Pediatric Cataract Follow up and Indications for Surgery

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- Congenital and Early Developmental Cataract are common ocular abnormalities
- Prevalence is about 1 of every 250 (0.4%) newborns
- Important cause of visual impairment in childhood
- 10 to 38% of Causes of all blindness in Children
- Only 26% of those children operated for congenital cataract were able to attend an ordinary school

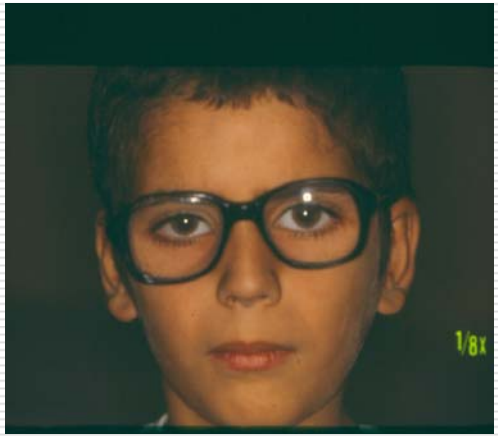
Indications for Treatment

- Any Pediatric Lens opacity (cataract) needs management:
- Concomitant ocular developmental defects (potential for vision): * Anterior segment
  * Posterior segment
- Systemic disease
- Severity of lens opacity: size, shape, location
- Severity of visual disturbance attributed to lens opacity
- Existance and management of refractive error(s)
- Amblyopia and its management
- Latency interval: from diagnosis to management

Decision Making for Surgical Management

- ***Simple cases:***
  - * Large, dense lens opacities, proximity to posterior lens
  - * Definite interference with normal visual development

- ***Intermediate and Complex Cases:***
  - * Moderate lens opacities
  - * Co-existance of refractive errors, amblyopia
  - * No Nystagmus
  - * Usually “second- opinion” needed



Intermediate- Case Decision- Making

- Visual and functional performance
- Poor retinoscopic (red) reflex
- Central lens opacity >3mm
- Poor Retina visualization with direct ophthalmoscope
- Presence of Relative APD: poor prognostic sign
- Progression of the lens opacity

Intermediate - Case Decision - Making … cont

- Unilateral Congenital cataracts (vs. bilaterality)
- Delayed diagnosis: due to contralateral normal eye
- Associated Ocular Defects: Microphthalmos, Foveal Dysplasia , Strabismus (in 30-70% of cases)
- Postoperative enlargement of Peripheral Field of vision
- BCVA <20/70 in involved eye
- Mydriatic- Cycloplegic drops:
  - * If lens opacity mild and central
  - * Photophobia aggravated
  - * Reading glasses:often necessary

Incision Construction in Pediatric Cataract Surgery

Applied Anatomy of Child's Eye

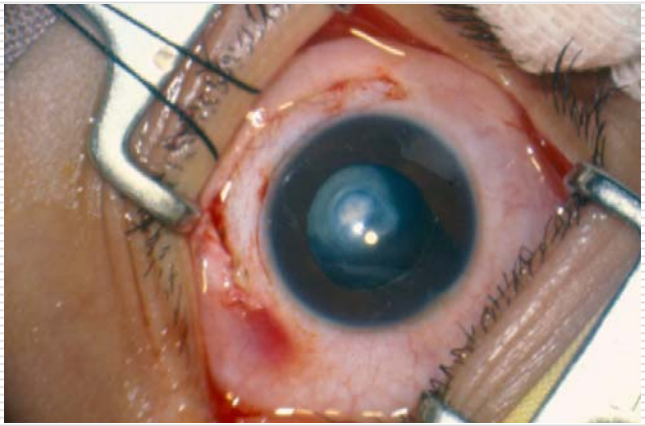
- Cornea in Premature and Full-term babies: Thick
- Thickness Reaches adult level in 2-4 years
- Sclera: Low Rigidity, Not so thick
- Anterior chamber: Shallower than adult
- Astigmatism:
  - * Higher prevalence of ATR during infancy
  - * Prevalence of WTR astigmatism increases with age

Incision Architecture

Incision Location

Superior approach:

- More protection by Brow, Bell's phenomenon
- Easily made: children rarely have deep set orbits or overhanging Brows
- Location of choice by 84% of AAPOS members



Location...(2)

Steepest Meridian:

- Decreases Surgically Induced Astigmatism
- Difficult in children:
  - * Preoperative Refractive Exam: Difficult
  - * Hand-held Keratometers: reliable?
  - * Topography: Difficult Cooperation and Fixation
- Changes with growth

Temporal

- More Trauma Exposed

Incision Construction

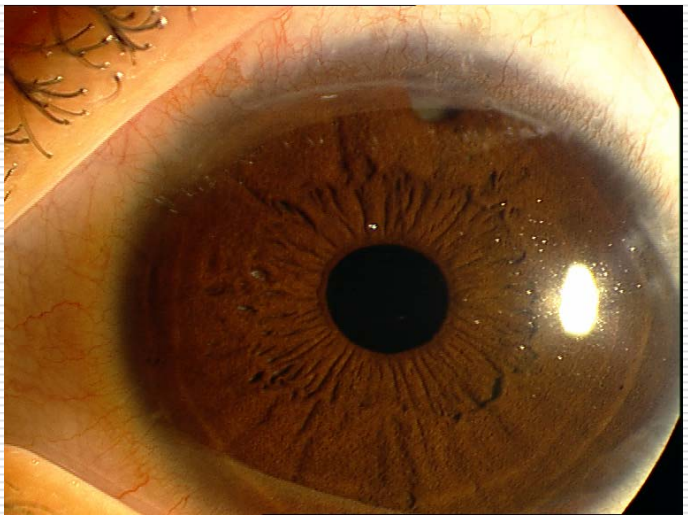
Scleral vs Corneal Incision

Advantages:

* Avoid Conjuctival Peritomy, Cauterization
* Avoid occasional Hyphema
* Ease of Intraoperative maneuvering
* Better Cosmesis
* Future Filteration surgery: better outcome
* Indicated in eyes receiving anticoagulant therapy
* Decreased early postoperative breakdown in blood – aqueous barrier

Disadvantages of Corneal Incision

- Higher rate of Surgically Induced Astigmatism
- Poor Wound Stability, especially if incision is larger
- Increased risk of Endophthalmitis: probably less in children due to suturing
- Higher rate of Endothelial Cell Loss
- Delayed healing compared to Scleral incision

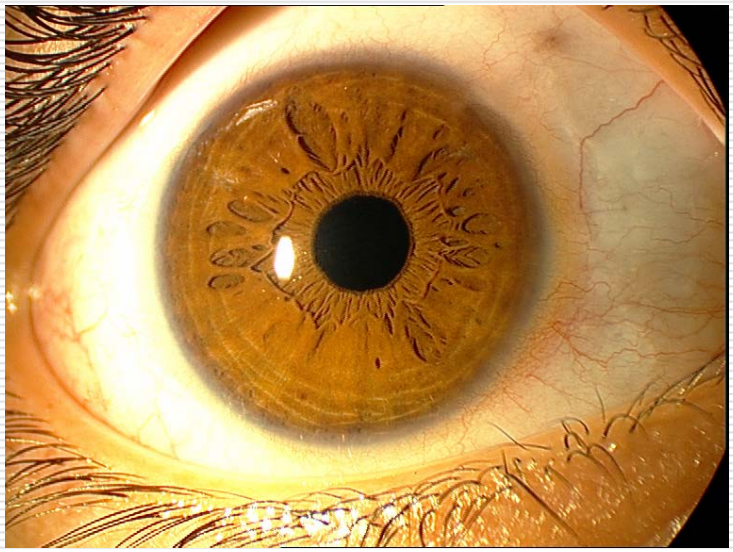


Scleral vs Corneal Incision

- Only 38% ASCRS and 27% AAPOS respondees prefer Corneal Tunnel Incision
- Opacification at site of corneal incision
- For rigid PMMA-IOL's Scleral tunnel preferred
- When IOL type (Rigid vs Foldable) Not certain e.g in eyes with trauma or lens subluxation
- In the case of Pars Plana Vitrectomy + Posterior capsulotomy: Scleral Tunnel preferred

Shape of the Incision

- All types of Scleral incisions are widely used

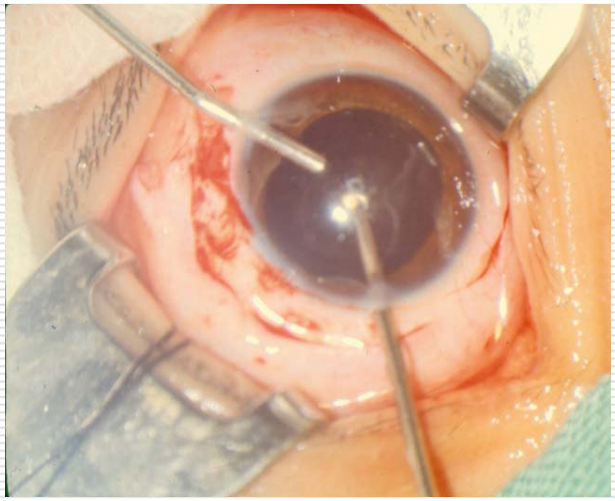


- Straight, Frown, Circumlimbal types are acceptable

Paracenthesis Incisions

Useful for:

1- Performing bimanual maneuvers (I/A, Cutting)
2- Intraocular solution injection,Ophthalmic Viscoelastic
3- Globe Stabilization
4- Controlling the Movement of instruments
5- Facilitating Lens implantation
6- Facilitating the use of iris retractors



Paracenthesis

- ***Location:***

  * 2 and 10 O'clock: for bimanual maneuvering

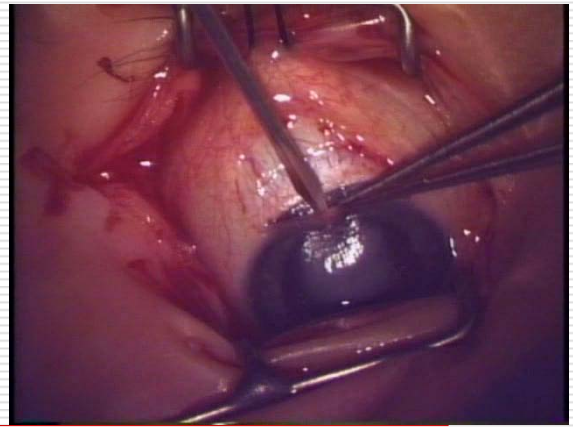
  * or 70° to left of Primary incision

- ***Length:***

  * ~1.0mm, Tunnel shaped, not true "stab"

- ***Width:***

  * 1mm, 20-gauge MVR (0.9mm) opening for 20- gauge Vitrector function



Surgical Technique

Conjunctival Opening

- Scleral tunnel: 6-7mm, Fornix-based
- Cauterization: Mild, bipolar (with Eraser tip)
- Heavier for Posterior vessels going toward incision

Groove

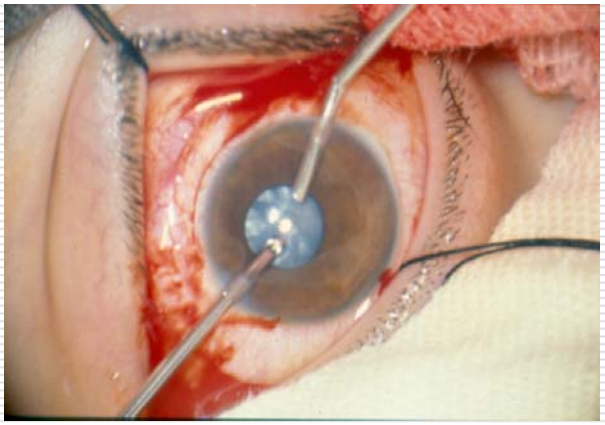
- Desired width: According to IOL type
- Depth: 1/3 to 1/2 Scleral Thickness, Perpendicular

Dissection:

- Half Scleral Thickness, bevel-up Crescent blade
- Superficial dissection: fragile flap
- Deep dissection: risk of premature entrance

Anterior Chamber Entry

- Use 3.2mm sharp Keratome



- Angle of enterance 45°
- Used for Capsulorrhexis forceps, I/A, IOL implantation
- Enlargement: according to IOL type & size

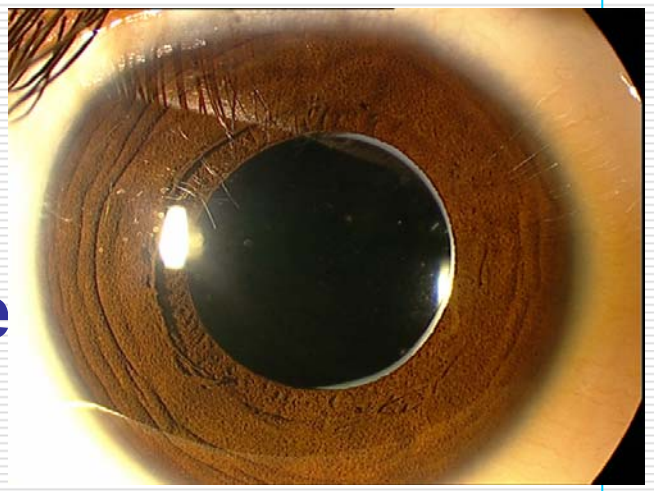
Suturing

- Tunnel incisions in Children Leak ⇨ needs suturing
- Only 2-8% of AAPOS responders left incision unsutured
- More frequent steroid use in children postpones healing
- Uncooperative postop child: Leakage can not be checked
- Self- sealing wounds fail to remain watertight in children <11yr

Capsule Management in Pediatric Cataract Surgery

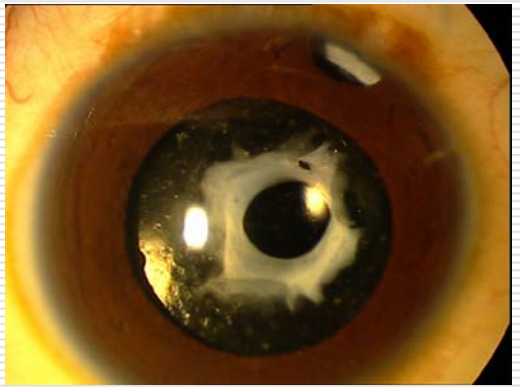
Why Anterior Capsulorrhexis is difficult in Children?

- **Extreme Elasticity of anterior capsule, Higher Fracture Toughness**
- **Positive Vitreous pressure, reduced Scleral Rigidity**
- **Difficult Visualization of capsule**
- **Sometimes: poor Mydriasis**
- **More tendency for capsulorrhexis extension:"Runaway Rhexis"**



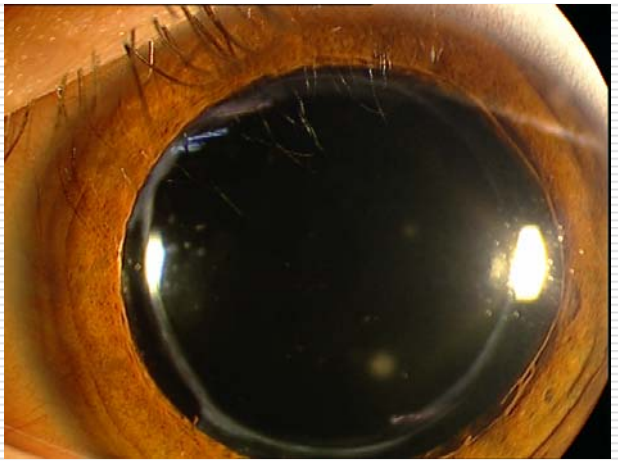
Techniques for Pediatric Capsulotomy

- Manual Continuous Curvilinear Capsulorrhexis (CCC)
- Can-Opener Anterior Capsulotomy
- Vitrectorrhexis (Vitrector Cut anterior capsulotomy)
- Bipolar radio-frequency Capsulotomy
- Fugo plasma blade Anterior Capsulotomy



How to Create an intact Manual CCC in Pediatric eyes?

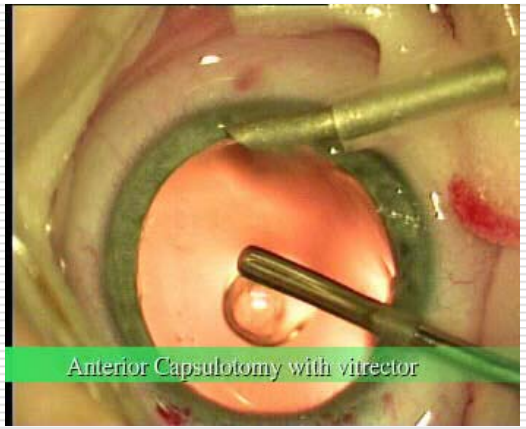
- Use a High MW-OVD (Healon GV, Healon5): to push anterior capsule back, Deepening anterior chamber
- Aim to make a Slighthly smaller CCC
- Frequently release capsular flap to see size, shape and direction
- Regrasp near the site of CCC, readjust the direction
- Repeat OVD injection to keep AC deep with capsule laxity
- Irrigation/ Aspiration of lens material reduces intralenticular pressure



Can-Opener Anterior Capsulotomy

- Some surgeons perform due to difficult CCC
- Can- opener Capsulotomy may have few radial tears due to Highly elastic capsule
- IOL will move outside of bag when Capsular Contracture occurs
- Decentration rate is higher in can-opener eyes than CCC

Vitrector-Cut Anterior Capsulectomy (Vitrectorrhexis)



- Comparable be CCC, Visualization is excellent
- Easier to perform in Children, better control
- Vitrector entered through paracenthesis or main incision
- Cut rate 150-300 cycle/min, Aspiration 150-250 mmHg
- Continuous capsule opening at the same time cortex removal
- Low rate of radial tear formation
- Scalloped edges roll outside, not predispose to radial tear

Points to Create a successful Vitrectorrhexis

- Paracenthesis Ports must have minimal leakage
- Venturi Pump of vitrector is preferred to peristaltic type
- Do not start with Bent-needle or cystotome
- Place vitrector touching anterior capsule: first aspiration
- After engagement of capsule activate Vitrector

- Do not leave right-angle edge; Predispose to radial tear

Bipolar Radiofrequency Capsulotomy (Kloti)

Kloti device ***cuts the anterior capsule with platinum alloy-tipped***

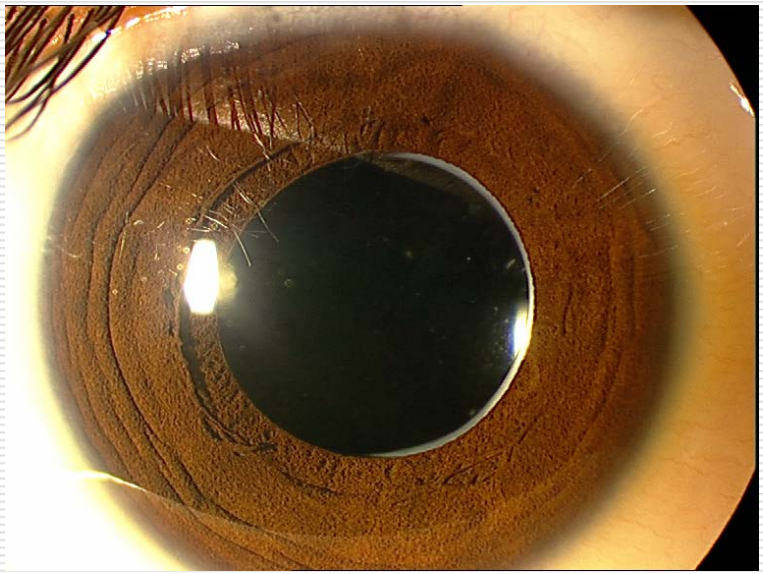
- **Probe: * High frequency current 500 KHz**
  *** Generated heat:160°**
  *** Under Viscoelastic**
- **Cut edge is less elastic than comparable CCC edge**
- **Higher risk of radial tear formation**

Fugo plasma blade anterior capsulotomy

- **Rapid cutting (<10sec), needs no red reflex**
- **Edge not more resistant than the Kloti diathermy**

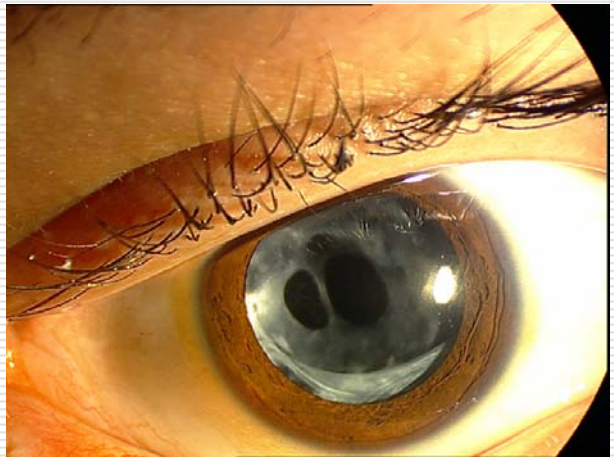
Posterior Capsulotomy and Anterior Vitrectomy

for the Management of Pediatric Cataract Surgery



When Posterior Capsulotomy is Indicated?

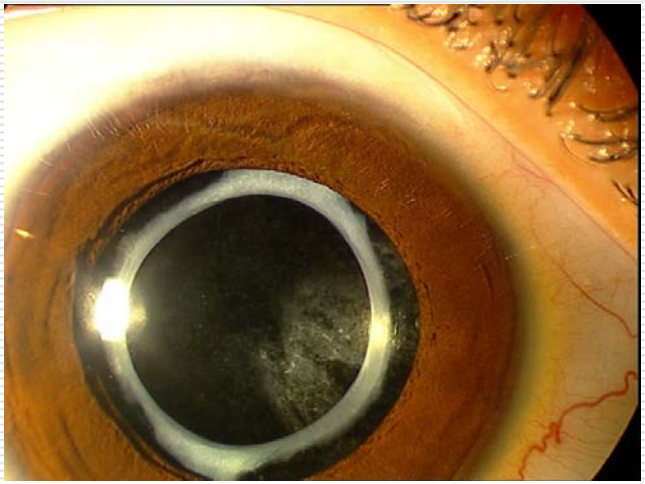
- One ofthe most common and Controversial questions
- All the cataract surgeries under the age 6 years (8 even 10?)
- Condition of the Posterior Capsule
  (Dense opacification, Plaque)



- Poor cooperative child for YAG capsulotomy, unavailable vertical-mounted YAG lasers

Why "posterior capsulotomy+Anterior vitrectomy" is indicated?

- High rate (~ 100%) of PCO and fibrosis in children under 6 years of age 18 mo to 2 years after surgery
- PCO and Visual axis opacification (VAO) are amblyogenic
- Dense VAO will need repeated YAG (?) or intraocular surgeries

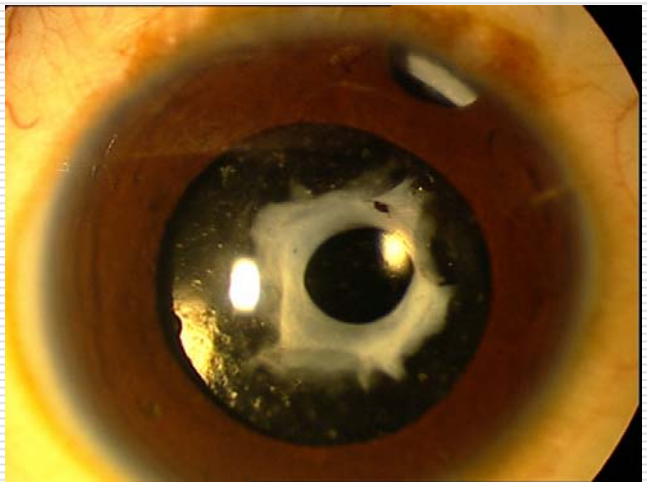


- Anterior Vitreous Face(AVF):
  - * Closely linked to posterior capsule
  - * More"reactive" in infants

*** Scaffold for lens epithelial cells, metaplastic pigment epithelial cells, exudates, cells, fibrous membranes**

Primary Capsulotomy vs. Secondary

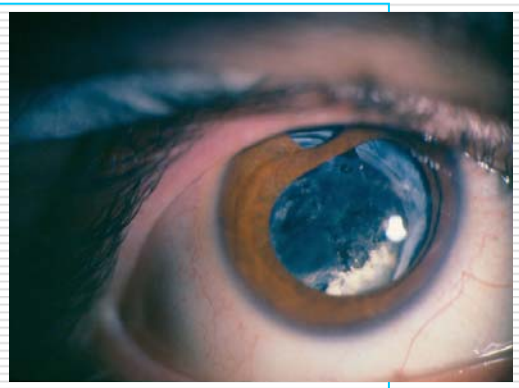
- More controllable capsulotomy as Primary
- Removal of Anterior Hyaloid Face (as scaffold of recurrent opacification in Primary Capsulotomy)
- Lower Risk of CME, and RD in primary procedures

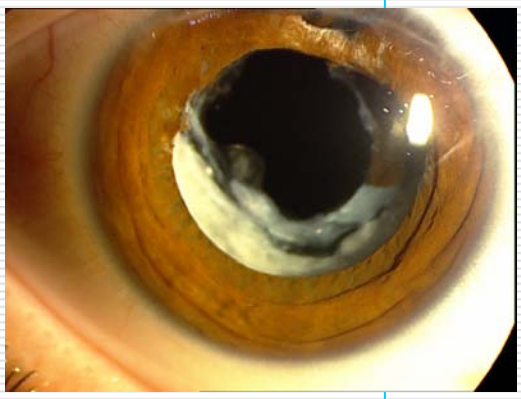


- Management of secondary opacifications may be more troublesome and difficult, more complicated more risk of intraocular structure trauma

Nd-YAG Laser Capsulotomy in Children

- First choice in adult PCO
- Repeated sessions needed in children
- May require general anesthesia with vertical mounted YAG which is not available
- High recurrence rate for membrane formation and opacification
- Increased risk of IOL trauma with laser
- Many of YAG capsulotomy tried in Children will need Secondary Operations





Techniques for Posterior Capsulotomy

- Manual Posterior Capsulorrhexis (PCCC)
- Vitrector Assisted Capsulotomy
- Radiofrequency diathermy

Anatomic differences between Anterior and Posterior Capsule

Posterior Capsule:

- 3 to 5 times thinner (4-9μ), minimal changes with aging
- Decreased Mechanical Strength with aging
- Decreased Extensibility by a factor of two
- Decreased force of breakage by a factor of five

Characteristics of Posterior Capsulotomy

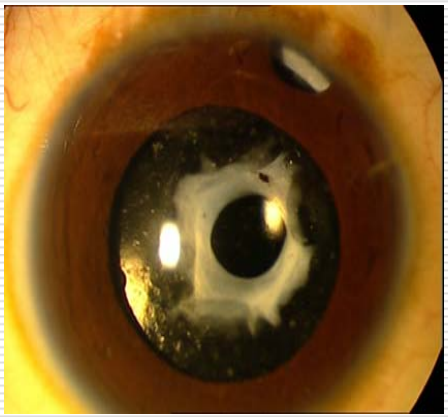
- Size: Goal 3.5-5.0 mm
- Small opening ⇒ Phymosis Contracture ⇒ Closure by inflammatory membrane

⇓

visual axis opacity

⇓

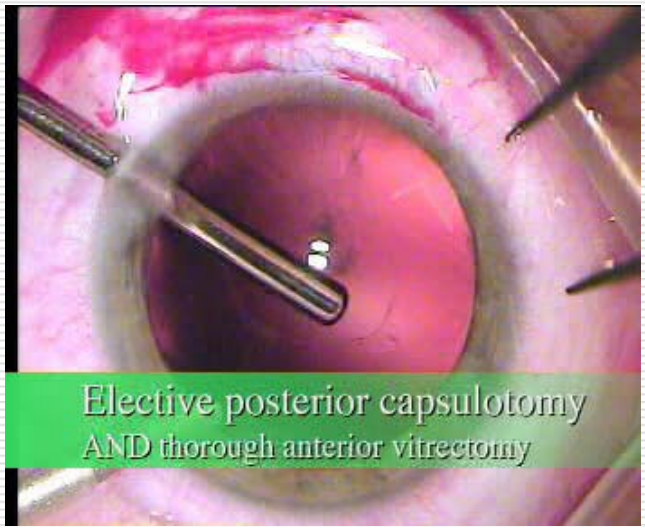
Need for secondary surgery



- For Optic Capture: 1-1.5mm smaller than optic
- Position: Central Rhexis
- Shape: ideal is Circular

Technique of Posterior Capsulorrhexis

- Fill A/C and lens bag with OVD after removal of lens material
- Ideal OVD: high viscosity sodium hyaluronate
- Initiation: central puncture with Cystotome tip ⇨ a small flap is formed in Posterior Capsule
- Visco-dissection of Posterior Capsule from AHF push Vitreous Posteriorly
- Flattening of posterior capsule by viscoelastic injection over it
- Posterior capsulorrhexis with forceps



Posterior Capsulotomy+Anterior Vitrectomy after IOL Implantation

Advantage:

- In-the-bag fixation of IOL : More Safe
- Less stressful PCIOL fixation
- Larger Capsulotomy size

Disadvantage:

- After IOL implantation Pars Plana approach is used but limbal is also possible
- Fibrin formation more common
- In-the-bag fixation of IOL more difficult before Vitrectomy

Anterior Vitrectomy

Route:

- Trans Limbal: after Posterior Capsulotomy
- Trans Pars Plicata or Pars Plana with Capsulotomy

Scleral Enterance:

- <1 years old: ≤2mm Posterior to limbus
- 1-4 yrs: 2.5mm Posterior to limbus
- >4 yes: 3mm Posterior to limbus

Anterior Vitrectomy

Goal:

- Removal of Central Anterior Vitreous
- No attempt for removal of peripheral or Posterior Vitreous

Setting: Different Vitrectors variable:

* Cut 350-500/min,
* Suc 60- 100mmHg,
AFR 20ml/min

Conclusion

- Anterior and Posterior Capsular Surgery and Anterior Vitrectomy are essential steps in surgical management of Pediatric Cataracts

- Delicate and accurate performance of these steps guarantees lower complication rates, in-the-bag fixation of IOL and long- term clarity of media

Thank You for Your Kind Attention!!