Course Handout
High Volume, High Quality and Cost-effective Cataract Surgery for the Developing World
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Why Manual SICS?

- Universal applicability
- Shorter and smoother learning curve
- Minimal complications
- Increased turnover time
- Helpful in conversion to phaco during training
- Highly economical both for the ophthalmologist and for patients
- No maintenance requirements as compared to phaco
- Early patient rehabilitation
- Indispensable technique for developing world with high backlog of cataract
- Reduces carbon footprint significantly
Instruments Required

Blades

26 G needle and Utrata forceps

Irrigating vectis

Simcoe cannula
Basic Steps

I. Wound construction

- **External groove**
  - Razor blade or 15 number blade
  - 6 to 7 mm length, 2 mm posterior to the anterior limbal border
  - ½ to ¾ scleral thickness
  - Limbus parallel, straight, frown or chevron shape

- **Sclero-corneal tunnel**
  - Using bevel up crescent
  - Wriggling and sweeping movement
  - Crescent blade should be just seen, not too much nor too less
  - 1 - 2mm into clear cornea

- **Internal lip**
  - Acts as the valve
  - Larger than external groove, giving inverted trapezoid shape
  - Anterior chamber entered by bevel down keratome. Look for Dimple sign
Paracentesis
- 1.5 mm length
- 8 or 9 o’ clock position
- Parallel to iris plane
- Uses: sub-incisional cortex removal, AC reformation at the end of surgery

II. Capsulotomy
- Can-opener capsulotomy
  - Easy to learn
  - Bent 26 G sharp needle
  - Easy to convert difficult capsulorhexis
  - Useful in cases of small pupil, mature cataract and brown cataract
- Capsulorhexis
  - Using bent 26 G needle or Utrata forceps
  - Small flap of capsule is raised and proceeded with Shearing force
  - Facilitates
    ✓ In the bag placement of IOL
    ✓ Comfortable cortex aspiration
    ✓ In case of posterior capsule tear, IOL can be placed over the rhexis margin in sulcus

III. Nucleus prolapse
- Manual prolapse
  - Using Sinskey hook
  - Embed the tip of Sinskey hook into the nucleus in the center and drag towards the equator and hook it out.
  - Take care not to pull the capsule
  - Preferable in advanced cataracts and in cases of can opener capsulotomy
Hydroprolapse
- Good hydrodissection is a prerequisite
- Hydrostatic pressure inside the capsular bag, created by hydrodissection, pops out the nucleus
- Requires large rhesis
- Preferable in softer cataracts
- Avoided in cases of discontinuous rhesis and PPC

Bimanual prolapse
- Using iris repositor and Sinskey hook.
- Done in cases of small pupil, hard cataract and weak zonules

IV. Nucleus extraction
- Irrigating vectis
  - Adequate viscoelastics over and under the nucleus
  - Vectis is placed under the nucleus, bridle suture is pulled, vectis extracted while pressing down the sclera to open up the wound and once the nucleus is in the tunnel, fluid is injected
  - Vectis is always visible, however dense the cataract be.
  - Avoid catching the iris between vectis and nucleus

Visco-expression and hydro-expression
Fish hook technique
Phaco-sandwich method
Blumenthal technique
V. Cortex aspiration

- Using Simcoe cannula (attached to IV line with BSS) and 5 cc syringe
- Epinucleus can be expressed with viscoelastics or irrigation fluid

VI. IOL implantation

- Single piece or 3 piece PMMA IOL is implanted in the bag.

Controlling Surgically Induced Astigmatism (SIA)

I. Induced corneal astigmatism is governed by:

- Nature of incision:
  - Site
  - Configuration
  - Size
  - Depth
- Scleral Cauterization: Excessive cautery - with the wound astigmatism (WTW)
- Use of topical steroids: Excessive use retards wound healing - aggravates against the wound astigmatism (ATW)
- Suturing: Induces WTW astigmatism

II. How does a sclerocorneal section affect corneal astigmatism?

- UNSUTURED SECTION: Flattens the meridian spanning which it is applied
• **SUTURED SECTION:** Steepens the meridian spanning which it is applied

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### III. Concept of Koch’s Incisional Funnel

- SIA directly proportional to length of incision
- SIA inversely proportional distance of incision from corneal centre
- Incision of 3-3.5 mm at the limbus results in minimal astigmatism of $0.25 – 0.50\text{D}$ cylinder: can be considered astigmatically neutral for all practical purposes

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**Fig.a: Koch’s Incisional Funnel**
- Imaginary funnel with base at limbus and widening farther away from it.
- Any incision which is made within this funnel is astigmatically neutral
IV. Temporal incision

Advantages
- Mild age-related pre-existing ATR compensated by WTR shift induced by temporal section
- Due to ellipsoidal shape of cornea, temporal wound is farther from center of the cornea, thus inducing lesser astigmatism than superior wound when placed at the same distance from limbus

Disadvantages
- No lid cover over the wound
- Accessible location susceptible to eye-rubbing
- Safety compromised in early post-operative period
V. To conclude

- Following basic principles of tunnel construction gives SIA of about 1-1.5 D cylinder against the wound
- Final corneal astigmatism governed by interaction of SIA with patient’s inherent corneal astigmatism
- Study patient’s keratometry pre-operatively
- To minimize final astigmatism plan:
  - Unsutured section spanning steeper meridian OR
  - Sutured section spanning flatter meridian

SICS in difficult situations

I. Mature cataract

- Wound construction
  - Make large tunnel for easy removal of nucleus
  - Can be sutured at the end to reduce induced astigmatism

- Absence of red glow
  - Stain the capsule by trypan blue dye

- Difficult capsulorhexis
  - Intumescent cataract
    - High risk of capsulorhexis extension due to raised intra-lenticular pressure
    - Argentina flag sign
    - Use high viscosity viscoelastics
    - Do rhesis through side port
    - Utrata forceps gives better control
    - Two stage rhesis or can opener capsulotomy
  - Morgagnian cataract
    - Linear capsulotomy or capsulorhexis
    - Wash out the liquid cortex that leaks out through capsular opening
    - Complete the capsulorhexis using forceps
Sclerotic cataract

- Fibrosed capsule
- Try to do capsulorhexis outside the fibrosis
- Vannas scissor can be used to cut the fibrotic area

Nucleus management

- Gentle, multi-quadrant hydrodissection to release all capsule cortical adhesions
- Nucleus prolapsed using sinskey or bimanual technique

Brown cataract

Wound construction

- Make large tunnel for easy removal of nucleus
- Can be sutured at the end to reduce induced astigmatism

Absence of red glow

- Stain the capsule by trypan blue dye

Capsulotomy

- Canopener capsulotomy can be done
- Large capsulorhexis can be done as risk of extension is less

Nucleus management

- Bimanual prolapse
- Avoid catching iris with irrigating vectis as chamber is fully filled with nucleus. Inject liberal viscoelastic under the nucleus to push down iris and posterior capsule
III. Small pupil

• **Causes**
  - Pseudoexfoliation
  - Diabetes mellitus
  - Post uveitic cataract
  - Chronic Pilocarpine therapy

• **Strategies to tackle small pupil**
  - Intracameral adrenaline 1:30000
  - Viscodilatation using cohesive viscoelastics
  - Synechiae release
  - Stretch pupilloplasty using Kuglen’s hook
  - Iris hooks, expanders and rings
  - Multiple sphincterotomies, sectoral iridectomy

• **Capsulorhexis**
  - Stain the capsule for better visualization
  - Use Utrata forceps
  - Blind rhexis beyond the pupillary margin

• **Nucleus prolapse**
  - Gentle multi-quadrant hydrodissection
  - Bimanual prolapse of nucleus
IV. Subluxated cataracts

• Causes
  o Hereditary – Marfan’s syndrome, Homocysteinuria etc.
  o Trauma
  o Pseudoexfoliation

• Capsulorhexis
  o Stain the capsule with trypan blue
  o Avoid going peripherally in area of zonular weakness
  o Iris retractors or capsular hooks can be used to support the capsule

• Nucleus prolapse
  o Bimanual prolapse, reduces the stress on zonules
  o Capsular tension devices can be implanted either before or after nucleus removal

Conversion
Modification of usual SICS steps to accommodate for the problem at hand. Need for conversion based on individual surgeon’s experience.

I. Aim
• Patient safety
• Best possible visual outcome with one’s range of skills and experience

II. Indications

• Premature entry
• Capsulozonular complications
• Large hard nucleus
  o Premature Entry
    ✓ Leads to recurrent, troublesome iris prolapse
Management
- Suture the initial wound and construct a new tunnel anteriorly or temporarily OR
- Convert to ECCE

- Capsulozonular Complications
  ✓ Early PCR with nucleus in situ eg. PCR during hydrodissection especially posterior polar cataract
  ✓ Large ZD/ traumatic subluxation
  Management
  - Risk of nucleus drop demands quick and safe nucleus delivery
  - May need conversion to ECCE and delivery of nucleus using irrigating or simple Vectis

- Difficulty In Nucleus Delivery
  ✓ Small rhexis with large nucleus
    - Convert rhexis to can-opener capsulotomy with multiple relaxing incisions with Vannas scissors
    - Relaxing the rhexis margin with a single cut can cause inadvertent posterior extension and PCR (never advisable)
  ✓ Large hard nucleus in AC
    - Difficulty in nucleus extraction despite large straight section
    - Risk of DM detachment
    - Risk if iris injury or iridodialysis
  Management: Convert to ECCE and deliver nucleus safely
III. How to convert?

a. Extension of angles of scleral incision with scissors towards limbus and further along limbal zone similar to ECCE

b. Final closure of wound with sutures
Assuring *Quality* & Ensuring *Efficiency* in a high volume setting

In a resource constrained setting, how do we provide high volume cataract services, simultaneously retaining high productivity and high quality of care?

I. **Challenges in ensuring high volume surgical work**

   - Creating the demand for eye care
   - Scarce Resources
   - Balancing Competence of surgeons with the volume of work
   - Ensuring constant flow of patients to the theater
   - Ensuring supply of sterile surgical sets without any delay

II. **Systems to Ensure Productivity & Quality**

   ➢ **Standardization of systems**
     - Guidelines on admitting for cataract surgery
     - Preoperative patient preparation
     - Sterilization of instruments
     - Surgical steps
     - Follow up activities

   ➢ **Streamlining OR activities**
     - Knowledge on the expected number of surgeries for the next day
     - To allot required staff for each area (OR, anesthesia & CSSD)
     - Usage & Balancing of Resources
     - To make sure all the equipments are in good working condition
     - To Ensure Availability of Surgical Supplies
     - Ensuring sterile supplies & asepsis

   ➢ **Ensuring patient safety measures**
     - Checklists to ensure Correct patient/ eye/ procedure/ IOL
     - Managing Systemic emergencies
     - Reduce post-op infection
Documentation

- Ensures a continuous care process
- Quality case-sheet and checklist
- Use technology where appropriate

Data Monitoring, Reviewing and Continuous improvement

References