

DISORDERS OF THE LENS

Cataract : any acquired or congenital opacity in the lens capsule or substance.

Aetiology:

1-Age related cataracts (senile cataracts)

Morphology: Subcapsular cataract which is either anterior or posterior, nuclear cataract involving the lens nucleus, cortical cataract involves the anterior, posterior or equatorial cortex.

All of these types of cataract can progress to maturity so that the entire lens becomes opaque. A hypermature cataract is one in which leakage of water has resulted in shrinkage of the lens capsule. A morgagnian cataract is a hypermature cataract in which total liquefaction of the cortex has allowed the nucleus to sink inferiorly. An intumescent cataract is a swollen cataractous lens because of fluid absorption. It may cause pupillary block with forward displacement of the iris causing shallowing of the anterior chamber which may result in secondary angle-closure glaucoma.

2-Presenile cataracts

Presenile cataracts may be associated with diabetes, myotonic dystrophy, atopic dermatitis and Neurofibromatosis.

3-Traumatic cataracts

Trauma is the most common cause of unilateral cataract in young individuals. Lens opacities may be caused by direct penetrating injury, concussion, electric shock, ionizing radiation, infrared and ultraviolet radiation. Alkali injuries to the ocular surface often result in cataract, in addition to damaging the cornea, conjunctiva, and iris.

4-Toxic cataracts (drug-induced lens changes)

Steroids, both systemic and topical, are cataractogenic. Other drugs which may cause cataract are chlorpromazine, miotics, amiodarone, gold, and phenothiazines.

5-Secondary cataracts:

A secondary (complicated) cataract develops as a result of some other ocular disease. Chronic anterior uveitis is the most common cause of secondary cataract. Other causes include acute congestive angle-closure glaucoma, high myopia, hereditary fundus dystrophies such as retinitis pigmentosa.

Symptoms and Signs

The cardinal symptom of juvenile or adult cataract is a progressive, painless loss of vision. The degree of loss depends on the location and extent of the opacity. When the opacity is in the central lens nucleus (nuclear cataract), myopia develops in the early stages, so that a presbyopic patient may discover that he can read without his glasses (second sight). Rarely, the cataract swells (intumescent cataract), producing secondary glaucoma and pain.

Opacity beneath the posterior lens capsule (posterior subcapsular cataract) disproportionately affects vision because the opacity is located at the crossing point of the light rays from the viewed object. Such cataracts are particularly troublesome in bright light.

Diagnosis

Gradual loss of vision beginning in middle age or later is characteristic of cataract.

Well-developed cataracts appear as gray or yellow-brown opacities in the lens. Examination of the dilated pupil with the ophthalmoscope held about 30 cm (1 ft) away usually discloses subtle opacities. Small - , cataracts stand out as dark defects in the red reflex. A large cataract may obliterate the red reflex. Slit-lamp examination provides more details about the character, location, and extent of the opacity.

General indications for cataract surgery

1. Visual improvement is by far the most common indication for cataract extraction.
2. Medical indications such as secondary angle closure by an intumescent lens, and diabetic retinopathy, for treatment of the fundus.
3. Cosmetic indications to restore a black pupil in an otherwise blind eye

Preoperative evaluation

- (a) Evaluation of the general health of the patient and ocular history.
- (b) External examination for any abnormalities or infection and pupillary reflexes.
- (c) Examination of the anterior segment and fundus evaluation. In mature cataract B scan ultrasonography is helpful. Light projection and color discrimination are helpful too.
- (d) Measurement of visual acuity.
- (e) Preoperative measurements include, refraction, biometry.

Surgical techniques

Cataract extraction is usually performed using local anesthesia and . There are three extraction techniques: intracapsular cataract extraction, which consists of removing the cataract in one piece (now rarely performed); extracapsular cataract extraction, which consists of removing the hard central nucleus in one piece, then removing the soft cortex in multiple small pieces; and phacoemulsification, which consists of dissolving the hard central nucleus within the eye by ultrasound, then removing the soft cortex in multiple small pieces. The smallest incision is used with phacoemulsification, thus enabling the fastest healing.

A polymethylmethacrylate (PMMA), acrylic or silicone lens is almost always implanted intraocularly to replace the optical focusing power lost by removal of the crystalline lens. The lens implant can be placed in front of the iris (anterior chamber intraocular lens), attached to the iris and, within the pupil (iris plane intraocular lens), or placed behind the iris (posterior chamber intraocular lens). The posterior chamber lens is by far the most common placement.

In most cases, patients are on a tapering schedule of topical antibiotics and topical corticosteroids for up to 4 wk after surgery.

Complications of cataract surgery Intra-

operative complications

- a. Rupture of posterior capsule which may be accompanied by vitreous loss.
- b. Posterior loss of lens fragments: large fragments should be removed to avoid progressive lens-induced inflammation and long-term glaucoma.
- c. Suprachoroidal (expulsive) haemorrhage. (intraoperative bleeding beneath the choroid causing the intraocular contents to be expelled through the incision)

Early postoperative complications

include, iris prolapse, striate keratopathy which is characterized by corneal oedema and folds in Descemet membrane, and acute bacterial endophthalmitis.

Late postoperative complications

include capsular opacification (treatable with laser), malposition of an IOL which is uncommon, corneal decompensation with bullous keratopathy usually associated with anterior chamber intraocular lens, retinal detachment, suture-related problems as superior limbic conjunctivitis and mechanical injury from broken sutures, cystoid macular edema, glaucoma, and chronic endophthalmitis.

ACUTE BACTERIAL ENDOPHTHALMITIS

The *causative organisms*, in order of frequency, are Staph. epidermidis, Staph. aureus, Pseudomonas sp, and Proteus sp.

Prevention by: Treatment before surgery of pre-existing infections. Preoperative instillation of povidone-iodine 5% solution. Meticulous draping technique Postoperative sub-conjunctival injection with antibiotics.

CLINICAL FEATURES

The clinical features depend on its severity at the time of examination. Mild or early endophthalmitis may be associated with only slight pain, and preservation of some red reflex. Severe endophthalmitis is characterized by pain, marked visual loss, corneal haze, hypopyon (pus in the anterior chamber), absent red reflex and inability to visualize the Fundus with the indirect ophthalmoscope.

MANAGEMENT

1. **Identification of the causative organism** from the aqueous and vitreous.
2. **Antibiotics** which cover both Gram-positive and Gram-negative organisms should be administered.
 - a. **Intravitreal antibiotics** should be given after the culture specimens have been obtained. ceftazidime (2mg), and vancomycin (1 mg) are injected slowly into the vitreous cavity.
 - b. **Periocular injections** consist of an anterior sub-Tenon injection of vancomycin 25 mg and ceftazidime 100 mg. The injections are repeated daily for 5-7 days according to the response to therapy.
 - c. **Topical therapy** consists of fortified gentamicin and vancomycin drops every 30-60 minutes.
 - d. **Systemic antibiotics** are not beneficial because of their relatively poor intraocular penetration.
3. **Steroid therapy** will not interfere with the control of the infection, provided the organisms are sensitive to the antibiotics.
 - a. **Periocular injections** of betamethasone or dexamethasone 4 mg (1 ml) are given daily for 5-7 days according to response to therapy.
 - b. **Systemic therapy** with oral prednisolone 80 mg/day for 10-14 days may be considered only in very severe cases.
 - c. **Topical therapy** with dexamethasone drops 0.1 % is given every 30 minutes.
4. **Vitreotomy** is beneficial only in cases with very severe infection and a visual acuity reduced to 'light perception'.

CONGENITAL CATARACTS

Morphological types: include nuclear, lamellar, sutural, coronary and polar cataract. Focal blue dot opacities are very common and innocuous.

Causes'

1. Inherited without systemic abnormality.
2. Metabolic causes as galactosaemia, galactokinase deficiency, and hypocalcaemia.
3. Intrauterine infections as Congenital rubella and toxoplasmosis.
4. Chromosomal disorders: e.g. Down and Turner syndrome.

Evaluation of the patient

Since visual acuity cannot be obtained in neonates, greater reliance has to be placed on the density and morphology of the opacity. Associated ocular pathology may involve the anterior or posterior segment. Other features indicative of severe visual impairment are absence of central fixation, and the presence of nystagmus or strabismus.

The investigation of infants with bilateral cataracts should include the following:

- (a) Serological tests for intrauterine infection (TORCH = toxoplasmosis, rubella, cytomegalovirus and herpes simplex).
- (b) *Urinalysis* for reducing substance after drinking milk.
- (c) *Urine chromatography* of amino acids for Lowe syndrome.
- (d) Other investigations include fasting blood sugar, serum calcium and phosphorus, and galactokinase levels. Paediatric evaluation and chromosome analysis should be looked for.

Surgery

Timing is crucial. Visually significant cataract should be removed immediately. Lensectomy/vitreotomy is a small incision technique by which the cataract is removed using a vitreous cutting instrument.

Postoperative complications

The incidence of complications is greater than that in adult eyes. These include posterior capsular opacification, secondary membranes may form across the pupil, lens re-proliferation in the equator, acute angle closure glaucoma due to pupillary block. Retinal detachment is a late complication.

Visual rehabilitation

Contact lenses provide a superior optical solution for both unilateral and bilateral aphakia. Spectacles are useful for older children with bilateral aphakia, but are not appropriate in patients with unilateral aphakia because of associated anisometropia. Intraocular lens implantation, , in young children, is still controversial. Lens implants are, however, being used with increased frequency in children.

ABNORMALITIES OF LENS SHAPE

1. *A lens coloboma* notching of the lens.
2. *Anterior or posterior lenticonus* is a projection of the anterior or posterior axial zone of the lens.

3. *Lentiglobus* is a generalized hemispherical deformity of the lens.
4. *Microphakia* is a lens with a smaller than normal diameter.

ECTOPIA LENTIS

Ectopia lentis refers to a displacement of the lens from its normal position. The lens may be completely dislocated from the pupillary space or partially displaced (subluxated).

Aetiology:

1. Acquired causes include trauma, a very large eye (i.e. high myopia, buphthalmos), anterior uveal tumours and a hypermature cataract.
2. Hereditary causes as Marfan syndrome, homocystinuria and WeillMarchesani syndrome.

Management of ectopia lentis

The main complications of ectopia lentis are: optical distortion, astigmatism, and glaucoma. The following are three treatment options:

1. Spectacle correction.
2. Nd:YAG laser zonulysis may be performed to displace the lens out of the visual axis.
3. Surgical removal of the lens is indicated for associated cataract, lens-induced glaucoma, uveitis, endothelial touch, or if the other methods are inappropriate.