VISUAL OUTCOME AND INTRAOCULAR PRESSURE CONTROL IN LENS INDUCED GLAUCOMAS FOLLOWING SURGERY
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ABSTRACT

BACKGROUND
Glaucoma is one of the preventable causes of blindness. Glaucoma may be primary or secondary. Lens induced glaucoma is one of the secondary glaucomas which is preventable. This study highlights the visual outcome and IOP reduction following surgery in various types of lens induced glaucomas. The aim of the study is to clinically analyse visual outcome and intraocular pressure control in lens induced glaucoma following surgery.

MATERIALS AND METHODS
100 patients with lens induced glaucoma attending glaucoma services of Regional Institute of Ophthalmology and Government Ophthalmic Hospital Chennai were included in the study. All the patients were subjected to visual acuity examination. Anterior segment examination by slit lamp, IOP measurement, B scan where fundus examination is not possible and UBM in required cases.

RESULTS
In our study, most cases (52%) were in the age group of 56-60 years. There was a slight male preponderance (59%). Maximum number of cases presented with very poor vision due to mature cataract and corneal oedema. Maximum cases (47%) presented with an IOP of 28-32 mmHg. Among 100 cases of lens induced glaucomas, 60% cases were phacolytic glaucomas, 29% were phacomorphic glaucomas, 10% were lens particle glaucomas, 1% was due to subluxated lens. Among 100 affected eyes, 50% had hyper mature cataract, 49% had mature cataract, 1% had immature cataract with subluxation. Maximum cases (72%) had PCIOL in other eye which was an important factor for late presentation to the hospital. All the patients were taken up for cataract extraction. The type of surgery depends on the type of lens induced glaucoma and was decided on the patient’s individual condition. At the end of six weeks the visual acuity for maximum number of cases (55%) was in the range of 6/36-6/18, 20% cases had vision in the range of 3/60-6/60, 20% cases had vision in the range of 6/12-6/9. Hence visual improvement occurred in 95% of cases at the end of sixth post-operative week. This is statistically significant (p<0.5).

With regard to IOP reduction, at the end of 6th post-operative week, intraocular pressure (IOP) was in the range of 12-14 mmHg in 60% cases, 16-18 mmHg in 40% cases.

CONCLUSION
Lens induced glaucoma occurs due to long standing cataractous lens which becomes hyper mature/mature and also due to trauma. In our study, most of the patients had good vision in fellow eye and PCIOL status. This shows that patients ignored the reduced vision in affected eye due to good vision in fellow eye, so their daily life was not affected until they developed symptoms. Hence it is important to educate the patient postoperatively, to regularly follow up and examine the fellow eye and advice cataract surgery promptly before complications develop.

KEYWORDS
Lens Induced Glaucomas, Phacolytic, Phacomorphic, Lens Particle Glaucoma, Subluxated Lens.


BACKGROUND
Glaucoma is a leading cause for blindness in the developing countries. It is a preventable cause of blindness and hence it is important to create an awareness about this condition. Congenital, juvenile, primary glaucoma and secondary glaucoma are the broad classification of glaucomas.1,2 There are various types of Secondary glaucomas like post inflammatory, angle recession, pseudo exfoliation, pigmentary glaucoma and lens induced glaucoma etc.3,4 With tremendous increase in medical facilities still there is a large rural population lacking access to modern medicine due to illiteracy, poverty, lack of awareness and therefore lens induced glaucomas are on the rise. Hence eye screening camps play a vital role in prompt identification of cataract.
cases before complications develop. In this study we have analysed the various lens induced glaucomas, its visual outcome and intraocular pressure reduction following surgery.

MATERIALS AND METHODS

Subject Selection
100 patients with lens induced glaucoma attending glaucoma services of Regional Institute of Ophthalmology and Government Ophthalmic Hospital were included in the study

Inclusion Criteria
Patients with phacolytic glaucoma / phacomorphic glaucoma/phacoanaphylaxis /lens particle glaucoma/ any subluxated or dislocated lens with raised IOP.

Exclusion Criteria
Patients under the age of 18, Patients with primary open angle glaucoma and primary angle closure glaucoma, Patients with other secondary glaucomas.
Patients with uncontrolled diabetes, hypertension, ischemic heart disease were excluded.

Examination Methods
All were subjected to anterior segment examination by slit lamp bio microscopy, best corrected visual acuity by Snellen chart. Intraocular pressure measurement was done either by Goldmann applanation tonometry or in cases with presence of corneal oedema rebound tonometry reading was recorded. Fundus examination if possible and in cases with no view of fundus B scan was done. All patients underwent Gonioscopic examination with Goldmann single mirror lens. In cases of lens subluxation, an Ultrasound Biomicroscopy (UBM) was done to know the degree of zonular dehiscence. Routine investigations like Blood sugar, Urine analysis, blood pressure measurement were done. Keratometry, Axial length, IOL power were calculated in patients undergoing surgery.

Follow Up
Patient undergoing cataract / combined surgery/lens removal with PC IOL will be under follow up for 6 weeks (post op day 1,3,7 and in end of 2nd, 4th and 6th week). At each visit visual acuity measurement, anterior segment examination by slit lamp, intraocular pressure by non-contact tonometer / rebound tonometer and fundus examination were done. At the end of one-month gonioscopy was repeated and field examination was done with automated perimetry/ manual fields.

RESULTS

In our study, among the 100 cases, 15 cases presented between age group 51-55 years, 52 cases in age group 56-60 years, 16 cases in age group 61-65 years, 15 cases in age group 66-70 years, 1 case in age group 71-75, 1 case in age group 76-80 years.

Maximum numbers of cases (52%) were in the age group of 56 -60 years.

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Maximum numbers of cases (52%) were in the age group of 56 -60 years.

Among the 100 cases in this study, 59% were males and 41% were females.

In our study out of 100 cases, 51% patients presented with a vision of perception of light (PL), 48% patients presented with a vision of hand movements (HM), 1% patients presented with a vision of reading at 1-meter distance (1/60).

<table>
<thead>
<tr>
<th>No. of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-55</td>
<td>15</td>
</tr>
<tr>
<td>56-60</td>
<td>52</td>
</tr>
<tr>
<td>61-65</td>
<td>16</td>
</tr>
<tr>
<td>66-70</td>
<td>15</td>
</tr>
<tr>
<td>71-75</td>
<td>1</td>
</tr>
<tr>
<td>76-80</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1. Showing Age Distribution of Patients
In our study, among 100 cases, 18% cases presented in an IOP range of 22-26 mmHg, 47% cases presented in IOP range of 28-32 mmHg, 23% cases presented in IOP range of 34-38 mmHg, 12% cases presented in IOP range 40-44 mmHg.

Maximum cases (47%) presented with an IOP of 28-32 mmHg.

In our study, among 100 cases of lens induced glaucomas, 60% Cases were Phacolytic Glaucomas (PLG), 29% were Phacomorphic Glaucomas (PMG),10% were Lens Particle Glaucomas (LPG),1% was due to Subluxated Lens Induced Glaucoma (SLIG).

In our study, among 100 cases, Posterior chamber IOL (PCIOL) in 72% and in 28% the unaffected other eye had of cases and immature cataract. Maximum cases (72%) had PCIOL in other eye.

In our study, among 100 cases, visual acuity in other eye was in the range 3/60-6/60 in 8% cases, 6/36-6/18 in 57% cases, 6/12-6/9 in 35% cases. Maximum number of cases (57%) had a visual acuity in 6/36-6/18 range.

In our study, among 100 cases of lens induced glaucomas, 15% of cases were taken up for combined surgery (SICS with Trabeculectomy), 16% of cases were taken up for Extra capsular cataract extraction (ECCE), 54% of cases were taken up for small incision cataract surgery (SICS), 10% of cases were taken up for small incision cataract surgery with peripheral iridectomy (SICS+PI), 5% of cases were taken up for small incision cataract surgery with lens removal (SICS+LR).

In our study, among 100 eyes which were operated 95% cases posterior chamber IOL (PCIOL) was implanted, 5% of cases were left aphakic due to complications.
Surgical Complications

Visual Acuity on Postoperative DAY 1
28% cases had 2/60 -6% cases had vision of range HM-2/60 (HM- 5%; 1/60-9% 2/60 -14%; 72% cases had vision of range 3/60-6/60 (3/60-16%; 4/60-25%; 5/60-21%; 6/60-10%) HM-2/60 (HM-1%; 1/60 9%). 84% cases had vision of range 3/60-6/60 (3/60- 21%; 4/60-14%; 5/60- 15%; 6/60-34%)

Visual Acuity on Postoperative DAY 3
In our study, among 100 cases: 16% had HM to 2/60 and 84% had 3/60 to 6/60

Visual Acuity on Postoperative DAY 7
5% cases had vision of range HM-2/60(HM- 0%; 1/60-5%; 2/60 -0%), 75% cases had vision of range 3/60-6/60(3/60-10%; 4/60-17%; 5/60-10%; 6/60-38%), 20% cases had vision of range 6/36-6/18 (6/36-15%; 6/24-5%; 6/18-0%)

Visual Acuity on Postoperative 2nd WEEK
5% cases had vision of range HM-2/60(HM- 0%; 1/60-5%; 2/60 -0%), 52% cases had vision of range 3/60-6/60(3/60-0%; 4/60-10%; 5/60- 5%; 6/60-37%), 38% cases had vision of range 6/36-6/18(6/36-28%; 6/24-10%; 6/18-0%), 5% cases had vision of range 6/12-6/9(6/12-5%,6/9-0%)

Visual Acuity on Postoperative 4th WEEK
5% cases had vision of range HM-2/60 (HM- 0%; 1/60-5%; 2/60 -0%), 35% cases had vision of range 3/60-6/60(3/60-0%; 4/60-0%; 5/60- 5%; 6/60-30%), 45% cases had vision of range 6/36-6/18(6/36-25%; 6/24-20%; 6/18-0%), 15% cases had vision of range 6/12-6/9(6/12-15%,6/9-0%) 15% cases had vision of range 6/12-6/9(6/12-20%, 6/9-0%).

Visual Acuity on Postoperative 6th WEEK
5% cases had vision of range HM-2/60(HM- 0%; 1/60-5%; 2/60 -0%), 20% cases had vision of range 3/60-6/60(3/60-0%; 4/60-0%; 5/60- 5%; 6/60-15%), 55% cases had vision of range 6/36-6/18(6/36-35%; 6/24-10%; 6/18-10%), 20.

In our study, among 100 eyes operated, post-operative iritis was present in all cases (100%).

In our study, among 100 eyes operated, zonular dehiscence occurred in 57% cases.
Postoperative IOP Control

<table>
<thead>
<tr>
<th>IOP (mmHg)</th>
<th>Pod 1</th>
<th>POD 3</th>
<th>POD 7</th>
<th>PO 2nd Week</th>
<th>PO 4th Week</th>
<th>PO 6th Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-14</td>
<td>26%</td>
<td>26%</td>
<td>42%</td>
<td>54%</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>16-18</td>
<td>49%</td>
<td>57%</td>
<td>42%</td>
<td>41%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>20-22</td>
<td>25%</td>
<td>17%</td>
<td>16%</td>
<td>05%</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 5. Showing Postoperative IOP Control

In our study among 100 cases, on post-operative day 1, intraocular pressure (IOP) was in the range of 12-14 mmHg in 26% cases, 16-18 mmHg in 49% cases, 20-22 mmHg in 25% cases. On post-operative day 3, intraocular pressure (IOP) was in the range of 12-14 mmHg in 26% cases, 16-18 mmHg in 57% cases, 20-22 mmHg in 17% cases. On post-operative day 7, intraocular pressure (IOP) was in the range of 12-14 mmHg in 42% cases, 16-18 mmHg in 42% cases, 20-22 mmHg in 16% cases. On post-operative 2nd week, intraocular pressure (IOP) was in the range of 12-14 mmHg in 54% cases, 16-18 mmHg in 41% cases, 20-22 mmHg in 5% cases. On post-operative 4th week, intraocular pressure (IOP) was in the range of 12-14 mmHg in 60% cases, 16-18 mmHg in 40% cases, 20-22 mmHg in. On post-operative 6th week, intraocular pressure (IOP) was in the range of 12-14 mmHg in 60% cases, 16-18 mmHg in 40% cases, 20-22 mmHg in 0% cases.

DISCUSSION

In our study, among 100 cases, at the end of 6th post-operative week visual field examination showed 95% with normal visual field, 5% of patients it could not be tested due to poor visual acuity.
Significance of The Study

Age
In our study, Maximum numbers of cases (52%) were in the age group of 56-60 years. In a study done by Venkatesh Prajna et al (1996) age group range was 43-80 years.\textsuperscript{5}

Sex
In our study there was a slight male preponderance (59%). Previous studies showed a slight female preponderance, but it was not statistically significant.\textsuperscript{6} Sex does not affect the disease process or the treatment in lens induced glaucoma cases.

Vision at The Time of Presentation
Among 100 cases, 51% patients presented with a vision of perception of light (PL), 48% patients presented with a vision of hand movements (HM), 1% patients presented with a vision of reading at 1-meter distance (1/60). Maximum number of cases presented with a very poor vision due to mature cataract and corneal oedema. In previous studies 90% cases presented with perception of light vision.\textsuperscript{6}

IOP at The Time of Presentation
Maximum cases (47%) presented with an IOP of 28-32 mmHg. IOP reduction should be done with medication before taking up for surgery. In a study done by Venkatesh Prajna et al (1996), IOP range was 22-70 mmHg.\textsuperscript{6}

Type of Lens Induced Glaucoma
In our study, among 100 cases of lens induced glaucomas, 60% cases were phacolytic glaucomas, 29% were phacomorphic glaucomas, 10% were lens particle glaucomas, 1% was due to subluxated lens induced glaucoma. Most of the previous studies were done only on phacolytic.\textsuperscript{7,8} and phacomorphic glaucomas.\textsuperscript{5,9,10}

Lens Status in The Other Eye
In our study, Maximum cases (72%) had PCiol in the other eye. This was an important factor for late presentation to the hospital.\textsuperscript{11} Since patient was operated in other eye and had good vision, they ignored the visual loss of the fellow eye and presented to hospital only when they had symptoms like pain and redness.

Visual Acuity in The Other Eye
Maximum number of cases (57%) had a visual acuity in 6/36-6/18 range and 6/12-6/9 in 35% cases. Because of good vision in other eye most of the patients are comfortable with the routine activity and presented late to hospital only when they developed pain and redness.

Type of Surgery Done
In our study, among 100 cases of lens induced glaucomas, 15% of cases were taken up for combined surgery (SICS with Trabeculectomy), 16% of cases were taken up for Extra capsular cataract extraction (ECCE), 54% of cases were taken up for small incision cataract surgery (SICS), 10% of
cases were taken up for small incision cataract surgery with peripheral iridectomy (SICS+PI), 5% of cases were taken up for small incision cataract surgery with lens removal (SICS+LR). The type of surgery depends on the type of lens induced glaucoma and decided on the patient’s individual condition.12

**IOL Implantation**
In our study, postoperatively 95% cases posterior chamber IOL was implanted, 5% cases were left aphakic due to surgical complications and planned for secondary IOL implantation in second sitting after inflammation reduces. The choice of secondary IOL can be iris claw lens or a scleral fixation lens.

**Surgical Complications**
Post-operative iritis was present in all cases (100%) zonular dehiscence occurred in 43% cases, 12% cases had posterior capsular rent and 5% cases had vitreous loss.

All these complications caused reduced visual acuity in early post-operative period. Patients who had conneal endothelial touch during surgery developed striate keratopathy post operatively and were treated with 5% hypertonic sodium chloride eye drops 4 times daily. In cases of severe post-operative iritis, subconjunctival dexamethasone injection of 0.5 cc is given, cycloplegics were used (cyclopentolate eye drops TDS).

**Post-Operative Visual Outcome**
At the end of six weeks the visual acuity for maximum number of cases (55%) was in the range 6/36-6/18, 20% cases had vision of range 3/60-6/60, 20% cases had vision of range 6/12-6/9. Hence visual improvement occurred in 95% of cases at the end of sixth post-operative week. This is a statistically significant (p<0.5) improvement.13 Among the 20% cases with a vision of 6/12, 15% were phacolytic glaucoma, 5% were lens particle glaucoma.

Out of 10 lens particle glaucoma cases, 50% (5 cases) had a good vision of 6/12 when compared to other types of lens induced glaucoma. 5% of cases had reduced vision due to aphakia and all the 5 cases had a vision in range of 6/18-6/12 with +10D Sph correction hence, planned for a secondary IOL implantation later after inflammation subsides.

**IOP Reduction**
At the end of 6th post-operative week, intraocular pressure (IOP) was in the range of 12-14 mmHg in 60% cases, 16-18 mmHg in 40% cases. Hence 100% cases had reduction in intraocular pressure following surgery in lens induced glaucoma. Hence surgery is the gold standard treatment for all lens induced glaucomas.14

**Visual Field Examination**
Among 100 cases, at the end of 6th post-operative week visual field examination showed 95% with normal visual field, 5% of patients it could not be tested due to poor visual acuity. Since all cases are promptly treated on time and intraocular pressure was controlled visual field loss was prevented

**CONCLUSION**
Lens induced glaucoma occurs due to long standing cataractous lens which patients had good vision in fellow eye and PCIOL status. This shows that patients ignored the reduced vision in affected eye due to good vision in fellow eye so their daily life was not affected until they developed symptoms. Hence it is important to educate the patient postoperatively, to regularly follow up and examine the fellow eye and advice cataract surgery promptly before complications develop.

Most of the patients who present with lens induced glaucoma were from rural areas where the surgical facilities are not easily available. Eye camps should be conducted in remote villages and screened for cataract and operated before complications occur. In lens induced glaucoma, surgery is the main stay of treatment after adequate control of intraocular pressure and inflammation with medications. Following surgery, intraocular pressure reduction occurs in all cases and visual improvement occurs in 95% cases.

**REFERENCES**

