Cataract

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**Cataract** *- developmental or degenerative* ***lens opacity***.

Etiology

1. Aging (**senile cataract**) - leading causes of blindness in world!!!
2. **Traumatic cataract** - secondary to blunt or penetrating ocular trauma.
3. Chronic exposure - X-ray, infrared (glass-blower's cataract), UV, electric shock.
4. Systemic disease (e.g. diabetes mellitus!, neurofibromatosis-2)
5. Chronic uveitis
6. Systemic medications (e.g. chronic corticosteroids).

Symptoms & Signs

*- progressive, painless* ***vision loss****.*



**nuclear cataract** (opacity in central lens nucleus) - excessive nuclear sclerosis and yellowing; nucleus can become very opaque and brown (**brunescent nuclear cataract**).

* clinical features:
* gradual, progressive lens thickening → myopia develops in early stages (**myopic shift**) - presbyopic patient discovers that he can read without his glasses (temporary second sight).
* **distance acuity** is decreased most (good near vision!).
* if nuclear changes are concentrated in inner lens layers → refractile area occurs in lens center → **monocular diplopia**.
* correlation with *smoking*.
* histology - homogenous lens nucleus with loss of cellular laminations.

**cortical cataract** - due to changes in ionic composition and hydration of lens fibers.

* clinical features:
* *visual acuity long remains intact* until late stages when cortical spokes compromise visual axis.
* mild glare is possible.
* correlation to solar UV exposure, diabetes, drug ingestion.
* histology - hydropic swelling of lens fibers with globules of eosinophilic material (morgagnian globules) seen in slit-like spaces between lens fibers.

**posterior subcapsular cataract** (granular and plaquelike opacities beneath posterior lens capsule).

* correlation (≈ as cortical cataract) to solar UV exposure, diabetes, drug ingestion.

N.B. if presents in children – may be specific feature of neurofibromatosis-2

* clinical features:
* opacities are located at crossing point of light rays -disproportionately affects vision (esp. **near acuity**!).
* particularly troublesome in bright light (disabling glare).
* histology - posterior migration of lens epithelial cells in posterior subcapsular area, with aberrant enlargement of epithelial cells (Wedl or bladder cells).

**Nuclear cataract** - dark brown nucleus that casts shadow on retroillumination:



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**Nuclear & Cortical Cataract** - nucleus is condensed, lens periphery has cuneiform opacities:



**Posterior Subcapsular, Nuclear and Cortical Cataract**

*slitlamp* - opacities in anterior cortex, nucleosclerosis, posterior subcapsular changes:



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*retroillumination* - shows subcapsular changes but only suggests nucleosclerosis:



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* rarely, *cataract swells*, producing secondary glaucoma and pain.

Senile cataract prevalence in general population ≥ 75 yrs:

nuclear - 65.5%

cortical - 27.7%

posterior subcapsular - 19.7%

N.B. ***alcohol*** is associated with all cataract types!

Traumatic cataracts:

**Blunt trauma** classically forms stellate- or rosette-shaped posterior axial opacities:

* may be stable or progressive.

**Penetrating trauma** (disruption of lens capsule) forms cortical changes; may remain focal (if small) or may progress rapidly to total cortical opacification.

**Blunt trauma:**

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**Siderosis lentis**:



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Diagnosis

**Ophthalmoscopy**

N.B. before pupils are dilated for ophthalmoscopy, *increased intraocular pressure and shallow anterior chamber must be ruled out*!

* gray / yellow-brown opacities in lens.
* examination of dilated pupil with ophthalmoscope held 30 cm away discloses subtle opacities - as dark defects in red reflex; large cataract obliterates red reflex.

**Slit-lamp examination** provides more details.

Staging

- based on visual acuity:

acuity < 20/200 - **mature** cataract.

acuity > 20/200 - **immature** cataract.

can still read at 20/20 but lens opacity confirmed by slit lamp - **incipient** cataract.

**Mature cataract**:



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**Mature cataract**: whitish opacification of whole lens with bulging of lens material in pupillary area (imminent phacolytic glaucoma):



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Morgagni cataract - **hypermature** cataract in which brown nucleus gravitates within liquefied milky-white capsule (risk of phacolytic glaucoma):





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Treatment

No proven medical treatment exists to delay, prevent, reverse development of senile cataracts!

* frequent **refractions & eyeglass changes** maintain vision during cataract development.
* **chronic pupillary dilation** is helpful for small lenticular opacities.
* **UV-coated glasses** must be worn in sunlight.
* investigated medications:
	1. aldose reductase inhibitors, sorbitol-lowering agents
	2. aspirin
	3. glutathione-raising agents
	4. antioxidant vitamins C and E.

**Surgery**

* indications:
	1. maximally corrected **vision ≤ 20/50** (6/15)
	2. subjective visual impairment that **prevents activities** (e.g. driving, reading, occupational activities).
	3. **disabling glare** (most common with *posterior subcapsular cataracts*).
	4. **lens-induced diseases** (e.g. phacolytic glaucoma, phacoantigenic uveitis).
	5. **need to visualize fundus** for management of diseases (e.g. diabetic retinopathy, glaucoma).
* 30-60 min prior operation instill 1 gtt 2,5% **phenylephrine** to achieve good mydriasis.
* local anesthesia + IV sedation.

**Extraction techniques**

1. **intracapsular cataract extraction**(now rarely performed) - removing cataract in one piece (i.e. *extraction of entire lens*, including posterior capsule).
* no need to worry about subsequent development of capsular opacity.
* less sophisticated equipment needed.
* uses *larger limbal incision* (often 160-180°) - following risks: delayed healing, significant against-the-rule astigmatism, iris incarceration, postoperative wound leaks, vitreous incarceration, corneal edema.
* because posterior capsule is not intact, IOL must be implanted either in anterior chamber or sutured to posterior chamber (both are more difficult than simply placing IOL in capsular bag).
* indication - severely impaired zonular integrity (doesn’t allow successful extracapsular lens removal and IOL implantation).
* absolutely contraindicated in children & young adults, cases with traumatic capsular rupture.
1. **extracapsular cataract extraction (ECCE)** - removing ***hard central nucleus*** in one piece (through opening in anterior capsule), then removing ***soft cortex*** in multiple small pieces; *retention of posterior capsule integrity*.
* smaller incision is required; *less short and long-term complications*.
* better anatomic IOL placement (in capsular bag).
* intact posterior capsule also reduces iris & vitreous mobility that occurs with saccadic movements (*endophthalmodonesis*).
* main requirement is **zonular integrity**.
1. **phacoemulsification** - dissolving ***hard central nucleus*** within eye by ultrasound, then removing ***soft cortex*** in multiple small pieces.
* differs from standard ECCE by method of nucleus extraction - ultrasonically driven needle fragments nucleus and aspirates lens substrate through needle port.
* uses smallest incision (≈ 4 mm)!!!
* with advent of phacoemulsification, patients are *advised against delaying lens extraction* to point when cataract is hard and mature and likelihood of postoperative complications increases.

**Intraocular lens (IOL)** - plastic or silicone; implanted intraocularly (such eye is called *pseudophakic*):

* 1. in front of iris (**anterior chamber IOL**)
	2. attached to iris and within pupil (**iris plane IOL**) - now rarely used (high frequency of postoperative complications).
	3. behind iris (**posterior chamber IOL**) - most common placement.
* IOL power must be compatible with refractive error of fellow eye to avoid postoperative anisometropia.

*aphakia* may be better choice in *highly inflamed eyes* and *young children*; they experience better outcomes if lens implantation is deferred;

* *if IOL is not implanted*, **contact lenses / thick glasses** are needed.

Postoperative period:

* eye shield for a few hours after; then wear shield while sleeping;
* tapering schedule of ***topical antibiotics & topical corticosteroids*** for 4 wk.
* avoid Valsalva maneuver, heavy lifting, bending forward too far, eye rubbing.
* refraction is stable at 6-8th postoperative week - corrective lenses can be prescribed.
* 95% eyes achieve vision ≥ 20/40 (6/12).

Complications of cataract surgery: retinal detachment, cystoid macular degeneration, bullous keratopathy, choroidal hemorrhage (causing intraocular contents to be expulsed through incision), endophthalmitis, posterior capsular opacification (treatable with YAG laser), glaucoma.

CONGENITAL CATARACT

1. **Chromosomal abnormalities** - trisomies (Down, Edward, Patau syndromes).
2. **Metabolic disease** (e.g. galactosemia [classic "oil droplet" cataract], hypoglycemia, dystrophia myotonica)
3. **Intrauterine infection** (toxoplasmosis, rubella, cytomegalovirus, herpes simplex [i.e. TORCH])
4. **Maternal disease** during pregnancy.
* may present as **irregular red reflex**, nystagmus, squint, amblyopia.
* if opacity is *in visual axis*, it is considered visually significant and may lead to blindness (*deprivation amblyopia*)!

if cataract is *small*, in *anterior lens portion*, or *in periphery*, no visual loss may be present.

* treatment - *visually significant cataract* must be removed within first 17 weeks (ideally < 2 months);
	+ **extracapsular extraction** with **primary**\* **posterior capsulectomy** and **anterior vitrectomy** is procedure of choice!

\*young eyes develop capsular opacification very quickly necessitating primary capsulectomy at time of cataract extraction;

intracapsular extraction in children is contraindicated (because of vitreous traction and loss at Wieger capsulohyaloid ligament).

* + IOL routinely is not placed!
	+ postoperative visual correction with spectacles / contact lenses / epikeratophakia (suturing of human cornea, lathed like contact lens, onto recipient's cornea) is difficult but necessary to achieve good vision.
* in *unilateral* cases, *refractive amblyopia is serious risk*! (even after cataract is removed – because quality of image in operated eye is inferior to that in normal eye).
* postoperative - many years of ***refractive correction*** (contact lenses or aphakic glasses), possible patching for amblyopia, frequent ***glaucoma screenings*** throughout life!

Bibliography for ch. “Ophthalmology” → follow this [link >>](http://www.neurosurgeryresident.net/Eye.%20Ophthalmology%5CEye.%20Bibliography.pdf)

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