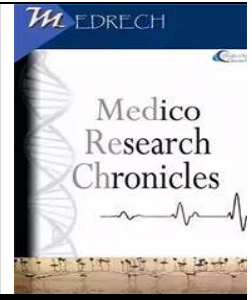




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A CLINICAL STUDY ON LENS-INDUCED GLAUCOMA AND ITS VISUAL OUTCOME AFTER CATARACT SURGERY AT TERTIARY EYE CARE CENTER IN WESTERN MAHARASHTRA

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ABSTRACT

Introduction: Lens-induced glaucomas (LIG) are a common occurrence in rural areas of India. It has long been recognized clinically that several forms of glaucoma may occur in association with the formation of cataracts, which are an important cause of secondary glaucoma in the developing world. The present study has endeavored to determine the characteristics, risk factors, and their consequences on the postoperative visual outcome, intraocular pressure (IOP), including optic disc changes in lens-induced glaucoma.

Purpose: To study the demographics, clinical presentations of different types of LIG, and its surgical outcome in terms of visual acuity and IOP control after cataract surgery.

Material and methods: This prospective study was conducted in the Ophthalmology department at Tertiary eye care center in Western Maharashtra from January 2015 to December 2019. Patients visiting the Hospital with classical symptoms of LIG were taken into study. All these patients underwent a complete ocular examination using Slit lamp biomicroscopy, Schiottz tonometry and Applanation tonometer. These patients were operated after explaining the possible prognosis by Small Incision Cataract Surgery (SICS) with PCIOL implantation.

Results: Total of 194 patients were taken into this study in which 88 (45.36%) were male patients and 106 (54.64%) were Female. Among different LIG patient's maximum patients had Phacomorphic Glaucoma

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accounting 61.86% (120 patients) and Phacolytic Glaucoma 37.11% (72 patients). Subluxated glaucoma was seen in 2 cases (1.03%). The majority of patients 61.86% presented after 1 week of symptoms and the reason for late presentation in more than half of the patients were financial constraints. Visual acuity was either hand-movement or just perception of light in majority of the eyes at the time of presentation. At last follow up 12 cases (6.19%) had best corrected visual acuity of more than 6/12.

Conclusion: Good visual acuity can be achieved in lens-induced glaucoma presenting within 1 week, with intraocular pressure of <35 mm of Hg and with meticulous control of intraocular pressure and inflammation with medications preoperatively. Necessary steps should be taken to educate especially rural population of India, the importance of timely surgery for better visual outcome and the dangers of poor visual result if cataract surgery is delayed.

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INTRODUCTION

Lens-induced glaucoma (LIG) was first described in the year 1900 by Gifford¹ and von Reuss² independent of each other. Later many other researchers did research on such types of cases and named it differently. At present all those conditions are termed as Lens Induced Glaucoma which includes many types of secondary Glaucoma in which Phacomorphic accounts for most of the cases followed by phacolytic Glaucoma^{3,4,5}. Phacolytic glaucoma and lens particle glaucoma are secondary open-angle glaucomas. The iridocorneal angle is open, and there is blockage of the trabecular meshwork by lens proteins. Phacomorphic glaucoma and lens displacement glaucoma are secondary angle-closure glaucoma^{6,7,8}.

This preventable and curable condition though rare in developed countries is still prevalent in developing countries due to a large backlog of cataract, poor health education, poor socioeconomic status, fear of the operation. The definitive treatment for lens-induced glaucoma is cataract extraction⁹. The outcome following surgery in lens-induced glaucoma is primarily related to the duration between the onset of symptoms and the treatment and the presence of optic atrophy, uveitis and corneal edema¹⁰.

The aim of our study was to see demographics, clinical presentations of different types of LIG and to study the surgical outcome in patients with LIG after cataract surgery in terms of visual acuity and IOP control.

MATERIAL AND METHODS

This prospective study was conducted in the Ophthalmology department at the Tertiary eye care center in Western Maharashtra for the period of 5 years from January 2015 to December 2019. Total 194 cases were included in the study. The present study was approved by the Institutional Ethical Committee and written informed consent was obtained prior to the study from all patients.

Inclusion criteria

All LIG patients were identified and included in the study.

Exclusion criteria

Patients having primary open or angle-closure glaucomas with cataract.

Patients having other secondary glaucomas (such as due to trauma, inflammation, neovascular glaucoma etc)

A detailed clinical examination of both eyes including the status of the lens, depth of the anterior chamber by slit-lamp biomicroscopy, and Schiottz tonometry were

performed. At presentation visual acuity, IOP, inflammation, including corneal changes was recorded. Diagnosis of phacomorphic glaucoma was made when patients presented with symptoms of pain, redness of the involved eye, headache, IOP above 21 mmHg and on slit-lamp examination shallow anterior chamber (both centrally and peripherally), conjunctival injection, and intumescent lens. Diagnosis of phacolytic glaucoma was made in the patient presenting with raised IOP of above 21 mmHg, hyper mature cataract, deep anterior chamber and flare, and cells in the anterior chamber.

Initially, control of IOP was done with acetazolamide 500 mg oral three times a day and topical timolol maleate 0.5% two times a day. Intravenous mannitol 20% with a dose of 1 mg/kg was given rapidly over 30 minutes in cases where IOP was above 40 mm Hg before the cataract surgery. Topical dexamethasone six times a day was given to reduce inflammation in phacolytic glaucoma. After obtaining informed consent and explanation of relatively guarded prognosis for surgery, the patients irrespective of the diagnosis of either phacomorphic or phacolytic glaucoma were subjected to SICS with intraocular lens (IOL)

implantation. Postoperatively in the ward, all the patients received the topical antibiotic-steroid combination, six times a day and mydriatic-cycloplegic, twice a day. If severe uveal inflammation was present, then a short course of systemic steroids was given. If the tension appeared to be on the higher side, topical timolol 0.5% two times a day, were instilled and in severe cases, oral acetazolamide or IV mannitol 20% was given depending on the severity. All the patients were followed up regularly at 1, 2, 4 and 6 weeks intervals. At every visit, patients were evaluated for visual acuity with Snellen's chart, IOP by schiottz tonometer, slit-lamp examination of the anterior segment and posterior pole examination with a direct ophthalmoscope and 90 D lens.

RESULTS

Over 5 years period, 194 cases of lens-induced glaucoma were enrolled. In our study, phacomorphic glaucoma was found to be more common 61.86% (120 cases) than phacolytic 37.11% (72 cases). Subluxated glaucoma was seen in 2 cases (1.03%). No cases were reported of phacoanaphylactic glaucoma. (Table 1).

Table 1- Types of LIG

Types of LIG	No. of cases
Phacomorphic glaucoma	120 (61.86%)
Phacolytic glaucoma	72 (31.11%)
Subluxated glaucoma	2 (1.03%).
Total	194

In this study, the age range was 51–83 years with a mean of 65.57 ± 7 years. There was a higher number of female 106 cases (54.64%) as compared to the male 88 cases (45.36%) with female to male ratio of 1.2:1 with a mean age of 65.60 ± 6 years in females and $66.53 \pm$

7 years in males. Age- and sex-wise distribution is as shown in Table 2. 194 cases recorded over 5 years accounted for about 1.9% of all cases of senile cataract admitted for cataract extraction during this period.

Table 2- Age and sex wise distribution of cases

Age in years	Male	Female	Total
51-60	18 (9.28%)	22 (11.34%)	40
61-70	28 (14.43%)	34 (17.53%)	62
71-80	36 (18.56%)	42 (21.65%)	78
>80	6 (3.10%)	8 (4.12%)	14
Total	88	106	194

The time gap between the onset of symptoms and reporting of patients to the hospital is crucial as far as the visual outcome is concerned. As many as 120 patients (61.86%) presented after 1 week and only 12 patients (6.18%) presented within 48 hours of their symptoms. 62 patients (31.96%) were presented between 3rd to 6th days after onset of their symptoms.

At presentation majority of the patients in the affected eye had visual acuity hand movement or perception of light (PL) present. Only 8 cases (4.12%) were having inaccurate Projection of rays (PR) vision on presentation (**Table 3**). Examination of the fellow eye revealed that 44% had immature cataract, 52% were pseudophakic and 4% were aphakic.

Table 3- Visual acuity of patients at presentation

Visual acuity at presentation	No. of cases
Hand movement close to face	120 (61.86%)
PL, PR accurate	66 (34.02%)
PR inaccurate	8 (4.12%).
Total	194

191 out of 194 patients underwent small incision cataract surgery with PCIOL implantation and 3 patients had Intracapsular cataract extraction with ACIOL implantation.

In this study, the total mean IOP, at presentation was 42.18 ± 11.61 mm Hg (range 21–58 mm Hg), after medication, it was 28.71 ± 9.06 mm Hg and at last, follow-up it was 16.44 ± 6.54 mm Hg (**Table 4**).

Table 4- IOP at presentation and at last follow up

IOP (mm of Hg)	At presentation	At last follow up (after 6 weeks)
11-20	0	188 (96.91%)
21-30	4 (2.06%)	4 (2.06%)
31-40	64 (32.99%)	2 (1.03%)
41-50	76 (39.18%)	0
51-60	50 (25.77%)	0
Total	194	194

In this study, uveitis was the most common postoperative complication in 58 cases (29.90%), cystoid macular edema in 20 cases

(10.31%) and bullous keratopathy in 9 cases (4.64%) (Table 5).

Table 5- Postoperative complications

Post-operative complications	No of cases
Uveitis	116 (59.80%)
Cystoid macular edema	40 (20.61%)
Bullous keratopathy	18 (9.28%)
Hyphaema	17 (8.76%)
Vitreous in anterior chamber	3 (1.55%)
Total	194

Best-corrected visual acuity (BCVA) of 6/12 or better, at last follow up was achieved in 9 cases (4.64%) of PMG and 3 (1.55%) cases of phacolytic glaucoma. (Table 7). The cause of

low vision in these cases was due to anterior uveitis, corneal edema, bullous keratopathy and optic atrophy.

Table 6- BCVA, at last, follow up

Best-corrected visual acuity	No of cases, at last, follow up (after 6 weeks)
>6/12	12 (6.19%)
6/18-6/60	104 (53.61%)
5/60- 3/60	60 (30.93%)
2/60- HM (+)	6 (3.09%)
PL, PR accurate	4 (2.06%)
PL, PR inaccurate	8 (4.12%)
Total	194

DISCUSSION

LIGs are a common occurrence in India, hardly surprising in a situation where the incident of cataract cases far exceeds the total number of surgeries performed currently. Though these are clinically distinct entities, they have certain common factors in that they are lens-induced, they compromise the function of the optic nerve due to the rise of intraocular pressure, cataract surgery is curative in these cases, and finally, they uniformly share a guarded prognosis¹⁰.

This clinical study was undertaken to outline the different characteristics of glaucomas, to determine the risk factors and their consequences on postoperative visual acuity, IOP following planned extracapsular cataract extraction. In this study, the magnitude of LIG was 1.9% during the study period as against 1.5% in Lahan study¹¹.

In our study, a total of 194 patients were taken into this study of which 88 (45.36%) were male patients and 106 (54.64%) were Female. This female dominance was also seen in a study conducted by Dr. Venkatesh Prajna *et al.*¹² In our study among all types of Glaucomas, the highest was seen Phacomorphic Glaucoma accounting 61.86% (120 patients). Phacolytic Glaucoma was present in 70 patients which accounted for 31.11%. Subluxated Glaucoma was seen in 2 patients in our study (1.03%). Similar findings were seen by V Prajna *et al.*¹² Lahan study has reported female-to-male ratio of 1.7:1.¹¹ Although these entities may be more common in females because of socioeconomic constraints, we also have to consider the fact that the prevalence of LIG is more common in females than males. This finding was consistent with data from the Punjab study in

India and the Matlab study in Bangladesh. In this study; none of the cases had vision better than hand movement at presentation. In this study, BCVA of 6/60 or better is slightly higher (59.80%) than the Lahan study series.¹¹

Intra Ocular pressure was measured on admission before any medication and noted. Highest percentage was among 41-50 mmHg (39.18%) followed by 31-40 mmHg (32.99%) and 51-60 mmHg (25.77%). At last, follow-up all those patients were measured again for IOP and noted. The highest patients were between 11-20 mmHg (96.91%). Rest was 21-30 mmHg (2.06%) making it clear that eyes were out of danger. This Drastic fall in IOP was only because the cause for the Glaucoma was Lens-induced swelling and elimination of cause, which brought the IOP back to normal. The same Findings were seen in studies conducted by Yaakub *et al.*¹³

CONCLUSION

Good visual acuity can be achieved in lens-induced glaucoma presenting within 1 week, with intraocular pressure of <35 mm of Hg and with meticulous control of intraocular pressure and inflammation with medications preoperatively. Planned small incision cataract surgery with IOL implantation, minimal tissue handling, and a good follow-up is the key factors in the management. Necessary steps should be taken to educate especially the rural population of India, the importance of timely surgery for better visual outcome and the dangers of poor visual results if cataract surgery is delayed.

This study has highlighted the characteristics, risk factors, and their consequences in LIGs, and also the importance of early diagnosis, and efficient medical and surgical management of LIG cases for preventing blindness.

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