Instruction Course (205): Guidelines and Techniques for Managing Subluxated Cataracts

Surgical management of a case of subluxated lens is one of the more challenging conditions which any anterior segment surgeon come across with.

Lens subluxation or Ectopia lentis is a condition wherein there is any displacement or malpositioning of the crystalline lens from the normal anatomic position irrespective of the cause or association.

Causes of Lens subluxation

Congenital

- Congenital coloboma, Marfan syndrome
- Homocystinuria, Ehlers-Danlos syndrome
- Hyperlysinemia, sulfite oxidase deficiency
- Simple primary ectopia lentis
- Congenital aniridia syndrome

Acquired
- Blunt external trauma
- Iatrogenic zonular dehiscence – Complicated cataract or post VR surgery
- Adult-onset zonular weakness
  - Pseudoexfoliation syndrome (PXF)
  - Retinitis pigmentosa

**Preoperative Examination**
- Visual Acuity
- Refractive Error
- SLE
- Corneal Scar of any trauma
- AC Depth
- Presence or absence vitreous in AC
- Pupil mydriasis and reaction
- Zonulodialysis
- Phacodonesis
- Type and grade of cataract
- Extent of subluxation quadrant involvement in clock hours.
- IOP
- Fundus examination by indirect ophthalmoscopy, SL biomicroscopy by +90 D.
- Keratometry & A Scan biometry, B Scan USG
- Upright examination at slit lamp & supine examination is of help in a case of gross subluxation.
- All non traumatic lens subluxation should be referred to a pediatrician, medical geneticist and cardiologist for a complete evaluation and a definitive diagnosis.
- In a case with family history of subluxated lens, all children should be examined for subluxation.

**Surgical approach**

**It differs depending on the degree of zonulopathy**

- < 3 clock hrs. – none or single capsule retractor (CR) is enough for successful surgical outcome.
- CTR to be used even in small progressive zonulopathy cases like PXF, RP, Weil Marchesani, marfan, syndrome, sulfite oxidase deficiency, only to help future refixation of lens-bag complex
- CTR may not be required in a focal small area of post traumatic zonulopathy.
- In a young case of progressive zonulopathy, scleral fixation of CTR (Cionni) would be prudent for future safety.
- ≥ 3 clock hrs. CR number will depend on degree of zonulodialysis, CTR/Cionni ring with scleral fixation for future safety is suggested
Capsulorhexis

A complete capsulorhexis is a must here to attempt for successful phaco and lens implantation.

**Capsulorhexis is challenging than in a normal case:**

- Initiation or first puncture in capsule is difficult as the capsule bag is lax.
- Start from the area of intact zonules
- Use MVR blade or two opposing 30G needles to puncture anterior capsule
- Capsulorhexis should be centered on the decentered crystalline lens, not on the pupil or corneal apex.
- Capsulorhexis should follow the shape of the lens.
- Trypan blue dye is helpful
  - Spreading a drop of dye is enough to stain the capsule
  - Excess dye can obstruct useful red reflex because of lack of antero posterior barrier
  - Use of dye reduces elasticity of capsule which is helpful in children.
- Capsulorhexis made with forceps is easier than with needle.
- Microincision forceps are useful to access along circumference from different paracentesis microincisions.
- Microincision prevent OVD leak from Anterior Chamber (AC) and avoid associated problems like shallow chamber, run out CCC, vitreous disturbance.
- To keep CTR in the bag at least 2mm of anterior capsule rim need be present especially when bag has to be fixed to sclera.
- Femto second laser assisted capsulorhexis offer advantages in less severe cases of subluxation.
**Capsule bag stabilization:**

*Use of capsule retractors*

- Capsule /Iris retractors (CR/IR) can be used through limbal stab incisions at capsulorhexis edge to support the bag.
- Capsule retractor (CR) supports the bag by its equator not the capsule margin.
- Avoid excess traction on the capsule to re-center the lens to prevent tear from the margin.
- CR can be placed at the intact capsulorhexis margin 2-3 clock hours from advancing edge to avoid radial tear of the incomplete capsulorhexis.
- Alternatively capsule segment can be used in the area of zonulopathy to fix the bag before doing phacoemulsification by stabilizing it with iris hook through limbal micro incision.
- Some surgeons prefer to put CTR early in the procedure to maintain expanded capsular bag to support zonules and to facilitate PE. But this could be challenging as nucleus may impede CTR progression in the bag and cortex removal is difficult.
- Place the CTR in the bag as later as you can and as soon as you must.

**Hydrodissection**

- Fill the chamber with OVD, to keep anterior lens surface flat.
- Gentle hydrodissection is a must in all cases. Ensure fee rotation of nucleus or else do multipoint hydrodissection.
- A careful and complete hydrodissection avoiding excess BSS creating capsule tear is suggested.
- In presence of zonulopathy, incomplete hydrodissection can damage remaining zonules and bag during nucleus rotation.

**Phacoemulsification**

- Soft lens in young patients can be aspirated with irrigation/aspiration (I/A) handpieces or cannula.
- Use low parameters, low aspiration flow rate (AFR), vacuum & adequate power
- Perform slow motion phaco, controlling by your foot pedal and control panel.
- Avoid shallowing of AC by filling it with second hand by OVD before removing the phaco or irrigating handpiece.
- While removing last piece of nucleus extra caution is suggested. Fill the bag with OVD to avoid its collapse.

**I&A**

- Cortex sheet aspiration should be firm, gentle & with care to avoid stress on the adjacent intact zonules.
- Tangential stripping of cortex from capsule is suggested in the area of weak/absent zonules.
- Excessive effort to remove small strands can produce capsule on zonular damage.
- Perform anterior vitrectomy after doing capsulorhexis and lens fixation by CR in a case vitreous is present in AC
Capsule Tension Ring (CTR) Selection

- <3 clock hours small dialysis, a standard CTR is suggested
- >3 clock hours dialysis, fixation of ring is required.
  - Cionni ring, Malyugin modified cionni ring
  - CTR + CTS (capsule tension ring segment)
  - Assi Anchor

IOL

- Single piece monofocal IOL is a preferred lens as it opens slowly in the bag with less chances of damage to the lens bag and zonules.
- Multi piece IOL can alternately be used with caution.
- IOL haptic is oriented in the long axis of subluxation mainly in a case when ring is not placed. This keeps the bag stretched in that week area.
  - Toric or Multifocal IOL should better be avoided. As there are high chances of decentration of the IOL and resultant poor vision.
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