CATARACT

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Introduction

- The word Cataract comes from the Greek word meaning "Waterfall"
- Until the mid 1700's, it was thought that cataract was formed by opaque material flowing, like a waterfall into the eye
- Cataract is caused by
 - Degeneration or opacification of lens fibres
 - Formation of aberrant lens fibres
 - Deposition of materials in the lens

Embryology of lens

Lens plate

• Cells of surface ectoderm that overlie optic vesicles become columnar ,this area of thickened cells is called lens plate or lens placode.

lens pit or fovea lentis is a small indentation inferior to center of lens plate

- lens pit continue to invaginate ,the stalk of cells that connects it to surface ectoderm consticts and eventually disappears
- The resultant sphere is called **lens vesicle**







EMBRYONIC NUCLEUS – 1-3 Months of GA FETAL NUCLEUS -3 months GA – Birth **INFANTILE NUCLEUS –** Birth to puberty ADULT NUCLEUS -**Adults**



Anatomy of the lens

- Transparent biconvex structure
- Placed between iris & vitreous , suspended by zonule of zinn from ciliary body

1.37

• Radius of curvature

Anterior	10mm
Posterior	6mm
Diameter of lens	8.8 to 9.2mm

Refractive index

- Dioptric power of lens 15-18D
- Thickness 4mm
- Weight at birth 65mg at 80 yrs 258mg
- Accommodative power at birth -----14-16D at 25 yrs----- 7-8D
 - at 50yrs----- 2D



Function of lens

- Maintenance of transparency
- Refraction
- Accommodation
- Protection from U-V rays

 Loss of transparency, or opacification of lens is called Cataract



Epidemiology

- Cataract is the leading cause of blindness in the world
- The prevalence of blindness in India is 14.9 per 1000. sixty two percent of this blindness is due to cataract alone
- Recent data from the World Health Organization (WHO) shows that there is a 25% decrease in blindness prevalence in India.



Classification of Cataract

Etiological classification:

- -Congenital and Developmental
- -Acquired
- 1.Age related (senile)
- 2.Cataract associated with ocular diseases(complicated or secondary)
- 3.Cataract associated with systemic diseases: Diabetes, Hypoglycaemia, Hypoparathyroidism

4.Skin Diseases – Atopic Dermatitis

- 5.Traumatic Cataract :
- Trauma
- **Electric Shock**
- Radiation
- 6. Drug induced cataract :

Corticosteroids, Anticholinesterases, Chlorpromazine, Busulfan, Choroquine

Morphological types of Developmental cataract



Dense Blue Dot Cataract



Anterior Capsular Cataract



Sutural Cataract



Posterior Polar Cataract



Cataracta pulverulenta

lamellar cataract



dense lamellar cataract with riders

Secondary cataract



Complicated cataract





posterior sub capsular cataract

glaucoma flecken

Cataract in systemic diseases





Snowflake cataract

stellate cataract



shield cataract

Traumatic cataract



Vossius' ring



Flower-shaped



Penetration

Morphological classification

- 1. Capsular
- 2. Subcapsular
- 3. Cortical
- 4. Supranuclear
- 5. Nuclear
- 6. Polar

Senile Cataract

Types:

- **1. Cortical Cataract**: hydration followed by coagulation of protein appears in cortex
- **2.** Nuclear or Sclerotic Cataract: slow sclerosis of nucleus.





Stages of cortical cataract

- Stage of lamellar separation
- Incipient cataract
- Immature cataract –

intumescent cuneiform cupuliform

- Mature cataract
- Hypermature cataract morgagnian cataract
 Sclerotic or shrunken

Symptoms

- Blurring of vision
- Frequent change of glasses due to rapid change in refractive index of the lens
- Painless, progressive, gradual diminution of vision
- Second sight or myopic shift -nuclear cataract



- Monocular diplopia or polyopia
- Glare
- Colored haloes
- generalized reduction -Visual field

Signs of senile cataract

- Lenticular opacity -grey or white opacity in lens
- Iris shadow in immature cataract
- No iris shadow in mature cataract
- Morgagnian Cataract- liquefied cortex- which is milky and nucleus is seen as brown mass









Morphological types



Nuclear Cataract



Mature Cataract



Cortical Cataract



Hypermature Morgagnian Cataract





Fig. 12.1

Age-related cataract. (a) Posterior subcapsular; (b) posterior subcapsular seen on retroillumination; (c) nuclear; (d) early nuclear cannot be seen on retroillumination

Management

- Cataract is the most treatable cause of decreased vision
- Observation and Refraction Early cataract
- When the glare, loss of contrast sensitivity or polyopia are present

or

• When activities of daily living, such as driving, reading, working, and self-care are affected

Surgery can be advised

Pre-operative evaluation

- Detailed history
- Systemic examination
- Dental and ENT examination to rule out any septic foci
- Ocular examination

Ocular examination

- Visual acuity testing
- Anterior Segment Examination :
 - Lens Grading
 - To rule out other anterior segment diseases
- Dilated Fundus Examination: To assess the posterior segment
- If fundus examination is not possible – B-Scan Ultrasonography



- Intraocular pressure measurement
- Examination of lacrimal apparatus and Syringing
- Intraocular lens Power Calculation





Anaesthesia

Local anaesthesia

- Peribulbar or Retrobulbar Block
- Adjuvant Facial Block if needed



Peribulbar block Needle outside the muscle cone

- Drugs used: 2% Xylocaine and 0.5% Bupivacaine in the ratio of 2:1
- Topical anaesthesia
- General anaesthesia → children, psychiatric patients

METHODS OF CATARACT SURGERY

- ICCE
- ECCE

Surgical Techniques

- Intracapsular Cataract Extraction (ICCE)
 - Entire lens is removed by rupturing the zonules
 - Obsolete
 - Indications: Dislocated lens





• Complications of ICCE:

- Intraocular lens cannot be placed
- Vitreous herniation into Anterior chamber can occur
- Aphakic glasses
 - Magnified images
 - Spherical aberrations
 - Jack-in-the-box phenomenon
 - Prismatic effect
 - Reduced visual field
 - Heavy spectacles

ECCE- SURGERY OF CHOICE

 AGE- UPTO 30 Yrs – LENS ASPIRATION LENSECTOMY AFTER 30 Yrs -CONVENTIONAL ECCE SICS PHACOEMULSCIFICATION

- Extracapsular Cataract Extraction (ECCE)
 - Part of anterior capsule, nucleus and cortex are removed leaving behind the posterior capsular bag
 - So that intraocular lens can be placed



<u>Conventional ECCE</u>



- Large incision (10-11mm) needs suturing
- Time consuming procedure
- Longer wound healing time

Extracapsular cataract extraction

1. Anterior capsulotomy

3. Expression of nucleus

5. Care not to aspirate posterior capsule accidentally



2. Completion of incision

4. Cortical cleanup

6. Polishing of posterior capsule, if appropriate

7. Injection of viscoelastic substance



11. Placement of haptics into capsular bag



8. Grasping of IOL and coating with viscoelastic substance

10. Insertion of superior haptic

12. Dialling of IOL into horizontal position

- Small Incision Cataract Surgery (SICS)
 - Sutureless surgery
 - Sclero-corneal tunnel is made
 - 6-7mm incision Post-operative astigmatism

Phacoemulsification

1. Capsulorrhexis

3. Sculpting of nucleus

5. Emulsification of each quadrant



2. Hydrodissection

4. Cracking of nucleus

6. Cortical cleanup and insertion of IOL

Femtosecond Laser cataract surgery



Incision with femtosecond laser



Capsulotomy



Lens Fragmentation



complications

Pre operative complications:

Anxiety Nausea and gastritis Irritative /allergic conjunctivitis Corneal abrasion Due to local anesthesia: **Retrobulbar hemorrhage Globe** perforation Oculocardiac reflex Sub conjunctival hemorrhage

Intra-operative complications:

- Detachment of descemet's membrane
- Iridodialysis
- Posterior capsular rupture
- Nucleus drop in to vitreous cavity
- Expulsive choroidal haemorrhage

Early post-operative complications:

- Hyphaema
- Iris prolapse
- Striate keratopathy
- Flat anterior chamber
- endophthalmitis





Late post-operative complications:

- Cystoid macular oedema
- Pseudophakic bullous keratopathy
- Retinal detachment
- After cataract
- Lens dislocation



Posterior Capsule Opacity





Elschnigs pearls



Soemmerings ring



dense posterior capsular opacity

Summary

- Opacification of crystalline lens is called Cataract
- Causes diminution of vision, glare, reduced contrast sensitivity
- Treatment is only surgical removal of cataract and implantation of intraocular lens
- Thorough pre-operative evaluation is necessary
- Advances in surgical technique and more sophisticated technology have helped make surgery a safe and effective treatment for cataracts

