

Lens

The lens is a transparent, biconvex structure of crystalline appearance placed between the iris and the vitreous.

It is suspended by the suspensory ligament of the lens or zonule of Zinn, which is attached to the ciliary body and equator of the lens.

Loses its vascular supply of interior during the uterine development

Lens is avascular, no innervation

Have 90 mg ...255 mg

Diameter is 6,5mm...9mm

Thickness 3,5mm...5mm

The lens is composed of 64% water, 35% protein and 1% lipid, carbohydrate and trace elements. The metabolism of the lens is anaerobic. Glycolysis is responsible for 85% glucose utilization resulting in lactate formation.

Structure

Lenticular capsule—It is a smooth, homogeneous, acellular envelope. The hyaline lens capsule is secreted by the underlying epithelial cells.

Lenticular epithelium—It is a single layer of cuboidal cells just deep to the anterior capsule. There is no corresponding posterior epithelium.

Lenticular fibres—The anterior cuboidal cells gradually become columnar and elongated (lens fibres) towards the equator. Anterior and posterior Y-shaped suture lines are formed at the junction of lens fibres.

Suspensory ligament or zonule of Zinn—This consists of transparent, straight and inextensible fibres.

Lens function:

-an important part of the dioptric system of the eye,

- focuses light rays into the retina,

-lens has approximately 20 diopters,

-the whole dioptric system of the eye has approximately 60 diopters, cornea has 40 diopters.

The accommodative power varies with age, being 14 to 16 D at birth, 7 to 8 D at 25 years age

And 1 to 2 D at 50 years old.

Any opacity in the lens or its capsule whether developmental or acquired is called cataract.

It is caused by biochemical changes

Biochemical changes responsible for cataract formation are: 1. Hydration—It occurs due to osmotic changes and changes in the semipermeability of lens capsule. The entire lens swells up and becomes opaque. 2. Denaturation and coagulation of proteins—It leads to the formation of dense, irreversible lenticular opacity.

Classification :

1. time – congenital, acquired
2. etiology – senil, traumatic, complication (metabol., inflammation, radiation, ...)
3. secondary
4. localisation- nuclear, cortical, polar, ...

CONGENITAL (DEVELOPMENTAL) CATARACT

Developmental cataract may be present at birth or it may occur in early childhood.

It has a tendency to affect a particular zone. It is usually stationary but may be progressive.

Incidence Congenital cataract occurs in about 3:10,000 live births. Two third of cases are bilateral.

- **Bilateral** - idiopathic., hereditary, metabol. disorders, Down sy, Marfan sy, inf. of mother – rubeola, CMV, varicella, lues, toxoplasma, ocular abnormalities – aniridia, dysgenesis of anterior segment

- **Unilateral** – idiopathic., ocular abnormalities, tumors, rubeola, radiation.

Etiology

1. Heredity—It accounts for approximately 25% of all congenital cataracts.
The most common cause is genetic mutation, usually autosomal dominant.
2. Maternal causes
 - i. Maternal malnutrition, e.g. as in zonular cataract.
 - ii. Maternal infection by virus, e.g. rubeola in the first trimester.
3. Foetal causes
 - i. Deficient oxygenation due to severe placental haemorrhage, e.g. placenta praevia.
 - ii. Metabolic disorders of the foetus or infant like galactosaemia, galactokinase deficiency
 - iii. Chromosomal abnormalities, e.g. as in Down syndrome (trisomy 21)
4. Idiopathic—Unilateral cataracts are usually sporadic and of unknown etiology.

Prevalence

- 65-74 y - 50%
- 75 y - 75%

Can be - Nuclear C.

- Cortical C.

- Posterior subcapsular C.

It is common to find cortical and nuclear senile cataracts co-existing together in one eye. In general, the relative frequency of coniform cataract is 70%, nuclear 25% and cupuliform cataract is 5% approximately.

Nuclear cataract:

- bilat.
- slow progres
- ↓ distance vision, near vision good – lenticular myopia (↑ refractive power of the nucleus)

Cortical cataract:

- bilat., asymet.
- vision affected – variable – localisation
- progresion – variable

We distinguish:

- incipiens
- -progreiens
- ↑ hydratation – intumescent c.
- mature c.
- hypermature c.

Posterior subcapsular cataract:

- younger pac.
- troubled by bright sunlight,
- near vision worse than distance vision

No medical treatment is effective once opacities have developed.

Surgical Treatment The technique of cataract extraction has changed drastically in recent years due to the introduction of operating microscope and intraocular lens implant. However, the modern trend is in favour of extracapsular lens extraction along with intraocular lens implantation. This reduces the incidence of vitreous loss to the minimum with superior visual results.

-ICCE - removing the lens with a capsule
-ECCE- removing the lens while retaining the capsule

-Fakoemulsification – by Kelman – 1967

USG – fragmentation of the nucleus – aspiration
small incision – small postoper. astigmat.

If only we use anesthesia in the form of drops and the solution of lidokain in the front chamber.

We use two or three small incisions that have a 1.4 to 2.5 mm

Continuous circular capsulorhexis :technique to create an anterior capsule opening
the capsule is only about four-thousandths of a millimeter thick!

Facoemulsification is procedure in which ultrasonic vibrations are used to break the cataract into smaller fragments, these fragments are then aspirated from the eye

Irrigation and aspiration: the softer peripheral cortex of the cataract is removed the posterior side of the lens capsule is left intact to help support the intraocular lens (IOL) implant

IOL implantation: -Insert the lens into the injector and implanted through a small incision.

- the IOL is implanted within the “capsular bag”
- haptics, hold the lens implant within the capsular bag
- we use foldable soft artificial IOL
- monofocal, multifocal
- pseudo-accommodation
- astigmatic

The surgery is completed by injecting solution of antibiotics in the front chamber and salt solution to hydrate the lateral walls and internal entry of incision .

Complication:

Operative c. – rupture of poster. capsule , loss of lens fragments, haemorrhage, injury of the corne

Early postoperative c. – IOP, CME, inflammation, hypotony, astigmat., corneal oedema, acute bacterial endophthalmitis, wound leak

Postoper. late c. – retinal detachment, dislocation of the IOL, sec. cataract, bulose keratopathy.

High intra-ocular pressure

This complication usually occur when the visco-elastic is left in the eye, or is not adequately aspirated prior to wound closure. The visco-elastic particles would block the trabecular meshwork and raise the IOP.

Expulsive hemorrhage

This is a dreadful complication that mainly happens following acute drop in intra-ocular pressure. The patient is usually hypertensive, diabetic, myopic, or having glaucoma. The short and long posterior ciliary arteries would suddenly bleed and the blood would accumulate in the supra-choroidal space. The intra-ocular pressure would then rises significantly and push the ocular content out of the eye. The surgeon should rapidly close the wound and give intra-venous osmotic agents to lower the intra-ocular pressure. Steroids should be given post-op to decrease the inflammation. Drainage of the blood should take place after two weeks when clots start liquefying. The visual prognosis is usually dismal.

Posterior Capsular Rupture

This can often occur during phacoemulsification or during the irrigation aspiration process. If no vitreous leaks and the tear is small, a PC-IOL is inserted. If the tear is big enough to jeopardize the stability of the IOL in the posterior chamber, the iris is constricted using Miochol® and an AC-IOL is inserted in the anterior chamber. If the tear leaks vitreous, then an anterior vitrectomy is performed following which a decision is to be made whether to put an AC-IOL or delay the IOL implantation. Anterior vitrectomy can be automated (using a probe called ocutome) or mechanical, which entails applying sponges on the wound then pulling them out and cutting any sticking vitreous strands

Corneal edema (Striate Keratopathy)

Endothelial loss and ischemia due to manipulation during surgery as well due to ultrasonic shockwaves during phacemulsification lead to corneal decompensation and corneal edema. Endothelial folds (striae) and increased thickness of the cornea with cloudiness follow.

Posterior Capsule Opacification (PCO)

A frequent late complication of cataract surgery. It extremely common in children. PCO comprises any or a combination of the following:

Elshnig's pearls occurs by proliferation of the anterior lens epithelium over the posterior capsule.

Primary Opacification occurs following opacification of already existent posterior capsular plaques

Malposition of the IOL

A tilted IOL can produce astigmatism, monocular diplopia, optical aberrations such as halos and glare. Miotics sometimes relieve these symptoms. In severe cases, replacement of the IOL might be necessary.