

A Clinical Study on the Incidence and Visual Outcome after Surgical Management of Lens-Induced Glaucoma

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ABSTRACT

Aims and Objectives: To determine 1) the incidence of lens-induced glaucoma. 2) the more prevalent type of LIG. and 3) Visual outcome following surgical management of LIG.

Material and Methods: 50 patients of lens-induced glaucoma, who presented in OPD of Regional Institute of Ophthalmology, were included in the study. All patients were admitted and managed in indoor wards. Informed and written consents were taken. A detailed history and a thorough ocular examination was done. Surgical correction was done by SICS or Phacoemulsification or triple procedures operations.

Results: A standardized proforma was used to compile data and it was analyzed statistically using Chi-square test and Probability value. The incidence of LIG was found to be 0.174 among all OPD attendees. Phacomorphic glaucoma (58%) was found to be the highest followed by phacolytic glaucoma (32%). No significant association with respect to sex and age of the cases was found. The presenting symptoms varied in severity and were directly proportional to the degree of rise of IOP. 38% of cases in our study achieved best corrected visual acuity of 6/9 and 28% achieved 6/12 acuity at the end of 6 weeks. Visual outcome was found to be better for cases with early detection and treatment.

Conclusion: The mainstay to prevent and treat LIG is early diagnosis and treatment of cataract. Delayed treatment of LIG may result in poor visual outcome.

Keywords: LIG, IOP, Phacomorphic glaucoma, Phacolytic glaucoma, SICS, Phacoemulsification.

INTRODUCTION

Glaucoma is a diverse group of eye diseases with a multifactorial etiology characterized by an acquired loss of retinal ganglion cells, progressive optic neuropathy with morphological abnormalities in the optic nerve head and visual field defect, in which raised intraocular pressure (IOP) is a major and only modifiable risk factor¹.

Glaucoma dates back to as early as 400 BC. Hippocratic writings are testimony to this where it is mentioned as 'glaucosis' although it included other blinding conditions including cataract²

Glaucoma is considered as a lifelong disease and is a leading cause of irreversible but preventable blindness. As a developing country, the main causes of blindness in India are as follows: cataract (62.60%), refractive error (19.70%), corneal blindness (0.90%), glaucoma (5.80%), surgical complications (1.20%), posterior capsular opacification (0.90%), posterior segment disorder (4.70%) and others (4.19%)³. It has been reported that glaucoma affects the quality of life to a greater degree in India than in the west³. Population based studies suggest that more than 90% of glaucoma cases in the country remain undiagnosed. This is in contrast to 40-60% rates of undiagnosed disease in more developed countries⁴⁻⁸. Glaucoma, although more commonly affects older adults above 40 years, it can occur in all age groups and all strata of the society making it a major public health problem with significant health and economic consequences. Nearly one fifth of

population affected by glaucoma become blind in one or both eyes⁹. The prevalence of glaucoma is higher in urban areas as compared to rural. Life style changes and higher rate of diabetes and cardiovascular diseases may contribute to the increased prevalence of glaucoma in urban area⁹.

But the major area of concern is that vast majority (90%) of cases of glaucoma remain undiagnosed because of

- Unawareness on the part of population affected by glaucoma
- Missed diagnosis at primary care level due to lack of comprehensive eye examination
- Misdiagnosed even at tertiary care

So, by improving the standard of ophthalmic examination through gonioscopy and optic disc evaluation we can reduce the incidence of glaucoma to a huge extent. Among the various risk factors, increased intra-ocular pressure (IOP) is the most frequent and modifiable causative risk factor for glaucoma.

About 60 types of glaucoma are known. Classical characteristics of glaucomas are¹⁰:

1. Abnormality of the anterior portion of the eye that results in increased IOP
2. Loss of retinal ganglion cells in a distribution that suggests the injury occurred at the optic nerve head (ONH)
3. Nerve fibre layer loss which corresponds to the pattern of visual field loss.

Lens induced glaucoma (LIG) is a special type of secondary glaucoma and is an ophthalmic emergency. In many cases, the crystalline lens may be associated with glaucoma if dislocated either due to trauma or certain inherited disorders. In many instances, cataractous lens is found in relation to glaucoma. In the year 1900 Gifford and Von Reuss first described lens induced glaucoma in relation to cataract¹¹. Since then various lens induced glaucomas has been reported and studied. The crystalline lens is implicated as a causative element in producing several forms of glaucoma. A cataractous lens may lead to

glaucoma by obstruction of trabecular meshwork with protein and macrophages (i.e. phacolytic glaucoma), lens particles and debris (i.e. lens particle glaucoma) or inflammatory cells as a part of immune response to lens protein antigen (phacoanaphylactic glaucoma). A swollen or intumescent lens may also lead to pupillary block and secondary angle closure glaucoma (phacomorphic glaucoma)^{2,12,13}.

There is cataract detection and management backlog of around 12 million in India¹⁴ which is annually increasing at an estimated rate of 3.8 million¹⁵. This huge backlog of ever increasing cataract is due to increased life expectancy, rapidly growing ageing population and disparity between rate of new cases and rate of surgical removal; hence the occurrence of lens induced glaucoma in India has high probability¹⁶

MATERIAL AND METHODS

The present study was conducted on the patients attending the outpatient department of the Regional Institute of Ophthalmology, Guwahati Medical College and Hospital, Guwahati, who were diagnosed with lens-induced glaucoma. The study was conducted for a period of 1 year from June 2020 to May 2021. All patients were admitted in the indoor wards of ophthalmology department. Informed and written consents in their own language were taken before including them in the study.

All cases diagnosed with lens induced glaucoma irrespective of age, sex and clinical types were interrogated, clinically investigated and managed.

Inclusion criteria: cases were clinically diagnosed into various types of LIG such as phacomorphic glaucoma, phacolytic glaucoma, lens particle glaucoma, glaucoma secondary to ectopia lentis/lens displacement glaucoma or phacotopic glaucoma and phacoanaphylactic glaucoma.

Exclusion criteria include cases of primary open angle glaucoma, lens induced

glaucoma with previous posterior segment pathology, corneal scarring or opacity which would hamper evaluation of visual outcome and other cases of secondary glaucoma.

Patient evaluation:

Patient evaluation was done by detailed history including history of trauma, past history suggestive of uveitis, history of surgeries in the fellow eye etc. A detailed clinical examination including visual acuity, tonometry, slit lamp examination, gonioscopy was done of both eyes. Biometry with IOL power calculation of affected eye was done wherever possible. B-scan of the affected eye to visualise the fundus was done to rule out posterior segment pathology. Best corrected visual acuity was recorded at the time of presentation and at 6 weeks using Snellen's chart, Landolt C chart and E chart. Other pre-operative tests like syringing of naso-lacrimal duct, blood pressure measurement was done routinely.

A detailed systemic examination was done of all cases to rule out any systemic disease.

Laboratory investigations include

1. Blood investigation TLC, DLC, ESR, haemoglobin, RBS, Se Creatinine
2. R/E urine
3. CXR
4. ECG

MANAGEMENT:

Medical management: All cases of lens induced glaucoma were admitted in the hospital and were first managed by medical therapy. The aim was to bring the raised IOP down and relieve the pain. Along with these, aim was also to subside the uveal inflammation prior to surgical management. Anti-glaucoma drugs like beta-blocker (timolol maleate 0.5%), topical carbonic anhydrase inhibitors Dorzolamide in combination with Timolol maleate, oral carbonic anhydrase inhibitors (Tablet Acetazolamide 250mg), hyperosmotic agents like Mannitol (20%), Glycerol, topical steroid either Prednisolone

acetate(1%) or Dexamethasone-antibiotic combination drops were used to bring down inflammation. Nd-YAG laser iridotomy was done in 1 case of angle closure with pupillary block with presence of peripheral anterior synechiae in which medical management failed to decrease the IOP.

Surgical management: Manual Small Incision Cataract Surgery (SICS) with PCIOL implantation was the preferred surgery. Suitable modifications were made according to the situation encountered. In some cases triple procedure i.e. SICS with PCIOL with trabeculectomy had to be performed as IOP was not responding with medical management. Also triple procedure was performed in cases with late presentation (>7days of symptoms) and peripheral anterior synechiae.

All patients were given topical antibiotic steroid combination drops and a short acting cycloplegic drop post operatively. Systemic steroid was given where indicated. Follow up of all the patients were done on 1st post-op day, at 2 weeks and 6 weeks. Best corrected visual acuity (BCVA) was recorded and required spectacle correction was prescribed at 6 weeks.

RESULTS AND OBSERVATION

A total number of 50 LIG cases were included in the study who presented to the OPD of Regional Institute of Ophthalmology (RIO, GMCH) during the period from June 2020 to May 2021.

INDICENCE:

TABLE 1: Incidence and occurrence of lens induced glaucoma

Total number of cases attending OPD in RIO, GMCH	28735
Total number of LIG cases	50
Incidence	0.174

Hence the incidence of lens induced glaucoma is 0.174. In all the 50 cases of LIG, a cataractous lens is found to be the cause of rise in IOP.

TABLE 2: TYPES OF LENS INDUCED GLAUCOMA

DIAGNOSIS	Frequency	%
LENS PARTICLE TYPE	3	6
PHACOLYTIC	16	32
PHACOMORPHIC	29	58
PHACOANAPHYLACTIC	2	4
TOTAL	50	100

In this study we have found that, the most prevalent type of glaucoma was phacomorphic (29 cases, i.e. 58%) followed by phacolytic glaucoma (16 cases, i.e. 32%). 3 cases were found to be of lens particle glaucoma and 2 cases of phacoanaphylactic glaucoma.

TABLE 3: SEX DISTRIBUTION

Sex	Frequency	Percent
Male	21	42
Female	29	58
Total	50	100

The study revealed a higher incidence of lens induced glaucoma in female (58%) than males(42%).

TABLE 4: AGE DISTRIBUTION

Age Group	Frequency	Percent
39-55	12	24
56-70	31	62
>70	7	14
Total	50	100

In this study we found that, highest number of affected individuals were in the age group of 56-70years (62%). Mean age of affected individuals is 61.540 year.

TABLE 5: STATISTICAL VALUES IN RELATION TO AGE

	AGE
Mean	61.540
Std. Error of Mean	1.238
Median	61.500
Std. Deviation	8.753
Minimum	39.000
Maximum	86.000
95%CI	59.05-64.03

In our study, 26 cases (52%) had right eye affected whereas 24 cases (48%) had their left eye affected. Hence no clinical significance was observed on the laterality of eye affected.

PRESENTING SIGNS AND SYMPTOMS

The presenting signs varied considerably with individuals and were directly proportional to the rise in IOP. Patients chiefly complained of diminution

of vision with pain and redness of affected eye. Unilateral presentation was noticed. Patients generally gave a history of gradual diminution of vision with a sudden acute attack of severe pain and redness in one eye.

Table 6: PRESENTING SYMPTOMS

SYMPTOMS	NO OF PATIENTS	%
SWELLING OF LIDS	24	48
DIMINUTION OF VISION	50	100
EYE PAIN	50	100
REDNESS OF EYE	46	92
HEADACHE	43	86
VOMITTING	9	18
WATERING	17	34

In our study 100% of cases presented with diminution of vision and eye pain. 92% of cases complained of redness of eye followed by headache (86%).

TABLE 7: PRESENTING SIGNS

Number	Signs	No Of Patients	Percentage%
1)	Circumcorneal congestion	50	100%
2)	Corneal edema	50	100%
3)	AC reaction	49	98%
4)	Shallow AC	29	58%
5)	Mid-dilated pupil	50	100%
6)	Fundus visible	50	100%
7)	Gonioscopic angle closed	31	62%

All patients were diagnosed with circumcorneal congestion, corneal edema, mid-dilated pupil and no fundus visibility. 49% patients had AC reaction and 62% had closed angles on gonioscopy.

Table 8: Duration of symptoms

DURATION OF SYMPTOMS	FREQUENCY	PERCENTAGE
<7 Days	28	56
1-2 week	16	32
2-4 week	4	8
>=4 week	2	4
Total	50	100

In this study, most cases (56%) presented within 7 days from onset of symptoms and 32% cases presented within 2 weeks of onset of symptoms.

Table 9: IOP AT PRESENTATION

IOP	Frequency	Percent
20-30 (mm of Hg)	3	6
31-40 (mm of Hg)	15	30
>40 (mm of Hg)	32	64
Total	50	100

Here majority of cases presented 30%, presented with IOP within 31- with IOP >40mmHg (64%). 15 cases i.e. 40mmHg.

TABLE 10: IOP DISTRIBUTION AT PRE-OP, IMMEDIATE POST-OP AND AT 6 WEEKS

	Mean	p value
IOP	43.84±9.93	<0.001
PREOP IOP	27.12±4.52	
IMMEDIATE POST OP IOP	17.82±2.75	
6 WEEK POST OP IOP	15.90±2.46	

P VALUE= <0.001

	IOP	PREOP IOP	IMMEDIATE POST OP IOP	6 WEEK POST OP POST OP IOP
Mean	43.84	27.12	17.82	15.90
Std. Deviation	9.93	4.52	2.75	2.46
Std. Error of Mean	1.40	0.64	0.39	0.35
Median	44.50	28.00	18.00	16.00
Minimum	22.00	15.00	14.00	10.00
Maximum	69.00	36.00	23.00	21.00

The mean IOP PRE-OP was found to be 43.84mmHg with highest IOP recorded was 69mmHg.

Table 11: PRESENTING IOP IN DIFFERENT TYPES OF LIG

DIAGNOSIS	IOP			Total	Chi	p value
	20-30 (mm of Hg)	31-40 (mm of Hg)	>40 (mm of Hg)			
Phacomorphic	0	12	17	29	10.951	0.09
Phacolytic	3	3	10	16		
Lens particle type	0	0	3	3		
Phacoanaphylactic	0	0	2	2		
Total	3	15	32	50		

P VALUE= 0.09. Here we found that the relation between the presenting IOP and different types of LIG is not statistically significant.

In this study, majority of cases had IOP >40mmHg at presentation in both phacomorphic and phacolytic glaucoma. Only a total of 3 cases presented with IOP <30mmHg.

TABLE 12: VISUAL ACUITY OF AFFECTED EYE AT PRESENTATION

Vision A/E	Frequency	Percent
HMCF	32	64
PL+	16	32
PL+/-	2	4
Total	50	100

VISUAL ACUITY

Presenting vision was affected to hand movement close to face (HMCF) to perception of light (PL+).

Cases presented with poor vision of hand movement close to face to perception of light. Few cases also presented with doubtful perception of light.

TABLE 13: STATUS OF THE LENS IN PHACOMORPHIC AND PHACOLYTIC GLAUCOMA CASES OF AFFECTED EYE

LENS	lens particle type	DIAGNOSIS			Total
		Phacolytic	phacomorphic	Phacoanaphylactic	
DL	0	0	2	0	2
HM	1	12	4	0	9
IN CAT	1	2	21	2	34
MAT CAT	1	2	2	0	5
Total	3	16	29	2	50

Majority of the phacomorphic LIG cases had intumescent cataract (IN CAT) i.e. 21 cases. And majority of phacolytic

LIG cases had hypermature cataract (HM) i.e 12 cases.

MANAGEMENT AND ITS RESPONSES

TABLE 14: SURGICAL PROCEDURE

SURGICAL PROCEDURE	lens particle type	phacolytic	Phacomorphic	Phacoanaphylactic	Total
SICS+PCIOL	2	12	16	2	31
SICS+PCIOL+I	0	1	5	0	6
TRIPLE PROCEDURE	1	3	8	0	13
Total	3	16	29	2	50

In this study we found that small incision cataract surgery with post capsular IOL implantation is the mainstay treatment with resultant decrease in IOP in all forms of LIGs.

TABLE 15: IMMEDIATE POST-OP IOP

IMMEDIATE POST OP IOP	Phacomorphic	Phacolytic	lens particle type	Phacoanaphylactic	Total
<20 mm Hg	24	12	3	2	41
>20 mm Hg	5	4	0	0	9
Total	29	16	3	2	50

Here we found that a total of 41 patients experienced IOP < 20mmHg immediately post op and only 9 cases had IOP> 20mmHg immediate post-op

VISUAL OUTCOME

TABLE 16: FINAL BCVA IN ALL CASES

	POST OP VD		BCVA 6 TH WEEK		p value
	Frequency	Percent	Frequency	Percent	
6/6	0	0.00%	3	6.00%	<0.001
6/9	0	0.00%	19	38.00%	
6/12	3	6.00%	14	28.00%	
6/18	6	12.00%	5	10.00%	
6/24	8	16.00%	4	8.00%	
6/36	9	18.00%	4	8.00%	
6/60	15	30.00%	1	2.00%	
FC AT 1M	3	6.00%	0	0.00%	
FC AT 3M	1	2.00%	0	0.00%	
FC ATB 4M	1	2.00%	0	0.00%	
HMCF	4	8.00%	0	0.00%	
Total	50	100.00%	50	100.00%	

The post-op vision and the BCVA at 6th week varied considerably in our study.

TABLE 17: PRESENTING IOP AND FINAL BCVA

IOP	BCVA			OR	95%CI	p value
	6/6-6/12 (Good Vision)	>6/18 (Poor Vision)	Total			
<40 mm Hg	14(82.4)	3(17.6)	17(100)	2.33	0.552-9.866	0.242
>40 mm Hg	22(66.7)	11(33.3)	33(100)			
Total	36(72)	14(28)	50(100)			

82.4% (14 cases) of cases with IOP <40mmHg had good vision post-op i.e. 6/6-6/12. Whereas 66.7%(22cases) cases had poor vision post-op i.e. > 6/18.

TABLE 18 : FINAL BCVA IN RELATION TO AGE

Age Group	BCVA			OR	95%CI	p value
	6/6-6/12 (Good Vision)	>6/18 (Poor Vision)	Total			
<50 Years	4(80)	1(20)	5(100)	1.625	0.166-15.963	0.675
>50 years	32(71.1)	13(28.9)	45(100)			
Total	36(72)	14(28)	50(100)			

80% cases with <50 years of age had good vision post op whereas 71% cases with > 50 years had good vision post op.

TABLE 19: FINAL BCVA IN RELATION TO DURATION OF DISEASE

DURATION	BCVA			OR	95% CI	p value
	6/6-6/12 (Good Vision)	>6/18 (Poor Vision)	Total			
<7	24(85.7)	4(14.2)	28(100)	5.00	1.295-19.31	0.0148
>7	12(54.5)	10(45.4)	22(100)			
Total	36(72)	14(28)	50(100)			

In this study we found that good duration between onset of symptoms and post-op vision was proportional to shorter management.

DISCUSSION

The study was carried out on 50 cases of lens induced glaucoma (LIG) who were admitted and treated in Regional Institute of Ophthalmology, Guwahati, GMCH.

It is a longitudinal study undertaken to outline the different characteristics of lens induced glaucoma along with its risk factors and its effect on post-operative visual acuity, IOP and following manual SICS operation.

The patients were followed up from their time of admission and managed in the ward. These patients were followed upto 6 weeks post-operatively and the factors influencing the final visual outcome were studied.

Statistically Chi-Square test(x) and Probability values (p) were used and $p < 0.05$ is considered statistically significant.

INCIDENCE:

In this study, the incidence of lens-induced glaucoma is 0.174% (Table no.1) out of the total cases attending outpatient department during the period of one year. The incidence of LIG in our study is marginally less but comparable to the observation by Saikia AK¹⁷ in a study conducted in the same institute. It is also much lower than that of previous report by Dutta et al²³. This relatively lower incidence is most probably due to the effective implementation of the National Programme for Control of Blindness under which multiple eye camps to detect eye diseases (mostly cataract and refractive error) are being conducted round the year in the catchment area of the RIO,GMCH.

Also due to the ongoing COVID 19 pandemic, the influx of patients to the hospital OPDs have reduced to a great extent owing to lockdowns and similar inconveniences.

DIAGNOSIS:

In our study (Table 2), it is observed that the most frequent type of LIG was

Phacomorphic glaucoma (58%) followed by Phacolytic glaucoma (32%). Similar occurrence was noted by Pradhan et al.²⁴ (72%), Rijal AP²⁵ (65%) and Murty et al²² (62%)

Hence occurrence of various lens-induced glaucomas in the above studies show variations but phacomorphic glaucoma has been the commonest among all the studies including our study. Lens particle glaucoma and phacoanaphylactic glaucoma constituted the remaining 10%. No cases of glaucoma due to subluxation/dislocation of lens were found in our study. It is seen that phacomorphic and phacolytic glaucoma were seen commonly in association with intumescent and hypermature cataract [Table 13]. This solidifies the importance of early detection and treatment of cataract.

SEX DISTRIBUTION:

In this study, females seemed to have an increased risk of having LIG compared to males with a ratio of 1.3:1. It was observed that the majority (58%) of cases occurred among females and 42% cases occurred in males. In this study $p=0.25$; which concludes that although clinically, incidence of LIG was more common in female it was not statistically significant maybe because of the ongoing COVID19 pandemic situation. [Table-3]. Prajna et al.¹⁸ in 1994 in Madurai, found marginally significant increased risk of having these glaucomas in females ($p=0.05$). We also found result similar result as with Pradhan et al.²⁴ who reported female to male ratio of 1.7:1. He observed that socio-economic and cultural constraints play a major role leading to neglect and late presentation of cataract in females in region where the study was done. In another study by Rijal AP²⁵ female to male ratio was 1.2:1. In our study also we found that female to male ratio is increased due to socio-economic constraints upon females.

AGE DISTRIBUTION:

In our study we found that lens induced glaucoma was more common in elderly people, particularly in the fifth decade and above with mean age at presentation being 61.54 years. Highest number of cases occurred in the age group 56-70 years (62%). [Table-4]

Pradhan et al²⁴, found occurrence of LIG in the age range of 40 to 80 years and highest (43.1%) in the 60 to 69 years age. Occurrence of LIG in the older age group is attributed to the fact that development of cataract is neglected till they become hypermature and produce acute symptoms like pain requiring immediate medical help. This was mainly because of insidious onset of cataract, lack of medical awareness and literacy, lack of regular eye check-up, ignorance and limited resources in developing countries. Similar observations were also made by Saikia AK¹⁷. In the study by Murty et al²² (78%) lens induced glaucoma were seen in the age group of above 50 years. In our study $\chi^2 = 1.407$, p -value=0.495 showing that no significant association existed between the age group of patients and the disease in this study.

Presenting signs and symptoms

Most of the cases of lens induced glaucoma presented with common symptoms. The onset of glaucoma in all of the cases was characterized by pain in and around the eyes with headache of varying intensity of nausea and vomiting. These symptoms were preceded by gradual progressive, painless diminution of vision for months or years. Redness and ciliary congestion were present in all the affected eyes. The presenting symptoms varied in severity and were directly proportional to the degree of rise of intraocular pressure. In phacomorphic group, patients also complained of sudden severe diminution of vision in the affected eye. [Table-7]. Dharet al.²⁶ (1984) also reported similar findings to our study with 100% occurrence of dimness of vision, eye pain and redness of eyes in his series of 214 cases of lens induced

glaucoma. Studies by Rohatgi et al.²⁷ and Saikia AK¹⁷ also reported same findings.

DURATION OF SYMPTOMS

Majority of the cases in this study 28(56%), presented with pain and redness within the first week after developing the symptoms. The rest of 22 cases (44%) presented after 1 week. The mean duration was 8.80 days. In the study by Pradhan et al.²⁴ 70% of cases presented after 10 days of onset of symptoms citing reasons like 'no escort' and 'lack of money'

In our study, duration of symptoms had a linear relation with best-corrected visual acuity at final follow up. More the delay in presentation, poorer was the visual outcome, which was both clinically and statistically significant ($p=0.0148$) [Table 19]

SOCIOECONOMIC BACKGROUND:

Most of the patients who presented with LIG were from rural and semi urban areas and of poor socioeconomic background. It was observed that literacy among the cases was low and many of them were from remote areas without any nearby eye care facility. This is one of the major causes for late presentation in our study.

In the series by Prajna et al¹⁸ all patients were from higher socio-economic group and belonged to the paying section. Both these series therefore may not reflect the true distribution of characteristics of these glaucomas in the general population.

INTRAOCULAR PRESSURE:

In our series 64% of cases presented with IOP of more than 40 mm of Hg.[Table-11]. The mean IOP at presentation in our study was 43.84 with SD of 9.93mmofHg [Table-9]. Dhar et al²⁶ in his study reported mean IOP in the affected eye of 36.6 mm of Hg with a standard deviation of 7.4 mm of Hg which was lower than that of our study with 9.93 mm of Hg. The highest recorded intra ocular pressure in the study by Dharet al.²⁶ was 60.3 mm of Hg which was comparable to our findings. Another

conducted by Rangaraj et al²⁰, the mean preoperative IOP was 46.2 mm of Hg which is slightly higher than that in our study. The intraocular pressure varied from 25 to 82 of Hg with a mean of 45.50 mm of Hg and showed a progressive rise with the duration of attack in the study by Jain IS et al²⁸. Prajna et al¹⁸ reported mean preoperative intraocular pressure of 42 mm of Hg with a standard deviation of 12 mm of Hg in his series.

In our study clinically significant proportion of cases (82.4%) with IOP at presentation less than 40 mmHg achieved good visual acuity of 6/6-6/12, than cases (66.7%) with IOP more than 40 mm Hg, whereas no significant difference was found for poor outcome. [Table-17]

Prajna et al.¹⁸ reported that no statistically significant association between the level of preoperative IOP and final visual acuity in his study. In 86.27 % [Table-17] of cases in our study, postoperative IOP was less than 20mm of Hg which is more than the observations by Pradhan et al.²⁴

Response to medical management:

In our study we found out that raised IOP and inflammation subsided significantly after the administration of topical steroids and anti-glaucoma medication. IOP was controlled by 20% mannitol, oral glycerol, acetazolamide orally and/or topical timolol maleate in different combinations. Similar observation was also reported by Dhar et al²⁶. In another study by Jain IS, Gupta et al²⁸, intraocular pressure was controlled preoperatively with or without mannitol in all the 86 eyes.

Surgical management:

In our study out of 29 cases of phacomorphic glaucoma, Combined surgery (SICS+PCIOL+Trabeculectomy) was done for 8 cases. Combined surgery was done in cases with longer duration of attack. SICS with PC IOL was done for remainder of cases of phacomorphic glaucoma cases, with short duration of attack. SICS with

PCIOL with iridectomy is done in 5 cases of phacomorphic glaucoma [Table-14]. Laser iridotomy was done in 1 of the case of phacomorphic glaucoma preoperatively, where IOP was not controlled with maximum medical management.

There were 16 Phacolytic glaucoma cases. SICS with PCIOL was done in 12 of those cases. Triple procedure was performed in 3 cases of phacolytic glaucoma and SICS+PCIOL+Iridectomy was done in 1 of the cases. Out of the three cases of lens particle glaucoma 2 were surgically managed with small incision cataract surgery with posterior chamber IOL implantation 1 with triple procedure. Also, the 2 phacoanaphylactic glaucoma cases were treated by combination of oral and topical steroid. After the symptoms were relieved, cataract operation with PCIOL was performed. [Table-14]

Prajna et al¹⁸ subjected all the patients to a traditional planned ECCE. A decision to implant a posterior chamber IOL was taken on those whose fellow eye was or which had a clear lens or very early lens changes, and those who insisted on having an IOL implant. A peripheral iridectomy was performed on all the patients.

In another study by Pradhan et al²⁴ the 311 cases underwent scleral tunnel suture less cataract surgery; 191 (61.4%) had ECCE without PCIOL and 102 (32.8%) received a +21D PCIOL. An ICCE was done in 17 (5.5%) patients; one of these patients (0.3%) received an ACIOL.

In our series we managed to do suture less cataract surgery in all the cases. Pre-operative IOP control in all those cases were achieved medically to acceptable limits before going for definitive surgery.

Best corrected visual acuity (BCVA) and its association with Age, IOP and duration of symptoms at presentation

BCVA of 6/12 or better was considered as good visual acuity and 6/18 or less as poor visual outcome.

In our study, out of 50 cases, (32%) cases presented with only perception of light

and 64% with hand movements close to face and 4% with doubtful perception of light [Table-12]

38% of cases in our study achieved best corrected visual acuity of 6/9 and 28% achieved 6/12 visual acuity at the end of final follow up at 6 weeks. 10% cases achieved visual acuity between of 6/18 and 36% regained visual acuity less than 6/24.[Table-16]

The cause of poor visual outcome in the cases of our series was attributed to late presentation leading to glaucomatous damage of the optic nerve head (ONH) in 5 of the cases which was characterized by increased Cup to disc ratio. In 6 cases of Proliferative and Non-proliferative diabetic retinopathy also contributed to the glaucomatous damage to produce poor vision.

In this series, BCVA of 6/12 or better is higher (58.82%) than observed by Pradhan et al²⁴. (31.40 %) and Gupta et al²⁸ (24 %) but is comparable to Prajna et al¹⁷. (59.12 %) and less than that observed by Murty et al.²²(80 %). 28% of cases in our study achieved moderately better vision between 6/18-6/60 which is higher than Murty et al.²² (10 %) and less than that observed by Rijal et al²⁵. (40%). BCVA in our series was better than that by Pradhan et al²⁴. Might be because the large sample size in that study (n=413) than ours (n=50). And more importantly 71% patients presented after 10 days in their series. In all case, we were able to do PCIOL implantation which factored in better visual outcome in our series. Also we were able to motivate patients to come for two follow up visits in 100 % cases unlike in the series by Pradhan et al²⁴ wherein spite of motivating the operated patients and offering monetary incentives, the follow-up rate was low. Only 105 patients (33.8%) reported for follow-up 4 - 12 weeks after surgery.

Association between Age and final BCVA

In this study [Table-18], 4 cases of age less than 50 years and 32 cases of age more than 50 years achieved good visual

acuity of better than 6/18. We observed that there was no statistically significant association between age at presentation and BCVA (P value =0.675, OR=1.625, 95 % CI -0.166-15.96). Marginally significant risk of poor visual outcome was observed in cases of age higher than 60 years when compared with younger patients by Prajna et al¹⁸ (OR=2.7, 95%CI=1.04 -6.93).

Association between duration of symptoms and BCVA

In this study (Table-19), 85.7 % of cases presenting earlier than 7 days, regained good visual outcome. Whereas only 54.5% of cases presenting beyond 7 days achieved good visual acuity of 6/12 or better. It showed that a significant risk of poor visual acuity was found when the duration between the onset of symptom and presentation to our OPD was more than 7 days (p value= 0.0148; OR=5.00; 95 % CI 1.295-19.31). Similar observation was made by Prajna et al¹⁸ where a significant risk of poor visual acuity was found when the duration between the onset of pain and surgery exceeded five days.

Association between IOP and BCVA

In our study, 82.4% [Table-17] of cases with IOP at presentation less than 40mmHg achieved good visual acuity, whereas cases with IOP more than 40 mm Hg i.e. 66.7% achieved good visual outcome. The correlation between pre-operative IOP and visual outcome was, clinically significant but statistically not significant (p value=0.252; OR=2.33, 95% CI=0.552-9.866). Madurai study (Prajna et al¹⁸) also had found no statistically significant association between the level of preoperative IOP and final visual acuity. (p value=0.07)

CONCLUSION

From our study we can draw the following conclusions

- A cataractous lens can produce an important vision-threatening

complication like lens-induced glaucoma and it can be of varied types.

- Diminution of vision, eye pain and redness are the main clinical presentation of LIG where extraction of the cataractous lens results in immediate reduction in IOP with a favourable visual outcome.
- The mainstay to prevent LIG is early diagnosis and treatment of cataract. Since delayed treatment of lens-induced glaucoma may result in poor visual outcome.
- Health education about regular eye checkup and prompt management of cataract is of utmost importance for a better visual outcome and to prevent complications like lens induced glaucoma. The role of community outreach programmes like eye-camps is an important tool for disease detection and a healthy community management in a developing country like India.

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