structure and stains with Periodic Acid Schiff, and under ultramicroscopic examination capsule has a lamellar appearance.

Each lamellae is made up of fine filaments.

Lens capsule receives insertion of zonular fibres at the equator[38].

Anterior lens epithelium

Anterior lens epithelium is a single layer of cuboidal epithelium lying beneath the anterior lens capsule. The epithelial cells are nucleated, containing all the organelles as in other typical epithelial cells.

Almost all the metabolic, synthetic and transport processes of the lens takes place in this layer[37].

At the equatorial region the cuboidal epithelium transforms into columnar and actively divide and elongate to form new lens fibres throughout life.

The anterior lens epithelium is divided into 3 zones namely central zone, intermediate zone and the germinative zone.

1. Central zone: It consists of flat, polygonal, cuboidal cells, containing round nuclei situated slightly apically.

These are stable cells and there number decreases slowly with ageing as those of corneal endothelial cells.

2. Intermediate zone: It consists of cells which are more cylindrical and relatively smaller in size, with round nuclei located centrally.

   They undergo mitosis occasionally.

3. Germinative zone: This zone is located in the pre-equatorial region, consisting of columnar cells. The nuclei of these columnar cells are flattened and lying in the plane of cell axis.

   The cells of germinative layer are actively dividing throughout life, to form new cells which migrate posteriorly forming lens fibres.

Lens fibres

These are formed by elongation of epithelial cells. Initially they are formed from posterior epithelium, later on from anterior epithelium at the equator. The epithelial cells divide, elongate and differentiate to produce long, thin, regularly arranged lens fibres, successively new fibres are laid on the older deeper fibres[37].

On cross section lens fibres are hexagonal in shape and are bound together by ground substance. There are interlocking processes between cells along with zonulae occludentes. The tips of the fibres meet those of other fibres to form sutures. In the fetal nucleus there is anterior erect Y and posterior inverted Y suture and in adult nucleus the sutures have a stellate appearance[38].

The lens fibres are arranged into different zones as nucleus and the cortex. The nucleus is the central part containing oldest lens fibres. It is further made of different zones- embryonic, fetal, infantile and the adult nucleus. Cortex lies outside the nucleus and is formed by youngest lens fibres.

## Biochemistry

Biochemically lens is mainly made up of water (65%) and proteins (34%). Lipids, glucose, inorganic ions, ascorbic acid, amino acids and glutathione constitute remaining portion of lens.

Lens is relatively dehydrated organ, cortex being more hydrated than nucleus. This relatively dehydrated state of lens is maintained by active sodium pump present in cell membrane of lens epithelium and the lens fibre.

Protein content of the lens is higher than that of any other organ in the body. It mainly contains two types of proteins namely insoluble and soluble. Cortex is richer in soluble proteins whereas nucleus mainly contains insoluble proteins. The insoluble proteins also called as albuminoids constitute to about 12.5% of total lens proteins. The soluble proteins also called as crystallins are alpha, beta and gamma crystallins[36]. Other minor proteins in lens are mucoproteins, nucleoproteins, glycoproteins, phosphoprotein and lipoprotein.

Carbohydrate metabolism in lens is highly active and main carbohydrates of lens include glucose, fructose and glycogen. Aqueous humour is the source of glucose in lens and the fructose is produced from glucose within the lens.

In addition lens also contains lipids mainly cholesterol and phospholipids; electrolytes (sodium, potassium, calcium and magnesium); organic phosphates; glutathione and ascorbic acid.

Glucose metabolism is the main source of energy for the lens, which is metabolized by anaerobic glycolysis, Krebs cycle, Hexose MonoPhosphate shunt and sorbitol pathway. About 80% of glucose is metabolized by anaerobic glycolysis, Krebs cycle is limited to the lens epithelium and Hexose MonoPhosphate shunt is used for production of pentose and NADPH.

Proteins are synthesized from free amino acids which are actively transported into the lens from the aqueous humour and are broken down by the enzymes peptidases and proteases.

Important factors responsible for transparency of lens are-

1. Single layer of epithelial cells.
2. Semipermeable character of lens capsule.
3. Sparsity and highly packed nature of lens cells.
4. Characteristic arrangement of lens proteins.
5. Pump mechanism of lens fibres.
6. Avascularity of lens and
7. Auto-oxidation (glutathione maintains the lens proteins in reduced state)

# MECHANICAL INJURIES

The mechanical injuries of the eye can be broadly classified into blunt and penetrating injuries.

Various terms are used to describe ocular trauma like closed/open globe injury, contusion, penetrating injury, perforating injury. According to Birmingham eye trauma terminology meaning for various terminology is as follows[39].

Closed globe injury- No full thickness wound of eye wall (the cornea and the sclera are not breached through and through)

Open globe injury- Full thickness wound of eye the wall (the cornea and/or sclera are breached through and through)

Contusion- No wound of the eye wall (The damage may be due to direct energy delivery/shock wave by the object, or to changes in the shape of the globe)

Rupture- Full-thickness wound of the eye wall, caused by a large blunt object (Since the eye is filled with incompressible liquid, the impact results in instant IOP elevation. The eye wall yields at its weakest point the actual wound is produced by an inside-out mechanism, and tissue prolapse is almost unavoidable)

Laceration- Full-thickness wound of the eye wall, caused by a sharp object (The wound is at the impact site and is created by an outside-in mechanism. since IOP elevation is unavoidable, tissue prolapse is common)

Penetrating injury- An entrance wound is present (If more than one wound is present, each must have been caused by a different object)

Perforating injury- Both an entrance and an exit wound are present (The two wounds caused by the same agent)

## Blunt trauma[16]

Wolter and weidenthal descried the pathogenesis of lens changes following blunt ocular trauma as coup and contre-coup injuries along with equatorial expansion of globe due to trauma.

Coup refers to direct damage at the site of impact resulting in abrasion or laceration, whereas contre-coup is damage occurring at a site distal to the site of impact caused by shock waves. Contusion cataract formation for an instance may result from contre-coup injury following a blunt trauma to the orbital region.

Shock waves passing through the eye may rupture the lens capsule with subsequent lens opacification and cataract formation.

The coup and contre-coup injuries are not the only forces and therefore cannot explain all injuries resulting from blunt trauma. Wiedenthal and schepens demonstrated changes in globe shape following blunt trauma i.e. equatorial expansion theory, which states that following blunt trauma to globe in anterior or posterior direction causes shortening of the meridian, with concomitant equatorial stretching.

The equatorial expansion may cause a rupture in the lens capsule at the equator resulting in lens opacification.

**Penetrating injuries**[17]

Penetrating injuries are as a result of objects with sharp edges striking the globe. These injuries occur most often at work[4].Injury from a penetrating object is both a result of cutting characteristic of object and its blunt force.

As in blunt injury, when a sharp object strikes the eye, energy is transmitted to the stationary globe.

Mechanism of penetrating injury can be classified as either intermediate or secondary. The immediate mechanisms of injury are the shearing and cutting forces and the forces of decompression of the globe.

The secondary mechanisms of injury are setup into motion during initial injury but often take days weeks or months to develop. They include inflammation, infection, etc. It is often these secondary changes that result in devastating complication of ocular penetration. The difference between blunt and penetrating injuries is therefore is the mode of transfer of energy rather than the magnitude of energy.

**Injuries of the lens[17]:**

Injuries to the lens and its supporting structures result from both concussive and penetrating trauma. They develop with unexpected frequency even after minor concussion of globe[4]. Apart from paresis or tearing of iris, lenticular damage is the commonest sequel of injuries of this type.

## **Mechanism of lens damage**[17]-

Concussion injuries:

In lens the vascular reaction and contusion effect are absent so that only the concussion effect on the cells themselves and laceration of the tissue becomes evident.

Pathogenesis-

When a sudden force strikes the eye, a wave of pressure thrusts the aqueous and iris forcibly against lens and pushes it backward into the vitreous, on its rebound the lens hurls itself a back against the iris. Moreover in fluid contents of the globe, the force is transmitted in all direction so that the capsule and its epithelium as well as lenticular substance itself are concussed. This may damage the protoplasmic structure of lens fibre and necrosis of the capsular epithelium as well as ciliary epithelium may result.

Bellows and Chinn (1941) found experimentally that after digital manipulation in vitro, even when the capsule was not torn, slightly traumatized lens initiated twice as much water as controls; this was attributed to separation of normal contiguity of fibres. Finally the damage to the capsule due to concussion may impair its semi-permeability allowing the imbibition of aqueous by the lens substance and disturbing the active transport of metabolites.

In more severe trauma, the mechanical force involved the forcible to and fro movements of the lens, the distortion of its shape and the strain put on zonules by the sudden anteroposterior contraction and associated circumferential expansion of the equatorial region of the globe may cause break in the capsule.

It has been general custom to divide concussion cataract into two categories i.e. those with a capsular tear and those without tear in the capsule.

In capsular tear there is free entry of aqueous into the lens, whereas in one which tear is absent, there is derangement of normal semi-permeability of capsule leading to similar but less severe imbibition of fluid.

Moreover the clinical appearance of the two varieties of cataract those occur with or without a visible capsular tear are frequently similar.

In vast majority of cases following concussion injury the opacity is localized and stationary with characteristic morphological features as to be diagnostic of previous injury even in absence of definite history of trauma[4].

such lesions are typically seen in young. Both experimentally and clinically they invariably commence in subcapsular zone and frequently retain a segmental distribution.

Some of these changes are transient, in which case they are probably due to the presence of fluid between the cellular element accompanied by cytoplasmic changes leading eventually to necrosis and fragmentation of cells sand fibres.

As the time goes these subcapsular lesions tend to be buried by the new formation of clear lens fibres, so that eventually they lie deeply in the lens with a zonular distribution, separated from the capsule by an optically clear zone.

In individuals above 40 to 50 years of age, initially similar opacities may appear, but these tend to be followed by progressive changes either pre-senile changes of the coronary type or those typical of senile cataract. It would seem that the injury serves to activate these degenerative processes, which gradually obliterate the specific morphology of the concussion opacities.

The difference in reaction of the young and old lens may be partly due to the greater resilience of the iris and the softer and more readily molded consistency of the youthful lens and partly to the tendency already present in the ageing lens to develop senile changes.

The lenticular opacities following concussion are protean in their morphology.

1. Localized opacities due to subcapsular changes
2. Vossius ring opacity
3. Diffuse cataract changes

**Vossius ring opacity[17]:**

A ring corresponding to the pupillary aperture composed of myriads of reddish brown or bronze amorphous granules of pigmented disposed flatly on anterior lens capsule following concussion, was first described by Vossius in 1903.

The ring is about 1mm in breadth and the pigment lies in single layer on the surface of the capsule, but the concentration of granules lessens and becomes more irregular axially and equatorially, the ring is also usually segmented in shape with constrictions or gaps in its contour, an appearance which seem to correspond to ridges and folds on the posterior surface of iris. The annular deposition of pigments appears only in young and tends to disappear slowly and gradually in course of several weeks or months.

**Discrete Sub-epithelial Opacities**[17]:

Concussion damage to the capsule impairs its permeability and lead to formation of subcapsular opacities. Depending on extent of damage, opacities may be localized or more widespread and depending on degree of force involved, the opacities may be transient or permanent.

**Sub-epithelial Disseminate Opacties**[17]:

The occurrence of small discrete punctate or flattened flake like opacities lying underneath the anterior epithelium following concussion to the eye was first studied by Vogt in 1922.

Rarely the sub-epithelial opacities are of considerable size, discrete, dense and round with layered structure somewhat like anterior polar cataract (cataractanodiformis).

**Cobweb Subcapsular Opacity**[17]:

It is rare opacity following both concussive and perforating injuries, it affects young people described by Rolette in 1940, usually in association with anterior, less frequently with posterior capsule.

**Traumatic Rosette shaped Opacity**[17]:

These are the result of more acute and diffuse changes, and constitutes most typical clinical picture following both concussive and perforating injuries, it occurs in presence or absence of tear in the capsule. The opacities originally described by Dyer in 1867.

**Traumatic Zonular Cataract**[17]:

This is probably end result of disseminated opacities occurring extensively over the lens or a rosette. Opacity following an injury received in early youth. The opacity may be vague and cloudy or dense and sufficiently opaque to abolish useful vision.

**Penetrating injuries of the lens**[17]:

The damage caused from penetrating injury to lens may vary from a localized or transient opacity to complete breaking of the lens.

After a penetrating injury, typical concussion changes are frequently seen in the lens. This is because a penetrating injury also has considerable concussive effect. As a rule, the concussion is probably indirect, but direct injury can occur when a penetrating foreign body strikes the capsule tangentially without perforating it.

**Localized Stationary Cataract**[17]:

These may assume the forms of scar in the capsule and opacities in the lens along the track of the wound. Capsular damage is invariable in penetrating injury, but in stationary type of cataract the tear in the capsule seals up before permanent and widespread damage is due. The tear in the capsule may gape allowing the lens fibres to protrude into the anterior chamber.

**Rosette (star shaped)**[17]:

A frequent sequel of perforating wound of the lens is rosette shaped opacity occurring in the subcapsular area, more commonly at the posterior pole. The rosette is situated axially and lies in a circumscribed plane.

**Total traumatic cataract**[17]:

Sometimes the whole lens swells up and becomes milky and opaque. The lens fibres become separated by cleft of fluid eventually the entire cortex tends to become uniformly milky white. In young people, the whole tissue may get absorbed producing aphakia, but after 30 years of age, it may lead to secondary glaucoma or recalcitrant iridocyclitis.

**Associated injuries to the ocular structures**[17]:

**Conjunctiva**:

Cojunctival hemorrhage of varying severity can occur. A subconjunctival hemorrhage may represent blood extending from an orbital injury or basal skull fracture or an occult scleral tear.

**Cornea**:

Following changes occur either due to blunt or perforating injury. Corneal edema either localized or generalized, folds in descemet's membrane are common. Blood staining of cornea due to hyphema with raised tension.

Broderlack(1972) found blood staining of the cornea in 6 of the 27 cases, which developed glaucoma[4]. Rupture of the cornea is more common in children occurring most often at the limbus. Most cases are associated with prolapse of the iris. Penetration of the lens capsule complicates up to 30% of all corneal laceration.

**Iris**[10]:

Most of the injuries of the iris are due to concussion probably resulting from the sudden impact of a pressure wave of aqueous driven backward by the incurving of the cornea, which forces the iris against a relatively unyielding lens. Iris sphincter tears occur along the pupillary margin and may be single or multiple.

**Pupil**[10]:

Spastic miosis is a constant immediate sequel to trauma to the globe. Trauma affects pupillary sphincter, its nerve supply and blood supply. Accommodation may or may not be paralysed.

**Hyphema**[10]:

Initial spasm followed by reactive vasodilation or when severe tears of vessels on the face of ciliary body or iris results in hyphema. Primary hemorrhage usually resolves without complications. Secondary hemorrhage occurs usually in second to fifth day, especially in old people due to lysis of clots (Cronch 1976).

According to Edward and Laydan (1973) 22% are primary hyphema and 58% secondary. Complications like blood staining of cornea and glaucoma can occur.

**Iridodialysis**[11]:

When trauma is of considerable severity as from direct blow of a stone, a ball or other flying object, the iris may be torn away from its insertion into the ciliary body.

**Ciliary body and angle structure**[11]:

Treacher Collins (1892) was the first to draw attention to tears in the anterior face of the ciliary body. Wolf and Zimmerman (1962) described frequent occurrence of angle recession and damage to major arterial circle in pathological specimens. Injury to ciliary body and angle structures result in secondary glaucoma.

**Posterior Segment Involvement**[11]:

The ring tissue at the vitreous base is prone for damage following trauma. This is one area most difficult to examine, particularly in immediate post traumatic period. As experimental studies of Wiedenthal and Schepens have demonstrated, equatorial expansion of the globe creates shearing forces between the extensible ocular wall and the relatively inextensible vitreous base.

Common pathological changes in this area include retinal breaks, avulsion of vitreous base, retinal dialysis and retinal detachment.

In penetrating injuries the retinal detachment is due to severe traction produced by vitreous bands and membranes that characteristically originate from the laceration in the wall.

Retinal tear and holes that occur posteriorly are more commonly due to the direct result of the coup-contrecoup forces. These holes are more common in the infero-temporal quadrant, which is the most frequent site of impact. Macular holes due to sudden separation of posterior hyaloid can occur.

Choroidal breaks occur following blunt injury. The classic Choroidal rupture is a tear in the chorio-capillaries and overlying Bruch’s membrane and is typically concentric to the disc.

Vitreous hemorrhage and avulsion of the optic nerve are the other associated problems that complicate the picture in these cases.

Berlin edema (commotio retinae) is a post traumatic retinal condition that may manifest even after relatively mild blunt trauma. Berlin in his original description attributed the changes to an extravasation of blood between the choroid and the sclera that resulted in compromise in the chorio-capillaries and consequent outer retinal ischemia with transudation of fluid into the retina.

**Optic Nerve Involvement**[11]:

The optic nerve is rather resilient to injuries from blunt trauma. In the absence of penetrating injury, blunt injury results in indirect injury to optic nerve.

**Associated Complications**:

**Iritis**[18 19]:

Post traumatic inflammation can lead to severe ocular complication. The inflammatory response to ocular trauma can range from mild, self-limited post traumatic iritis to fulminant panuveitis. In penetrating trauma, the chance of post-traumatic inflammation is increased because of liberation of lens material with resultant glaucoma.

**Glaucoma**[20]:

Traumatic cataract patients can present with glaucoma could be induced by lens itself or may be due to traumatic angle recession.

Tojin (1966) believes that 94% of patients with hyphema also have angle recession. Howard and Mooney (1965) have classified angle recession into 3 grades according to severity.

Grade-I Shallow angle tears

Grade-II Moderate angle tears

Grade-III Deep angle tears

Patients with tears more than $180^o$ have great risk of developing glaucoma (Kauffman, 1974). Lens induced glaucoma may be due to phacolytic, phacoanaphylactic or phacomorphic causes.

**Lens subluxation and dislocation**:

Injury to the suspensory ligament results in subluxation or dislocation of lens into various position[17].Subluxation occurs when at least25% of the zonules are ruptured[21]. A more severe injury can lead to dislocation of lens into vitreous, anterior chamber or rarely subconjunctivally[17].

A subluxated lens may cause astigmatism and glare, while a dislocated lens poses problems depending on the site of dislocation. If lens is dislocated into anterior chamber, pupillary block and corneal endothelial damage may set in and needs emergency extraction[6].

**Evaluation**[21]:

**History**: A detailed history is essential. A Standard medical and ocular history is taken.

**Ocular History**:

- -Past history of each eye including baseline visual function.
- -Previous injury
- -Amblyopia
- -History of eye disease
  - Glaucoma
  - Optic neuropathy
  - Cataract
- -Mechanism of injury
- -Precise nature of foreign body
- -Nature of visual complaint

Acute stable versus gradual visual loss

-Monocular diplopia

**Examination**[21]:

A detailed examination should be performed to assess the extent of injury and to estimate the risk of infection.

**Vision evaluation**[21]:

Impaired visual acuity after trauma is common finding and in some instances, the most important predictor of visual outcome. It is important to determine the poor visual acuity is a result of media opacity, rather than retinal or optic nerve pathology.

If lens opacity or vitreous hemorrhage precludes visualization of fundus, subjective test like PL, PR,two point discrimination, Maddox rod testing etc. should be done to assess visual prognosis[17].

**Intraocular Pressure Measurement**[21]:

Accurate measurement of IOP can be limited in patient with severe ocular trauma because of lid swelling, corneal irregularities or edema; very low tension should arouse the suspicion of occult globe rupture.

High tension can be caused by angle damage, pupillary block, dislocated lens or phacolytic glaucoma.

**Anterior Segment Evaluation**[21]:

Anterior segment involvement is common in injuries of the lens. Several structures like the iris, ciliary body and trabecular meshwork may be damaged[10].Asymmetry of the depth of anterior chamber in the involved and uninvolved eye may reveal lens subluxation or dislocation[10]. Iris sphincter tears usually lead to miotic, poorly reactive pupil. Vitreous in the anterior chamber signifies zonular disruption.

**Angle Evaluation**[22]:

It is not possible in the acute setting because of lid swelling, corneal clouding and in cases of suspected globe rupture.

Gonioscopy should be performed after stabilization of the injury and visualization is best.

Presence of peripheral anterior synechiae, posterior synechiae or a retinal foreign body may alter the therapeutic decision.

**Lens Evaluation**[21]:

Knowledge of lens status is called for in planning surgical intervention. Integrity of the capsule and zonules are important. Zonular disruption can be inferred from the presence of iridodonesis or phacodonesis.

If the lens is dislocated into the vitreous, it may settle at the vitreous base or may be seen over the posterior pole.

**Posterior Segment Evaluation**[22]:

Evaluation by direct ophthalmoscopy is difficult in case of traumatic cataract. Vitreous hemorrhage may hinder indirect ophthalmoscopy.

**Ancillary Studies**[22]:

B-scan ultrasonography can provide valuable information in the setting of hyphema, dense cataract or vitreous hemorrhage. In addition to delineating a foreign body, several other important diagnosis can be ascertained including iridodialysis, zonular rupture, lens capsule rupture, detachment of posterior vitreous, retina and choroid.

## MANAGEMENT

**Non-Surgical Management**[21]:

After acute injuries have been treated, non-surgical management of focal lens opacities may be attempted. In general, the principle is to alter the pupil size or position either to correspond to a clearer area of lens or to render the patient aphakic.

Miotic and Mydriatic agents[23]:

In case of focal and eccentric lens opacity, miosis can prevent glare. In case of subluxation, miotic agents serve to relax the zonules, thereby allowing the lens move anteriorly, minimizing the induced myopia. When lens is dislocated, the use of miotic agent may clear the visual axis, rendering the patient aphakic.

Laser iridoplasty and Zonulysis[23]:

When chronic Mydriatic therapy is poorly tolerated, laser photomydriasis may be considered. The goal of this treatment is to reposition the pupil, leaving an aphakic visual axis.

**Surgical management**:

Surgical outcome of traumatic cataract was poor in the past[21]. Improved closure of the corneoscleral laceration and a better understanding of vitreous along with the advancement of vitrectomy equipment's and techniques have improved the surgical procedures[24]. Development of viscoelastic and intraocular lenses have made this type of surgery more successful[21].

**Indication for Lens Removal**[24]:

-Primary lens removal is rarely necessary, but pupillary block or lens induced reaction may prompt intervention.

-In the absence of glaucoma, iritis or its sequelae, a cataractous lens can be removed electively, the indication being same as those for senile cataracts.

-Lens induced reactions call for emergent surgery and ECCE with posterior chamber intraocular lens can be done after careful assessment of the eye.

**Indication for Intraocular lens implantation**[24]:

The decision to insert intraocular lens in a case of traumatic cataract requires forethought. In the simplest case of an intact capsule and zonules an IOL can be inserted into the capsular bag. If the lens is subluxated or dislocated, an ACIOL or sulcus fixation lens or scleral fixation lens may be placed.

**Preoperative Management**[21]:

Preoperative management of patient with traumatic cataract differs in the acute and non-acute settings.

If a ruptured globe is suspected, a shield should be placed over the periorbital region, tetanus toxide administered and conjunctival swab should be taken for culture. Broad spectrum intravenous antibiotics are administered.

When cataract extraction is planned electively, inflammation and IOP should be treated medically. Health of the cornea and endothelial count should be assessed. When intraocular lens insertion is planned, IOL power must be determined using A-scan biometry[24].

**Surgical Technique**[24]:

The surgical technique chosen for lens removal is based on both the integrity of the capsule and the status of zonules.

1. **Capsule intact, Zonules intact**: When the capsule and zonules are intact, the case can be managed as a non-traumatic cataract[21]. If a small anterior capsular rupture is present, the capsular flap may be grasped and a capsulorrhexis may be performed.
2. **Capsule intact, Zonules broken**:

**Lens subluxation**: In the young patient, if zonular disruption is minimal and no vitreous is present in the anterior chamber, a gentle dry aspiration may be performed[21]. Phacoemulsification technique may help avoid further stress on the zonules[21, 24].

3. **Anterior capsule broken, zonules intact**[21]: If a small central anterior capsular rupture is present, it may be possible to grasp the capsular flap and perform a capsulorrhexis. A beer-can-type capsulotomy can be performed surrounding a central capsular tear[10].
4. **Dislocation of Lens**[24,25]: Dislocation of the lens into AC is an emergency situation because of the associated pupillary block and

raised IOP. Corneal touch and subsequent decompensation also make the surgery more difficult.

Initially attempts may be made to reposition the lens using mydriatics, osmotic agents to dehydrate the vitreous, corneal manipulation with a indentation gonioscope, or a cotton swab, if adequate repositioning is achieved, pilocarpine therapy is started and peripheral iridotomy performed[24]. In case of dislocation of lens into vitreous, if there is no reaction it can be left alone[25].

5. **Capsule broken, Zonule broken**[24]:

This situation usually occurs more with penetrating trauma and may be complicated by vitreous hemorrhage and retinal injury. A pars plana approach allows aggressive removal of fragments dislocated posteriorly.

**Surgical Technique for Intraocular Lens Implantation**:

The surgical techniques are identical to those used for non-traumatic cataracts with several modifications[21]. Intraocular lens implantation depends primarily on capsular and zonular support[4]. An IOL can be placed within an intact capsular bag, if the posterior capsule is ruptured and anterior capsule is intact peripherally, PCIOL can be placed in the sulcus[1].

In the absence of capsular support, an ACIOL or posterior chamber scleral fixated lens may be used. Alternatively an iris fixated lens may also be used[1,4].

**Complications:**

**Intraoperative complications**[26]:

1. Posterior capsular tears or rents due to inadvertent handling of instruments in AC during surgery.

2. Posterior capsule rupture may be accompanied by vitreous loss.

3. Loss of lens material into the vitreous where it is irretrievable using an anterior approach is the primary lens related intraoperative complication.

Capsule tear with vitreous loss is managed by doing a good vitrectomy. If sufficient capsular support is present, then posterior chamber intraocular lens can be implanted.

Capsule tear with vitreous loss is managed as follows:

-If the tear is small, a posterior chamber intraocular lens may be implanted with the aid of a guide.

-If tear is large, then an anterior chamber intraocular lens may be used.

Vitreous loss[24]:

It is one of the serious complications in traumatized eyes. Presence of glaucoma and positive vitreous pressure in children in a traumatized eye predispose to vitreous loss.

Measures to Prevent Vitreous Loss[24]:

-Preoperative osmotic agents should be used to control IOP

-Any external pressure on the globe should be removed before the AC is opened.

Management of Vitreous Loss[24]:

In the absence of automated vitrectomy instrument, an anterior vitrectomy is performed and miotics are installed, topical and systemic steroids are usually required for several weeks to control postoperative iridocyclitis.

**Postoperative Complications**[24]:

The postoperative complications after traumatic cataract extraction can be secondary to trauma surgery or both.

Striate keratopathy:

Damage to the corneal endothelium during surgery can lead to corneal edema and folds in the descemet's membrane. This risk of damage to the corneal endothelium during intraocular lens insertion can be reduced by viscoelastic substance. Moderate to severe keratopathy may be treated by installation of hypertonic saline drops (5% sodium chloride).

Cases with irreversible endothelial damage may develop pseudophakic bullous keratopathy, which needs keratoplasty.

Shallow anterior chamber:

The common causes for shallow anterior chamber are as follows:

1. Leaking wound

2. Pupillary block

3. Severe vitreous hemorrhage

4. Choroidal detachment

Symptoms and Signs[24]:

In case of late loss of chamber, there may be sudden pain and sensation of moisture.

-The AC may show variation in depth on each examination.

-The conjunctiva overlying the area of wound leak show a bogginess.

-If the anterior chamber is shallow for more than 48 hours, then there might be Choroidal detachment.

Treatment[24]:

If the anterior chamber is flat 24 hours after surgery, firm pressure is applied to the operated eye.

Hyphema[24]:

In 1974, Meumenee reported 2% incidence of hyphema. Hemorrhage into the anterior chamber can arise from the cataract incision, the ciliary body or iris. Postoperative bleeding occurs not commonly between 2nd and 7th days after surgery. Injury to the ciliary body increases the chance of hyphema.

Blood absorption in the eye occurs by two routes, the trabecular meshwork and the uveal pathway involving the iris and ciliary body.

Complication due to hyphema leads to corneal blood staining with elevated IOP. Secondary glaucoma can occur due to hemolytic glaucoma.

Treatment[24]:

If the blood does not absorbed in weeks' time, then a paracentesis should be done. If IOP is raised, it should be treated with topical and systemic drugs.

Retained Lens Matter[24]:

1. Lens cortex in anterior segment: The cortex swells and can impair vision for few weeks. It dissolves in a few weeks of time. If the cortex gets trapped between anterior and posterior capsule then it constitutes to sommering's ring.

2. Nucleus in the anterior segment: If it lies in contact with the endothelium, it can cause endothelial damage; if nucleus is not removed it can lead to endothelial dystrophy.

3. Cortex in posterior segment: The posterior capsule and hyaloid face are disrupted allowing cortex into the vitreous cavity.

4. Nucleus in posterior segment: If the fragment of nucleus is in the vitreous cavity with no rise in IOP it can be managed conservatively. A chronic low grade macular edema begins and persists until the nuclear matter dissolves.

Posterior capsular opacification:

The incidence of PCO is 18% to 50%[27]. After cataract may present as thickened posterior capsule or dense membrane or sommering's ring which refers to thick ring of after cataract formed behind the iris enclosed behind the two layers of capsule or elschnig pearls in which the vacuolated subcapsular epithelial cells are clustered like soap bubbles along the posterior capsule[9,24,26,27].

Treatment:

Posterior capsular opacification can be best treated with Nd:YAG laser capsulotomy[27].

Cystoid Macular Edema:

It is also called as Irvine Gass syndrome. Predisposing factors include inflammation, vitreous traction and generalized vascular incompetence; prostaglandins have been implicated as mediator for various stimuli[24].

Intraocular Lens related complications:

Complications like decentration and tilt can occur. Decentration occurs with intraocular lens fixated in ciliary sulcus than those in within the bag. These lenses may be displaced downwards (sunset syndrome) or upwards (sunrise syndrome)[24].

In some cases, the lower loop may remain fixed in position, while upper haptic and optic move side to side causing wind shield wiper syndrome. These lenses need fixation of the upper loop or removal of posterior chamber intraocular lens[4].

Endopthalmitis:

Post-traumatic endopthalmitis remains a complication of penetrating ocular trauma with grave prognosis[28]. Rate of culture positive endopthalmitis following penetrating ocular trauma ranges from 2% to 7%[29].

Chiselit et al reported the surgical result of traumatic cataract, noted endopthalmitis in 3.2% of cases[28].

Symptoms and Signs[28,29]:

Pain, marked visual loss, lid edema, corneal haze, fibrinous exudates in AC, hypopyon, vitritis and inability to see fundus.

Treatment[28,29]:

Intravitreal antibiotics should be given after the culture reports have been obtained. Vancomycin or Amphotericin-B (in case of fungal etiology) should be injected into the mid vitreous cavity using a 25G needle. Periocular injections of antibiotics like Vancomycin 25mg and ceftazidime 100mg can be given daily for 5 to 7 days.

Steroid therapy should be given under antibiotic coverage.

Vitrectomy: when patient does not improve within 48 hours after above therapy, vitrectomy should be performed.

# MATERIALS AND METHODS

The present study consists of 34 cases of traumatic cataract in age group of 5 to 50 years attending Government Rajaji Hospital, Madurai Medical College, Madurai. The study was done for a period of nine months from March 2012 to November 2012.

Out of 34 cases, 24 were male and 10 were female. Out of 34 cases, 29 cases underwent small incision cataract surgery with posterior chamber intraocular lens implantation, 5 cases underwent small incision cataract surgery with anterior chamber intraocular lens implantation because of posterior capsular rupture.

These 34 cases were taken proper and detail history regarding cause of trauma, duration, associated ocular injury; intraoperative and postoperative complications were noted. The visual prognosis after the surgery was noted.

**Inclusion criteria:**

All patients within age group of 5 years to 60 years having traumatic cataract due to blunt and penetrating ocular injuries.

**Exclusion criteria:**

All the cases of traumatic cataract having complex posterior segment injury on clinical examination or investigation, secondary glaucoma, retained intraocular foreign body.

Traumatic cataract due to electric shocks, ionizing radiations like X-Rays, non- ionizing radiations such as infrared and ultraviolet light.

Cases in which intraocular lens could not be placed primarily after cataract extraction.

**Methodology**:

These 34 cases of traumatic cataract were admitted and the following tests were done preoperatively:

- Routine blood analysis
- Routine urine analysis
- Lacrimal patency test
- Intraocular pressure measurement
- Systemic examination
- Blood pressure

- Radiological study, B-scan ultrasonography to rule out intraocular foreign body, retinal detachment, vitreous hemorrhage.

**Ocular examination**:

- Using torch light, slit lamp biomicroscopy, direct and indirect ophthalmoscopy was done.
- Preoperative visual acuity was recorded in both eyes.
- Keratometry and A-scan biometry was done for intraocular power calculation, but in case of corneal scarring the power of other eye was calculated.

**Preoperative Preparation**:

- Informed and written consent was taken.
- Xylocaine 2% test dose injection was given.
- Topical antibiotic eye drops every 2 hours for 1 day prior to surgery.
- Tab acetazolamide 250 mg; 1 tablet was given at night and one in morning before surgery.
- Antiglaucoma medication was given in cases associated with glaucoma with raised IOP.

- Eyelashes were trimmed.
- Pupils were dilated with 1% cyclopentolate or 0.5% tropicamide until full dilation was achieved.

In case of traumatic cataract associated with inflammation, it was controlled by topical antibiotic and NSAIDs before taking for surgery.

In uncooperative cases they were posted under general anesthesia, they were subjected to pre-anesthetic checkup and advised to keep on empty stomach overnight.

**Surgical procedure**:

**Anesthesia**:

Peribulbar anesthesia was given, which consist of 2% Xylocaine with adrenaline in a concentration of 1 in 1,00,000 and hyaluronidase 15 units per ml.

General anesthesia was given in un cooperative patients.

- Part was painted with betadine solution and draped.
- Superior rectus bridle suture was applied and fornix based conjunctival flap was raised.

- Manual Small incision cataract surgery was performed with 6-6.5 mm scleral incision made 2.5 mm behind anterior limbus.
- Using crescent knife a partial thickness scleral tunnel was dissected into cornea.
- A side port paracentesis was made.
- The anterior chamber was entered with 3.2 mm keratome and the anterior chamber was filled with viscoelastic before making a 6-6.5 mm capsulorrhexis.
- Hydrodissection and hydrodelineation done and nucleus prolapsed into the anterior chamber.
- In case of can-opener capsulotomy or where hydroprolapse is incomplete, using sinsky hook nucleus was prolapsed into the anterior chamber.
- The nucleus was hydroextracted with an irrigating vectis.
- The epinucleus and residual cortex were aspirated with a simcoe cannula and a 6mm optic PMMA IOL was implanted.
- In cases where ACIOL was placed pupil was constricted using intracameral pilocarpine.

- Subconjunctival injection of dexamethasone 0.25 ml and gentamycin 0.3 ml was given, patching of the eye was done with pad and bandage.

**Postoperative Measures**:

- Postoperative antibiotic i.e. ciprofloxacin 500mg Bid was given for 5 days.
- Injection diclofenac sodium was given.
- Next morning the eye was examined under slit lamp and seen for any postoperative complications.
- Patients were asked to instill antibiotic steroid eye drops.
- Daily dressing was done until discharge.
- Patients were discharged depending upon postoperative complication.
- Following instructions were given at discharge:
    - Use dark goggles.
    - Antibiotic steroid eye drops were asked to continue for 2 months.
    - Patients were asked to come for follow-up at 1week, 3 weeks, 6 weeks and at 12 weeks.

- Visual acuity was recorded at each visit with Snellen's chart.

- Postoperative refraction and opthalmoscopic examination was done.

# ANALYSIS OF DATA AND RESULTS

The study group consists of thirty four cases of traumatic cataract. This study is based on etiological distribution and age wise distribution of traumatic cataract, type of cataract, associated ocular injuries, associated complications, surgical complications and final visual outcome after cataract extraction and primary intraocular lens implantation.

**Table-1: Age and Sex Wise Analysis**

| Age Group (years) | Male | Female | Number of Cases | Percentage |
|---|---|---|---|---|
| <10 years | 02 | 00 | 02 | 5.88 |
| 11-20 years | 07 | 02 | 09 | 26.47 |
| 21-30 years | 08 | 03 | 11 | 32.35 |
| 31-40 years | 03 | 02 | 05 | 14.71 |
| 41-50 years | 02 | 02 | 04 | 11.76 |
| >50 years | 02 | 01 | 03 | 8.82 |
| Total | 24 | 10 | 34 | 100.00 |

The age group ranged from 5 to 60 years. More number of cases was found in the age group of 21-30 years (32.35%). Out of 34 cases, 24 were males and 14 were females. The male-female ratio is 2.4:1.

**Table-2 Laterality**

| Laterality | No. of cases | Percentage |
|---|---|---|
| Right eye | 20 | 58.82 |
| Left eye | 14 | 41.18 |

All the patients had unilateral injury. There was no significant preponderance

**Table-3 Type of Trauma**

| Type of Trauma | Male | Female | Number of Cases | Percentage |
|---|---|---|---|---|
| Blunt | 09 | 03 | 12 | 35.29 |
| Penetrating | 15 | 07 | 22 | 64.71 |
| Total | 24 | 10 | 34 | 100.00 |

**Table-4 Object Causing Injury**

| Object causing injury | No.of cases | Percentage |
|---|---|---|
| Stick or thorn | 27 | 79.41 |
| Stone particles | 03 | 8.82 |
| Metallic particles | 04 | 11.76 |
| Total | 34 | 100.00 |

The mode of injury was analyzed. Out of 34 cases of traumatic cataract, 27 were caused by stick or thorn, 3 were caused by stone particles and 4 were caused by metallic particles.

**Table-5: Place of Injury**

| Place of Injury | No. of cases | Percentage |
|---|---|---|
| Domestic | 11 | 32.35 |
| Field | 09 | 26.47 |
| Work place | 06 | 17.65 |
| Play ground | 04 | 11.76 |
| School | 01 | 2.94 |
| Road | 03 | 8.82 |
| Total | 34 | 100 |

Most of the injuries occurred at home, field and work of place accounting for 26 cases (76.47%)

**Table-6: Occupation**

| Occupation | No. of cases | Percentage |
|---|---|---|
| Farmer | 10 | 29.41 |
| Mechanic or Factory worker | 08 | 23.53 |
| Student | 06 | 17.65 |
| House wife | 03 | 8.82 |
| Others | 07 | 20.59 |
| Total | 34 | 100 |

**Type of cataract:**

Analyzing the type of cataract it was found that 31 cases had total lens opacity and 3 cases were found to be of rosette type.

**Table-7: Duration between trauma and Surgery**

| Duration | No. of cases | Percentage |
|---|---|---|
| Within a week | 02 | 5.88 |
| Within a month | 10 | 29.41 |
| Within a year | 19 | 55.88 |
| More than one year | 03 | 8.82 |
| Total | 34 | 100.00 |

The duration between trauma and surgery was analyzed and it was found that the duration varied from less than a week to more than one year.

**Table-8: Preoperative Visual Acuity**

| Visual Acuity | No. of Eyes | Percentage |
|---|---|---|
| PL/PR | 08 | 23.53 |
| HM | 19 | 55.88 |
| CF | 05 | 14.71 |
| 6/60 | 02 | 5.88 |
| Total | 34 | 100.00 |

In 8 cases (23.53%), the preoperative visual acuity was PL/PR. In 19 cases (55.88%), the preoperative visual acuity was perception of hand movements. In 5 cases (14.71%), the preoperative visual acuity was counting fingers. In 2 cases (5.88%), the preoperative visual acuity was 6/60.

Visual acuity of other eye was recorded in all patients and was found to be within the normal range.

**Associated Ocular Damage:**

Associated ocular injuries go long way in determining the ultimate visual prognosis in cases of traumatic cataract.

**Table-9: Associated Ocular Injuries**

| Associated Ocular Injury | No. of Patients | Percentage |
|---|---|---|
| Central Corneal injuries | 02 | 5.88 |
| Peripheral Corneal injuries | 20 | 58.82 |
| Injury to the Iris | 08 | 23.53 |
| Posterior synechiae | 04 | 11.76 |
| Subluxated lens | 01 | 2.94 |

Out of 34 cases of traumatic cataract 2 patients (5.88%) had central corneal injuries and 20 patients (58.82%) had peripheral corneal injuries in the form of scars, perforation or opacities. Injury to the iris in the form of iridodialysis, traumatic mydriasis was seen in 8 cases (23.53).

Posterior synechiae was seen in 4 cases (11.76%) and Subluxated lens was noted in 1 case (2.94%).

**Type of surgery:**

Out of 34 cases of traumatic cataract, 29 cases underwent small incision cataract surgery with posterior chamber intraocular lens implantation. 5 cases underwent small incision cataract surgery with anterior chamber intraocular lens implantation.

**Table-10: Type of Surgery**

| Type of Surgery | No. of Eyes | Percentage |
|---|---|---|
| SICS with PCIOL | 29 | 85.29 |
| SICS with ACIOL | 05 | 14.71 |

**Intraoperative Complications:**

Complications during surgery can be either due to trauma or surgery or both.

**Table-11: Intraoperative Complication**

| Complication | No. of Eyes | Percentage |
|---|---|---|
| Vitreous loss | 05 | 14.71 |
| Hyphema | 03 | 8.82 |

Vitreous loss was seen in 5 cases (14.71%) and hyphema occurred in 3 cases (8.82%).

**Postoperative Complications:**

Many of the complications observed during routine SICS with PCIOL were observed in this series. The postoperative complications seen in traumatic cataract may be due to trauma, surgery or both.

The following complications were seen in this series:

1. Shallow anterior chamber
2. Striate keratopathy

3. Hyphema

4. Uveitis

5. Posterior capsule opacity

**Table-12: Postoperative Complications**

| **Post-Operative Complications** | **No. of Eyes** | **Percentage** |
|---|---|---|
| Shallow AC | 01 | 2.94 |
| Striate keratopathy | 04 | 11.76 |
| Uveitis | 03 | 8.82 |
| Hyphema | 03 | 8.82 |
| PCO | 05 | 14.71 |
| IOL Decentration | 02 | 5.88 |

## Final Visual Acuity:

Final visual acuity (best corrected visual acuity) was measured at the end of three months.

**Table-13: Final Visual Acuity**

| Final Visual Acuity | No. of cases | Percentage |
|---|---|---|
| 6/6-6/12 | 22 | 64.71 |
| 6/18-6/36 | 09 | 26.47 |
| </=6/60 | 03 | 8.82 |

The Final visual acuity(best corrected visual acuity) was assessed at the end of three months. The patients were followed up at 1week, 6weeks and at 12 weeks.

Final visual acuity of 6/6-6/12 was achieved in 22 cases (64.71%), 6/18-6/36 in 9 cases (26.47%) and in 3 cases (8.82%) final visual acuity was </= 6/60.

# DISCUSSION

This is a prospective study of 34 cases of traumatic cataract that were managed with lens extraction with intraocular lens implantation, at Government Rajaji Hospital, Madurai Medical College, Madurai.

Man is subjected to accidental trauma in various ways, and this may happen to any individual at any age, young people seem to be more vulnerable. Ocular trauma often leads to traumatic cataract along with damage to other ocular structures. In cataract the lens needs to be removed and if intraocular lens implantation has not been done it leads to uniocular aphakia.

Correction of this uniocular aphakia using spectacle does not help in developing binocular single vision in children who have not yet developed binocular single vision and using contact lens it helps to certain extent only. With improvement in technology and intraocular lenses, one can achieve good vision in cases of traumatic cataract by extraction of cataractous lens and primary implantation of intraocular lens[1].

The development of traumatic cataract is a well-known complication following blunt or penetrating injury to the eye[8]. The incidence of developing cataract following trauma, reflected in ophthalmic literature varies from 1% to 15% of all ocular injuries[21].

The type of trauma, extent of lenticular damage, associated damage to other ocular structures determines the ultimate visual prognosis[21].

In India 14% of all cases of cataract in children are due to trauma[12].

Age wise analysis showed that majority of cases occurred in younger age group (11-30 years). This is because of the greater involvement in outdoor activity and dangerous sports and work pattern of the people studied. Most injuries resulted from wooden stick[12].

Other studies also showed an increased incidence of traumatic cataract in younger age group.

Daljit Singh showed similar age group distribution[4].

**Table-14: Age Wise comparison**

| Age group | Daljit Singh et al (n=61) | | Present Study (n=34) | |
|---|---|---|---|---|
| | No. | Percentage | No. | Percentage |
| <10 | 11 | 18.03 | 02 | 5.88 |
| 11-20 | 10 | 16.39 | 09 | 26.47 |
| 21-30 | 20 | 32.78 | 11 | 32.35 |
| 31-40 | 7 | 11.47 | 05 | 14.71 |
| 41-50 | 2 | 9.83 | 04 | 11.76 |
| >50 | 2 | 9.83 | 03 | 8.82 |

Sex wise analysis of 34 cases traumatic cataract showed 24 (70.58%) males and 10 females (29.41%). The study shows a male preponderance. This is because men are more exposed to ocular trauma because of occupation and they form wage earning group in rural areas.

**Object causing injury:**

The study found that most of the cases i.e. 27 (79.41%) were caused by stick and thorns. This is because of the rural people who are working in fields. The type of injury was mostly of penetrating type. Four cases (11.76%) were due to metallic particles whereas three cases (8.82%) were due to stone particles. These were seen in people working in wielding and mining works**.**

Krishnamachary M[9] also found that most of the injuries i.e., 54.7% were caused by stick or bow and arrow.

**Type of trauma:**

The relative frequency of blunt and penetrating trauma in 34 cases of traumatic cataract in this study showed penetrating trauma was common mode of injury i.e., 22 cases (64.71%) and blunt trauma accounted to 12 cases (35.29%).

**Table-15: Comparison of type of Trauma**

| Type of Trauma | Daljit Singh et al[4] (n=61) | Renuka Srinivasan[10] (n=34) | David Benezra[30] (n=40) | Present study (n=34) |
|---|---|---|---|---|
| Penetrating | 30 | 30 | 36 | 22 |
| Blunt | 24 | 4 | 4 | 12 |

In this study, it was found that penetrating trauma was found in more number of cases, it was because the study included rural population working in fields. The penetrating injury usually leaves a scar on the cornea, in this study 22 cases showed corneal lesion either in the form of scar or opacity.

**Duration between trauma and surgery:**

It varied from within one week to more than a year. Two cases (5.88%) presented within a week. Ten cases (29.41) presented within a month, nineteen cases (55.88%) presented within one year and three cases (8.82%) presented after more than a year from injury.

**Preoperative Visual Acuity:**

It is very important to assess the preoperative visual acuity because the ultimate visual prognosis is dependent upon it. The preoperative visual acuity in this study was,eight eyes (23.53%) had visual acuity of PL/PR, nineteen (55.88%) eyes had visual acuity of hand movements, five (14.71%) eyes had visual acuity of counting fingers and two (5.88%) eyes had visual acuity of 6/60.

In the studies conducted by Renuka and Srinivasanet al[10] and Krishnamurthy M[9], the preoperative visual acuity was less than 6/60 to PL and PR in most of their cases.

The preoperative visual acuity of other eye was also measured using snellen's visual acuity chart and it was in the range of 6/6 to 6/12. This is very important for the development of binocular single vision following surgery to the injured eye.

**Associated damage to other ocular structures:**

The visual prognosis in traumatic cataract is poor because of concomitant injury to other ocular structures[9]. The management of traumatic cataract depends on integrity of posterior capsule, zonular apparatus and associated injury to cornea, uveal tissue and posterior segment. In this study the associated damage are corneal injuries in the form of scar and opacity seen in 22 cases. Corneal scaring and opacity affected the visual acuity by obstructing the visual axis and causing astigmatism.

Corneal scarring may lead to quantitatively and qualitatively poor vision[9]. Injury to the iris was seen in 8 cases (23.53%) in the form of traumatic mydriasis, iridodialysis and posterior and anterior synechiae.

The iris related complication did not affect much to the visual prognosis. Adherent leucoma was seen in one case (2.94%), which caused astigmatism and partial obstruction of visual axis.

**Table-16: Comparison of Associated Complications**

| Studies | Corneal injury | Iris related |
|---|---|---|
| Marcus blum et al[8] | 61.9% | 52.3% |
| Krishnamchary et al[9] | 60.5% | 49.6% |
| Daljith singh[4] | 37% | 26.2% |
| Present study | 64.7% | 23.53% |

**Intraoperative complications:**

In this series of studies the intraoperative complications noted were:

**Hyphema:** Blood into the anterior chamber was seen in 3 cases (8.82%). It was due to the damage to the iris, which is highly vascularized tissue.

Shoeb Ahmed[11] reported 5 (10%) cases of hyphema. Zou Y noted intraoperative bleeding from ciliary body in 2 cases (6.25%)[31].

**Vitreous loss**: Was noted in 5 cases (14.71%) in the present study. The cause was due to posterior capsular rent during surgery.

Shoeb Ahmed[11] reported 10 (20%) cases of vitreous loss in his study.

**Table-17: Comparison of Postoperative Complications**

| Complication | Marcus Bhum[8] | Daljit Singh[4] | Renuka Srinivasan[10] | Present study |
|---|---|---|---|---|
| Shallow AC | 3(2%) | 1(1.6%) | -- | 1 (2.94%) |
| Striate keratopathy | -- | 18(30%) | 3(8.8%) | 4(11.76%) |
| Uveitis | 5(3.7%) | 7(11.5%) | 6(17.6%) | 3(8.82%) |
| Hyphema | 3(2%) | 4(6.5%) | 4(11.8%) | 3(8.82%) |
| PCO | -- | -- | 2(9%) | 5(14.71%) |
| IOL Decentration | 3(2%) | -- | 3 (8.2%) | 2(5.88%) |

**Striate keratopathy:**

In present study striate keratopathy was seen in 4 cases (11.76%). Striate keratopathy was more common in penetrating injury, the procedures like irrigation and aspiration, and while implanting IOL, which causes the damage to the endothelium leading to striate keratopathy.

Daljit Singh et al reported striate keratopathy in 18 cases (30%). RenukaSrinivasan reported 3 (8.8%) cases. Striate keratopathy in present study resolved within one week of surgery.

**Shallow Anterior Chamber:**

Shallow Anterior Chamber in the present study was seen in one case (2.94%). The cause for shallow anterior chamber was wound leakage. Pressure bandage was done, if not formed within 48 hours then surgical repairs for wound leakage was done. Daljit Singh reported 1 (1.6%) cases of shallow anterior chamber.

**Uveitis:**

In present study uveitis was seen in 3 cases (8.82%). The cause for uveitis was due to damage to iris and introduction of infection due to trauma, chances are more following penetrating injury[41,40].

Daljit Singh reported 7 (11.5%) cases. RenukaSrinivasan reported 6 (17.6%) cases of uveitis. Gangadeep S[14] noted 40.9% cases in blunt trauma and 61% in penetrating injury.

**Hyphema:**

In present study hyphema was noted in 3 (8.82%) cases. Hyphema was due to bleeding from the injured iris due to more handling during surgery, on the table hyphema was managed by aspiration, but the injured iris bleed postoperatively. The cases resolved without affecting visual prognosis.

**Posterior capsule opacification:**

PCO occurred in 5 (14.71%) cases in present study. It was one of the late complications, which was usually seen after 8-10 weeks following surgery. The rate of PCO was higher in children.

These cases were advised for Nd:YAG laser capsulotomy. PCO can be at best avoided by continuous curvilinear capsulorrhexis and through cortical wash.

Murali Krishnamachary[9] noted 41.66% of PCO in their series, who were treated with Nd:YAGcapsulotomy and regained good vision.

Eckstein, Michael[15] noted 92% of clinically significant posterior capsule opacification was almost universal (92%) and they were treated with Nd:YAG laser capsulotomy.

**IOl Decentration:**

In this study IOL decentration was seen in 2 (5.88%) cases. Marcus Blum[8] reported 3 (2%) cases of IOL dislocation in his study.

**Final Visual Acuity:**

All the 34 cases of traumatic cataract that underwent surgery, the final visual acuity (best corrected visual acuity) were assessed at the end of three months.

Final visual acuity of 6/6-6/12 was achieved in 22 cases (64.71%), 6/18-6/36 in 9 cases (26.47%) and in 3 cases (8.82%) final visual acuity was </= 6/60.

The main cause of the impaired vision in the study was due to corneal scars and opacity obstructing the visual axis, and posterior capsular opacification.

In this study of 34 cases of traumatic cataract who were managed by cataract extraction and primary intraocular lens implantation showed good visual outcome, as shown by other studies.

Gangadeep S[14] noted excellent visual results of 90%. Daljit singh[4] reported 70%. Renuka Srinivasan[10] noted 88.2% visual outcome.

# CONCLUSION

The following should be concluded from this prospective study of 34 cases of traumatic cataract carried out over a period of nine months at Government Rajaji Hospital, Madurai Medical College, Madurai.

1. Out of 34 cases of traumatic cataract, age group ranged from 5-60 years. Maximum number of cases were seen in younger age group i.e. 22 cases (64.71%) were seen between 5-30 years of age.
2. Male preponderance was seen, out of 34 cases of traumatic cataract, 24 cases (70.59%) were males whereas females accounted for 10 cases (29.41%) with a male to female ratio of 2.4:1.
3. The highest number of cases had history of trauma with penetrating injury 22 cases (64.71%) followed by blunt trauma in 12 cases (35.29%). Penetrating injury was seen more in people of rural areas, working in fields. Stick thorn were the major objects causing injury.
4. The type of cataract seen was mainly total cataract in 31 cases, although rosette shaped cataract is described frequently in literature, in this study it was seen only in 3 cases.
5. Traumatic cataract was seen to be associated with other ocular injuries like corneal injuries (64.70%), iris injuries (23.53%), adherent leucoma and posterior synechiae (11.76%).

6. Corneal scarring obstructing the visual axis and posterior capsular opacification were the important cause for poor visual outcome.
7. Spectacle correction does not help in developing binocular vision and contact lenses are helpful to certain extent only.
8. Traumatic cataract extraction and primary intraocular lens implantation is a well-established procedure for visual rehabilitation.
9. The type of trauma, extent of lenticular involvement, associated damage to ocular structure go a long way in determining the ultimate visual prognosis with improved technology and increasing popularization of IOL, the problem of binocular vision will be solved and thus we can prevent the traumatic eye from being amblyopic and divergent.

# SUMMARY

This is a prospective study carried out over a period of nine months at Government Rajaji Hospital, Madurai Medical College, Madurai.

The present study of 34 cases of traumatic cataract includes patients from age of 5-60 years. This study is based on age wise analysis, etiological distribution of traumatic cataract, type of cataract, associated ocular injuries, surgical complication and final visual outcome after cataract extraction and primary intraocular lens implantation.

Traumatic cataract can occur following ocular trauma, along with damage to other ocular structures. Both penetrating and blunt trauma can cause traumatic cataract.

Young individuals between 11-30 years had increased incidence of traumatic cataract, this is because of greater involvement of outdoor activity. Most of the injuries resulted from wooden stick.

In this study there was male preponderance because men are exposed to ocular trauma because of their occupation and they formed wage earning group in rural areas.

Penetrating injury was common mode of injury when compared to blunt trauma. The associated ocular damage were injury to cornea in the form of scar or opacity, injury to the iris in the form of traumatic mydriasis, anterior synechiae, posterior synechiae and subluxation of lens.

The cases were managed by Small incision cataract surgery with posterior or anterior chamber intraocular lens implantation.

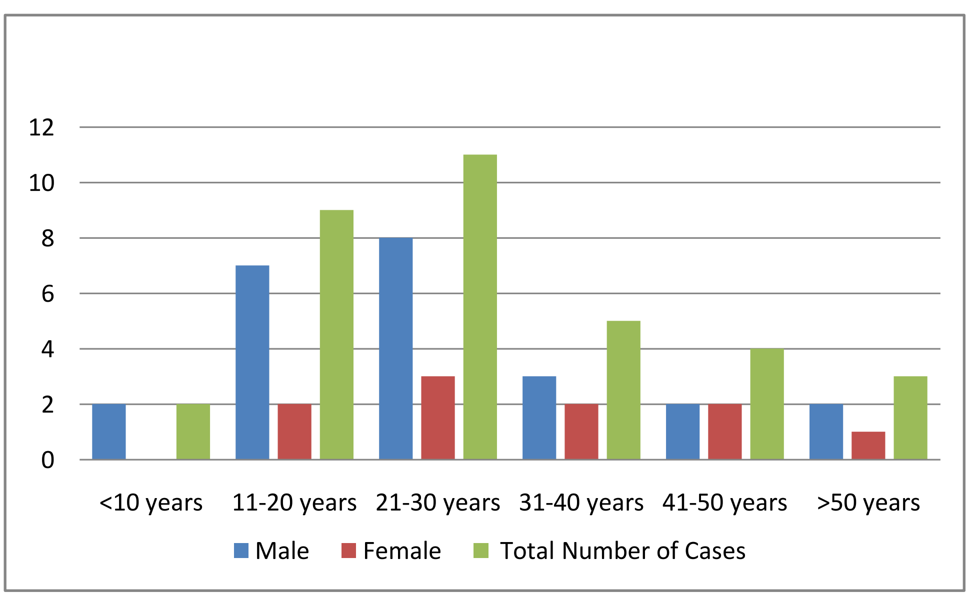
Twenty nine cases underwent SICS with posterior chamber IOL implantation.

Five cases underwent SICS with anterior chamber IOL implantation.

Postoperative complications such as striate keratopathy, shallow anterior chamber, uveitis, hyphema and PCO were observed. These postoperative complications were managed with appropriate topical antibiotic and steroid eye drops.

Final visual outcome showed good results i.e. 22 cases (64.71%) had visual acuity between 6/6 to 6/12, 9 cases (26.47%) had visual acuity between 6/18 to 6/60 and 3 cases (8.82%) had visual acuity less than 6/60.

It is observed that traumatic cataract extraction and primary IOL implantation will give good visual outcome thereby saving the eyes from being amblyopic and divergent.


12
10
8
6
4
2
0
<10 years
11-20 years
21-30 years
31-40 years
41-50 years
>50 years
Male
Female
Total Number of Cases

## FIGURE-1: AGE AND SEX WISE ANALYSIS

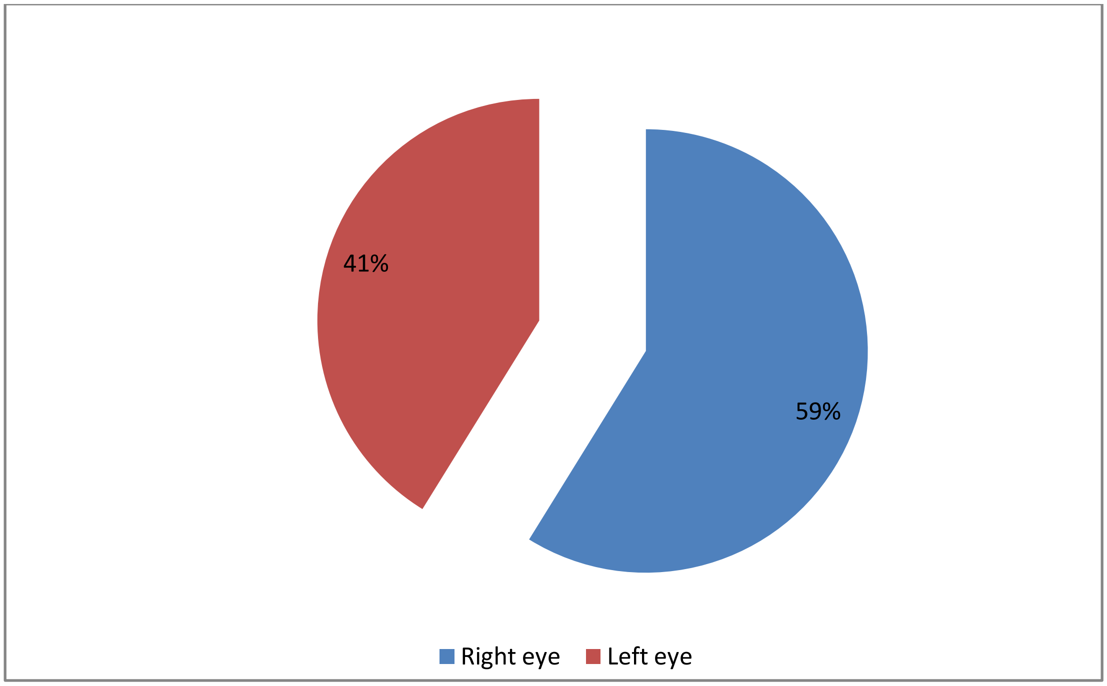



**FIGURE-2: LATERALITY**

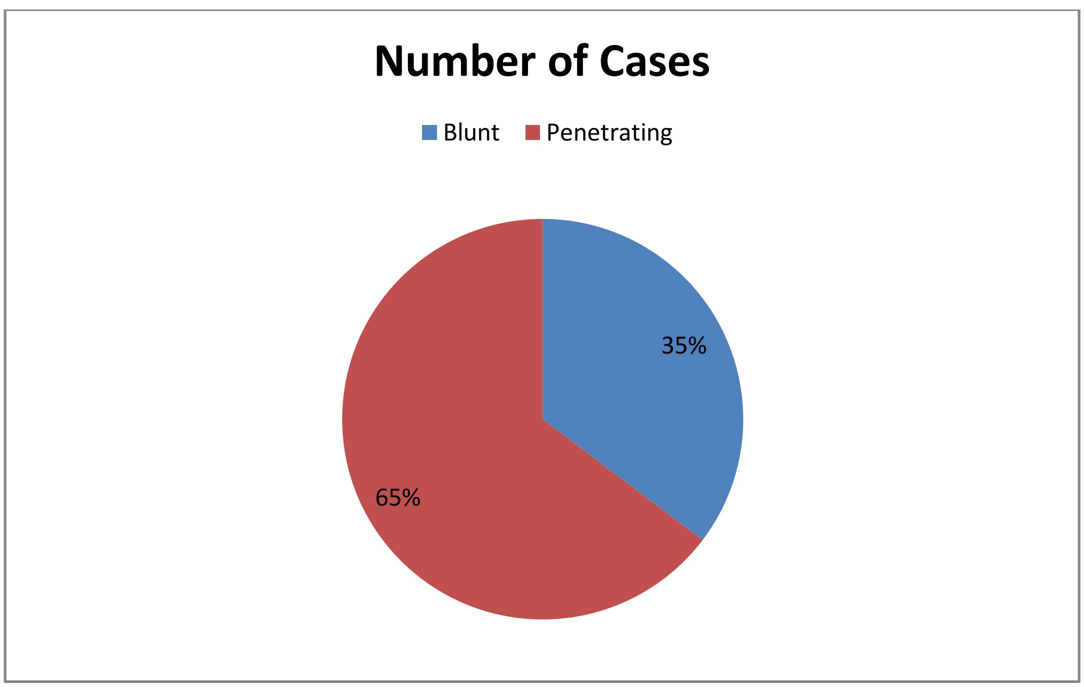



**FIGURE-3: TYPE OF TRAUMA**

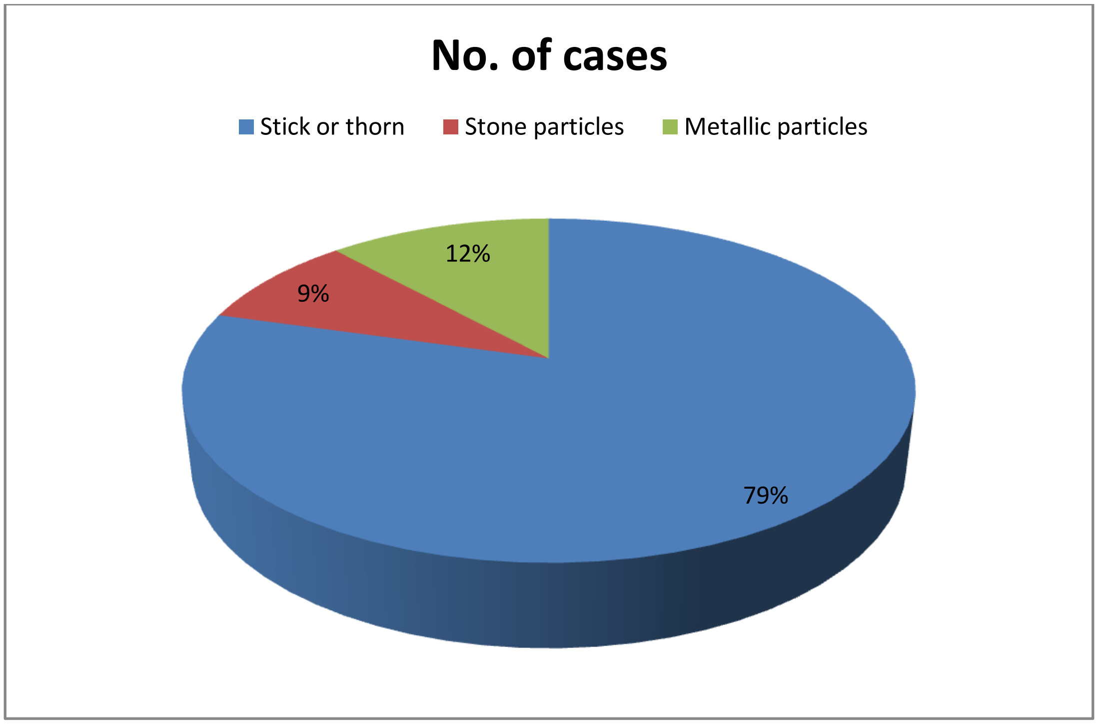



**FIGURE-4: OBJECT CAUSING INJURY**

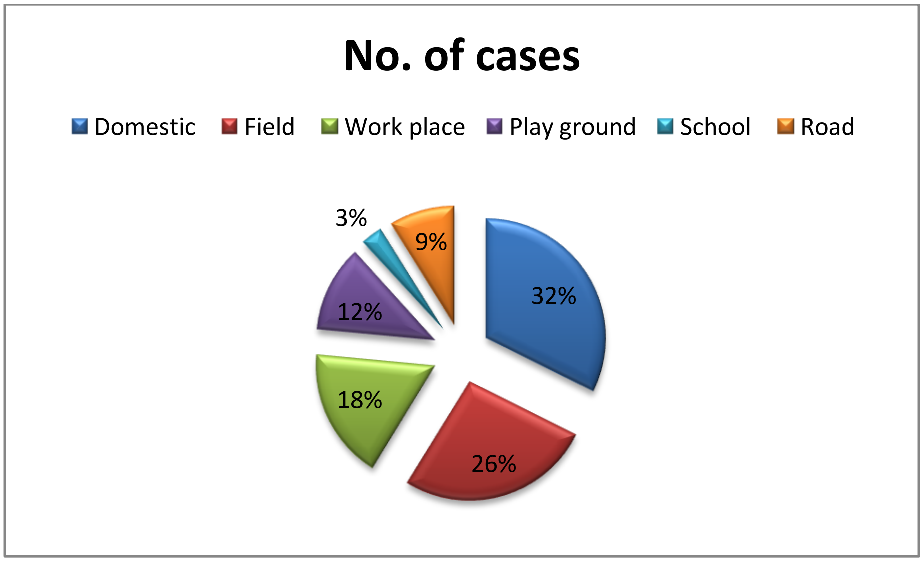



**FIGURE-5: PLACE OF INJURY**

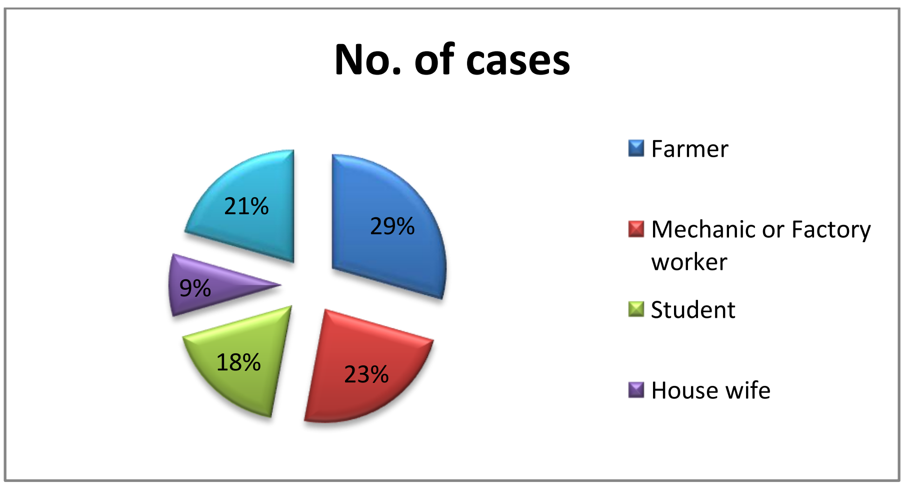



**FIGURE-6: OCCUPATION**

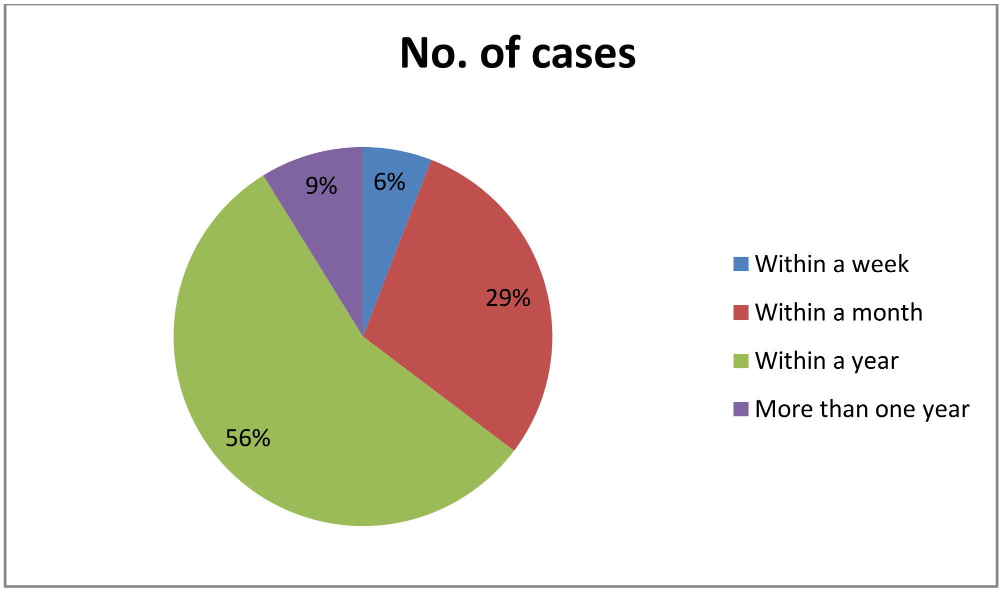



**FIGURE-7: DURATION BETWEEN TRAUMA AND SURGERY**

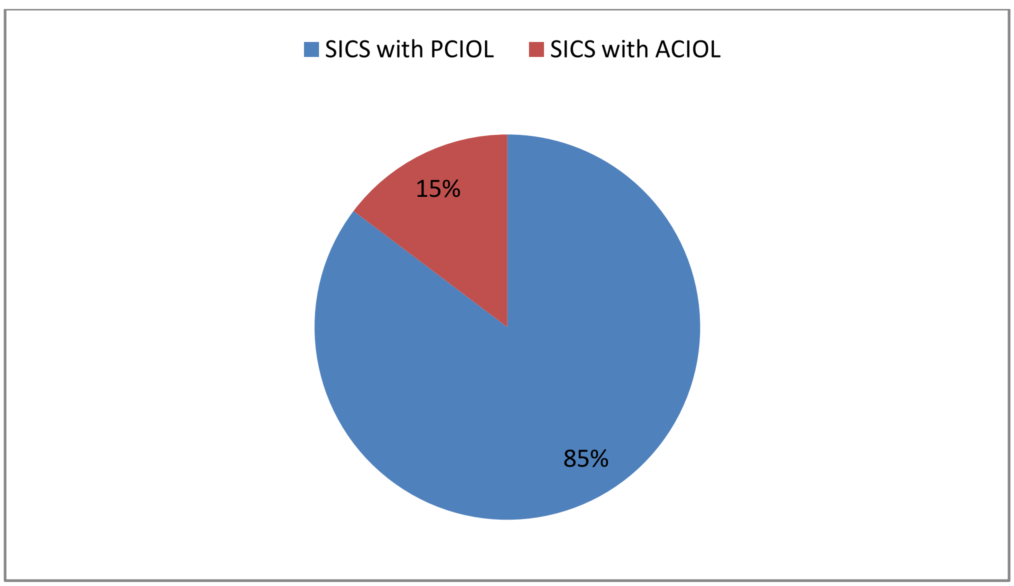



**FIGURE- 8:TYPE OF SURGERY**

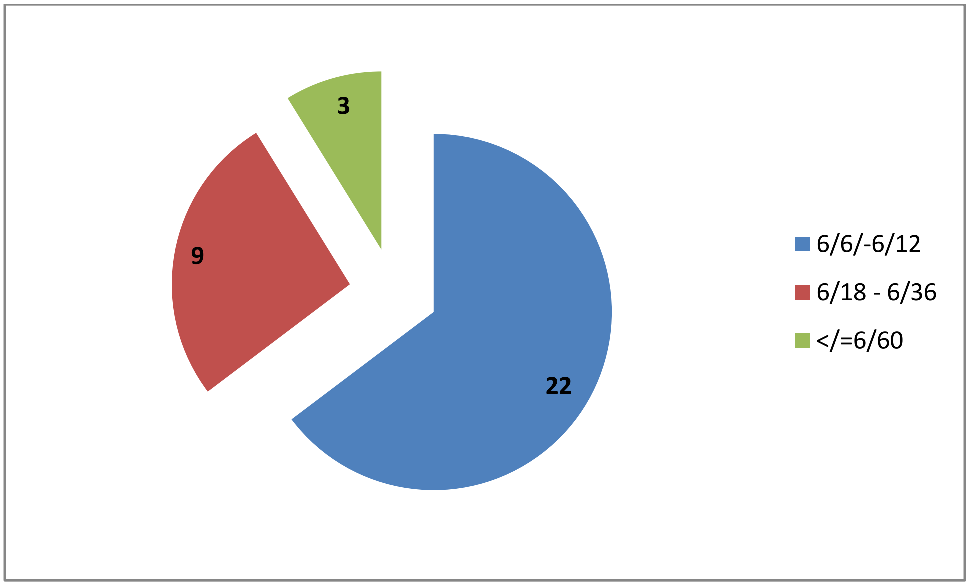



**FIGURE- 9: FINAL VISUAL ACUITY**

**FIG 10. Showing RE traumatic cataract with peripheral penetrating corneal injury**

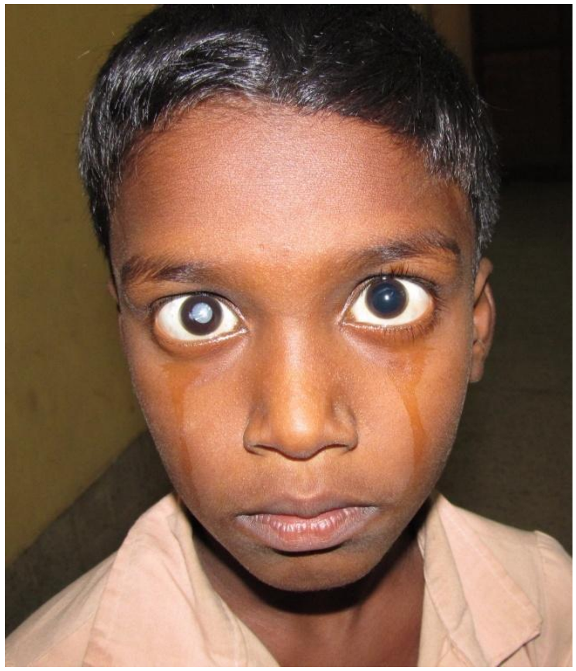


**FIG 11. Traumatic cataract with posterior synechiae**

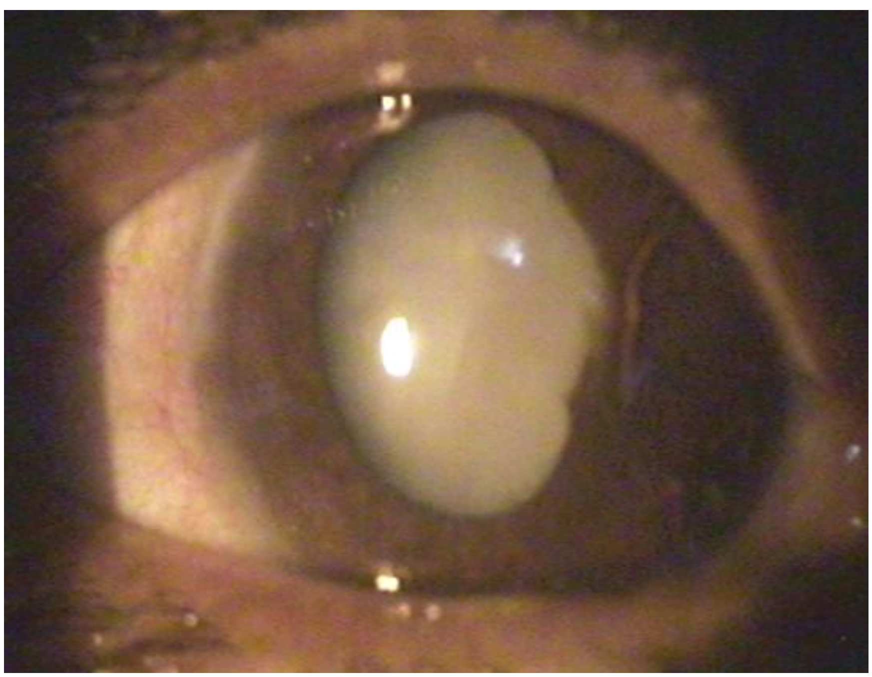


**FIG 12. Rosette cataract**

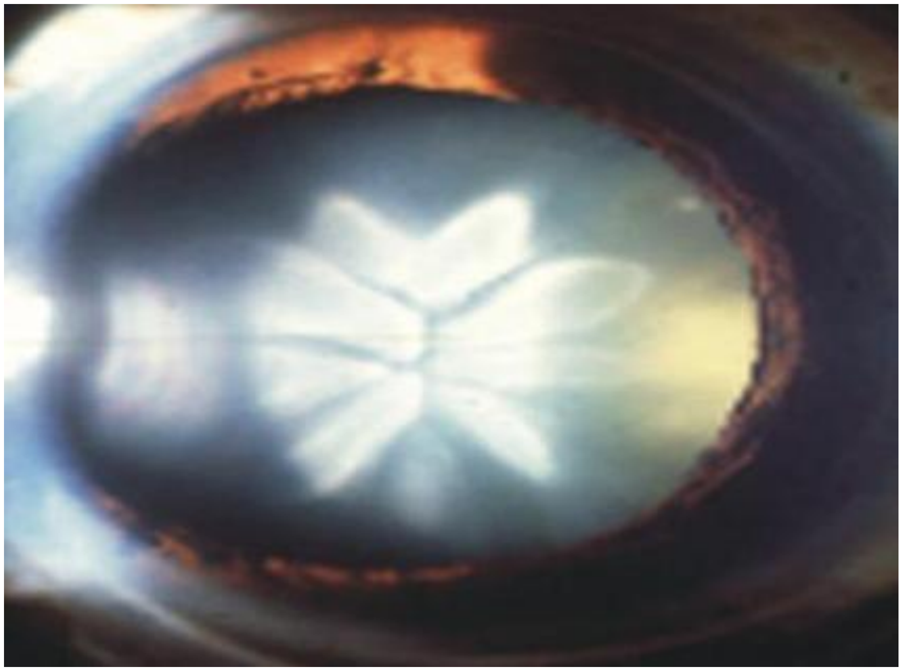
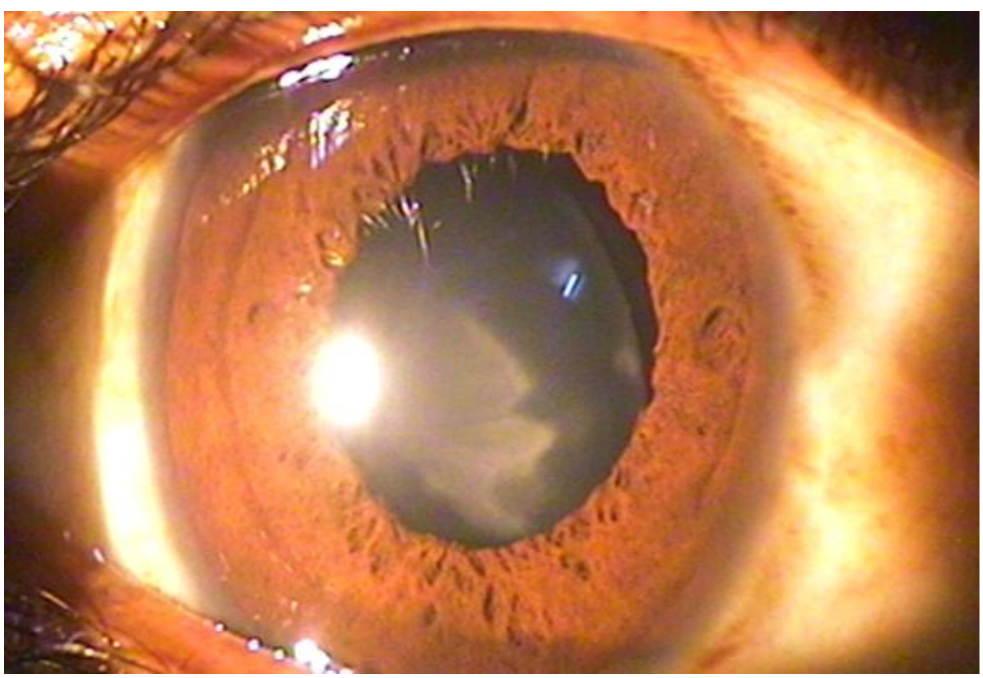


**FIG 13. Traumatic catract with subluxatiion of lens**



# ANNEXURE – I

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# ANNEXURE – II

# PROFORMA

Name: Age:

Sex: IP No.

Occupation:

Address:

**Presenting complaints:**

**Traumatic history:** Detailed history regarding the following was taken.

Blunt/Penetrating trauma

Date

Time

Eye involved: Right/Left

**Object causing injury:**Description of object.

**Examination of eye using:**Torch Light, Slit lamp, direct and indirect ophthalmoscope.

**Eyebrow and eyelids:**

Edema, ecchymosis

Ptosis

Abrasion

Partial or full thickness laceration

**Conjunctiva:**

Subconjunctival hemorrhage

Chemosis, superficial/ciliary congestion

Discharge, laceration

**Cornea:**

Edema

Blood staining of cornea

Descemet's folds

Corneal scar

Corneal opacity

**Sclera:**

Tear with or without underlying tissue incarceration or prolapse

**Anterior Chamber:**

Depth: Normal/Shallow/Obliterated

Lens matter/Hyphema/Cells/Flare

**Iris:**

Traumatic mydriasis

Sphincter tear

Iridodialysis

Traumatic iridocyclitis

Anterior or posterior synechiae

Iris prolapse

**Pupil:**

Reaction

Size

Shape

RAPD

**Lens:**

Position: in situ/subluxation/dislocation

Lens opacity: Subcapsular, Rosette, Intumescent, Total cataract

**Vision:**

Distance, Near, Pinhole

**Ophthalmoscopy:**

Direct and Indirect Ophthalmoscopy to detect posterior segment involvement

**Intraocular pressure:**

Right eye and Left eye

**Investigations:**

Hb%

TC, DC, ESR

RBS

Urine routine

X-Ray orbit

Keratometry

A-scan

**General Physical and Systemic Examination:**

Pulse

Bp

CVS

RS

PA

CNS

**Diagnosis:**

**Treatment:**

Medical Management- topical/systemic

Surgical Management

Preoperative:

Antibiotics- systemic/local

Sedatives

Hypotensive agents

Anesthesia

Local

General

Operative notes:

Complications:

Intraoperative

Early postoperative

Late postoperative

At the time of discharge:

Vision, corrected vision and final examination.

Follow-up

1week

3weeks

6weeks

12weeks

# Key to master chart

M-male; F-female

RE-right eye; LE-left eye

PT-penetrating trauma; BT-blunt trauma

STK-stick or thorn; ST-stone; MP-metallic object

T-total; R-rosette

PL/PR-perception of light/projection of rays

HM-hand movements; CF-counting fingers

D-day; MT-month

P-peripheral; C-central

TM-traumatic mydriasis

PS-posterior synechiae

TR-tear

SLX-subluxation

SICS-small incision cataract surgery

PCIOL-posterior chamber intraocular lens

ACIOL-anterior chamber intraocular lens

HYP-hyphema; VL-vitreous loss

SK-striate keratitis

SH-AC-shallow anterior chamber

UVT-uveitis

IOL-D-intraocular lens decentered

# LIST OF ABBREVIATIONS USED

ACIOL………………..Anterior chamber intraocular lens

Ad Lu………………...Adherent leucoma

CF……………………Counting fingers

DL…………………….Dislocation of lens

HM…………………...Hand movements

IOP……………………Intraocular pressure

MP……………………Metallic particle

Op…………………....Opacity

PC rent……………….Posterior capsular rent

PCR…………………,.Posterior capsular rupture

PL…………………....Perception of light

PS………………….…Posterior synechiae

PT…………………....Penetrating injury

SICS/IOL…………....Small incision cataract surgery with intraocular lens implantation

SK………………….…..Striate keratopathy

STK…………………Stick/Thorn

T-Cat………………...Total cataract

TM………………..….Traumatic mydriasis

UVT………………….Uveitis

VL…………………...Vitreous loss

Ref. No. 3104/E4/3/2012

Govt.Rajaji Hospital,Madurai.20.
Dated: .03.2012

Institutional Review Board / Independent Ethics Committee.

**Dr. A. Edwin Joe, M.D (FM), BL.,**
Dean, Madurai Medical College & 2521021 (Secy)
Govt Rajaji Hospital, Madurai 625020.
**Convenor**
grhethicssecy @gmail.com.

**Sub:** Establishment-Govt. Rajaji Hospital, aMadurai-20-
Ethics committee-Meeting Agenda-communicated-regarding.

The Ethics Committee meeting of the Govt. Rajaji Hospital, Madurai was held at 11.00 Am to 1.00Pm on 29.03.2012 at the Dean Chamber, Govt. Rajaji Hospital, Madurai. The following members of the committee have been attended the meeting.

| | | |
|---|---|---|
| 1. Dr.N.Vijayasankaran,M.ch(Uro.)<br>094-430-58793<br>0452-2584397 | Sr.Consultant Urologist<br>Madurai Kidney Centre,<br>Sivagangai Road,Madurai | Chairman |
| 2. Dr.P.K. Muthu Kumarasamy, M.D.,<br>9843050911 | Professor & H.O.D of Medical,<br>Oncology(Retired) | Member Secretary |
| 3. Dr.T.Meena,MD<br>094-437-74875 | Professor of Physiology,<br>Madurai Medical College | Member |
| 4. Dr. S. Thamilarasi, M.D (Pharmacol) | Professor of pharmacology | |
| 5. Dr.Moses K.Daniel MD(Gen.Medicine)<br>098-421-56066 | Professor of Medicine<br>Madurai Medical College | Member |
| 6. Dr.M.Gobinath,MS(Gen.Surgery) | Professor of Surgery<br>Madurai Medical College | Member |
| 7. Dr.S. Dilshadh, MD(O&G)<br>9894053516 | Professor of OP&Gyn<br>Madurai Medical College | Member |
| 8. Dr.S.Vadivel Murugan., M.D,<br>097-871-50040 | Professor of Medicine<br>Madurai Medical College | Member |
| 9. Shri.M.Sridher,B.sc.B.L.<br>099-949-07400 | Advocate,<br>2, Deputy collectors colony<br>4th street KK Nagar, Madurai-20. | Member |
| 10. Shri.O.B.D.Bharat,B.sc.,<br>094-437-14162 | Businessman<br>Plot No.588,<br>K.K.Nagar,Madurai.20. | Member |
| 11.Shri. S.sivakumar,M.A(Social) Mphil<br>093-444-84990 | Sociologist, Plot No.51 F.F,<br>K.K Nagar, Madurai. | Member |

Following Projects were approved by the committee

| Sl. No | Name of P.G. | Course | Name of the Project | Remarks |
|---|---|---|---|---|
| 1. | Govindaraj. B | PG, M.S ( Ophthal) | Primary intraocular lens implantation in traumatic cataracts | Approved |

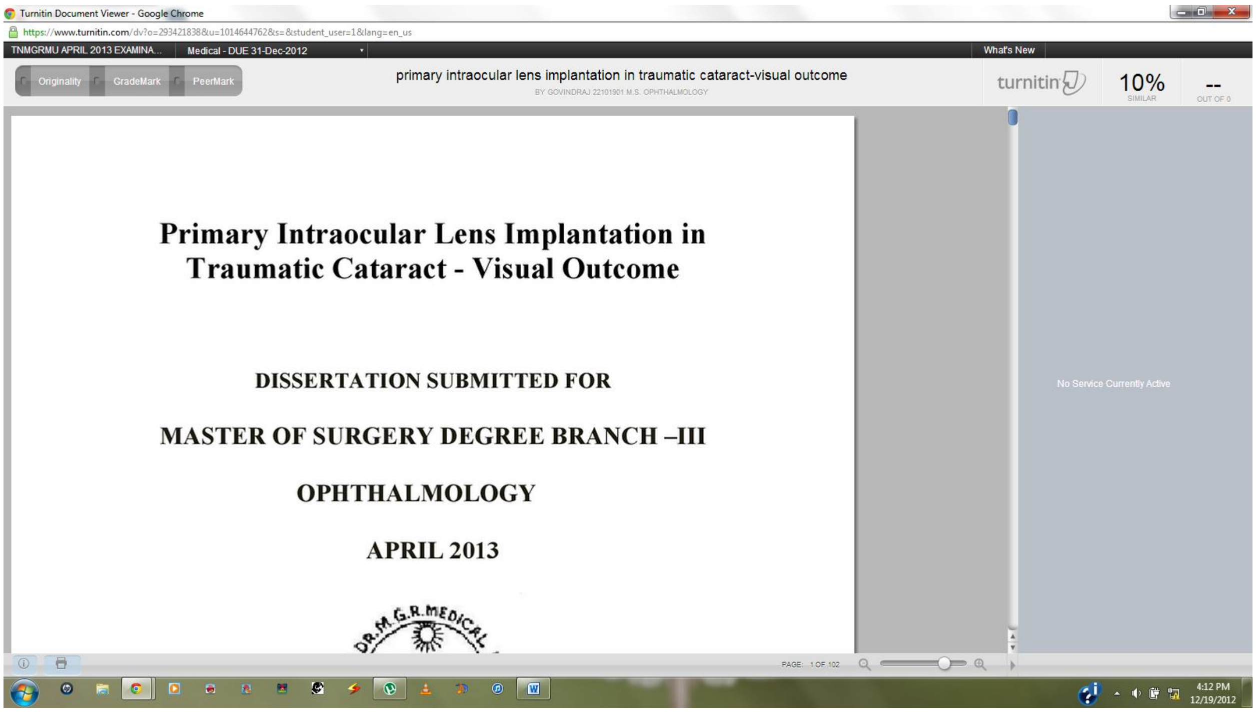
Please note that the investigator should adhere the following: She/He should get a detailed informed consent from the patients/participants and maintain Confidentially.

1. She/He should carry out the work without detrimental to regular activities as well as without extra expenditure to the institution to Government.
2. She/He should inform the institution Ethical Committee in case of any change of study procedure site and investigation or guide.
3. She/He should not deviate for the area of the work for which applied for Ethical clearance. She/He should inform the IEC immediately, in case of any adverse events pr Serious adverse reactions.
4. She/he should abide to the rules and regulations of the institution.
5. She/He should complete the work within the specific period and apply for if any Extension of time is required She should apply for permission again and do the work.
6. She/He should submit the summary of the work to the Ethical Committee on Completion of the work.
7. She/He should not claim any funds from the institution while doing the word or on completion.
8. She/He should understand that the members of IEC have the right to monitor the work with prior intimation.

**DEAN**

To
**All the above members and Head of the Departments concerned.**
**All the Applicants.**

# ANNEXURE – V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Primary Intraocular Lens Implantation in Traumatic Cataract - Visual Outcome DISSERTATION SUBMITTED FOR MASTER OF SURGERY DEGREE BRANCH –III OPHTHALMOLOGY APRIL 2013 THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY CHENNAI, TAMILNADU Dept. of Ophthalmology, Govt. Rajaji Hospital, Madurai. CERTIFICATE This is to certify that this dissertation entitled “Primary intraocular lens implantation in traumatic cataract - visual outcome.” Has been done by Dr. Govindraj B under my guidance in the Department of Ophthalmology, Madurai Medical College, Madurai. I certify regarding the authenticity of the work done to prepare this dissertation. DR. P.THIYAGARAJAN M.S.,D.O., PROFESSOR & H.O.D. DEPARTMENT OF...

**ANNEXURE -III - MASTER CHART**

| Sl. No. | Name | Age | Sex | Ip No. | Injured Eye | Type of Trau | Object Causi | Type of Catai | Pre-op VA of | VA of Uninjui | Duration bet | Corneal Injur | Iris | Lens | Type of Surg | Intra-op Com | Post-op Com | Final VA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Kandhavel | 8 | M | | RE | PT | STK | T | PL/PR | 6/6 | 2 D | P | | | SICS/PCIOL | | PCO | 6/12 |
| 2 | Alamelu | 17 | F | | RE | PT | STK | T | CF | 6/6 | 3 MT | P | | | SICS/PCIOL | | | 6/9 |
| 3 | Yeshodhai | 45 | F | | RE | PT | STK | T | HM | 6/6 | 3 Y | P | | | SICS/PCIOL | | IOL-D | 6/36 |
| 4 | kanaghu | 40 | F | | LE | PT | STK | T | PL/PR | 6/6 | 22D | P | | | SICS/PCIOL | | UVT | 6/18 |
| 5 | Damodaran | 53 | M | | LE | PT | STK | T | CF | 6/6 | 8MT | P | | | SICS/PCIOL | | PCO | 6/24 |
| 6 | Gnyanasekar | 11 | M | | LE | PT | STK | T | CF | 6/6 | 3MT | P | | | SICS/PCIOL | | PCO | 6/9 |
| 7 | Sarvanan | 18 | M | | LE | BT | ST | T | HM | 6/12 | 3MT | | TM | | SICS/PCIOL | | | 6/6 |
| 8 | Shanmughavel | 25 | M | | RE | PT | STK | T | HM | 6/9 | 1MT | P | | | SICS/PCIOL | | | 6/9 |
| 9 | Pandi | 33 | M | | RE | PT | STK | T | HM | 6/9 | 4D | P | | | SICS/PCIOL | HYP | | 6/12 |
| 10 | Murugesan | 12 | M | | LE | PT | ST | T | HM | 6/6 | 2MT | P | PS | | SICS/PCIOL | | | 6/6 |
| 11 | Venkat | 30 | M | | RE | BT | MP | R | HM | 6/6 | 10MT | | | | SICS/ACIOL | VL | SK | 6/24 |
| 12 | Saraswathi | 19 | F | | LE | PT | STK | T | HM | 6/9 | 8MT | P | | | SICS/PCIOL | | | 6/6 |
| 13 | Santosh | 20 | M | | LE | PT | STK | T | CF | 6/6 | 1MT | P | | | SICS/PCIOL | | PCO | 6/18 |
| 14 | Muthumanikam | 46 | M | | LE | PT | STK | T | HM | 6/12 | 28D | P | | | SICS/PCIOL | | UVT | 6/6 |
| 15 | Nagoor meeran | 60 | M | | RE | BT | STK | T | HM | 6/12 | 29D | | TM | | SICS/PCIOL | | PCO | 6/36 |
| 16 | Shakthivel | 27 | M | | LE | PT | STK | T | HM | 6/6 | 7MT | P | | | SICS/PCIOL | | | 6/6 |
| 17 | Alagammal | 49 | F | | RE | BT | STK | T | PL/PR | 6/6 | 17D | | TM | | SICS/PCIOL | HYP | HYP | 6/9 |
| 18 | Raman | 44 | M | | LE | PT | STK | T | HM | 6/12 | 2Y | P | PS | | SICS/ACIOL | VL | SK | 6/60 |
| 19 | Nalathambi | 19 | M | | RE | PT | STK | T | PL/PR | 6/6 | 15D | C | | | SICS/PCIOL | | | 4/60 |
| 20 | Elavarasan | 29 | M | | LE | BT | S | T | HM | 6/6 | 2MT | | | | SICS/PCIOL | | | 6/6 |
| 21 | Syedu | 36 | M | | RE | PT | MP | T | HM | 6/6 | 9MT | P | TR | | SICS/PCIOL | | | 6/6 |
| 22 | Kharmegam | 38 | M | | LE | BT | STK | T | HM | 6/6 | 7MT | | | | SICS/ACIOL | VL | SK | 6/24 |
| 23 | Marudai | 39 | F | | RE | BT | STK | R | 6/60 | 6/6 | 3MT | | TM | | SICS/PCIOL | | | 6/6 |
| 24 | Raju | 14 | M | | RE | BT | STK | T | PL/PR | 6/9 | 5MT | | | | SICS/PCIOL | | SH-AC | 6/6 |
| 25 | Rathnakumar | 23 | M | | RE | BT | MP | T | HM | 6/6 | 18D | | TM | | SICS/PCIOL | HYP | HYP | 6/12 |
| 26 | Pushpamary | 24 | F | | RE | PT | STK | R | PL/PR | 6/12 | 17D | P | | SLX | SICS/ACIOL | VL | | 6/9 |
| 27 | Mohdbeebi | 30 | F | | LE | PT | STK | T | CF | 6/9 | 8MT | P | | | SICS/PCIOL | | HYP | 6/9 |
| 28 | Seeni | 14 | M | | RE | PT | STK | T | HM | 6/6 | 23D | P | | | SICS/PCIOL | | | 6/6 |
| 29 | Prabhuchamy | 28 | M | | RE | BT | MP | T | PL/PR | 6/6 | 19D | | | | SICS/PCIOL | | UVT | 6/18 |
| 30 | Alaghu | 55 | F | | RE | PT | STK | T | PL/PR | 6/6 | 2Y | C | PS | | SICS/ACIOL | VL | SK | 3/60 |
| 31 | Vijayan | 22 | M | | RE | PT | STK | T | HM | 6/6 | 6MT | P | TR | | SICS/PCIOL | | | 6/6 |
| 32 | Shakunthala | 26 | F | | LE | BT | ST | T | 6/60 | 6/9 | 11MT | | TM | | SICS/PCIOL | | IOL-D | 6/36 |
| 33 | Mohan | 9 | M | | RE | BT | STK | T | HM | 6/9 | 21D | | | | SICS/PCIOL | | | 6/12 |
| 34 | Kotaichamy | 21 | M | | RE | PT | STK | T | HM | 6/9 | 4MT | P | PS | | SICS/PCIOL | | | 6/6 |