Ophthalmology

LENS

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Fifth grade

The Lens

Cataract

Acquired cataract

Cataract maturity

Cataract in systemic diseases

Secondary cataract

Traumatic cataract

Drugs induced cataract

Cataract surgery

Congenital cataract

The lens

It is a transparent biconvex structure situated behind iris-pupil diaphragm and in front of the vitreous body. It is one of the refractive media of the eye, it contributes about 15diopter of the total refractive power of the eye which is 58diopters. Lens also play important role in process of accommodation.

Structure

The lens is made of three parts

. An elastic capsule.

A lens epithelium, which is confined to the anterior surface of the lens.

. The lens fibers, which constitute the main mass of the lens. The lens fibers are formed by multiplication and differentiation of lens epithelial cells at equator. The earliest formed fibers are those in the center forming the lens nucleus while the later fibers in outer layer forming the lens cortex.

The lens is held in position by a series of radially arranged fibers, collectively called suspensory ligament or zonules

Function of lens

1-account for 15 diopter of eye refractive power

2-Focuses light rays onto the retina

3-Play role in accommodation process

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Cataract

A cataract is a clouding of the natural intra ocular crystalline lens that focuses the light entering the eye onto the retina. This cloudiness can cause a decrease in vision and may lead to eventual blindness if left untreated. Cataracts often develop slowly and painlessly, so vision and lifestyle can be affected without a person realizing it. Cataract can be acquired or congenital

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ACQUIRED CATARACT

Age-related cataract

The pathogenesis is multifactorial and not completely understood. Chemical modification of lens proteins can play role in cataract development. Age related cataract can be classified according to its anatomical location into the followings

Sub capsular cataract

Anterior sub capsular cataract lies directly under the lens capsule while posterior sub capsular opacity lies just in front of the posterior capsule and due to its location at the nodal point of the eye, a posterior sub capsular opacity has a more profound effect on vision than a comparable nuclear or cortical cataract. Near vision is frequently impaired more than distance vision. Patients are particularly troubled under conditions of miosis, such as produced by headlights of oncoming cars and bright sunlight.

. Nuclear cataract

Nuclear cataract starts as an exaggeration of the normal aging changes involving the lens nucleus. It is often associated with myopia due to an increase in the refractive index of the nucleus. Nuclear sclerosis is characterized in its early stages by a yellowish hue due to the deposition of urochrome pigment.

. Cortical cataract

The opacities start as clefts and vacuoles between lens fibres due to hydration of the cortex. Subsequent opacification results in typical cuneiform (wedge shaped) opacities.

Cataract maturity

. Immature cataract is one in which the lens is partially opaque.

Mature cataract is one in which the lens is completely opaque.

Hyper mature cataract has a shrunken and wrinkled anterior capsule due to leakage of water out of the lens.

Cataract in systemic diseases

Diabetes mellitus

Hyperglycemia is reflected in a high level of glucose in the aqueous humor, which diffuses into the lens. Glucose is metabolized by aldose reductase into sorbitol resulting in secondary osmotic over hydration of the lens substance with subsequent cataract formation.

Myotonic dystrophy

About 90% of patients develop visually innocuous, fine cortical opacities in the 3rd decade which evolve into visually disabling posterior sub capsular opacities.

Atopic dermatitis

About 10% of patients with severe atopic dermatitis develop cataracts in the 2^{nd}- 4th decades.

Neurofibromatosis type 2

NF2 is associated with cataract in about 60% of patients.

Secondary cataract

A secondary (complicated) cataract develops as a result of some other primary ocular disease.

Chronic anterior uveitis

Chronic anterior uveitis is the most common cause.

Acute congestive angle-closure

High myopia

Hereditary fundus dystrophies

Traumatic cataract

Trauma is the most common cause of unilateral cataract in young individuals and may include the following:

. Penetrating trauma

. Blunt trauma

. Electric shock

. Infrared radiation

Ionizing radiation

Drugs induced cataract

. Steroids: both systemic and topical, are cataractogenic.

. Other drugs: Busulphan, Gold, Allopurinol

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TREATMENT OF CATARACT

There is no medical treatment to prevent the development or progression of cataract, treatment by surgery.

INDICATIONS FOR SURGERY

. Visual improvement is by far the most common indication for cataract surgery. Operation is indicated only if and when the opacity develops to a degree sufficient to cause difficulty in performing essential daily activities.

. Medical indications are those in which a cataract is adversely affecting the health of the eye, for example, phacolytic or phacomorphic glaucoma. Cataract surgery to improve the clarity of the ocular media may also be required in the context of fundal pathology (e.g. diabetic retinopathy) requiring monitoring or treatment.

Anesthesia

The vast majority of cataract surgery is performed under local anesthesia (LA) although general anesthesia is required in some circumstances such as children and many young adults, very anxious patients, some patients with learning difficulties, epilepsy, dementia and those with a head tremor.

Surgery

Intra capsular cataract extraction (ICCE), an older procedure in which the surgeon removed the complete lens within its capsule and left the eye aphakic (without a lens) then patient's vision was corrected by extremely thick eyeglasses or by contact lenses or by implantation of anterior chamber intra ocular lens (AC IOL).

Extra capsular cataract extraction (ECCE) is a category of eye surgery in which the

lens of the eye is removed by manual expression through an incision (about 10 mm) made in the cornea or the sclera of the eye while the elastic capsule that covers the lens is left partially intact to allow implantation of an intra ocular lens (IOL).

Phacoemulsification, in which the lens is broken into fragments inside the capsule by ultrasound energy and removed by aspiration through corneal incision (about 3mm) followed by implantation of foldable IOL through the same small incision. Phacoemulsification ('phaco') has become the preferred method of cataract extraction over the last 15 years. The smaller incision of phacoemulsification is associated with little induced postoperative astigmatism and early stabilization of refraction (usually 3 weeks for 3.0 mm incision). Postoperative wound-related problems such as iris prolapse have been almost eliminated. One disadvantage of phaco is that it requires complex machinery to break up the lens nucleus and remove it through a small incision. Considerable training and practice is required to learn the techniques adequately.

CONGENITAL CATARACT

Etiology

Congenital cataracts occur in about 3 in 10 000 live births. Two-thirds of cases are bilateral and the cause can be identified in about half of those affected.

Systemic metabolic associations

Galactoasemia

Lowe syndrome

Fabry disease

Mannosidosis

Associated intrauterine infections

Congenital rubella

Toxoplasmosis

Cytomegalovirus infection

Varicella

Associated chromosomal abnormalities

Down syndrome

Edwards syndrome

Treatment

Surgery involves anterior capsulorhexis, aspiration of lens matter, capsulorhexis of the posterior capsule, limited anterior vitrectomy and IOL implantation, if appropriate. It is important to correct associated refractive errors.

Timing is crucial and the main considerations are as follows:

. Bilateral dense cataracts require early surgery when the child is 4–6 weeks of age.

. Bilateral partial cataracts may not require surgery until later.

. Unilateral dense cataract merits urgent surgery (possibly within days) followed by aggressive anti amblyopia therapy.

. Partial unilateral cataract can usually be observed