
Pediatric Cataract Follow up and Indications for Surgery

***Farid Karimian M.D
Associate Professor of Ophthalmology
Labbafinejad Medical Center***



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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



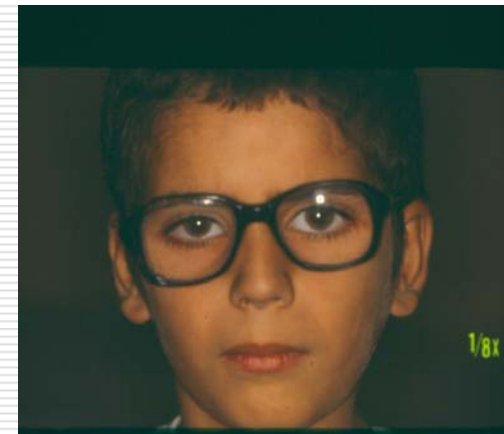
Decision Making for Surgical Management

+ *Simple cases:*

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

+ *Intermediate and Complex Cases:*

- * Moderate lens opacities
- * Co-existence 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



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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



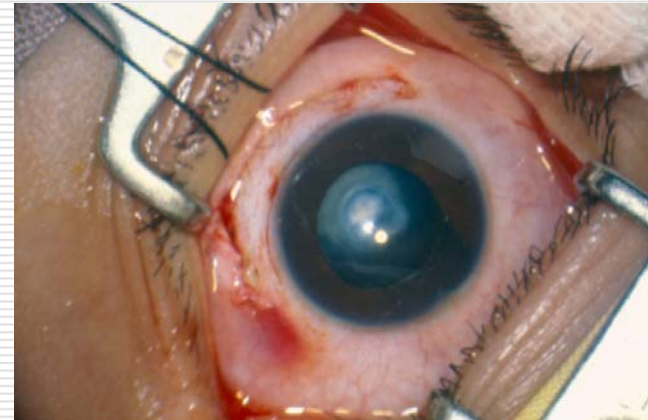
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Incision Location

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

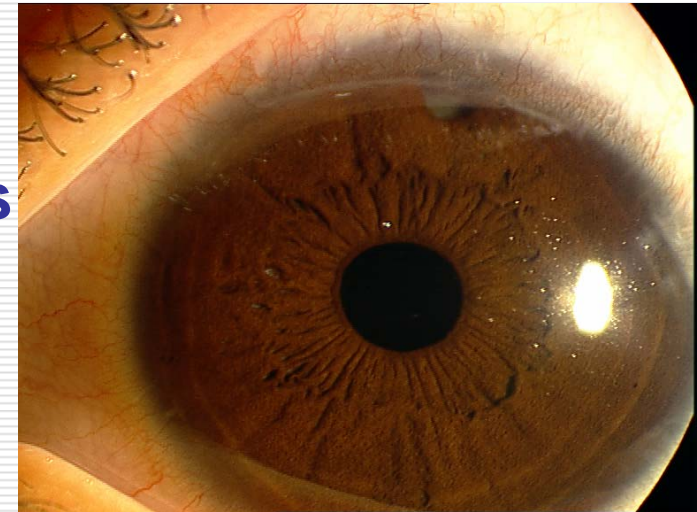
Advantages:

- * **Avoid Conjunctival Peritomy, Cauterization**
- * **Avoid occasional Hyphema**
- * **Ease of Intraoperative maneuvering**
- * **Better Cosmesis**
- * **Future Filtration 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**



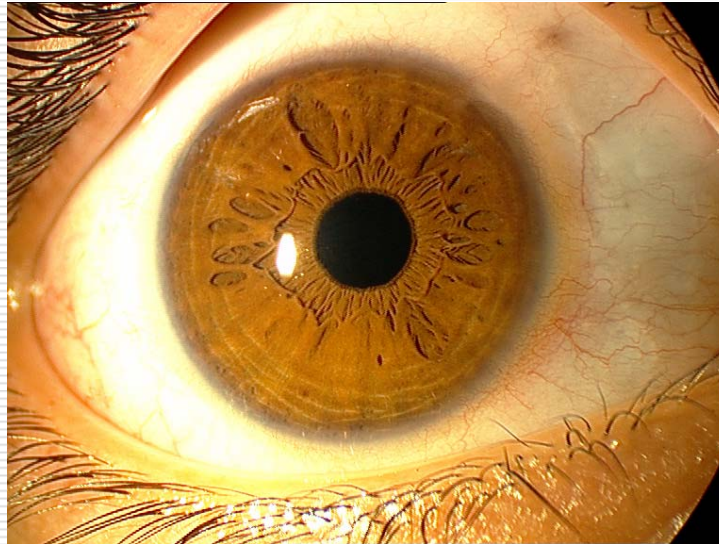
Scleral vs Corneal Incision

- ✦ 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**



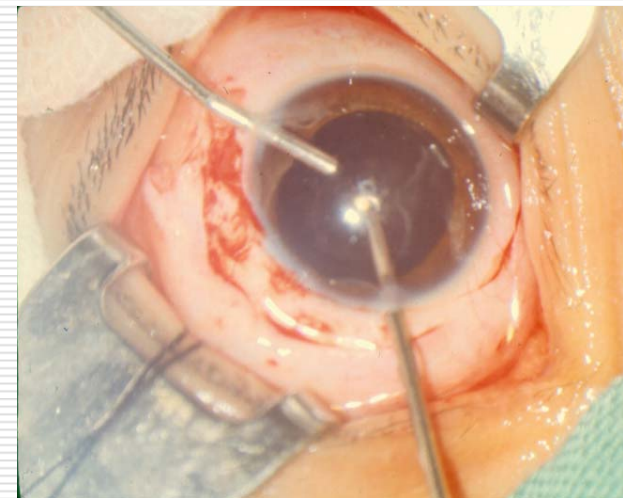
- ✦ **Straight, Frown, Circumlimbal types are acceptable**



Paracentesis 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**



Paracentesis

✦ *Location:*

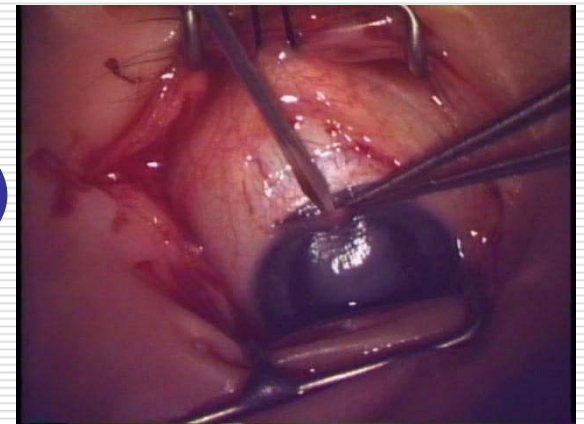
- * 2 and 10 O'clock: for bimanual maneuvering
- * or 70° to left of Primary incision

✦ *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:

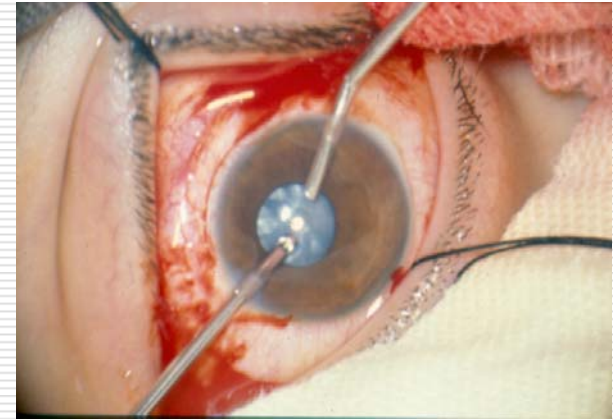
- ✦ **Half Scleral Thickness, bevel-up Crescent blade**
- ✦ **Superficial dissection: fragile flap**
- ✦ **Deep dissection: risk of premature entrance**



Anterior Chamber Entry

- ✦ Use 3.2mm sharp Keratome

- ✦ Angle of entrance 45°



- ✦ Used for Capsulorrhexis forceps, I/A, IOL implantation

- ✦ **Enlargement:** according to IOL type & size

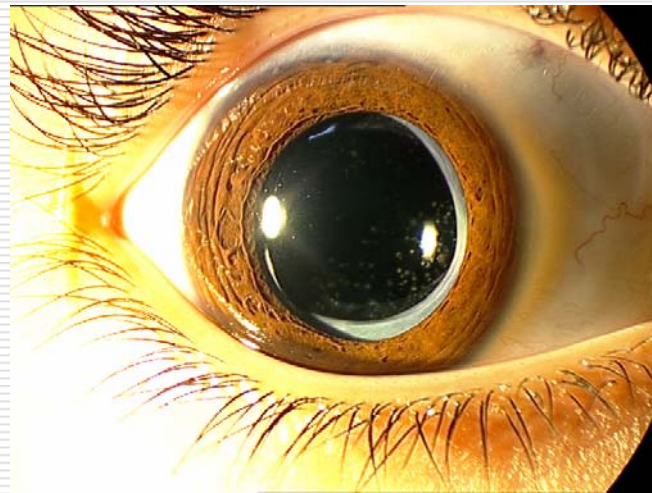


Suturing

- ⊕ 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 <1yr



Capsule Management in Pediatric Cataract Surgery

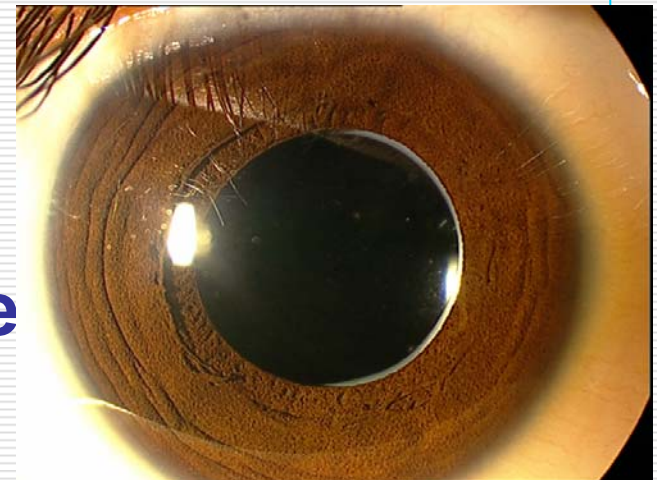


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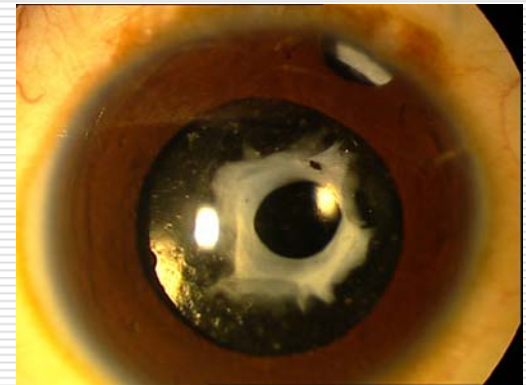
Why Anterior Capsulorrhexis is difficult in Children?

- ✦ **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"**



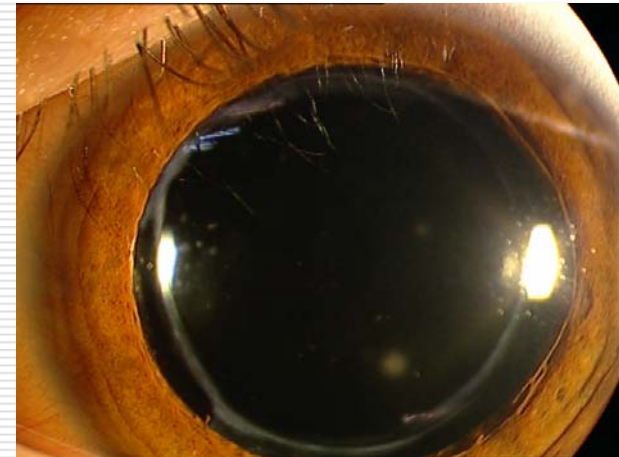
Techniques for Pediatric Capsulotomy

- ✦ Manual Continuous Curvilinear Capsulorrhexis (CCC)
- ✦ Can-Opener Anterior Capsulotomy
- ✦ Vitrectorrrhexis (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 **Slightly 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



Vitreor-Cut Anterior Capsulectomy (Vitreorrhexis)

- ✦ Comparable be CCC, Visualization is excellent
- ✦ Easier to perform in Children, better control
- ✦ Vitrector entered through paracentesis 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

- ⊕ Paracentesis 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**

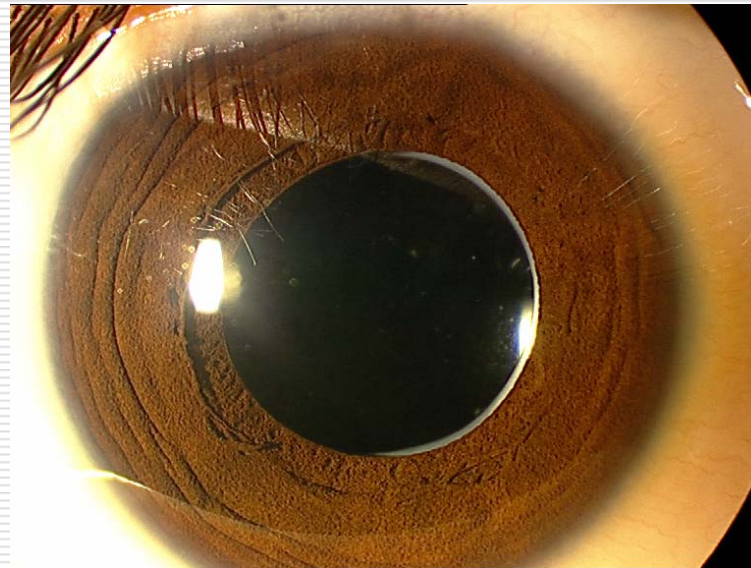
Fugo plasma blade anterior capsulotomy

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



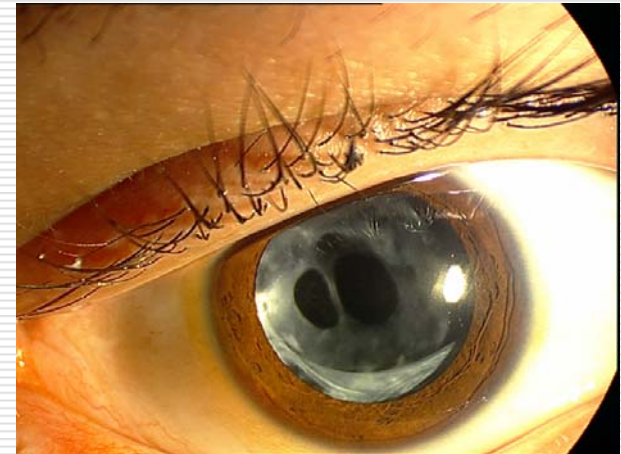
Posterior Capsulotomy and Anterior Vitrectomy

for the Management of Pediatric Cataract Surgery



When Posterior Capsulotomy is Indicated?

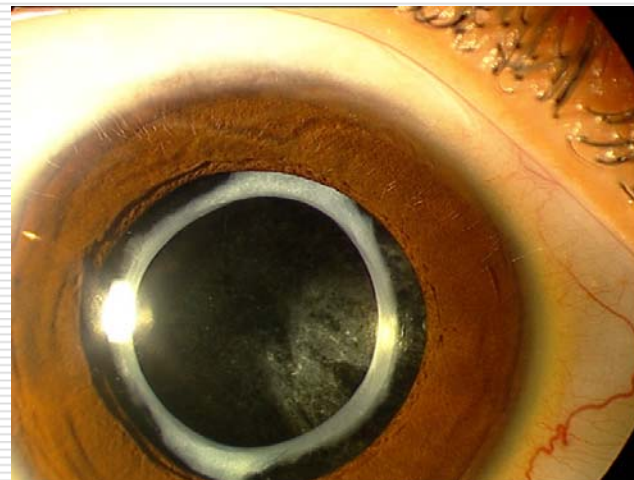
- ✦ One of the most common and Controversial questions
- ✦ All the cataract surgeries under the age 6 years (8 even 10?)
- ✦ **Condition of the Posterior Capsule**
(Dense opacification, Plaque)
- ✦ **Poor cooperative child for YAG capsulotomy,**
unavailable vertical-mounted YAG lasers



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

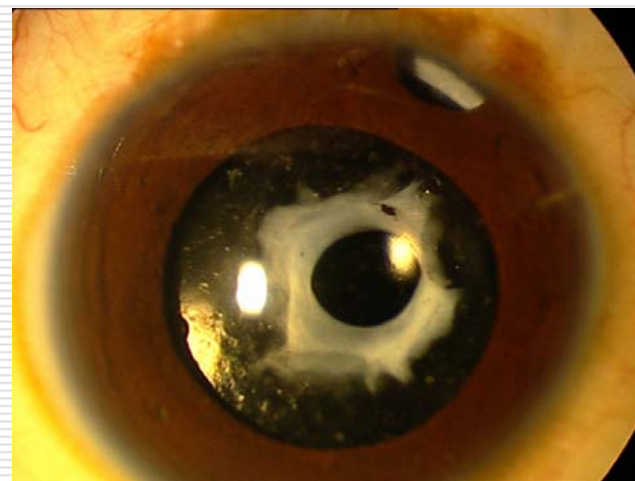


- * Scaffold for lens epithelial cells, metaplastic pigment epithelial cells, exudates, cells, fibrous membranes



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)**
- ✦ **Vitreoractor Assisted Capsulotomy**
- ✦ **Radiofrequency diathermy**



Anatomic differences between Anterior and Posterior Capsule

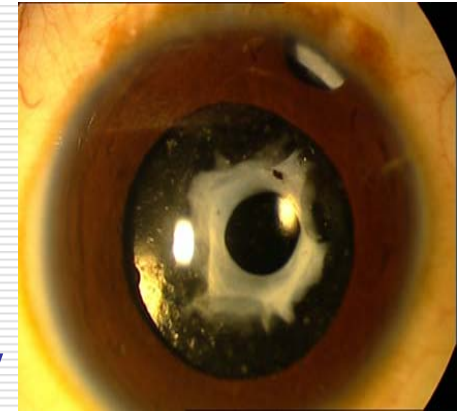
Posterior Capsule:

- ✦ 3 to 5 times thinner (4-9 μ), 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 \longrightarrow Phymosis Contracture \longrightarrow Closure by inflammatory membrane
- \downarrow
- visual axis opacity
- \downarrow
- 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: ≤ 2 mm 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

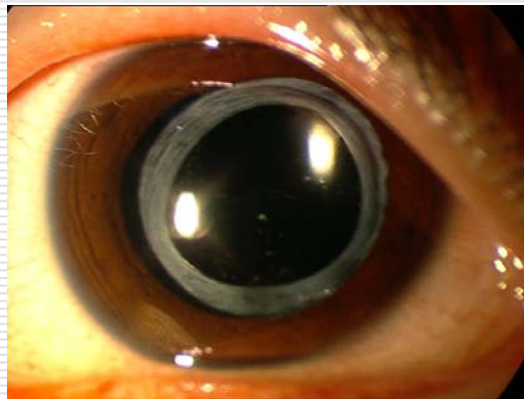


Conclusion

- ✦ 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!!***



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