

Visual Outcome in Patients of Lens Induced Glaucoma by Surgical Management

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Abstract:

Background: Lens induced glaucoma (LIG) is a type of secondary glaucoma and sight threatening disease. It is common in India and seen in the patient with senile cataract, requiring immediate attention and management to restore vision and prevent blindness.

Aim: To study the visual outcome and intraocular pressure control following surgical management of lens induced glaucoma.

Materials and Methods: A total of 64 cases of lens induced glaucoma were included after taking prior consent. The evaluation included best corrected visual acuity (BCVA), intraocular pressure (IOP), slit lamp biomicroscopy and management either by Cataract surgery alone or cataract surgery combined with trabeculectomy. All cases were followed up postoperatively on day 1, 1 week & 6 weeks.

Results: Out of 64 cases, the male: female ratio was 1:1.4 and most common age group to be affected was 61–70 years (46.9 %). The vision was diminished to projection of light (PL), projection of ray (PR) accurate in all quadrants in 53.1 % of cases and the mean IOP was 47.36 mmHg at the time of presentation. Phacomorphic glaucoma (61 %) was the commonest type and 46.9% of cases were reported within 10 days of onset of symptoms. Cataract extraction & PCIOL were done in 64.1% of cases; combined surgery in 25%, and 9.3% of cases remained aphakic due to intraoperative complications. Post-operative BCVA was 6/12 or better in 73.3 % of cases presenting within 10 days of onset of symptoms. At last follow up 84.43% cases had IOP < 20 mmHg and 15.7% cases had IOP > 20 mmHg. The post-operative mean IOP was 17.82±3.78 mmHg.

Conclusion: Early diagnosis and timely intervention will achieve an excellent visual prognosis with control of IOP in lens induced glaucoma.

Keywords: Phacolytic glaucoma, Phacomorphic glaucoma, Secondary glaucoma, intraocular pressure.

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Introduction

Lens induced glaucoma (LIG) is a distinct pathological entity clinically recognizable, easily preventable and often curable by extraction of cataractous lens.[1] Lens induced glaucoma is common in India.[2] It is a common condition seen in the patient with senile cataract and is one of the commonest cause of secondary glaucoma requiring immediate attention and management to restore vision and prevent blindness.[3] In developing country like India due to poor socio economic condition and inadequate health care delivery system many of cataract cases progress to a state of hypermaturity with subsequent increased incidence of lens induced glaucoma. Even when an acute attack sets in it is usually ignored due to the above reasons and this delay in treatment sometimes leads to poor visual prognosis. Lens induced glaucoma

are heterogenous group of disorders which develop through either open angle or angle closure mechanism. Phacolytic glaucoma which is a principal complication of hypermature cataract and lens particle glaucoma both is types of secondary open angle glaucoma where anterior chamber angle is open. Hypermature cataract may cause the leakage of lens protein from intact capsule, which initiate intense inflammation and blockage of trabecular meshwork, subsequently responsible for intra ocular pressure elevation. Phacomorphic glaucoma and lens displacement glaucoma are secondary angle closure glaucomas. In phacomorphic glaucoma swollen lens block the normal flow of aqueous humor pushing the iris forward. Eventually trabecular meshwork gets blocked by iris which leads to sudden and extreme

rise in intraocular pressure.[4] The management of lens induced glaucoma suffers from controversy. Some advocate combined lens extraction and filtering surgery in cases of lens induced glaucoma of more than 10 days duration due to extensive peripheral anterior synechiae seen in such cases. Others differ stating that lens extraction alone would result in control of IOP in 80% of cases and combined surgery is unnecessary and would result in increased complication.[5,6] Whatever the mode of surgical management, the accepted definitive treatment for lens induced glaucoma is removal of lens.[7]

Each case depending on the mechanism by which glaucoma occurs has to be managed in different way. In general after controlling the intraocular pressure cataract surgery should be performed as soon as possible. Currently small incision cataract surgery with posterior chamber intraocular lens implantation with or without iridectomy is the preferred method.[8] Preoperative and post-operative morbidity is more in case of lens induced glaucoma than in an eye with a simple uncomplicated cataract.[9] Whatever be the mode of surgical intervention, the prognosis for good postoperative visual recovery in these conditions remains guarded, unless diagnosed early and managed efficiently.[10] The role of early diagnosis and treatment has to be stressed as visual prognosis worsens with increased duration of attack. The education of our public, mostly those of poor socioeconomic status is important as most of them in their ignorance feel that cataract should not be operated until one is totally blind. The purpose of this study is to find out visual outcome and intraocular pressure control following surgical management of lens induced glaucoma.

Materials and Methods

This prospective observational study was conducted in the department of ophthalmology, Veer Surendra Sai Institute of Medical Science and Research, Burla, Odisha, India, from November 2018 to October 2020. The ethical approval was obtained from institutional Ethics Committee. A total of 64 cases of lens induced glaucoma (LIG) were admitted and informed consent were taken from them for study. Patient diagnosed as LIG based on clinical symptoms and signs which included pain, loss of vision, redness of eye, headache and presence of an intumescent, mature or hyper mature cataract associated with raised IOP of more than 21 mm Hg were included in the study. LIG due to secondary cataract and Secondary glaucoma other than Lens Induced Glaucoma were excluded from the study. All the 64 patients after

clinical diagnosis were admitted and a detailed history, visual acuity test by Snellen's chart, Slit lamp examination, measurement of intraocular pressure by Goldman applanation tonometer, gonioscopy and B-scan were done. Other routine tests like lacrimal syringing, A-scan biometry and laboratory investigation were done. Medical management was done for relief from pain, bringing down the raised IOP and for control of the uveal inflammation. Prior to surgery, IOP was recorded in all patients and if the IOP was still raised intra venous injection Mannitol 20%, 100 ml was given at the rate of 50 drops/minute over a period of 30 minutes.

Pre-operatively pupils were dilated with combination of Tropicamide (0.8%) and Phenylephrine (5%) eye drops, instilled every 15min until the pupils dilated. After obtaining written informed consent and an explanation of a relatively guarded prognosis, all patients were taken for surgery irrespective of the level of fall of IOP. After the peribulbar block, digital pressure was applied except in lens displacement cases, for nearly 8 to 10 minutes to achieve good hypotony. Postoperatively all patients had received a topical antibiotic-steroid combination, 1 drop 6 to 8 times per day for a period of 6 weeks on tapering dose. A short-acting cycloplegic was used to prevent posterior synechiae formation. If the tension was above 20 mm Hg, topical timolol 0.5% twice daily was instilled. The data were tabulated on a Microsoft Excel spreadsheet. Qualitative data was analyzed using a chi-square test and Quantitative data were analyzed using an independent t-test where ever applicable using SPSS version 23. A p value less than 0.05 was taken as statistically significant.

Results

A total of 64 cases of Lens induced glaucoma, 27 (42.2 %) were male and 37 (57.8 %) cases were female. The mean age of the patients was 64.66 ± 10.54 years (range: 41-98 yrs). The LIG was commonest between 61-70 years (46.9 %) followed by age group 51-60 years (21.9%) and 14.1% of cases were between 71-80 years. Vision was diminished to PL and PR accurate in all quadrants in 34 (53.1 %) cases, PL present and PR defective in 26 (40.6%) cases and only 4 (6.3 %) cases present with hand movement at the time of presentation. The presenting symptoms diminution of vision, pain, redness and watering of eyes were present in all cases. Headache was present in 56 (87.5 %) cases, swelling of lid 33 (51.5 %) cases and vomiting in 8 (12.5 %) cases.

Table 1: Incidence of various types of lens induced glaucoma

Type of lens induced glaucoma	No of cases	Percentage (%)
Phacomorphic glaucoma	39	60.9%
Phacolytic glaucoma	22	34.4%
Glaucoma due to anterior dislocation on of lens	3	4.7%
Total	64	100%

The Phacomorphic glaucoma (PMG) was found in 39 (60.9%) cases followed by phacolytic glaucoma (PLG) 22 (34.4%) cases and 3 cases (4.7%) had glaucoma due to anterior dislocation of lens.

Table 2: Duration of symptoms at the time of presentation

Duration of symptoms (in days)	No of cases	Percentage
0-10	30	46.9 %
11-20	17	26.5 %
21-30	9	14.1 %
>30	8	12.5 %
Total	64	100 %

A total of 30 patients (46.9%) were reported before 10 days of onset of symptoms, 17 cases (26.5%) reported within 11 to 20 days, 9 cases (14.1%) reported within 21 to 30 days and 8 cases (12.5 %) presented after 30 days of onset of symptoms. The earliest was on the 5th day and 3 patients reported after 35 days.

Table 3: Incidence of presenting signs

Presenting signs	No of cases	Percentage
Cilliary congestion	64	100 %
Corneal edema	64	100 %
Keratic precipitate	14	21.8 %
Shallow anterior chamber	42	65.6 %
Aqueous flare	58	90.6 %
Mid dilated pupil	64	100 %
Persistence of pupillary reaction	8	12.5 %
Lens in AC	3	4.7 %

The ciliary congestion, corneal edema and mid dilated pupil were seen in all cases (100%). Aqueous flare was seen in 58 (90.6%) of cases. A shallow anterior chamber was seen in all 39 cases of phacomorphic glaucoma and 3 cases of dislocation of lens and constitutes total 65.5%. Eight cases (12.5%) of phacolytic glaucoma showed persistence of sluggish pupillary reaction. 3 cases had anterior dislocation of lens, causing pupillary block and secondary glaucoma.

Table 4: Preoperative IOP

Preoperative IOP(mm H g)	No of cases	Percentage
21 - 30	6	9.4 %
30- 40	17	26.6 %
> 40	41	64.1 %
Total	64	100 %

The maximum no of patients 41 (64.1%) had an IOP of more than 40 mmHg, 6 (9.4%) cases had IOP between 21–30 mmHg, and 17 cases (26.6 %) had IOP between 31-40 mmHg at presentation. The mean IOP recorded was 47.36 ± 13.5 mmHg. The maximum IOP was 75.1 mmHg while minimum was 21.9 mmHg. The IOP after medical management, 36 (56.3 %) cases had within normal range and in 28 (43.7 %) IOP was more than 20 mmHg. The mean IOP was 21.6 ± 6.04 mmHg after medical management.

Table 5: Surgical treatment under taken in case of lens induced glaucoma

Type of surgery	No of cases	Percent
SICS + PCIOL	41	64.1 %
SICS only	5	7.8 %
ICCE+SFIOOL	2	3.1 %
Combined	16	25 %
Total	64	100 %

The small incision cataract surgery (SICS) with posterior chamber intraocular lens (PCIOL) implantation was performed in 41 (64.1%) cases

and Combined surgery (lens extraction with Trabeculectomy) in 16 (25 %) cases having intraocular pressure of more than 25 mmHg even

after medical management. Out of 3 cases of anterior displacement of the lens 2 cases (3.1%) underwent ICCE and SFIOL implantation and 1 case underwent combined surgery due to long standing duration and had compromise outflow

facility and patient left aphakic. In 5 cases (7.8%) only SICS was done without IOL implantation due to intraoperative complications i.e. posterior capsular rupture and vitreous leakage.

Table 6: Post-operative best corrected visual acuity (BCVA)

BCVA at last follow up	Phacomorphic glaucoma	Phacolytic glaucoma	Displaced lens	p Value
6/6 – 6/12	15 (38.5 %)	13 (59.1 %)	0 (0 %)	0.282
6/18 – 6/60	15 (38.5 %)	5 (22.7 %)	2 (66.7 %)	
< 6/60	9 (23 %)	4 (18.2 %)	1 (33.3 %)	
Total	39 (100 %)	22 (100 %)	3 (100 %)	

The BCVA 6/12 or better at the last follow-up was achieved in 28 (43.8%) cases, useful vision (6/18 – 6/60) in 22 (34.4 %) cases and poor visual outcome <6/60 in 14 (21.8%) cases. 15 cases (38.5 %) of PMG and 13 cases (59.1 %) of PLG had 6/12 or better vision and 9 (23 %) cases of PMG and 4 (18.2 %) cases of PLG had poor visual recovery (<6/60) at last follow up. In case of lens dislocation 66.7% had useful vision and 33.3% had poor visual outcome [Table-6].

Table 7: Relation of post-operative BCVA with duration of symptoms

Post op BCVA	0 – 10. days	11-20. days	21-30. days	> 30. days	p value
Good	22 (73.3 %)	5 (29.4 %)	1 (11.1 %)	0 (0 %)	< 0.05
Useful	7 (23.3 %)	9 (53 %)	3 (33.3 %)	3 (37.5 %)	
Poor	1 (3.4 %)	3 (17.6 %)	5 (55.6 %)	5 (62.5 %)	
Total	30 (100 %)	17 (100 %)	9 (100 %)	8 (100 %)	

Out of 30 patients who were presented within 10 days of symptoms 22 (73.3%) cases had good visual acuity, 7 (23.3 %) cases had useful visual acuity and only 1 (3.4 %) case had poor visual recovery. Out of 8 cases presented after 30 days, 3 (37.5 %) cases had useful vision and 5 (62.5 %) cases had poor vision. There was statistically significant relationship between post-operative BCVA and duration of symptoms with p value <0.05.

Table 8: IOP control by different surgical modalities

Post IOP in mmHg	Types of surgery				Total
	SICS + PCIOL	SICS	ICCE + SFIOL	SICS + Trabeculectomy	
< 20	37(90.2 %)	3 (60 %)	0 (0 %)	14 (87.5 %)	54(84.3 %)
> 20	4 (9.8 %)	2(40 %)	2 (100 %)	2(12.5 %)	10(15.7 %)
Total	41(100 %)	5(100 %)	2(100 %)	16(100 %)	64(100 %)

At last follow up 54 (84.43%) cases had IOP < 20 mmHg whereas 10 (15.7%) cases had IOP > 20 mmHg. The post-operative mean IOP was 17.82±3.78 mmHg. Out of 48 cases of lens extraction, only (SICS+PCIOL,SICS alone and ICCE+SFIOL) 40 cases(83.3%) had post-operative IOP at last follow up less than 20 mm Hg, 8(16.7%) cases had IOP more than 20mm Hg and 14(87.5%) cases had IOP <20 mmHg those subjected to combined surgery.

Table 9: Intraoperative and postoperative complication

Complication	Types of surgery				Total N=64
	SICS + PCIOL n = 41	SICS N = 5	ICCE + SFIOL N = 2	Combined N = 16	
PCR with VL	4(9.6%)	3(60%)	0(0%)	3(18.7%)	10(15.6%)
Striate keratitis	6(14.6%)	1(20%)	2(100%)	6(37.5%)	15(23.4%)
Uveitis	15(36.6%)	3(60%)	1(50%)	9(56%)	28(43.7%)
Hyphaema	0(0%)	0(0%)	0(0%)	1(6%)	1(1.6%)
Shallow AC	2(4.9%)	0(0%)	1(50%)	13(81%)	16(25%)

The SICS with PCIOL group showed low incidence of complication both intraoperatively as well as post operatively. Posterior capsular rupture with vitreous loss was only intraoperative complication noted in 10(15.6%) cases. Among SICS with PCIOL group 15(36.6%) cases had uveitis followed by striate keratitis in 6(14.6%)

cases. Where as in SICS without IOL implantation group 60% had uveitis and 20% had striate keratitis. Out of total 16 cases underwent combined surgery 13(81%) cases had shallow AC, 9(56%) cases had uveitis, Striate keratitis, PCR with VL and hyphaema present in 6(37.5%), 3(18.7%), 1(6%) cases respectively.

Discussion

Lens induced glaucoma occurs commonly in developing country like India. LIG are clinically distinct entities having certain common factors which are lens induced and compromise the function of optic nerve due to high intra ocular pressure. The definitive treatment is lens extraction.[14] In our study out of total 64 cases, 27 (42.2 %) were male and 37 (57.8 %) cases were female and shows a slight female preponderance with male to female ratio 1:1.4.

A similar observation like the higher incidence of LIG in female as compared to male was seen by other studies.[3,10,11,12,13] This is because of the fact that lesser attention paid to old females in our society and delay in getting them operated for senile cataract, especially in rural areas leads to development of LIG. This is also explained by another reason that senile cataract is more prevalent among females than males. This finding was consistent with data from various study.[14,15] In this study, the age range was 41-98 years with a mean age of 64.66 ± 10.54 years. The highest number of cases occurred in the age group 61-70 years (46.9%). This was in accordance with other previous study where the incidence was maximum in 61-70 years age group.[3,10,12,16,17] This is explained by the fact that LIGs are a condition of old age. Phacomorphic glaucoma was the commonest type (61 %) of glaucoma induced by cataractous lens in our series followed by phacolytic glaucoma 34.4%. The highest incidence of PMG (61 %) in present study was supported by the finding of various previous studies.[3,7,10,11,12,18] Phacomorphic and Phacolytic glaucoma contribute main bulk of the present study (95.3%) which occurs following neglecting the cataract till it attains hypermaturity and lead to glaucoma. This is due to the unawareness about the disease and utility of available services. The present study shows that 30 patients (46.9%) of reported before 10 days of onset of symptoms with mean average being 15.03 days. The findings in the present study was in accordance with other previous study.[7,15] However more number of cases presents before 10 days of onset of symptoms in some other studies.[16,19] In our series 53.1% cases were presented late. Poverty, ignorance and fear of operation may have contributed to their delay in seeking treatment.

The presenting symptoms diminution of vision, pain, redness and watering of eyes were present in all cases. These symptoms have also been noted in all previous literature.[19,20,21] Cilliary congestion, corneal edema, mid dilated pupil were seen in all cases (100%). A shallow anterior chamber seen in all 39 cases of phacomorphic glaucoma and 3 cases of dislocation of lens and

constitute a total of 65.5%. Shallow anterior chamber with phacomorphic glaucoma was also noted by other studies.[22,23] Cases of phacolytic glaucoma showed either deep anterior chamber or anterior chamber of normal depth in this series which was also noted by other studies.[20,24,25] Eight cases (12.5%) of phacolytic glaucoma showed persistence of sluggish pupillary reaction which was also noted by the previous study as an important sign of phacolytic glaucoma.[18] Present study showed that at the time of presentation vision was diminished to PL and PR accurate in all quadrants in 53.1 % cases, only 6.3 % cases present with hand movement at the time of presentation. No cases had vision better than hand movement during presentation. Similar finding were noted by various authors in their studies.[10,19,26,27]

The mean IOP recorded in the present series was 47.36 mmHg with standard deviation of 13.59 and maximum no of patient 41 (64.1%) had an IOP of more than 40 mm Hg at the time of presentation. During presentation the mean IOP recorded by various authors ranges from 36.6 mm Hg to 44.18 ± 11.61 mm Hg.[3,11,17,19] According to some authors the height of IOP depended on the duration of attack, with higher pressure recorded if the duration of attack was long.[3,26] In our study we did not find statistically significant relations between height of IOP and durations of attack ($p=0.705$) and it was also supported by other studies.[13,17] The mean IOP was 21.6 ± 6.04 mmHg after medical management. Out of 64 cases 16 cases had IOP above 25 mmHg even after rigorous medical treatment. Most of these cases are phacomorphic type with extensive PAS formation. All of these cases were posted for combined lens extraction and trabeculectomy. SICS with PCIOL implantation was the treatment of choice in majority 41 (64.1 %) cases followed by combined surgery in 16 (25 %) cases.

According to various authors ECCE with PCIOL implantation in LIG is said to be safe and effective procedure to obtain visual recovery in such cases and maintenance of IOP less than 20 mm Hg on early post-operative days.[13,28,29,30,31,32] Planned manual small incision cataract extraction with PCIOL implantation is preferred now a day for management of LIG.[3,16,17] Hence we preferred manual SICS and PCIOL implantation as treatment of choice in majority (64.1 %) of cases. In this study BCVA 6/12 or better at last follow up was achieved in 28 (43.8%) cases, of which 15 (38.5 %) cases were PMG and 13 (59.1 %) cases were PLG. Present study showed that good visual acuity (BCVA 6/12 or better) achieved more in case of PLG than PMG as the PMG cases presents late, had more duration of attack and more IOP at presentation which contribute to poor visual

outcome, but the difference between two groups are not statistically significant.

Almost similar observations were noted by various authors in their studies.[3,9,10,11,12,17] Those patients who presents within 10 days of symptoms, most of them had BCVA 6/12 or better, while none of the patient presenting after 30 days of symptoms had 6/12 or better vision. However poor visual acuity (vision <6/60) was found in 62.5% of cases those who presented after 30 days of symptoms and in 3.4% of cases presenting within 10 days of symptoms due to development of uveitis. In our study we found both clinically and statistically significant correlation between the duration of attack and post-operative best corrected visual acuity. The relation of postoperative visual acuity with duration of attack has been noted by several authors.[3,9,13,16,26,28]

Out of total 41 cases subjected to SICS with PCIOL implantation 25(61%) cases had BCVA 6/12 or better and in 5(12.2 %) cases had poor visual outcome (<6/60) postoperatively, while postoperative BCVA 6/12 or better only in 18.8% cases subjected for combined surgery and 43.75% had poor vision (<6/60). This was because most (94%) of the cases subjected to combined surgery had duration of attack more than 10 days of duration in our study. Most of the cases with postoperative BCVA <6/60 had evidence of glaucomatous optic atrophy (7 cases, 11%). The uveitis, senile macular degeneration and corneal edema were found in 6.3%, 3.1% and 1.5% respectively which may result in poor visual outcome during last follow up. Rao VP et al [12] performed SICS with IOL implantation in all 32 cases in their study and found that maximum patients had BCVA between 6/12-6/18 (43.75%) followed by 6/24-6/36 (37.20%) with appropriate IOL implantation.

One notable finding was that even cases with defective PR had 6/12 or better vision post operatively. The similar findings have also been reported by various authors.[7,13,20,28,29,30,31] At last follow up the mean IOP was 17.82±3.78 mmHg. In combined surgery group slightly more no of cases (87.5%) had good control of IOP than only lens extraction group (83.3%) in present study. But no statistically significant difference was (P value=0.691) found between lens extraction alone with combined group in control of post-operative IOP <20 mm Hg in our series.

This findings closely matches the observations noted by Branganza A et al.in their study.[26] There is good control of IOP and visual prognosis after planned manual SICS with PCIOL which have been explained by various authors in recent time.[3,9,12,17] Posterior capsular rupture with vitreous loss was only intraoperative complication

noted in 10 (15.6%) cases. Similar intraoperative complications were noted by other author.[9] Complications tend to be little more in case of combined surgery as compare to SICS with PCIOL group. This findings were in accordance with other studies done by various authors.[6,19]

Conclusion

The early diagnosis, efficient medical management to control IOP and inflammation with meticulous surgery, expert postoperative management and timely follow-up will achieve an excellent visual prognosis with control of IOP in lens induced glaucoma.

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