



MANAGEMENT OF CATARACT IN SMALL PUPIL

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A pupil that fails to dilate beyond 4 mm is often defined as small pupil. It not only impairs visualisation of lens & posterior segment but also creates hindrance in performing a successful cataract surgery.

TECHNICAL CHALLENGES IN PERFORMING A SMALL PUPIL CATARACT SURGERY

The various challenges we face while performing a cataract surgery in small pupil are:

1. Reduced red reflex
2. Increased risk of iris damage and bleeding
3. Iris prolapse from wound(s)
4. One may land up in small capsulorrhexis size which may later lead to anterior capsular damage by a chopper or ultrasonic tip or a postoperative capsular phimosis.
5. There may be incomplete evacuation of the cortical matter
6. Problem in ensuring in the bag IOL placement
7. Issues with proper alignment of toric IOL
8. Increased tissue damage may lead to CME (due to prostaglandin release)

ETIOLOGY

The causes of a non-dilating pupil are:

1. Age related iris atrophy
2. Pseudo exfoliation syndrome
3. Intraoperative floppy iris syndrome due to systemic drugs like tamsulosin
4. Diabetes mellitus
5. Posterior synechiae due to uveitis, angle closure glaucoma or previous surgery.
6. Chronic use of miotics

PRE-OP PREPARATIONS

Following preoperative planning should be done:

1. Shifting from topical to peribulbar anaesthesia; as iris handling may cause pain
2. Perform surgery under steroid cover in patients of uveitis
3. Switch from miotics to other IOP lowering drugs, at least a week prior to surgery.
4. Start topical NSAIDS atleast one week prior to surgery

Intraoperative Measures

They are directed towards making a capsular opening of at least 6mm.

A. Pharmacological Method:

1. High Molecular weight viscoelastics as sodium hyaluronate 2.3%
2. Non preserved epinephrine 0.5ml in 500ml of balanced salt solution for infusion.¹
3. Intracameral 1% lidocaine followed by wash with balanced salt solution.

B. Synechiolysis

If posterior synechie is present, swipe it with cannula of viscoelastic syringe. If there is a synechial ring, strip it with capsulorrhexis forceps.

C. Surgical Methods

If above measures fail, there are other methods to enlarge the pupil. They include:

- a) Mechanical stretching
- b) Mini sphincterotomy

- c) Iris hook
- d) Ring expander
- e) Iris suture

a) Mechanical stretching

Stretch pupilloplasty/ Mechanical stretching can be accomplished by using two hooks, ie, two Kuglen hooks or alternatively one Kuglen and one Sinsky hook.

One of the hooks is passed through the paracentesis and the other through the main wound. Pupil margin is engaged at the 6 and 12 o'clock positions and stretched to a maximum for 15- 20 seconds. Can be repeated at the 3 and 9oclock positions

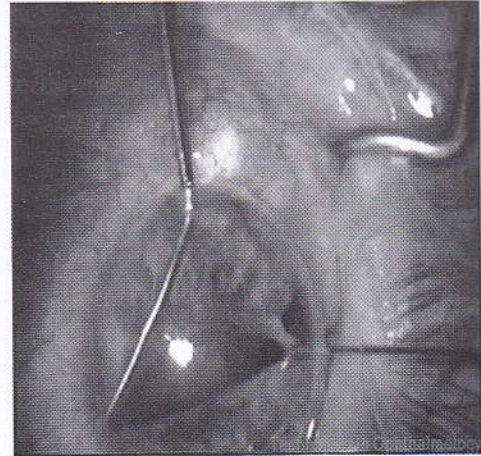


Figure1 : Mechanical Stretching Using Kuglen Hooks

Alternatively, a two- or three-hook Beehler or Keuch pupil dilator can be used. However it stretches pupil in asymmetric four quadrant pattern.

Problems with mechanical stretching:

1. Does not prevent progressive miosis
2. Increased risk of iris prolapse due to atonicity
3. Irregular pupillary dilatation
4. Accidental anterior capsular tear
5. Should be avoided in patients with rubeosis iris, chronic uveitis, or coagulopathy; due to risk of bleeding

b) MINISPINCTEROTOMIES

Can be done using vannas scissor , however some prefer retinal scissors as they can be passed via paracentesis & cut sub-incisionally.^{2,3} One should aim at crescentic sphincterotomies as it will lead to a physiological pupil post-operatively.

c) IRIS HOOKS:

They were initially described by Mackool⁴. He used titanium hooks attached to titanium base and iris repositor. Later they were replaced by nylon retractor with sialistic sleeves.

Disadvantages of iris hooks

1. There may be peripheral shallowing of anterior chamber
2. Too many ports have tendency to leak
3. Iris may prolapse from improperly created wounds
4. Anterior capsule damage may occur
5. DM may be injured
6. post operatively there may be irregular pupil function

d) RING EXPANDERS:

Cause circumferential expansion in physiological plane and also stabilize and protect pupil margin

Main advantages of pupil expander rings are:

1. Placement through the main incision (multiple additional paracentesis aren't necessary)
2. Protection of the iris margin
3. Prevention of iris sphincter from overstretching.

Available ring expanders are Perfect Pupil, the Morcher pupil dilator ring, the Graether 2000 pupil-expander system , the Malyugin ring system, I- Ring (Beaver Visitech International) pupil expander and the Asia Pupil Expander.

Perfect Pupil™ (Milvella) is an incomplete ring made of polyurethane. It has an internal diameter of 7 mm, which allows a large capsulorrhexis. There is an opening of 45° which allows easy manipulation by instruments⁵.

FIGURE 2: The Perfect Pupil



Morcher Pupil Dilator Ring™ is a rigged ring made up of polymethyl methacrylate (PMMA) and has an internal diameter of 7.5mm

Figure 3: Morcher Pupil Dilator Ring



Graether 2000 Pupil Expander System™ (Eagle Vision) it also has an internal diameter of 7.0mm, is made up of soft silicone and has a grooved outer circumference which engages the iris.

Figure 4: Graether 2000 Pupil Expander



The Malyugin Ring System™ (Microsurgical Technology) It consists of a holder and inserter packaged with a ring. It has 8 fixation points with absence of sharp edges and a reliable clamping mechanism and hence causes minimal trauma to the iris tissue. Various models are available. One made up of 4-0 polypropylene enters via a 2.2mm incision while Malyugin ring 2.0, made up of 5-0 polypropylene can even be introduced via a 2.0mm incision.

Figure 5: The Malyugin Ring



The Assia Pupil Expander (APX)™ (APX Ophthalmology)

It has two tiny spring loaded devices which can be introduced via 1.1mm side-port incisions. It requires no intraocular manipulation.

Lastly, 10-0 nylon sutures can also be used when iris hooks and other devices are unavailable. Peripheral iris can be captured and sutured to clear cornea with 10-0 nylon suture.⁶

Therefore, whenever you encounter a small pupil, enlarge it, to make the surgery enjoyable for the surgeon and safer for the patient.

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