

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Conference on: “ Intraocular Lenses”

***Anterior Segment
Complications of Intraocular
Lens Implantation***

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F.K 1/30

Complications of IOL Implantation

A- IOL Malpositioning

- a. IOL decentration
- b. Pupillary capture



B- Anterior Chamber Inflammation

C- Glaucoma

- a. Uveitis- Glaucoma- Hyphema syndrome
- b. Pupillary block glaucoma
- c. Malignant Glaucoma



Complications of IOL Implantation

... Cont

D- Pseudophakic Bullous keratopathy

E- Anterior Capsular Opacification (ACO)

F- Posterior Capsular Opacification (PCO)

G- IOL Discoloration



A- IOL Malpositioning

a. IOL Decentration

Causes:

- * **Asymmetric haptic placement**
 - * **one loop bag-one loop sulcus (47%)**
 - * **Both loops in the bag (32%)**
 - * **Both loops in sulcus (17%)**



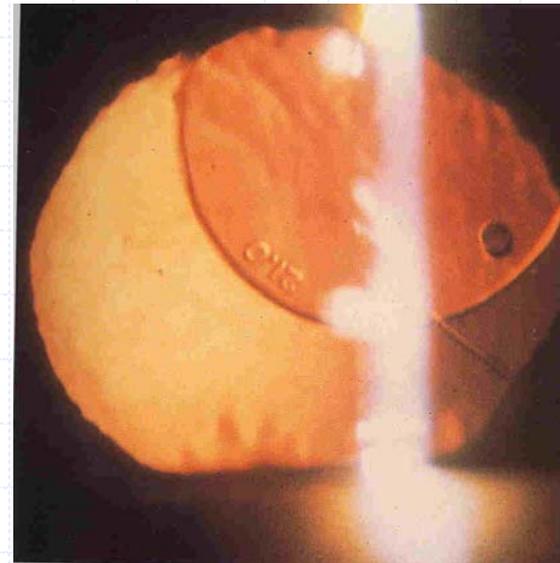
A- IOL Malpositioning

Common:

* Inferior haptic in the bag → bag contracture

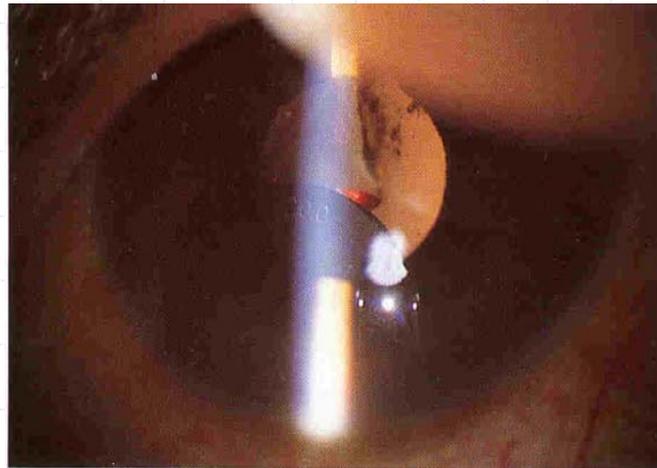
superior migration →

“ Sunrise syndrome ”



A- IOL Malpositioning

- **Inferior subluxation** →
- **“Sunset syndrome”**
- * **Horizontal zonular dehescence**
“East-west syndrome”

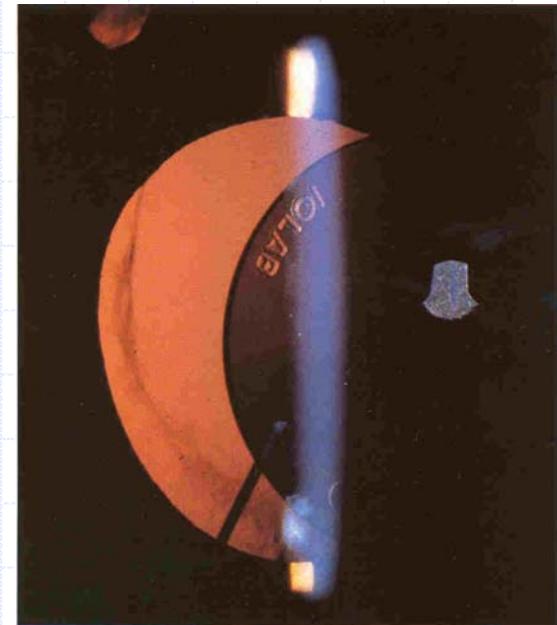


A- IOL Malpositioning

- **“Windshield- Wiper syndrome”**

**Pendular motion of PCIOL
(Pseudophacodonesis)**

➔ **improper sized IOL**



- **Iris tuck mostly occur with ACIOL's**

- **Rare with PCIOL's**



B - Pupillary Capture

Definition:

- * Entire or a portion of optic entrapped in the pupillary aperture

Incidence:

- * 1-14%, lower with angled than uniplanar or rigid haptic
- * 0-1.5% when IOL is placed in the bag



Onset:

- * usually 30-60 day after surgery



Risk Factors

- **After combined glaucoma and cataract extraction surgery**
- **“Can-opener” capsulotomy**
- **Eyes with angle- closure glaucoma vs
No glaucoma**
- **Manual ECCE (> phaco)**
- **Sulcus fixation (> in- the- bag)**
- **Small optic (5-6 mm) > large optic**



Causes of Pupillary Capture

- * Wound leakage
- * Shallow anterior chamber
- * Pupil dilation
- * Posterior synechiae
- * Sulcus fixation
- * Capsule contraction
- * Persistent iritis

Partial pupillary capture will cause:

- * Elongation of pupil (“cat’s eye” pupil)
- * Chronic uveitis due to long term uveal contact
- * IOL deposits
- * Lens tilt
- * CME
- * Posterior Capsule Opacification
- * Pupillary block glaucoma



C - Anterior Chamber Inflammation

Cause:

- **Breakdown of Blood-Aqueous-Barrier**
- **Ciliary band contact** →
Chronic inflammation & Uveitis



- **Posterior iris surface touch and the loops in Ciliary Sulcus**
- **Pseudophakic iris chafing**



C - Anterior Chamber Inflammation

Manifestation:

- Cellular response and pigment deposits over IOL or on the posterior capsule
- AC reaction (cell & flare)

Cytologic response:

- Small Cell
- Giant Cell (probably by fusion of small cells)



C - Anterior Chamber Inflammation

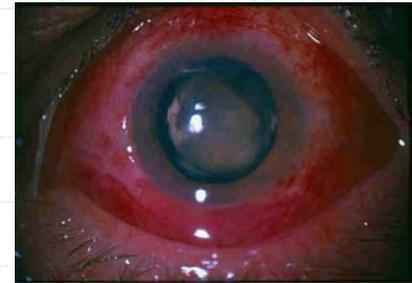
IOL material and cellular response:

- **Silicone IOLs:** - Mostly small cell
 - Giant cell: later
 - More reaction than Acrylic
- **Acrysof (hydrophobic Acrylic):**
no giant cells
- **Hydrogel:** most biocompatible material



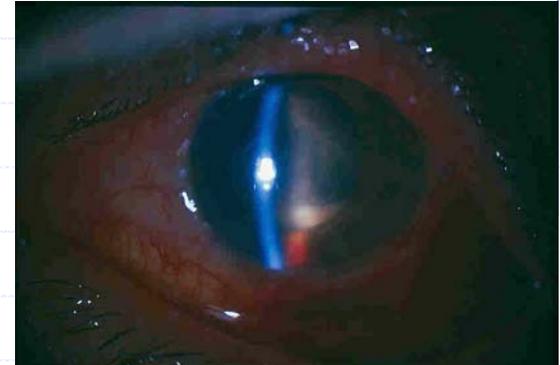
Shauerberger study:

- * Compared Pharmacia 920 silicon lens, Alcon Acrysof , Bausch & Lomb Hydroview and ORC Memory lens
- * All current foldable IOL's are highly biocompatible
- * Postoperative inflammation in all is subclinical
- **Anterior chamber inflammation may be related to haptic material**
- **Polypropylene undergoes superficial surface alteration, cracking, flaking**



Toxic Lens Syndrome

- **Postoperative IOL- related sterile uveitis and hypopyon**
- **Cause: is secondary to:**
 - **Residual of polishing compounds on the lens surface**
 - **Defective IOL haptics or optics**
 - **Excessive anterior segment and iris manipulation**



D - Glaucoma

a. Uveitis -Glaucoma- Hyphema (UGH) Syndrome (Ellingson's Synd.)

- Can occur with any type of IOL: mainly poorly manufactured ACIOLs
- IOL unpolished rough haptic or optic: mechanically traumatizing angle or iris
- Latest incidence (1995):0.25% ↓ ➡ due to improved manufacturing techniques
- Mechanisms of glaucoma:
 - * Pigment dispersion synd.
 - * Secondary hemolytic glaucoma: macrophages containing RBC accumulated in TM



D - Glaucoma ... cont

Treatment:

- **Mild UGH: Topical steroids:
Systemic and topical CAI's
ALT**



- **Severe UGH: Decreased vision, Excess uveal touch, Persistent uveitis, Retinal injury, Poor medical controlled → IOL explantation**



b- Pupillary Block Glaucoma

- **Setting:** IOL optic blocks aqueous flow through the pupil
- Reported with all kinds of IOL's
- Zonular disruption, posterior capsule complications can cause anterior movement of vitreous and pupillary block
- **Pseudophakic pupillary block:**
 - * Is not benign
 - * Sequelae: Synechia formation
Angle closure glaucoma



c- Malignant Glaucoma

Pseudophakic malignant glaucoma, is rare

**Probable mechanism: separation of vitreous base from
pars plana**



Aqueous flow into vitreous



Apposition of Ciliary body to IOL optic (usually large)



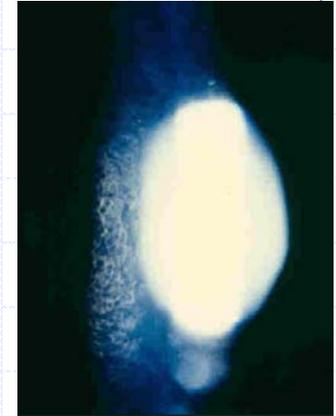
Forward movement of IOL → IOP ↑

Setting: Nanophthalmos

Short axial length eyes



D- Pseudophakic Bullous Keratopathy (PBK)



Incidence:

- * <1% of patients with PCIOL develop PBK
- * 8% of indications for PK were associated with PCIOL's which is increased due to Phaco Complications

Average Endothelial cell loss:

- * Aging: 3500 to 2800/mm² (2nd to 9th decade)
- * ACIOL ~ 112 cell mm² per year : all develop PBK in 20 yrs
- * PCIOL ~ 31.5 cell /mm² per year

Indicators of cell loss:

- * ↓ Cell Density, ↑ polymegetism, ↑ polymorphism



PBK... cont

Causes of PBK:

- **Direct mechanical trauma (intermittent) due to excess ACIOL vaulting**
- **Lens mobility (pseudophacodonesis): undersized or poorly fixed IOL**
- **Peripheral Corneal- IOL touch ➡ stimulation of endothelial migration from center**
- **Closed-loop ACIOL's ➡ Erosion into peripheral iris, Ciliary body**

inflammation, precipitates on IOL



PBK... cont

Course of PBK:

- **When PBK occurred in wide area IOL removal will not prevent decompensation**

Treatment

- **Medical:- Steroids: low potency, low dose**
 - Hypertonic Sodium Chloride 5%

Surgical:- Penetrating Keratoplasty

- Endothelial Transplantation: DLEK, DSEAK
- Conjunctival flap,
- Thermo Keratoplasty



E- Anterior Capsular Opacification (ACO)

- **Fibroblast- like cells transform from LEC's and produce Collagen type IV**
- **Time: Earlier than PCO**
- **IOL characteristics, lens material, lens design**
 - * **The more hydrophilic ➡ the less Postop inflammation ➡ Slower ACO**
 - * **HSM lenses had much less ACO than PMMA**
 - * **Foldable IOL's:**
 - Silicone lenses > Acrylic > Hydrogel (least)**
 - * **Silicone platehaptic > loop-haptic due to larger area of contact**



Complications of ACO

- **Effect on vision: Usually minimal**
- **Fibrous contraction of the capsule**
- **IOL decentration**
- **Capsular phimosis**
- **Opacification causing difficulty in examination of retinal periphery**



F- Posterior Capsule Opacification (PCO)

➤ The most **Common Complication** of cataract surgery



➤ ***Clinical findings:***

* **Fibrous membrane formation: Postop 2-6mo**

* **Formation of Elschnig pearl: LEC migration at equator: months to yrs**

➤ ***Incidence* 10-50%, variable**



(PCO) ... cont

Clinical Significant PCO:

- **Reduction in BCVA > 2 lines than early Postop**
- **PCO seen against red reflex in Dilated Pupil**
- **PCO in central area of pupil on SLE exam**
- **Patient complaints: glare, reduced vision**



(PCO) ... cont

- **Cause of different PCO incidence between different IOL's: design's & materials**
- **IOL adhesion to posterior capsule:
Acrylic IOL >PMMA> Silicone (no adhesion)**
- **Acrylic and PMMA IOLs inhibit LECs and lens fibers at optic edge from proliferating and migrating toward capsule center**
- **With Silicone IOL abundant proliferated tissue and LEC's was seen on the posterior capsule**
- **During 3 year follow up **rate of PCO** were: acrylic lenses 10% , Silicone lenses 40% and PMMA 56%**



PCO and IOL Design

***Sharp Squared Optic Edge •
Design
has Markedly Reduced PCO***

**In 16% of Acrylic lenses there has •
been no LEC in 3 mo but late
migration onto the posterior capsule
has occurred**

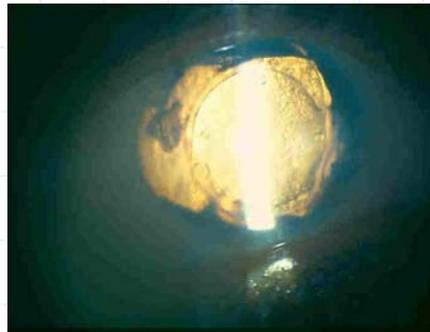


- **With PMMA and Silicone lenses mostly PCO progression is seen**
- **With Acrylic lenses more regression of LEC's occur: cause of regression can be due to:**
 - 1. Tight adhesion between the lens and capsule**
 - 2. Restricted access of nutrients and growth factors to LEC's**



Treatment of PCO

- *Nd-YAG Laser Capsulotomy is Treatment of PCO*
- **PMMA lenses have the greatest need**
- **Acrylic lenses the least indication**



- **Silicone lenses induce PCO and need for YAG capsulotomy twice as fast as do PMMA lenses**



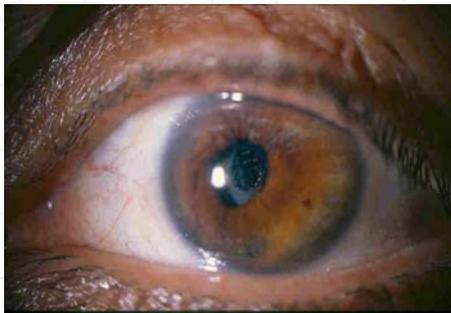
Disadvantages of YAG Laser Capsulotomy

- **Inconvenience and cost to the patient**
- **Damage to the IOL**
- **IOP elevation: usually transient**
- **CME**
- **Retinal detachment: increased rate**
- **IOL subluxation**
- **Localized endophthalmitis exacerbation**



Intraoperative Techniques to Prevent PCO

- **Polishing the lens capsule with a blunt rough cannulae**
- **Capsular bending ring of PMMA to create a sharp discontinuous capsule bend in fornix contact inhibition of migrating LEC's**
- **Hoffer design of 360- degree PCIOL ridge**
- **Experimental:- Immunotoxin (IMT) to prevent**



PCO

- IMT is toxic to human LEC's



F- IOL Discoloration

1- IOL Calcification: •

a- Hydrogel Hydroview B&L:

- Explanted for Calcification in England
- Plastic case ; Changed •

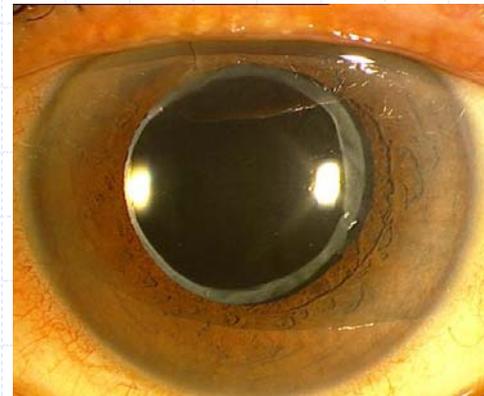
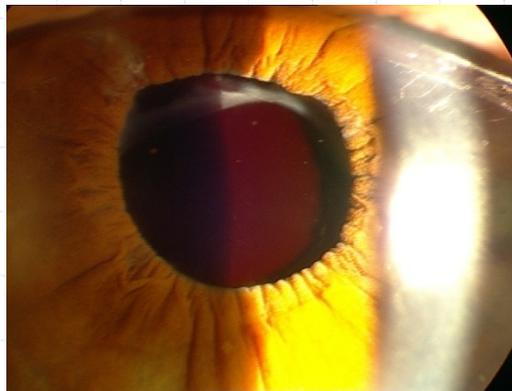
b- Hydrophobic Acrylic Matrix: •



F- IOL Discoloration

2 - IOL Bloody Staining: •
- Hydrophilic Acrylic Lens •

3 - Trypan Blue Staining: •
- Hydrophilic Acrylic Lens •



Thank You!!



F.K