Mastering phaco nightmares and worst case scenarios:
A video based course

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POSTERIOR CAPSULAR RUPTURE

Any breach in the continuity of the posterior capsule is defined as a posterior capsule tear. Intrasurgical posterior capsule tears are the most common and can occur during any stage of cataract surgery. The incidence of posterior capsule complications is related to the type of cataract and conditions of the eye, increases with the grade of difficulty of the case, and furthermore is influenced by the level of experience of the surgeon. Timely recognition and a planned management, depending upon the stage of surgery during which the posterior capsule tear has occurred, is required to ensure an optimal visual outcome.

COMMON RISK FACTORS FOR POSTERIOR CAPSULAR RUPTURE (PCR):

1. Intraoperative factors causing variation in anterior chamber depth
2. Type of cataract
3. Extended rhexis

Intraoperative factors causing variation in anterior chamber depth

Intraoperative shallow anterior chamber could be due to various reasons. It may be a tight lid speculum, tight drapes, or pull from the recollecting bag. In all the above cases, remove the precipitating factor (Remove the speculum pressure, remove the tight drapes and collecting bags). Variation in the amount of space in the anterior and posterior chambers may result from changes in the intraocular pressure (IOP) due to an alteration in the equilibrium between inflow and outflow of fluid. Diminished inflow may be secondary to insufficient bottle height, tube occlusion or compression, bottle emptying, too tight incisions compressing the irrigation sleeve, or the surgeon moving the phaco tip out of the incision, making the irrigation holes come out of the incision. Excessive outflow may be caused by too high vacuum/flow parameters, or too large incisions with leakage. Another cause is the postocclusion surge. Use of air pump or gas forced infusion (FIG 1)solves most of these problems of intraoperative shallow anterior chamber.
AIR PUMP

A simple and effective method to prevent anterior chamber collapse during phacoemulsification and phakonit is by increasing the velocity of the fluid inflow into the anterior chamber. This is achieved by an automated air pump which pumps atmospheric air through an air filter into the infusion bottle thereby preventing surge. This can be used with any phacoemulsification machine to minimize surge. This air pump is a locally manufactured automated device, used in fish tanks (aquariums) to supply oxygen, is utilized to forcefully pump air into the irrigation bottle. This pump is easily available in aquarium shops. A micropore air filter is used between the air pump and the infusion bottle so that the air pumped into the bottle is clean of particulate matter.

An IV set connects the air pump to the needle which is normally fixed for air in the infusion bottle. When the air pump is switched on, it pumps air into the infusion bottle. This air goes to the top of the bottle and because of the pressure, it pumps the fluid down with greater force. With this, the fluid now flows from the infusion bottle to reach the phaco handpiece or irrigating chopper. The amount of fluid coming out is much more than what would normally come out and with more force. An air filter is connected between the air pump and the infusion bottle so that the air which is being pumped into the bottle is sterile. This extra amount of fluid coming out compensates for the surge which would otherwise occur.
Continuous infusion:

Before we enter the eye, we fill the eye with viscoelastic. Then once the tip of the phaco handpiece in phaco or irrigating chopper in phakonit is inside the anterior chamber we shift to continuous irrigation. This is very helpful especially for surgeons who are starting phaco or phakonit. This way, the surgeon, never comes to position zero and the anterior chamber never collapses. Even for excellent surgeons this helps a lot.

Advantages:

1. With the air pump, the posterior capsule is pushed back and there is a deep anterior chamber.
2. The phenomenon of surge is neutralized. This prevents posterior capsular rupture.
3. Striate keratitis post-operatively is reduced, as there is a deep anterior chamber.
4. One can operate hard cataracts also quite comfortably, as striate keratitis does not occur post-operatively.
5. The surgical time is shorter as one can emulsify the nuclear pieces much faster as surge does not occur.
6. One can easily operate microphakonit with the 700 micron cataract surgical system (MST, USA) (Fig 2)

![Fig 2- Microphakonit- 700 micron cataract surgery (MST, USA). Note the nucleus has](image)

Topical or no anesthesia cataract surgery:

When one operates under topical or no anesthesia, the main problem is sometimes the pressure is high especially if the patient squeezes the eye. In such cases, the posterior capsule comes up anteriorly and one can produce a posterior capsular rupture. To solve this problem, surgeons tend to work more anteriorly, performing supracapsular phacoemulsification. The disadvantage of this is that striate keratitis tends to occur.
With the air pump, this problem does not occur. When we use the air pump, the posterior capsule is quite posterior, as if we are operating a patient under a block. In other words, there is a lot of space between the posterior capsule and the cornea, preventing striate keratitis and inadvertent posterior capsular rupture.

**Internal Gas forced infusion:**

This was started by Arturo Pérez-Arteaga from Mexico for phakonit. The anterior vented gas forced infusion system (AVGFI) of the accurus surgical system can be used. This is a system incorporated in the Accurus machine that creates a positive infusion pressure inside the eye. One can also use the Bausch and Lomb Millenium machine.

**Type of cataract**

A higher incidence of posterior capsule tear with vitreous loss is associated with cataract with pseudoexfoliation, diabetes mellitus, and trauma. Missing the diagnosis in a posterior polar cataract can be catastrophic to the surgeon and the patient. It is frequently associated with a weakened or deficient posterior capsule. Posterior lenticus, cataracts with persistent primary hyperplastic vitreous, cataracts following vitreoretinal surgery and morgagnian cataracts are some of the other types.

**POSTERIOR POLAR CATARACT**

The posterior polar cataract has a unique circular whorl like appearance located in the central axis near the nodal point of the eye with the rest of the lens remaining clear. It is frequently associated with a weakened or deficient posterior capsule. Missing the diagnosis in a posterior polar cataract can be catastrophic and a nightmare. Interdigitation with the posterior capsule is characteristic as opposed to a posterior subcapsular cataract.

**SURGICAL TIPS:**

A small CCC is aimed for in the eventuality of the IOL having to be placed in the sulcus. Hydrodissection may cause hydraulic perforation at the weakened area of the capsule, hence only a careful controlled hydrolinelineation is preferred (Fig 3). This epinuclear shell provides additional protection by tamponading any vitreous or capsular breach during phacoemulsification. A small amount of viscoelastic can be injected just under the rim of the rhesis all around to form a mechanical barrier for fluid from accidentally entering the subcapsular plane while performing hydrolinelineation.

*Fig 3: Intra operative picture of a posterior polar cataract with hydrolinelineation*
**SUB 1 mm: 700 MICRON CATARACT SURGERY:**

Microphakonit or bimanual phacoemulsification through two 0.7 mm instruments (an irrigating chopper and a phaco needle) can be used effectively to tackle a posterior polar cataract. Hydrodissection can be done through both ports here. Another advantage of this technique is that one can easily revert to bimanual vitrectomy in case of vitreous loss. **The advantage of microphakonit over phaco is that one has a closed chamber throughout surgery as both the incisions are so small.**

**EXTENDED RHEXIS**

Extension of anterior capsule can occur as a complication in MICS also. During capsulorhexis, anterior capsular tears can cause posterior capsule tear by extending to the periphery. In a new method of managing this situation, a nick is made from the opposite side of the rhexis using a cystitome or vannas and the capsulorhexis is completed. The viscoelastic in the anterior chamber (AC) is then expressed out to make the globe hypotonous, following which a gentle hydrodissection is done at 90 degrees from the tear while pressing the posterior lip of the incision to prevent any rise in intraocular pressure (IOP). No attempt is made to press on the center of the nucleus to complete the fluid wave. The fluid is usually sufficient to prolapse one pole of the nucleus out of the capsular bag; else it is removed by embedding the phacoemulsification probe, making sure not to exert any downward pressure and then gently pulling the nucleus anteriorly. The whole nucleus is brought out into the AC and no nuclear division techniques are tried in the bag. The entire nucleus is prolapsed into the anterior chamber and emulsified.

**STEPS FOR MANAGEMENT OF PCR**

**Reduce the Parameters:** Lowering aspiration flow rate and decreasing the vacuum will control surge and will allow the bottle to be lowered, diminishing turbulence inside the eye. If the nucleus is soft, only a small residual amount remains, and there is no vitreous prolapse, the procedure may be continued. If vitreous is already present, special care must be taken for preventing additional vitreous prolapse into the anterior chamber or to the wound. Small residual nucleus or cortex can be emulsified by bringing it out of the capsular bag and can be emulsified in the anterior chamber with viscoelastic underneath the corneal endothelium. The recommended parameters are low bottle height (20–40 cm above the patient’s head), low flow rate (10–15 cc/ min), high vacuum (120–200 mm Hg) and low ultrasound (20–40%).

**Dry cortical aspiration:** If there is only a small amount or no vitreous prolapse in the presence of a small capsular rent, a dry cortical aspiration with 23 G cannula can be performed.

**Viscoexpression:** It is a method of removal of the residual nucleus by injecting viscoelastic underneath the nucleus to support it and the nucleus is expressed along with the viscoelastic.
Conversion to ECCE: If there is sizeable amount of residual nucleus, it is advisable to convert to a large incision ECCE to minimize the possibility of a dropped nucleus.

Anterior bimanual vitrectomy: Bimanual vitrectomy is done in eyes with vitreous prolapse. Use 23 G irrigating cannula via side port after extending the side port incision. The irrigation bottle is positioned at the appropriate height to maintain the anterior chamber during vitrectomy. Vitrectomy should be performed with cutting rate (500 to 800 cuts per minute), an aspiration flow rate of 20 cc/min, and a vacuum of 150–200 mmHg.

Anterior chamber cleared of vitreous: Vitrectomy is continued in the anterior chamber and the pupillary plane. A rod can be introduced into the anterior chamber to check the presence of any vitreous traction and the same should be released. Complete removal of the vitreous from the anterior chamber can be confirmed if you see a circular, mobile pupil and complete air bubble in the anterior chamber.

Suture the wound: In cases with vitreous loss with PCR, it is recommended to suture the corneal incision.

IOL implantation: Depending upon the state of the capsular bag and rhexis, IOL is implanted.

In the bag: In the presence of a posterior capsule tear with good capsular bag, the IOL can be placed in the bag. Small PCR with no vitreous loss and good capsular bag, foldable IOL can be placed.

In the sulcus: If the rent is large, if the capsular rim is available, then the IOL can be placed in the sulcus. Seal wound as a prophylaxis to prevent infection. The “chopstick technique” is another method of placing IOL in sulcus. In this new chopstick forceps namely, ‘Agarwal- Katena forceps’ (Fig 4) is used for IOL implantation. This chopstick technique refers to the IOL being held between two flangs of the forceps. The advantage is the smooth placement of the IOL in the sulcus without excess manipulation. Moreover, the IOL implantation is more controlled.

FIG 4: Photograph of an ‘Agarwal- Katena’ forceps. Reverse opening shown (left)
Deficient posterior capsule:
Now recently Glued IOL is easily performed in such cases with deficient posterior capsules. Scleral fixated posterior chamber lenses and anterior chamber IOLs is also implanted when the posterior capsule tear is large.

MIOTIC PUPIL
A small pupil affects all steps of phacoemulsification, right from capsulorhexis to IOL insertion. Difficult maneuvering causes iris damage, sphincter tears, zonular dialysis, bleeding and so on. Poor exposure through a small pupil forces the surgeon to make a smaller rhexis, adding further to the difficulty and frequently leading to capsular dehiscence and nucleus drop - the worst nightmare. The prolonged surgical time takes it toll thereafter. Corneal edema, uveitis, secondary glaucoma, cystoid macular edema, distorted pupil, ...the list is endless. All these lead to poor visual outcome, an unhappy patient and a frustrated surgeon.

PREOPERATIVE
A good surgeon should not wait unprepared to deal with the devil on the operating table. A preoperative evaluation should include pupillary dynamics. Poor pupillary dilatation should be detected and noted down. Appropriate history is important for detecting any underlying etiology for the miotic pupil, may it be the use of miotics or long standing diabetes. Any co-existing conditions like zonular weakness in pseudo-exfoliation or synechiae in chronic uveitis should be detected preoperatively. The pupil should be dilated with a combination of cycloplegic, mydriatic and NSAID drops.

SPHINCTER SPARING TECHNIQUES
Pharmacological mydriasis alone may not be effective in cases with posterior synechiae, pupillary membrane or scarred pupils. Such pupils need intraoperative procedures. High molecular weight cohesive viscoelastics such as Healon-5 or Healon GV can be injected into the center of the pupil to mechanically dissect any synechiae and to stretch the sphincter. If this does not work, synechiolysis may be done with a blunt spatula passed through the side port incision. Viscomydriasis can then be repeated. Pupillary membranes can be stripped mechanically by the utrata forceps. Pure, preservative free adrenaline can be added to the irrigation bottle, after appropriate dilatation. Care should be taken in hypertensives and the irrigating solution should be immediately changed to an adrenaline free solution in case of a posterior capsular rupture.

SPHINCTER INVOLVING TECHNIQUES
Mini sphincterotomies, less than 1 mm, and limited to the sphincter tissue can be made with either Vanass scissors or the vitreoretinal scissors. This gives adequate dilatation intraoperatively and maintains a functionally and esthetically normal pupil postoperatively. The disadvantage is that the incision is more difficult to create in the clock hour of the wound.
Dilatation can also be achieved by pupillary stretching using push-pull instruments. Under viscoelastic cover, two hooks are used in a slow, simultaneous and controlled fashion, to stretch the pupil in one or more axes. Bipronged, tripronged and quadripriodged pupil stretchers are also very effective (Fig 5A). The prongs should be maintained parallel to the iris plane and should not slip out into the pupil margin, especially on starting to depress the plunger to create the pupil stretch. The disadvantage of pupil stretch techniques is that the iris sometimes becomes flaccid and prolapses through the incision during surgery. Postoperatively, the pupil usually remains esthetically acceptable.

Fig 5A: Tri-pronged pupil stretchers  Fig 5B: Iris hooks inserted to enlarge the pupil

In very small pupils, commercially available iris hooks can be used to stretch the pupil (Fig 5B). Gradual and optimal enlargement of the pupil to a size just adequate for the surgery should be attempted to avoid pupillary atony. The hooks should be placed parallel to the iris plane through small, short peripheral paracentesis. If not placed properly, they can pull the iris diaphragm forwards, resulting in chaffing and thermal damage during phacoemulsiication of the nucleus.

Pupil ring expanders have been introduced to stretch the pupil without sphincter damage. They are inserted through the main port and manipulated into the pupil space. They can create the largest diameter pupil by producing a uniform expanding force around approximately 300° of the pupil. As they do not produce point pressure on the pupillary margin, sphincter tears are infrequent. One of the best is the perfect pupil made by Milvella in Australia (Fig 6). This has been developed by John Milverton, MD of Sydney, Australia. It is a sterile, disposable, flexible polyurethane ring with an integrated arm that allows for easy insertion and removal. It is inserted with a forceps or injected with an injector through the main port. The integrated arm remains outside the eye to aid in easy removal. It can be inserted through an incision less than 100 microns. Because of the open ring design of the Perfect Pupil there is no interference with other instrumentation.
Recently, Malyugin devised a new iris expander named Malyugin Ring (Fig 7) that can pass through a 2.2 mm clear corneal incision. The square-shaped transitory implant has 4 circular scrolls that hold the iris at equidistant points, which provides balanced stretching and gentle control of the iris tissue. In eyes with intraoperative miosis with PCR, IOL can be implanted with the pupil expansion with “Agarwal’s modified malyugin ring” method. In this method, a 6-0 polyglactinic suture is placed in the leading scroll of the Malyugin ring and injected into the pupillary plane. The end of the suture stays at the main port incision. Once in place, the ring produced a stable mydriasis of about 6.0 mm. Hereby IOL can implanted easily in the sulcus with visualization and this prevents the inadvertent dropping of the iris expander into the vitreous during intraoperative manipulation.

Fig 7: (A) Intraoperative miosis with posterior capsular tear. (B) Agarwal’s modification of the Malyugin ring iris expansion: A 6-0 polyglactinic vicryl suture passed in the leading scroll of the ring and injected. The end of the suture stays at the main port incision.
INTRAOPERATIVE FLOPPY IRIS SYNDROME

The intraoperative floppy iris syndrome has recently been described by David Chang in patients who have been on the alpha-1 receptor antagonist – tamsulosin for benign prostatic hypertrophy. These patients have intra-operative iris billowing, iris prolapse and progressive intra-operative miosis. Pupil stretching and sphincterotomies are ineffective for them and they require iris hooks or pupil ring expanders like the Perfect Pupil.

GLUED IOL IN ABSENT POSTERIOR CAPSULE

Under peribulbar anesthesia, superior rectus is caught and clamped. Localized peritomy and wet cautery of the sclera at the desired site of exit of the IOL haptics is done. Infusion cannula or anterior chamber maintainer is inserted. Positioning of the infusion cannula should be preferably in inferonasal quadrant to prevent interference in creating the scleral flaps. Two partial thickness limbal based scleral flaps about 2.5 mm x 3 mm are created exactly 180 degrees diagonally apart and about 1.5mm from the limbus (Fig 8). This is followed by vitrectomy via pars plana or anterior route to remove all vitreous traction. Two straight sclerotomies with a 22G needle are made about 1.5mm from the limbus under the existing scleral flaps. The sclerotomies are positioned such a way that the superior one lies close to the upper edge of the flap and the inferior one close to the lower edge of the flap. A scleral tunnel incision is then prepared for introducing the

![Image](image.jpg)

Fig 8: Scleral flaps (sf) of 2.5x3mm made about 1.5mm from the limbus. Two flaps 180 degrees diagonally apart.

IOL. While the IOL is being introduced with the one hand of the surgeon using a McPherson forceps, an end gripping 25G micro rhexis forceps (Micro Surgical Technology, USA) is passed through the inferior slerotomy with the other hand (Fig 9). The tip of the leading haptic is then grasped with the micro rhesis forceps, pulled through the inferior sclerotomy following the curve of the haptic and is externalized under the inferior scleral flap. Similarly, the trailing haptic is also externalized through the superior sclerotomy under the scleral flap. Limbal wound is sutured with 10-0 monofilament nylon. The tip of the haptics are then tucked inside a scleral tunnel made with 26 G
Fig 9: Image showing sclerotomy made with 22G needle beneath the flaps
Haptics exteriorized by 25G forceps beneath the scleral flaps (sf)

needle at the point of extension of the haptics. Scleral flaps are closed with fibrin glue. The anterior chamber maintainer or the infusion cannula is removed. Conjunctiva is also closed with the same fibrin glue.

**Fibrin Glue**

The fibrin kit used is (Reliseal, Reliance Life Sciences, India). Another widely used tissue glue namely Tisseel (Baxter) can also be used. The fibrinogen and thrombin are first reconstituted according to the manufacturer’s instructions. The commercially available fibrin glue that is virus inactivated and is checked for viral antigen and antibodies with polymerase chain reaction; hence the chances of transmission of infection are very low.

**DROP IN VITREOUS**

“FAVIT” technique — a technique described by Agarwal et al. “FAVIT” is an acronym for a technique to remove *FAllen* nucleus from the *VITreous*. In this technique (Fig 10), a chandelier illumination system is coupled to the infusion cannula to achieve visualization of the posterior segment is introduced in the infero temporal port and an endoilluminator is inserted through a second port. The 20 G vitrectomy probe is used in a

Fig 10: A: Intra operative photograph of a hard nucleus dropped on the retina B: 700 micron phaco needle is used to hold the nucleus C: Nucleus is brought through the limbal route.
third port — all ports are through the pars plana — to achieve complete vitreous removal. Complete core pars plana vitrectomy is done and is performed till the nucleus is released of all tractions in the vitreous and starts moving freely. Then the vitrectomy probe is replaced with the sleeveless phaco probe with a 700 micron phaco needle. Suction-only mode is used on the phaco probe to lift the lens off the retina and hold it while it is repositioned into the anterior chamber, where phaco or an enlarged limbal incision is used to remove the lens. If the nucleus is hard, one should extend the incision so that endothelial damage is prevented. Scleral depression is performed to identify and remove any residual lens material trapped in the vitreous base and to confirm the absence of any peripheral retinal breaks. This technique can be easily done without any special instrumentation.

**POSTERIOR ASSISTED LEVITATION**

Posterior assisted levitation (PAL) introduced by Kelman et al, in which a cyclodialysis spatula is passed through a pars plana stab incision to push the nucleus up into the anterior chamber from below. Then Packard modified the technique using a Viscoat cannula, inserting it through a pars plana stab incision located 3.5 mm behind the limbus. Viscoat is first slowly injected downward well behind the nuclear piece to provide supplemental support. The nucleus is then elevated into the anterior chamber through a combination of additional Viscoat injection and manipulation of the cannula tip.

Staining of the vitreous material with triamcinolone acetonide during vitrectomy and phacofragmentation surgery for luxated nuclei helped in total removal of the vitreous body, thus preventing the aspiration of peripheral vitreous fibrils by the phaco tip, which might induce retinal detachment intraoperatively or postoperatively.

**IOL DROP**

**PARSPLANA VITRECTOMY WITH IOL REMOVAL WITH/WITHOUT PERFLUOROCARBON**

In this method, pars plana vitrectomy should be done first followed by IOL removal with intravitreal forceps under direct visualization of the IOL. The IOL is released from all the vitreous traction. The under wide angle view the IOL is picked with he intravitreal forceps and retrieved through the limbal incision. Thus in this method, PFCL is not used. The risk of injury to the retina or vasculature exit during manipulation. However, this can be overcome by using super macula lens viewing system which gives greater magnification and stereopsis. **Hand shake technique** (Fig 11) is the method in which the IOL is transferred from one hand to other hand with the intravitreal forceps.
FIG 11: “Hand shake” technique demonstrated. A: IOL haptic is held with the left hand intravitreal forceps. B: IOL haptic is transferred to the other hand to another intravitreal forceps.

In another method, after complete vitrectomy and freeing of the vitreous around the lens fragment, PFCL is injected over the optic nerve. The high specific gravity of the PFCL floats the IOL off the retinal surface into the mid vitreous space, where it can be safely picked with the intravitreal forceps. Due to their unique physical properties, perfluorocarbon liquids are well suited for floating dropped IOL, in order to insulate the underlying retina from damage. At the same time, the anterior displacement of the dislocated IOL by the perfluorocarbon liquids facilitates its removal or repositioning. With intravitreal forceps IOL is held and brought out through the limbal route.

REPOSITIONING THE DISLOCATED IOL

Localized peritomy and wet cautery of the sclera at 3, 9 and 7 o’clock is performed. Two partial thickness limbal based scleral flaps f1, f2 2.5 mm x 3 mm are created exactly 180 degrees diagonally apart and 1mm from the limbus (Fig 12). A third scleral flap f3 is made about 2mm from the limbus. A pars plana sclerotomy about 3mm from the limbus is made with a 20 G needle under the scleral flap f3. A polyglactil 6-0 suture is placed and a 4 mm infusion cannula connected to 500 ml bottle of balanced salt solution is inserted through the sclerotomy. Infusion cannula with a halogen light source (Chandelier illumination) can also be used. Two straight sclerotomies with a 20 G needle are made about 1 mm from the limbus under the existing scleral flaps. Vitrectomy system is used for posterior vitrectomy. Posterior vitreous detachment is induced mechanically using suction of the 20 gauge vitrectomy probe. A thorough vitrectomy to free all the IOL attachments is done with 20 Gauge vitrectomy probe and endoilluminator. When the vitreous tractions are released, a diamond coated 20 Gauge intravitreal forceps (Grieshaber, Alcon, Fort Worth, Tex., USA) is used to hold the haptic tip. The IOL is gently lifted up to bring it at the level of the sclerotomy sites. The intravitreal forceps (holding the haptic) is then withdrawn from the sclerotomy site (f1), externalizing the haptic in the process. With the assistant holding the tip of the externalized haptic, the
Fig 12: Intra operative photograph showing the three partial thickness scleral flaps (F1, F2, F3) made for 20 G sutureless vitrectomy. B: Sclerotomy made for infusion cannula C: Pars plana sclerotomy made for vitrectomy probe D: Pars plana vitrectomy performed with 20 G instruments.

Other haptic is pulled through the other sclerotomy (f2) using intravitreal forceps. The tips of the haptic are then tucked through an intralamellar scleral tunnel made with a 26 G needle at the point of externalization. Scleral flaps (f1, f2) are closed with fibrin glue (Tisseel, Baxter). Polyglactil suture and the infusion cannula were removed and the third scleral flap (f3) was also sealed with the glue. Conjunctiva was also apposed at the peritomy sites with the tissue glue.

TOXIC ANTERIOR SEGMENT SYNDROME

Toxic Anterior Segment Syndrome (TASS) is being more widely reported after first being recognized as a specific entity in 1992. The classic features of TASS are early and intense postoperative inflammation after anterior segment surgery without vitreal involvement. Previously, postoperative inflammation that appeared to be non-infectious was sometimes described as sterile endophthalmitis or postoperative uveitis of unknown origin. My special guest in this column is Simon P Holland, MB,FRCSC from Vancouver to explain on this new development.
Definition

TASS is described as a group of signs and symptoms but lack of a precise definition due to the overlap with early infectious endophthalmitis, uveitis from retained cortex and prior history of iritis. The expected characteristics are early onset (24 to 72 hours), intense anterior segment inflammation including fibrin deposition and corneal edema, minimal or no pain and the absence of vitritis. Infectious endophthalmitis can be differentiated by later presentation (peaks between day three and day seven), pain and vitritis. However, early cases of endophthalmitis may present as TASS and wherever there is doubt regarding the diagnosis, the case should be treated as infectious endophthalmitis. The case illustrated (Fig 13A) shows the appearance eight hours after cataract surgery and was initially thought to be TASS. The patient was subsequently diagnosed as having endophthalmitis, culture positive for Staphylococcus aureus. The second case shows a more classical presentation on day one (Fig 13B).

Fig 13A. Early endophthalmitis presenting on the day of surgery.

Fig 13B. TASS on the first postoperative day.
Differential Diagnosis: TASS vs. Infectious Endophthalmitis

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<tr>
<th>Characteristics</th>
<th>TASS</th>
<th>Infectious Endophthalmitis</th>
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<tr>
<td>Onset</td>
<td>1 to 3 days</td>
<td>3 to 7 days</td>
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<tr>
<td>Symptoms</td>
<td>Blurred vision</td>
<td>Pain, blurred vision</td>
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<td></td>
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<td>Vitreous</td>
<td>Clear</td>
<td>Vitritis</td>
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**Vitritis**

Vitritis is almost never associated with TASS and indicates infectious endophthalmitis. However, it is possible that some cases of culture-negative endophthalmitis may also be caused by toxins and contaminating agents that cause TASS and be a ‘spill over’ of the anterior segment inflammation. Better differentiation between infectious endophthalmitis, culture-negative or sterile endophthalmitis, and TASS may occur with newer techniques such as PCR analysis of aqueous and vitreal aspirates.

**Response to steroids**

TASS cases usually respond rapidly to frequent topical steroids without need for surgical intervention and thus this feature has been used as a confirmation of the diagnosis of TASS.

**TASS etiology**

TASS is multi-factorial and determining the cause can be difficult. Surgeons in centers experiencing a TASS outbreak are likely to make multiple, simultaneous changes and thus retrospectively determining the causative agent is frequently impossible. Multiple possible factors have been demonstrated to be associated with TASS.

Conditions implicated in TASS
Intraocular causes

Incomplete cortex removal, pupil stretching, and possible immunological differences (as with DLK in atopic patients).

Intraocular medication

Dosing errors with antibiotics, preservatives, ointments (Werner et al., 2006), and pH imbalance.

Instrument contamination

Bacterial endotoxins, dried debris eg. inadequate cleaning of cannulas, persistence of detergents, irrigating solutions, endotoxins in irrigating fluids (Endosol) (Holland et al., 2006), incorrect pH or composition of irrigating fluids.

Treatment

Frequent topical steroids every 30 to 60 minutes are usually effective with improvement within the first 24 to 48 hours. In cases where corneal and endothelial toxicity occurs, a corneal transplantation may be necessary.

Outcomes

Early diagnosis and treatment invariably leads to excellent outcomes with majority of patients achieving a BSCVA of 20/40 or better. Patients can develop glaucoma from initial trabeculitis and long-term as a result of fibrin
membranes.

**CYSTOID MACULAR EDEMA**

**Prophylactic treatment**

1. Steady and gentle pre operative ocular compression.
2. Avoiding ICCE and unplanned ECCE.
3. Gentle tissue handling and avoiding excessive instrumentation
4. Avoiding complications like posterior capsular rent, vitreous loss, iris prolapse etc.
5. Proper management of vitreous loss with thorough anterior vitrectomy.
6. In the bag IOL placement.
7. IOL with chemically inert haptics and high quality optics with good surface finish and correct dimensions.
8. Avoiding photoxicity by using co-axial light only when red reflex is essential and using oblique illumination at all other times. Also by using a pupil occluder, decreasing the intensity of illumination and by rotating the macula away from light during suturing and also by using an IOL with UV absorbing optics.
9. Pharmacological prophylaxis with post operative steroids and non steroidal anti inflammatory drugs (NSAID’s) through topical, sub conjunctival, sub-Tenon or systemic routes. The use of steroids and NSAIDs decreases the amount of intraocular inflammatory substances released at the time of surgery.

**THERAPY FOR ESTABLISHED CME**

**I MEDICAL THERAPY**

a. Topical Steroids: They are given 4-6 times per day.

b. Repository Steroid Injections: Methyl prednisolone acetate suspension (Depo-Medrol) or triamcinolone acetonide (Kenalog) , usually 40 mg (1ml) is given sub conjunctivally once a month. It is not to be used in eyes with a known propensity for steroid induced rise in IOP.

c. Systemic Steroids: Efficacy is not known as yet. Dosage: 40-100 mg per day or every alternate day.
d. Topical NSAID’s: Topical indomethacin 1%, Ketorolac 0.5% Diclofenac 0.1% and Flurbiprofen 0.03% can be tried. Studies have shown an improvement in vision but an on-off phenomenon may be seen.

e. Oral NSAID therapy: Indomethacin 25 mg tid after meals can be tried.

II. ND-YAG LASER VITREOLYSIS

This avoids an invasive procedure. Elevated vitreous strands are transected using Nd-YAG laser. Bisecting vitreous membranes that are adherent to the anterior surface of the iris may be difficult without producing small hemorrhages which diffuse into the aqueous and make accurate focussing impossible. Therefore laser treatment is primarily used in those cases in which vitreous strands bridge the margin of the pupil to the undersurface of the cataract wound without adhering to the anterior surface of the iris.

III. SURGICAL THERAPY

1. For Aphakic CME

   Vitrectomy: The goal of the surgery is to remove all formed vitreous elements from the anterior segment to restore the anatomy of the iris and pupil to a state as near normal as possible.

2. For Pseudophakic CME with ACIOL

   a. With relatively round pupil: Removal of the ACIOL with anterior vitrectomy is done. The surgical aphakia is corrected either with a sulcus IOL if adequate posterior capsular rim remains (but the disadvantage here is irritation to the uveal tissue) or a scleral fixated IOL. Other solutions are contact lenses or Excimer laser.

   b. With moderate pupillary distortion from disrupted vitreous or malpositioned haptics: Anterior vitrectomy and anterior segment restoration is done. The IOL may be left in situ or exchanged.

3. For Pseudophakic CME with PCIOL

   a. With pupillary distortion: Anterior segment restoration with a core pars plana vitrectomy is done.

   b. With in-the-bag IOL, intact posterior capsule, normal mobile pupil, no peripheral anterior synechiae: Here a pars plana vitrectomy could be performed to remove the vitreous sump or vitreous traction from the macula, but the sump theory is not yet proved, hence it is better not to operate. If done to release vitreo macular traction, such traction should be confirmed pre operatively by
biomicroscopic examination with posterior pole contact lens. This situation is rare and hence surgical intervention should be uncommon. But before resorting to surgery in such cases, other causes for CME should be ruled out and a complete course of medical therapy should have been tried.

For Your Information:

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