Pediatric cataract

Pediatric cataract can be:

- Congenital or acquired
- Unilateral or bilateral
- Partial or complete
- Sporadic or inherited
Indications for surgery

➢ Anterior capsular opacities are not significant unless they occlude the entire pupil.
➢ Central & posterior lens opacities 3mm in diameter & dense to obstruct view of the Fundus.
➢ Strabismus in unilateral cataract.
➢ Nystagmus in bilateral cataract.
Timing of surgery

Infants born with Cataract

- Early surgery is necessary in congenital cataract to prevent amblyopia.
- Total unilateral cataract should be operated within 6 weeks
- Total bilateral cataract should be operated within 10 weeks
Timing of surgery

In Children beyond infancy

Surgery is indicated when the level of visual function interferes with the child visual needs

In a literate child: Snellen visual acuity

20/60 or worse

Pre-operative exam
Workup

Unilateral cataract
➢ Usually not associated with systemic or metabolic disease.

Bilateral cataract
➢ Has positive family history
   - no need for systemic workup
➢ Has no family history:
   - basic lab evaluation
   - pediatric consultation

Lab Study

For bilateral cataract, with negative family history
- Urine for reduced sugar (Galactosemia)
- Serum Ca (Hyperparathyroidism)
- Blood glucose (DM)
-Urine amino acid test (Lowe syndrome)
- Infectious diseases: TORCH & Varicella titre, VDRL

Pediatric Consultation
Ocular examination under anesthesia
- Cataract morphology
- Corneal diameter
- AC depth
- Iris configuration
- Lens position
- IOP
- Biometry
- Fundoscopy
- U/S

Surgical technique
Anatomical difference of pediatric eyes

- Small eye.
- Small pupil (poor mydriasis).
- Shallow AC.
- Anterior lens capsule is elastic & difficult to tear.
- Thin, less rigid sclera.
- High vitreous pressure.
- Risk of severe inflammatory response.

Wound construction

**Tunnel incision** corneal tunnel have replaced the limbal incision after shift to foldable IOLs:

- Better AC stability (closed chamber technique.)
- Less iris prolapse.
- Less astigmatism.
Scleral vs. corneal tunnel

**Corneal tunnel:**
- Easy operative maneuvering.
- Less inflammation.
- Leaves the conjunctiva undisturbed (Increase risk of glaucoma surgery).

**Scleral tunnel:**
- No corneal opacity in infants.
- Less astigmatism.
- Can be enlarged for PMMA IOL.

Superior vs. temporal tunnel

**Superior approach:**
- Wound protection by brow & Bell’s phenomenon.
- Less risk of injury & postoperative endophthalmitis.
Corneal tunnel
- 2.2-2.4mm
- Just inside the limbus
- Square incision
- Sutured

Paracentesis incision
- Near the limbus.
- MVR 20-G (0.9mm)
- Snug fit for instruments that pass into AC.
- Should be sutured.
Anterior Capsulorhexis

- Intact ACCC supports all subsequent steps.
- Shape, size & edge integrity is important for long-term centration of IOL.
- Rhexis should be continuous, 5.5mm, round & central.

Difficult CCC in children

- Anterior capsule is elastic & difficult to tear
  - AC is shallow
- Poor dilatation of pupil.
- Low scleral rigidity & high vitreous pressure encourage radial tears
Extreme elasticity of the capsule

➢ Tearing requires great force.

➢ Capsule first stretches & distends before abruptly splitting.

➢ Tearing is very rapid & tends to spiral out.

Instruments for Capsulorhexis
Capsulorhexis by Cystotme

Capsulorhexis by Cystotme
Capsulorhexis by micro-coaxial forceps

Capsulorhexis by Utrata’s forceps
Capsulorhexis guidelines

Ophthalmic Viscoelastic Devices (OVD)

Viscous & super-viscous cohesive OVDs (Healon GV, Healon5)
Creates & maintains space, deepens AC flattens anterior capsule.

• Offset low scleral rigidity & increased vitreous pressure.
• Facilitates ACCC, PCCC & IOL implantation.
Visco expansion of the pupil

Capsular stain

Trypan blue 0.1 %

- AC is filled with OVD or air.
- Use special cannula.
- Leave the dye for 1 min.
Capsular stain
Protect cornea with air bubble or OVD.
Use small amount of dye.

Capsulorhexis guidelines
Maintain AC deep all the time

- Use of high viscous OVD to flatten the anterior capsule.
- Proper construction of main incision.
- Eliminate eye pressure & wound distortion.
Shallow AC

Lens is pushed forwards

Increased tension on zonules & capsule

Capsular tear runs peripherally
Capsulorhexis guidelines

Keep flap folded down against the underlying capsule (tear by shearing).

➢ Lifting the flap increases the radius of tear & the tear runs peripherally.
Direct the tear towards the center of the pupil
Hold the flap as close as possible to the origin of the tear.

➢ The farther the grasping point from the tear point the large the opening.

➢ Frequent re-grasping.

➢ Go slowly in small steps.
Small diameter Rhexis is easier to control.

Ideal size of CCC: 5-5.5mm

- Anterior convexity of lens equator tends to steer any capsular tear toward the periphery.

- Big tear can encounter a zonular attachment, sending the tear out to the equator.

**Multiple quadrant Hydrodissection**

- Contraindicated in Lentiglobus or posterior polar cataract.

- 27-G cannula on 2cm syringe
Lens substance aspiration

Bimanual I/A

- 20-g MVR
- Tight incisions.
- Complete cleaning of the bag
- Continuous irrigation
Phacoaspiration

Capsule polishing
PCCC
Posterior capsulorhexis & anterior vitrectomy

- In children < 5-8 years.
- Before vs. after IOL implantation.
- Limbal vs. pars-plana
- Manual vs. vet rector.
- 1.5-2mm smaller than IOL optic

Anterior vitrectomy
Primary IOL implantation

IOL implantation at the time of cataract surgery has become the standard means of optical correction for children beyond infancy

- in the bag
- in the sulcus

AcrySof IOL

- Hydrophobic acrylic, highly biocompatible.
- One piece – Square edge for bagal fixation, 3 piece for sulcus fixation.
- Flexible haptics bend & twist during entry.
- Slow unfolding.
- Stable – force haptics have good memory & re-expansion to resist capsular fibrosis.
- Stickiness impedes LEC migration.
- High RI, thin
- Injected through 2.2 mm incision.
- Low PCO rate.
Viscoelastic inflation of capsular bag

Primary IOL implantation in the bag
Incision suturing

- Low Scleral rigidity promotes wound leakage.
- High dose of steroids postpone healing.
- Children younger than 12 years should be stitched, main incision & side ports.
- 10/0 Nylon removed after 1-2 month.
- 10/0 Vicryl (absorbable).
Wash of viscoelastics

IOL power calculation in children

- In aphakia & pseudophakia there is no compensatory flattening of the lens. This gives rise to myopic shift.
- Allowance can be made for axial growth & myopic shift that occur during childhood
Initial desired refractive outcome:

- Hypermetropia- depending on the age of the child.
  - Infants < 10 weeks : 8 – 9 D hyperopia.
  - Infants 12 months : 4 D hyperopia.
  - Age of 24 months : 2 D hyperopia.
  - Age of 36 Ms & on : 1 D hyperopia.
- Residual refractive error corrected by CL or spectacles.
- Continuous adjustment.

Piggy-back IOLs:

- Refraction in young infants can change > 9D.
- For this reason Wilson 2001 have implanted 2 IOLs, one in the bag (expected power at adulthood) & the second in the sulcus.
- at about 3-4 years postoperatively he explanted the second lens adjusting the child’s refraction automatically.
- Useful in children non-complaint to contact lenses.
In infants under 1 year of age most surgeons recommended primary aphakia with contact lens correction & secondary IOL later in life.
Concern about IOL implantation in infancy

1. **Eye is smaller** than adult size
   Current IOLs oversized to capsular bag (bag stretch, ovaling, folds, zonular stretch).
2. Potential for **large myopic shift**
3. High risk of **visual axis opacification**
4. Increased **inflammatory response**
Secondary IOL implantation
Sulcus fixation
secondary IOL implantation
( in the bag fixation )

Post-operative treatment

• **Steroids**: - *Topical 2 -3 m.*  
  - *Subconjunctival.*  
  - *Intracameral.*

• **Atropine** → cyclopentolate.

• **Contact lens** – **spectacles**.

• **Bifocals at age of 2 -3 yrs.**

• **Exam under GA** – repeated.
Post-operative visual rehabilitation

- Contact lens or spectacle as soon as media are clear.
- Frequent retinoscopy & correction of refractive error.
- Overcorrection + 2 D until bifocals are tolerated.
- Occlusion in amblyopia.

Complications

Different from those in adults.

( RD, CME & corneal edema are rare ).

- Postoperative increased inflammatory response
- Strabismus
- PCO, Pupillary capture, IOL decentration
- Glaucoma
- Amblyopia
Pupillary capture

Poor design of old IOLs & Sulcus fixation was followed by Uveitis, decentration & IOL capture.

PCO
Wash of pearls behind the IOL

Glaucoma after cataract surgery in infants

- Incidence 10 - 33 %.
- Usually open angle.
- Onset: early or as late 5-15 years after surgery.
Glaucoma after cataract surgery in infants

Risk factors:
- Young age: risk is high for surgery is performed in the first year & very high if surgery is performed in the first 4 weeks of life.
- Microcornea.
- PFV.
- Surgical complications.

Patching regimen for unilateral congenital cataract surgery
The major problem in the management of unilateral cataract is amblyopia treatment.
- Full compliance with occlusion therapy is uncommon (20% of children) & good VA (0.2 or more) is achieved only in children who adhered to occlusion therapy.
- Long-term patching therapy can cause extreme stress for child & family & child-family relationship. uncommon
Patching regimen for unilateral congenital cataract surgery

**Optimal occlusion time** is controversial

- VA does not develop if patching is insufficient
- Intensive patching hinders development of binocular vision.

**Jeffery (2001)** found no difference between intensive occlusion (80%) & reduced occlusion (20-50%) of waking hours.

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Parent education

Treatment takes a long-term strategy

- Removal of cataract is only the beginning & visual rehabilitation requires many years of refractive correction, use of spectacles, patching & repeated examinations possibly under GA.
- Repeated surgical procedures for VAO or squint may be needed.
- Lifelong observation for glaucoma.
- Risk of potential visual loss from amblyopia, glaucoma or RD.