Paediatric cataract
pathogenesis and management

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Incidence...

• 1 to 13 per 10 000 live births\(^1\)

• 200,000 children blind due to bilateral cataract\(^2\)


Adult vs. Paediatric

A child is not a small adult

1. Etiology ...
2. Laterality ...
3. Age of onset...
4. Whether to operate ...
5. When to operate ...
6. Who operates ...
7. IOL ...
8. Inflammation
9. Complications
10. Rehab
POLL - 1

You are...?

1. Practising Paediatric ophthalmologist
2. General ophthalmologist
3. Ophthalmology resident
4. Others
Pathogenesis...
Classification...

1. Morphological

2. Etiological
Morphological classification...
Morphological classification...

- **Anterior**
  - Ant.polar
  - Ant pyramidal
  - Ant subcapsular

- **Posterior**
  - Post subcapsular
  - Post lenticonus
  - Persistent fetal vasculature
  - Mittendorf’s dot
Anterior cataracts
Posterior cataracts
Morphological classification...

• **Central**
  – Nuclear
  – Lamellar
  – Cortical riders
  – Sutural
  – Pulverulent
  – Ceruleun/bluedot
  – Acueliform/coraliform
Central cataracts
Etiological classification

• Idiopathic
• Congenital or developmental
  – Idiopathic
  – Hereditary
  – Associated with TORCH, inborn errors of metabolism
• Traumatic
• Part of anterior or posterior segment anomalies
• Steroid induced
• Complicated cataract
Management...
POLL - 2

How do you manage these...?
Visually insignificant...
Operate or not to operate...

Is this a relevant question..? 

When do we face this question...

- No symptoms... (?)
- Bilateral symmetrical cataract
- No secondary effects – nystagmus, strabismus, anisometropia
- Non-progressive – early steroid induced
Non – surgical management

Is it possible…?

• When cataract may be ONE of the reasons for the vision problem
  – High anisometropia
  – Strabismus
  – Corneal opacity
  – Macular pathology

Dilating drops, Glasses and patching

Exotropia
-3.00 @ 150 deg

Vision – 6/24, N8
Surgical management...
Indications for early surgery

- Total cataract
- Unilateral cataract
- Asymmetric cataract
- Secondary effects – nystagmus, strabismus etc
- Symptoms
  - **Vision** – worse than 6/18
  - Photophobia
IOL versus No IOL...

- **Age of the child**
  - DBR surprises
  - Myopic shift

- **Laterality of the cataract**
  - High anisometropia
  - Visual rehabilitation

- **Corneal diameter**

- **Axial length**
Techniques...

1. Lens aspiration with primary posterior capsulorhexis with anterior vitrectomy and foldable intra-ocular lens implantation

Or

2. Lensectomy with vitrectomy
   (pars plana or limbal route)
How to choose IOL...?
Factors influencing IOL power calculation

- Myopic shift
- Amount of shift and age
- IOL power formula
- AL/K measurement
- Target refraction
POLL - 3

Preferred IOL formula
1. SRK – II
2. SRK – T
3. Hoffer Q
IOL power calculation

Any standard table – SRK II, Hoffer Q, SRK – T

SRK II: \[ P = AI - 0.9 K - 2.5 L(1), \] where

- \( P \): IOL Power for emmetropia
- \( K \): corneal refractive power (\( K \)-reading)
- \( L \): axial Length
- \( A \): \( A \)-constant

Neely DE et al. JAAPOS 2005
Target refraction ...

Rule of 7
for above 2 years

2 + 5 D = 7

Enyedi LB et al. AJO 1978
Target refraction …

**Infants**

- $< 6\text{m} : \geq 3\text{D} \text{ to } 7\text{D}$
- $12 \text{m} : >0 \text{ to } < 3\text{D}$

Wilson ME et al. JCRS 2003

- $4 - 6 \text{wks} : 8\text{D}$
- $6 \text{wks} – 6\text{m} : 6\text{D}$

Infant aphakia study - PEDIG
Target refraction – what we follow

- Age > 4 years
- Age 2 – 4 years
- Age < 2 years

Undercorrect by 10%
Undercorrect by 20%
Choice of IOL

- Single or multi piece PMMA
- Hydrophobic acrylic single piece: in-the-bag
- Hydrophobic acrylic 3 piece: in-the-sulcus
- **Safe to use**
- **Optimal diameter – 10.5 – 12mm**

1. Wilson ME et al. JAAPOS 2001
2. Trivedi RH et al. JCRS 2003
3. Brar GS et al. CEO 2008
4. Rowe NA et al. BJO 2001
Steps of surgery

1. General anaesthesia
2. Scleral tunnel – till at least 4 years of age
3. Anterior capsulorhexis – 6mm
4. Cortical aspiration
5. Posterior capsulorhexis – 4mm
6. Limited anterior vitrectomy (..?)
7. In-the-bag IOL placement
8. Suturing of the wound – 8 years
Steps of surgery...

Wound construction

Scleral tunnel

Corneal tunnel
Steps of surgery... Anterior capsule management

• Single most crucial step
  – Critical for IOL placement

• Most challenging step
  – Highly elastic
  – Tendency to run
  – No red glow
Steps of surgery ... Cortical aspiration
POLL - 4

How do you manage posterior capsule...?

1. Primary posterior capsulorhexis with forceps – Before IOL
2. Posterior capsulotomy with vitrector – Before IOL
3. Posterior capsulotomy with vitrector – After IOL
4. Pupillary capture
Steps of surgery...

- Mandatory step till 6 yrs
- Rate of PCO – 100%
- Atleast 4mm
- Manual or with vitrector
- With anterior vitrectomy till at least 6 yrs

Posterior capsule rhexis
Various clinical scenarios...

• Congenital/developmental cataract
• Cataract associated with other ocular anomalies
• Cataract associated with systemic conditions
• Traumatic cataract
• Steroid induced cataract
• Complicated cataract
Traumatic cataracts...
Other types...

Associated corneal opacity

Membranous cataract
Uveitic cataract...
If no primary IOL.., then..?
Aphakia management

- Lensectomy with anterior vitrectomy
- Limbal or parsplana approach
Aphakia management
Aphakia ...

**Bilateral**

- Aphakic glasses
  - Single vision - < 2 years
  - Bifocals - > 2 years
- Contact lenses
  - Prevents nystagmus
- Secondary lens implantation

**Unilateral**

- Contact lenses
  - RGP
  - Silicon extended wear lenses
  - Difficult insertion
- Glasses
- Secondary IOL
So... Surgery over...
Is it over...?

• **Surgery is only the first step**

• Appropriate glasses
  – Infants – single vision glasses for near
  – < 2 years : single vision glasses for 1 m distance
  – > 2 years : bifocals

• Amblyopia management

• IOP assessment life long
What’s the latest issue...?
Infantile vs. Paediatric

- Maximum myopic shift - < 24 months
- Associated conditions – microcornea, persistant fetal vasculature
- Surgical expertise
- Anaesthesia issues
Indications for early surgery

- Unilateral cataract – 8 weeks
- Asymmetric cataract
- Bilateral dense cataract – 12 weeks
- Secondary effects – nystagmus, strabismus
POLL - 5

How early you implant IOL in infants?
1. < one year
2. < 6 months
3. < 2 months
Primary IOL implantation...

- Corneal diameter - > 10mm
- Normal intra ocular pressure
- Absent angle anomalies
- Axial length - > 16mm
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<thead>
<tr>
<th></th>
<th>CL group</th>
<th>IOL group</th>
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<tbody>
<tr>
<td>Visual outcome</td>
<td>comparable</td>
<td>comparable</td>
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<tr>
<td>Adverse events</td>
<td>25%</td>
<td>77%</td>
</tr>
<tr>
<td>Additional surgeries</td>
<td>12%</td>
<td>63%</td>
</tr>
<tr>
<td>Intraop complications</td>
<td>11%</td>
<td>28%</td>
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</tbody>
</table>
IATS ... @ 4.5 years

**CL group**
- Visual outcome – comparable
- Adverse events – 56%
- Additional surgeries – 12%
- Glaucoma – comparable
  - Unger age
  - Smaller corneas

**IOL group**
- Visual outcome – comparable
- Adverse events – 81%
- Additional surgeries – 63%
- Glaucoma – comparable
  - Unger age
  - Smaller corneas
So...
Take home...

1. Early surgery doesn’t translate to early IOL

2. **Primary IOL implantation**
   1. *Unilateral* – 6 months
   2. *Bilateral* – 8 months

3. Choice of IOL

4. Steps to prevent capsule opacification

5. Timely correction of residual hyperopia with near add

6. Amblyopia management as long as needed

7. Proper timing of secondary lens implantation
In Unity, there is Strength