

A Clinical Study on Complications and Visual Outcomes of Sphincterotomy In Poorly Dilating Pupils in SICS

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Abstract:

Background: Cataract is the leading cause of blindness in India accounting for 62% of avoidable blindness in the country. India has a high prevalence of cataract due to various factors, including a large aging population, limited access to healthcare and inadequate eye care infrastructure. The aim of the study is to evaluate intraoperative and postoperative complication and visual outcome of sphincterotomy in poorly dilating pupils in small incision cataract surgery.

Method: A Study was done between January 2023 to June 2023 which included patients with poorly dilating pupils (< 6 mm) after pharmacological dilation underwent sphincterotomy in small incision cataract surgery by the same surgeon. Intraoperative postoperative complications were studied. Patients were reviewed up to 6 weeks postoperatively and visual outcome was studied.

Result: Total 56 eyes with poorly dilating pupils underwent small incision cataract surgery. Sphincterotomy was done intraoperatively. Our study shows that 56 (10.9%) had poorly dilated pupils (<6 mm) after pharmacologically dilated with tropicamide phenylephrine 0.5% eye drop. Our study shows 27 (48%) patients associated with pseudoexfoliation. Intraoperative complications were zonular dialysis (1 eye), posterior capsular tear (1 eye). Postoperative complications were corneal oedema 3 (5.3%), anterior chamber reaction 2 (3.5%), retained cortex 2 (3.5%), atonic pupil 10 (17.8%). 91% of patients had best corrected visual acuity more than 6/18.

Conclusion: There are various methods described to make pupils wider during surgery like iris suture, healon 5, iris hook, mechanical stretching and ring expander. But these are cost-effective. Our study was done to evaluate efficacy and safety of sphincterotomy. This study on 56 eyes shows that sphincterotomy is a safe, easy-to-perform and cost effective method to obtain adequate pupil size during small incision cataract surgery.

Keywords: Sphincterotomy, complications, Visual Outcome, Poorly dilating pupil, SICS.

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Introduction

Cataracts are one of the major causes of reversible blindness accounting for about 33% of cases of visual impairment in the world according to WHO [1]. Small incision cataract surgery (SICS) is one of the surgical techniques commonly used in developing countries.[2] Most important thing in cataract surgery is pupil size. At least 2% of cases have pupils dilate maximally to 5mm or less.[3] Many factors are responsible for small pupils like pseudoexfoliation syndrome, chronic miotic therapy, previous trauma or surgery, uveitis with synechiae. A small pupil may also occur due to intraoperative floppy iris syndrome (IFIS) characterized by billowing of iris, iris prolapse and progressive intraoperative pupil constriction[4]

Strong relation has been found with alpha one adrenergic receptor antagonist medication like tamsulosin[5] Small pupil with brown and hard cataract is prone to more complication during SICS. Performing cataract surgery on an eye with small pupil remains technically challenging and causes iris trauma, iris prolapse into a wound, posterior capsular rupture, dropped nuclear fragments and incomplete evacuation of any cortical material[3,6] Intraoperative floppy iris syndrome (IFIS) was described in 2005 is associated with pupil constriction during surgery, secondary to atrophy of iris dilator muscle and iris tissue rigidity[7] Complication rates in patients with IFIS syndrome has been reported to be up to 12.5%.[8] Various

methods can be used to enlarge the pupil during cataract surgery. Ophthalmic viscosurgical device (OVD) is injected into the anterior chamber. With OVD injection the anterior chamber deepens and the pupil becomes wider. This technique known as viscomydriasis, highly viscous OVD such as healon-5 (abbott) is used.[9] There are four main surgical maneuvers to be considered when the pupil is not sufficiently dilated. They are synechiolysis, pupil stretching, iris cutting and use of mechanical pupil expander.[10] Pupil stretching is done with the help of two instruments (spatula, kuhlen hood or similar) introduced paracentesis incision located contralateral to each other or special tripod instrument through main incision.[11] Being relatively simple and effective but in many cases this manipulation may not provide sufficient mydriasis, causes iris bleeding and pupil atony postoperatively.[12] Nowadays various type of pupil expansion ring available like Malyugin ring, iring, Bhattacharjee pupil expansion ring. Single use expansion rings that retract and protect pupil margin throughout surgery but they require special instruments (ring inserter), more time to place, extra care in removal and a significant economic cost which is inaccessible to many patients in developing nations.[13]

Material and Method

This was a clinical study conducted in the Department of Ophthalmology Sri Venkateshwaraa Medical College and Research Center, Puducherry. This study was done for a period of six months between January 2023 to June 2023. A total of 510 patients admitted for cataract surgery. Out of this number 56 patients had poorly dilated (<6 mm) pupils after pharmacological dilation with tropicamide and phenylephrine 0.5% eye drop.

Inclusion Criteria

Age above 40 years and below age of 90 years of either sex were included in the study.

Exclusion Criteria

Patients with a history of miotics use, traumatic cataract, complicated cataract, lens-induced glaucoma. All patients underwent detailed preoperative ocular examination including clinical history and systemic examination. Uncorrected visual acuity and best corrected visual acuity was taken. Intraocular pressure(IOP) was measured with Goldmann Applanation tonometry. Detailed examination of eyes done under slit lamp

biomicroscopy to assess cause of poorly dilating pupil (<6mm) like pseudoexfoliation over lens capsule, pupillary border and posterior synechiae. Documentation of pupillary size was done. A detailed fundus examination was done. Prophylactic antibiotics moxifloxacin 0.5% eye drop was started one day before surgery. Patients were dilated with tropicamide and phenylephrine 0.55 eye drops and nonsteroidal antiinflammatory drops like flurbiprofen sodium 0.03% used three times one hour before surgery.

Surgical Technique

All patients underwent small incision cataract surgery by the same surgeon.

Peribulbar block done with 5 ml of 2% lignocaine with adrenaline to which 150 unit/ml hyaluronidase was added. Povidone iodine 5% was instilled into the conjunctival sac. Fornix based conjunctival flap was done. A frown shaped scleral incision was made. Sclerocorneal tunnel was created and entry into the anterior chamber was done by keratome. Intracameral epinephrine was used for pupillary dilatation. Sphincterotomy was performed by an angled vannas scissor. The first site of sphincterotomy was either 6 or 9 o'clock position and if pupillary dilatation was less than another sphincterotomy was done 180° away. Anterior capsulotomy was done with a 26 gauge needle. Continuous curvilinear capsulorhexis done in mature and hypermature cataract, can opener technique was used for hypermature cataract. Nucleus was prolapse into the anterior chamber and removed with a vectis forcep. Residual cortical matter was removed by simcoe irrigation aspiration cannula. Rigid, single piece, biconvex posterior chamber IOL was implanted in the bag. Intraoperative postoperative complications were noted.

Postoperatively patients were put on topical antibiotics and steroids and tapered over 6 weeks. Patients were followed on postoperative day 1,2,7 and 14 for 6 weeks. Postoperative visual acuity was recorded on every visit and best corrected visual acuity was recorded at 6th week.

Results

A total of 510 patients admitted for cataract surgery. Out of this 56 (10.9%) had poorly dilated pupils (< 6 mm) after pharmacologically dilated with tropicamide and phenylephrine 0.5% eye drop.

Table 1: Distribution based on frequency of poorly dilated pupil (n =56)

Age Group of Patient (in years)	Frequency of poorly dilated pupils (n = 56)		Percentage (%)
	Male	Female	
40-50	0	2	3.5
51-60	3	6	16
61-70	9	16	44.7
71-80	12	2	25
81-90	5	1	11
Total	29 (51.7%)	27 (48.3%)	100

Out of 56 patients 29 (51.7%) were male, 27(48.3%) were female. Majority of patients were in the age group of 61-70 years (44.7%). Least number (3.5%) of patients were in the age group of 40-50 years.

Table 2: Distribution based on size of pupils

Size of Pupil (in mm)	No. of patients (n = 56)	Percentage (%)
< 4	2	3.5
4-5	44	78.5
5-6	10	17.8

Table 2 shows pupillary dilation among the study population. 44 (78.5%) patients had pupil dilatation was 4-5 mm. Only 2 (3.5%) patients had pupil size < 4 mm.

Table 3: Distribution based on clinical causes for small pupil

Age Group (in years)	Diabetes Mellitus	Pseudoexfoliation	Posterior Synechiae
40 – 50	1	0	0
51 – 60	1	3	1
61 – 70	5	12	0
71 – 80	2	10	0
81 – 90	0	2	0
Total	9 (16%)	27 (48%)	1 (1%)

This table shows association of small pupils with diabetes mellitus, pseudoexfoliation , posterior synechiae. In our study out of 56 study population 9 (16%) patients had diabetes mellitus, 27 (48%) patients had pseudoexfoliation and 1(1%) patients had posterior synechiae.

Table 4: Distribution based on intraoperative and postoperative complications

Intraoperative Complications		
Complication	Number of Patients	Percentage (%)
Zonular Dialysis	1	1.7
Posterior Capsular Tear with vitreous loss	1	1.7
Postoperative Complications		
Complication	Number of Patients	Percentage (%)
Corneal Oedema	3	5.3
Anterior Chamber Reaction	2	3.5
Retained Cortex	2	3.5
Atonic Pupil	10	17.8

This table shows that the most common complication was atonic pupil (17.8%) and corneal oedema (3.5%).

Table 5: Distribution based on visual outcome after 6 weeks

Best Corrected Final Visual Acuity	No. of Patients	Percentage (%)
6/6 to 6/18	51	91
6/18 to 6/60	4	7
Less than 6/60	1	1.7

This table shows that 91% of patients in the study population had a good visual outcome.

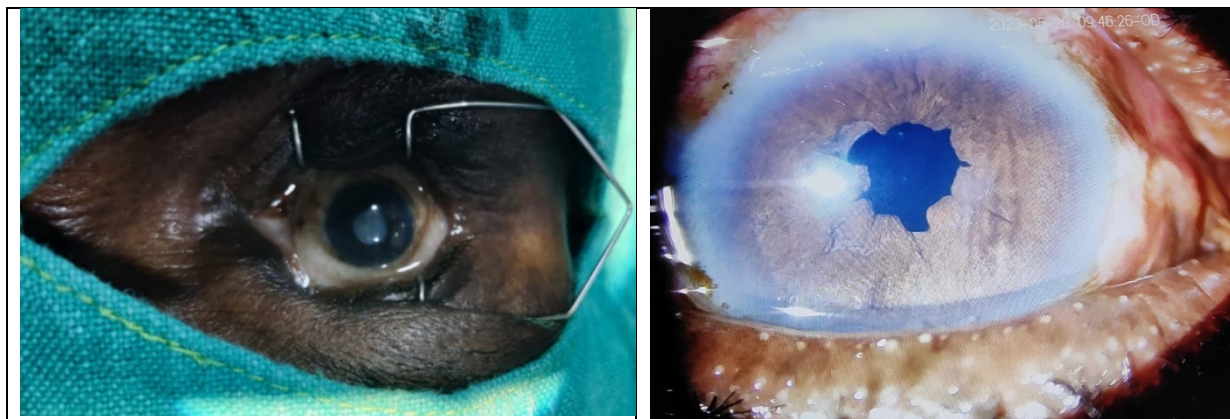


Figure 1: Shows a poorly dilated pupil preoperatively

Figure 2: Postoperative Day 1

Discussion

Cataracts continue to be the leading cause of reversible blindness globally.[14] Patients in developing nations like India often present late with brown or hard cataract. Intraoperative small pupils are a challenge even to experienced surgeons. A combination of topical and intracameral mydriatics administration can provide sufficient pupil expansion in a proportion of patients within a poorly dilating pupil using a combination of lidocaine and epinephrine intracamerally.[15] Our study shows 10.9% had poorly dilated pupil (< 6 mm). In our study patients were in the age group between 40-90 years. Small pupils were more common among 61-70 years (44.71%) and 71 -80 years (25%). Our study shows male were 51.7% and females were 48.3%. Some previous studies showed male preponderance. While Aravind et al in 2003 showed no sex predilection.[16] In our study out of 56 patients 2 (3.5%) had pupil diameter < 4 mm, 44 (78.5%) had pupil diameter 4-5 mm, 10 (17.8%) had pupil diameter 5-6 mm. A study from Karnataka shows 10% had <4 mm pupil diameter, 33.3% and 4-5 mm pupil, 56.6% had pupil diameter 5-6mm.[17] In our study 27 (48%) poorly dilated pupil was associated with pseudoexfoliation and 1(1%) patient had posterior synechiae. Only 9(16%) had diabetes mellitus. This indicates that there is no correlation between diabetic and poorly dilated pupils.

A study done at Kakinada shows that small pupil in 31(31%) were due to posterior synechiae, 25 (25%) were due to pseudoexfoliation and 44 cases were due to sclerosed pupil.[18] A study from Tel Aviv, Israel shows pseudoexfoliation was associated with 44% of poorly dilated pupil. Type 2 diabetes was associated with 32%, posterior synechiae 22% of poorly dilated pupils[19]

Pseudoexfoliation is relatively common in elderly patients. Direct signs of zonular instability such as lens subluxation, zonular dialysis, iridodonesis, phacodonesis should be carefully looked before

surgery. The amount of exfoliative material in zonules doesn't seem to be predictive of intraoperative zonular weakness.[20] Intraoperative complications in our study was zonular dialysis 1(1.7%) noted. Posterior capsular tear with vitreous loss noted 1(1.7%) patient. A study from Raichur Karnataka shows zonular dialysis found with 3.33% of study population and posterior capsular tear with vitreous loss found 1.66%[17] In another study conducted by Islam et al on 512 eyes with pseudoexfoliation underwent cataract surgery found iridodialysis in 6(1.7%), zonular dialysis in 7(1.36%), posterior capsular rupture/ with vitreous loss in 14(2.73%), retained cortical matter in 44(8.59%), decentered intraocular lens 23(4.49%), postoperative hyphema in 6 cases (1.17%). There was significant intraocular inflammation in 61(11.91%) cases and corneal decompensation in 23 (4.49%).[21]

In our study postoperative complications were corneal oedema 3(5.3%), anterior chamber reaction 2 (3.5%) retained cortex 2 (3.5%), tonic pupil (17.8%). A study from Karnataka shows postoperative complication in poorly dilated pupil were corneal oedema (20%), anterior chamber reaction (10%), irregular pupil (10%),[17] A study from Israel shows postoperative complication were corneal oedema 4(4%), IOP elevation 3(6%) sphincter irregular (2%).[19],

In our study final best corrected visual acuity after 6 weeks of surgery 6/6-6/18 visual acuity was noted in 51 (91%) of study population, 6/18-6/60 visual acuity 4(7%) and <6/60 visual acuity noted in 1 (1.7%) patients. A study by Anupama et al showed that 6/6- 6/18 vision (80%), 6/18 -6/60 (15%) and <6/60 (5%) was noted among patients under gone SICS with poorly dilating pupil.[17] A study from Rohtak, Haryana shows 6/6 6/9 vision 18 (96%) patient, < 6/9 2 (4%) patients.[22]

Cutting the pupillary sphincter is a great method of obtaining a large pupil during surgery.[23]

Conclusion

Small pupil is a well-known risk factor associated with numerous complications. Sphincterotomy is a safe procedure during cataract surgery. It provides increased exposure during maneuvers within eyes. We suggest that sphincterotomy can be done as a safe and effective procedure in poorly dilating pupils during SICS.

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