Chapter - 5

MICROSURGERY AND
EXTRACAPSULAR CATARACT EXTRACTION

Various surgical techniques namely intracapsular cataract extraction (ICCE), extracapsular cataract extraction (ECCE), small incision cataract surgery (SICS), and phacoemulsification are available. Because of high complication rates and availability of better options ICCE is no longer recommended. The other three techniques will be discussed in this volume.

The term ECCE refers to the technique in which a portion of anterior capsule of the lens is removed, allowing extraction of the lens nucleus and cortex, leaving the remainder of anterior capsule, the posterior capsule, and the zonular support intact. This is the case in all the present cataract surgery techniques- ECCE, SICS and phacoemulsification. By convention, however, ECCE refers to a procedure in which intact lens nucleus is removed from the eye through a limbal incision, approximately 10 mm in length. Phacoemulsification refers to a surgical technique in which the lens nucleus is removed from the eye through a limbal incision approximately 3mm in length. This chapter refer to ECCE and subsequent two will refer to SICS and phacoemulsification.

Instrumentation

The development of microsurgery, viscoelastics, hypotony, better lens design and phacoemulsification has revolutionized cataract surgery.

Due attention should be paid to operating microscope and operating instruments.

Operating microscope

It is essential that the microscope has good coaxial illumination. It should also have comfortable working distance, bright illumination and preferably foot control magnification and zoom facility.
**Microsurgical instruments**

General features of microsurgical instruments are as follows

1. Length should not exceed 10 cm.
2. Closing pressure should not be too stiff to avoid tremors. Working parts should not open more than 1 cm.
3. The surface should be dulled to avoid glare

Materials include stainless steel, titanium and plastic. Titanium does not offer a great advantage over good quality stainless steel instruments.

Few basic instruments required are sharp blades, needle holder, 0.12 mm 2x1 toothed forceps, McPherson’s curved forceps, a Sinskey manipulator and Vannas scissors. Microsurgery offers the advantage of minimal tissue trauma, precise surgery and better surgical results.

**MICROSCOPE ADJUSTMENT**

**Basic principles**

1. Use low magnification 6 to 8X should be adequate. If necessary for certain step like capsulotomy (especially capsulorhexis), higher magnification may be used.
2. There is no substitute to regular practice for mastering the operating microscope. Initially use microscope on dummy eye or goat’s eye for practice.
3. Adjust the eye pieces for your refractive error, if any, and if you are operating without your spectacles/contact lens correction.
4. Adjust the eyepieces to your interpupillary distance. You can check this by closing one eye at a time while looking through microscope. The field through either eyepiece shall be identical.
5. If your microscope has adjustable tilt for eyepieces, then adjust the tilt to your sitting position for comfort. Make sure your head and neck position are comfortable.
6. Obtain sharp focus on limbus or iris. Vessels at limbus should be sharply visible.
Care of operating Microscope
1. Ensure a steady voltage power supply by means of U.P.S., C.V.T., or voltage stabilizer in that order of preference.
2. Keep microscope clean and dry. When not in use, cover it with plastic cover.
3. In our country, fungus growth may be a problem. This can be overcome by having O.T. air conditioned. As an alternative, desiccating agents such as silica gel may be placed inside the plastic cover.
4. Only trained person should be called for maintenance work on operating microscope. If necessary, housing part, except optical lenses may be cleaned with a dry duster or dust brush. Optical lens may be cleaned with clean soft linen cloth after dust particles are removed with air puff. Soap free solution like Colin (from Reckitt-Benckiser) may be safely used.

Care of Microsurgical Instruments
1. Clean the instruments immediately after use. This may be done with the help of an ultrasonic cleaner. If this is not available, wash all instruments in distilled water and clean with tooth brush. Saline should be avoided. A good and gentle grease dissolving detergent may be used.
2. Thoroughly dry the instruments after cleaning.
3. Inspect the tip of instruments under magnification.
4. Lubricate the hinges and tip of instrument with liquid paraffin or mineral or silicone oil.
5. Keep the tip protected with safety cover e.g. cut piece of silicone tubing.
6. Store instruments in moisture free environment.

Pre-operative preparation
Preparation for cataract surgery involves following steps.
Mydriasis: Maximal pupillary dilatation is essential and should be maintained throughout surgery. To achieve this, following combination may be used.
1. Tropicamide 0.8% and phenylephrine 5%: Use two times at 15 min. interval (use with caution in hypertensives and arrhythmic patients as phenylephrine, a pure alpha agonist can raise blood pressure).
2. Phenylephrine 2.5% with cyclopentolate 0.5% to 1%: Instilled four times at 10 min interval to achieve wide pupillary dilatation.
3. Adrenaline 1:1,000,000 or 0.5ml in 500ml of irrigating solution should be used.
Prostaglandin Inhibitor

Topical flurbiprofen sodium 0.03% drops starting 2 hrs before surgery four times at half hourly interval helps to prevent pupillary miosis during surgery.

The potential disadvantages include inhibition of platelet aggregation (causing bleeding during surgery or postoperatively), delay in wound healing and exacerbation of herpes simplex infection.

Anesthesia

ECCE is usually performed under regional block.

Lowering Intra Ocular Pressure

Lowering of IOP before cataract surgery minimizes operative difficulty and complications.

1. Digital pressure for five minutes. Pressure should be intermittent.
2. ‘Super Pinkie’ ball, a rubber ball held in place over the eye with the help of elastic band that exerts pressure of about 30 mm Hg. This should be kept for 10 min., with intermittent release of pressure after every 2-3 minutes.

Antimicrobial Preparation of Skin and Conjunctiva

Use of povidone iodine 5% and disposable plastic drapes are two most important measures to reduce the incidence of post-operative endophthalmitis.

Paint the periocular region with 5% povidone iodine solution. Begin from central i.e. eyelid margin, to outer. The horizontal extent must be from midline to beginning of auricle and vertical extent from hairline to a line passing horizontally from angle of mouth. Wait for it to dry (about 5 min). Scrub lid margin with povidone iodine applicators. Instill povidone iodine drop into cu-de-sac. Wash after 2-3 minutes with normal saline.

Apply Opsite or other plastic drape taking particular attention to ensure its tight adherence to medial canthus, nasal bridge, inferior and superior bony margin. Avoid corneal touch. Make an incision in middle of two lids with two vertical cuts at two ends. Insert speculum so as to cover the lash line. Pass a bridle suture in the superior rectus if necessary for better exposure of the superior limbus.
Operating Technique

This can be broadly divided into 3 steps

1. Anterior capsulotomy
2. Nucleus expression.
3. Cortex clean-up.

In a conventional ECCE, after preparation of fornix based conjunctival flap, a groove incision, approximately 10 mm long is made in the sclera in posterior limbal are. Anterior chamber is then entered using a sharp blade. The A.C. is filled with viscoelastic. Anterior capsulotomy can be of 3 types.

a. Can opener capsulotomy
b. Envelope opening capsulotomy
c. Continuous curvilinear capsulorrhexis (CCC).

Making a bent needle capsulotome: For capsulotomy, a 26/27 Gauge needle attached to 2cc syringe is used. Bending of needle is best done under microscope. Use a firm large needle holder and hold the needle at half of length of tip and bend it 90 degrees. The needle is then held near the hub and bent in the opposite direction to make an angle of about 120-130 degrees.

Can Opener Capsulotomy

Enter the viscoelastic filled anterior chamber with needle turned sideways. Now turn the tip and start making multiple radial communicating cuts, about 40 in number. Anterior capsule may be removed with McPherson forceps. Any tags left are removed by holding with McPherson forceps and cutting with Vannas scissors.

Envelope Capsulotomy

This is the preferred method, especially in mature and hypermature cataracts. A horizontal cut is made in superior part of anterior capsule extending its full width.
Continuous curvilinear capsulorhexis (CCC) is superior to all above as it does not leave any tags of anterior capsule. It is mandatory in phacoemulsification.

Now using a cannula, hydrodissection is performed separating nucleus from cortex. Stage is now set for nucleus removal.

**Delivery of Nucleus**

Enlarge the incision with scissors from 10 - 2 o’clock i.e. about 10 mm. Larger incision is required in mature, nuclear cataracts. Beginners should also make a bigger incision. With lens expresser, gentle pressure is exerted at 6 o’clock just outside limbus and counter pressure is given with one tooth or wire vectis 2 mm away from scleral incision. Direction of pressure in both cases should be towards the center of eye. If nucleus is not delivered, consider three possibilities.

1. Anterior capsule is not fully cut
2. Small pupil.
3. Small section.

It is very important that superior equator of nucleus is presented first before further pressure is applied. This is achieved by gentle pressure at 12 o’clock to push scleral side of incision. Alternatively, with bent needle nucleus is engaged 2 mm from its 12 o’clock edge and push downward toward 6 o’clock until 12 o’clock edge is visible indicating that nucleus has separated from cortex. With intermittent pressure at 6 o’clock and gentle constant pressure at 12 o’clock nucleus will deliver.

**Removal of Cortex**

The anterior chamber is kept deep constantly with infusion solution with bottle height 60 cm above patient eye.

Using a Simcoe irrigation aspiration cannula, cortex is removed. Tip of the cannula should always face anteriorly, i.e. towards the surgeon. Cortex is engaged in the peripheral part with gentle pressure, brought in the central area and aspirated in central part of the anterior chamber where depth is the greatest. Surgeon should be
able to differentiate between tags of anterior capsule and cortex. Pulling the capsule will invariably result in zonular rupture or posterior capsule dehiscence.

Sometimes it is difficult to remove subincisional cortex i.e. 12 o’clock cortex. Special J shaped cannula may be helpful. If unusual difficulty is being encountered, it is advisable to leave a little cortex behind rather than risking rupture of posterior capsule.

**Intraocular lens implantation:**

Fill the anterior chamber with viscoelastic i.e. methylcellulose. Start injecting at 6 o’clock and then fill inside the capsular bag so bag is inflated.

Check the power and other specification of IOL. The implant should be inspected under the microscope for any crack, impurity. Convexity of J or C of inferior loop should be right side of surgeon. IOL should be rinsed with irrigating solution on both of its surfaces. The inferior haptic is passed through the incision without lifting the cornea. The haptic is passed across anterior chamber till it reaches under the rim of anterior capsule at 6 o’clock. The forceps is released and with McPherson forceps end of superior loop is grasped. Loop is flexed sufficiently so its convexity can be passed under superior iris and anterior capsule. A gentle pronation of wrist will put superior loop in the bag. Usually the lens is rotated by Sinskey dialing hook in clockwise direction to place haptics at 3 and 9 o’clock position. Methylcellulose in anterior chamber is fully washed off with Simcoe cannula.

**Wound closure**

Wound is usually closed with 10-0 monofilament nylon suture. One can use interrupted or continuous suture. The aim is to have a water tight incision which produces minimal astigmatism. Sutures should be radial, equidistant and with optimal pressure. Depth of suture should be around 90% of thickness of cornea.
Conjunctival flap is secured with electrocautery. Subconjunctival antibiotic is injected in lower fornix. The eye is patched with sterile pad.

**Post operative medication**
1. Tab Ciprofloxacin 1 gram/daily x 5 day
2. Analgesic 1 tab SOS
3. T. Acetazolamide 250 mg QID x 2 day
4. Continue all the drugs required for system illness.

**Topical medication**
1. Antibiotic - steroid combination drops six times a day and taper slowly within 6 weeks period
2. Cycloplegic - mydriatic once a day for 2 weeks.

**Post operative follow up**
- 1st day
- 4th day
- 15 day
- 6th week - prescription of glasses

**Post operative instructions**
Following are some of the post-operative instructions. They are to be followed for 6 weeks only.
1. Do no lift heavy weights
2. Do not stoop or bend over
3. Do not touch the operated eye with bare hands
4. Avoid head bath. Bathe below the neck only.
5. Face can be cleaned with wet cloth. Shaving and brushing of teeth are allowed. Avoid vigorous shaking of head.
6. Avoid dusty and crowded places.
7. Avoid smoking, alcoholic drinks, and usage of snuff. There are no special diet restrictions.
8. In case of cough or constipation, consult physician for treatment. For any other systemic problems, seek necessary medical treatment.
9. You can use previous corrective spectacles. Use dark glasses outdoors. The dark glasses should have closed sides.

10. Use an eye shield during sleep.

11. Have the eye cleaned by your attendant in the manner as shown by the surgeon. Cleaning should be done twice daily.

12. Use medications as prescribed.

13. In case of persistent pain, sudden marked redness, excessive discharge, lid swelling, sudden decrease in vision, call on your surgeon immediately.