

# Management of the Small/Mid dilated Pupil during Small Incision Cataract Surgery-Still a Challenge!?

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**Abstract:** A small pupil is a relatively common problem experienced during cataract surgery. It has been shown that about 1.6% of cases will fall into this category. The small pupil can impede visualization and make instrumentation into the eye more difficult. Eyes complicated by Pseudoexfoliation(1) with small pupil likely to cause lot of intraoperative and postoperative complications. In the current study adrenaline mixed BSS has been used to get needed mydriasis during surgery. 50 target patients attending to Govt. Gen. Hospital, Guntur, were operated with this and another 50 without applying this procedure(Controls). The results are compared. Simple Intra operative use of adrenaline mixed BSS is also effective when compared to procedures like costly mechanical stretching.

**Keywords:** Small pupil, Pseudoexfoliation syndrome, Adrenaline mixed BSS

## 1. Introduction

Many patients who present for cataract surgery have eyes complicated by pupils with iris sphincter sclerosis due to aging, synechiae, previous trauma or surgery, diabetes, iridoschisis, uveitis, chronic miotic therapy, pseudoexfoliation, or other issues may cause a pupil to dilate poorly. The small pupil (less than 3.0mm or middilated pupil < 6mm) can impede visualization and make instrumentation into the eye more difficult. A well-dilated pupil with a sharp red reflex enhances the ease of cataract extraction and decreases the likelihood of complications like iris sphincter tear, bleeding, ruptured posterior capsule and loss of the nucleus. The postoperative result of these encounters can be an irregular and atonic pupil, photophobia and discomfort for the patient decreased VA.

Present methods of dealing with a small pupil(2) at the time of cataract surgery have all had limitations. Hence, the surgeon's plan to eyes with a small pupil, requires flexibility and resourcefulness. The underlying pathophysiology should be taken into consideration when strategizing the surgical plan.

This study is undertaken to assess the protective effect and dilating potential of Adrenalin 0.5CC (ampoule containing 1 mg in 1 ml.) added to infusion bottle, to minimize intra operative thereby minimizing P.O. complication of Cataract Surgery in Mid dilated pupil in SICS.

## 2. Materials and Method

Total No. of Cases Studied – 50 and another 50 cases of similar pupil without adopting this procedure, are taken as case controls. All the cases are the patients attending to ophthalmology department OF Govt. General Hospital, Guntur Medical College –Guntur (AP).

The study is done for a period of about one year i.e. from August 2011 to April 2012. In all these cases Pseudoexfoliation is the basic pathology for poor pupillary dilatation

## 3. Pre-Operative Precautions

In all patients complete pre-operative evaluation is done viz Visual Acuity Slit Lamp examination, IOP measurement, Pupillary Reaction, Fundus examination, B-Scan & A Scan Biometry, Keratometry and proper management of systemic diseases like Diabetes, Hypertension, and Asthma by the concerned specialists. 3:2 (M: F) is the gender ratio in both the groups. More than 40 years of patients are recruited into the study

Table 1

Age group	No. of patients in study group	No. of patients in control group
40 to 49 years	4	3
50. to 59 years	16	12
More than 60 years	30	35

All belonged to **Poor Socio Economic Status** and most of them are farmers by occupation.

**Slit Lamp examination** revealed Cornea & Anterior Chamber Depth are Normal, except for Arcus Senilis in most of the cases.

Iris Pattern: Thick & Hyperpigmented in all the cases.

*Pupil: Pseudoexfoliation of Pupillary Margin is seen in 40 out of 50 Cases (Table No2) with Normal Direct and Consensual Reflex action. However, all are of small miotic pupil < 3mm.*

Table 2

Pathology for small pupil	Study group	controls
Pseudo exfoliation	40	47
No exfoliation	10	3

Table 3

Cataract grading	Study group	Control group
Grade I to II	10	7
Grade III to IV	40	43

In all cases there is nuclear sclerosis. Visual Acuity ranged from CF 2-4 Mts., in all these Cases. Fundus is within normal limits except for Tessellation observed in 2/3 cases. B-Scan is performed in all the cases

Dilation with mydriatic drops produced 6mm in 35 cases and <6mm in 15 Cases. Pupil equal to or less than 6 mm is considered as abnormal after Mydriatic instillation in study group as well as in controls.

**Pre-Operative Preparation:** The eye is prepared with systemic antibiotics along with Topical Antibiotic & Anti Inflammatory Eye Drops. IOP kept under teens with Oral Acetazolamide 250 Mg night & 2 hours before surgery. Local analgesia required for surgery, is achieved by Peribulbar Block with the infiltration of Xylocaine 2% combined with Bupivacaine 0.5% Adrenalin 1 in 2,00,000 and hyaluronidase.

#### 4. Incision and Surgical Strategies

In all cases Adrenalin 0.5CC (1mg for 1ml ampule) added to infusion bottle. 7 mm in Grade I & II and >7mm in Grade-III and above, Tunnel is created, good CCC achieved. Under visco Nucleus is delivered after hydrodissection. The procedures of capsulorrhexis, hydrodissection, nucleus expression into AC, its removal from AC with visco and IOL insertion are carried out in the same manner in all the cases by the same surgeon. The Perfect round Pupil is then achieved by stopping the adrenaline mixed infusion at the end of surgery.

#### Intraoperative difficulties

**Table 4**

Subjects	Nuclear Prolapse	Conversion of tunnel to big in size requiring suturing	No IOL due to PC tear
Study group	20 (40%)	2(4%)	1(2%)
Control group	27(54%)	5(10%)	4(8%)

No difficulty in 30 Cases. Difficulty felt in 20 cases where L.S. of Grade-III and above and pupil size is <5mm with exfoliation. Pupil dilated mechanically before capsulotomy. Sphincterotomy done in 2 cases where pupil is rigid, <5mm size, lens is Grade-IV.

**Nucleus Delivery:** Conversion done in 2 cases where in spite of capsulotomy & big tunnel nucleus delivery was difficult. Conversion is done to prevent endothelial damage. Nuclear break-up occurred in 4 cases where 2nd attempt to remove nucleus is done.

**Aspiration of Lens Matter:** Complete aspiration possible with Adrenaline on infusion & side port. PCIOL: 49 Cases PCIOL could be inserted and one case IOL could not be placed due to PC rent

**Tunnel Closure is done with** 10-0 nylon in two (2) cases.

**P.O. complications are almost nil except in one case (2%)** Striate Keratopathy of Gr III is noted, in which second attempt was made to remove Nucleus.

Round Pupil could be achieved in 47 (94%) Cases and irregular pupil was noted in three (6%) cases due to sphincterotomy 6/9 to 6/6 of Visual acuity could be Achieved in all cases. 5 (10%) of cases developed PCO within 6 months of follow up and are managed Nd YAG capsulotomy (vide table No.5)

**Table 5**

Patients	SK	Irregular pupil	PCO	VA 6/9 to 6/6
Study group	2%	6%	10%	100%
Controls	10%	18%	12%	76%

#### 5. Discussion

Present methods of dealing with a small pupil at the time of cataract surgery have all had limitations. Pharmacological therapy with the use of non-steroidal eye drops, or strong mydriatics such as 10% phenylephrine, are often associated with untoward ocular and systemic side effects and may be ineffective in dilating bound-down and scarred pupils. The surgeon can simply ignore pupil size and perform the maneuvers of small incision surgery through an unenlarged incision, but this may result in the inadvertent complications described. Many surgeons have turned to mechanical methods and devices to enlarge the pupil at cataract surgery. These include using a blade, needle or scissors to make multiple iris sphincter tears, MALYUGIN RINGS,(3) iris hooks to retract the iris tissue through four or more corneal stab incisions, or introducing mechanical stretching devices to pull on the sphincter margin. All of these methods are cumbersome, require specialized instruments, difficult intraocular maneuvers, and are associated with bleeding, permanent loss of iris sphincter function, and abnormal pupil shape postoperatively.(7)

Fortunately, many eyes with small pupils respond to pharmacologic technique. Intracameral lidocaine,(4,5) epinephrine in balanced salt solution (BSS; Alcon Laboratories, Inc.), and intracameral solutions such as Surgicaine (4% unpreserved lidocaine diluted 1:3 with BSS Plus [Alcon Laboratories, Inc.]) are all tools at the cataract surgeon's disposal. (To make epinephrine for intracameral use, we use 1:1,000 epinephrine and mix 0.1 mL epinephrine with 0.9 mL BSS, then use 0.1 mL of that mixture intracamerally for a total of 1:10,000.)(6). In diabetics or pseudoexfoliative eyes, these agents may be just what the doctor ordered. Visco mydriasis with a visco dispersive agent of heavy molecular weight such as Healon GV or Healon5 (both from Abbott Medical optics Inc.) can also be helpful in breaking mild to moderate synechial closures. Visco mydriasis alone should be used with caution, however, as the limited duration of this effect will likely not last throughout phacoemulsification if other pupil-related pathologies exist. In an eye on miotic therapy, the miotic agent should be discontinued preoperatively if IOP control will not be compromised.

#### 6. Conclusion

Successful surgical outcomes may be achieved with both mechanical iris dilation and iris retention devices. The retention devices add to overall surgical cost and generally

require more time in the OR than a mechanical pupillary stretch.<sup>7</sup> Pupillary stretch is more traumatic to the iris and also possibly to the corneal endothelium, but this method does not appear to detract from the surgical outcome. Within our setup, more so in peripheral hospitals this technique is good for all, when compared those surgeries in which these precautions are not taken.

By the above study good preoperative evaluation, proper intraoperative precautions, and timely judgement prevents various complications during surgery in mid dilated pupil. Copious use of viscoelastics wherever necessary is important. The above study was compared with controls where Intra operative complications like, zonule dehiscence, PC rent, vitreous prolapse, irido dialysis intra-operative bleeding, nuclear prolapse & break-up were high. Also post operative complication like corneal endothelial damage, hyphema, retained lens matter, macular edema were high. P.O. visual outcome also was poor.

Slow surgery prevents prolonged intra operative period

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