Intraocular lens Difficulties

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IOL in history

• Sir Harold Ridley, in the 1940s, discovered that shards of acrylic cockpit canopies remained inert in the eyes of a British pilot who was blinded when his aircraft crashed during World War II.
• Ridley developed and implanted the first artificial lens in November, 1949, and reported on the first 27 cases in 1952. It was the first medical device implanted in a human being and generated considerable opposition from his peers.
IOL development

- ICCE: Rigid anterior chamber IOL, iris clip IOL (UGH syndrome, bullous keratopathy)
- ECCE:
  1977: Shearing J looped haptic IOL
  1981: Sinskey C-looped haptic IOL
- AC-IOL: Closed loop then open loops
- Phacoemulsification: Foldable IOL

Sources of problems

1- Improper choice of the IOL
2- Improper technique
Improper choice

1. Material
2. Design
3. Power

Ideal IOL

- Mimicking the natural lens
- The lens should be
  - Transparent
  - Durable over extended periods of time
  - Non-reactive (biocompatible)
  - Accommodation
  - Stable position
  - Non adhesive for cells and bacteria (low water content)
  - Able to restore vision (and correct preexisting refractive problems)
  - UV blocking (restore biological visual spectrum)
  - Additional functions eg Toric
### IOL materials

- The most common materials used today are:

  1. Foldable silicone and acrylic, as they can be implanted through a small incision.
  2. Polymethyl methacrylate (PMMA), less commonly used, is a rigid material suitable for rigid 1- and 3-piece IOL designs or for haptic materials.
  3. Heparin-Coated
  4. Yellow-tinted
IOL design

Haptic designs;
*PC-IOL
1-Plate haptic
2-Loop haptic (J, C, modified C)
2-Plate loop

*AC-IOL
1-Closed loop
2-Open loop
• Accommodating IOL

• *Iris fixation clips
Optic Design

Monofocal
Multifocal
Toric

Edge design:
1-Sharp edge
2-Square edge
3-Rounded anterior and sharp posterior edge
IOL power Calculation

- Machines, A constant, IOL type
- Other factors: Other eye refraction, patient needs, silicone filled eye
- Formulas
  - 1- Short eyes: Hoffer-Q, Haigis, Holliday II
  - 2- Long eyes: Wang-Koch, SRK/T

IOL calculation after refractive surgery

- Problems:
  - 1- Conventional keratometers can not accurately measure anterior corneal power
  - (solution: topography or Pentacam)
  - 2- distorted ratio between anterior and posterior corneal surfaces
  - (solution: directly measure posterior surface power with Pentacam)
  - 3- conventional formulas mispredict ELP
  - (solution: IOL master or Pentacam to directly measure ACD) and use the correct formula eg Haigis L or Shammas
Ideal techniques

• Minimal eye disturbance:
  • Better delivery systems and smart materials
  • Ideal Location of the IOL

Intraoperative difficulties

• 1- stuck haptic in the injector leading to broken haptic
• Reasons: improper loading
• Prevention: preloaded IOL
• Detection; resistance during injection
• Treatment: if detected early reload or replace, if cut haptic explant
Incomplete or slow unfolding

- Reason: insufficient viscoelastic in the cartridge or dried out
- Treatment: wait and help with second instrument or viscoelastic injection

Capsular block syndrome

- Reasons: small CCC
- Detection: High IOP, shallow AC, Iris Prolapse
- Treatment: push IOL posteriorly with second instrument
Unstable IOL

- Reasons: Large CCC, asymmetrical CCC, Incomplete CCC, subluxated capsular bag, PC hole
- Treatment: larger optic or 3 piece IOL, opposite capsular relaxing incision, CTR, sulcus implantation

Postoperative complications

- 1- early
- Malpositions
Late Postoperative IOL complications

- 1. Posterior Capsule Opacification
- 2. Anterior Capsule Opacification
- 3. Interlenticular Opacification
Continued

- 4-late postop endophthalmitis
- 5-Pigment dispersion
  - Anterior implants – Iris contact
- 6-Corneal edema